

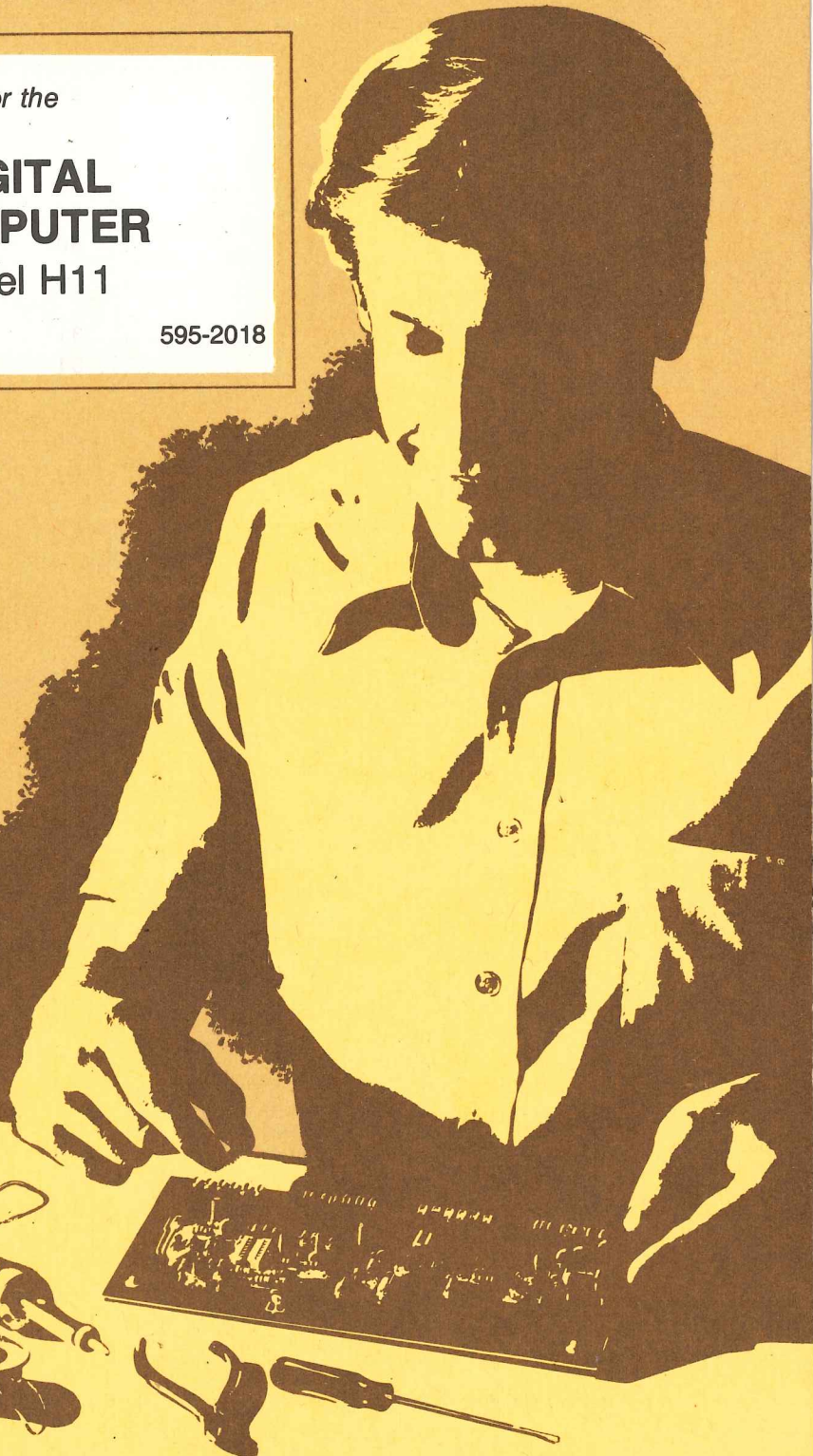
# HEATHKIT<sup>®</sup> MANUAL

for the

## DIGITAL COMPUTER Model H11

ASSEMBLY

595-2018



HEATH COMPANY • BENTON HARBOR, MICHIGAN



## HEATH COMPANY PHONE DIRECTORY

The following telephone numbers are direct lines to the departments listed:

Kit orders and delivery information ..... (616) 982-3411  
Credit ..... (616) 982-3561  
Replacement Parts ..... (616) 982-3571

### Technical Assistance Phone Numbers

8:00 A.M. to 12 P.M. and 1:00 P.M. to 4:30 P.M., EST, Weekdays Only  
R/C, Audio, and Electronic Organs ..... (616) 982-3310  
Amateur Radio ..... (616) 982-3296  
Test Equipment, Weather Instruments and  
Home Clocks ..... (616) 982-3315  
Television ..... (616) 982-3307  
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Appliances and General Products ..... (616) 982-3496  
Computers ..... (616) 982-3309



## YOUR HEATHKIT 90-DAY FULL WARRANTY

If you are not satisfied with our service - warranty or otherwise - or with our products, write directly to our Director of Customer Services, Heath Company, Benton Harbor, Michigan 49022. He will make certain your problems receive immediate, personal attention.

Our attorney, who happens to be quite a kitbuilder himself, insists that we describe our warranty using all the necessary legal phrases in order to comply with the new warranty regulations. Fine. Here they are:

For a period of ninety (90) days after purchase, Heath Company will replace or repair free of charge any parts that are defective either in materials or workmanship. You can obtain parts directly from Heath Company by writing us at the address below or by telephoning us at (616) 982-3571. And we'll pay shipping charges to get those parts to you — anywhere in the world.

We warrant that during the first ninety (90) days after purchase, our products, when correctly assembled, calibrated, adjusted and used in accordance with our printed instructions, will meet published specifications.

If a defective part or error in design has caused your Heathkit product to malfunction during the warranty period through no fault of yours, we will service it free upon proof of purchase and delivery at your expense to the Heath factory, any Heathkit Electronic Center (units of Schlumberger Products Corporation), or any of our authorized overseas distributors.

You will receive free consultation on any problem you might encounter in the assembly or use of your Heathkit product. Just drop us a line or give us a call. Sorry, we cannot accept collect calls.

Our warranty does not cover and we are not responsible for damage caused by the use of corrosive solder, defective tools, incorrect assembly, misuse, fire, or by unauthorized modifications to or uses of our products for purposes other than as advertised. Our warranty does not include reimbursement for customer assembly or set-up time.

This warranty covers only Heathkit products and is not extended to allied equipment or components used in conjunction with our products. We are not responsible for incidental or consequential damages. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

HEATH COMPANY  
BENTON HARBOR, MI. 49022

Prices and specifications subject to change without notice.

# Heathkit® Manual

*for the*

## **DIGITAL COMPUTER** Model H11

ASSEMBLY

595-2018

**HEATH COMPANY**  
BENTON HARBOR, MICHIGAN 49022

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## UNPACKING

Your Digital Computer shipping carton contains a box marked "100-1718" and another box marked "Packs 1-3." After you remove these two boxes, the remaining parts in the shipping carton form the Main Pack, which are items too large to fit in the other parts packs and those items which you will use in the chassis assembly section.

- ( ) Set aside the boxes marked "100-1718" and "Packs 1-3" until one of these packs is called for in an assembly section. DO NOT disturb either of these packs yet.

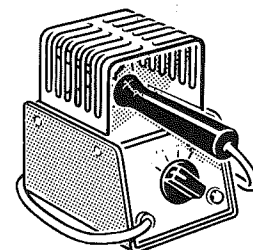
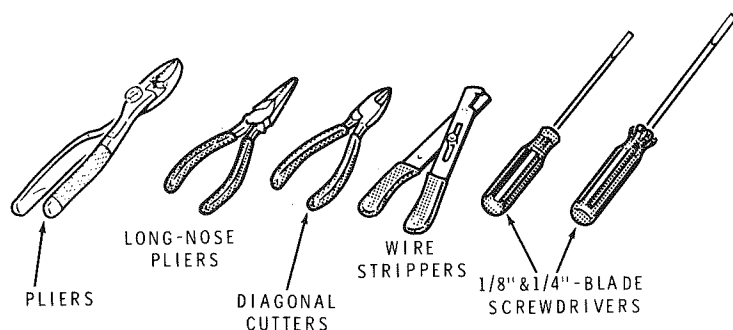
Each assembly section of this Manual contains its own "Parts List" and "Step-by-Step Assembly" instructions. At the beginning of each Parts List, you will be instructed which parts pack to locate and unpack. You may also be directed to locate certain required parts from the Main Pack.

To avoid intermixing parts, do not remove or open any of the parts packs until you are directed to do so at the beginning of one of the "Parts Lists." Return any part that is packed in an individual envelope, with the part number on it, back in its envelope after you identify it until that part is called for in a step. Some envelopes have one transparent side so you can identify the parts inside without opening the envelope.

# ASSEMBLY NOTES

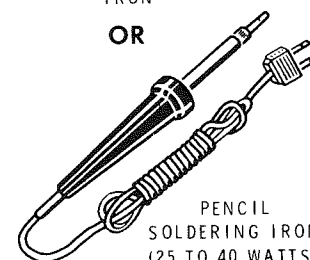
## TOOLS

You will need these tools to assemble your kit.

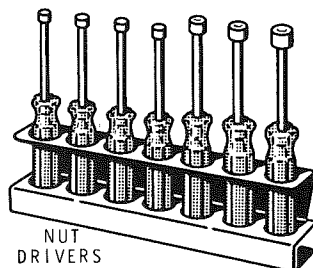
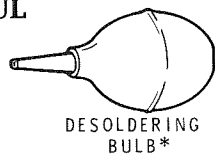


HEATHKIT  
SOLDERING  
IRON

OR



### OTHER HELPFUL TOOLS



\*TO REMOVE SOLDER FROM CIRCUIT CONNECTIONS.

## ASSEMBLY

1. Follow the instructions carefully. Read the entire step before you perform each operation.
2. The illustrations in the Manual are called Pictorials and Details. Pictorials show the overall operation for a group of assembly steps; Details generally illustrate a single step. When you are directed to refer to a certain Pictorial "for the following steps," continue using that Pictorial until you are referred to another Pictorial for another group of steps.
3. Most kits use a separate "Illustration Booklet" that contains illustrations (Pictorials, Details, etc.) that are too large for the Assembly Manual. Keep the "Illustration Booklet" with the Assembly Manual. The illustrations in it are arranged in Pictorial number sequence.
4. Position all parts as shown in the Pictorials.
5. Solder a part or a group of parts only when you are instructed to do so.





6. Each circuit part in an electronic kit has its own component number (R2, C4, etc.). Use these numbers when you want to identify the same part in the various sections of the Manual. These numbers, which are especially useful if a part has to be replaced, appear:
- In the Parts List,
  - At the beginning of each step where a component is installed,
  - In some illustrations,
  - In some sections of the Operation Manual.
7. When you are instructed to cut something to a particular length, use the scales (rulers) provided at the bottom of the Manual pages.

**SAFETY WARNING: Avoid eye injury when you cut off excess lead lengths. Hold the leads so they cannot fly toward your eyes.**

## SOLDERING

Soldering is one of the most important operations you will perform while assembling your kit. A good solder connection will form an electrical connection between two parts, such as a component lead and a circuit board foil. A bad solder connection could prevent an otherwise well-assembled kit from operating properly.

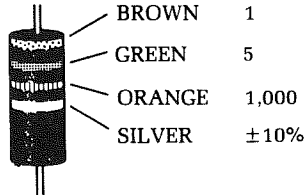
It is easy to make a good solder connection if you follow a few simple rules:

1. Use the right type of soldering iron. A 25 to 40-watt pencil soldering iron with a 1/8" or 3/16" chisel or pyramid tip works best.
2. Keep the soldering iron tip clean. Wipe it often on a wet sponge or cloth; then apply solder to the tip to give the entire tip a wet look. This process is called tinning, and it will protect the tip and enable you to make good connections. When solder tends to "ball" or does not stick to the tip, the tip needs to be cleaned and retinned.

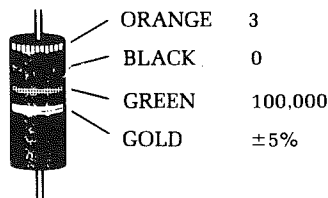
## PARTS

**Resistors** will be called out by their resistance value in  $\Omega$  (ohms),  $k\Omega$  (kilohms), or  $M\Omega$  (megohms). Certain types of resistors will have the value printed on the body, while others will be identified by a color code. The colors of the bands and the value will be given in the steps, therefore the following color code is given for information only.

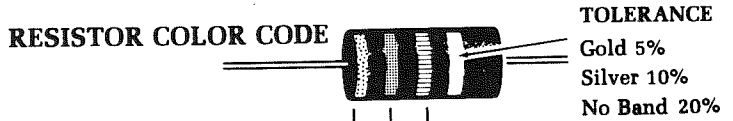
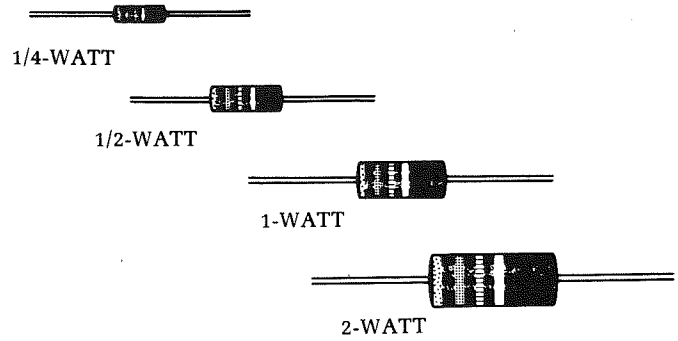
**EXAMPLES:**



$15 \times 1,000 = 15,000 \Omega$  (15,000 OHMS),  
or "15  $k\Omega$ "



$30 \times 100,000 = 3,000,000 \Omega$  (or 3  $M\Omega$ )  
3  $M\Omega = 3$  MEGOHMS



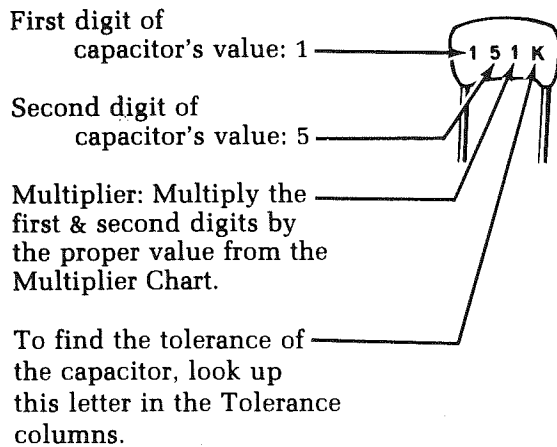
COLOR	1st DIGIT	2nd DIGIT	MULTIPLY BY
BLACK	0	0	1
BROWN	1	1	10
RED	2	2	100
ORANGE	3	3	1,000
YELLOW	4	4	10,000
GREEN	5	5	100,000
BLUE	6	6	1,000,000
VIOLET	7	7	10,000,000
GRAY	8	8	100,000,000
WHITE	9	9	1,000,000,000
GOLD			.1
SILVER			.01

**Capacitors** will be called out by their capacitance value in  $\mu F$  (microfarads) or  $pF$  (picofarads) and type: ceramic, Mylar\*, electrolytic, etc. Some capacitors may have their value printed in the following manner:

**EXAMPLES:**

$151K = 15 \times 10 = 150 pF$   
 $759 = 75 \times 0.1 = 7.5 pF$

**NOTE:** The letter "R" may be used at times to signify a decimal point; as in:  $2R2 = 2.2 (pF \text{ or } \mu F)$ .



MULTIPLIER		TOLERANCE OF CAPACITOR		
FOR THE NUMBER:	MULTIPLY BY:	10pF OR LESS	LETTER	OVER 10pF
0	1	$\pm 0.1 pF$	B	
1	10	$\pm 0.25 pF$	C	
2	100	$\pm 0.5 pF$	D	
3	1000	$\pm 1.0 pF$	F	$\pm 1\%$
4	10,000	$\pm 2.0 pF$	G	$\pm 2\%$
5	100,000		H	$\pm 3\%$
			J	$\pm 5\%$
8	0.01		K	$\pm 10\%$
9	0.1		M	$\pm 20\%$

\*DuPont Registered Trademark



# CHASSIS ASSEMBLY

## PARTS LIST

- ( ) Locate and remove all of the parts from the main pack (parts left in the shipping carton). Be sure you have removed the items from the carton as directed in the "Unpacking" section.
- ( ) Unpack these parts and check each part against the following list. The key numbers correspond to the numbers on the "Chassis Parts Pictorial" (Illustration Booklet, Page 1). Set aside any re-

maining parts not called for in this Parts List. They will be called for later.

To order a replacement part, always include the PART NUMBER. Use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Customer Service" inside the rear cover of this Manual. For prices, refer to the separate "Heath Parts Price List."

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
---------	----------------	------	-------------	-------------------

### ELECTRONIC COMPONENTS

A1	21-70	2	.01 $\mu$ F ceramic capacitor	C1, C2
A2	54-945	1	Power transformer	T1
A3	60-54	1	120/240 slide switch	SW2
A4	60-619	1	Rocker switch	SW1
A5	420-65	1	Fan	
A6	421-6	1	3-ampere, 3AG, slow-blow fuse	F1
A6	421-32	1	5-ampere, 3AG fuse	F1

### HARDWARE

NOTE: Hardware packets are marked to show the size of the hardware they contain (HDW #4, or HDW #2 & #6, etc.). You may have to open more than one packet — in this pack — to locate all of the hardware of any one size (#6, for example).

#### #6 Hardware

B1	250-381	15	6-32 $\times$ 3/8" black screw
B2	250-1264	11	6-32 $\times$ 3/8" hex head screw
B3	250-206	8	6-32 $\times$ 11/16" screw

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
---------	----------------	------	-------------	-------------------

### Hardware (cont'd.)

B4	252-3	10	6-32 nut
B5	252-22	2	6-32 Speed Nut*
B6	252-195	12	6-32 self-retaining nut (2 extra)
B7	253-35	2	#6 fiber flat washer
B8	254-1	12	#6 lockwasher
B9	255-83	4	6-32 threaded spacer
B10	259-1	1	#6 solder lug

### #8 & #10 Hardware

C1	250-1186	2	8-32 $\times$ 3/8" screw
C2	252-4	2	8-32 nut
C3	252-14	4	8-32 cap nut
C4	253-9	4	#8 flat washer
C5	254-21	6	#8 external tooth lockwasher
C6	253-8	1	#10 flat washer

### Other Hardware

D1	252-193	14	Push-on nut
----	---------	----	-------------

\*Registered Trademark, Tinnerman Company

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
---------	----------------	------	-------------	-------------------

**SHEET METAL PARTS**

E1	200-1305-1	1	Main chassis	
E2	203-1905-1	1	Front panel	
E3	203-1906-1	1	Top cover	
E4	204-2282	1	AC shield	
E5	204-2294	1	Fan mounting bracket	
E6	204-2267-1	1	Large cable clamp	

**WIRE-SLEEVING**

344-2	36"	Medium black wire
344-3	36"	Medium red wire
344-7	21"	Large black wire
344-21	21"	Small red wire (pretinned)
344-28	36"	Large yellow wire
344-30	18"	Orange wire
344-31	18"	Large brown wire
344-33	36"	Small black wire (pretinned)
344-34	36"	Small brown wire (pretinned)
344-36	30"	Small yellow wire (pretinned)
344-44	18"	Violet wire
344-45	18"	Gray wire
344-46	21"	White wire
344-118	36"	Large red wire
346-2	1	Large sleeving (5" long)
346-21	5"	Small sleeving
347-55	27"	8-wire cable
89-54	1	Line cord

**PRINTED MATERIAL**

F1	390-926	1	Caution label
F2	390-1388	1	Model label
F3	390-1403	1	LSI-11 label
	390-1405	1	Instruction card
	390-1406	2	Label sheet
F4	390-1411	1	Switch label
F5	391-34	1	Blue and white label
	597-260	1	Parts Order Form
		1	Assembly Manual (See Page 1 for part number.)
		1	Operation Manual (See Page 1 for part number.)

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
---------	----------------	------	-------------	-------------------

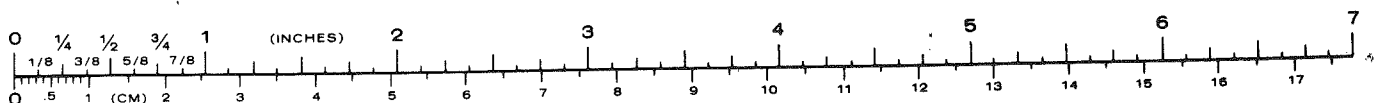
**PRINTED MATERIAL (cont'd.)**

		1	Software Manual (See Page 1 for part number.)	
	597-1654	1	DECUS Information Form	
	597-1655	1	DECUS Application Form	
	597-1656	1	Heath User's Group (HUG) Application	
	597-1659	1	HUG Return Envelope	
	597-1657	1	Computer Catalog	
	597-1664	1	Service Contract Card	

**MISCELLANEOUS**

G1	73-39	18"	Foam tape
G2	73-132	1	Rubber grommet
G3	75-736	1	Strain relief
G4	261-20	4	Rubber foot
G5	266-953	5	Hole cover
G6	354-5	7	Cable tie
G7	391-611	1	Nameplate
G8	391-613	1	Label housing
G9	423-11	1	Fuseholder
G10	431-41	1	2-lug terminal strip
G11	432-70	1	9-hole socket shell
G12	432-156	1	4-hole plug shell
G13	432-861	11	Small male connector pin (2 extra)
G14	490-185	1	Package of Soder Wick*
	203-1879	1	Set of side panels containing:
G15	203-1877	1	Right side panel
G16	203-1878	1	Left side panel
G17	206-1272	1	Fan guard
G18	490-5	1	Nut starter
G19	490-168	1	Wrench
	75-737	1	Fishpaper (6" x 8")
	701-29	1	3-ring binder
	703-17	1	Set of 11 tabs (for binder)
		1	Package of tapes
			Solder

\*Registered Trademark, Solder Removal Company







## STEP-BY-STEP ASSEMBLY

Refer to Pictorial 1-1 (Illustration Booklet, Page 3) for the following steps.

( ) Position the chassis as shown in the Pictorial.

### NOTES:

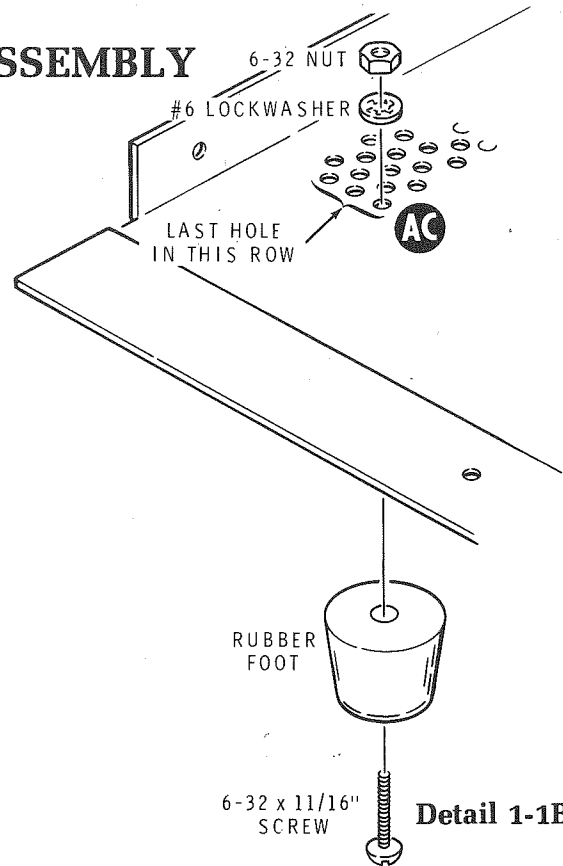
1. When a step calls for hardware, only the screw size is given. For instance, if a step calls for "6-32 x 3/8" hardware," it means you should use a 6-32 x 3/8" screw, one or more lockwashers, and a 6-32 nut at each mounting hole. The detail referred to in the step shows the proper number and placement of lockwashers.

2. Use the plastic nut starter supplied with this kit to hold and start 4-40 and 6-32 nuts on screws.

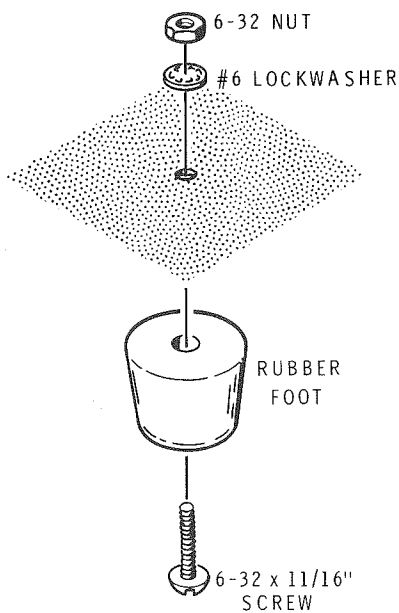
( ) Refer to Detail 1-1A and mount rubber feet on the bottom of the chassis at AA and AB. Use 6-32 x 11/16" hardware.

( ) Refer to Detail 1-1B and mount a rubber foot on the bottom of the chassis at AC. Use 6-32 x 11/16" hardware.

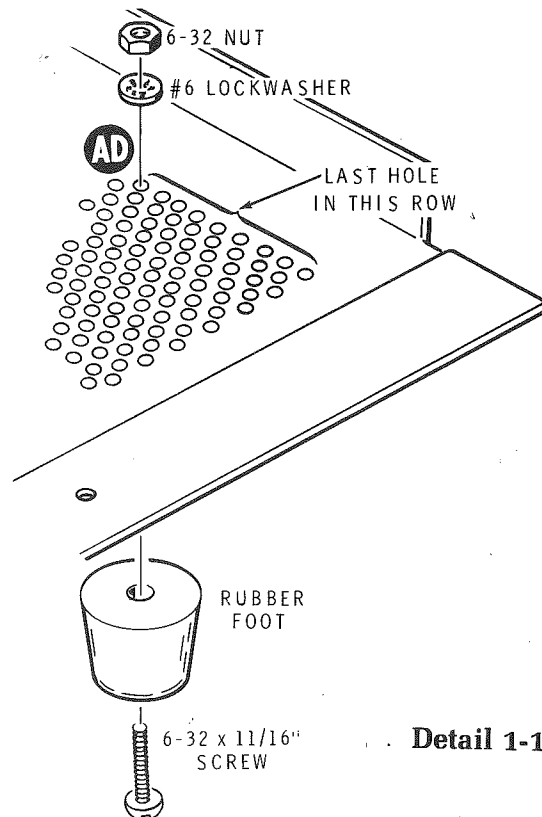
( ) Refer to Detail 1-1C and mount a rubber foot on the bottom of the chassis at AD. Use 6-32 x 11/16" hardware.



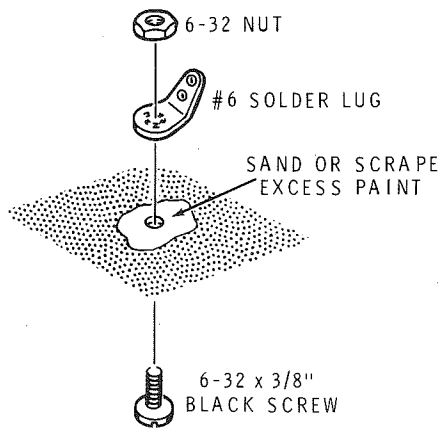
**Detail 1-1B**



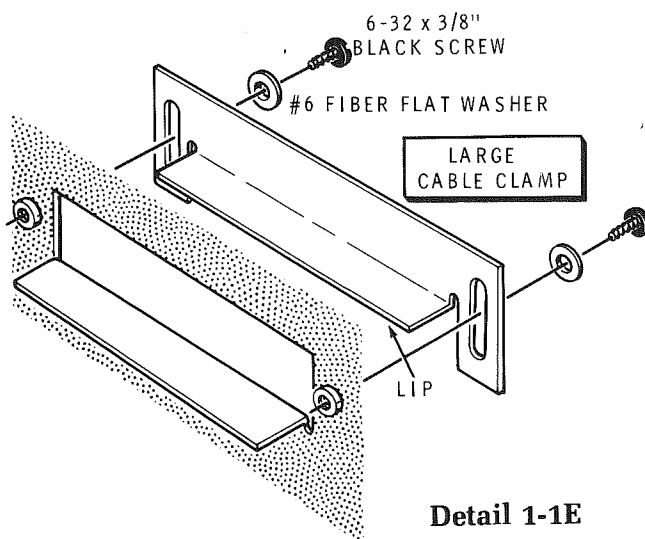
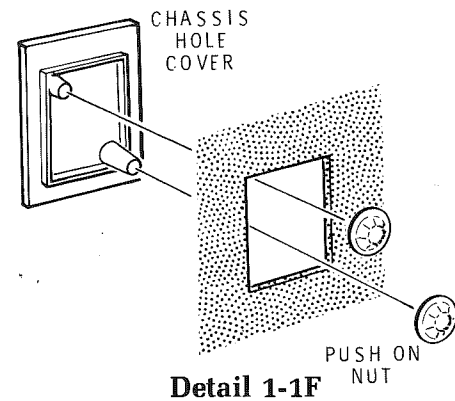
**Detail 1-1A**



**Detail 1-1C**

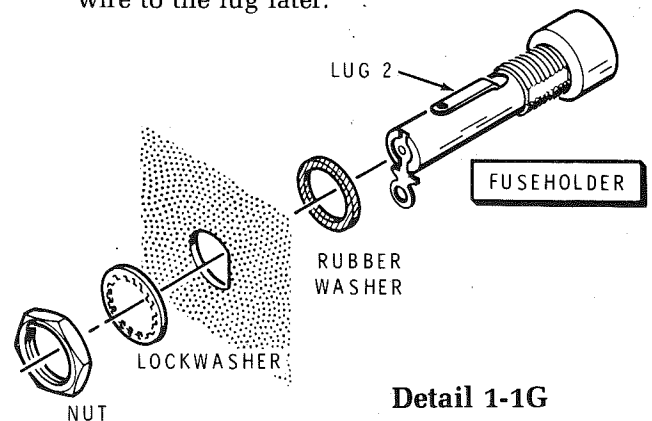
**Detail 1-1D**

- ( ) Scrape or sand any excess paint from around hole AE on the inside of the chassis.
- ( ) Refer to Detail 1-1D and mount a #6 solder lug at AE. Use 6-32 x 3/8" hardware and be sure to position the solder lug as shown in the Pictorial. Use a 6-32 x 3/8" black screw.
- ( ) Refer to Detail 1-1E and mount the large cable clamp on the rear of the chassis at AF. Use two 6-32 x 3/8" black screws and two #6 fiber flat washers. Be sure to position the lip on the clamp as shown. Slide the clamp down as far as possible before you tighten the screws.

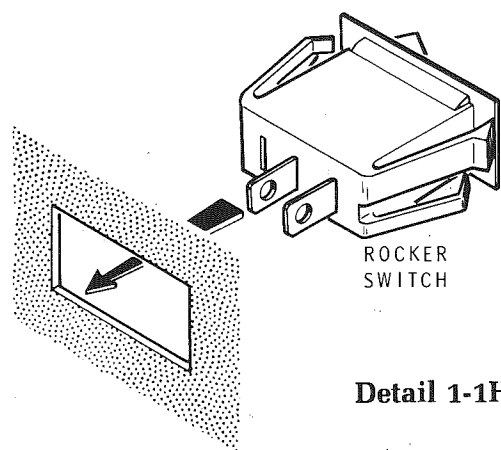
**Detail 1-1E****Detail 1-1F**

**NOTE:** Use the following procedure to mount the hole covers in the next three steps.

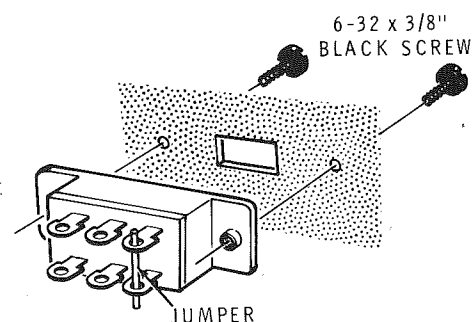
1. Refer to Detail 1-1F and from the outside of the chassis, insert the cover into the hole.
  2. Hold the cover in place and secure it with two push-on nuts.
- ( ) If you do not have a Serial Interface Module, install a hole cover at AG.
  - ( ) If you do not have a Parallel Interface Module, install hole covers at AH, AJ, AK, and AL.
  - ( ) If you have only one Parallel Interface Module, install hole covers at AH and AJ.
  - ( ) Refer to Detail 1-1G and mount the fuseholder at F1. Use the hardware supplied with the fuseholder. Position the fuseholder as shown in the Pictorial and do not overtighten the nut.
  - ( ) Carefully bend lug 2 of the fuseholder away from the fuseholder body so you can connect a wire to the lug later.

**Detail 1-1G**



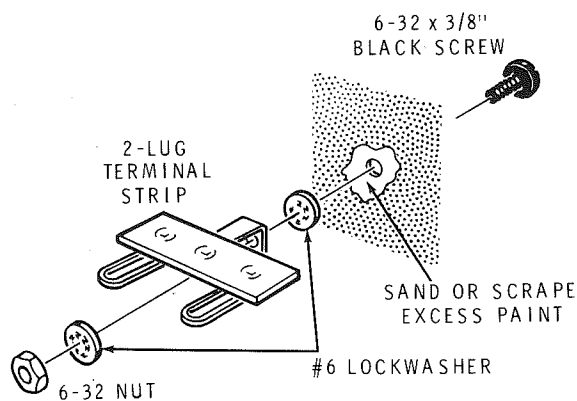


Detail 1-1H

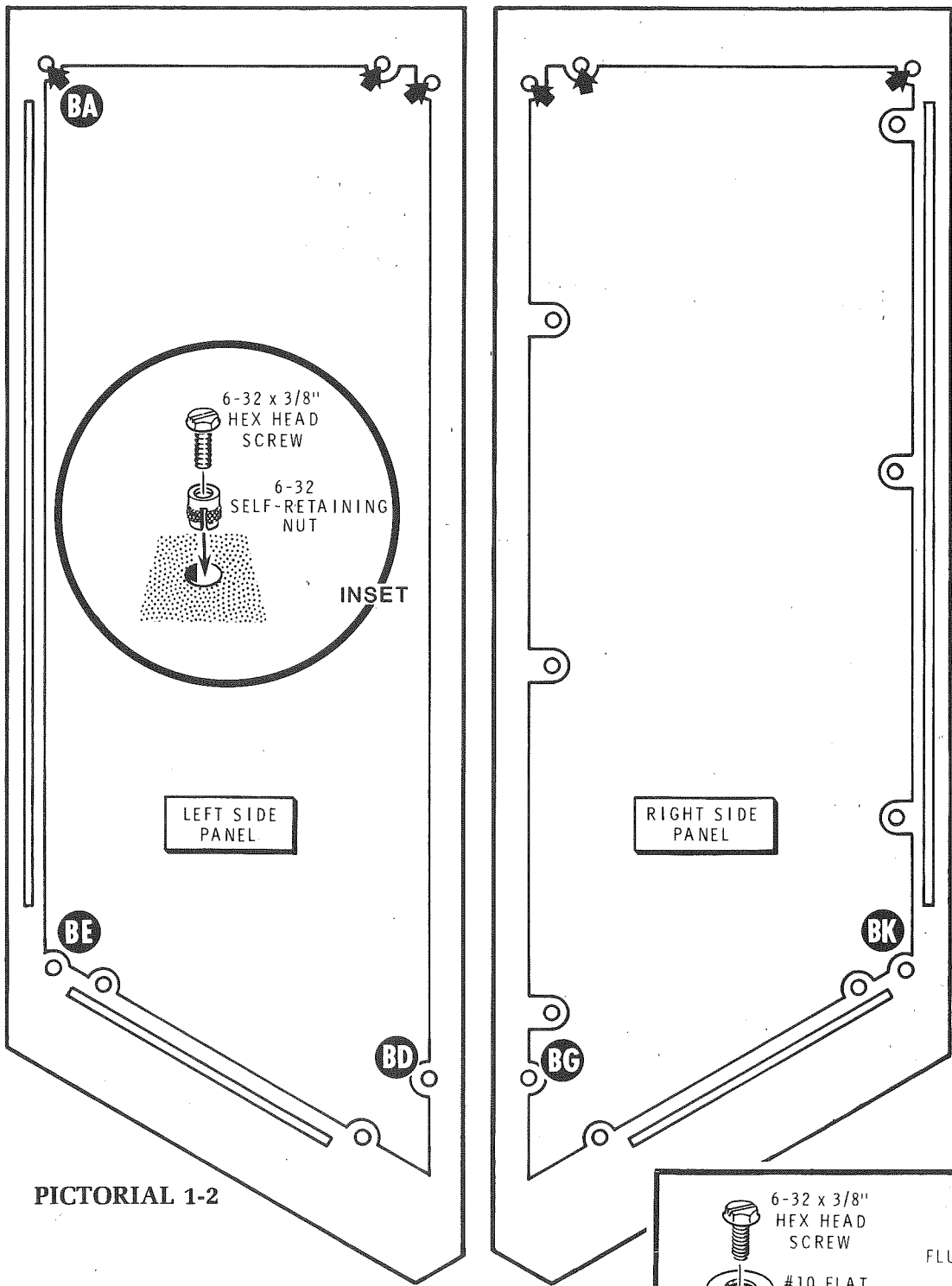


Detail 1-1K

- ( ) SW1: Refer to Detail 1-1H and install the rocker switch in the chassis at SW1. Be sure to position the switch so the lugs are positioned as shown in the Pictorial. Push the switch into the chassis hole until it locks in place.
- ( ) Scrape or sand any excess paint from around hole AN on the inside rear of the chassis.
- ( ) Refer to Detail 1-1J and mount a 2-lug terminal strip at AN. Use 6-32 x 3/8" hardware and be sure to position the terminal strip as shown in the Pictorial. Use a 6-32 x 3/8" black screw.
- ( ) SW2: Refer to Detail 1-1K and mount the 120/240 slide switch at SW2. Use two 6-32 x 3/8" black screws and be sure to mount the switch so the bare jumper wire, connected between lugs 3 and 6, is positioned as shown in the Pictorial.
- ( ) F1: Remove the fuseholder cap by twisting it counterclockwise with a screwdriver. Then install a 5-ampere fuse for 120-volt operation (3-ampere fuse if you intend to operate the Computer from a 240-volt AC source) and replace the cap.

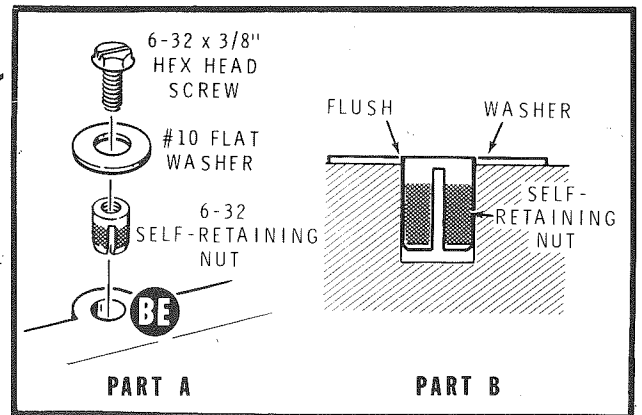


Detail 1-1J



PICTORIAL 1-2

Detail 1-2A



PART A

PART B



Refer to Pictorial 1-2 for the following steps.

( ) Locate the left and right side panels and position them on your work surface as shown in the Pictorial. Place the panels on a soft cloth to prevent them from being scratched when you perform the following steps.

( ) Refer to the inset on the Pictorial and install a 6-32 self-retaining nut at BA in the left side panel as follows:

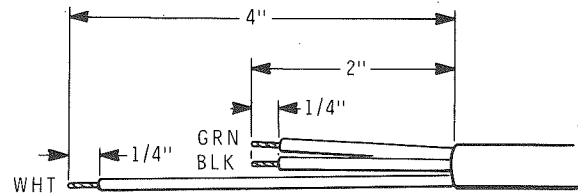
1. Start the split (slotted) end of the nut into the hole in the panel.
2. Use the handle of a nut starter (or screwdriver) to push the nut all the way into the panel.
3. Turn a 6-32  $\times$  3/8" hex head screw all the way into the nut. Then remove the screw and save it for the next three steps. This seats the nut in the panel and makes it easier to reinstall a screw later.

( ) Similarly, install 6-32 self-retaining nuts in two of the remaining holes (marked with arrows) in the left side panel and the three indicated holes in the right side panel.

NOTE: Perform the next two steps carefully. These self-retaining nuts must be installed exactly as shown so the front panel will fit properly.

( ) Refer to Detail 1-2A and install a 6-32 self-retaining nut at BE as follows:

1. Start the split (slotted) end of the nut into the hole in the panel.
2. Place the #10 flat washer over the end of the self-retaining nut.
3. Use the handle of a nut starter (or screwdriver) to push the nut into the panel until the top of the nut is flush with the flat washer.
4. Turn a 6-32  $\times$  3/8" hex head screw all the way into the nut. Then remove the screw and flat washer and save them for the next step.



Detail 1-3A

( ) Similarly, install self-retaining nuts at BD, BG, and BK. Discard the #10 flat washer and hex head screw.

( ) Refer back to Pictorial 1-1 and mount the left side panel to the chassis at BA, BB, BC, and BD as shown. Use four 6-32  $\times$  3/8" hex head screws.

( ) Mount the right side to the chassis at BF, BG, BH, and BJ as shown in the Pictorial. Use four 6-32  $\times$  3/8" hex head screws.

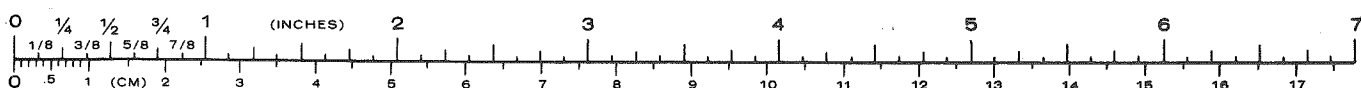
Refer to Pictorial 1-3 (Illustration Booklet, Page 4) for the following steps.

( ) Refer to Detail 1-3A and prepare the end of the line cord as follows:

1. Remove the outer insulation of the line cord for 4".
2. Cut the black and green leads to 2".
3. Remove 1/4" of insulation from the end of all three leads.
4. Twist together the fine wire strands at the end of each lead. Then melt a small amount of solder to the end of each lead to hold the strands together.

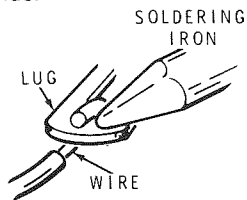
NOTES:

1. When you are directed to "make a mechanically secure connection," as in the following steps, refer to the inset drawing on the Pictorial.
2. In the following steps, (NS) means not to solder because you will add other wires later. "S-" with a number following it, such as (S-3), means to solder the connection. The number following the "S-" tells you how many wires should be at the connection.

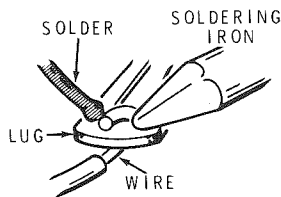


- ( ) Route the end of the line cord through hole AP in the chassis. Then connect the green line cord lead to solder lug AE (NS). Make a mechanically secure connection.
- ( ) Refer to the following information and solder the wire to solder lug AE as shown. NOTE: The lug shown in the illustration may look different than the one in your kit. However, the soldering procedure is the same. Always keep your soldering iron tip clean.

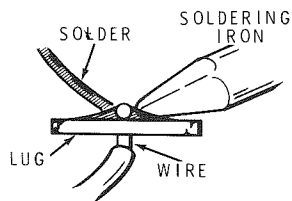
1. Push the soldering iron tip against the wire and the lug. Heat both the wire and the lug for two or three seconds.



2. Apply solder to the wire and the lug, **not** to the soldering iron. IMPORTANT: Let the heat of the wire and lug melt the solder.



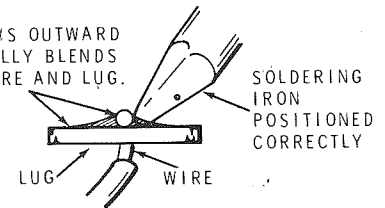
3. As the solder begins to melt, allow it to flow around the connection. Then remove the solder and the iron and let the connection cool.



- ( ) Check the soldered connection. Compare it to the illustrations below.

### A GOOD SOLDER CONNECTION

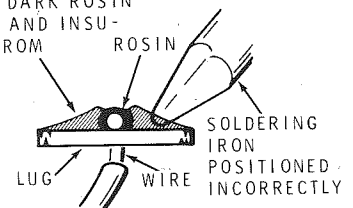
SOLDER FLOWS OUTWARD AND GRADUALLY BLENDS WITH THE WIRE AND LUG.



When both the wire and the lug are heated at the same time, the solder will flow onto the wire and the lug evenly. The solder will make a good electrical connection between the wire and the lug.

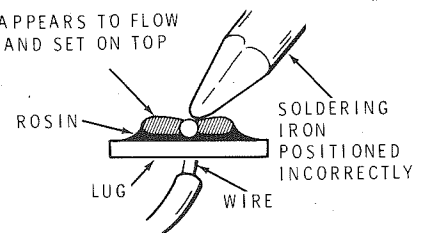
### POOR SOLDER CONNECTIONS

SOLDER DOES NOT FLOW ONTO THE LUG AND WIRE. A DARK ROSIN BEAD SURROUNDS AND INSULATES THE WIRE FROM THE CONNECTION.

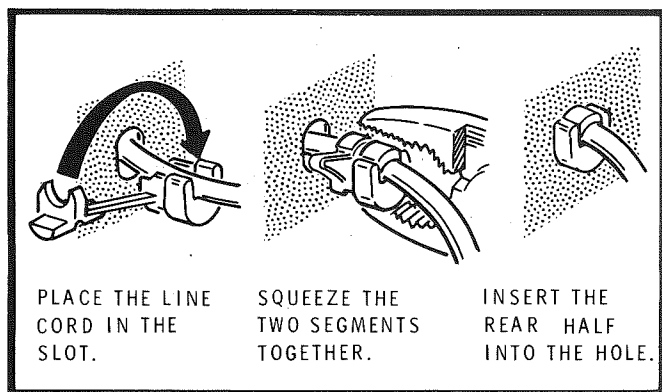


When the wire is not heated sufficiently, the solder will not flow onto the wire as shown above. To correct, reheat the connection and, if necessary, apply a small amount of additional solder to obtain a good connection.

SOLDER APPEARS TO FLOW INWARD AND SET ON TOP OF LUG.



When the lug is not heated sufficiently, the solder will blob on the lug as shown above. To correct, reheat the connection and, if necessary, apply a small amount of additional solder to obtain a good connection.



Detail 1-3B

- ( ) Connect the black line cord lead to fuseholder F1 lug 1 (S-1). Make a mechanically secure connection.
- ( ) Connect the white line cord lead to terminal strip AN lug 2 (NS). Make a mechanically secure connection.
- ( ) Install the strain relief on the line cord at AP as shown in Detail 1-3B.

NOTE: When you wire this kit, you will be directed to prepare the wires 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. If the wires are not already tinned, melt a small amount of solder on the bare wire ends to hold the fine wire strands together. The wires are listed in the order in which you will use them.

- ( ) Prepare the following small (pretinned) wires:

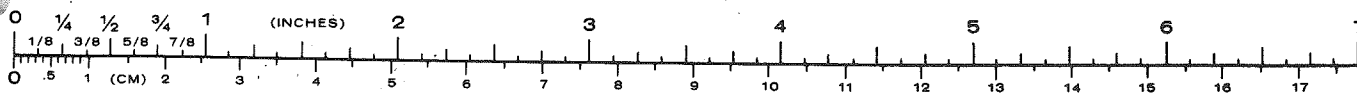
1-1/2" black	17-1/4" black
2" black	16-1/4" red
1-1/2" black	18" brown
3-1/2" red	18-1/2" yellow

NOTE: Make mechanically secure connections when you connect the prepared wires in the following steps.

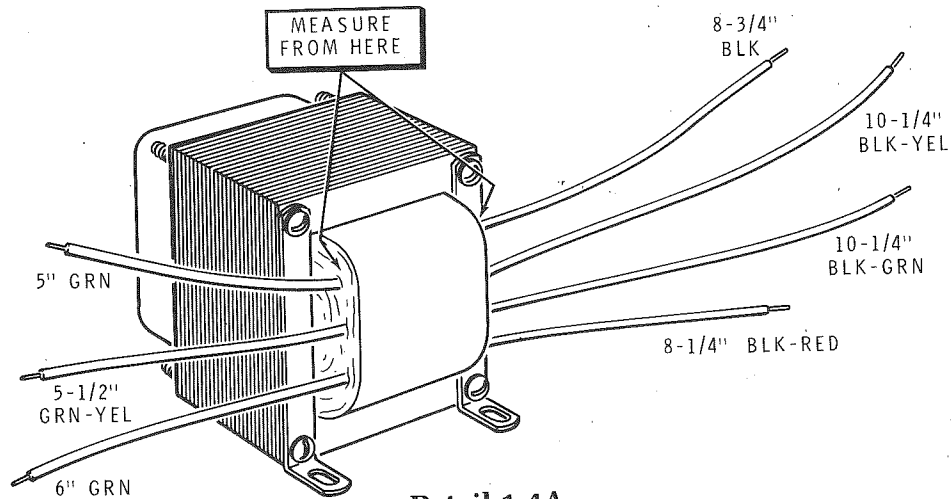
- ( ) Connect a 1-1/2" black wire from fuseholder F1 lug 2 (S-1) to switch SW1 lug 2 (S-1).
- ( ) Connect one end of a 2" black wire to switch SW1 lug 1 (S-1). The other end will be connected later.

NOTE: Be sure to use the eyelets in the terminal strip when you connect the ceramic capacitors in the following steps. First insert the lead through the eyelet. Then bend the lead over flat against the terminal strip **toward** the lug as shown in the Pictorial.

- ( ) C1: Cut both leads of a .01  $\mu$ F ceramic capacitor to 1/4". Then connect the capacitor between the center eyelet (NS) and the eyelet at lug 2 (S-1).
- ( ) C2: Cut both leads of a .01  $\mu$ F ceramic capacitor to 1/4". Then connect the capacitor between the eyelet at lug 1 (S-1) and the center eyelet (S-2).
- ( ) Connect the free end of the black wire coming from switch SW1 lug 1 to terminal strip AN lug 1 (NS).
- ( ) Connect a 1-1/2" black wire from terminal strip AN lug 1 (NS) to switch SW2 lug 4 (S-1).
- ( ) Connect a 3-1/2" red wire from terminal strip AN lug 2 (NS) to switch SW2 lug 1 (S-1). Route this wire as shown in the Pictorial.
- ( ) Connect one end of a 17-1/4" black wire to terminal strip AN lug 1 (NS). The other end will be connected later.
- ( ) Connect one end of a 16-1/4" red wire to terminal strip AN lug 2 (NS). The other end will be connected later.
- ( ) Connect one end of an 18" brown wire to switch SW2 lug 5 (NS). The other end will be connected later.
- ( ) Connect one end of an 18-1/2" yellow wire to switch SW2 lug 2 (NS). The other end will be connected later.







Detail 1-4A

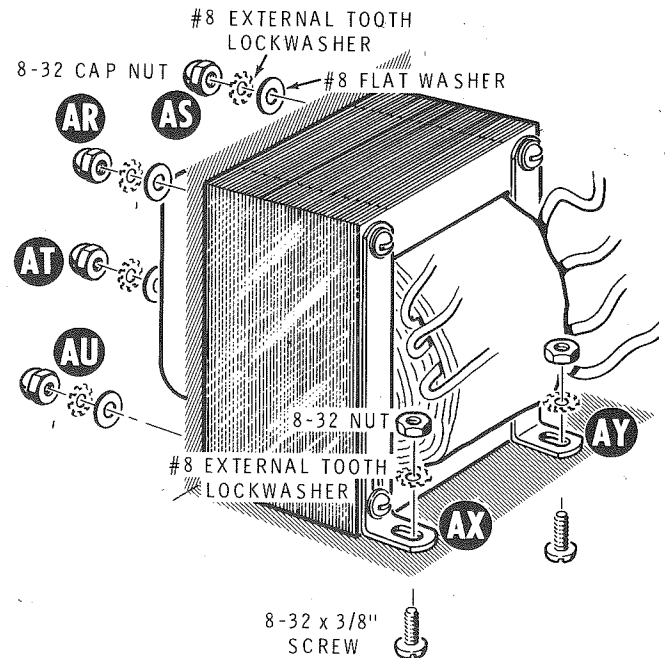
Refer to Pictorial 1-4 (Illustration Booklet, Page 4) for the following steps.

- ( ) Locate the power transformer.
- ( ) Refer to Detail 1-4A and cut the leads of the power transformer to the lengths shown. Then remove 1/4" of insulation from the end of each lead. Be sure to measure the leads from the point where they leave the transformer.
- ( ) Refer to Detail 1-4B and mount the power transformer to the chassis. Use four #8 external tooth lockwashers, four #8 flat washers, and four 8-32 cap nuts on the rear of the chassis at AR, AS, AT, and AU. Use 8-32 × 3/8" hardware at AX and AY. Tighten the nuts at AT and AU before you tighten the other hardware.
- ( ) Slide the rubber grommet over the black, black-red, black-green, and black-yellow transformer leads.

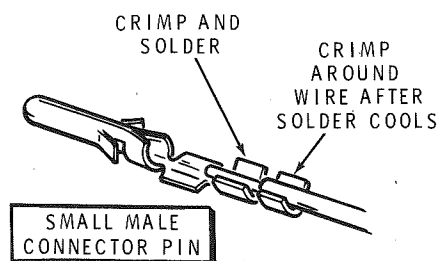
**NOTE:** Make mechanically secure connections when you connect the transformer leads in the following steps.

- ( ) Connect the black transformer lead to terminal strip AN lug 1 (S-4).
- ( ) Connect the black-red transformer lead to terminal strip AN lug 2 (S-4).
- ( ) Connect the black-green transformer lead to switch SW2 lug 5 (S-2).
- ( ) Connect the black-yellow transformer lead to switch SW2 lug 2 (S-2).

- ( ) Locate the free ends of the four long wires (black, red, yellow, and brown) coming from terminal strip AN and switch SW2. Then push these four wires through the rubber grommet that is already installed on the transformer leads.
- ( ) Refer to Detail 1-4C and install small male connector pins on the free ends of the green-yellow and the two green transformer leads.
- ( ) Similarly, install small male connector pins on the free ends of black, red, yellow, and brown wires coming from the rubber grommet.



Detail 1-4B



Detail 1-4C

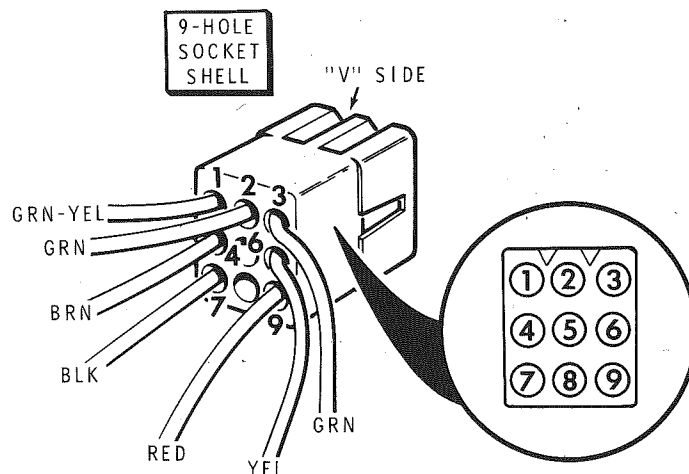
- ( ) S101: Refer to Detail 1-4D and position the 9-hole socket shell as shown. Note the position of the "V" side of the shell.

Push the connector pins on the free ends of the wires coming from the area of the transformer into the 9-hole socket shell as follows. Push on each wire until it locks into place.

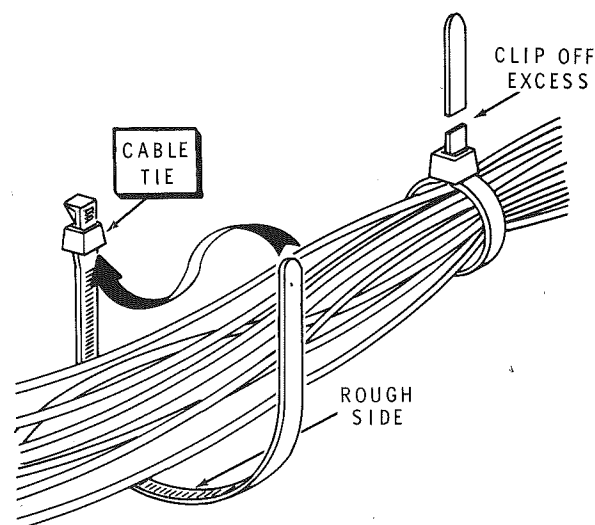
- ( ) Either green wire to hole 3.  
 ( ) Yellow wire to hole 6.  
 ( ) Red wire to hole 9.  
 ( ) Remaining green wire to hole 2.

NOTE: Be sure to skip holes 5 and 8.

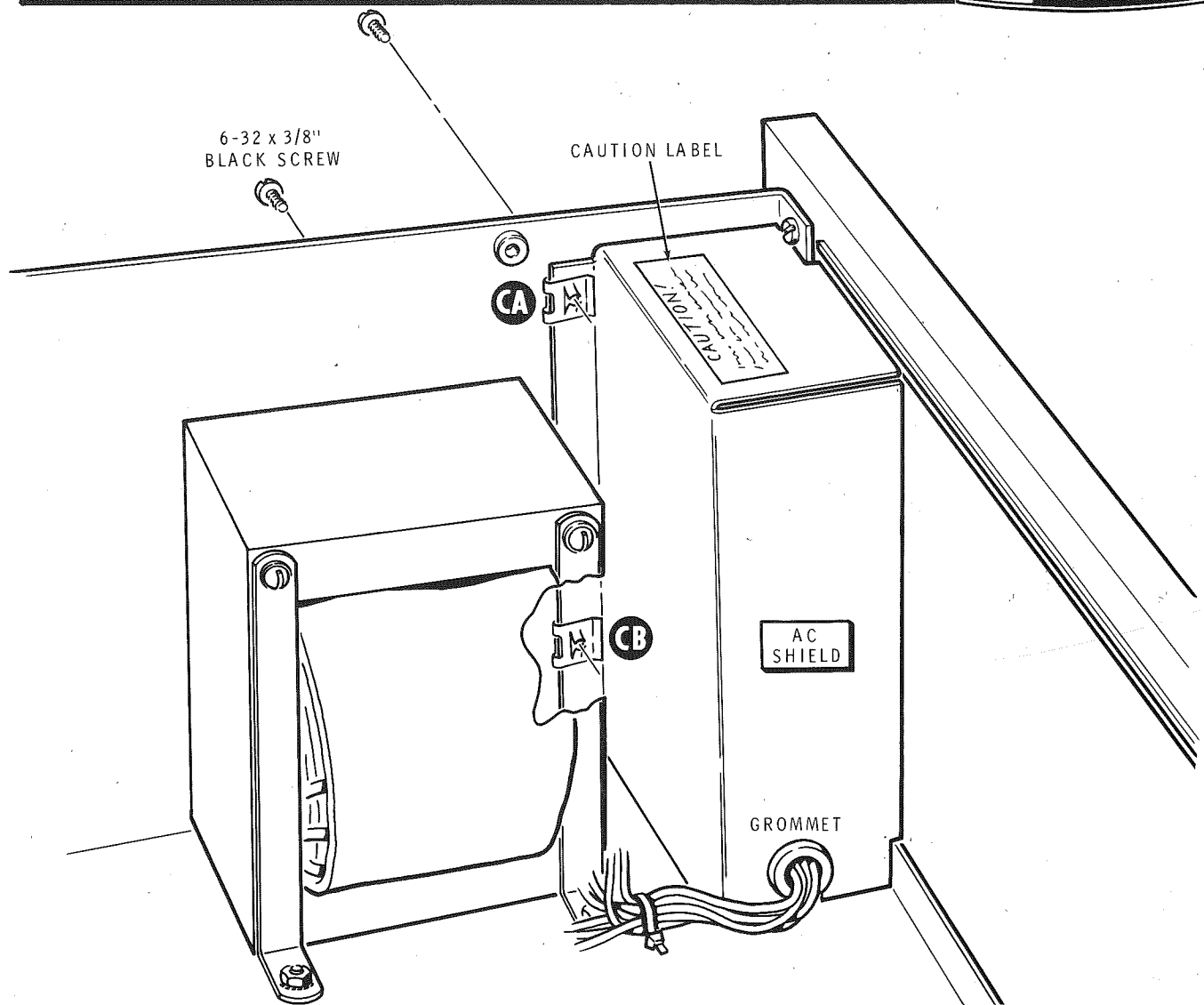
- ( ) Green-yellow wire to hole 1.  
 ( ) Brown wire to hole 4.  
 ( ) Black wire to hole 7.  
 ( ) Refer to Detail 1-4E and install a cable tie on all of the wires coming from the 9-hole socket shell. Be sure to install this cable tie just behind the socket shell as shown.  
 ( ) Position the wires coming from the 9-hole socket shell and the power transformer as shown in the Pictorial. Then install cable ties at the six remaining locations shown.



Detail 1-4D



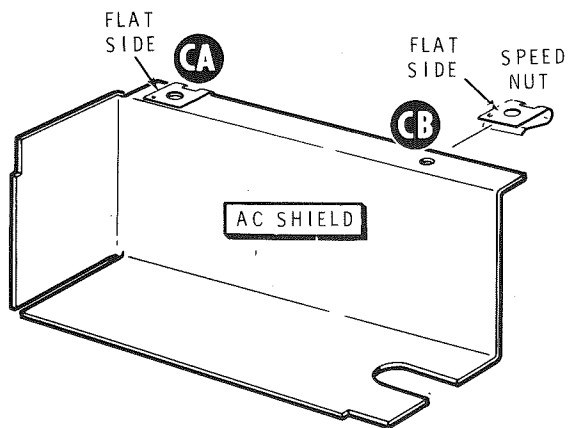
Detail 1-4E



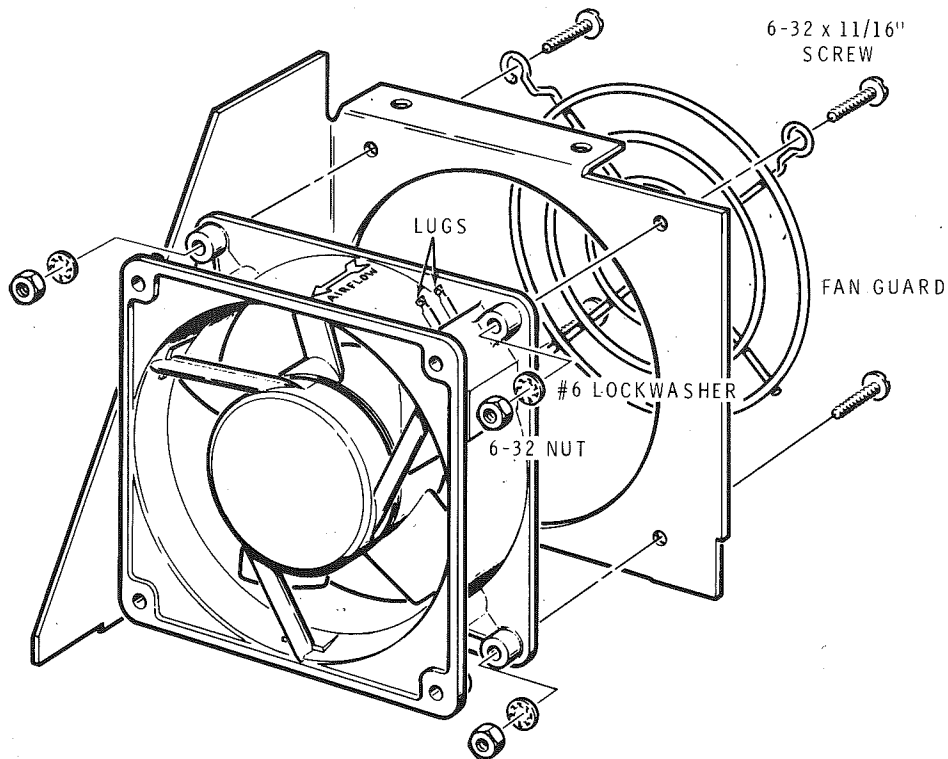
**PICTORIAL 1-5**

Refer to Pictorial 1-5 for the following steps.

- ( ) Locate two 6-32 Speed Nuts. Note that each Speed Nut is flat on one side. Refer to Detail 1-5A and push the Speed Nuts onto the lip of the AC shield with the flat side as shown at CA and CB.
- ( ) Mount the AC shield to the rear of the chassis at CA and CB with two 6-32 × 3/8" black screws. Be sure to place the rubber grommet into the slot in the bottom edge of the AC shield. Also be careful not to pinch any wires between the AC shield and the chassis.
- ( ) Carefully peel away the backing paper from the caution label. Then press the label on top of the AC shield as shown in the Pictorial.

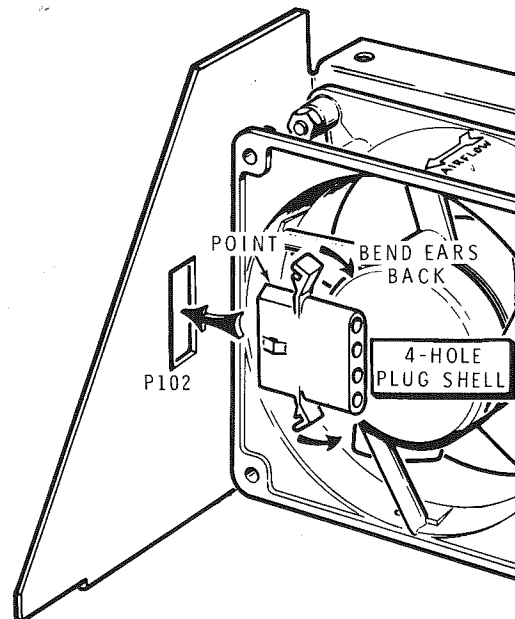


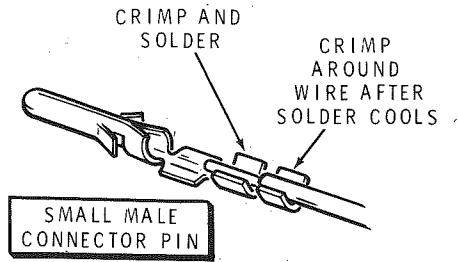
**Detail 1-5A**


**Detail 1-6A**

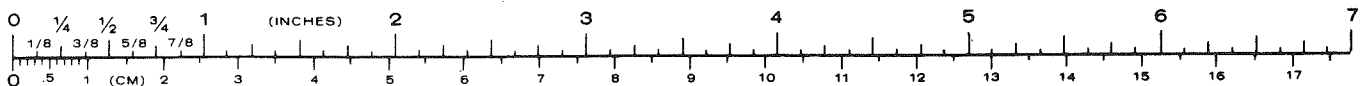
Refer to Pictorial 1-6 (Illustration Booklet, Page 5) for the following steps.

- ( ) Refer to Detail 1-6A and mount the fan and fan guard to the fan bracket as shown. Use 6-32 x 11/16" hardware. Be sure to mount the fan so the air flow is in the direction shown. Also be sure to mount the fan so the lugs are positioned as shown.
- ( ) P102: Position the point on the 4-hole plug shell as shown in Detail 1-6B. Then bend the "ears" on the shell back and push the shell into hole P102 in the fan bracket as shown.

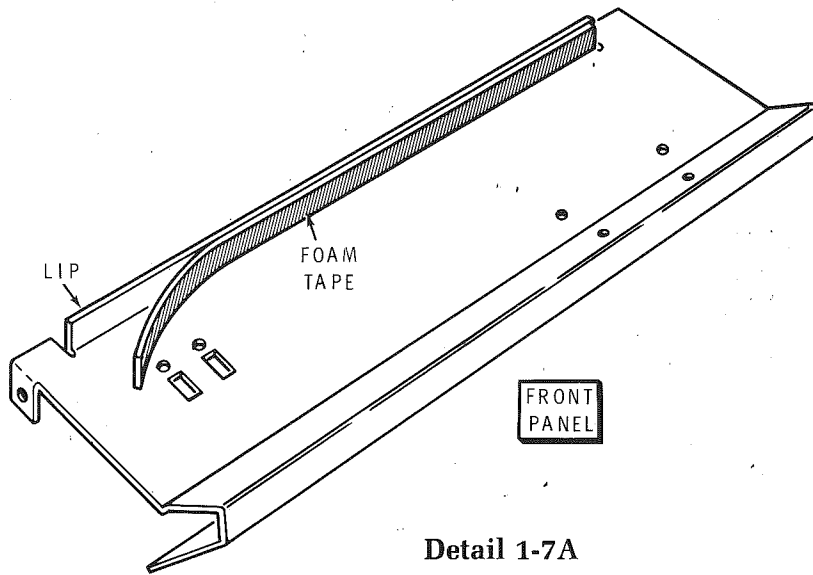

**Detail 1-6B**

**Detail 1-6C**

- ( ) Prepare an 8" small (pretinned) yellow wire and an 8" small (pretinned) black wire.
- ( ) Refer to Detail 1-6C and install small male connector pins on one end of each of the prepared wires.
- ( ) Cut two 1" lengths of large sleeving. Use these pieces of sleeving in the following two steps.
- ( ) Slide a 1" length of large sleeving onto the free end of the black wire. Then connect the black wire to fan lug 1 (S-1). After the connection cools, slide the sleeving down over the connection.
- ( ) Slide a 1" length of large sleeving onto the free end of the yellow wire. Then connect the yellow wire to fan lug 2 (S-1). After the connection cools, slide the sleeving down over the connection.
- ( ) Loosely (approximately one turn per inch) twist the two wires together.
- ( ) Push the connector pin on the end of the black wire into plug P102 hole 1 until it locks in place.
- ( ) Push the connector pin on the end of the yellow wire into plug P102 hole 3 until it locks in place.
- ( ) Position the twisted pair of wires down close to the fan as shown in the Pictorial. Be sure the wires are out of the way of the fan blades.
- ( ) Position the fan assembly as shown in the Pictorial. Then mount the fan bracket to the bottom of the chassis at CC, CD, CE and CF with 6-32 × 3/8" black screws.



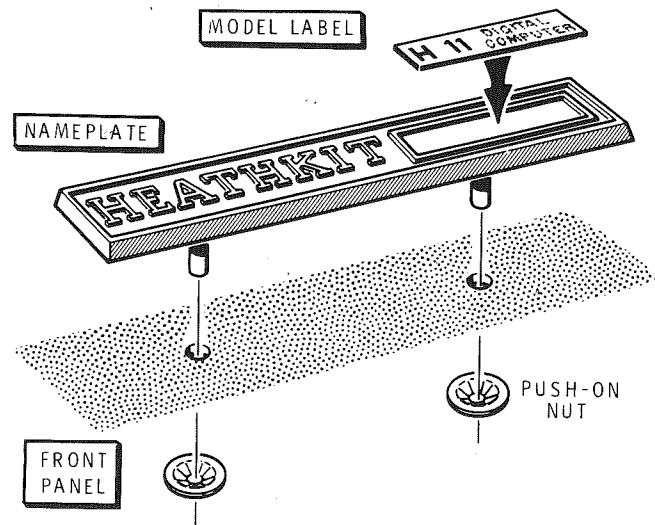




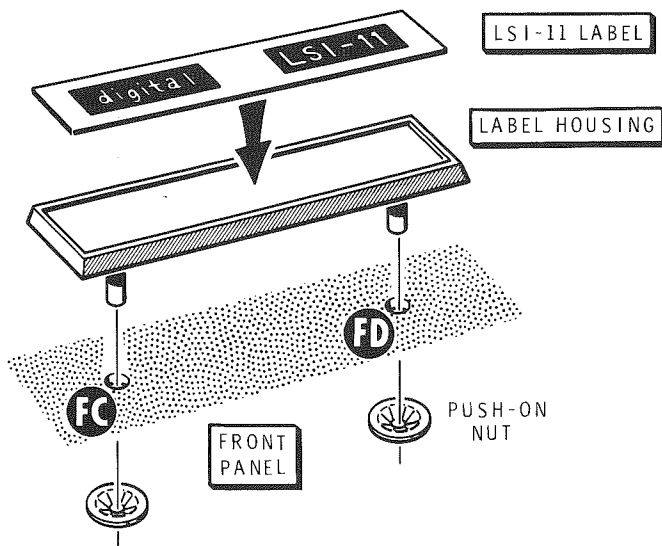
Detail 1-7A

Refer to Pictorial 1-7 (Illustration Booklet, Page 5) for the following steps.

- ( ) Locate the front panel and position it as shown in Detail 1-7A.
- ( ) Cut a 16-1/4" length of foam tape. Then carefully remove the backing paper and press the tape onto the lip of the front panel as shown in Detail 1-7A.
- ( ) Refer to Detail 1-7B and mount the nameplate onto the front panel as follows:
  1. From the front of the panel, insert the studs on the nameplate into holes FA and FB.
  2. Hold the nameplate in place and turn the front panel over. Then secure the nameplate to the panel with two push-on nuts.
  3. Carefully peel the backing paper from the model label. Then press the label onto the nameplate in the area shown.



Detail 1-7B

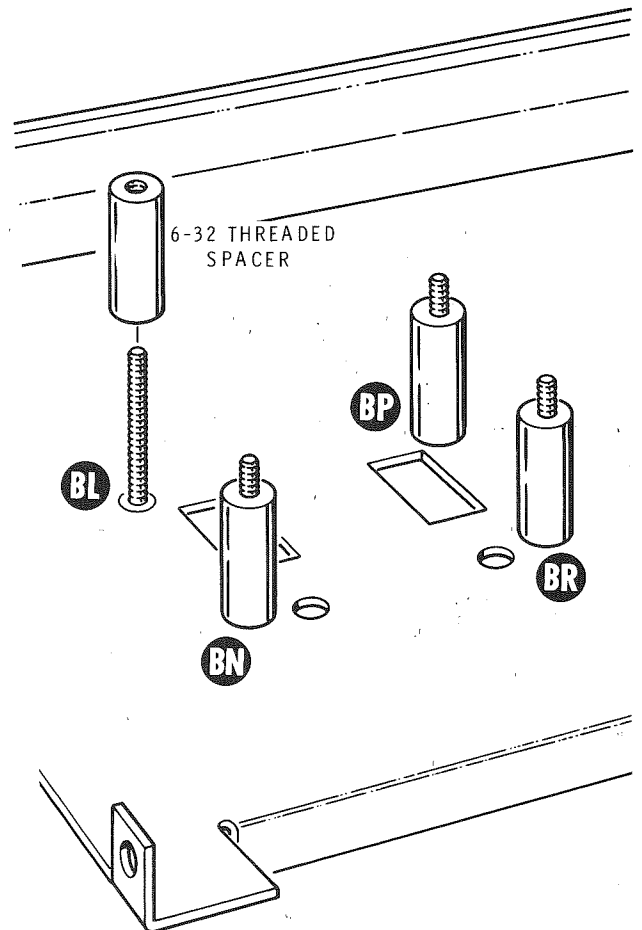


Detail 1-7C

( ) Refer to Detail 1-7C and mount the label housing onto the front panel as follows:

1. From the front of the panel, insert the studs on the label housing into holes FC and FD. NOTE: This label housing can be installed either way.
2. Hold the label housing in place and turn the panel over. Then secure the label housing to the panel with two push-on nuts.
3. Carefully peel the backing paper from the LSI-11 label. Then press the label onto the label housing as shown.

( ) Carefully peel the backing paper from the switch label. Then line up the holes in the label with the holes in the front panel and press the label in place as shown in the Pictorial.



Detail 1-7D

- ( ) Refer to Detail 1-7D and turn a 6-32 threaded spacer all the way onto each of the four studs at BL, BN, BP, and BR on the front panel.
- ( ) Position the front panel between the chassis side panels as shown in the Pictorial. Be sure the lip on the bottom of the front panel is under the lip on the chassis. Then mount the front panel at BE and BK with two 6-32 × 3/8" hex head screws. Do not tighten the screws at this time.
- ( ) Secure the front panel to the chassis with three 6-32 × 3/8" black screws. Tighten these screws only until they are snug. Then tighten the screws at BE and BK.

NOTE: Save the remaining hardware for use during "Final Assembly."

Proceed to "Primary Wiring Tests."

## PRIMARY WIRING TESTS

A wiring error in the primary wiring circuit (line cord, AC Power Switch, etc.) of your kit could cause you to receive a severe electrical shock. These "Primary Wiring Tests" will assure you that no such wiring errors exist.

- ( ) Be sure the line cord is not plugged in.
- ( ) Push the AC POWER SWITCH (rear panel) to OFF, if not already done.

If you do not have an ohmmeter, remove the AC shield and carefully check the line cord, fuseholder, AC Power Switch, 120/240 switch, terminal strip AN, and the transformer wiring against that shown in Pictorials 1-3 and 1-4. Make sure there are no fine strands of wire or solder blobs touching adjacent terminals or the chassis. Then proceed to "Switch Circuit Board."

If you have an ohmmeter, perform the following resistance measurements, NOTE: You will be instructed to connect one of the ohmmeter leads to ground. This ground can be the metal fan bracket.

- ( ) Place the ohmmeter switch in the  $R \times 10$  position.

METER CONNECTIONS			
RED LEAD	BLACK LEAD	METER READING	POSSIBLE CAUSE OF TROUBLE
( ) 1. Either flat prong of the line cord.	Ground	Infinite with AC Power Switch On or Off.	A. Wiring on switches SW1 or SW2. B. Wiring on terminal strip AN. C. T1. D. Capacitor C1 or C2.
( ) 2. Other flat prong of the line cord.	Ground	Infinite with AC Power Switch On or Off.	A. Wiring on switches SW1 or SW2. B. Wiring on terminal strip AN. C. T1. D. Capacitor C1 or C2.
( ) 3. Round prong of the line cord.	Ground	0 $\Omega$ with AC Power Switch On or Off.	A. Green lead of the line cord not properly connected at solder lug AE. See Pictorial 1-2.
( ) 4. Either flat prong of the line cord.	Other flat prong.	1 M $\Omega$ or higher (AC Power Switch OFF).	A. Wiring on switches SW1 or SW2. B. Wiring on terminal strip AN. C. T1.
( ) 5. Either flat prong of the line cord.	Other flat prong.	Approximately 1 $\Omega$ or less (AC Power Switch On).	1. Wiring on switches SW1 or SW2. B. Wiring on terminal strip AN. C. T1. D. Fuse F1 or wiring on fuseholder.

This completes the "Primary Wiring Tests." If all of the tests were satisfactory, proceed to "Switch Circuit Board." If any of the tests were not correct, you must make the corrections necessary to obtain the correct readings before you continue.

NOTE: You will have the top cover, several printed items, and several tapes left over at this time. These items will be used later.

# SWITCH CIRCUIT BOARD

## PARTS LIST

- ( ) Locate the pack marked Pack #1.
- ( ) Unpack these parts and check each part against the following list. Return any part that is packed in an individual envelope, with the part number on it, to the envelope after you identify it until that part is called for in a step. Do not discard any packing materials until all parts are accounted for. The key numbers correspond to

the numbers on the "Switch Circuit Board Parts Pictorial" (Illustration Booklet, Page 5).

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

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
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### RESISTORS

NOTE: The following resistors are 1/4-watt and have a tolerance of 5% (gold fourth color band).

A1	1-60-12	1	100 $\Omega$ (brown-black-brown)	R207
A1	1-69-12	1	1000 $\Omega$ (brown-black-red)	R205
A1	1-80-12	5	10 k $\Omega$ (brown-black-orange)	R201, R202, R203, R204, R206

### TRANSISTOR-INTEGRATED CIRCUIT (IC)

NOTE: Transistors and integrated circuits are marked for identification in one of the following four ways:

1. Part number.
2. Type number. (For integrated circuits this refers only to the numbers, the letters may vary.)
3. Part number and type number.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
---------	----------------	------	-------------	-------------------

### Transistors — Integrated Circuits (cont'd.)

4. Part number and type number other than the one listed.

B1	417-821	1	MPSA06 transistor	Q201
B2	443-728	1	74LS00 IC	IC201

### HARDWARE

C1	252-3	4	6-32 nut
C2	254-1	4	#6 lockwasher

### MISCELLANEOUS

D1	25-200	1	10 $\mu$ F tantalum capacitor	C201
D2	61-33	2	Switch	SW201, SW202
D3	412-83	2	#8602 lamp	PL201, PL202
D4	432-984	1	10-pin plug	
D5	434-298	1	14-pin IC socket	
D6	490-189	1	IC puller	
	85-1998-3	1	Circuit board	

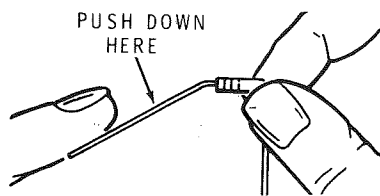
## STEP-BY-STEP ASSEMBLY

## START

In the following steps, you will be given detailed instructions on how to install and solder the first part on the circuit board. Read and perform each step carefully. Then use the same procedure whenever you install parts on a circuit board.

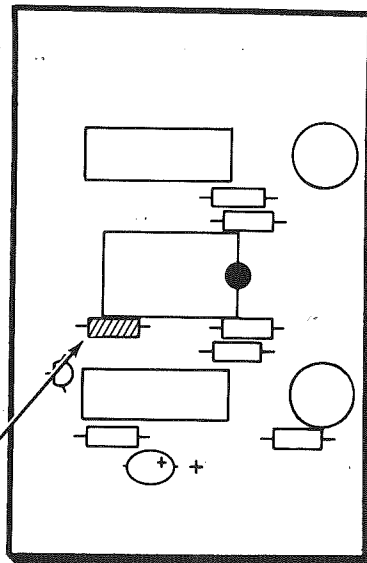
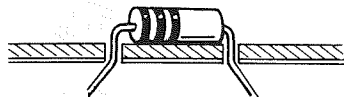
- ( ) Position the circuit board as shown with the printed side (not the foil side) up.

- ( ) R205: Hold a 1000  $\Omega$  (brown-black-red) resistor by the body as shown and bend the leads straight down.



- ( ) Push the leads through the holes at the indicated location on the circuit board. The end with color bands may be positioned either way.

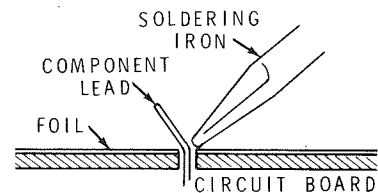
- ( ) Press the resistor against the circuit board. Then bend the leads outward slightly to hold the resistor in place.



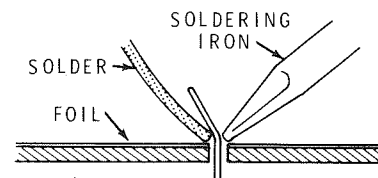
## CONTINUE

- ( ) Solder the resistor leads to the circuit board as follows:

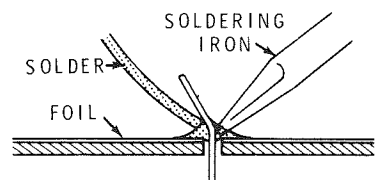
1. Push the soldering iron tip against both the lead and the circuit board foil. Heat **both** for two or three seconds.



2. Then apply solder to the other side of the connection. **IMPORTANT:** Let the heated lead and the circuit board foil melt the solder.



3. As the solder begins to melt, allow it to flow around the connection. Then remove the solder and the iron and let the connection cool.



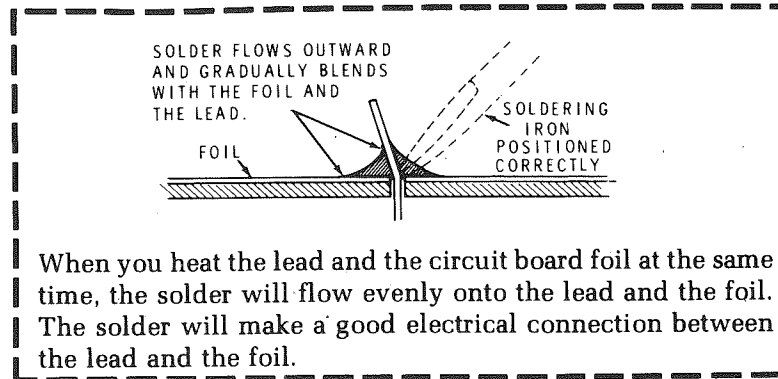
- ( ) Cut off the excess lead lengths close to the connection. **WARNING:** Clip the leads so the ends will not fly toward your eyes.

- ( ) Check each connection. Compare it to the illustrations on Page 26. After you have checked the solder connections, proceed with the assembly on Page 27. Use the same soldering procedure for each connection.

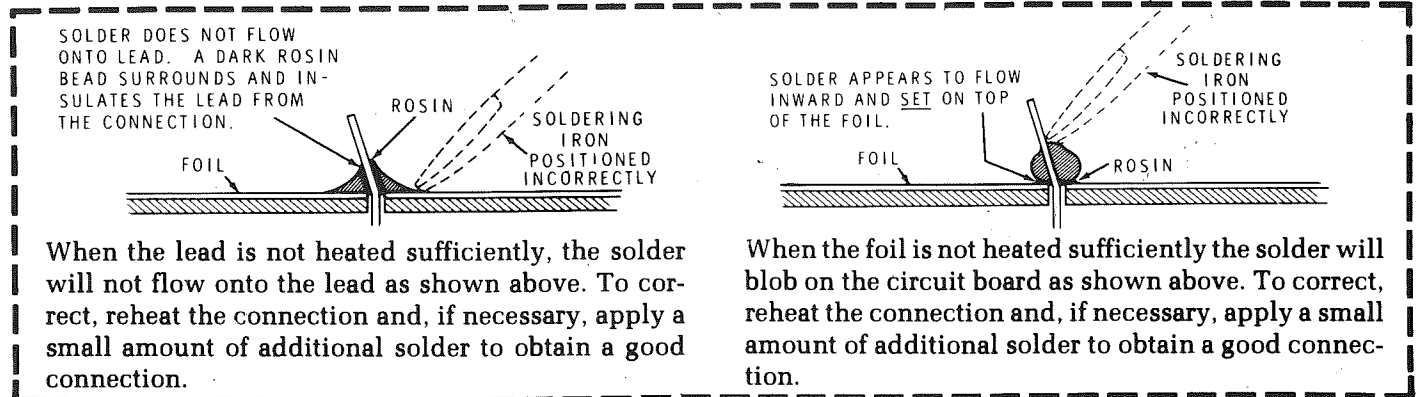
PICTORIAL 2-1



## A GOOD SOLDER CONNECTION



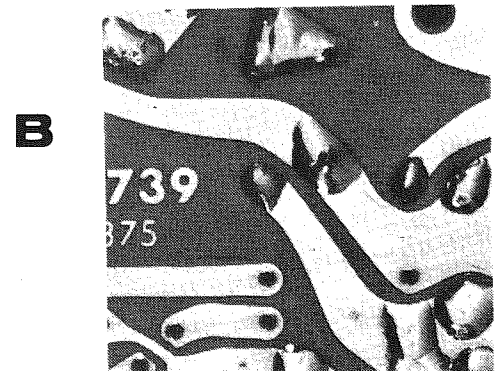
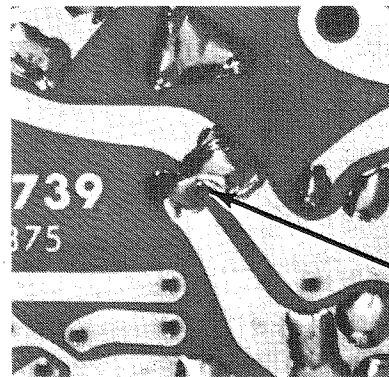
## POOR SOLDER CONNECTIONS



## SOLDER BRIDGES

A solder bridge between two adjacent foils is shown in photograph A. Photograph B shows how the connection should appear. A solder bridge may occur if you accidentally touch an adjacent previously soldered connection, if you use too much solder, or if you "drag" the soldering iron across other foils as you remove it from the connection. A good rule to follow is: always take a good look at the foil area around each lead before you solder it. Then, when you solder the connection, make sure the solder remains in this area and does not bridge to another foil. This is especially important when the foils are small and close together. NOTE: It is alright for solder to bridge two connections on the same foil.

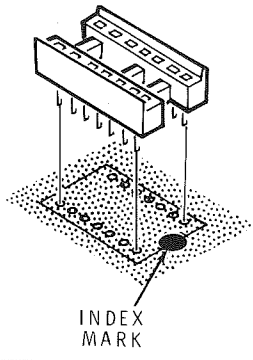
Use only enough solder to make a good connection, and lift the soldering iron straight up from the circuit board. If a solder bridge should develop, turn the circuit board foil-side-down and heat the solder between connections. The excess solder will run onto the tip of the soldering iron, and this will remove the solder bridge. NOTE: The foil side of most circuit boards has a coating on it called "solder resist." This is a protective insulation to help prevent solder bridges.



**START** ▾

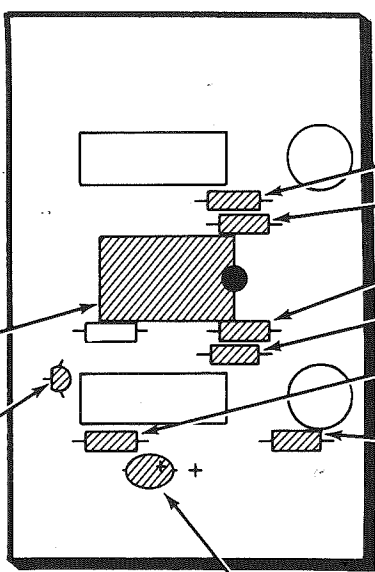
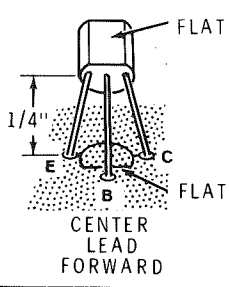
NOTE: Make sure you have installed the resistor in Pictorial 2-1.

NOTE: The IC socket that you will install in the following step can be installed either way in the circuit board. Be sure the pins are straight, insert the pins into the holes, and solder the pins to the foil.



( ) 14-pin IC socket.

( ) Q201: MPSA06 transistor (#417-821). First bend the center lead toward the flat side of the transistor. Then line up the flat on the transistor with the outline of the flat on the circuit board and insert the leads into their corresponding holes. Solder the leads to the foil and cut off the excess lead lengths.



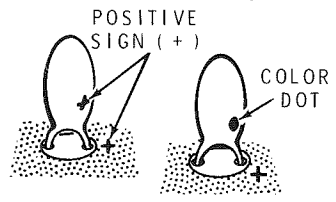
**CONTINUE** ▾

Install five 10 kΩ (brown-black-orange) resistors at:

- ( ) R201.
- ( ) R202.
- ( ) R203.
- ( ) R204.
- ( ) R206.

( ) R207: 100 Ω (brown-black-brown).

NOTE: When you install a tantalum capacitor, always position the positive (+) or dot marked lead of the capacitor in the positive (+) marked hole.



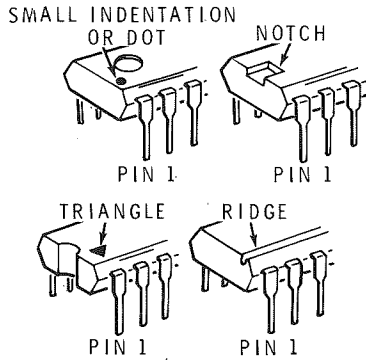
( ) C201: 10 μF tantalum capacitor.

( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 2-2

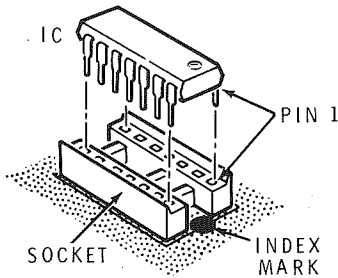
**START**

NOTE: The indexed (pin 1) end of inline integrated circuits may be marked in a number of ways such as a notch, triangle, dot, the numeral 1, etc.



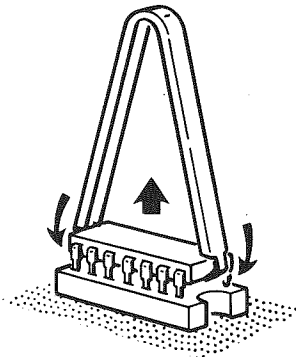
Be sure you install each IC so its pin 1 end is toward the index mark on the circuit board.

Before you apply downward pressure to an IC, make sure each pin is centered in its proper socket hole. Handle IC's with care as their pins bend very easily.



( ) IC201: 74LS00 integrated circuit (#443-728).

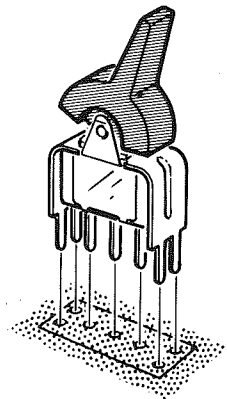
NOTE: An IC puller has been furnished so you can remove an inline IC from its socket if necessary.



Insert the hooks of the puller beneath the IC; then gently rock the tool back and forth to lift the IC.

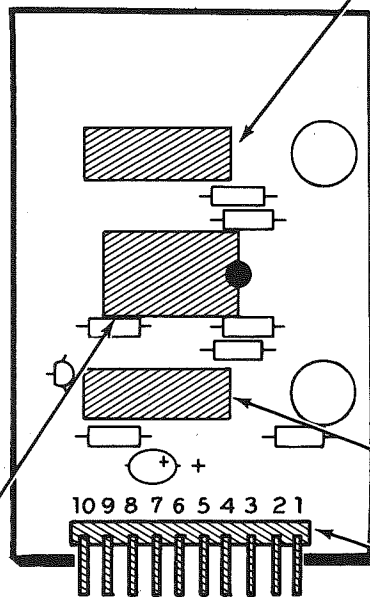
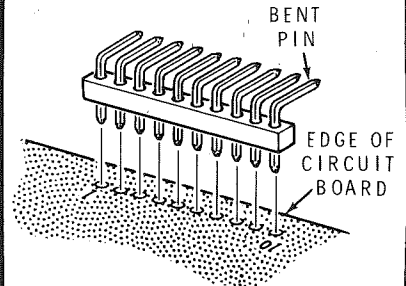
**CONTINUE**

( ) SW201: Switch. This switch may be installed either way in the circuit board. Push the switch down tight against the circuit board. Then solder the seven lugs to the foil.



( ) SW202: Switch. Push the switch down tight against the circuit board. Then solder the seven lugs to the foil.

( ) 10-pin plug. Insert the straight pins of the plug into the circuit board holes with the bent pins pointing towards the edge of the circuit board. Push the plug tight against the circuit board. Then solder the pins to the foil.

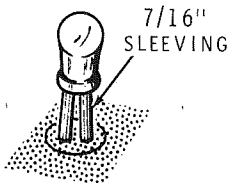


PICTORIAL 2-3

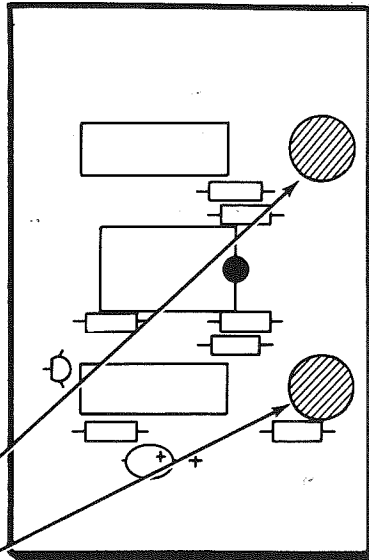
**START** →

- ( ) Cut four 7/16" lengths of small sleeving. These lengths of sleeving will be used in the next two steps.

NOTE: When you install the following lamps, first place a length of small sleeving on each lamp lead. Then insert the leads into the circuit board holes. Pull the lamps down snug against the circuit board and solder the leads to the foil. Then cut off any excess lead lengths.



- ( ) PL201: #8602 lamp (#412-82).
- ( ) PL202: #8602 lamp (#412-82).



**CONTINUE** ↘

**CIRCUIT BOARD CHECKOUT**

Carefully inspect the foil side of the circuit board for the following most commonly made errors.

- ( ) Unsoldered connections at leads that have foil.
- ( ) Poor solder connections.
- ( ) Solder bridges between foil patterns.
- ( ) Protruding leads which could touch together.

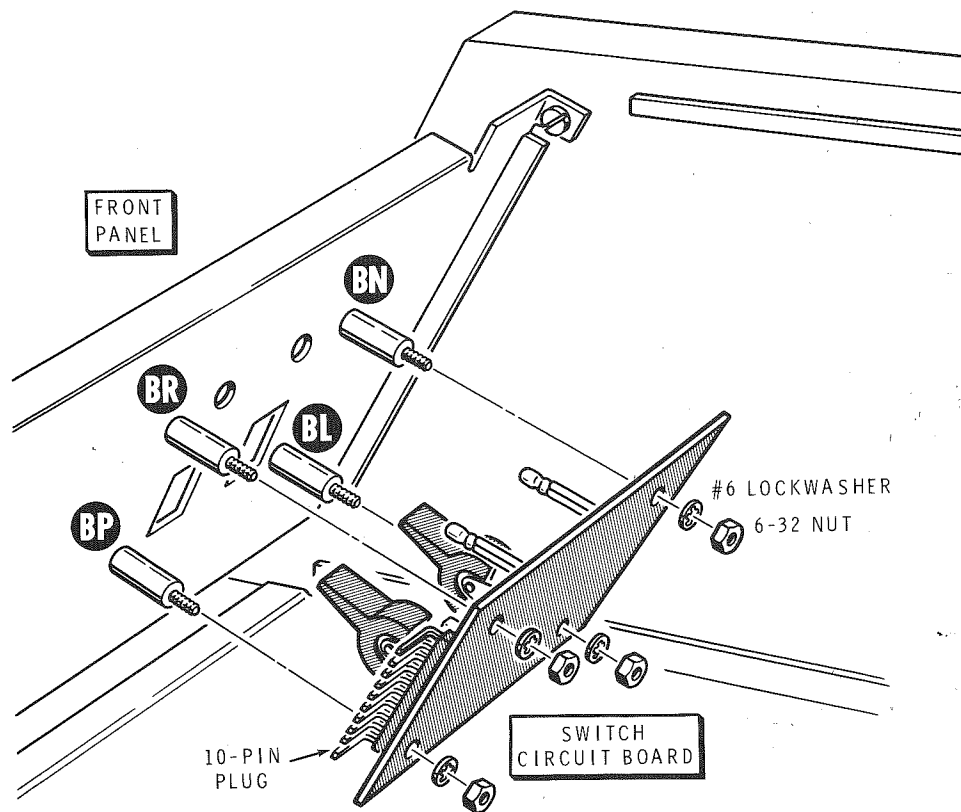
Refer to the illustrations where the parts were installed as you make the following visual checks.

- ( ) Transistor for proper installation.
- ( ) Integrated circuit for proper installation.
- ( ) Tantalum capacitor for the correct position of the positive (+) mark.

PICTORIAL 2-4



## CIRCUIT BOARD INSTALLATION



PICTORIAL 2-5

( ) Refer to Pictorial 2-5 and mount the switch circuit board on the inside of the front panel as shown. Use four #6 lockwashers and four 6-32 nuts. Be sure to position the circuit board so the 10-pin plug extends from the indicated side of

the circuit board. Also be sure the pilot lamps are centered in the front panel holes.

This completes the switch circuit board assembly and installation. Proceed to "Power Supply Assembly."



# POWER SUPPLY ASSEMBLY

## PARTS LIST

- ( ) Locate the pack marked Pack #2.
- ( ) Unpack these parts and check each part against the following list. Return any part that is packed in an individual envelope, with the part number on it, to the envelope after you identify it until that part is called for in a step. Do not throw away any packing materials until all parts are accounted for. The key numbers cor-

respond to the numbers on the "Power Supply Parts Pictorial" (Illustration Booklet, Page 6).

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

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
---------	----------------	------	-------------	-------------------

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
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### RESISTORS

#### NOTES:

1. Resistors may be packed in more than one envelope. Open all of the resistor envelopes in this pack before you check the resistors against the Parts List.
2. The following resistors have a tolerance of 5% unless otherwise noted. 5% is indicated by a fourth color band of gold.

### Resistors (cont'd.)

#### 1/4-Watt

A1	2-741-12	1	4.7 $\Omega$ , 1% precision	R161
A2	1-57-12	4	33 $\Omega$ (orange-orange-black)	R123, R125, R135, R143
A2	1-60-12	3	100 $\Omega$ (brown-black-brown)	R126, R141, R156
A2	1-69-12	9	1000 $\Omega$ (brown-black-red)	R101, R102, R103, R113, R131, R136, R144, R147, R157

A2	1-73-12	1	2700 $\Omega$ (red-violet-red)	R166
A2	1-124-12	1	3000 $\Omega$ (orange-black-red)	R154
A2	1-76-12	2	4700 $\Omega$ (yellow-violet-red)	R129, R132
A2	1-104-12	1	6200 $\Omega$ (blue-red-red)	R152
A2	1-79-12	14	8200 $\Omega$ (gray-red-red)	R112, R114, R119, R122, R124, R127, R133, R137, R145, R149, R151, R158, R162, R163
A2	1-80-12	4	10 k $\Omega$ (brown-black-orange)	R105, R106, R128, R134
A2	1-94-12	1	18 k $\Omega$ (brown-gray-orange)	R164
A2	1-83-12	2	47 k $\Omega$ (yellow-violet-orange)	R108, R116
A2	1-156-12	4	68 k $\Omega$ (blue-gray-orange)	R109, R111, R117, R118
A2	1-153-12	3	150 k $\Omega$ (brown-green-yellow)	R107, R115, R121
A2	1-100-12	1	270 k $\Omega$ (red-violet-yellow)	R104



KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
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**Resistors (cont'd.)****Others**

A3	3-45-10	1	.025 Ω, 10-watt	R142
A4	3-8-3	1	.1 Ω, 3-watt, 1% precision	R155
A5	2-229	1	2 Ω, 1/2-watt, 1% precision	R148
A6	2-13-12	2	10 Ω, 1/8-watt, 1% precision	R147, R159
A7	1-173	1	10 Ω, 1/2-watt (brown-black-black)	R139
A8	1-54-1	2	270 Ω, 1-watt (red-violet-brown)	TEST

**CAPACITORS****Ceramic**

B1	21-21	2	200 pF	C122, C131
B1	21-46	1	.005 μF	C115
B1	21-82	2	.02 μF	C121, C129
B1	21-143	2	.05 μF	C123, C132
B1	21-95	5	.1 μF	C106, C116, C124, C125, C134

**Electrolytic**

B2	25-210	3	.22 μF tantalum	C103; C104, C111
B3	25-200	2	.68 μF tantalum	C108, C109
B2	25-197	2	1 μF tantalum	C112, C113
B3	25-221	2	2.2 μF tantalum	C105, C107
B3	25-252	1	15 μF tantalum	C114
B4	25-845	3	330 μF	C126, C127, C128
B5	25-208	1	1500 μF	C102
B4	25-846	3	2200 μF	C117, C118, C119

**DIODES**

C1	56-58	1	1N709A zener	ZD101
C1	56-56	7	1N4149	D103, D104, D105, D107, D112, D113, D115
C1	57-65	3	1N4002	D102, D109, D114
C1	57-607	1	1N5817	D111
C2	57-608	1	1N5831	D110
C3	57-86	1	NL576A SCR	D108
C1	56-87	2	FH1100	D106, D116
C4	57-604	1	SR711A	D101
C1	56-32	1	VR-13.5 zener	ZD102

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
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**TRANSISTORS-INTEGRATED CIRCUITS (IC's)**

NOTE: Transistors and integrated circuits are marked for identification in one of the following ways:

1. Part number.
2. Type number. (For integrated circuits this refers only to the numbers, the letters may vary.)
3. Part number and type number.
4. Part number with a type number other than the one listed.

D1	417-821	4	MPSA06 transistor	Q101, Q102, Q103, Q106
D1	417-823	2	MPU131 transistor	Q107, Q109
D2	417-896	1	PIC600 transistor	Q105
D2	417-895	1	PIC625 transistor	Q108
D3	417-907	1	2N6274 transistor	Q104
D4	442-603	1	78M05 IC	IC101

**IMPORTANT**

If any components are missing from the sealed IC package, return the UNOPENED package for replacement. Claims for missing IC's will not be honored if the package has been opened.

If you locate damaged or defective IC's, order individual replacements. Be sure to follow the standard instructions on the "Parts Order Form" and on the inside rear cover of the manual. Save defective or damaged components for return instructions.

D5	443-819	1	8838 IC	IC104
D6	442-24	2	LM376 IC	IC106, IC108
D7	442-616	2	2901 (selected 3302) IC	IC103, IC107
D7	443-728	1	74LS00 IC	IC105
D5	443-727	1	96L02 IC	IC102

**CONNECTORS—SOCKETS**

E1	432-134	2	Wire socket
E2	432-71	1	9-hole plug shell
E3	432-157	1	4-hole socket shell
E4	432-860	1	12-hole plug shell
E5	432-866	10	Spring connector (2 extra)
E6	432-873	9	Small female connector pin (2 extra)
E7	432-958	1	10-hole socket shell
E8	432-982	11	Large female connector pin (2 extra)
E9	434-117	1	Transistor socket
E10	434-230	2	8-pin IC socket
E11	434-298	3	14-pin IC socket
E12	434-299	2	16-pin IC socket



KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
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### HARDWARE

NOTE: Hardware packets are marked to show the size of the hardware they contain (HDW #4, or, HDW #2 & #6, etc.). You may have to open more than one packet — in this pack — to locate all of the hardware of any one size (#6, for example).

#### #6 Hardware

F1	250-89	13	6-32 × 3/8" screw	
F2	250-381	5	6-32 × 3/8" black screw	
F3	250-162	2	6-32 × 1/2" screw	
F4	252-3	13	6-32 nut	
F5	254-1	19	#6 lockwasher	
F6	259-1	1	#6 solder lug	

#### #10 Hardware

G1	250-1259	1	10-32 × 1-1/8" screw	
G2	250-1258	1	10-32 × 1-1/2" screw	
G3	252-5	3	10-32 nut	
G4	253-42	2	#10 flat washer	
G5	254-3	3	#10 lockwasher	
G6	259-26	2	#10 solder lug	

#### Other

H1	252-183	1	Large hex nut	
H2	253-73	2	Black flat washer	
H3	254-14	1	Large lockwasher	

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
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### MISCELLANEOUS

J1	10-994	2	1000 Ω control	R153, R165
J2	46-68	1	60 μH filter choke	L101
J3	46-67	1	100 μH filter choke	L102
J4	75-56	1	Diode insulator	
J5	75-707	1	Transistor insulator	
J6	100-1654	1	Capacitor mounting strap	
J7	260-65	2	Fuse clip	
J8	352-31	1	Thermal compound*	
J9	354-5	5	Cable tie	
J10	421-18	4	20-ampere, 3AG fuse (3 extra)	F101

### PARTS FROM THE MAIN PACK

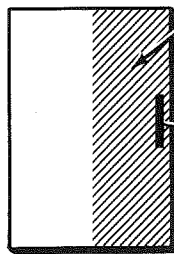
K1	25-847	1	39,000 μF electrolytic capacitor	C101
	85-2047-1	1	Power supply circuit board	
K2	200-1307	1	Power supply chassis	

\*Dow Corning thermal heat sink compound contains Zinc Oxides, SiO<sub>2</sub>, and slight traces of CO<sub>2</sub>.

# STEP-BY-STEP ASSEMBLY

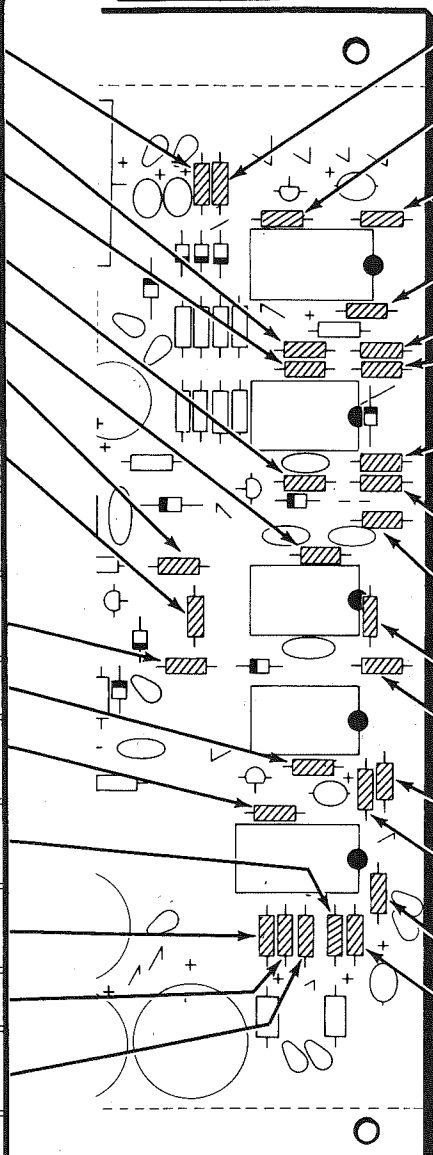
IDENTIFICATION  
DRAWING

The steps performed in this Pictorial are in this area of the circuit board.



**START** →

- ( ) Position the power supply circuit board as shown in the Identification Drawing. Then complete all of the steps in the following Pictorials.
- ( ) R103: 10 kΩ (brown-black-orange).
- ( ) R111: 68 kΩ (blue-gray-orange).
- ( ) R118: 68 kΩ (blue-gray-orange).
- ( ) R102: 1000 Ω (brown-black-red).
- ( ) R163: 8200 Ω (gray-red-red).
- ( ) R162: 8200 Ω (gray-red-red).
- ( ) R131: 1000 Ω (brown-black-red).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.
- ( ) R146: 1000 Ω (brown-black-red).
- ( ) R137: 8200 Ω (gray-red-red).
- ( ) R136: 1000 Ω (brown-black-red).
- ( ) R125: 33 Ω (orange-orange-black).
- ( ) R123: 33 Ω (orange-orange-black).
- ( ) R122: 8200 Ω (gray-red-red).
- ( ) R126: 100 Ω (brown-black-brown).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.



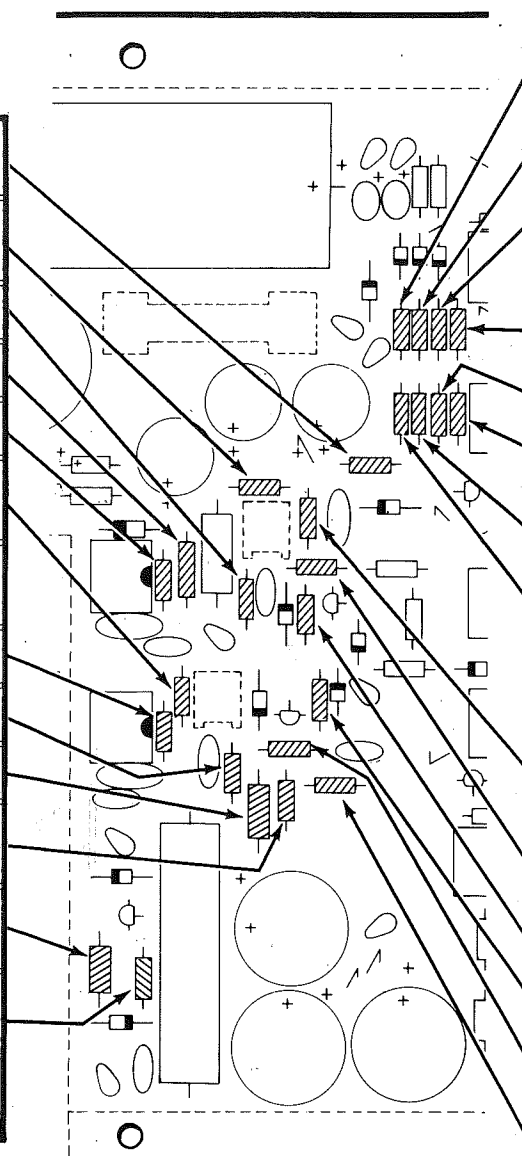
**CONTINUE** ↘

- ( ) R106: 10 kΩ (brown-black-orange).
- ( ) R103: 1000 Ω (brown-black-red).
- ( ) R104: 270 kΩ (red-violet-yellow).
- ( ) R121: 150 kΩ (brown-green-yellow).
- ( ) R112: 8200 Ω (gray-red-red).
- ( ) R119: 8200 Ω (gray-red-red).
- ( ) R113: 1000 Ω (brown-black-red).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.
- ( ) R101: 1000 Ω (brown-black-red).
- ( ) R114: 8200 Ω (gray-red-red).
- ( ) R151: 8200 Ω (gray-red-red).
- ( ) R133: 8200 Ω (gray-red-red).
- ( ) R134: 10 kΩ (brown-black-orange).
- ( ) R125: 33 Ω (orange-orange-black).
- ( ) R127: 8200 Ω (gray-red-red).
- ( ) R124: 8200 Ω (gray-red-red).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 3-1

**START** ↘

- ( ) R128: 10 kΩ (brown-black-orange).
- ( ) R164: 18 kΩ (brown-gray-orange).
- ( ) R166: 2700 Ω (red-violet-red).
- ( ) R161: 4.7 Ω, 1% precision.
- ( ) R159: 10 Ω, 1% precision.
- ( ) R154: 3000 Ω (orange-black-red).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.
- ( ) R147: 10 Ω, 1% precision.
- ( ) R152: 6200 Ω (blue-red-red).
- ( ) R148: 2 Ω, 1% precision.
- ( ) R143: 33 Ω (orange-orange-black).
- ( ) R139: 10 Ω, 1/2-watt (brown-black-black).
- ( ) R141: 100 Ω (brown-black-brown).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.



**CONTINUE** ↙

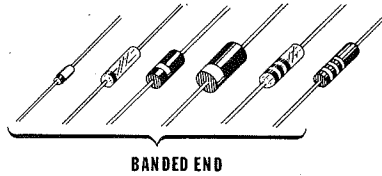
- ( ) R115: 150 kΩ (brown-green-yellow).
- ( ) R116: 47 kΩ (yellow-violet-orange).
- ( ) R107: 150 kΩ (brown-green-yellow).
- ( ) R108: 47 kΩ (yellow-violet-orange).
- ( ) R117: 68 kΩ (blue-gray-orange).
- ( ) R109: 68 kΩ (blue-gray-orange).
- ( ) R132: 4700 Ω (yellow-violet-red).
- ( ) R129: 4700 Ω (yellow-violet-red).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.
- ( ) R156: 100 Ω (brown-black-brown).
- ( ) R157: 1000 Ω (brown-black-red).
- ( ) R158: 8200 Ω (gray-red-red).
- ( ) R145: 8200 Ω (gray-red-red).
- ( ) R144: 1000 Ω (brown-black-red).
- ( ) R149: 8200 Ω (gray-red-red).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 3-2

**START** →

NOTE: When you install a diode, position its banded end as shown in the Pictorial. A circuit will not operate properly if the diode is installed backward.

IMPORTANT: THE BANDED END OF DIODES CAN BE MARKED IN A NUMBER OF WAYS.



Install three 1N4149 diodes (#56-56) at:

- ( ) D104.
- ( ) D103.
- ( ) D105.

( ) D102: 1N4002 diode (#57-65).

( ) D106: FH1100 diode (#56-87).

( ) D114: 1N4002 diode (#57-65).

( ) D116: FH1100 diode (#56-87).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) D107: 1N4149 diode (#56-56).

( ) ZD102: VR-13.5 zener diode (#56-32).

( ) D115: 1N4149 diode (#56-56).

( ) ZD101: 1N709A zener diode (#56-58).

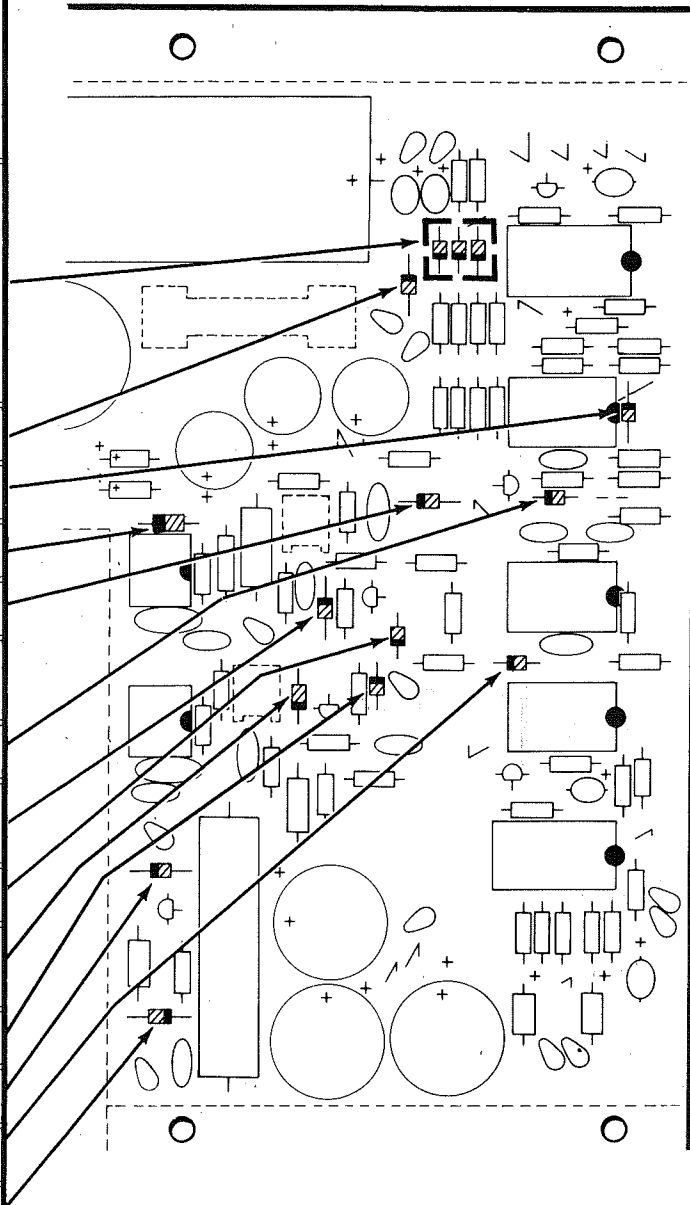
( ) D112: 1N4149 diode (#56-56).

( ) D109: 1N4002 diode (#57-65).

( ) D113: 1N4149 diode (#56-56).

( ) D111: 1N5817 diode (#57-608).

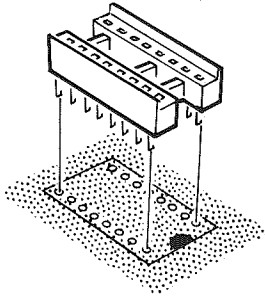
( ) Solder the leads to the foil and cut off the excess lead lengths.



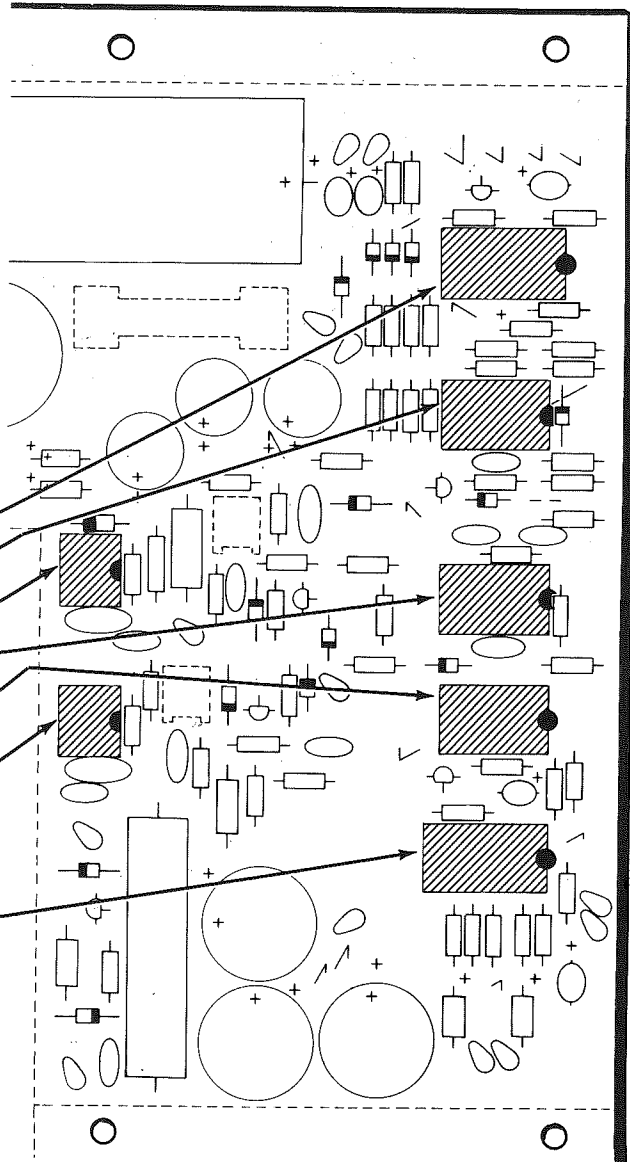
PICTORIAL 3-3

**START** →

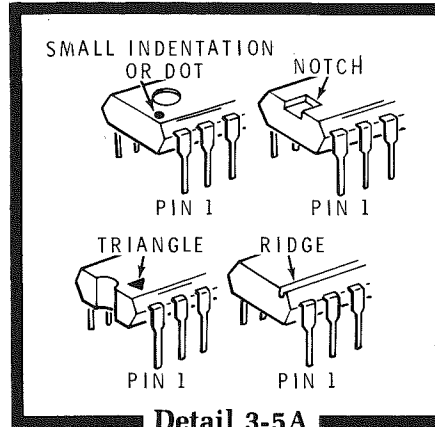
NOTE: The IC sockets that you will install in the following steps can be installed either way in the circuit board. Be sure the pins are straight, insert the pins into the holes, and solder the pins to the foil as you install each socket.



- ( ) 16-pin IC socket IC102.
- ( ) 14-pin IC socket at IC103.
- ( ) 8-pin IC socket at IC108.
- ( ) 14-pin IC socket at IC107.
- ( ) 14-pin IC socket at IC105.
- ( ) 8-pin IC socket at IC106.
- ( ) 16-pin IC socket at IC104.



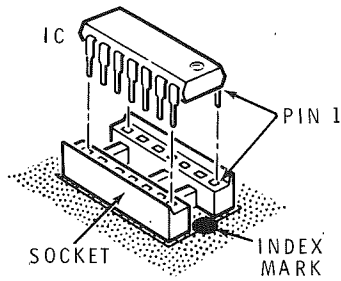
PICTORIAL 3-4



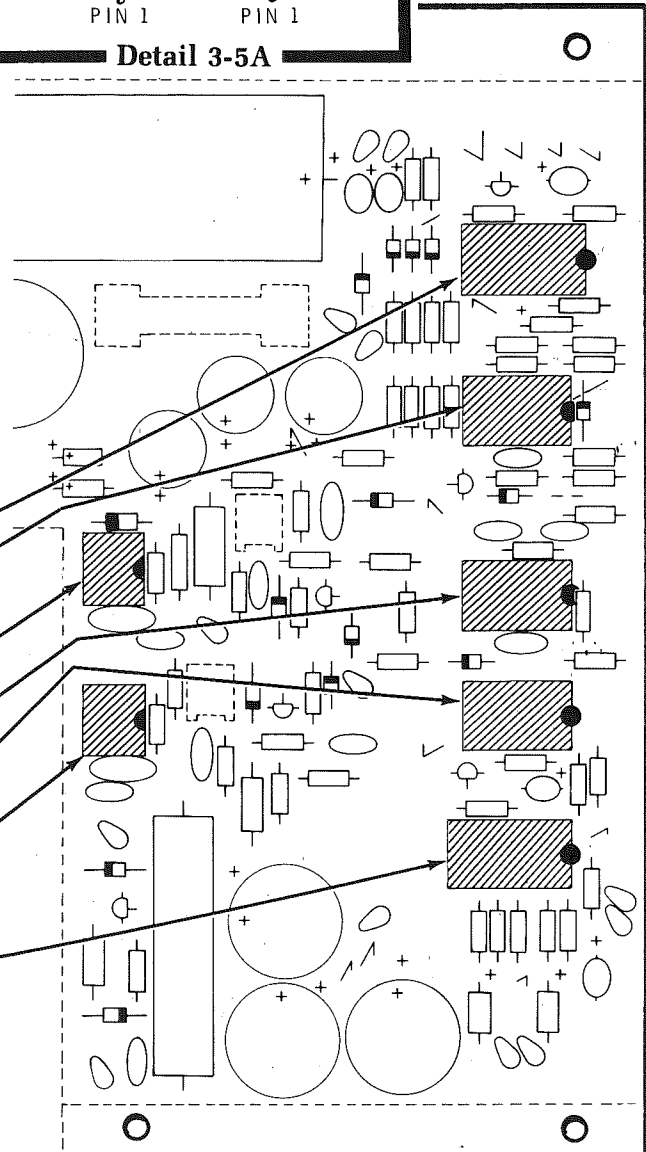
**START**

**NOTE:** When you install each of the following IC's, be sure to position the pin 1 end of the IC (see Detail 3-5A) toward the index mark on the circuit board.

Before you apply downward pressure to an IC, make sure each pin is centered in its proper socket hole. Handle IC's with care as their pins bend very easily.



- ( ) IC102: 96L02 IC (#443-727).
- ( ) IC103: 2901 (selected 3302) IC (#442-616).
- ( ) IC108: LM376 IC (#442-24).
- ( ) IC107: 2901 (selected 3302) IC (#442-616).
- ( ) IC105: 74LS00 IC (#443-728).
- ( ) IC106: LM376 IC (#442-24).
- ( ) IC104: 8838 IC (#443-819).

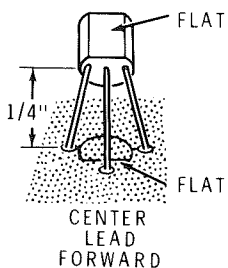


**PICTORIAL 3-5**



**START**

NOTE: When you install each of the following transistors, first bend the center lead toward the flat side of the transistor. Then line up the flat on the transistor with the outline of the flat on the circuit board and insert the leads into their corresponding holes. Solder the leads to the foil and cut off the excess lead lengths.



( ) Q101: MPSA06 transistor (#417-821).

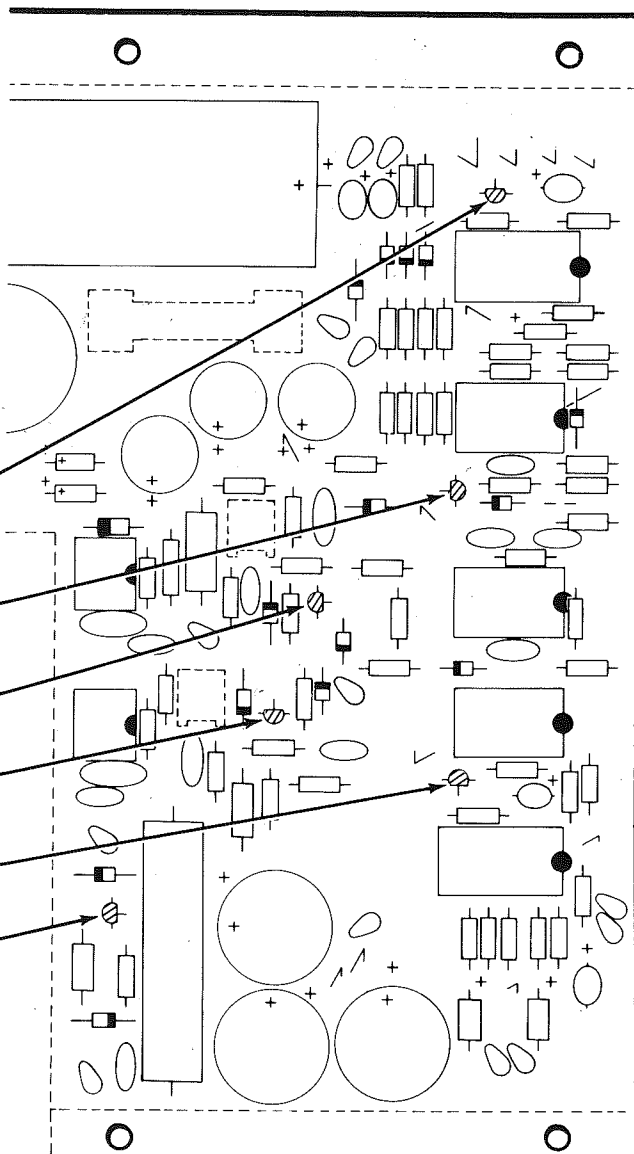
( ) Q102: MPSA06 transistor (#417-821).

( ) Q109: MPU131 transistor (#417-823).

( ) Q107: MPU131 transistor (#417-823).

( ) Q103: MPSA06 transistor (#417-821).

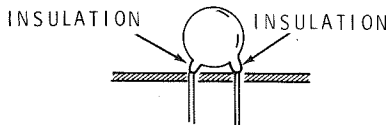
( ) Q106: MPSA06 transistor (#417-821).



PICTORIAL 3-6

**START** ↘

NOTE: When you install ceramic capacitors, do not push the insulated portion of the leads into the circuit board holes. This could make it difficult to solder the leads to the foil.



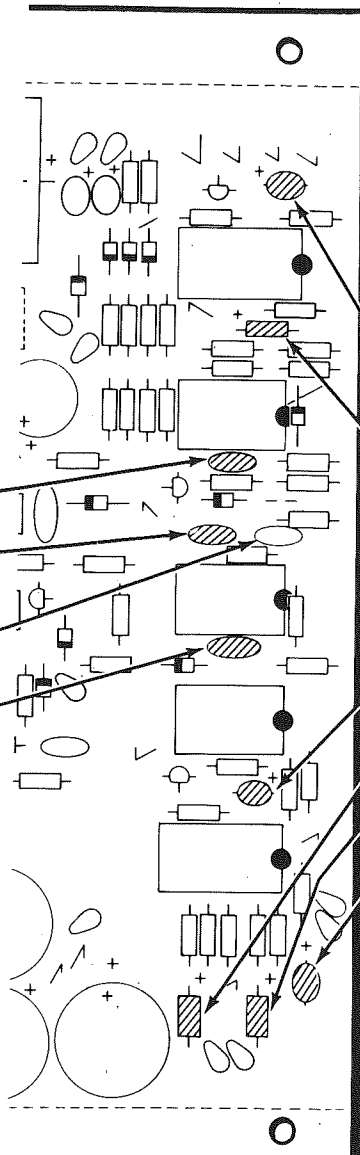
C106: .1  $\mu$ F ceramic.

C134: .1  $\mu$ F ceramic.

DO NOT INSTALL A CAPACITOR AT THIS LOCATION.

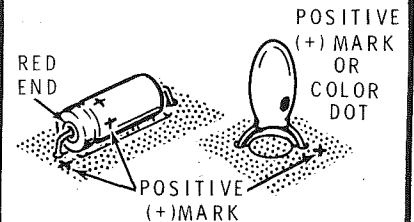
C124: .1  $\mu$ F ceramic.

Solder the leads to the foil and cut off the excess lead lengths.



**CONTINUE** ↘

NOTE: When you install electrolytic and tantalum capacitors, be sure to match the positive (+) mark, color dot or red end on the capacitor with the positive (+) mark on the circuit board as shown.



C107: 2.2  $\mu$ F tantalum.

C111: .22  $\mu$ F tantalum.

C114: 15  $\mu$ F tantalum.

C112: 1.0  $\mu$ F tantalum.

C113: 1.0  $\mu$ F tantalum.

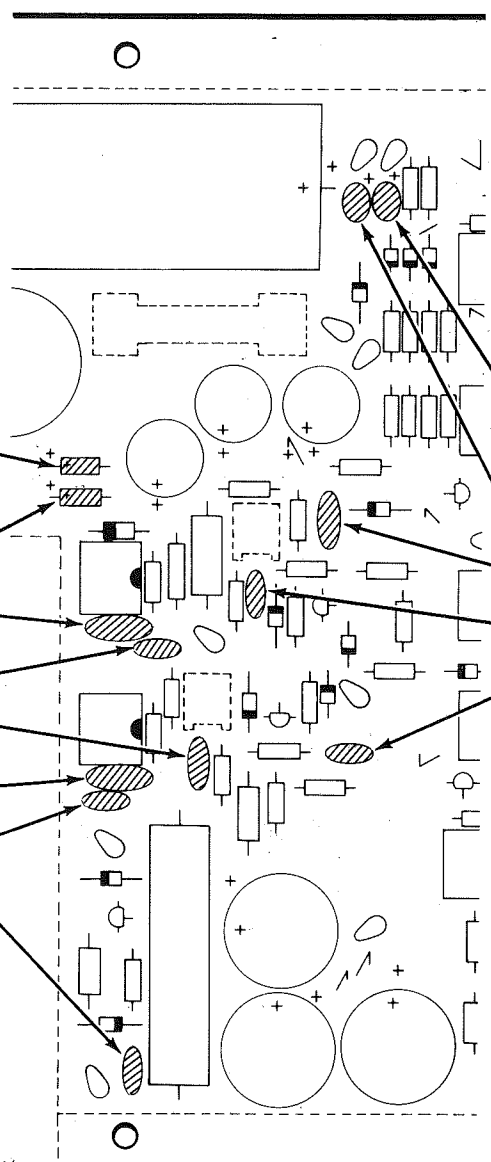
C105: 2.2  $\mu$ F tantalum.

Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 3-7

**START** ↘

- ( ) C104: .22  $\mu$ F tantalum. Be sure to position the positive (+) marked lead or red end toward the positive (+) mark on the circuit board.
- ( ) C103: .22  $\mu$ F tantalum.
- ( ) C129: .02  $\mu$ F ceramic.
- ( ) C131: 200 pF ceramic.
- ( ) C123: .05  $\mu$ F ceramic.
- ( ) C121: .02  $\mu$ F ceramic.
- ( ) C122: 200 pF ceramic.
- ( ) C115: .005  $\mu$ F ceramic.
- ( ) Solder the leads to the foil and cut off the excess lead lengths.



**CONTINUE** ↘

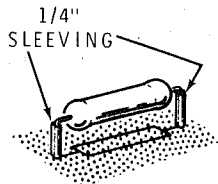
- ( ) C108: .68  $\mu$ F tantalum. Be sure to position the positive (+) or dot marked lead toward the positive (+) mark on the circuit board.
- ( ) C109: .68  $\mu$ F tantalum.
- ( ) C125: .1  $\mu$ F ceramic.
- ( ) C132: .05  $\mu$ F ceramic.
- ( ) C116: .1  $\mu$ F ceramic.
- ( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 3-8

**START**

( ) Cut four 1/4" lengths of Teflon sleeving. These lengths of sleeving will be used in the next two steps.

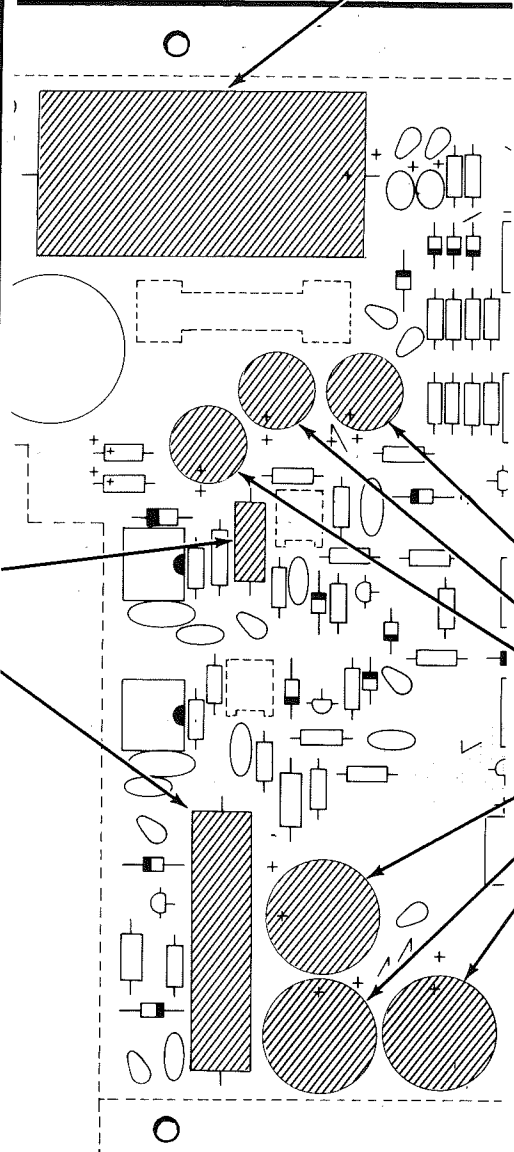
NOTE: When you install the following resistors, first place 1/4" length of small sleeving on each resistor lead. Then insert the leads into the circuit board holes and pull the resistor down snug against the circuit board.



( ) R155: .1  $\Omega$ , 3-watt, 1% precision.

( ) R142: .025  $\Omega$ , 10-watt, 1% precision.

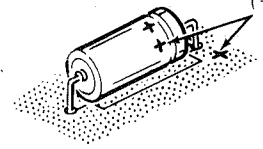
( ) Solder the leads to the foil and cut off the excess lead lengths.



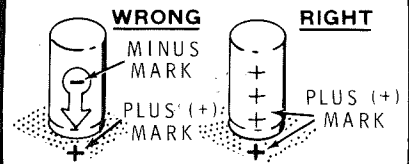
**CONTINUE**

( ) C102: 1500  $\mu\text{F}$  electrolytic. Be sure to install this capacitor as shown on the circuit board.

POSITIVE (+) MARK



NOTE: When you install the following electrolytic capacitors, be sure to position the plus (+) marked side of each capacitor as shown on the circuit board.



Install three 330  $\mu\text{F}$  electrolytic capacitors at:

( ) C128.

( ) C127.

( ) C126.

Install three 2200  $\mu\text{F}$  electrolytic capacitors at:

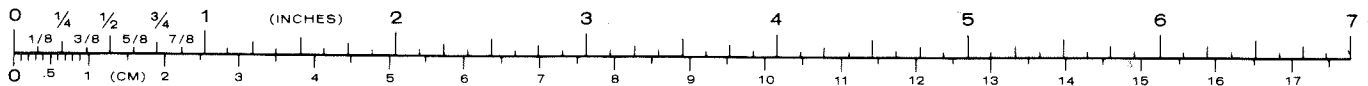
( ) C119.

( ) C118.

( ) C117.

( ) Solder the leads to the foil and cut off the excess lead lengths.

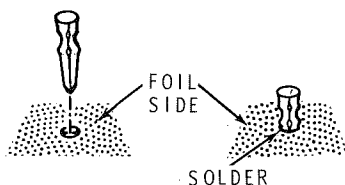
PICTORIAL 3-9



**START** ↘

- ( ) Position the circuit board component-side-down as shown.

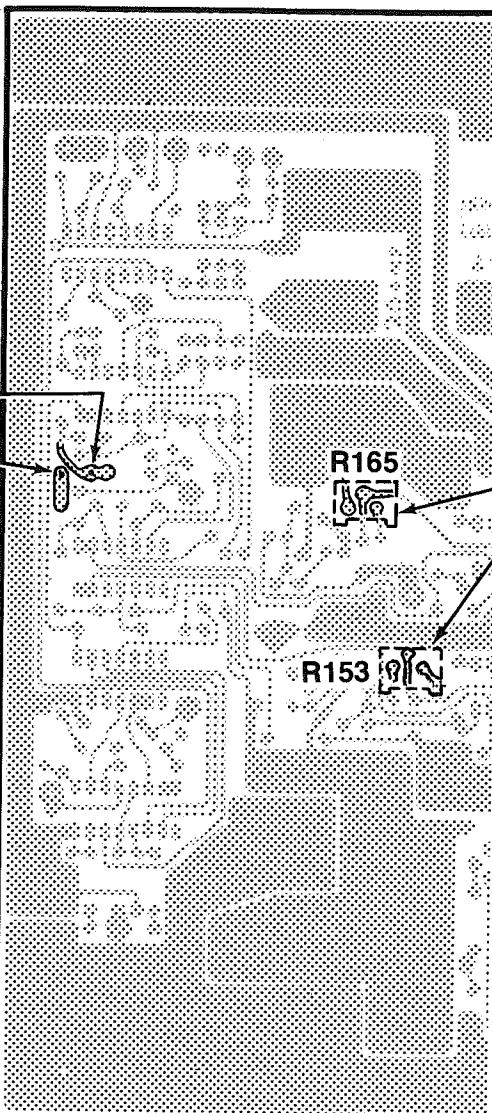
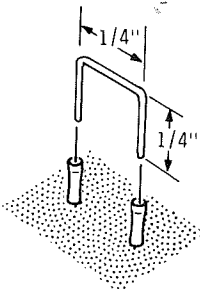
NOTE: When you install the following wire sockets, insert the sockets into the indicated holes on the foil side of the circuit board. Then **lightly** solder them to the foil side of the circuit board.



- ( ) Wire socket.

- ( ) Wire socket.

- ( ) Remove all of the insulation from a 3/4" length of small (pretinned) brown wire. Then form the wire as shown and push it into the wire sockets just installed.



**CONTINUE** ↘

NOTE: When you install the following controls, insert the leads into the circuit board holes on the foil side of the circuit board. Then turn the circuit board over and solder the leads to the foil on the component side of the board. Cut off any excess lead lengths.

- ( ) R165: 1000 (1k)  $\Omega$  control.

- ( ) R153: 1000 (1k)  $\Omega$  control.

- ( ) Preset control R165 to its fully counterclockwise adjustment.

- ( ) Preset control R153 to its fully counterclockwise adjustment.

PICTORIAL 3-10

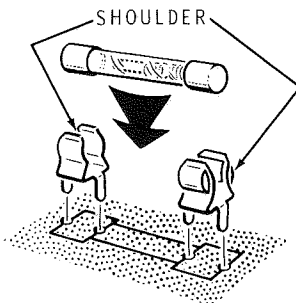
**START** ▾

( ) Turn the circuit board foil-side-up as shown.

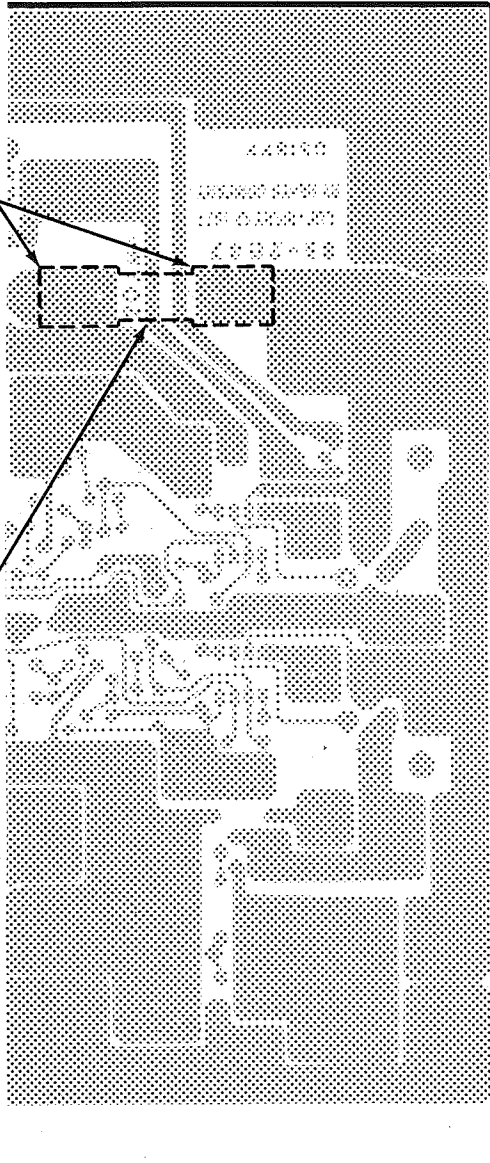
( ) Install the fuse clips on the foil side of the circuit board at the indicated locations. Be sure to position the fuse clip shoulders as shown. Do not solder the fuse clips yet.

NOTE: Several 20-ampere fuses are supplied with this kit. These fuses are sufficient for use in the power supply section of this kit with a fully loaded backplane assembly. NEVER USE A FUSE LARGER THAN 20 AMPERES AT F101.

( ) F101: Install a 20-ampere fuse into the fuse clips. Then turn the circuit board over and solder the lugs to the foil on the component side of the board.



NOTE: Save the extra 20-ampere fuses for use during "Power Supply Tests and Adjustments."

**CONTINUE** ▾**CIRCUIT BOARD CHECKOUT**

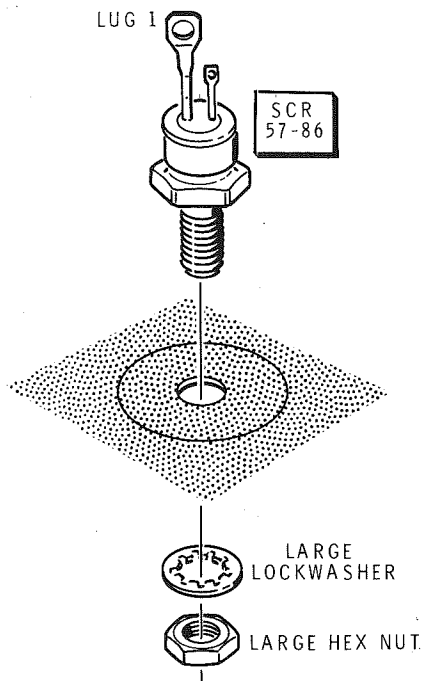
Carefully inspect the foil side of the circuit board for the following most commonly made errors.

- ( ) Unsoldered connections at leads that have foil.
- ( ) Poor solder connections.
- ( ) Solder bridges between foil patterns.
- ( ) Protruding leads which could touch together.

Refer to the illustrations where the parts were installed as you make the following visual checks.

- ( ) Transistors for the proper **type** and **installation**.
- ( ) Integrated circuits for the proper **type** and **installation**.
- ( ) Electrolytic and tantalum capacitors for the correct position of the positive (+) mark.
- ( ) Diodes for the correct **type** and **position** of the banded end.

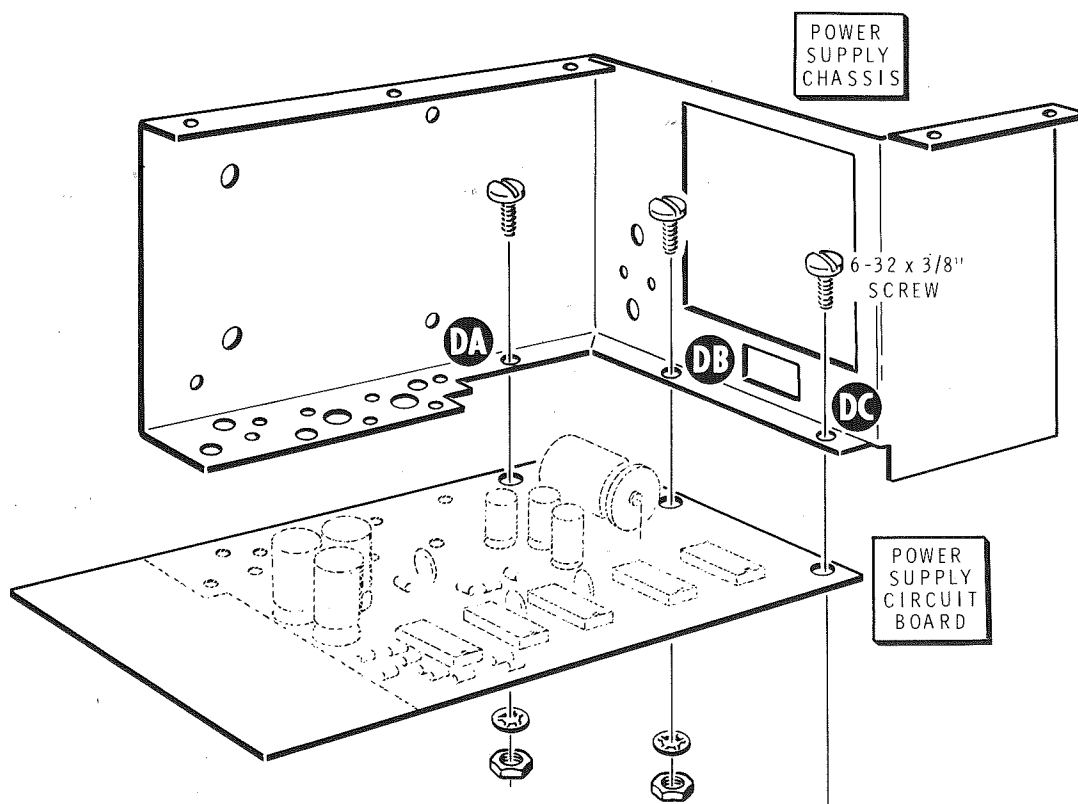
PICTORIAL 3-11



Refer to Pictorial 3-12 (Illustration Booklet, Page 7) for the following steps.

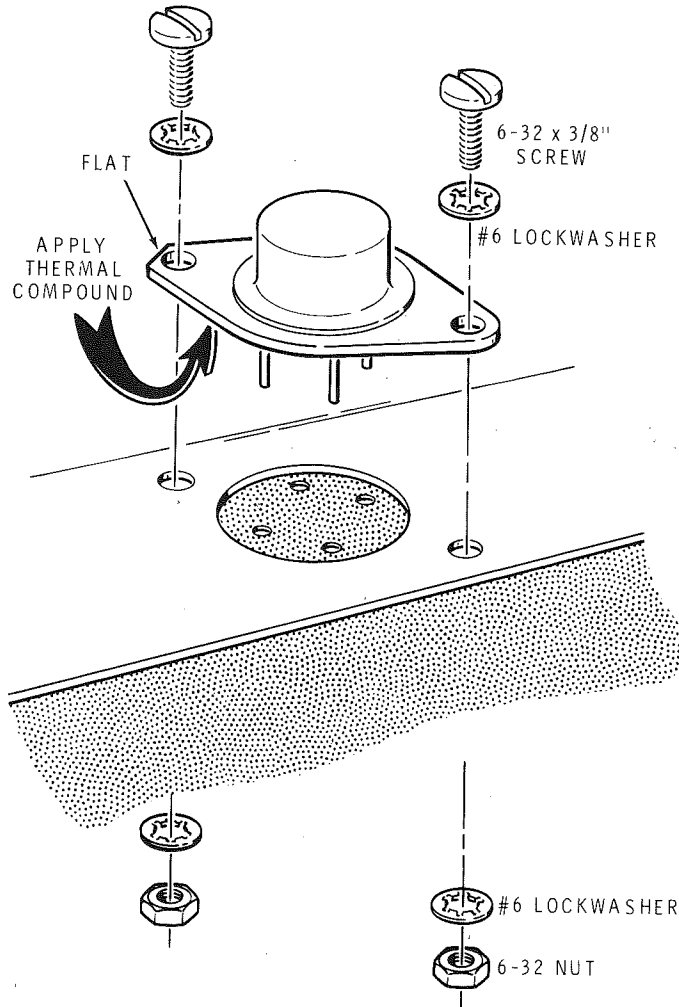
- ( ) Position the circuit board as shown.
- ( ) D108: Refer to Detail 3-12A and mount an NL576A SCR (#57-86) at D108. Use a large lockwasher and a large hex nut. Be sure to position lug 1 of the SCR (the longest lug) as shown in the Pictorial.
- ( ) Refer to Detail 3-12B and loosely mount the power supply chassis to the power supply circuit board at DA, DB, and DC. Use 6-32 x 3/8" hardware.

Detail 3-12A



Detail 3-12B

- #6 LOCKWASHER
- 6-32 NUT



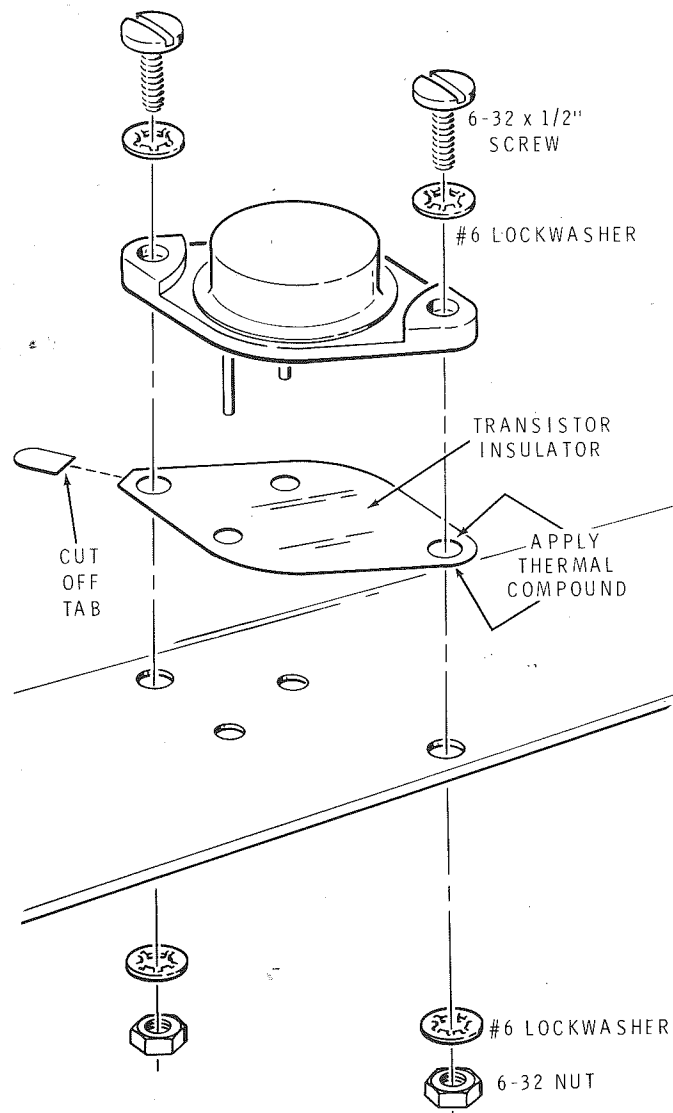
Detail 3-12C

**WARNING:** You will be using Dow Corning 340 thermal heat sink compound in the next step and several other steps in the Manual. Although the compound is not caustic, it may cause temporary discomfort if it gets into your eyes. If this happens, rinse your eyes with warm water. If the compound gets into your clothing, the clothing may require professional cleaning. The compound contains Zinc Oxides,  $\text{SiO}_2$ , and slight traces of  $\text{CO}_2$ . Always wash your hands after you use the compound. Keep this and all chemicals out of the reach of children.

- ( ) Refer to the inset drawing on the Pictorial and cut open the thermal compound container. Then spread a thin layer of the compound onto the bottom (the side with the leads) of a PIC625 transistor (#417-895).

- ( ) Q108: Refer to Detail 3-12C and loosely mount the prepared transistor to the power supply chassis and circuit board at Q108. Use 6-32  $\times$  3/8" hardware. Be sure to mount this transistor with the flat in the mounting flange positioned as shown in the Pictorial.
- ( ) Q105: Similarly, spread a thin layer of thermal compound onto the bottom of a PIC600 transistor (#417-896). Then loosely mount the transistor to the power supply chassis and circuit board at Q105. Use 6-32  $\times$  3/8" hardware. Be sure to mount this transistor with the flat in the mounting flange positioned as shown in the Pictorial.

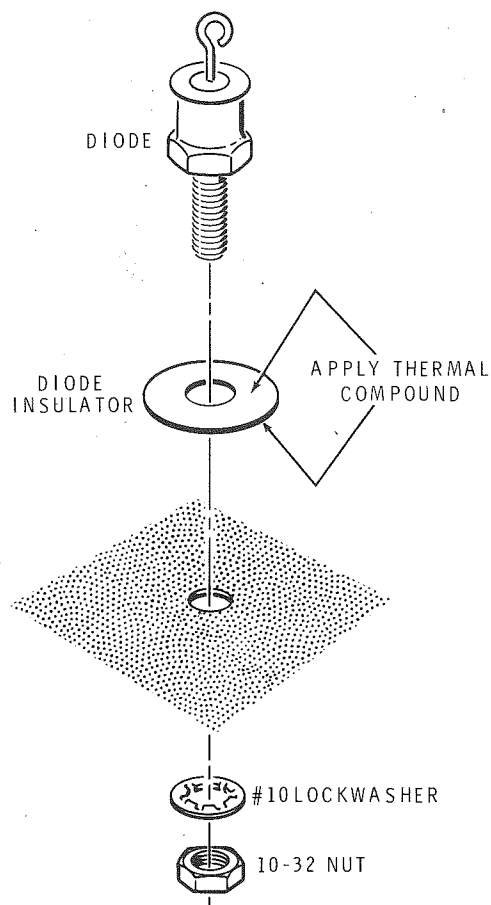




Detail 3-12D

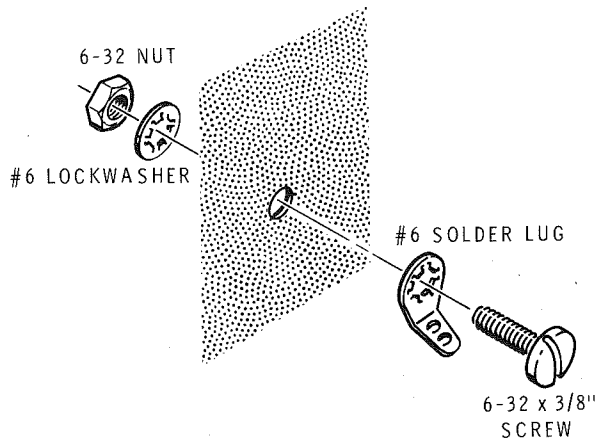
- ( ) Center the four holes in the circuit board for transistor Q104 in the corresponding holes in the power supply chassis. Then tighten the hardware at DA, DB, DC, Q105, and Q108.
- ( ) Refer to Detail 3-12D and cut the tab from the transistor insulator.

NOTE: When you mount the following transistor, be sure the indicated wide space on the transistor and transistor insulator lines up with the wide space on the power supply chassis.

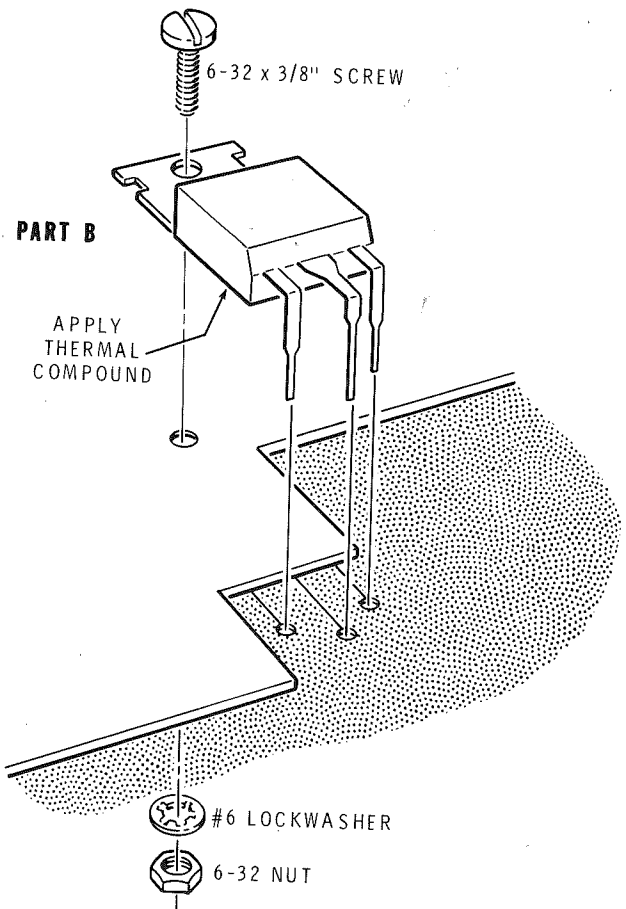
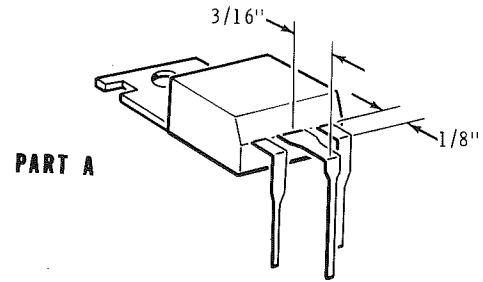


Detail 3-12E

- ( ) Q104: Spread a thin layer of thermal compound on both sides of the prepared insulator. Then refer again to Detail 3-12D and mount the 2N6274 transistor and transistor insulator to the power supply chassis and circuit board at Q104. Use 6-32 x 1/2" hardware.
- ( ) D110: Spread a thin layer of thermal compound on both sides of the diode insulator. Then refer to Detail 3-12E and mount a 1N5831 diode (#57-608) to the power supply chassis and circuit board at D110. Use a #10 lockwasher and a 10-32 nut. Position this diode so the hole in the lug is positioned as shown in the Pictorial.

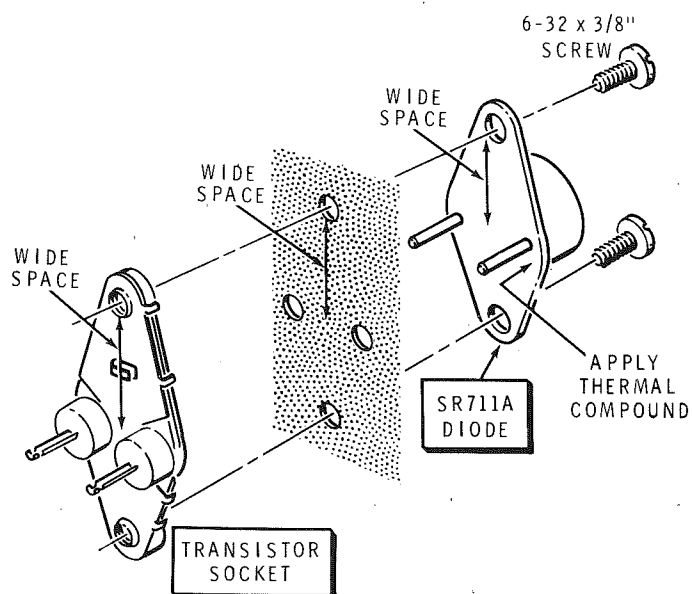
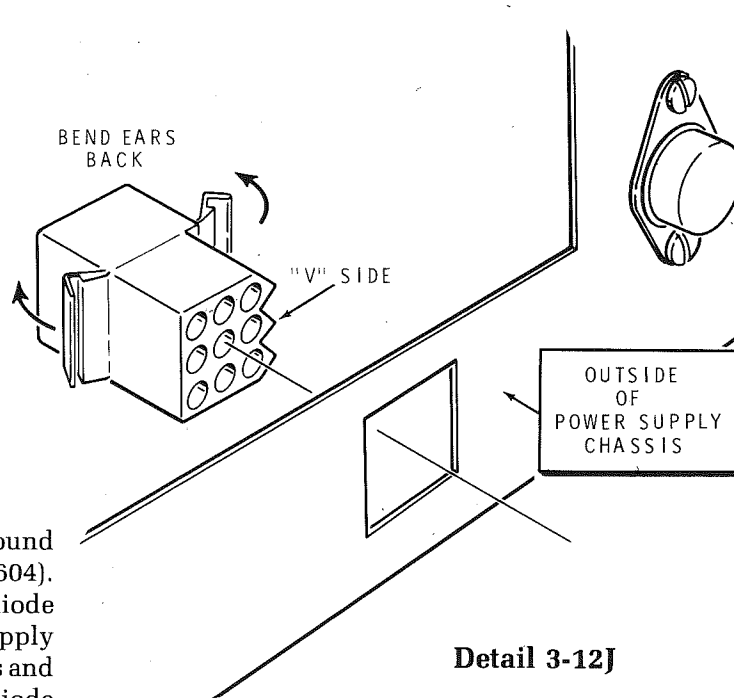


Detail 3-12F

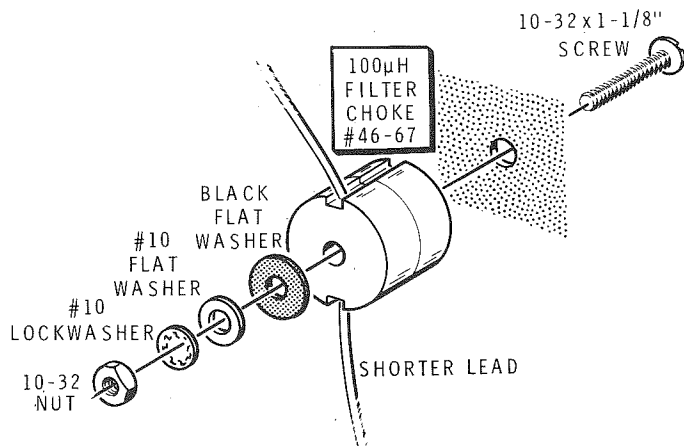


Detail 3-12G

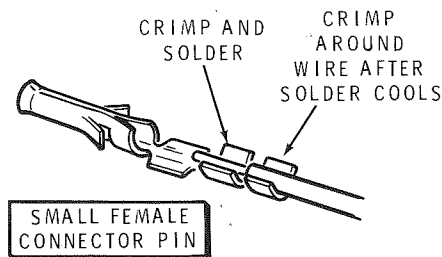
- ( ) Refer to Detail 3-12F and mount a #6 solder lug to the power supply chassis at DD. Use 6-32 × 3/8" hardware. Be sure to position the solder lug as shown in the Pictorial.
- ( ) Refer to Part A of Detail 3-12G and bend the leads of a 78M05 integrated circuit (#442-603) as shown.
- ( ) IC101: Spread a thin layer of thermal compound onto the flat side of the prepared integrated circuit. Then refer to Part B of the Detail and mount the integrated circuit to the power supply chassis and circuit board at IC101. Use 6-32 × 3/8" hardware.
- ( ) Turn the power supply chassis over and solder the leads of IC101, Q108, Q105, and Q104 to the circuit board foil. Then cut off the excess lead lengths.


**Detail 3-12H**

**Detail 3-12J**

- ( ) D101: Spread a thin layer of thermal compound onto the bottom of an SR711A diode (#57-604). Then refer to Detail 3-12H and mount the diode and a transistor socket to the power supply chassis at D101. Use two 6-32 × 3/8" screws and be sure the indicated wide space on the diode and the socket lines up with the wide space on the power supply chassis. Discard the remaining thermal compound.
  
- ( ) Refer to Detail 3-12J and bend the ears of a 9-pin plug shell back as shown. Then push the plug shell into hole P101 in the power supply chassis until it locks into place. Be sure to install this plug shell so the "V" side is positioned as shown.



**Detail 3-13A**



**Detail 3-13B**

Refer to Pictorial 3-13 (Illustration Booklet, Page 8) for the following steps.

- ( ) Prepare a 1-1/4" large red wire. Then connect the wire from solder lug DD (S-1) to D110 lug 1 (S-1).

**NOTE:** Be sure to mount the following chokes so the shorter lead is toward the circuit board, and do not overtighten the hardware.

- ( ) L102: Refer to Detail 3-13A and mount a 100 µH filter choke (#46-67) onto the power supply chassis at L102. Use a 10-32 × 1-1/8" screw, a black flat washer, a #10 flat washer, a #10 lockwasher, and a 10-32 nut.
- ( ) L101: Similarly, mount a 60 µH filter choke (#46-68) to the power supply chassis at L101. Use a 10-32 × 1-1/2" screw, a black flat washer, a #10 flat washer, a #10 lockwasher, and a 10-32 nut.

Connect the leads coming from choke L102 to the circuit board as follows. Cut off any excess wire ends.

- ( ) Shorter lead to hole N (S-1). **NOTE:** This hole is not labeled on the circuit board.
- ( ) Longer lead to hole P (S-1).

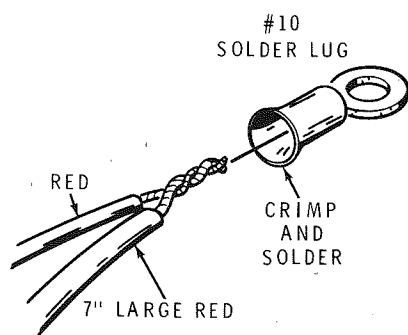
Connect the leads coming from choke L101 to the circuit board as follows. Cut off any excess wire ends.

- ( ) Shorter lead to hole K (S-1).
- ( ) Longer lead to hole L (S-1).
- ( ) Prepare the following wires:
  - 5" large brown
  - 4" large brown
  - 7" medium red
- ( ) Refer to Detail 3-13B and install a small female connector pin on **one end** of each of the prepared wires.

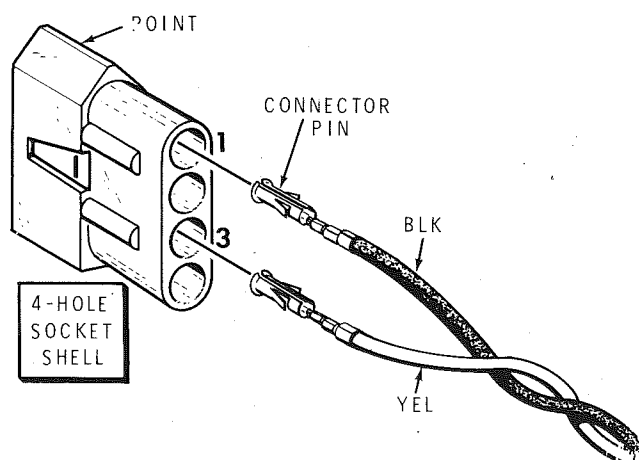
Push the connector pins on the ends of the prepared wires into the holes of the 9-pin plug shell at P101 as follows. Push on each wire until it locks into place.

- ( ) 5" brown wire to hole 3.
- ( ) 4" brown wire to hole 2.
- ( ) 7" red wire to hole 1.
- ( ) Connect the free end of the brown wire coming from P101 hole 3 to D101 lug 2 (NS).
- ( ) Connect the free end of the brown wire coming from P101 hole 2 to D101 lug 3 (NS).





Detail 3-13C



Detail 3-13D

NOTE: The red wire coming from P101 hole 1 will be connected later.

( ) Prepare the following wires:

5" small (pretinned) brown	7" large red
4" small (pretinned) brown	3" large black
3" small (pretinned) black	2" large black
6" small (pretinned) brown	

( ) Connect the 5" small brown wire from circuit board hole D (S-1) to D101 lug 2 (S-2). Do not solder the diode lead to the socket lug.

( ) Connect the 4" small brown wire from circuit board hole C (S-1) to D101 lug 3 (S-2). Do not solder the diode lead to the socket lug.

( ) Connect the 3" small black wire from circuit board hole T (S-1) to D108 lug 1 (S-1).

( ) Connect the 6" small brown wire from circuit board hole M (S-1) to D108 lug 2 (S-1).

( ) Refer to Detail 3-13C and install a #10 solder lug on one end of the 7" large red wire and the red wire coming from P101 hole 1.

( ) Connect the free end of the large red wire to circuit board hole A (S-1).

( ) Install a #10 solder lug on one end of the 3" large black wire and the 2" large black wire.

( ) Connect the free end of the 3" large black wire to circuit board hole B (S-1).

( ) Connect the free end of the 2" large black wire to socket D101 lug 1 (S-1).

( ) Prepare a 16" large yellow wire and a 16" medium black wire.

( ) Install small female connector pins on each end of each prepared wire.

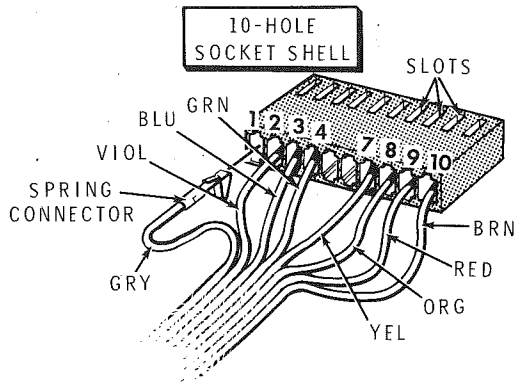
( ) Push the connector pin on one end of the yellow wire into plug P101 hole 6 until it locks in place.

( ) Push the connector pin on one end of the black wire into plug P101 hole 7 until it locks in place.

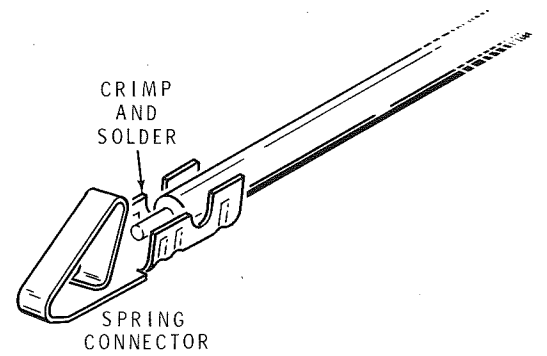
( ) Loosely (approximately 1 turn per inch) twist together the black and the yellow wires.

( ) S102: Refer to Detail 3-13D and push the connector pin on the free end of the black wire into hole 1 of a 4-hole socket shell. NOTE: Use the point on the socket shell as a reference to locate hole 1.

( ) Push the connector pin on the free end of the yellow wire into hole 3 of the 4-hole socket shell.



**PICTORIAL 3-14**

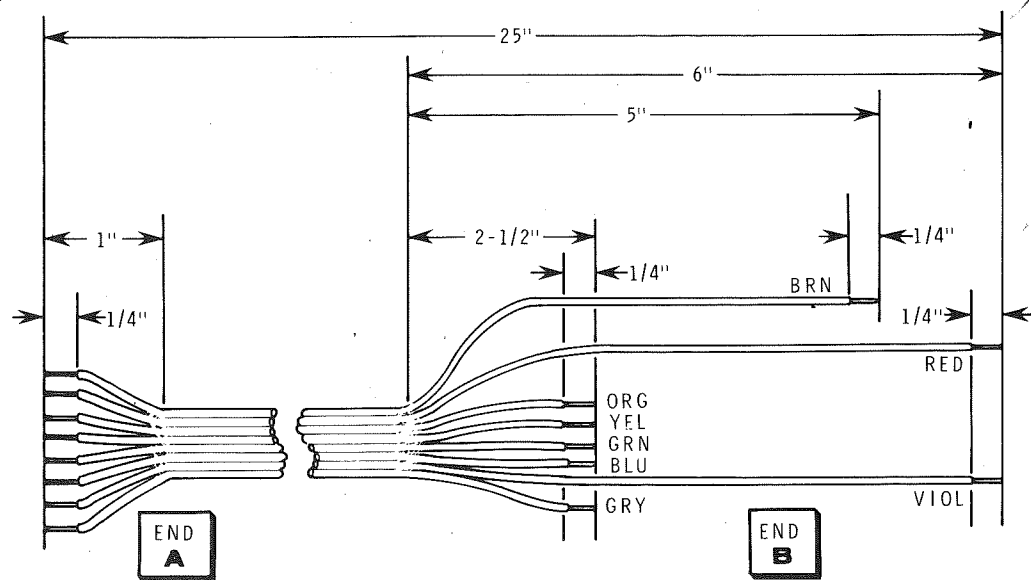


**Detail 3-14B**

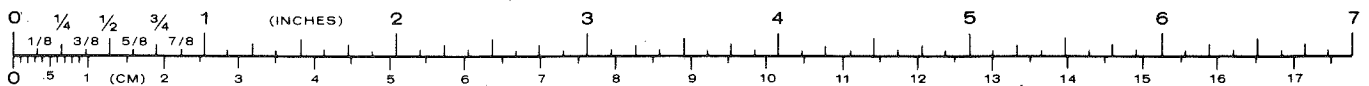
Refer to Pictorial 3-14 for the following steps.

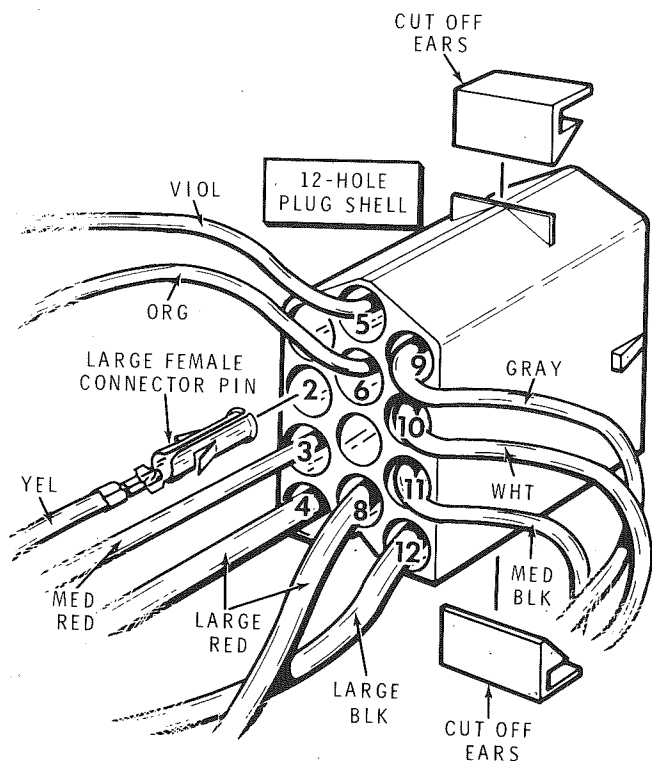
- ( ) Refer to Detail 3-14A and prepare a 25" length of 8-wire cable as shown.
- ( ) Refer to Detail 3-14B and install a spring connector (#432-866) on each wire at **end A** of the cable.
- ( ) Refer to the Pictorial and insert the spring connector on the gray wire into hole 1 of the 10-hole socket shell.

**NOTE:** When you perform the following steps, be sure to position the 10-hole socket shell and spring connectors as shown before you insert the connectors into the socket shell. Push in on each wire until the connector locks in place.



**Detail 3-14A**





**PICTORIAL 3-15**

Insert the remainder of the spring connectors into the holes of the 10-hole socket shell as follows:

- ( ) Violet wire into hole 2.
- ( ) Blue wire into hole 3.
- ( ) Green wire into hole 4.

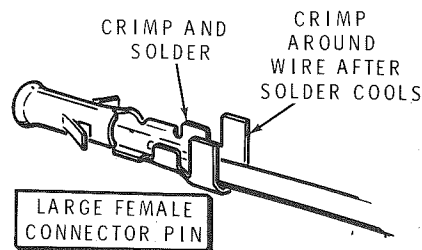
NOTE: Be sure to skip holes 5 and 6.

- ( ) Yellow wire into hole 7.
- ( ) Orange wire into hole 8.
- ( ) Red wire into hole 9.
- ( ) Brown wire into hole 10.
- ( ) Set the prepared 8-wire cable assembly aside temporarily.

Refer to Pictorial 3-15 for the following steps.

- ( ) Prepare the following wires:

One 11" large yellow      One 8-1/2" gray



**Detail 3-15A**

- One 10" medium red      One 11" white
- Two 6" large red      One 11" medium black
- One 10" violet      One 6" large black
- One 7-1/2" orange

- ( ) Refer to Detail 3-15A and install a large female connector pin on one end of each of the prepared wires.
- ( ) Cut the ears from the 12-hole plug shell as shown in the Pictorial.
- ( ) Position the 12-hole plug shell as shown in the Pictorial and push the connector on the end of the prepared large yellow wire into hole 2 of the plug shell. Be careful you do not use hole 1.

Push the remaining prepared wires into the 12-hole plug shell as follows:

- ( ) Medium red wire into hole 3.
- ( ) Either large red wire into hole 4.
- ( ) Violet wire into hole 5.
- ( ) Orange wire into hole 6.

NOTE: Be sure to skip hole 7.

- ( ) Remaining large red wire into hole 8.
- ( ) Gray wire into hole 9.
- ( ) White wire into hole 10.
- ( ) Medium black wire into hole 11.
- ( ) Large black wire into hole 12.
- ( ) Set the prepared 10-wire assembly aside temporarily.

Refer to Pictorial 3-16 (Illustration Booklet, Page 9) for the following steps.

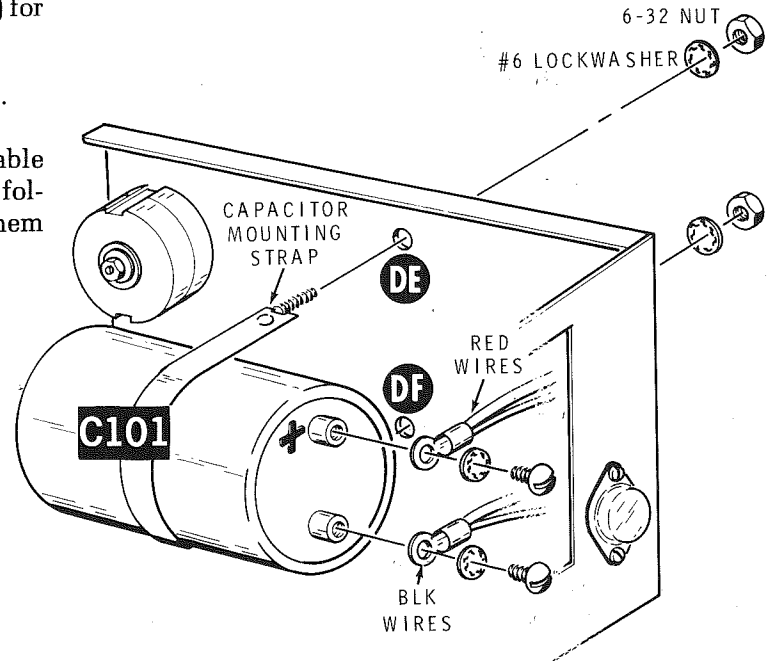
- ( ) Locate the prepared 8-wire cable assembly.

Connect the wires at the free end of the 8-wire cable assembly to the power supply circuit board as follows. Solder the wires to the foil as you connect them and cut off any excess lead lengths.

- ( ) Violet wire to hole RUN LIGHT.
- ( ) Red wire to hole HALT.
- ( ) Brown wire to hole DC ON.
- ( ) Blue wire to hole E.
- ( ) Green wire to hole F.
- ( ) Gray wire to hole DC ON LIGHT.
- ( ) Orange wire to hole J.
- ( ) Yellow wire to hole H.
- ( ) Locate the prepared 10-wire assembly.

Connect the wires at the free end of the 10-wire assembly to the power supply circuit board as follows. Solder the wires to the foil as you connect them and cut off any excess lead lengths.

- ( ) Yellow wire to hole S RUN.
- ( ) White wire to hole B HALT.
- ( ) Smaller black wire to hole R.
- ( ) Smaller red to hole +12V.
- ( ) Violet wire to hole BEVNT.
- ( ) Orange wire to hole BPOK.
- ( ) Gray wire to hole BDCOK.
- ( ) Either large red wire to hole +5B.
- ( ) Other large red wire to hole +5V.
- ( ) Large black wire to hole S.



PICTORIAL 3-18

- ( ) Refer to Pictorial 3-17 (Illustration Booklet, Page 10) and install cable ties on the cable assemblies at the five locations shown.

Refer to Pictorial 3-18 for the following steps.

- ( ) C101: Position the 39,000  $\mu$ F electrolytic capacitor inside the power supply chassis assembly as shown. Then connect the #10 solder lug on the end of the red wires to the positive (+) marked terminal of the capacitor. Use the hardware supplied with the capacitor.
- ( ) Connect the #10 solder lug on the end of the black wires to the other capacitor terminal. Use the hardware supplied with the capacitor.
- ( ) Mount capacitor C101 to the power supply chassis at DE and DF with a capacitor mounting strap. Use two #6 lockwashers and two 6-32 nuts.

Proceed to "Power Supply Tests and Adjustments."





## POWER SUPPLY TESTS AND ADJUSTMENTS

### SECONDARY WIRING TESTS

If you have a VTVM (or another suitable meter) available, make the following resistance checks before you proceed to "Voltage Checks." If you do not obtain the proper results, refer to the "Possible Cause" chart which follows and correct the problem before you continue.

Refer to Pictorial 3-19 (Illustration Booklet, Page 11) for the following steps.

- ( ) Position the power supply assembly near the chassis assembly as shown.
- ( ) Push socket S101 coming from the power transformer onto plug P101 on the rear of the power supply assembly.
- ( ) Push socket S102 coming from the power supply assembly onto plug P102 on the fan bracket.
- ( ) Temporarily remove fuse F101 from the power supply circuit board.

**NOTE:** The internal wiring of most ohmmeters is such that the positive terminal of the meter battery is connected to the positive test lead and the negative battery terminal is connected to the negative (common) test lead. In some ohmmeters, this wiring is reversed and will give erroneous readings in the following measurements. Interchange the ohmmeter leads if the measurements do not check out properly the first time.

- ( ) Connect the common or ground lead of your meter to the power supply chassis.
- ( ) Be sure the meter is in the  $R \times 10$  position.
- ( ) Touch the other meter lead to TP1. The meter should indicate an infinite reading.

PROBLEM	POSSIBLE CAUSE
1. Low reading.	A. Mounting of D108, Q104, Q105, Q108, IC106 or IC108. B. Solder bridge on power supply circuit board.

- ( ) Touch the meter probe to TP2. The meter needle should drop to a low indication and then rise (charging of capacitors C117, C118, and C119) and stop at a reading greater than 2000  $\Omega$ .

PROBLEM	POSSIBLE CAUSE
1. Low reading.	A. Diode D110. B. Mounting of Q104. C. Zener diode ZD101. D. Solder bridge on power supply circuit board. E. Capacitors C117, C118, or C119.

- ( ) Touch the meter probe to TP3. The meter needle should drop to a low indication and then rise (charging of capacitors C126, C127, and C128) and stop at a reading greater than 5000  $\Omega$ .

PROBLEM	POSSIBLE CAUSE
1. Low reading.	A. Mounting of transistor Q108. B. Zener diode ZD102. C. Solder bridge on power supply circuit board. D. Capacitors C126, C127, and C128.

- ( ) Disconnect the meter leads from the power supply assembly.

## VOLTAGE CHECKS

- ( ) Be sure the AC POWER SWITCH (rear panel) is in the OFF position.
- ( ) Be sure the 120/240 switch (rear panel) is in the proper position.
- ( ) Set your VTVM to measure +30 volts DC.
- ( ) Connect the common or ground lead of your VTVM to the power supply chassis.
- ( ) Plug the line cord into a proper AC outlet.
- ( ) Push the AC POWER SWITCH to ON. The fan should operate.

PROBLEM	POSSIBLE CAUSE
1. Fan does not operate.	A. Check wiring of connectors P101/S101 and P102/S102. B. Check wiring on terminal strip AN. DISCONNECT THE LINE CORD BEFORE YOU REMOVE THE AC SHIELD.

- ( ) Push the AC POWER SWITCH to OFF.
- ( ) Unplug socket S102 from P102 on the fan bracket.
- ( ) Push the AC POWER SWITCH to ON.
- ( ) Touch your VTVM probe to TP4. The meter should indicate between 25 and 35 volts.

PROBLEM	POSSIBLE CAUSE
1. Low reading.	A. Transformer T1 wiring. B. Connector P101/S101 wiring. C. Diode D101. D. Capacitor C101. E. Switch SW2.
2. High reading.	A. Transformer T1 wiring. B. Connector P101/S102 wiring. C. Diode D101. D. Switch SW2.

- ( ) Set your VTVM to measure +5 volts DC.
- ( ) Touch your VTVM probe to TP5. The meter should indicate between 4-1/2 and 5-1/2 volts.

PROBLEM	POSSIBLE CAUSE
1. Low reading.	A. Diode D102. B. Capacitor C102. C. IC101. D. Capacitors C103, C104, C105, or C106. E. Solder bridge on power supply circuit board.
2. High reading.	A. IC101. B. Solder bridge on power supply circuit board.

- ( ) Push the AC POWER SWITCH to OFF.



Refer to Pictorial 3-20 (Illustration Booklet, Page 12) for the following steps.

NOTE: Pictorial 3-20 shows the switch circuit board as you would see it when viewed from over the top of the front panel.

- ( ) Push the 10-hole socket, on the end of the 8-wire cable coming from the power supply assembly, onto the 10-pin plug on the switch circuit board. Be sure to orient the socket so the brown and gray wires are positioned as shown.
- ( ) Be sure the common or ground lead of your VTVM is still connected to the power supply chassis.
- ( ) Push the AC POWER SWITCH to ON.
- ( ) Touch your VTVM probe to TP6. The meter should indicate between 4-1/2 and 5-1/2 volts.

PROBLEM	POSSIBLE CAUSE
1. TP6 does not indicate between 4-1/2 and 5-1/2 volts.	A. Wiring error at green and blue wires of 8-wire cable. B. Solder bridge on switch circuit board. C. Capacitor C201. D. IC201. E. Socket connected wrong to switch circuit board.

- ( ) Touch your VTVM probe to TP7. The meter should indicate greater than 3.5 volts with the RUN/HALT switch in the RUN position and 0 volts in the HALT position.

PROBLEM	POSSIBLE CAUSE
1. TP7 does not toggle between 3.5 volts or greater and 0 volts.	A. IC201. B. Transistor Q201. C. Switch SW202. D. Solder bridge on switch circuit board or power supply circuit board.

Refer to Pictorial 3-21 (Illustration Booklet, Page 12) for the following steps.

- ( ) Touch your VTVM probe to TP8. The meter should indicate greater than 3.5 volts with the RUN/HALT switch in the RUN position and 0 volts in the HALT position.

PROBLEM	POSSIBLE CAUSE
1. TP8 does not toggle between 3.5 volts or greater and 0 volts.	A. Wiring error at red wire of 8-wire cable.

- ( ) Touch your VTVM probe to TP9. The meter should indicate between 1 and 3 volts.

PROBLEM	POSSIBLE CAUSE
1. TP9 does not indicate between 1 and 3 volts.	A. IC103A.

- ( ) Touch your VTVM probe to TP10. The meter should indicate greater than 2.4 volts (high) with the DC ON/OFF switch in the ON position and less than .4 volts (low) in the OFF position.

PROBLEM	POSSIBLE CAUSE
1. TP10 does not toggle between high and low.	A. IC201 on switch circuit board. B. Wiring error on brown wire of 8-wire cable.

- ( ) Touch your VTVM probe to TP11. The meter should indicate greater than 2.4 volts with the DC ON/OFF switch in the ON position and less than .4 volts in the OFF position.

PROBLEM	POSSIBLE CAUSE
1. TP11 does not toggle between high and low.	A. IC102B.

- ( ) Touch your VTVM probe to TP12. The meter should indicate 2.4 volts or higher with the DC ON/OFF switch in the ON position and .4 volts or less in the OFF position.

PROBLEM	POSSIBLE CAUSE
1. TP12 does not toggle between high and low.	A. IC104.

- ( ) Touch your VTVM probe to TP13. The meter should indicate 2.4 volts or higher with the DC ON/OFF switch in either position.

PROBLEM	POSSIBLE CAUSE
1. TP13 does not indicate 2.4 volts or higher.	A. IC105A. B. Solder bridge on power supply circuit board. C. Fuse F101 is installed.

- ( ) Touch your VTVM probe to TP14. The meter should indicate .4 volts or less with the DC ON/OFF switch in either position.

PROBLEM	POSSIBLE CAUSE
1. TP14 does not indicate .4 volts or less in both positions.	A. IC104D. B. Solder bridge on power supply circuit board. C. Fuse F101 is installed.

- ( ) Place the DC ON/OFF switch and the AC POWER SWITCH in the OFF position.  
( ) Install a 20-ampere fuse (removed earlier) in the fuse clips on the power supply circuit board.

NOTE: If you do not obtain the proper results in the next four steps, immediately push the AC POWER SWITCH to OFF and correct the problem before you continue.

- ( ) Temporarily tack solder a 270  $\Omega$ , 1-watt (red-violet-brown) resistor between TP15 and TP17.  
( ) Temporarily tack solder a 270  $\Omega$ , 1-watt (red-violet-brown) resistor between TP3 and TP18.  
( ) Be sure controls R165 and R153, on the power supply circuit board, are set at their fully counterclockwise setting.  
( ) Push the AC POWER SWITCH to ON and touch your VTVM probe to TP15. The meter should indicate 1 volt or less.

PROBLEM	POSSIBLE CAUSE
1. TP15 does not indicate 1 volt or less.	A. Q104, Q105, or Q106. B. Solder bridge on power supply circuit board.

- ( ) Touch your VTVM probe to TP3. The meter should indicate 1 volt or less.

PROBLEM	POSSIBLE CAUSE
1. TP3 does not indicate 1 volt or less.	A. Q108. B. IC106. C. Solder bridge on power supply circuit board.

- ( ) Push the DC ON/OFF switch to ON: The DC ON light may or may not be lit. NOTE: You may hear a high pitch whine; this is normal.  
( ) Again touch your VTVM probe to TP15. Then use a small screwdriver to adjust control R153 until the meter indicates 5.0 volts.

PROBLEM	POSSIBLE CAUSE
1. Cannot obtain 5.0 volts at TP15.	A. Fuse F101. B. Choke L101. C. R142. D. Solder bridge on power supply circuit board.



- ( ) Again touch your VTVM probe to TP3. Then use a small screwdriver to adjust control R165 until the meter indicates 12.0 volts.

PROBLEM	POSSIBLE CAUSE
1. Cannot obtain 12.0 volts at TP3.	A. Choke L102. B. R155. C. Solder bridge on power supply circuit board.

NOTE: The DC ON light should now be lit. If it is not lit, check PL201, IC104D, IC105A, IC103C, and IC103D.

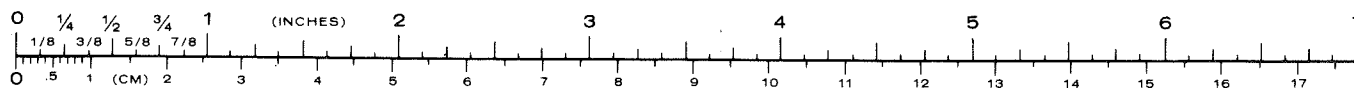
- ( ) Touch your VTVM probe to TP14. The meter should indicate greater than 3.5 volts with the DC ON/OFF switch in the ON position and .4 volts or less in the OFF position.

PROBLEM	POSSIBLE CAUSE
1. TP14 does not toggle between high and low.	A. IC103C and D, IC104B and D, or IC105A.

- ( ) Touch your VTVM probe to TP16. The meter should indicate greater than 3.5 volts with the DC ON/OFF switch in the ON position and .4 volts or less in the OFF position.

PROBLEM	POSSIBLE CAUSE
1. TP16 does not toggle between high and low.	A. IC104A or IC105B, C, and D. B. Q103.

- ( ) Push the DC ON/OFF switch to OFF.
- ( ) Push the AC POWER SWITCH to OFF.
- ( ) Unsolder and remove the two 270  $\Omega$  resistors you tack soldered on the power supply circuit board.
- ( ) Prepare a 6" medium red wire.
- ( ) Temporarily solder one end of the prepared wire to TP17 (GND) and the other end to TP15 (+5 V).
- ( ) Push the AC POWER SWITCH to ON.
- ( ) Push the DC ON/OFF switch to ON. The power supply should make a loud singing sound which indicates the +5 V current limiting circuit is operating.
- ( ) Push the DC ON/OFF switch to OFF.
- ( ) Push the AC POWER SWITCH to OFF.
- ( ) Unsolder the end of the wire from TP15 (+5 V). Then temporarily solder the end of the wire to TP3 (+12 V).
- ( ) Push the AC POWER SWITCH to ON.
- ( ) Push the DC ON/OFF switch to ON. The power supply should make a loud singing sound which indicates the +12 V current limiting circuit is operating.
- ( ) Push the DC ON/OFF switch and the AC POWER SWITCH to OFF.
- ( ) Unsolder the wire from TP3.



NOTE: In the following steps, you will intentionally blow fuse F101 to check the overvoltage protection circuitry of the power supply.

- ( ) Push the AC POWER SWITCH and the DC ON/OFF switch to ON.

NOTE: When you perform the next step, fuse F101 should blow within one second.

- ( ) Touch the free end of the wire coming from TP17 to TP19. Fuse F101 should blow.

PROBLEM	POSSIBLE CAUSE
1. F101 does not blow within 1 second.	A. ZD101, D109, D110, or D108.

- ( ) Push the DC ON/OFF switch and the AC POWER SWITCH to OFF.

- ( ) Remove the wire from TP19.

- ( ) Replace fuse F101 with a good fuse.

- ( ) Push the AC POWER SWITCH to ON. The fuse should not blow.

PROBLEM	POSSIBLE CAUSE
1. F101 blows.	A. D108.

- ( ) Push the DC ON/OFF switch to ON. The fuse should not blow.

PROBLEM	POSSIBLE CAUSE
1. F101 blows.	A. Q108.

NOTE: When you perform the next step, fuse F101 should blow within one second.

- ( ) Touch the free end of the wire coming from TP17 to TP20. Fuse F101 should blow.

PROBLEM	POSSIBLE CAUSE
1. F101 does not blow within 1 second.	A. Q106, Q107, ZD102, or D108.

- ( ) Push the DC ON/OFF switch and the AC POWER SWITCH to OFF.

- ( ) Remove the wire from TP20 and unsolder the other end from TP17.

- ( ) Replace fuse F101 with a good fuse.



- ( ) Push the AC POWER SWITCH to ON. The fuse should not blow.

PROBLEM	POSSIBLE CAUSE
1. F101 blows.	A. D108.

- ( ) Push the DC ON/OFF switch to ON. The fuse should not blow.

PROBLEM	POSSIBLE CAUSE
1. F101 blows.	A. Q103 or Q102.

- ( ) Push the DC ON/OFF switch and the AC POWER SWITCH to OFF.
- ( ) Unplug the line cord.
- ( ) Unplug the 10-hole socket from the switch circuit board.
- ( ) Unplug socket S101 from P101 on the rear of the power supply chassis.

This completes the power supply assembly and checkout. Proceed to "Power Supply Assembly Installation."

## POWER SUPPLY ASSEMBLY INSTALLATION

Refer to Pictorial 3-22 (Illustration Booklet, Page 13) for the following steps.

- ( ) Place the power supply assembly inside the chassis as shown. Be sure the cables from the power transformer and the circuit board are positioned as shown.
- ( ) Secure the power supply assembly to the fan bracket at EA and EB with two 6-32 × 3/8" screws.
- ( ) Secure the power supply assembly to the bottom of the chassis at EC, ED, and EE with three 6-32 × 3/8" black screws.

Refer to Pictorial 3-23 (Illustration Booklet, Page 13) for the following steps.

- ( ) Secure the power supply assembly to the bottom of the chassis at EF and EG with two 6-32 × 3/8" black screws.
- ( ) Push socket S101, coming from the power transformer, onto plug P101 on the rear of the chassis assembly.
- ( ) Push socket S102, coming from the power supply circuit board, onto plug P102 on the left side of the fan bracket.
- ( ) Push the 10-hole socket, on the end of the 8-wire cable coming from the power supply circuit board, onto the 10-pin plug on the switch circuit board. Be sure to position the socket so the slots are away from the front panel as shown.

This completes the "Power Supply Assembly Installation." Proceed to "Backplane Assembly."



# BACKPLANE ASSEMBLY

## PARTS LIST

- ( ) Locate the pack marked Pack #3.
- ( ) Unpack these parts and check each part against the following list. Return any part that is packed in an individual envelope, with the part number on it, to the envelope after you identify it until that part is called for in a step. Do not discard any packing materials until all parts are accounted for. The key numbers correspond to

the numbers on the "Backplane Assembly Parts Pictorial" (Illustration Booklet, Page 14).

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

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
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### HARDWARE

NOTE: Hardware packets are marked to show the size of the hardware they contain (HDW #4, or, HDW #2 & #6, etc.) You may have to open more than one packet-in this pack-to locate all of the hardware of any one size (#6, for example).

A1	250-89	19	6-32 × 3/8" pan head screw	
A2	250-381	7	6-32 × 3/8" black screw	
A3	250-9	8	6-32 × 3/8" round head screw	
A4	250-162	1	6-32 × 1/2" screw	
A5	250-29	2	6-32 × 3/4" screw	
A6	252-3	18	6-32 nut	
A7	253-89	1	#6 D washer	
A8	254-1	18	#6 lockwasher	
A9	255-23	2	6-32 threaded spacer	

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
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### CONNECTORS

B1	432-981	13	Large male connector pin (2 extra)	
B2	432-859	1	12-hole socket shell	
B3	432-966	16	Card socket	

### MISCELLANEOUS

C1	207-22	1	Plastic cable clamp	
C2	265-33	2	Hinge	
C3	266-944	16	Card guide	

### PARTS FROM THE MAIN PACK

	85-2001-1	1	Backplane circuit board	
D1	200-1306	1	Backplane chassis	
D2	204-2284	2	Tie bracket	
D3	205-1732	1	Left side plate	
D4	205-1736	1	Right side plate	





# STEP-BY-STEP ASSEMBLY

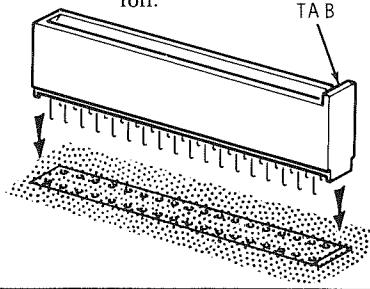
## START

( ) Position the circuit board as shown in the Identification Drawing. Then complete all of the steps in the following Pictorials.

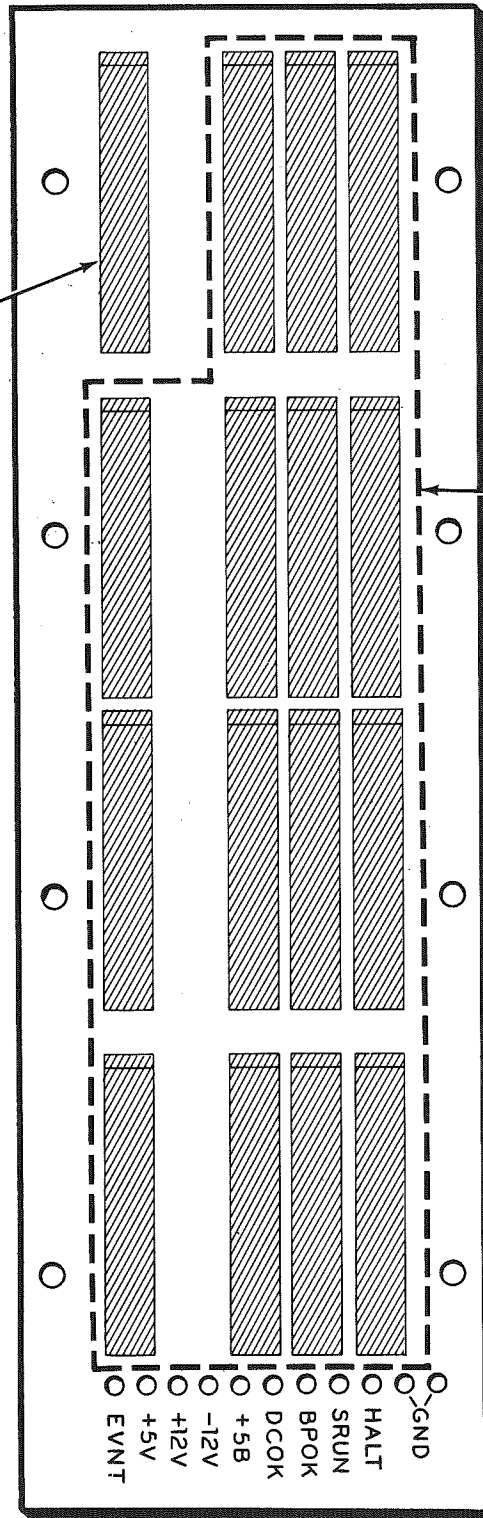
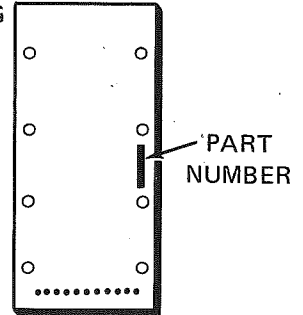
**NOTE:** Be sure you install each of the card sockets in the following steps correctly. They are virtually impossible to remove once they are installed wrong.

( ) J7B: Install a card socket at J7B as follows:

1. Locate a card socket. Then carefully straighten any bent pins. Also make sure none of the contacts inside of the socket are bent.
2. Note that one end of the socket has a raised tab.
3. Match the tab on the socket with the outline of the tab on the circuit board as shown. Then insert the pins into the holes.
4. Push the socket down tight against the circuit board.
5. Make sure all of the socket pins are through the circuit board. Then solder one pin at each end of the socket to the foil.
6. Make sure the socket is still tight against the circuit board. Reheat and reposition the socket as necessary. Then solder the remaining pins to the foil.



## IDENTIFICATION DRAWING



## CONTINUE

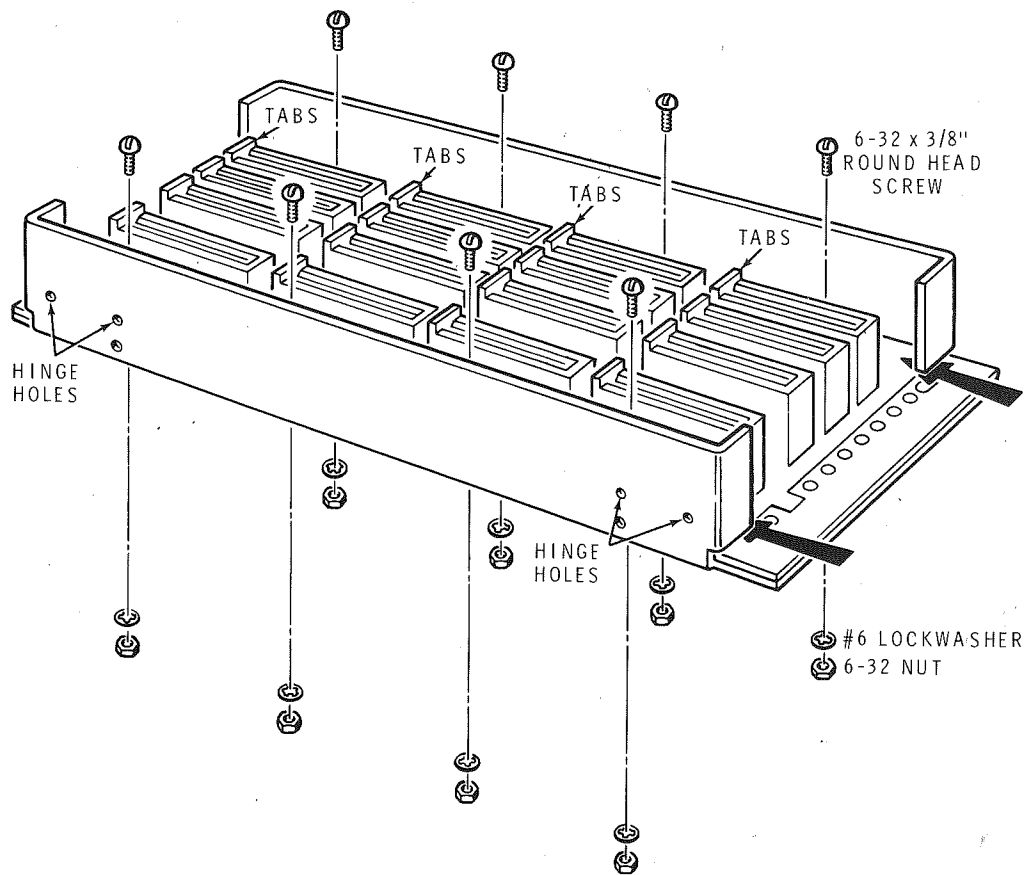
( ) J1A-J7A: In the same manner, install card sockets at the 15 remaining locations. Be sure to install each socket with the raised tab as shown on the circuit board.

## CIRCUIT BOARD CHECKOUT

Carefully inspect the foil side of the circuit board for the following most commonly made errors.

- ( ) Unsoldered connections.
- ( ) Poor solder connections.
- ( ) Solder bridges between foil patterns.

PICTORIAL 4-1



Detail 4-2A

Refer to Pictorial 4-2 (Illustration Booklet, Page 15) for the following steps.

- ( ) Position the backplane chassis as shown in the Pictorial. Use the hinge holes as a reference.
- ( ) Note the direction of the tabs on the card sockets, then refer to Detail 4-2A and slide the circuit board into the backplane chassis as shown. Then secure the circuit board to the backplane chassis with 6-32 x 3/8" round head hardware at the eight mounting holes.

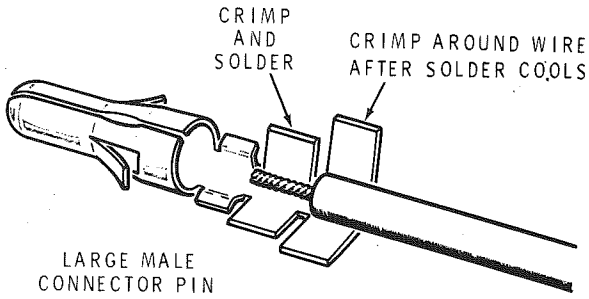
- ( ) Prepare the following wires:

5-1/4" violet	5-3/4" orange
5" large red	6" large yellow
5" medium red	6-1/2" white
5-1/4" large brown	6-1/2" medium black
5-1/2" large red	7" large black
5-3/4" gray	

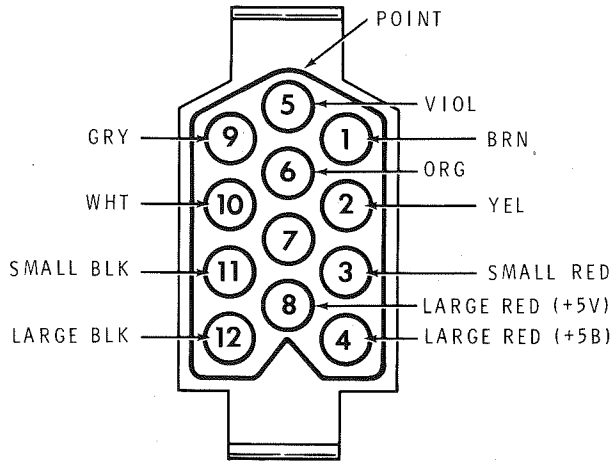
- ( ) Refer to Detail 4-2B and install a large male connector pin on the free end of each wire coming from the backplane circuit board.

Connect the free end of the prepared wires to the backplane circuit board as follows. Solder each wire to the foil as you install it and cut off any excess lead lengths.

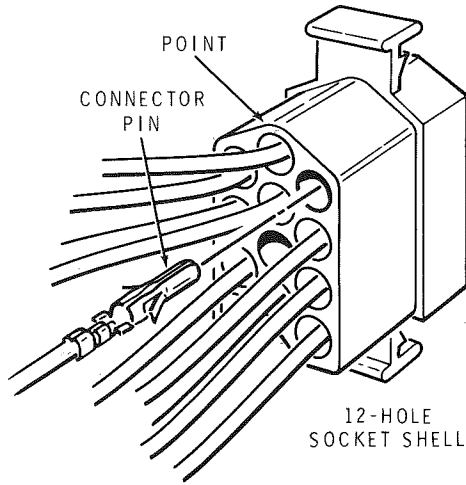
- ( ) Violet wire to hole EVNT.
- ( ) 5" large red wire to hole +5V.
- ( ) Medium red wire to hole +12V.
- ( ) Brown wire to hole -12V.
- ( ) Remaining large red wire to hole +5B.
- ( ) Gray wire to hole DCOK.
- ( ) Orange wire to hole BPOK.



Detail 4-2B



- ( ) Yellow wire to hole SRUN.
- ( ) White wire to hole HALT.
- ( ) Medium black wire to the smaller hole at GND.
- ( ) Large black wire to the larger hole at GND.
- ( ) Position the 12-hole socket shell as shown in Detail 4-2C (use the point on the socket as a reference). Then push the connector pin on the free end of the brown wire into hole 1 of the socket shell until it locks in place.

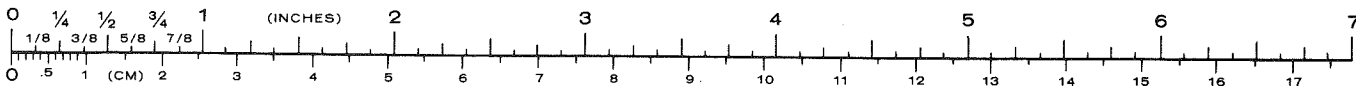


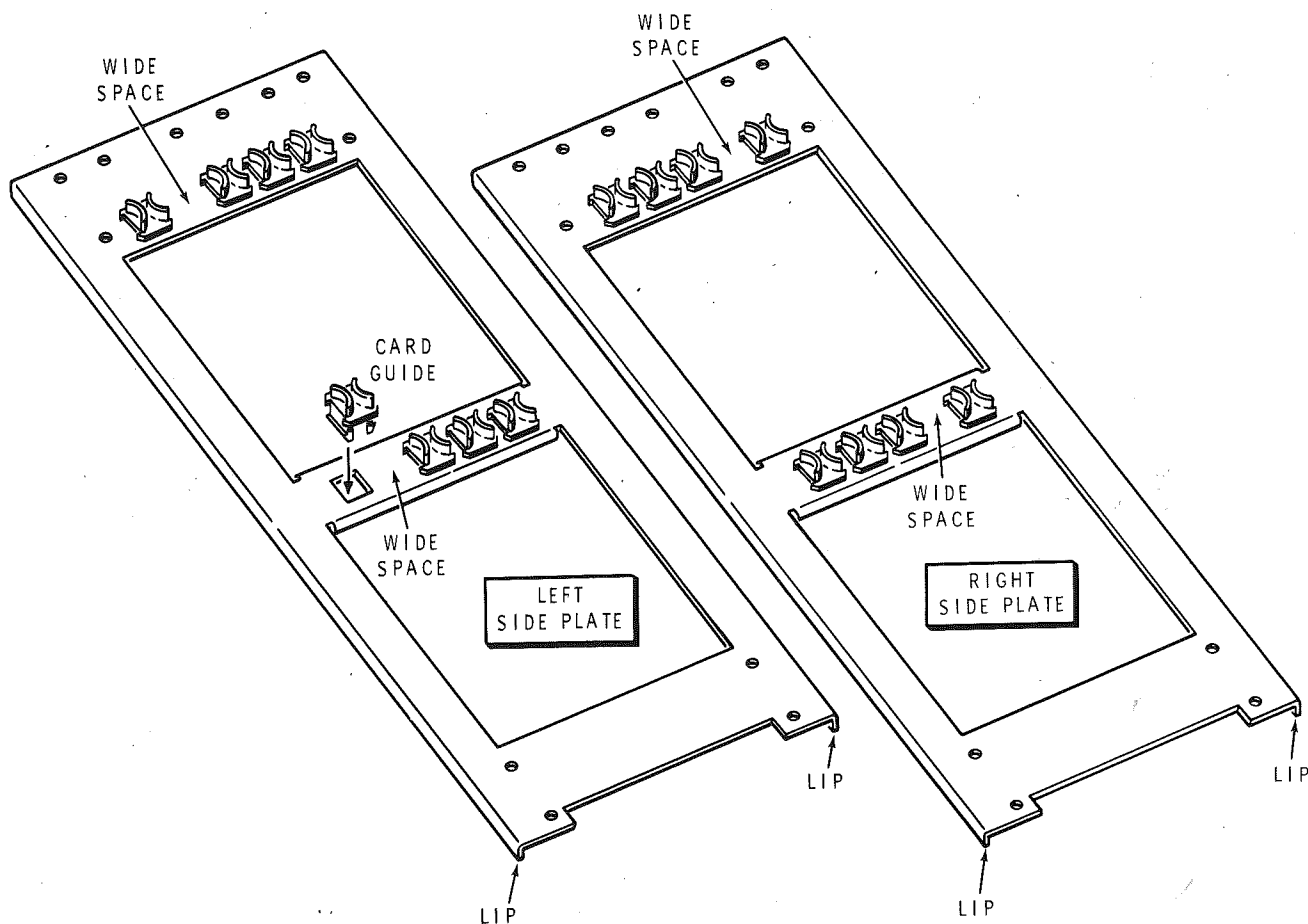
Detail 4-2C

Refer again to Detail 4-2C and push the connector pins on the remaining wires coming from the circuit board into the holes of the socket shell as follows:

- ( ) Yellow wire into hole 2.
- ( ) Small red wire into hole 3.
- ( ) Large red wire from +5B into hole 4.
- ( ) Violet wire into hole 5.
- ( ) Orange wire into hole 6.
- ( ) Remaining large red wire (from +5 V) into hole 8.
- ( ) Gray wire into hole 9.
- ( ) White wire into hole 10.
- ( ) Smaller black wire into hole 11.
- ( ) Large black wire into hole 12.

NOTE: Be sure to skip hole 7.

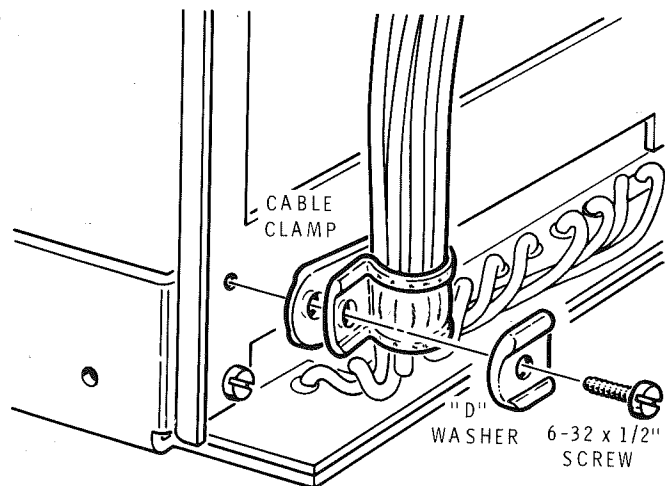




Detail 4-3A

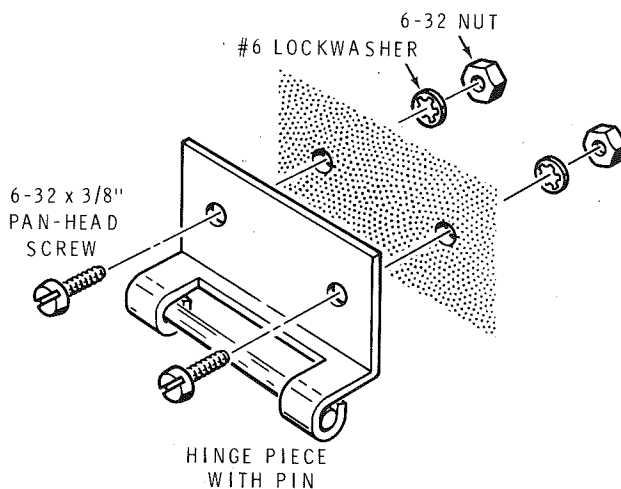
Refer to Pictorial 4-3 (Illustration Booklet, Page 16) for the following steps.

- ( ) Position the left (#205-1732) and right (#205-1736) side plates as shown in Detail 4-3A. Note the position of the wide space between the square holes. Also be sure the lip on the edges of the side plates are downward.
- ( ) Refer again to Detail 4-3A and push a card guide into each of the 16 square holes until it locks into place. Be sure to install each card guide so the slot is positioned as shown.
- ( ) Secure the left side plate (#205-1732) to the left side of the backplane chassis as shown in the Pictorial. Use four 6-32  $\times$  3/8" pan head screws.
- ( ) Similarly, loosely secure the right side plate (#205-1736) to the right side of the backplane chassis as shown in the Pictorial. Use three 6-32  $\times$  3/8" pan head screws. Do not install a screw at GA at this time.



**Detail 4-3B**

- ( ) Refer to Detail 4-3B and install a plastic cable clamp on the wires coming from the 12-hole socket shell. Then secure the cable clamp to the backplane chassis at GA with a #6 D washer and a 6-32 × 1/2" screw. Now tighten all the screws on the right side plate.
- ( ) Mount a tie bracket between the side plates at GB and GC as shown in the Pictorial. Use four 6-32 × 3/8" pan head screws.
- ( ) Similarly, mount a tie bracket between the side plates at GD and GE as shown in the Pictorial. Use four 6-32 × 3/8" pan head screws.
- ( ) Mount a 6-32 threaded spacer to the tie bracket at GF. Use a 6-32 × 3/4" screw and a #6 lockwasher.
- ( ) Similarly, mount a 6-32 threaded spacer to the tie bracket at GG. Use a 6-32 × 3/4" screw and a #6 lockwasher.



**Detail 4-3C**

- ( ) Locate the two hinges. Then, if not already done, unhook the two hinge pieces. You will use the hinge pieces that have the pins in the next two steps. Save the other hinge pieces for use later.

**NOTE:** When you perform the next two steps, be sure to mount each hinge piece parallel to the edge of the backplane chassis.

- ( ) Refer to Detail 4-3C and mount a hinge piece (with the pin) to the backplane chassis at GH. Use two 6-32 × 3/8" pan head screws and be sure to position the hinge as shown.
- ( ) Similarly, mount a hinge piece (with the pin) to the backplane chassis at GJ. Use two 6-32 × 3/8" pan head screws and be sure to position the hinge as shown.

## BACKPLANE ASSEMBLY CHECKS

### VISUAL CHECKS

- Position the backplane assembly as shown in Pictorial 4-4.

NOTE: Perform the next step as carefully as possible. A solder bridge on the backplane circuit board could cause damage to your preassembled processor circuit board.

- Carefully compare the foil pattern on the back of the backplane circuit board against that shown in Pictorial 4-4 (Illustration Booklet, Page 17). Make sure no foil bridges are present between adjacent foil patterns.

### VOLTAGE CHECKS

Refer to Pictorial 4-5 (Illustration Booklet, Page 18) for the following steps.

- Position the backplane assembly inside the chassis as shown.
- Plug socket S103 coming from the backplane assembly onto plug P103 coming from the power supply assembly. NOTE: The brown wire in socket S103 does not mate with any wire in plug P103. The brown wire is not used in this configuration.
- Set your VTVM to measure +5 volts DC.

- Connect the common or ground lead of your VTVM to one of the side plates of the backplane assembly.
- Plug the line cord into a proper AC outlet.
- Push the AC POWER SWITCH and the DC ON/OFF switch to ON.

NOTE: If you do not obtain the proper voltages in the following steps, check for wiring errors between the power supply assembly and the backplane assembly.

- Touch the probe of your VTVM to TP21. The meter should indicate 5 volts.
- Touch the probe of your VTVM to TP22. The meter should indicate 5 volts.
- Set your VTVM to measure +12 volts DC.
- Touch the probe of your VTVM to TP23. The meter should indicate 12 volts.
- Push the DC ON/OFF switch and the AC POWER SWITCH to OFF.
- Disconnect your VTVM leads from the backplane assembly.
- Unplug the line cord.

## BACKPLANE ASSEMBLY INSTALLATION

Refer to Pictorial 4-6 (Illustration Booklet, Page 19) for the following steps.

- Turn the backplane assembly around and position it inside the chassis as shown.
- Refer to the inset drawing on the Pictorial. Then install the hinge pieces (set aside earlier) onto the hinge pieces on the backplane assembly as shown.
- Insert the screws coming from the spacers at GF and GG into the corresponding holes in the

chassis.

- Secure the hinges on the rear of the backplane assembly to the chassis at GK and GL with 6-32  $\times$  3/8" hardware as shown. Use 6-32  $\times$  3/8" black screws.

NOTE: Save the two remaining 6-32 nuts for use during the installation of the processor circuit board.

This completes the backplane assembly, checkout, and installation. Proceed to "Processor Circuit Board."



## PROCESSOR CIRCUIT BOARD

**IMPORTANT:** The KD11-F processor circuit board (Part #100-1718) is supplied assembled, wired, and tested. If it malfunctions during the 90-day warranty period, return the complete circuit board assembly directly to Heath Company or through a Heathkit Electronic Center. A tested, operational board will be promptly returned from the factory. **DO NOT** attempt to service this circuit board yourself; to do so voids the warranty.

A one year service contract may be purchased for this processor board for \$25.00. The contract is supplied with the Digital Computer kit. This contract will commence with the expiration date of the original 90-day warranty and must be initiated within the original warranty period. The service contract will provide a significant saving over the normal service fees if a failure occurs during the contract period. Just complete the contract application and mail it to Heath Company.

## PROCESSOR INSTALLATION

Refer to Pictorial 5-1 (Illustration Booklet, Page 20) for the following steps.

- ( ) Locate the box marked "100-1718." Then carefully unpack the circuit board. Save the packaging material so you can use it to return the circuit board for service, if this ever becomes necessary.
- ( ) Raise the front of the backplane assembly up out of the Computer chassis as far as possible.

**IMPORTANT:** The processor circuit board and the card sockets may be damaged if the circuit board is plugged in backwards. Be sure to install the processor circuit board with the component side facing downward.

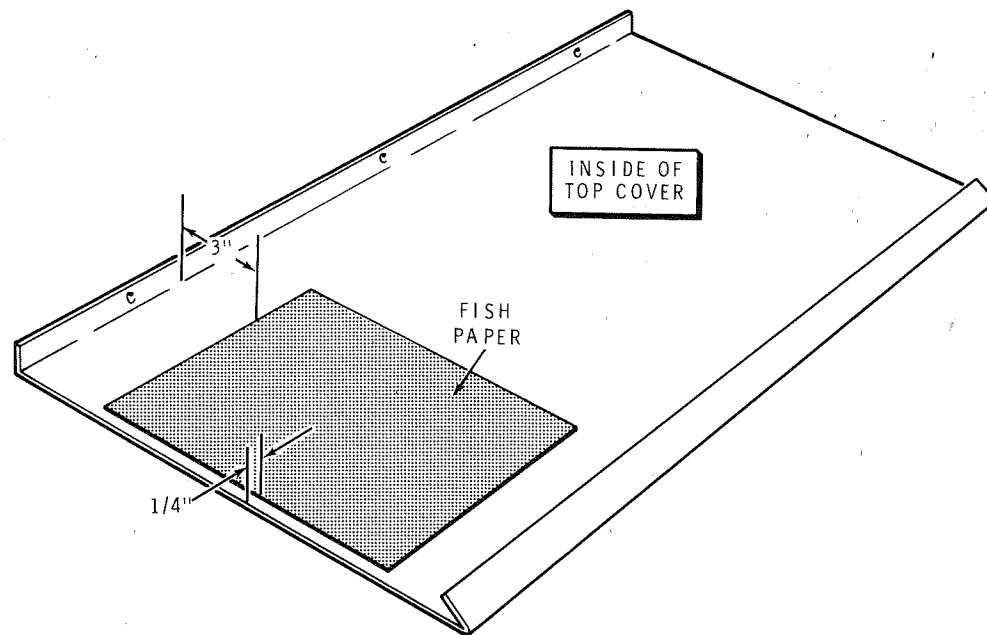
( ) Install the processor circuit board as follows:

1. Carefully start the processor circuit board into the top row of card guides on each side of the backplane assembly.
2. Push the circuit board into the backplane assembly and carefully start the handle fingers into the left and right backplane side plates as shown in the inset drawing.
3. Press downward on the metal handles to lock the circuit board in place. Be sure to press downward on both handles at the same time.

- ( ) Lower the backplane assembly into the chassis and secure it on the bottom of the chassis with two 6-32 nuts.

This completes the processor installation. Proceed to "Final Assembly."

# FINAL ASSEMBLY



PICTORIAL 6-1

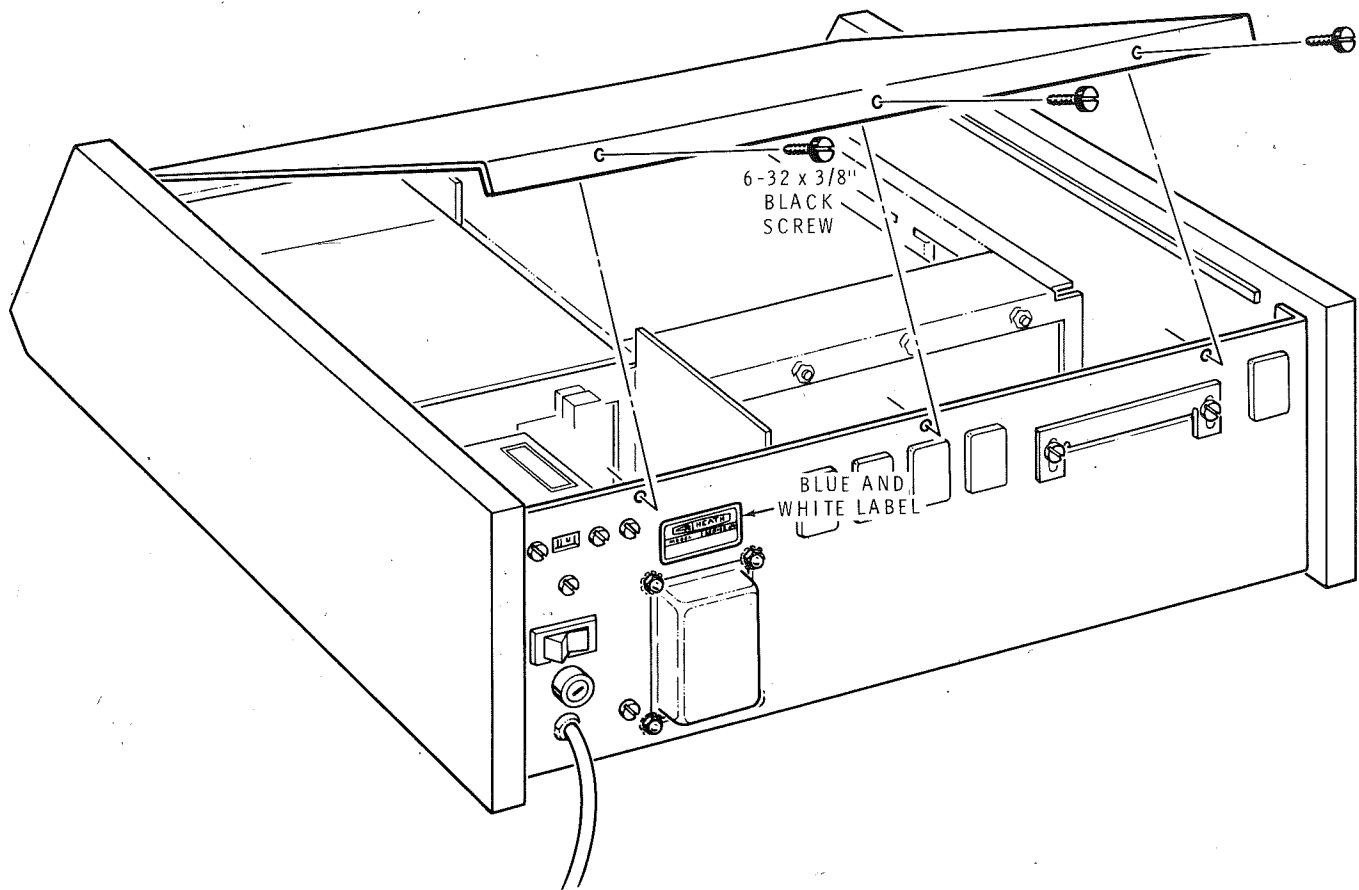
Refer to Pictorial 6-1 for the following steps.

( ) Position the top cover on your work surface as shown.

( ) Carefully peel the backing paper from the piece of fish paper. Then carefully press the fish paper onto the top cover as shown.







**PICTORIAL 6-2**

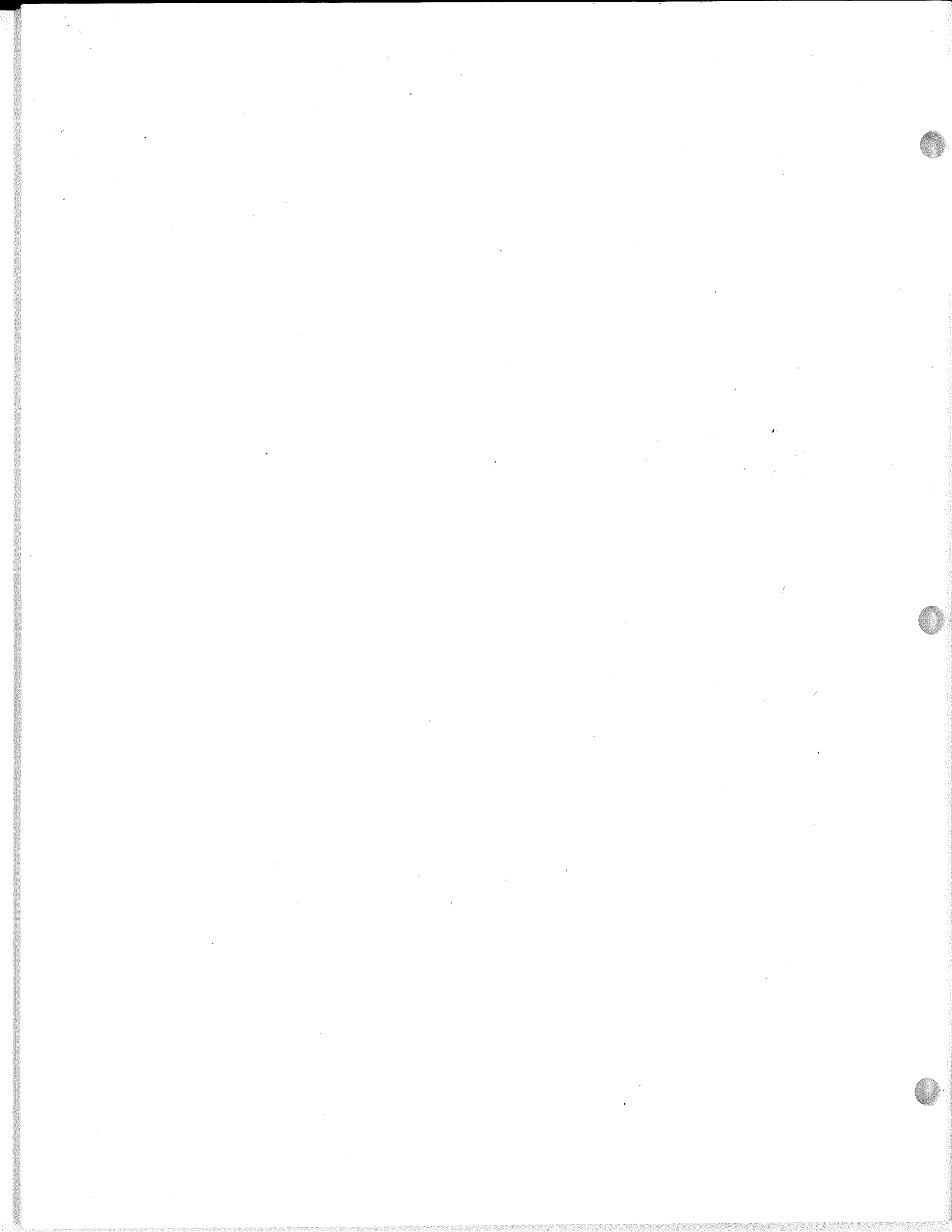
Refer to Pictorial 6-2 for the following steps.

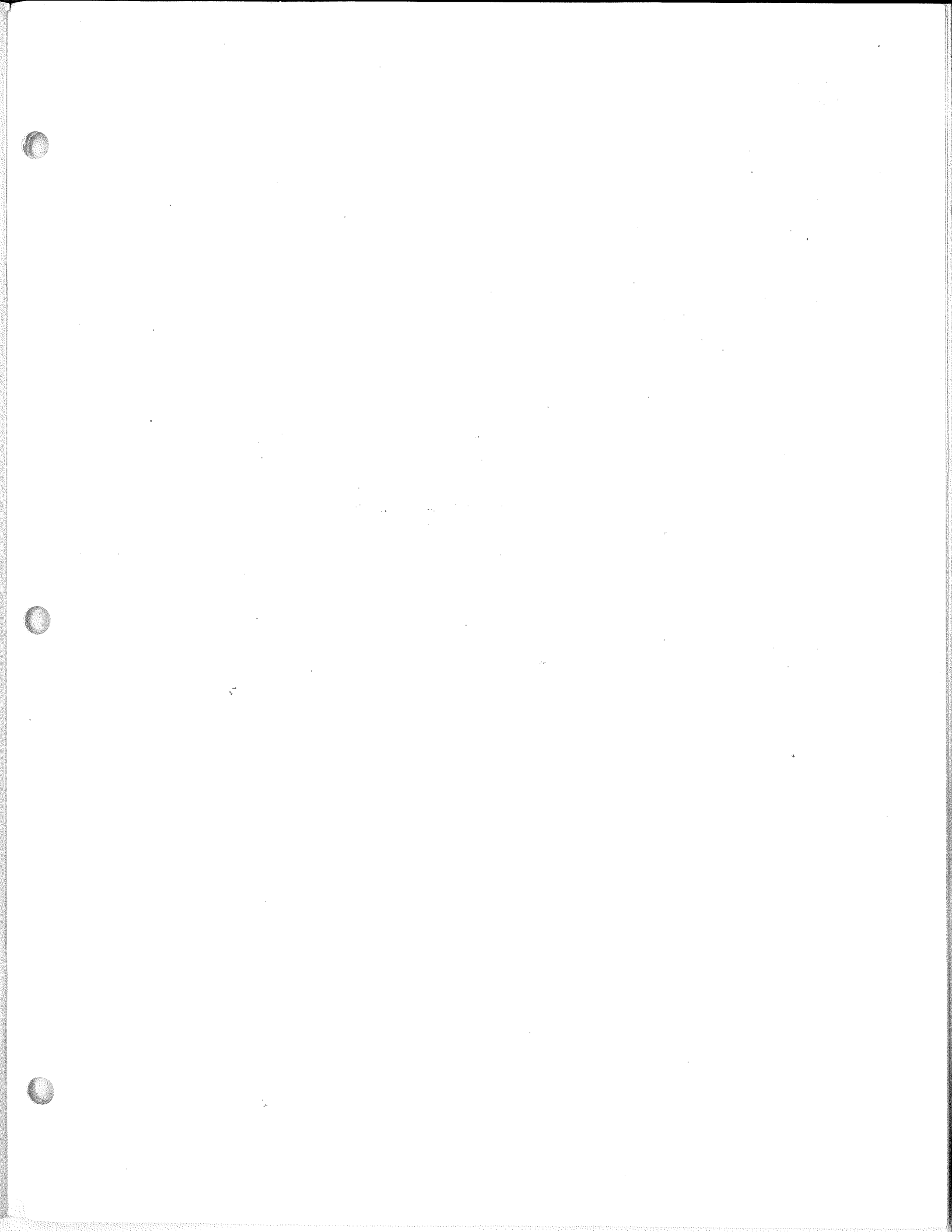
- ( ) Install the top cover on the chassis assembly as follows:
1. First hook the front of the top cover over the lip on the front panel.
  2. Push the rear of the top cover down onto the edge of the rear panel.
  3. Secure the top cover to the chassis at AX, AY, and AZ with three 6-32 × 3/8" black screws.

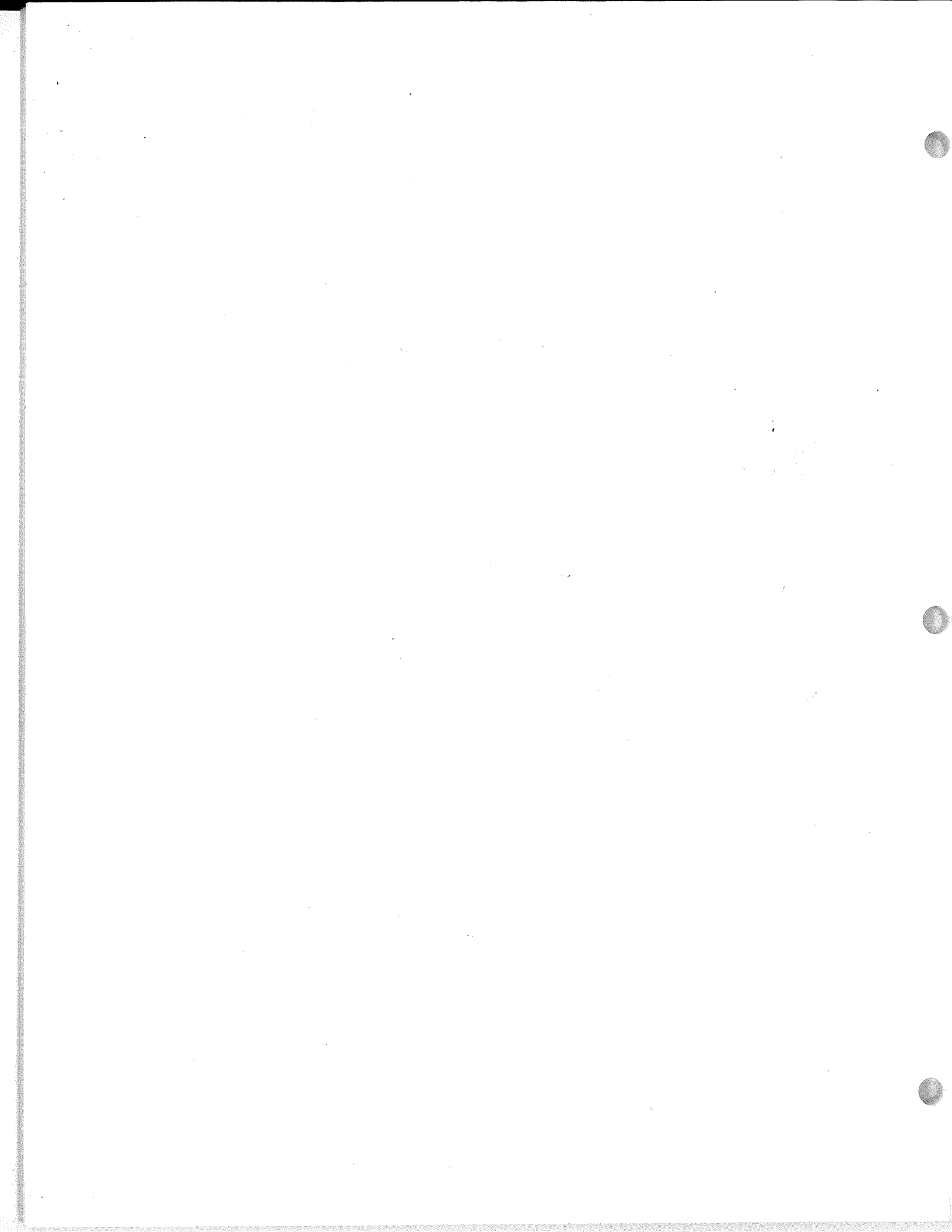
**NOTE:** The blue and white label shows the Model Number and Production Series Number of your kit. Refer to these numbers in any communications with the Heath Company about your kit. This assures you that you will receive the most complete and up-to-date information in return.

- ( ) Carefully peel the backing paper from the blue and white label. Then press the label onto the rear of the chassis in the location shown.

This completes the "Final Assembly." Proceed to the Operation Manual.









**FOR PARTS REQUESTS ONLY**

- Be sure to follow instructions carefully.
- Use a separate letter for all correspondence.
- Please allow 10 - 14 days for mail delivery time.

**DO NOT WRITE IN THIS SPACE**

**INSTRUCTIONS**

- Please print all information requested.
- Be sure you list the correct **HEATH** part number exactly as it appears in the parts list.
- If you wish to prepay your order, mail this card and your payment in an envelope. Be sure to include 10% (25¢ minimum, \$3.50 maximum) for insurance, shipping and handling. Michigan residents add 4% tax.  
Total enclosed \$ \_\_\_\_\_
- If you prefer COD shipment, check the COD box and mail this form. COD

NAME \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_  
 STATE \_\_\_\_\_ ZIP \_\_\_\_\_

The information requested in the next two lines is not required when purchasing nonwarranty replacement parts, but it can help us provide you with better products in the future.

Model # \_\_\_\_\_ Invoice # \_\_\_\_\_  
 Date \_\_\_\_\_ Location \_\_\_\_\_  
 Purchased \_\_\_\_\_ Purchased \_\_\_\_\_

LIST HEATH PART NUMBER	QTY.	PRICE EACH	TOTAL PRICE

TOTAL FOR PARTS	
HANDLING AND SHIPPING	
MICHIGAN RESIDENTS ADD 4% TAX	
<b>TOTAL AMOUNT OF ORDER</b>	

SEND TO: **HEATH COMPANY**  
 BENTON HARBOR  
 MICHIGAN 49022  
**ATTN: PARTS REPLACEMENT**

Phone (Replacement parts only): 616 982-3571

THIS FORM IS FOR U.S. CUSTOMERS ONLY  
 OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR

**FOR PARTS REQUESTS ONLY**

- Be sure to follow instructions carefully.
- Use a separate letter for all correspondence.
- Please allow 10 - 14 days for mail delivery time.

**DO NOT WRITE IN THIS SPACE**

**INSTRUCTIONS**

- Please print all information requested.
- Be sure you list the correct **HEATH** part number exactly as it appears in the parts list.
- If you wish to prepay your order, mail this card and your payment in an envelope. Be sure to include 10% (25¢ minimum, \$3.50 maximum) for insurance, shipping and handling. Michigan residents add 4% tax.  
Total enclosed \$ \_\_\_\_\_
- If you prefer COD shipment, check the COD box and mail this form. COD

NAME \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_  
 STATE \_\_\_\_\_ ZIP \_\_\_\_\_

The information requested in the next two lines is not required when purchasing nonwarranty replacement parts, but it can help us provide you with better products in the future.

Model # \_\_\_\_\_ Invoice # \_\_\_\_\_  
 Date \_\_\_\_\_ Location \_\_\_\_\_  
 Purchased \_\_\_\_\_ Purchased \_\_\_\_\_

LIST HEATH PART NUMBER	QTY.	PRICE EACH	TOTAL PRICE

TOTAL FOR PARTS	
HANDLING AND SHIPPING	
MICHIGAN RESIDENTS ADD 4% TAX	
<b>TOTAL AMOUNT OF ORDER</b>	

SEND TO: **HEATH COMPANY**  
 BENTON HARBOR  
 MICHIGAN 49022  
**ATTN: PARTS REPLACEMENT**

Phone (Replacement parts only): 616 982-3571

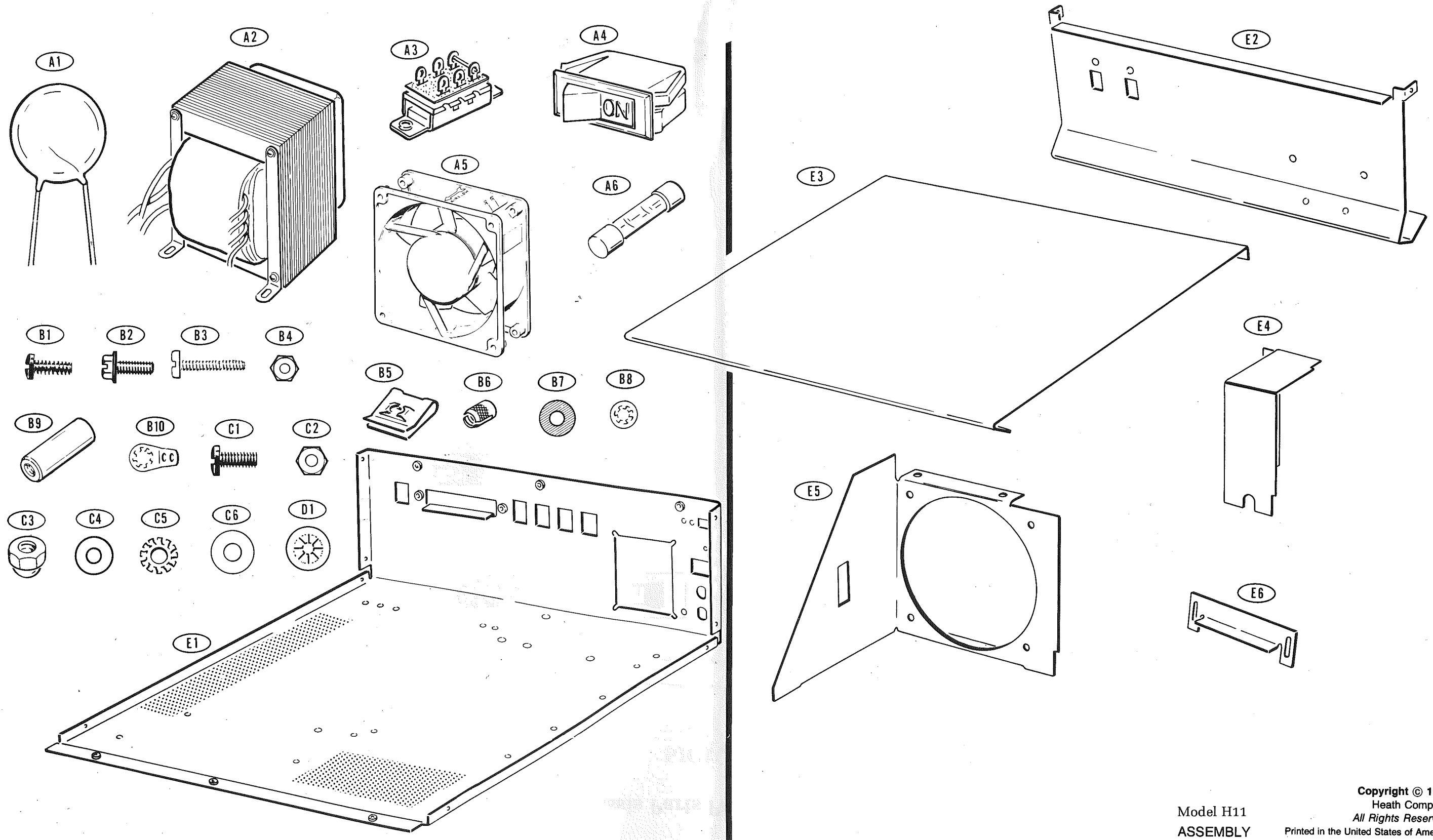
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CUT ALONG DOTTED LINE

# ILLUSTRATION BOOKLET

Part of 595-2018

## CHASSIS PARTS PICTORIAL



Model H11  
ASSEMBLY

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Printed in the United States of America

### Chassis Parts Pictorial (Cont'd.)

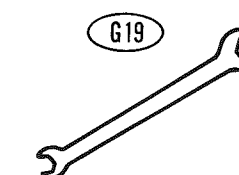
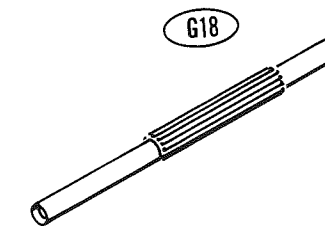
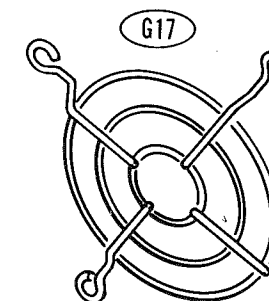
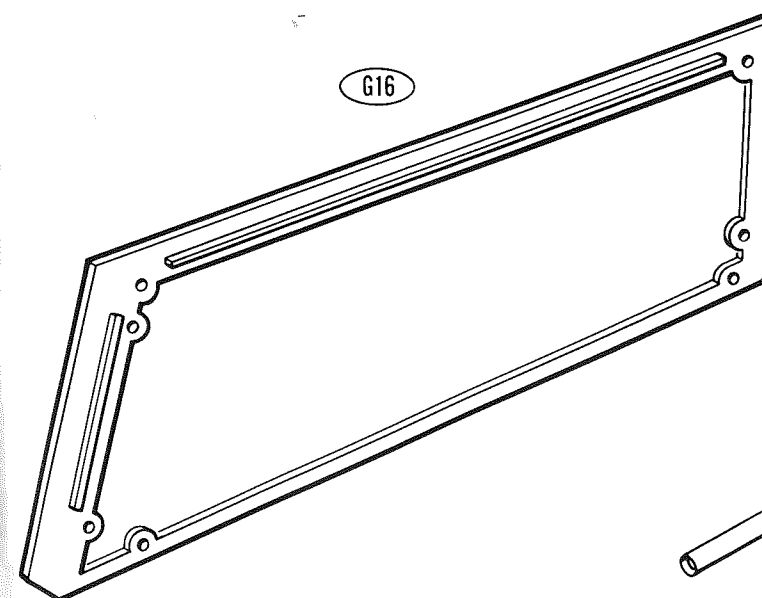
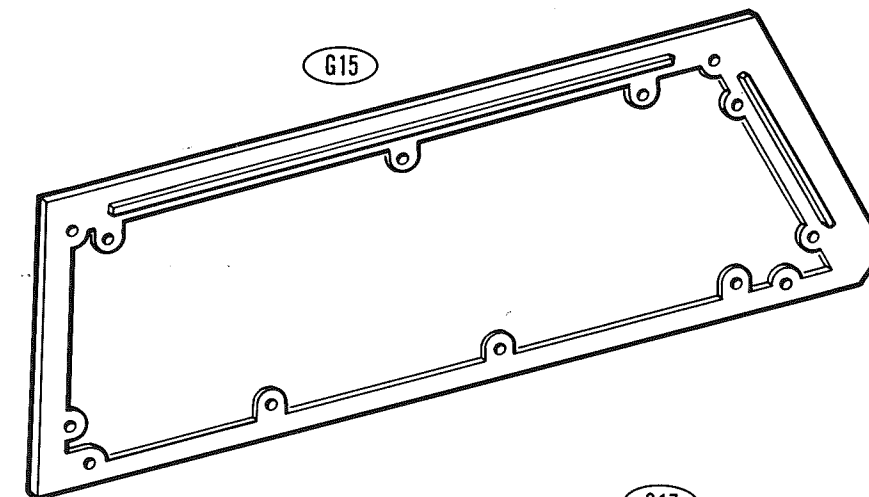
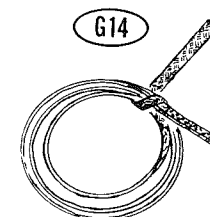
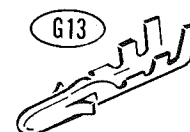
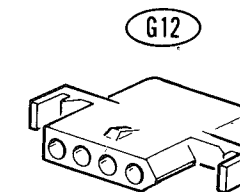
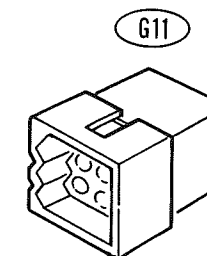
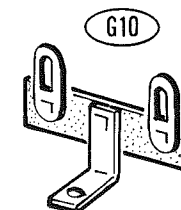
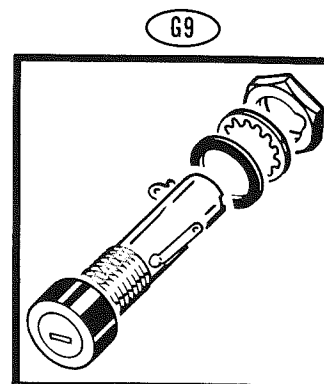
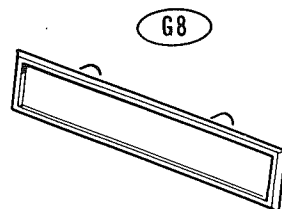
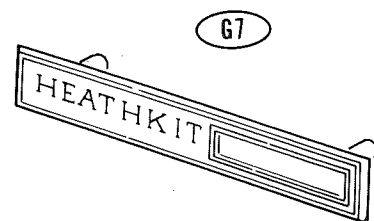
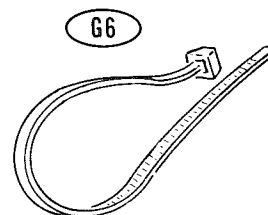
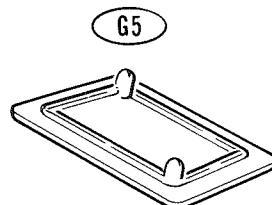
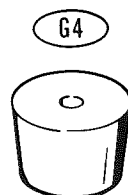
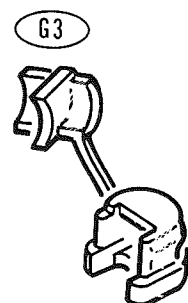
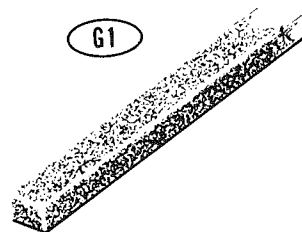
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**CAUTION**  
DISCONNECT LINE CORD  
BEFORE OPENING

F2  
**H11 DIGITAL COMPUTER**

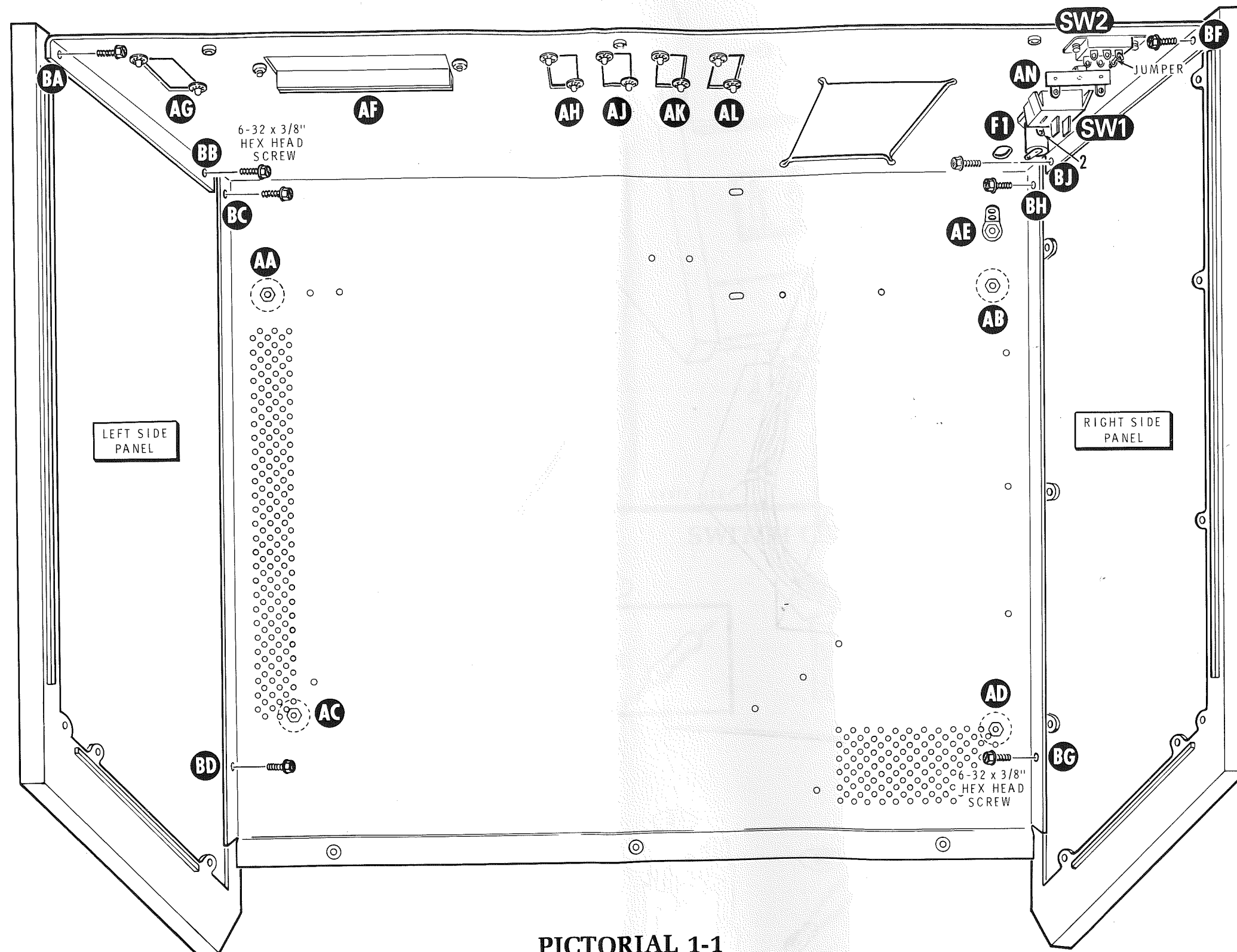
F3  
INCORPORATING THE  
**digital**  
LSI-11  
©TRADEMARK OF DIGITAL EQUIPMENT CORPORATION

F4  
DC ON      RUN  
DC OFF     HALT

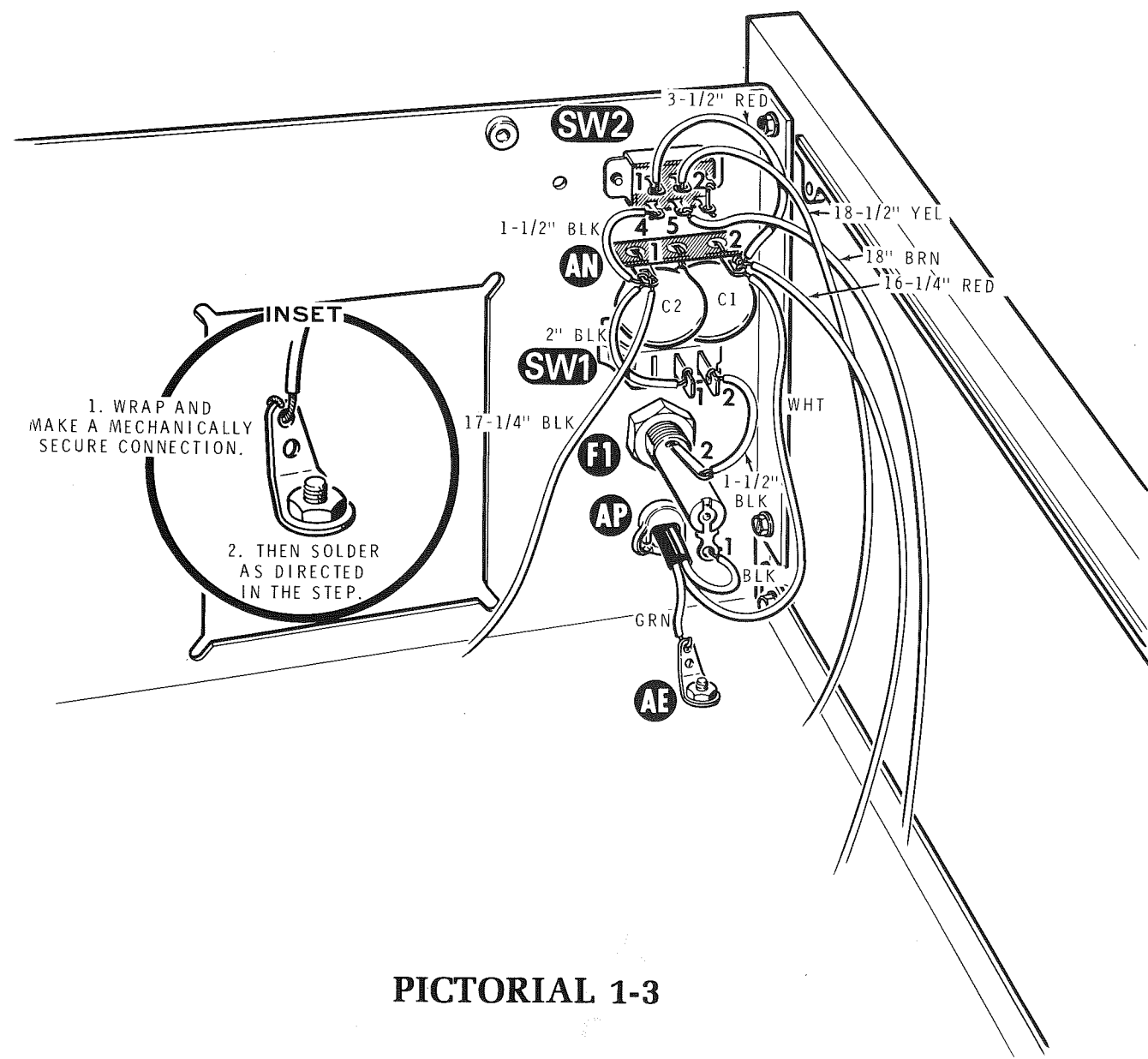
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**HEATH**  
MODEL      SERIES NO.



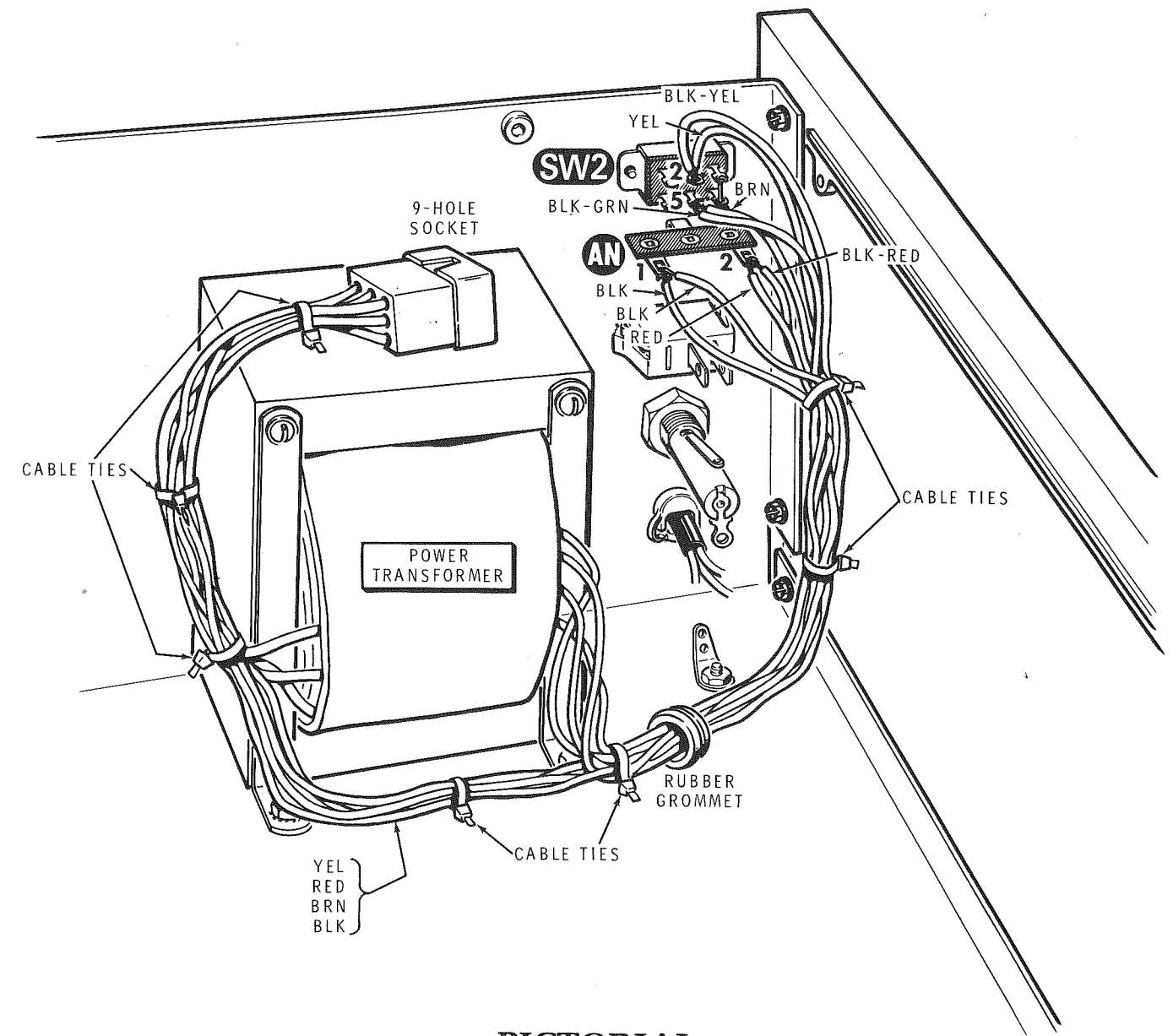




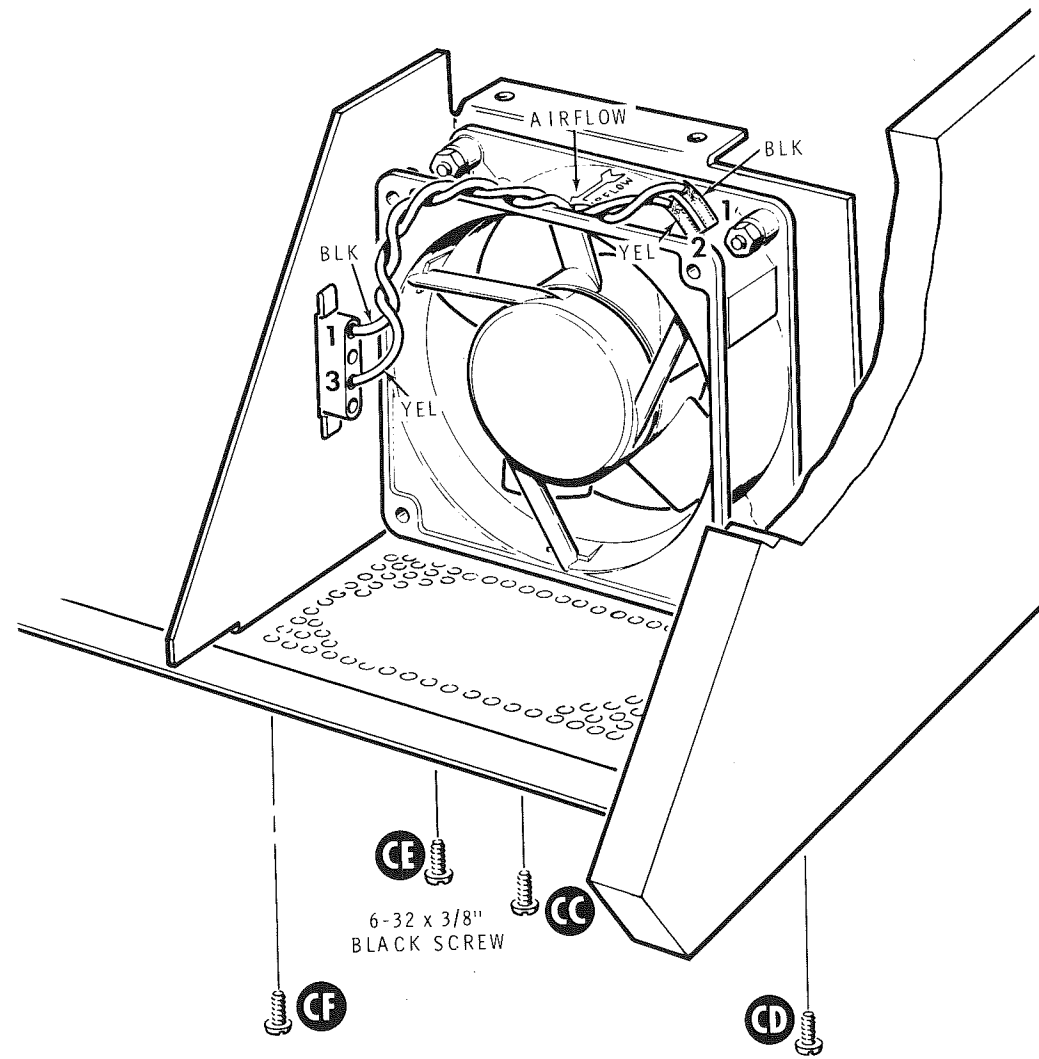
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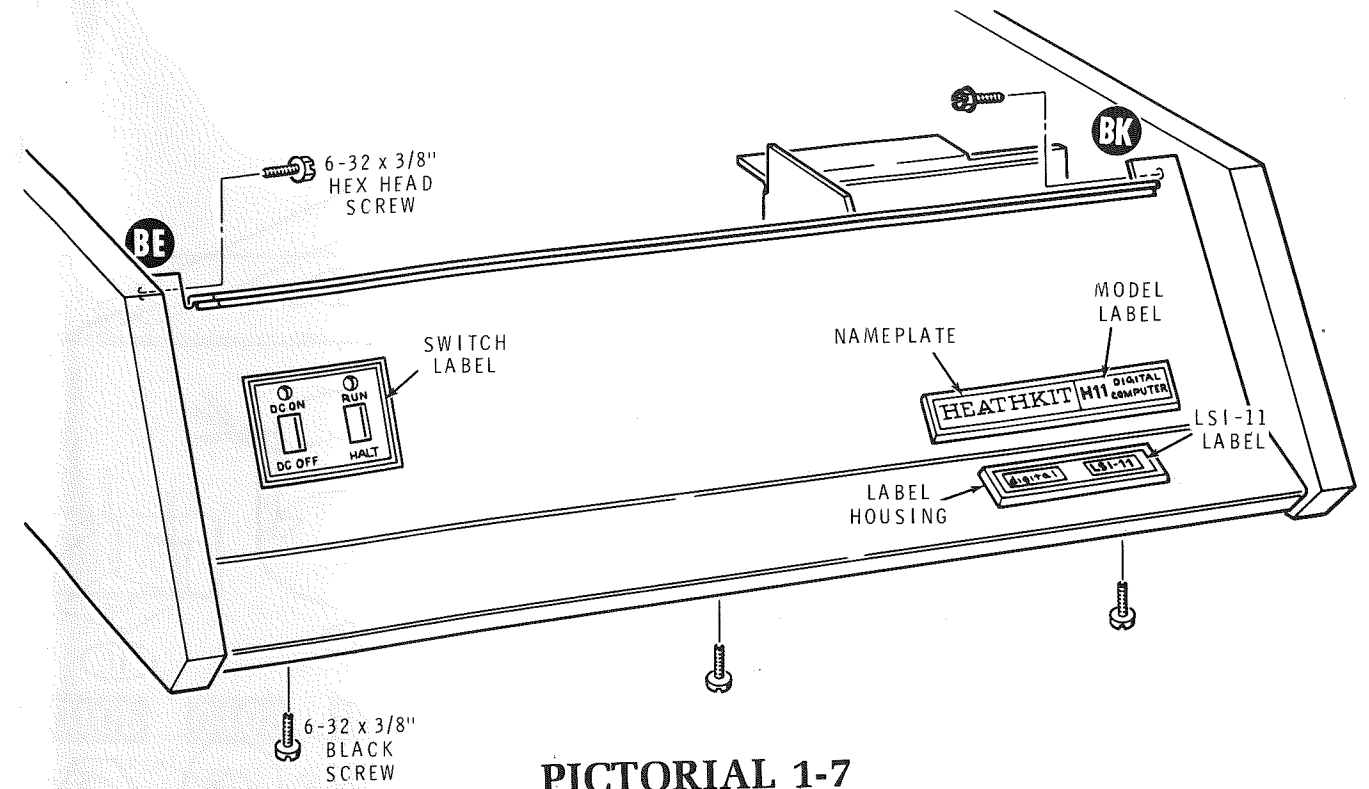
PICTORIAL 1-3



PICTORIAL 1-4

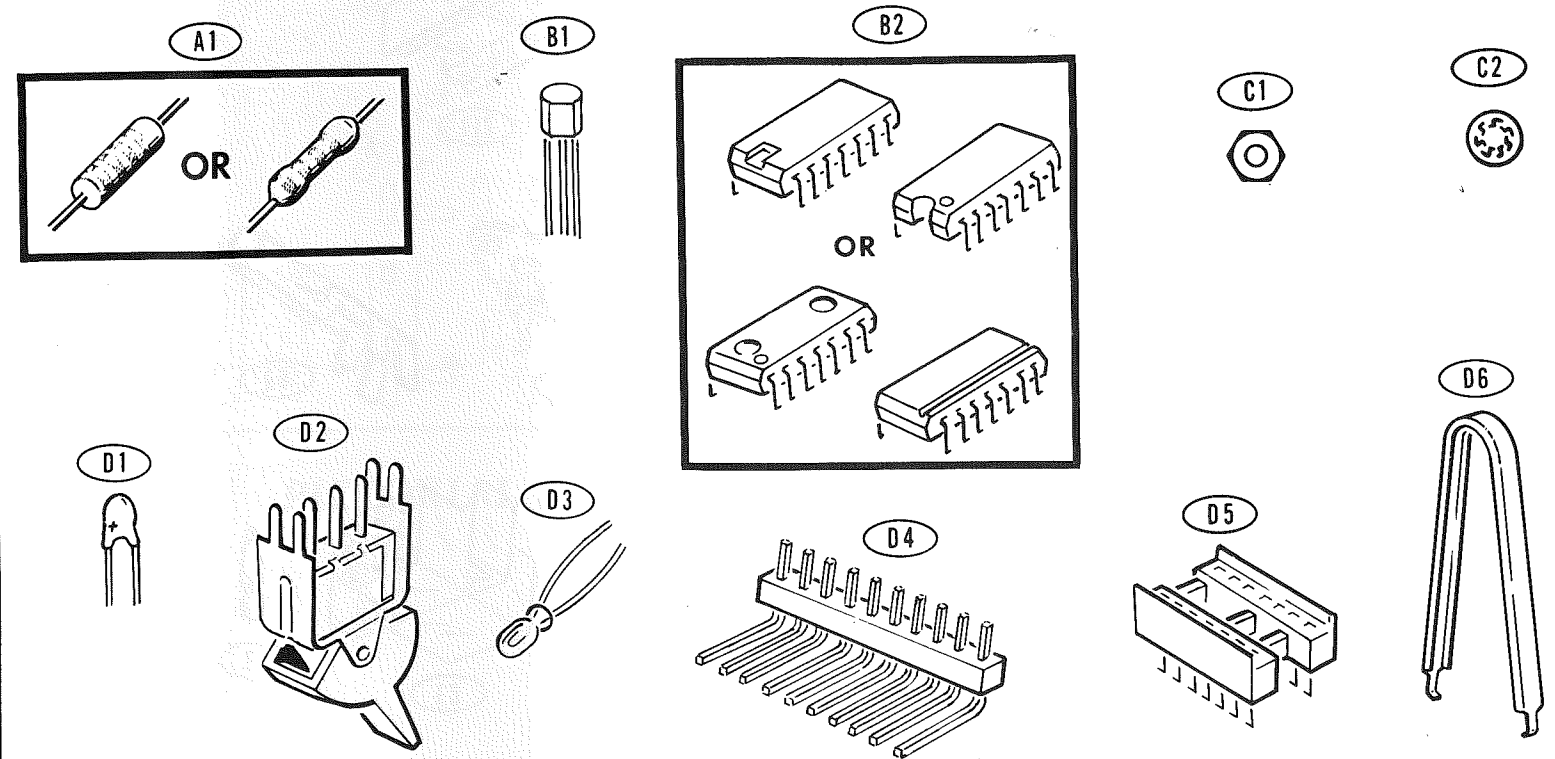


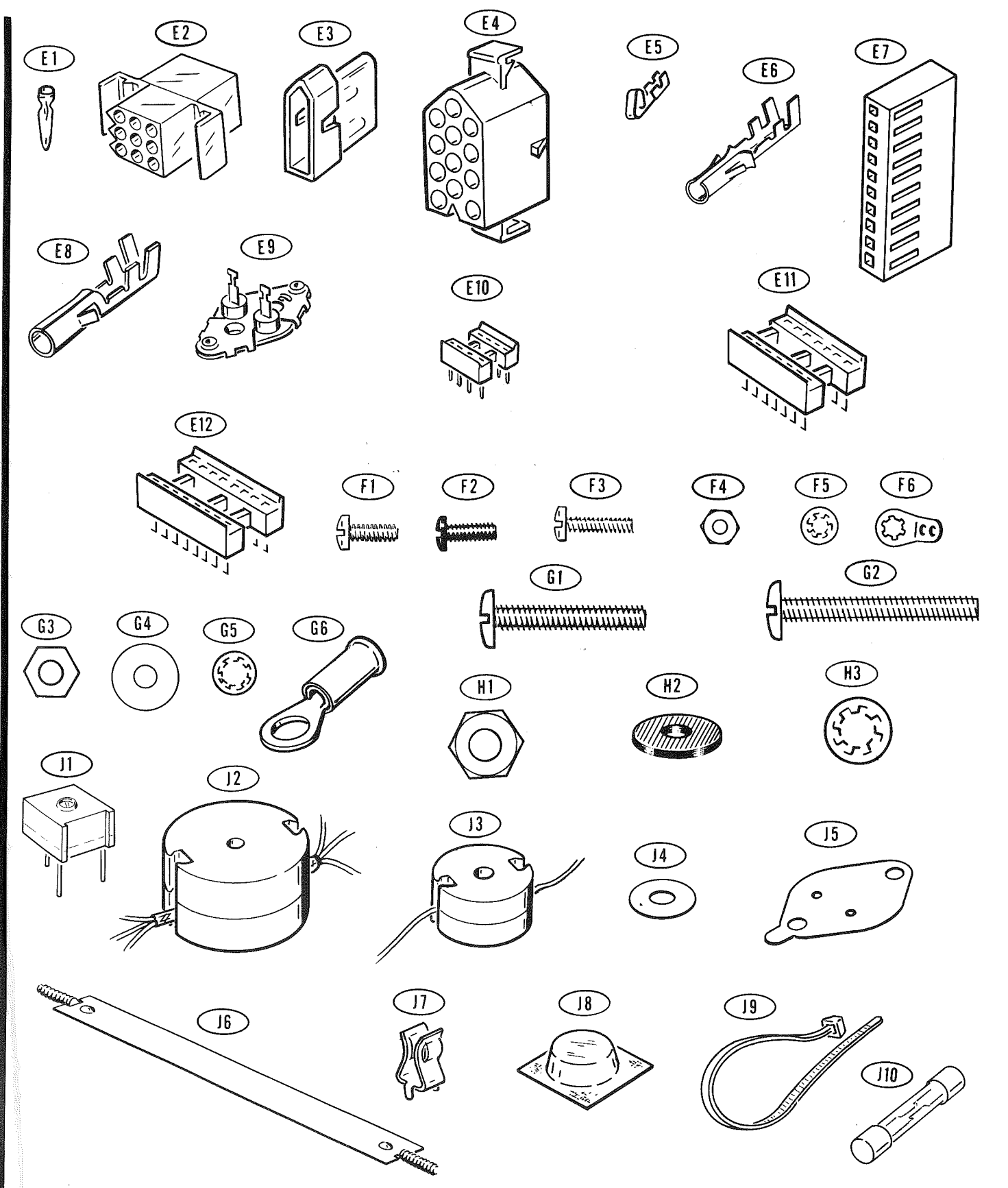
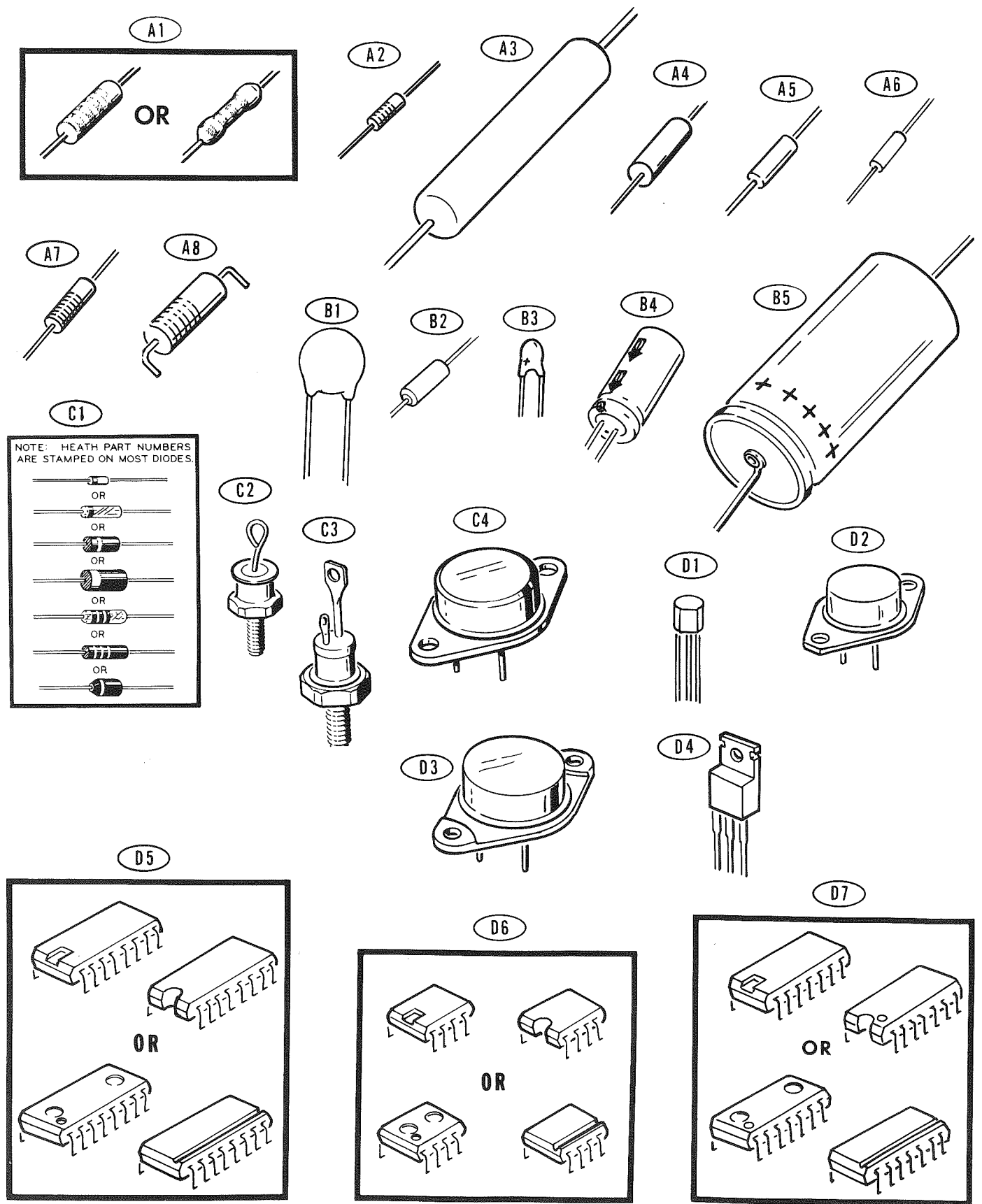
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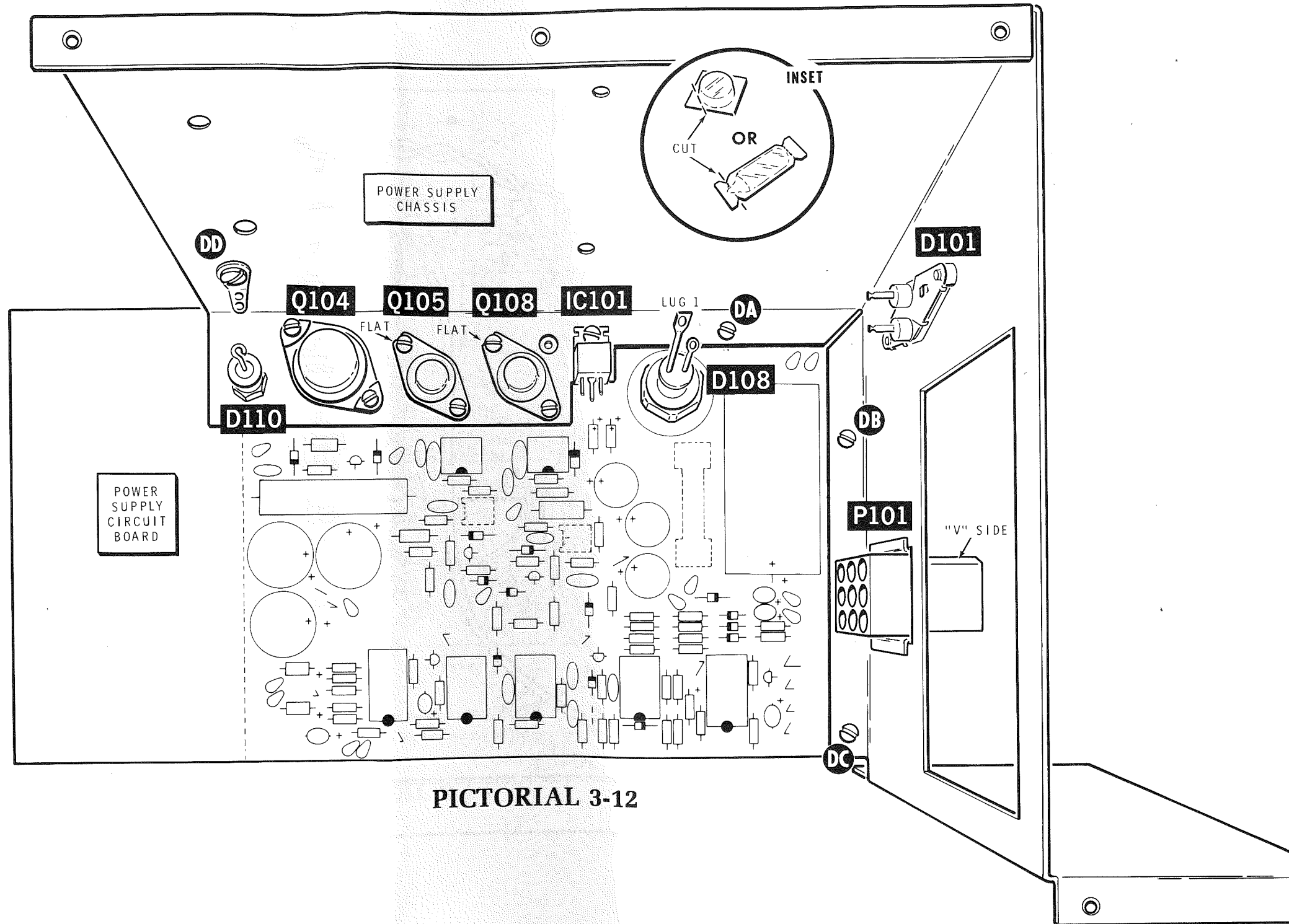
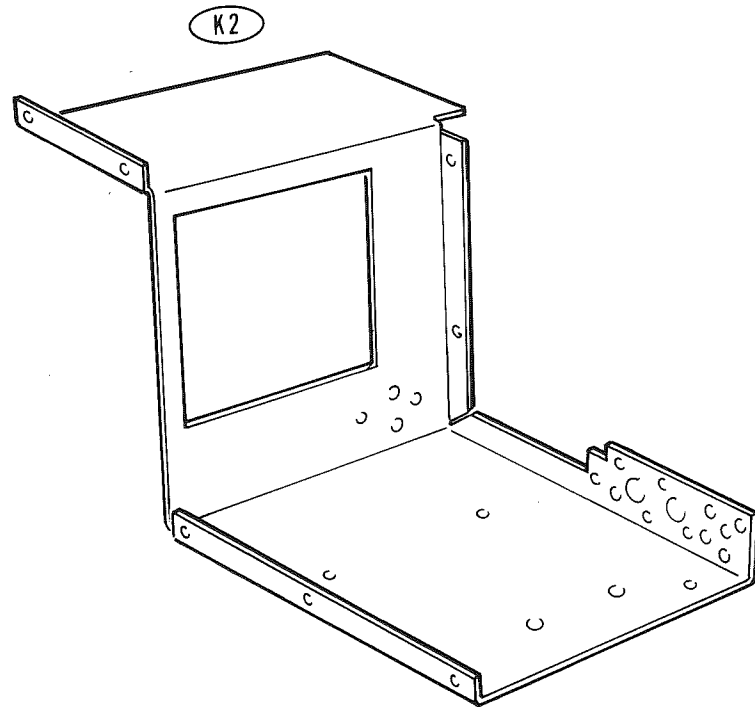
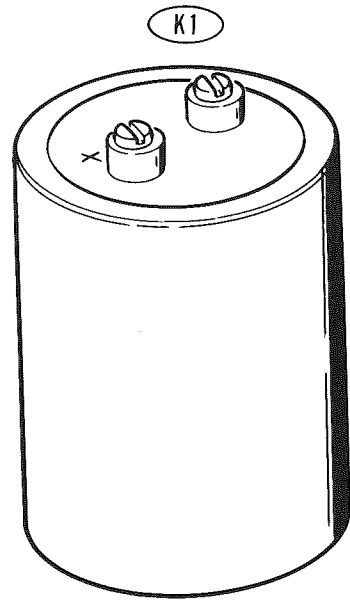
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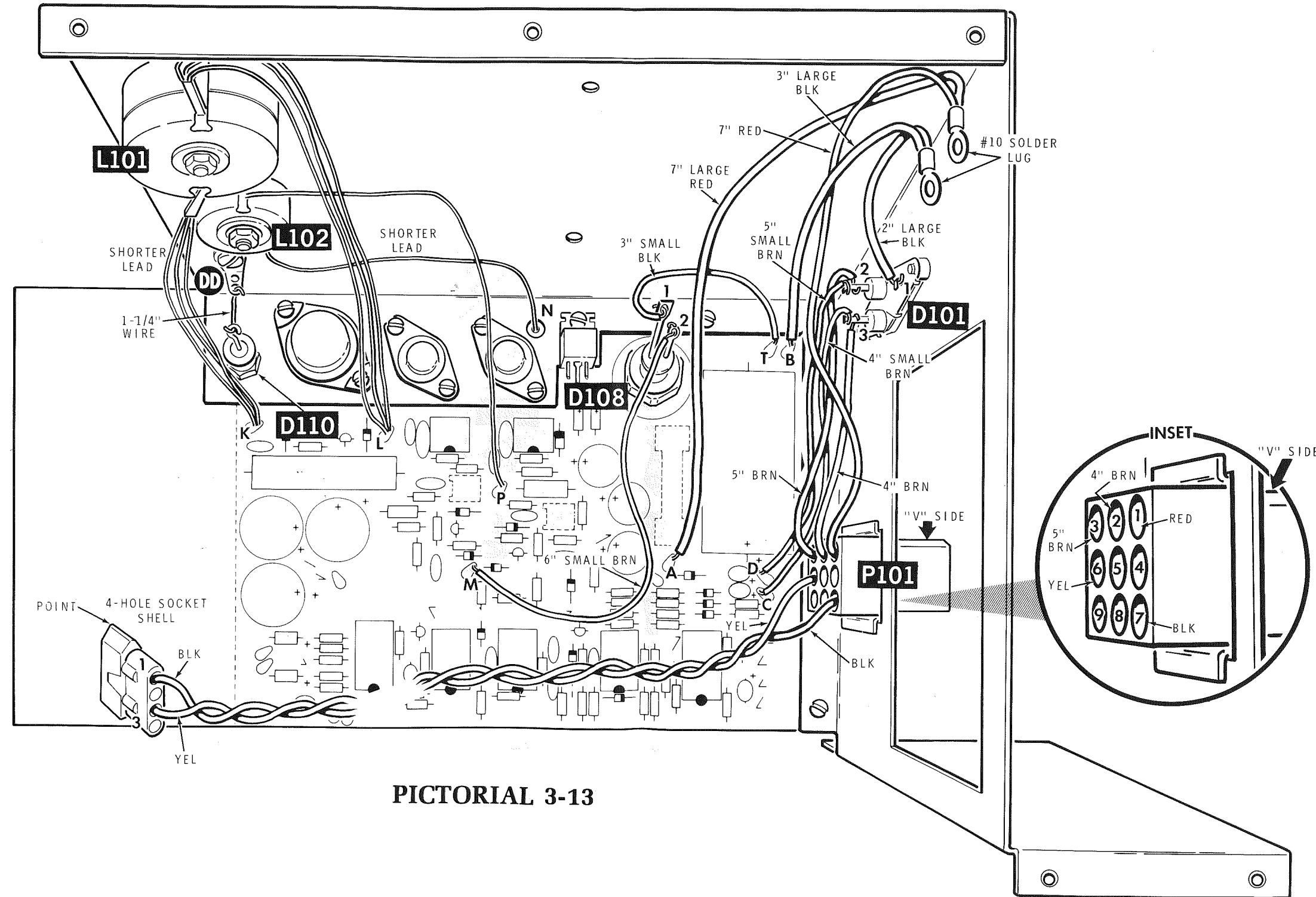
SWITCH CIRCUIT BOARD PARTS PICTORIAL

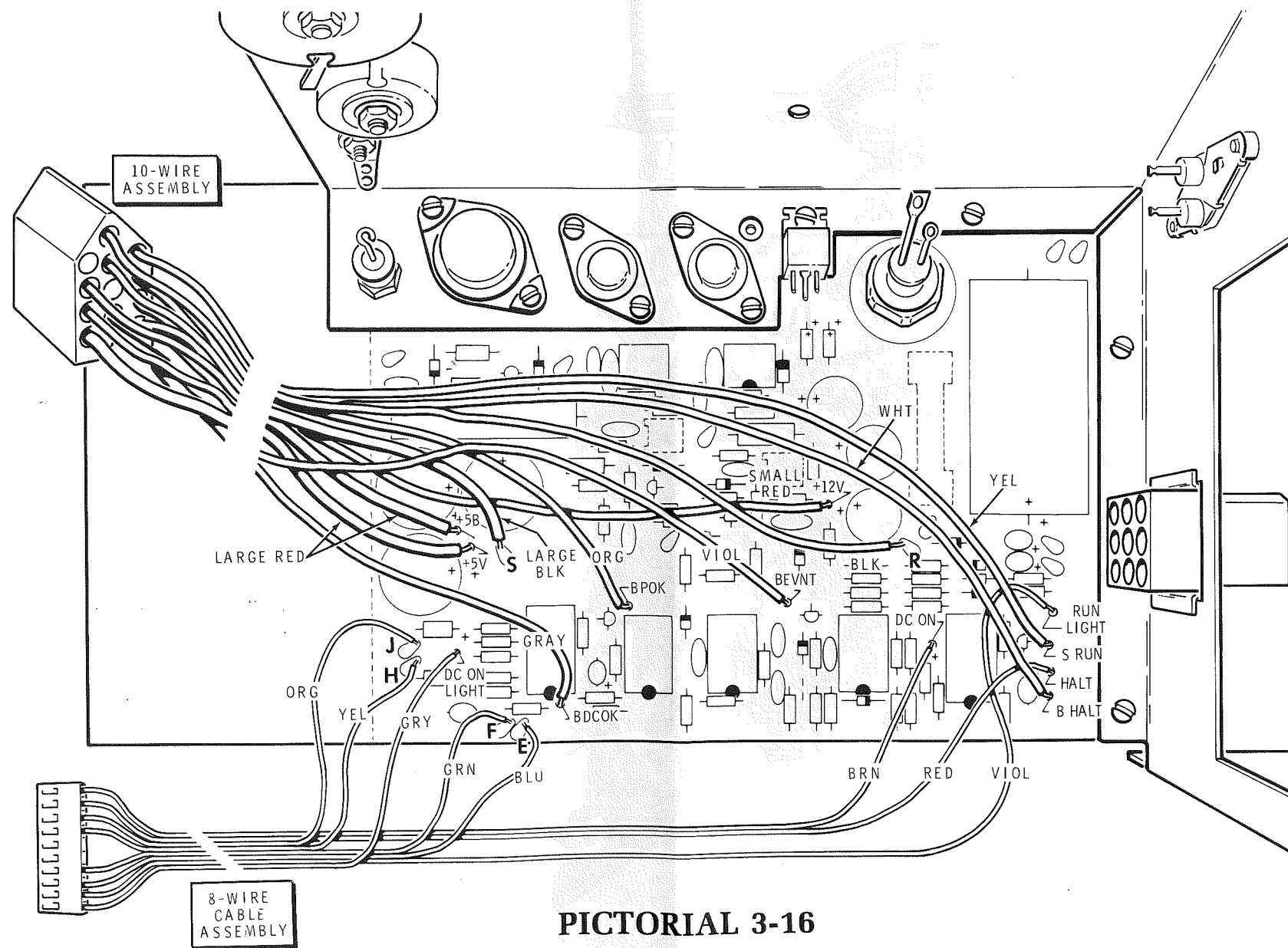




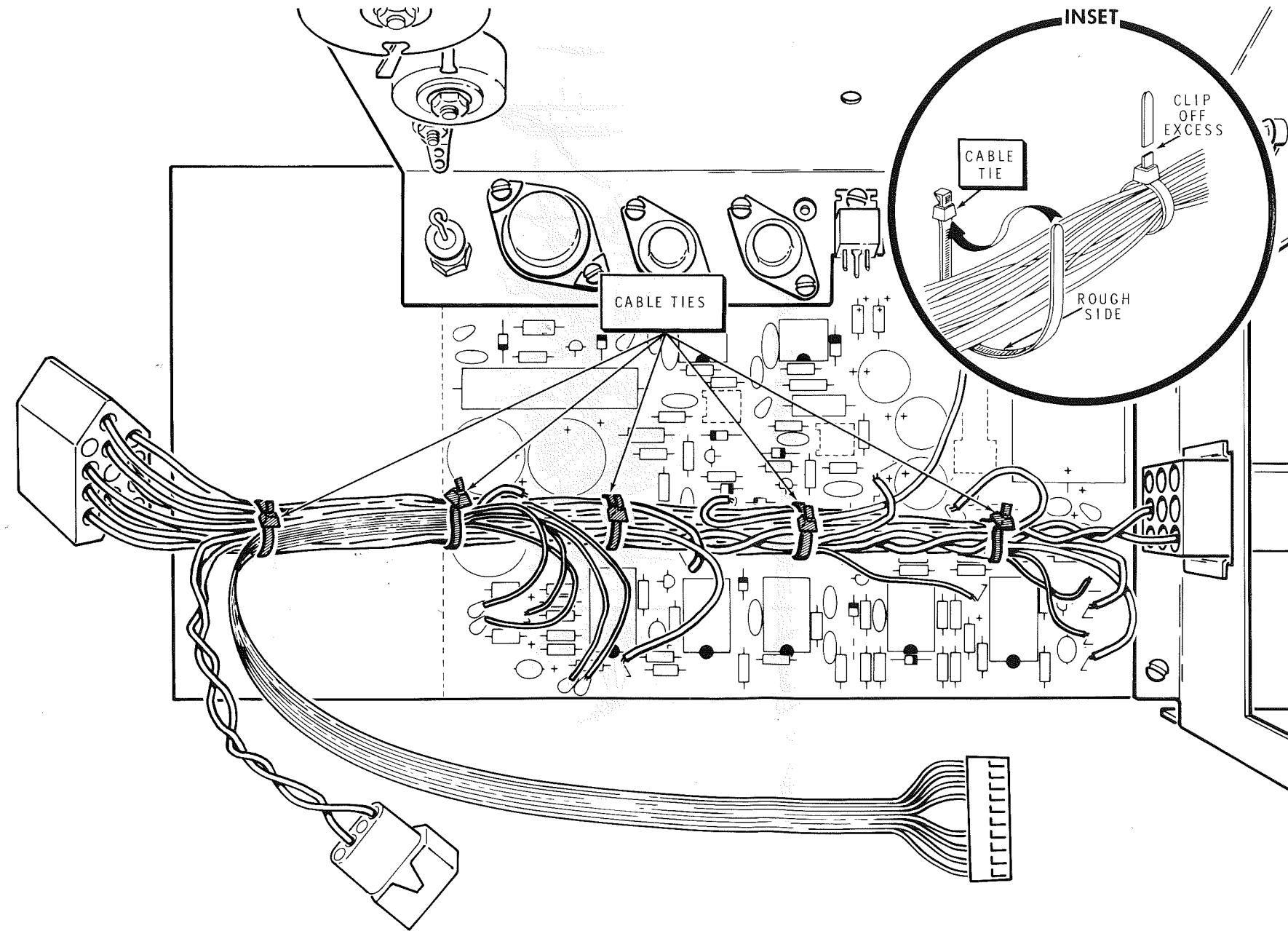
**Power Supply  
Parts Pictorial (Cont'd.)**





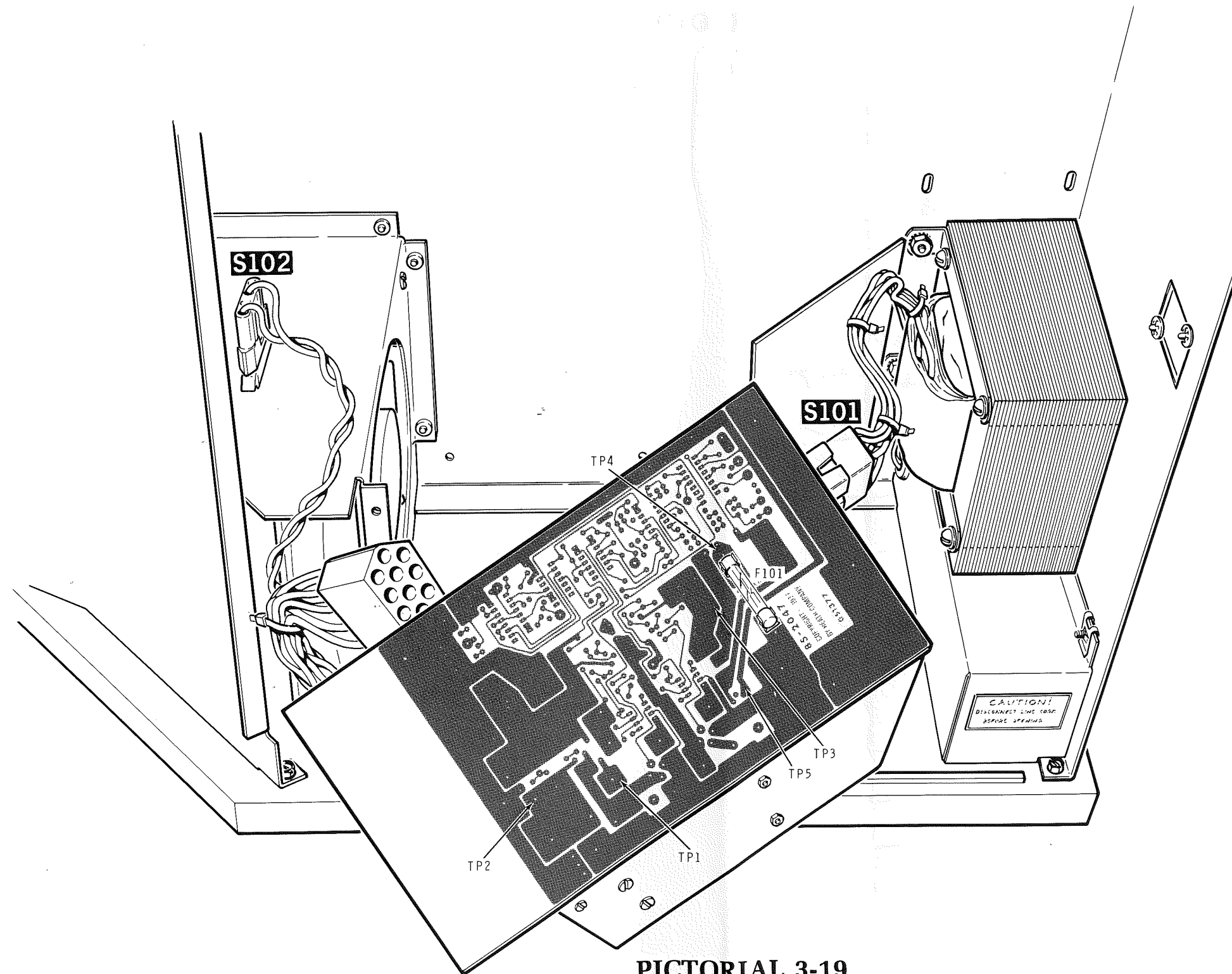


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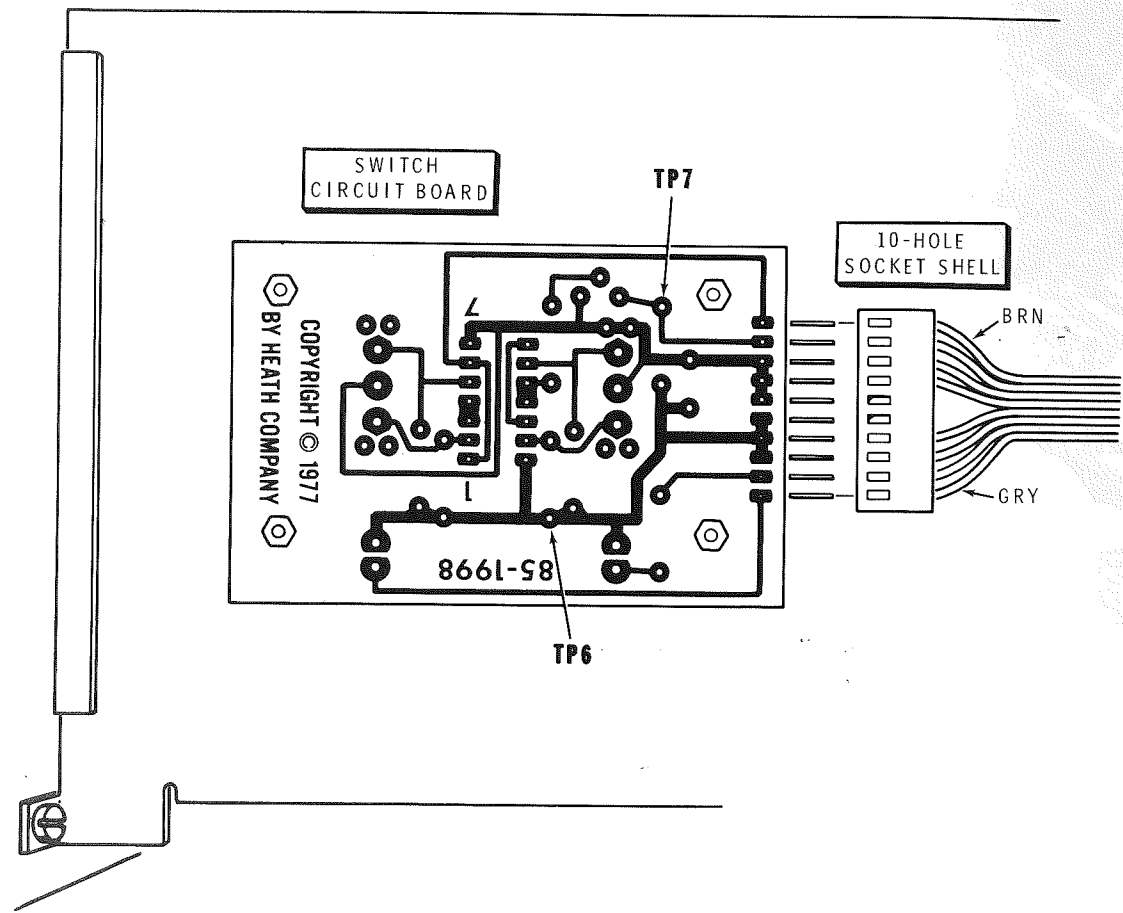


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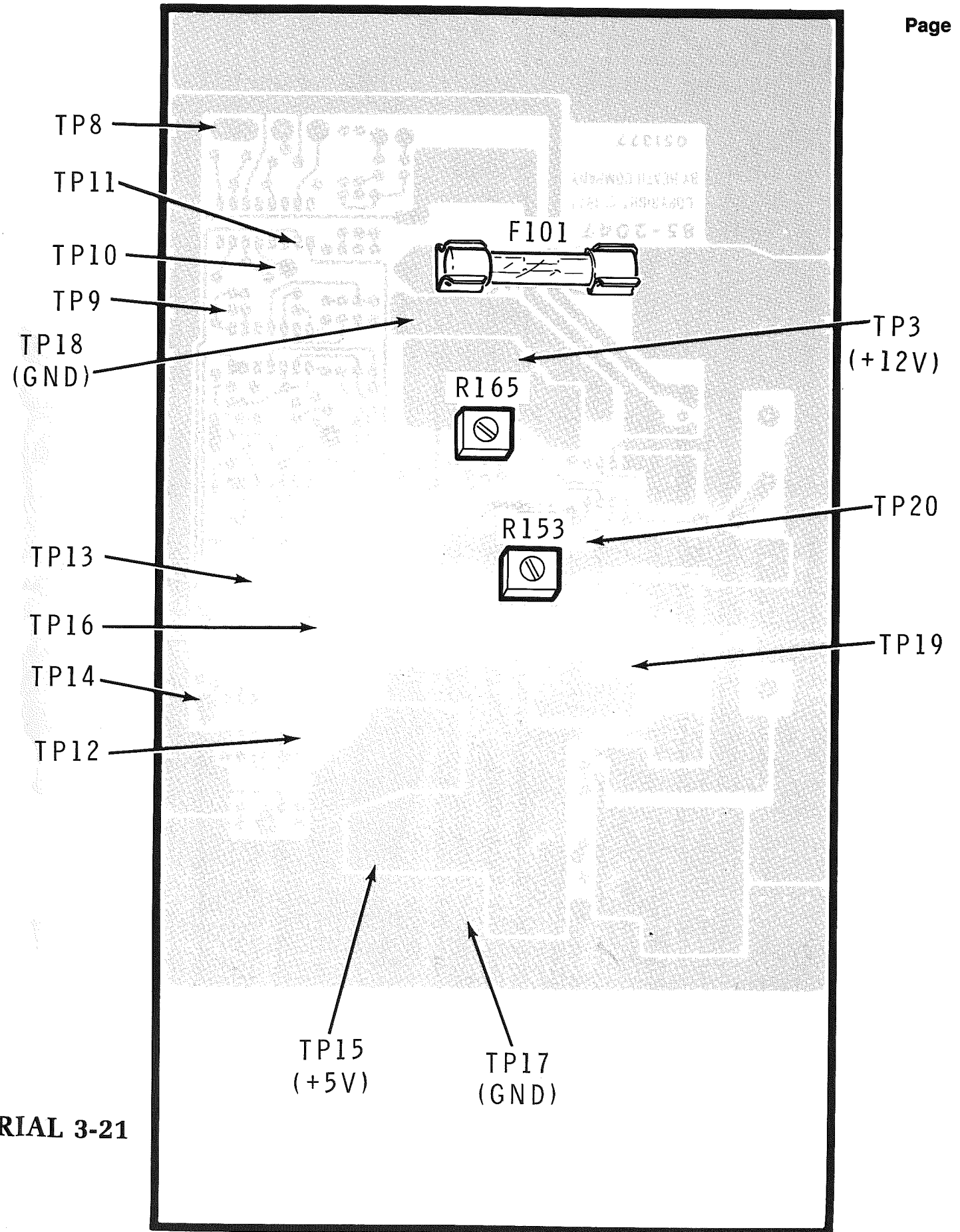




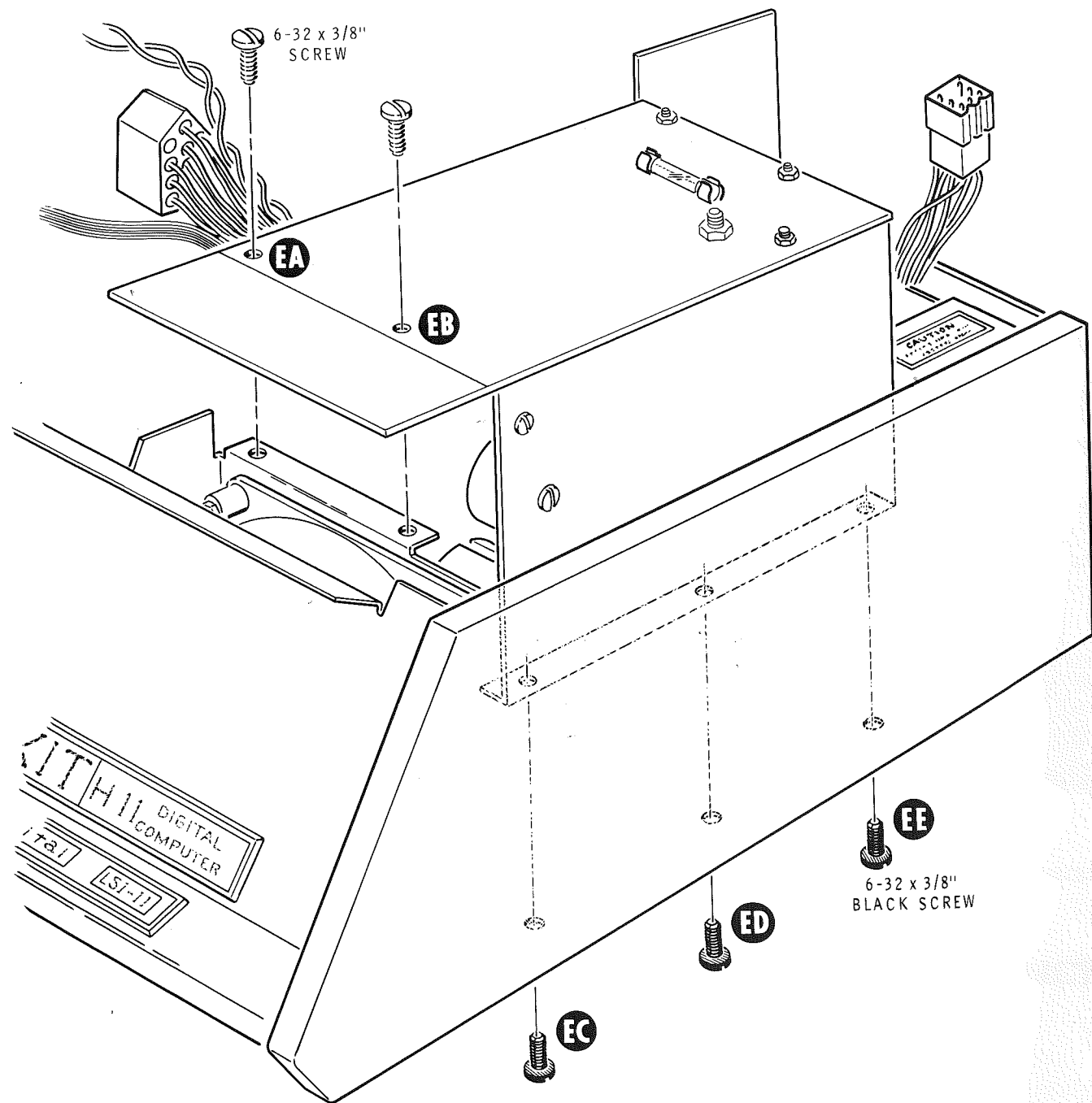
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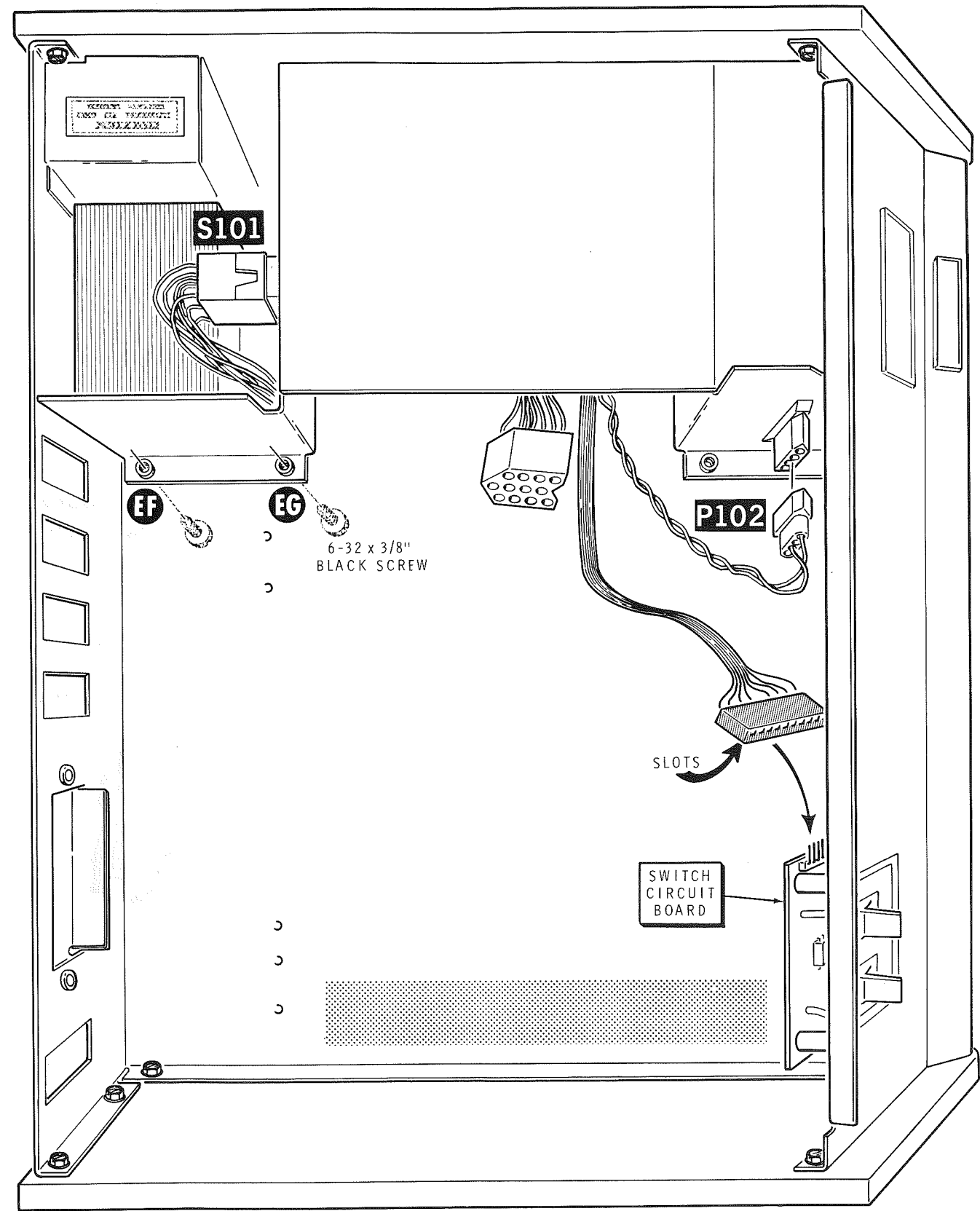
PICTORIAL 3-20



PICTORIAL 3-21

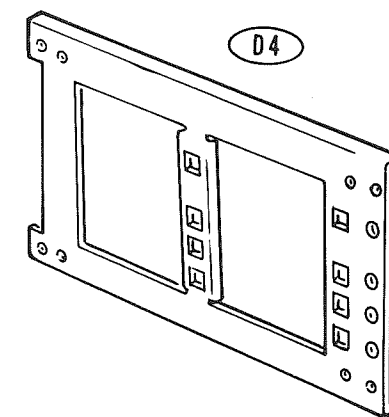
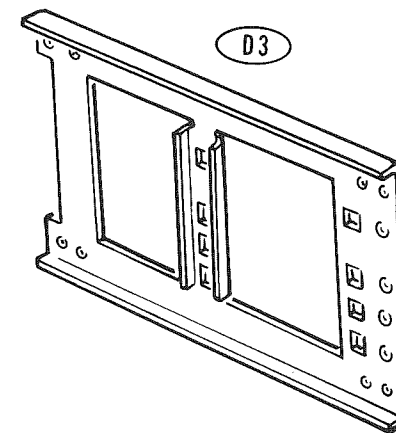
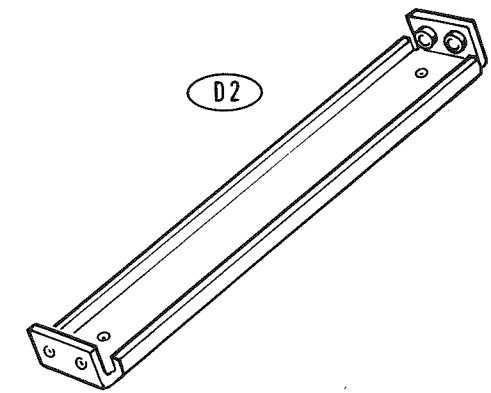
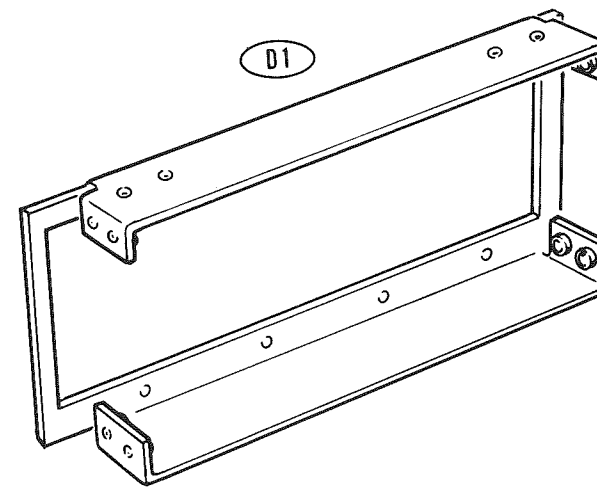
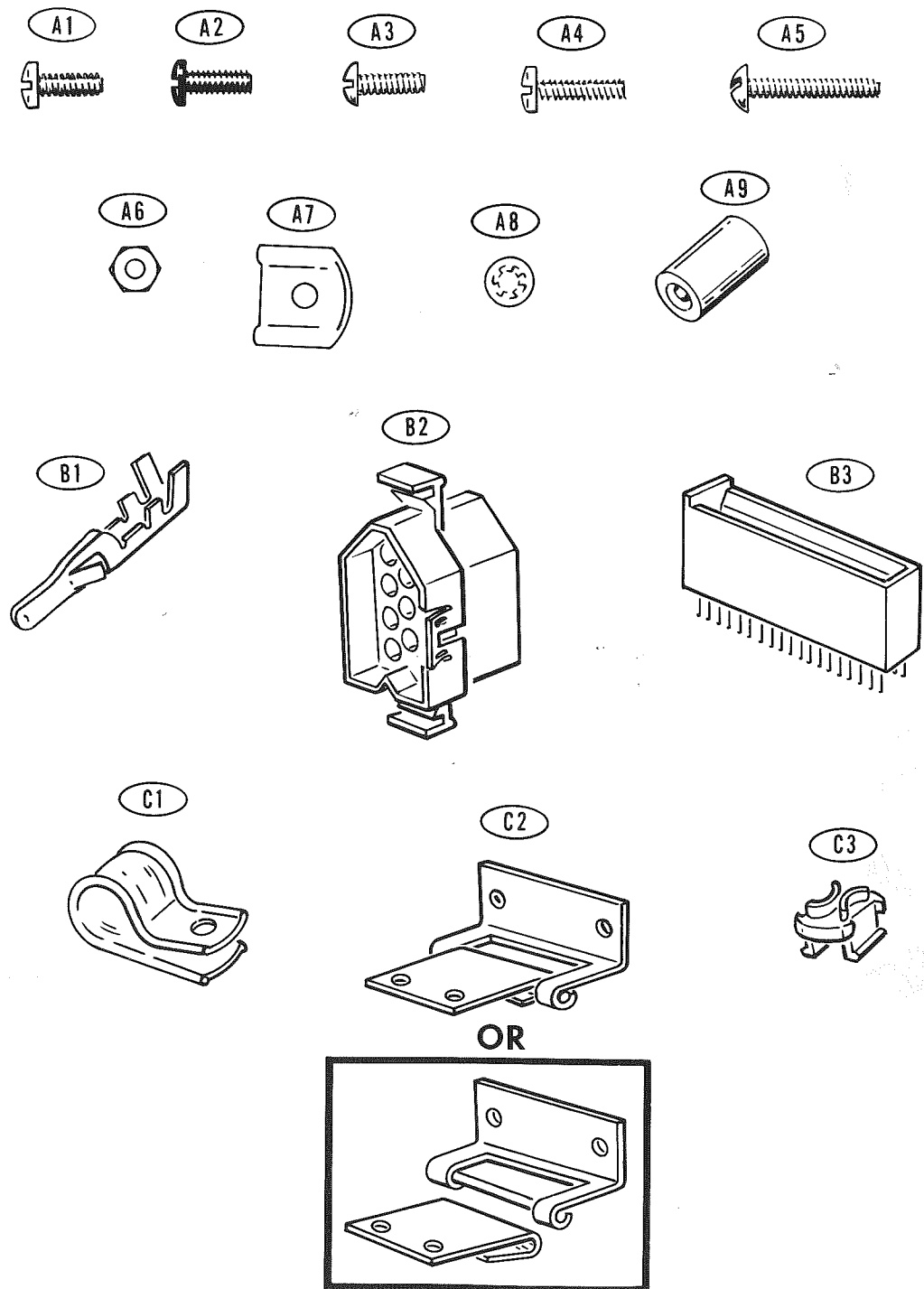


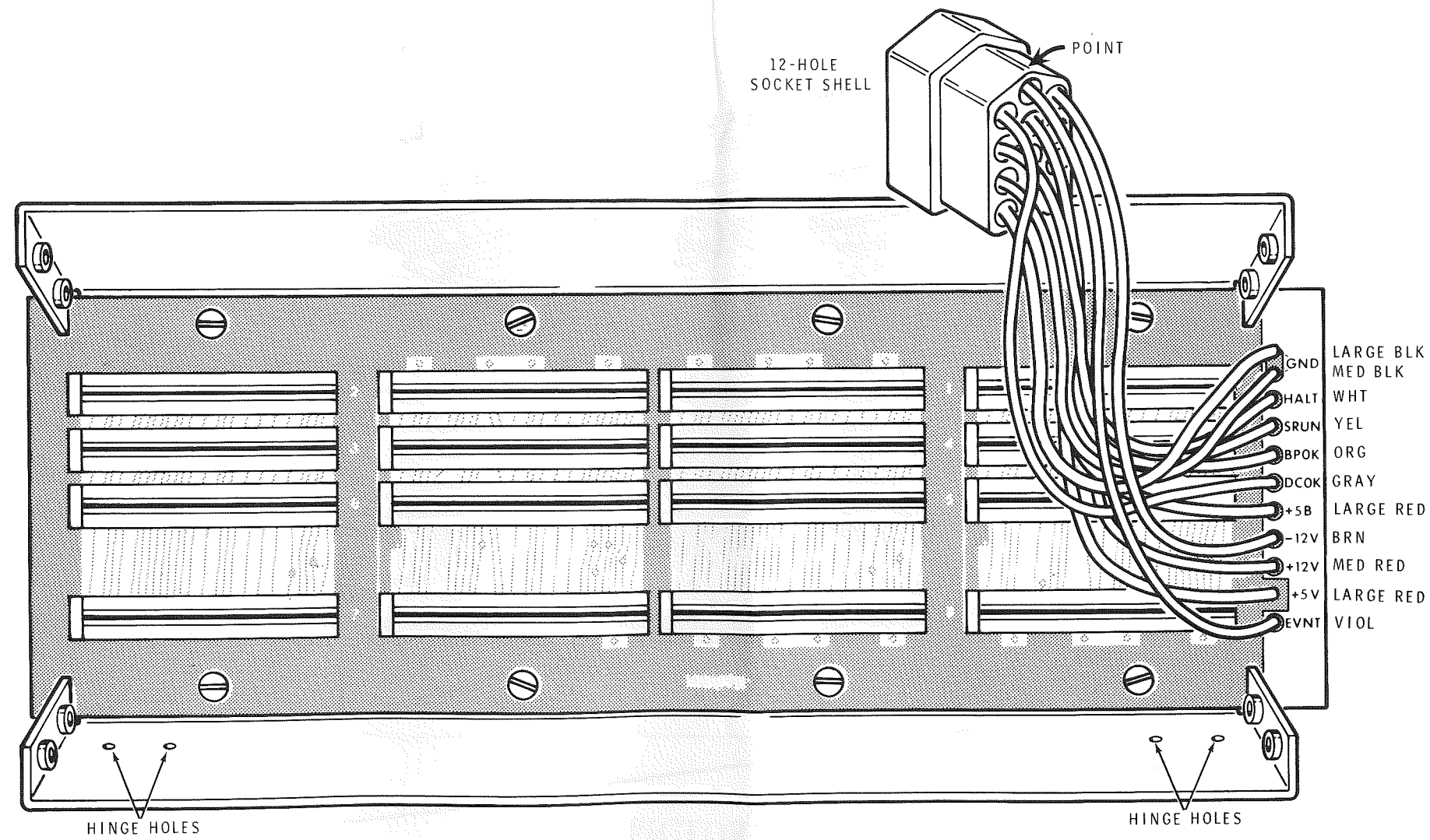
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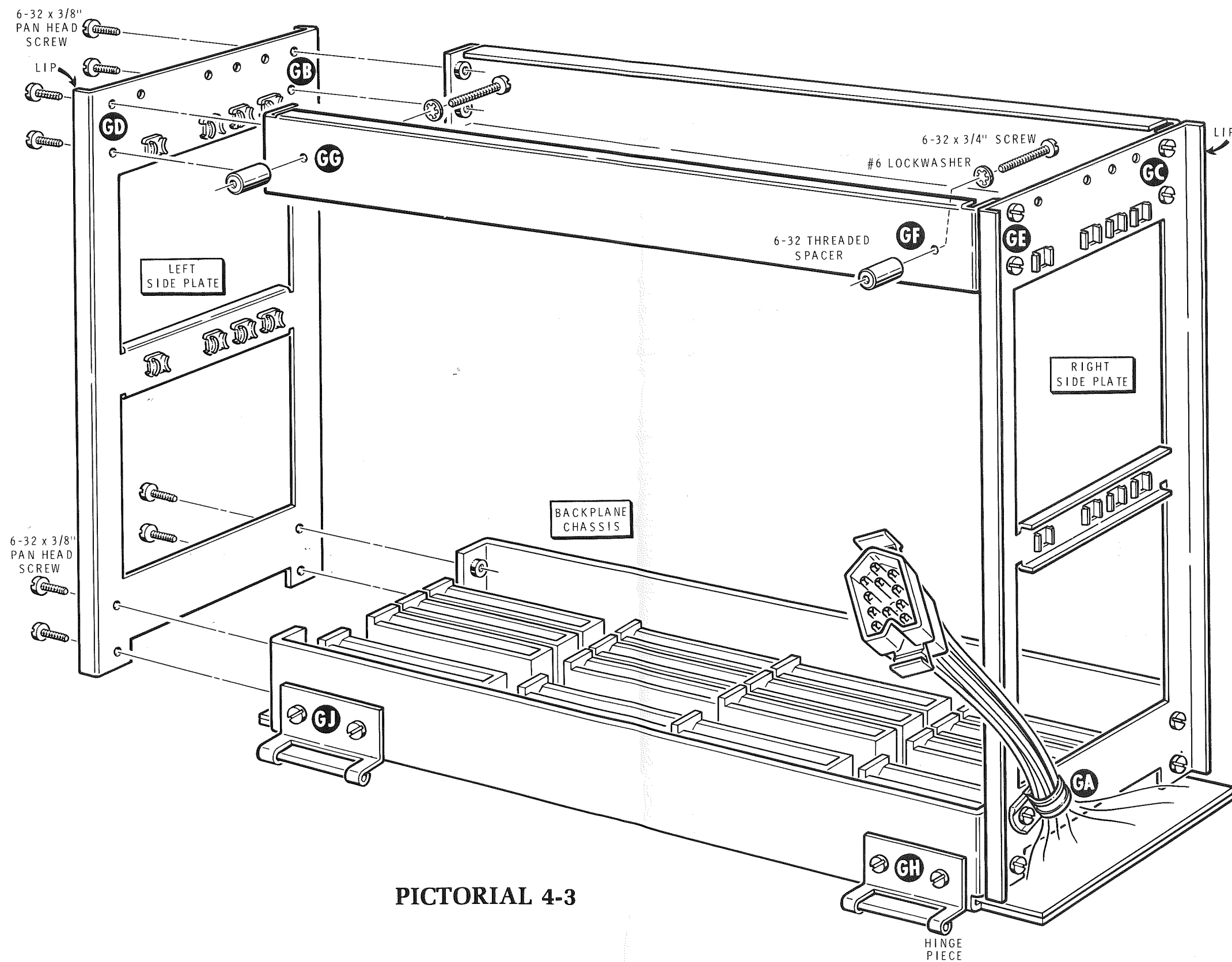
PICTORIAL 3-23

# BACKPLANE ASSEMBLY PARTS PICTORIAL

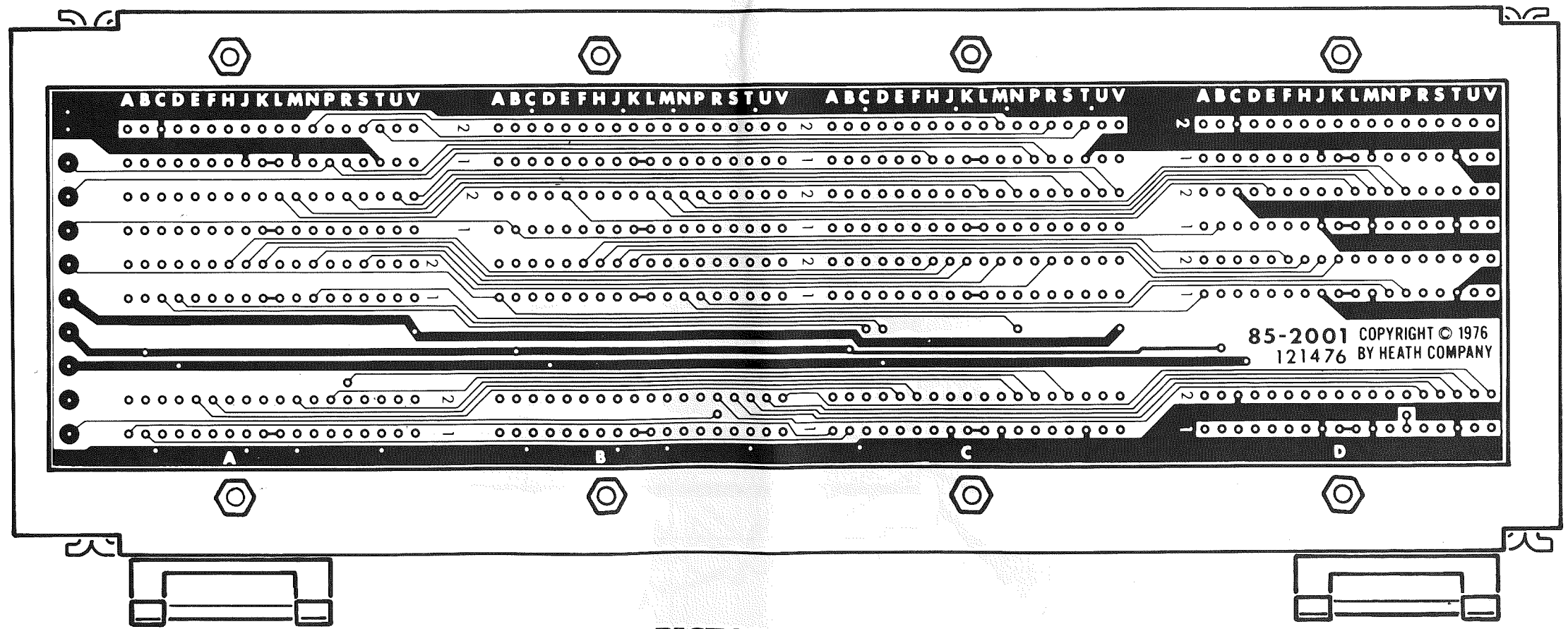




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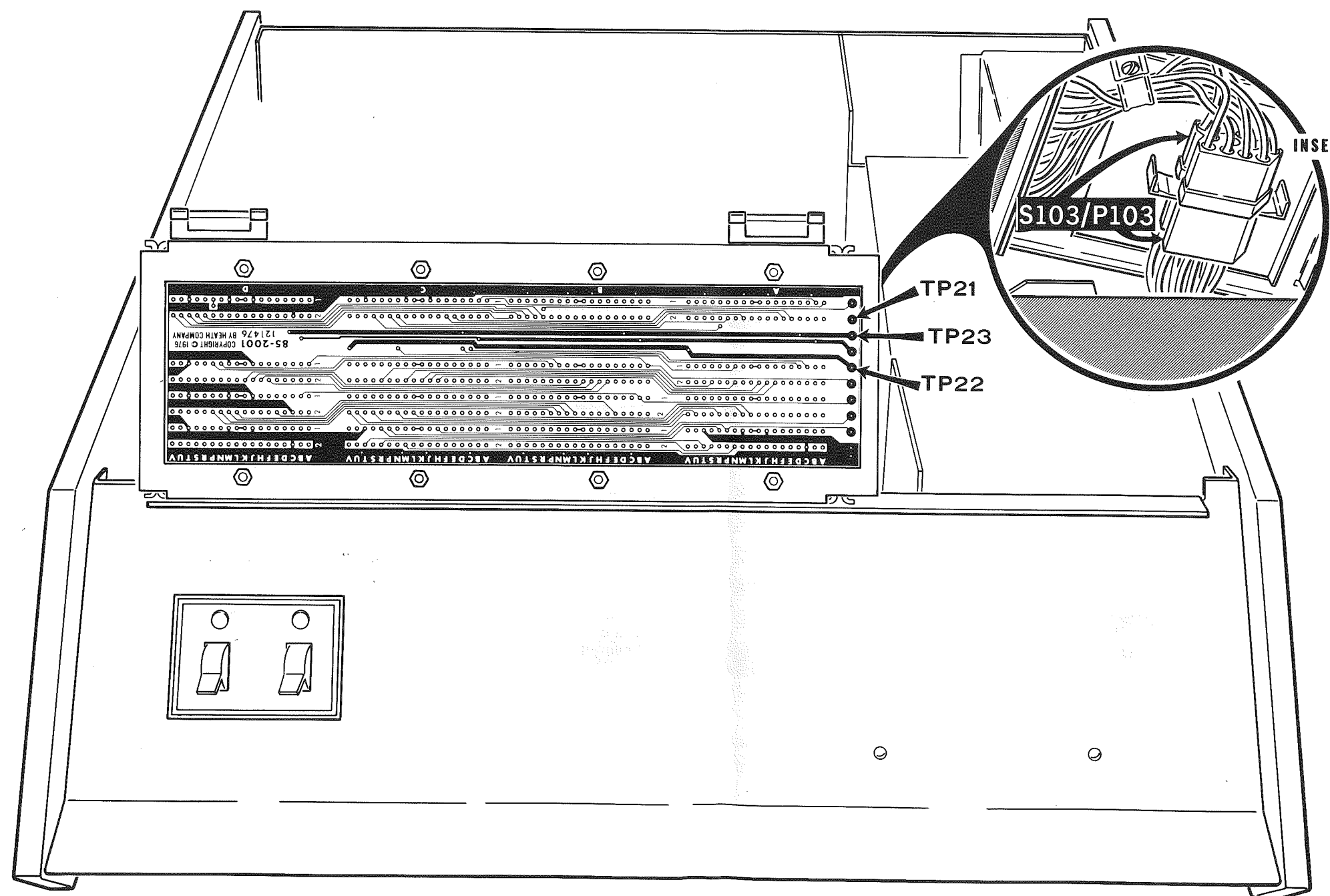


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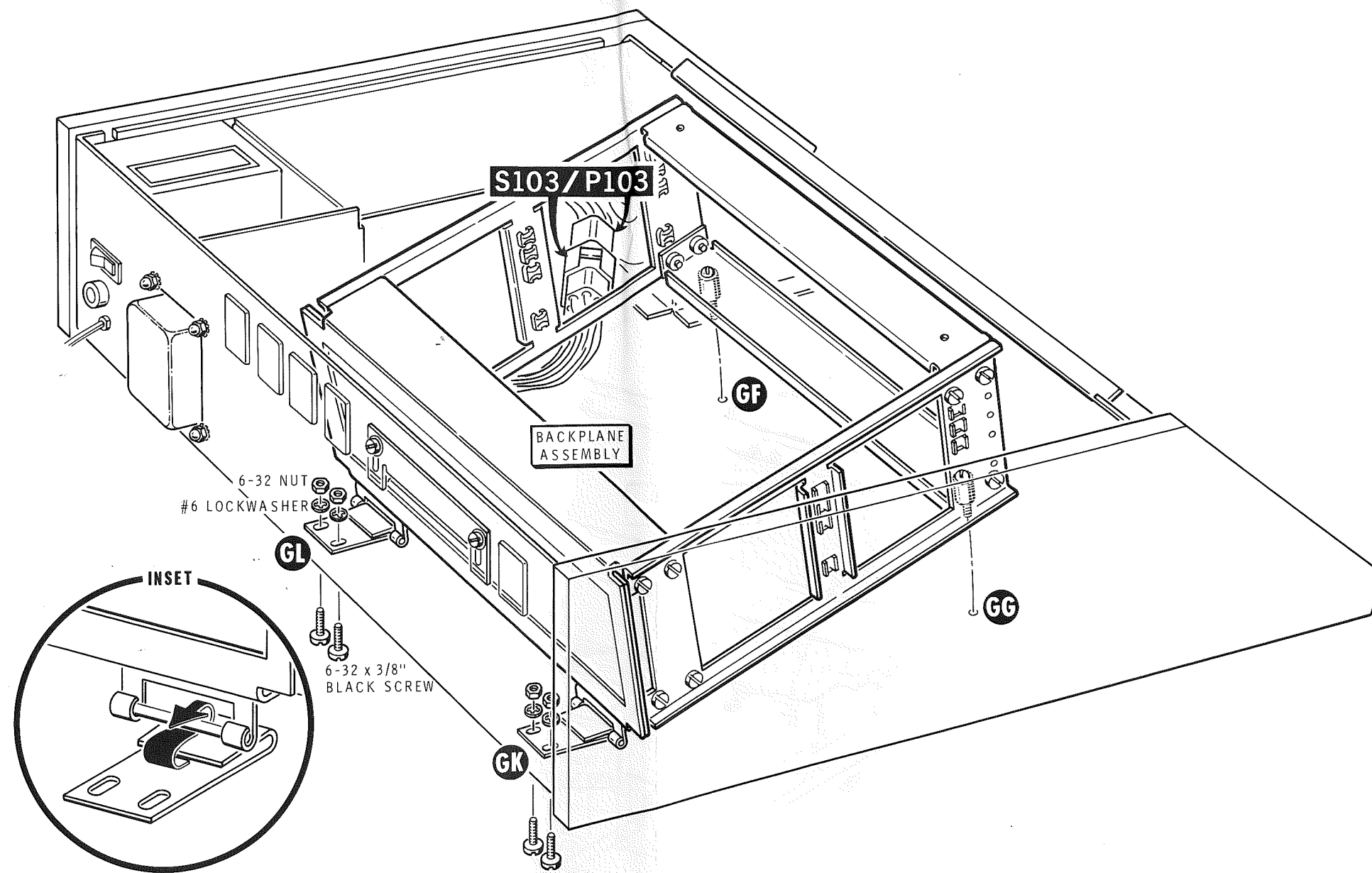
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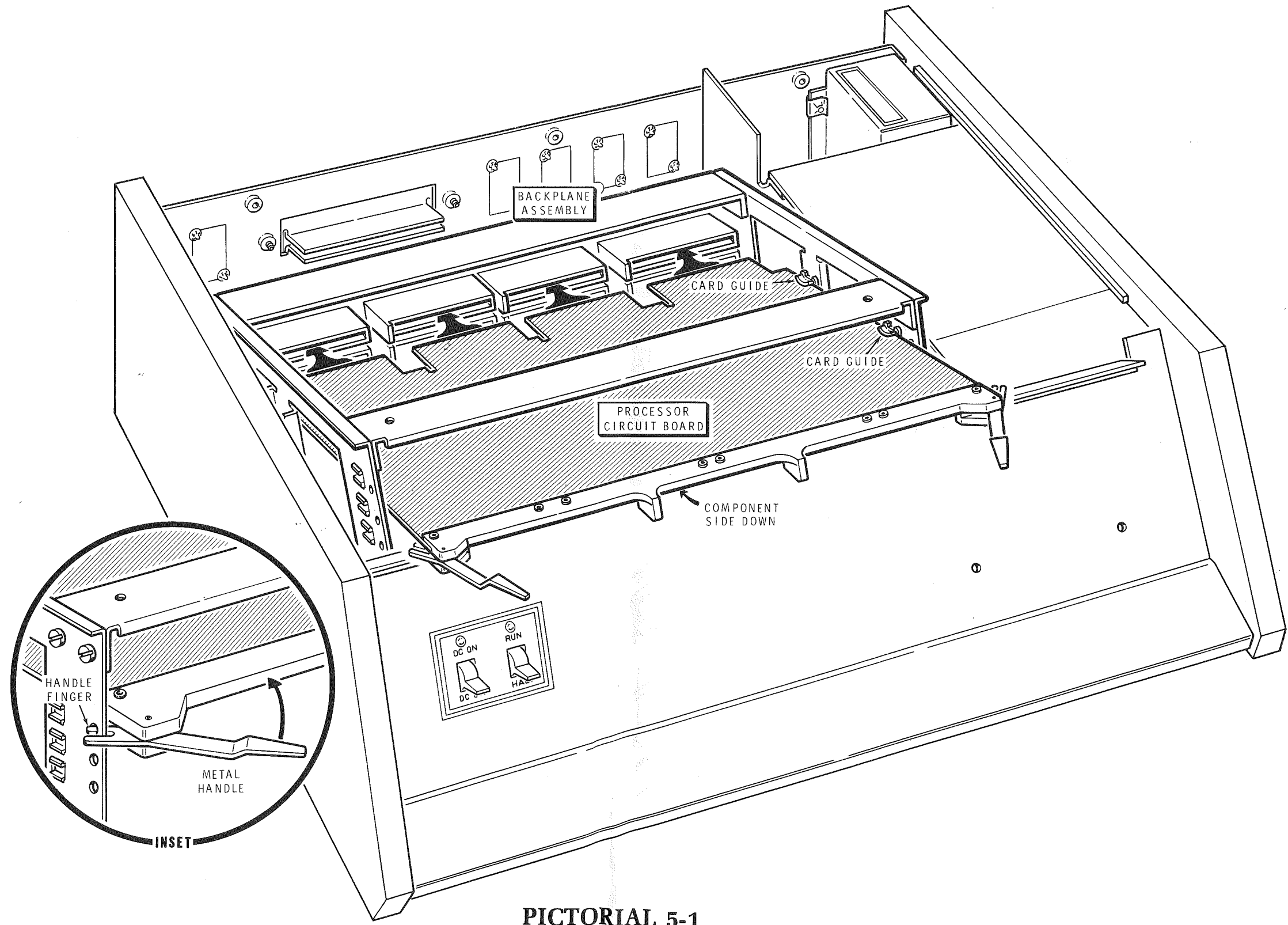


PICTORIAL 4-5





PICTORIAL 4-6



PICTORIAL 5-1

# SCHEMATIC OF THE HEATHKIT® DIGITAL COMPUTER MODEL H11

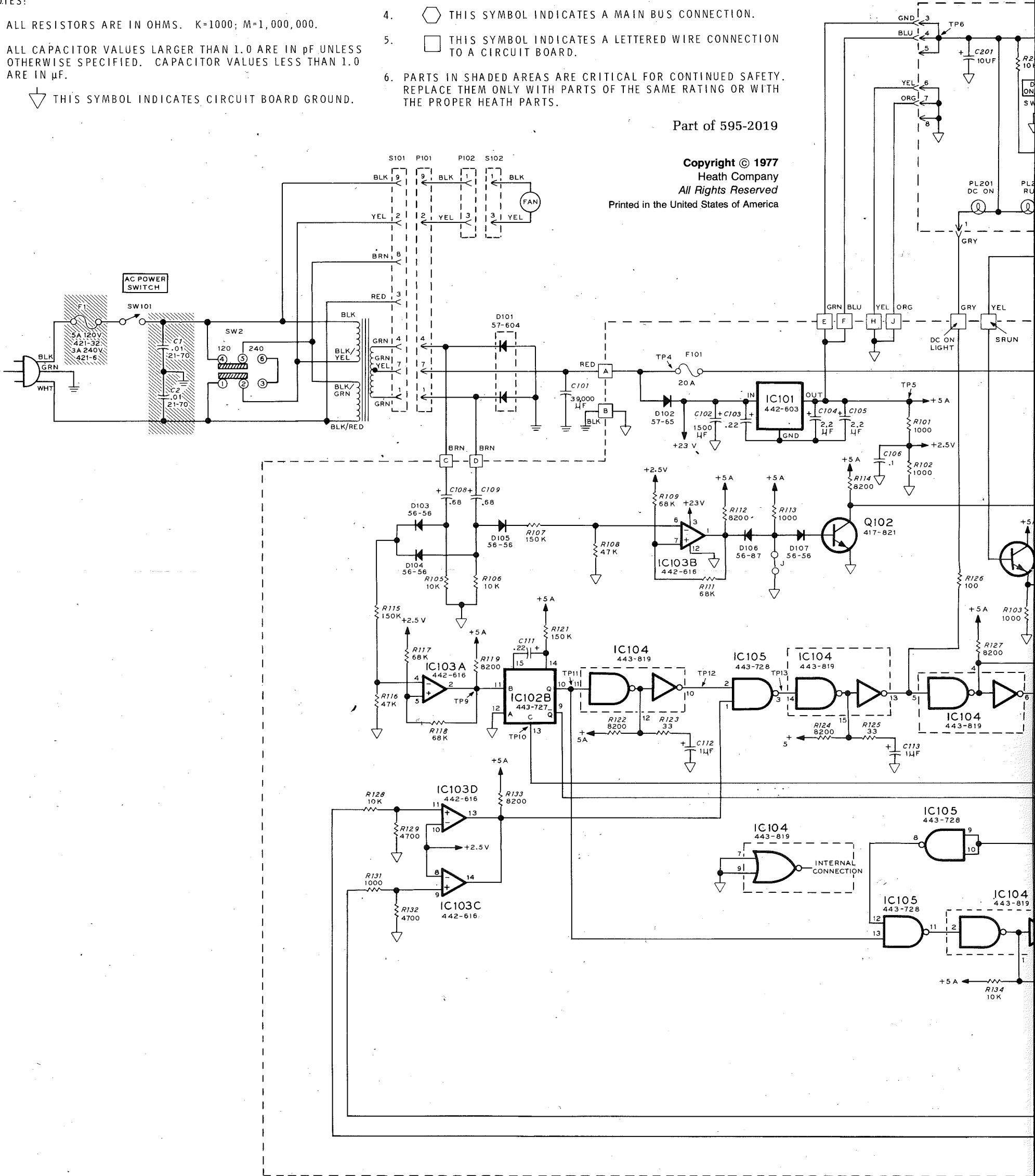
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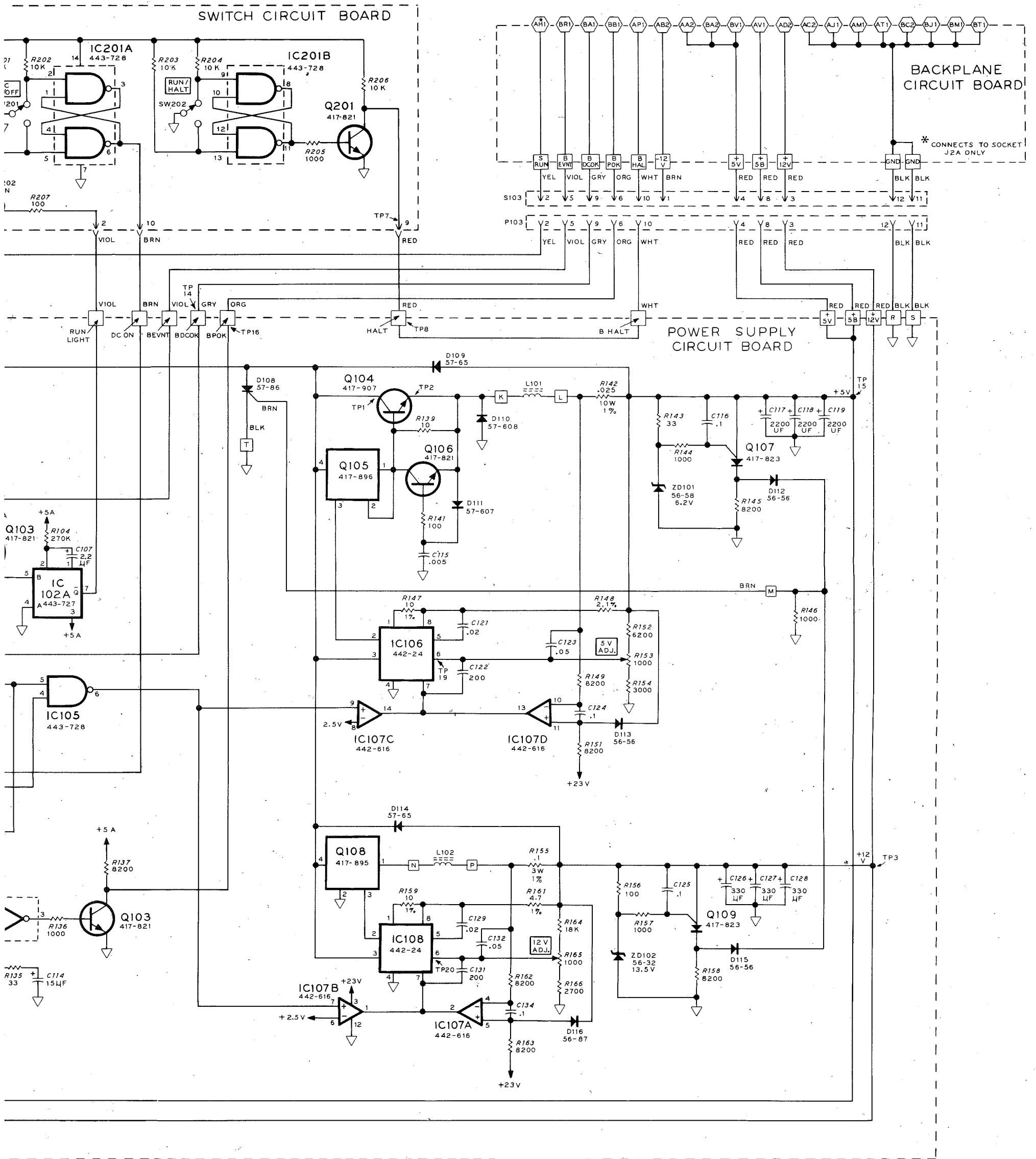
1. ALL RESISTORS ARE IN OHMS. K=1000; M=1,000,000.
2. ALL CAPACITOR VALUES LARGER THAN 1.0 ARE IN pF UNLESS OTHERWISE SPECIFIED. CAPACITOR VALUES LESS THAN 1.0 ARE IN μF.
3. ▽ THIS SYMBOL INDICATES CIRCUIT BOARD GROUND.

4. ◻ THIS SYMBOL INDICATES A MAIN BUS CONNECTION.
5. □ THIS SYMBOL INDICATES A LETTERED WIRE CONNECTION TO A CIRCUIT BOARD.
6. PARTS IN SHADED AREAS ARE CRITICAL FOR CONTINUED SAFETY. REPLACE THEM ONLY WITH PARTS OF THE SAME RATING OR WITH THE PROPER HEATH PARTS.

Part of 595-2019

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# CUSTOMER SERVICE

## REPLACEMENT PARTS

Please provide complete information when you request replacements from either the factory or Heath Electronic Centers. Be certain to include the **HEATH** part number exactly as it appears in the parts list.

## ORDERING FROM THE FACTORY

Print all of the information requested on the parts order form furnished with this product and mail it to Heath. For telephone orders (parts only) dial 616 982-3571. If you are unable to locate an order form, write us a letter or card including:

- Heath part number.
- Model number.
- Date of purchase.
- Location purchased or invoice number.
- Nature of the defect.
- Your payment or authorization for COD shipment of parts not covered by warranty.

Mail letters to: Heath Company  
Benton Harbor  
MI 49022  
Attn: Parts Replacement

**Retain original parts until you receive replacements. Parts that should be returned to the factory will be listed on your packing slip.**

## OBTAINING REPLACEMENTS FROM HEATH ELECTRONIC CENTERS

For your convenience, "over the counter" replacement parts are available from the Heath Electronic Centers listed in your catalog. Be sure to bring in the original part and purchase invoice when you request a warranty replacement from a Heath Electronic Center.

## TECHNICAL CONSULTATION

Need help with your kit? — Self-Service? — Construction? — Operation? — Call or write for assistance. you'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number and Series number from the blue and white label.
- The date of purchase.
- An exact description of the difficulty.
- Everything you have done in attempting to correct the problem.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

**Please do not send parts for testing**, unless this is specifically requested by our Consultants.

Hints: Telephone traffic is lightest at midweek — please be sure your Manual and notes are on hand when you call.

Heathkit Electronic Center facilities are also available for telephone or "walk-in" personal assistance.

## REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

**If it is convenient, personally deliver your kit to a Heathkit Electronic Center. For warranty parts replacement, supply a copy of the invoice or sales slip.**

If you prefer to ship your kit to the factory, attach a letter containing the following information directly to the unit:

- Your name and address.
- Date of purchase and invoice number.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit COD for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. (Do not include any wooden cabinets or color television picture tubes, as these are easily damaged in shipment. Do not include the kit Manual.) Place the equipment in a strong carton with at least **THREE INCHES** of *resilient* packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions (control sticks, large knobs, etc.). If the unit weighs over 15 lbs., place this carton in another one with 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by prepaid express, United Parcel Service, or insured Parcel Post to:

Heath Company  
Service Department  
Benton Harbor, Michigan 49022



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