

# HEATHKIT<sup>®</sup> MANUAL

*for the*  
**FLOPPY DISK**

Model H77

595-2356-02



HEATH COMPANY • BENTON HARBOR, MICHIGAN

# Heathkit® Manual

*for the*

## FLOPPY DISK

Model H77

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HEATH COMPANY  
BENTON HARBOR, MICHIGAN 49022

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## INTRODUCTION

NOTE: If you presently have an H88 Computer, you must first convert it to an H89 Computer by installing an H88-4 Accessory before you can use this Floppy Disk system.

The Heath Model H77 Floppy Disk is a mass storage device that stores programs and information for the H89 Computer.

Information is stored on a 5.25-inch, oxide-coated diskette in 40 tracks, which provides a total of 102.4k bytes. Two drive units can be installed in the H77 to double the storage capabilities of this device (only one drive unit is supplied with the kit).

The recording head is a single Read/Write gap-type head. The head carriage is positioned by a lead screw which is driven by a stepper motor. The disk interface circuit board, which installs in the H89 computer, is

an interface between the computer bus and the drive unit.

A photosensor in the drive unit detects the presence or absence of a notch in the diskette to insure write protection. If the notch is not detected, a signal is transmitted to the controller to indicate a read only operation. If the notch is detected, the signal indicates a read/write operation.

The diskettes load quickly and easily through the door in the front panel. The disk interface circuit board installs easily in the computer, and connection between the Floppy Disk and the computer is simple.

### CAUTION

DO NOT OPERATE YOUR H89 COMPUTER UNLESS THE H77 FLOPPY DISK IS TURNED ON. TO DO SO MAY ERASE THE INFORMATION ON THE MAIN DISK SECTOR THAT IS UNDER THE HEAD AT THE TIME.

## UNPACKING

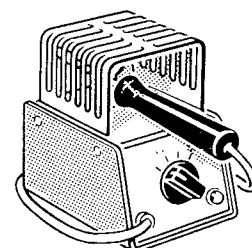
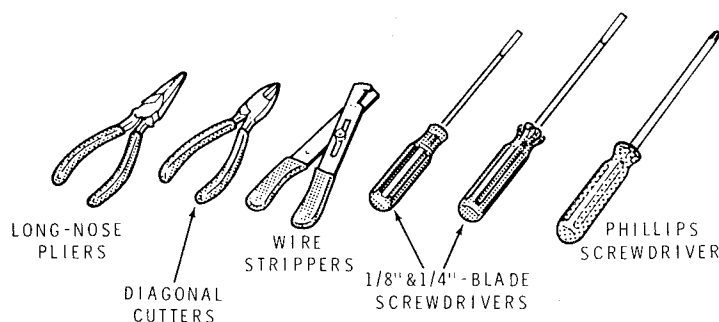
Open the large shipping carton and refer to the Pack Index Sheet. Then remove Packs #2 and #3, and set them aside. The parts and packs that remain in the large carton are Pack #1.

You will use Pack #1 first. Some parts will remain in Pack #1 as you go to Pack #2.

# ASSEMBLY NOTES

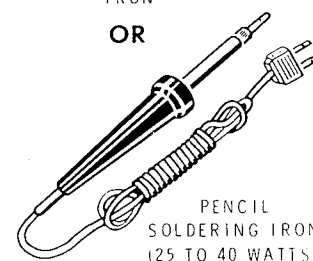
## TOOLS

You will need these tools to assemble your kit.



HEATHKIT  
SOLDERING  
IRON

OR



PENCIL  
SOLDERING IRON  
(25 TO 40 WATTS)

### OTHER HELPFUL TOOLS



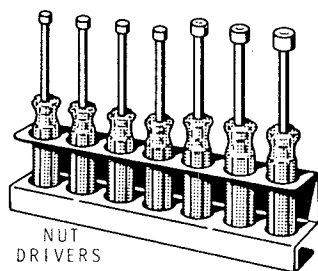
NUT STARTER  
(MAY BE SUPPLIED  
WITH KIT)



DESOLDERING  
BULB\*



DESOLDERING  
BRAID\*



NUT  
DRIVERS

\*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 (D102, C101, ect.). 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 the Schematic,
  - In the section at the rear of the 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 excessive 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.

NOTE: Always use rosin core, radio-type solder (60:40 or 50:50 tin-lead content) for all of the soldering in this kit. This is the type we have supplied with the parts. The Warranty will be void and we will not service any kit in which acid core solder or paste has been used.

## PARTS

**Capacitors** will be called out by their capacitance value in  $\mu\text{F}$  (microfarads) and type: tantalum, electrolytic, etc. Some capacitors may have their value printed in the following manner:

### EXAMPLES:

$$151\text{K} = 15 \times 10 = 150 \text{ pF}$$

$$759 = 75 \times 0.1 = 7.5 \text{ pF}$$

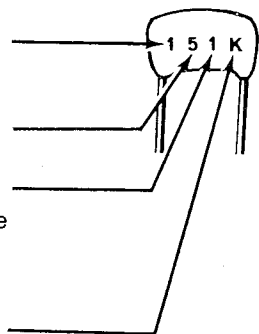
NOTE: The letter "R" may be used at times to signify a decimal point: as in: 2R2 = 2.2 (pF or  $\mu\text{F}$ ).

First digit of capacitor's value: 1

Second digit of capacitor's value: 5

Multiplier: Multiply the first & second digits by the proper value from the Multiplier Chart.

To find the tolerance of the capacitor, look up this letter in the Tolerance columns.



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



# CHASSIS

## PARTS LIST

Open Pack #1 and check each part against the following list. Any part that is packed in an individual envelope with the part number on it should be placed back in the envelope after you identify it until it 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 Parts Pictorial on Pages 1 and 2 in the separate Illustration Booklet.

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.
------------	-------------------	------	-------------	----------------------

### ELECTRICAL

A1	54-940	1	Power transformer	T1
A2	60-54	1	120/240 slide switch	SW2
A3	60-608	1	Low/Nor slide switch	SW3
A4	60-619	1	Rocker switch	SW1
A5	150-90	1	AC line filter	
A6	150-91	1	Disk drive	
A7	421-20	1	1/2-ampere, 3AG, slow-blow fuse	F1 (240 V.)
A7	421-23	1	1-ampere, 3AG, slow-blow fuse	F1
A8	423-11	1	Fuseholder	

### LINE CORD — WIRE

89-54	1	Line cord
340-8	6"	Bare wire
344-15	30"	Stranded black wire
344-16	30"	Stranded red wire
344-80	30"	Stranded orange wire
344-33	16"	Solid black wire

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

### HARDWARE

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 the hardware of any one (#6, for example) size.

#### #6 Hardware

B1	250-155	3	#6 × 3/8" black sheet metal screw
B2	250-381	35	6-32 × 3/8" black screw
B3	250-250	4	6-32 × 1/2" black screw
B4	250-548	3	#6 × 5/8" black sheet metal screw
B5	250-1305	4	#6 × 5/8" black hex head self-tapping screw
B6	250-206	4	6-32 × 11/16" screw
B7	252-3	8	6-32 nut
B8	254-1	6	#6 lockwasher
B9	259-1	2	#6 solder lug

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

CIRCUIT Comp. No.
-------------------

## #8 Hardware

C1	250-98	2	8-32 × 1/2" screw
C2	252-4	2	8-32 nut
C3	252-706	4	8-32 locknut
C4	253-45	4	#8 flat washer
C5	254-2	2	#8 lockwasher

## CHASSIS—CABINET PARTS

D1	92-709-1	1	Bezel
D2	200-1366-1	1	Chassis
D3	203-2015-1	1	Housing
D4	204-2267-1	1	Cable clamp
D5	204-2449	1	Drive bracket
D6	204-2455	1	AC bracket
D7	206-1337	1	AC shield
D8	215-626	1	Heat sink
D9	95-646	1	Disk box

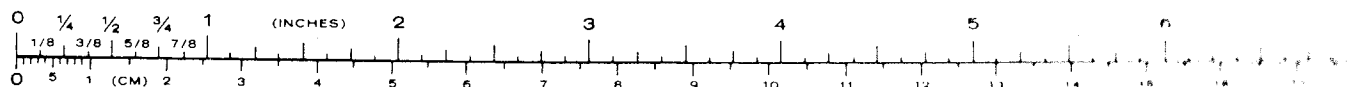
KEY No.	HEATH Part No.	QTY.	DESCRIPTION
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CIRCUIT Comp. No.
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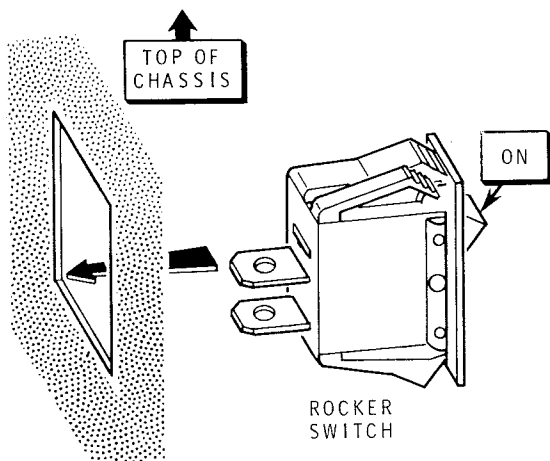
## MISCELLANEOUS

E1	73-45	1	Plastic grommet
E2	73-165	1	Rubber pad
E3	75-142	2	IC cover
E4	75-754	1	Line cord strain relief
E5	134-1087	1	Drive flat cable
E6	261-6	2	Round foot
E7	261-41	2	Square foot
E8	352-13	1	Silicone grease
E9	352-33	1	Locking compound*
E10	390-926	1	Caution label
E11	390-1696	1	Model label
E12		1	Blue and white label
E13	448-258	1	Blank diskette
E14	490-5	1	Nut starter
E15	490-112	1	Extractor tool
E16	73-151	1	Mounting tape
	490-185	1	De-soldering braid
	597-260	1	Parts Order Form
	597-1656	1	HUG form
			Solder
		1	Manual (See Page 1 for part number.)
	595-2365	1	Drive manual

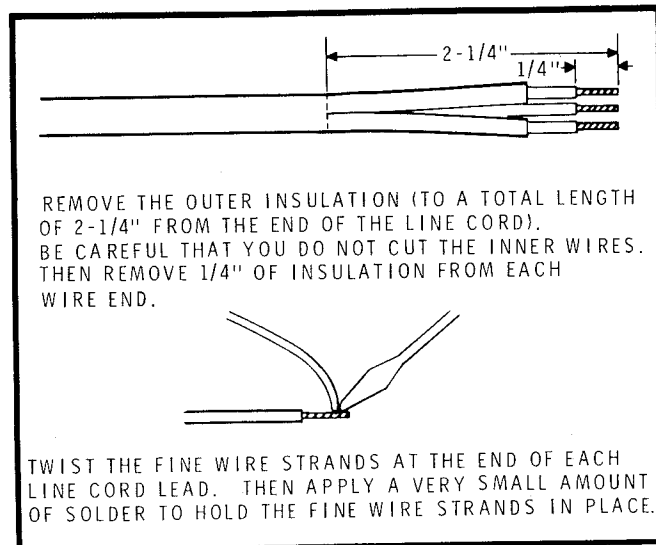
\*WARNING: This locking compound contains 1,1,1-TRICHLOROETHANE. If swallowed, induce vomiting and call a physician. Avoid contact with the skin and eyes; use with adequate ventilation. In case of eye contact, flush thoroughly with water.



## STEP-BY-STEP ASSEMBLY



Detail 1-1A



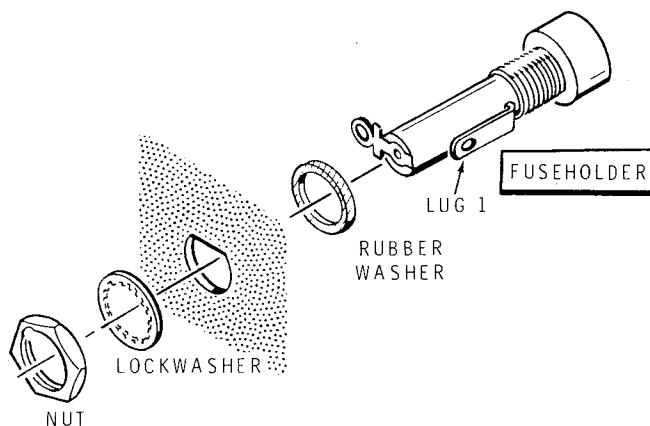
Detail 1-1C

Refer to Pictorial 1-1 (Illustration Booklet, Page 3) and position the chassis as shown.

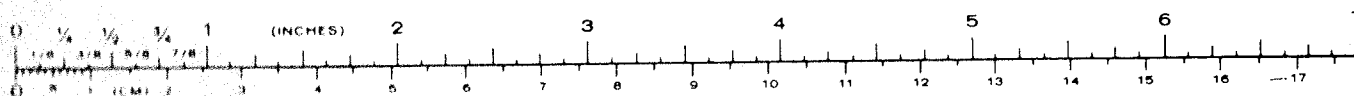
- ( ) SW1: Refer to Detail 1-1A and install the rocker switch in the rear panel at SW1. Position the ON lettering towards the top edge of the chassis.
- ( ) F1: Refer to Detail 1-1B and install the fuseholder in the rear panel at F1. Use the hardware supplied with the fuseholder, and position the lugs as shown. NOTE: Do not overtighten the fuseholder hardware, as the fuseholder may crack.

- ( ) Remove the fuseholder cap, insert the 1-ampere, 3AG, slow-blow fuse, and replace the cap. Do not overtighten it. NOTE: If you will be operating your H77 Floppy Disk on 240 VAC, use the 1/2-ampere, 3AG, slow-blow fuse that is supplied with your kit.

- ( ) Refer to Detail 1-1C and prepare the end of the line cord as shown.
- ( ) Route the prepared end of the line cord through hole A in the rear panel.

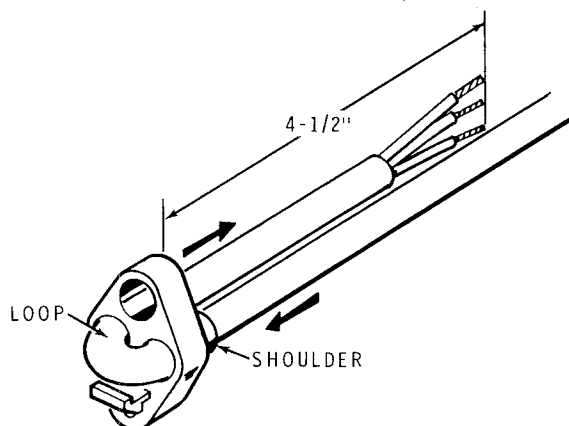


Detail 1-1B

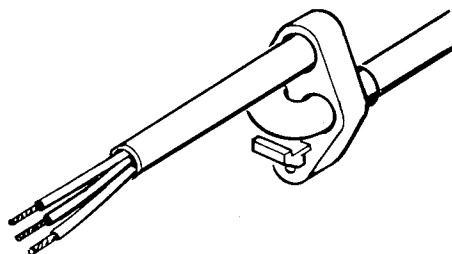


## PART A

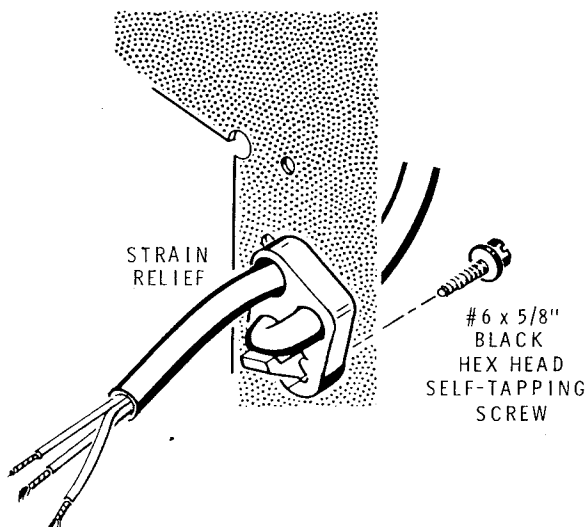
1. INSERT THE PREPARED END OF THE CABLE THROUGH THE SHOULDER ON THE STRAIN RELIEF AND BACK THROUGH THE SIDE HOLE FOR 4-1/2".



2. ROUTE THE PREPARED END OF THE CABLE BACK THROUGH THE UPPER HOLE IN THE STRAIN RELIEF AND PULL IT TIGHT.



## PART B



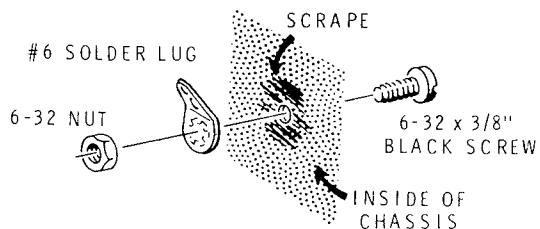
Detail 1-1D

- ( ) Refer to Detail 1-1D Part A and install the strain relief on the line cord as shown.
- ( ) Refer to Detail 1-1D Part B and mount the line cord strain relief at A with a #6 × 5/8" black hex head self-tapping screw.

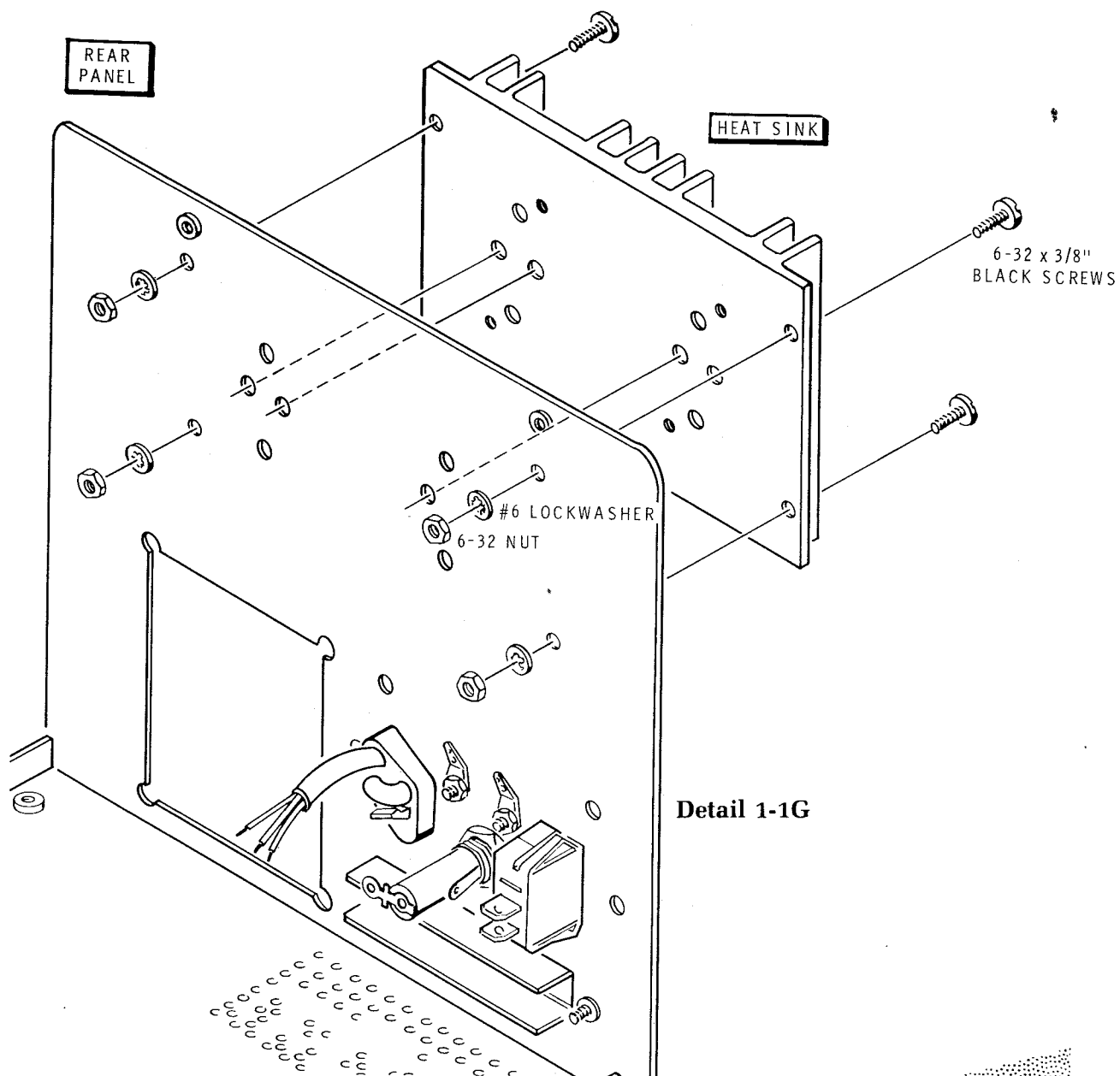
NOTE: Use the plastic nut starter to hold and start 6-32 nuts on screws.

- ( ) If necessary, scrape the paint away from around holes B and C.

- ( ) Refer to Detail 1-1E and mount a #6 solder lug at hole B with a 6-32 × 3/8" black screw and a 6-32 nut. Position the lug as shown in the Pictorial.
- ( ) In the same manner, mount a #6 solder lug at hole C and position it as shown in the Pictorial.



Detail 1-1E

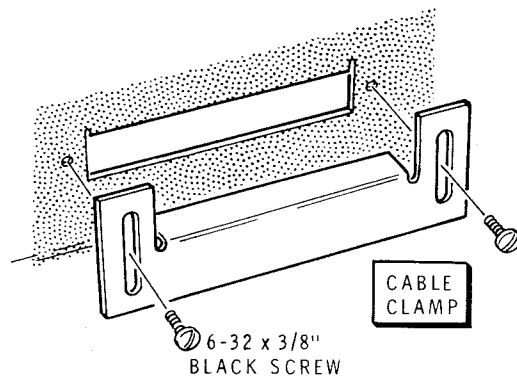


Detail 1-1G

- ( ) Refer to Detail 1-1F and install the cable clamp on the outside of the rear panel with two 6-32 x 3/8" black screws. Do not tighten the screws.

NOTE: In the next step, make sure that the eight large holes in the heat sink line up with the holes in the rear panel.

- ( ) Refer to Detail 1-1G and mount the heat sink to the back side of the rear panel with four 6-32 x 3/8" black screws, four #6 lockwashers, and four 6-32 nuts.



Detail 1-1F

- ( ) NOTE: To make a "secure mechanical connection in some of the following steps, form a hook in one end of the wire. Then wrap the wire, through the indicated lug (as shown below) and crimp it securely before you solder the connection.

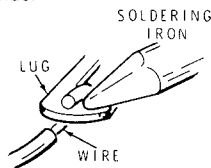
## MECHANICAL CONNECTIONS

Some steps in your Manual may instruct you to "make a secure mechanical connection." To make a secure mechanical connection:

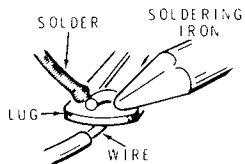
1. Wrap the wire or lead end all the way around the indicated connector.
2. Crimp the connection together firmly with pliers.
3. Solder the connection when directed to do so in a step.



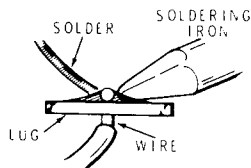
1. Push the soldering iron tip against the wire and the lug. Heat both the wire and the lug for two or three seconds.



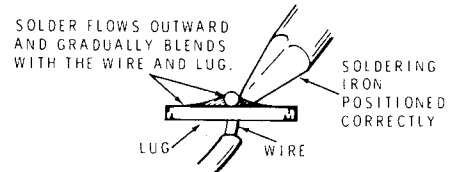
2. Apply solder to the wire and the lug, **not** to the soldering iron. IMPORTANT: Let the heat of the wire and lug melt the solder.



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.



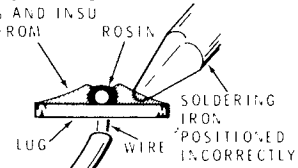
## A GOOD SOLDER CONNECTION



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.

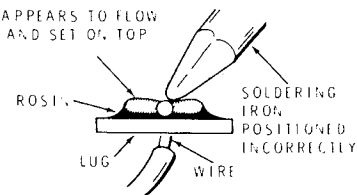
## POOR SOLDER CONNECTIONS

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

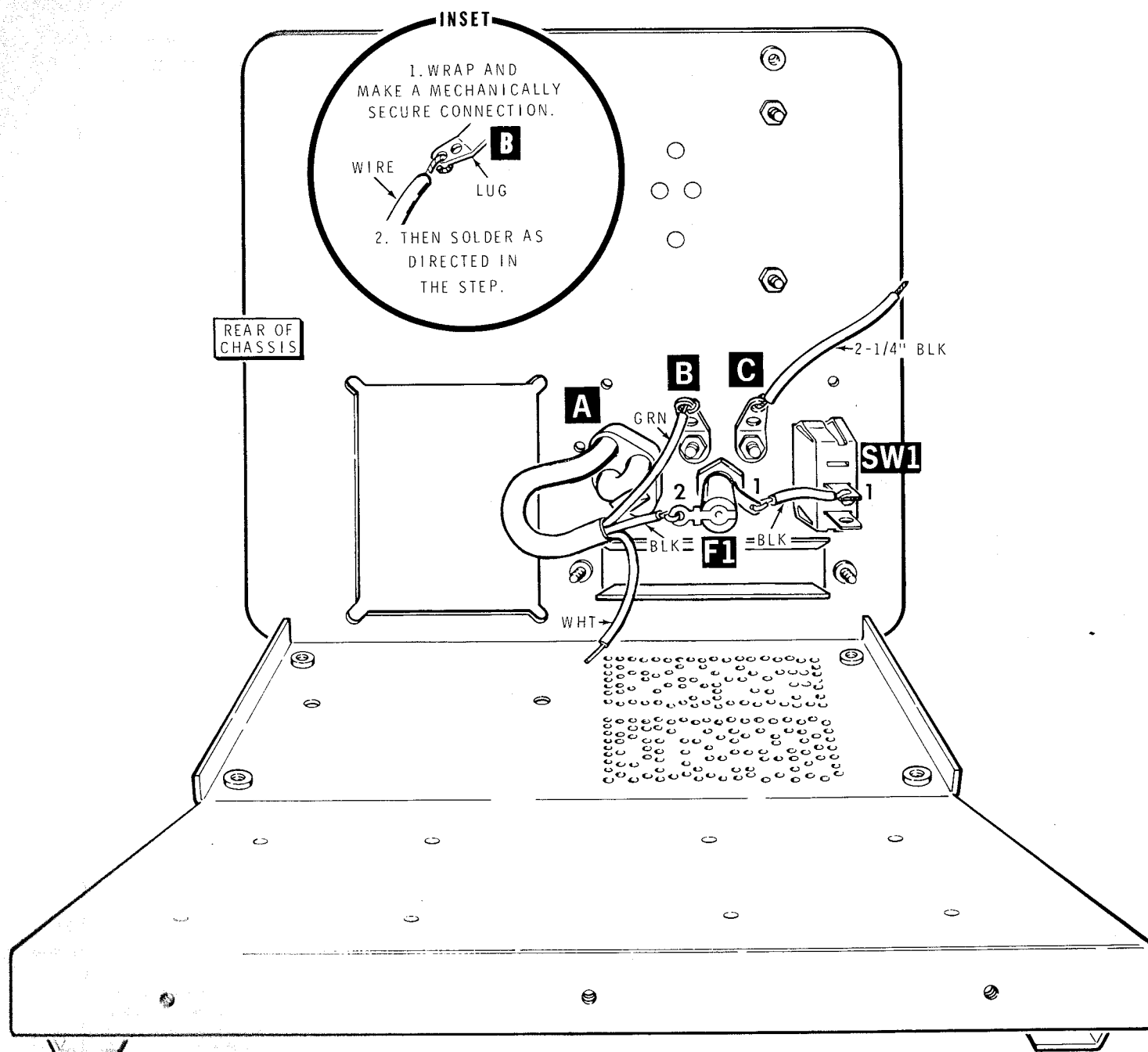


When the wire is not heated sufficiently, the solder will not flow onto the wire as shown above. To correct, reheat the connection and, if necessary, apply a small amount of additional solder to obtain a good connection.

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.



PICTORIAL 1-2

Refer to Pictorial 1-2 for the following steps.

- ( ) NOTE: In the following steps, (NS) means not to solder because other wires will be added later. "S-" with a number following it, such as (S-3), means to solder the connection. The number three tells you that there are three wires and/or leads in the connection.
- ( ) Refer to the Pictorial and connect the green line cord lead to solder lug B (S-1). Make this connection mechanically secure as shown in the inset drawing.
- ( ) Refer to Detail 1-2A and bend lug 1 of the fuseholder out slightly. Be careful that you do not apply pressure to the lug where it comes out of the fuseholder or the fuseholder could break.
- ( ) Connect the black line cord lead to fuseholder F1 lug 2 (S-1). Make this connection mechanically secure.

NOTE: When you are instructed to prepare a wire, cut it to the indicated length and remove 1/4" of insulation from each end. For stranded wire, twist the strands together and apply a small amount of solder to keep them in place.

- ( ) Prepare the following solid black wires:

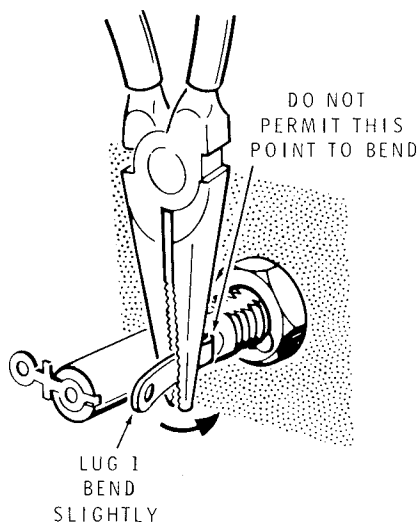
2-1/4"

1-3/4"

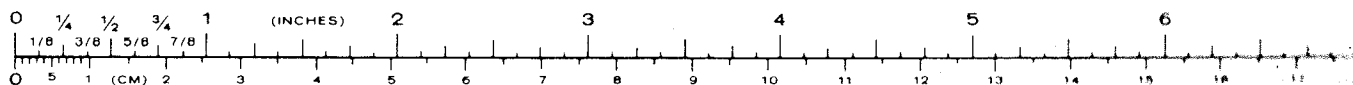
NOTE: Make mechanically secure connections in the next two steps.

- ( ) Connect one end of the 2-1/4" solid black wire to solder lug C (S-1). The other end will be connected later.
- ( ) Connect the 1-3/4" solid black wire between switch SW1 lug 1 (S-1) and fuseholder F1 lug 1 (S-1).

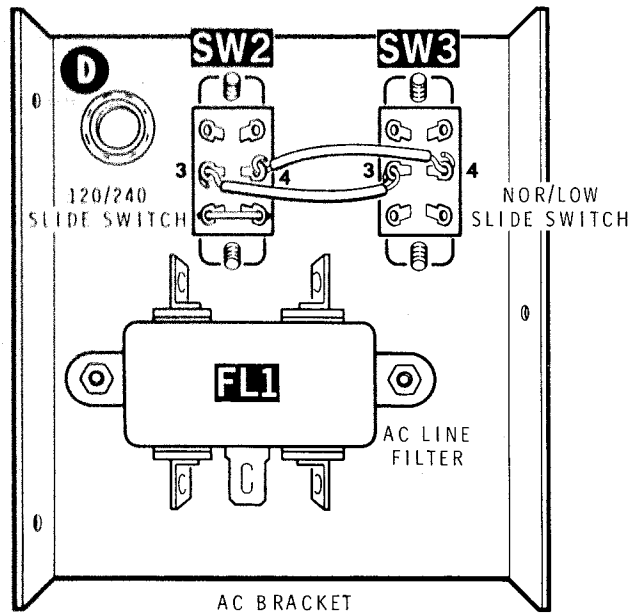
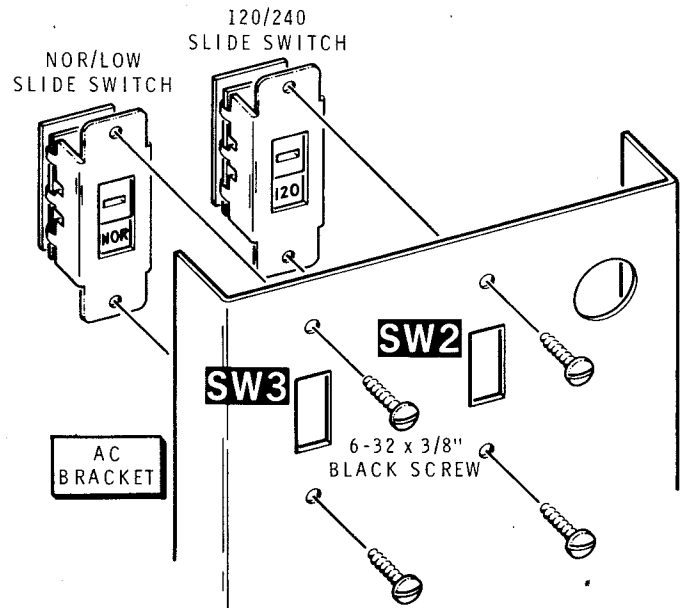
Temporarily set the chassis aside.



Detail 1-2A

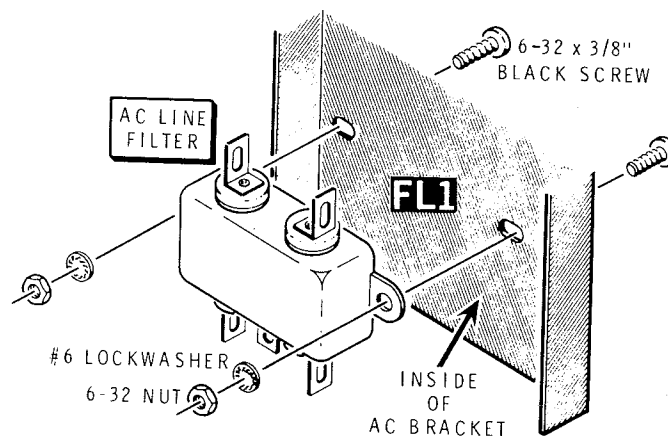


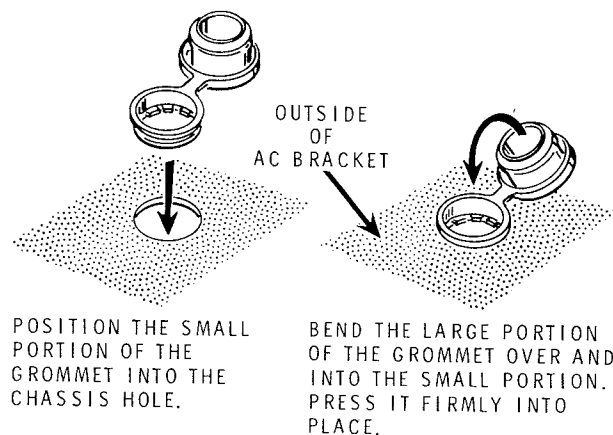


**PICTORIAL 1-3****Detail 1-3A**

Refer to Pictorial 1-3 for the following steps.

- ( ) Refer to Detail 1-3A and mount the 120/240 slide switch at SW2 on the AC bracket with two 6-32  $\times$  3/8" black screws. Position the switch as shown.
- ( ) Similarly, mount the Nor/Low (normal-low) slide switch at SW3 with two 6-32  $\times$  3/8" black screws. Position the switch as shown.
- ( ) Locate the AC line filter and scrape or sand the lugs (so you can make better connections to them later).
- ( ) Refer to Detail 1-3B and mount the AC line filter at FL1 with 6-32  $\times$  3/8" black screws two #6 lockwashers and two 6-32 nuts. Position the lugs as shown in the Pictorial.

**Detail 1-3B**



Detail 1-3C

- ( ) Refer to Detail 1-3C and install a plastic grommet at hole D.

- ( ) Prepare two 1-3/4" solid black wires.

NOTE: Make mechanically secure connections on all of the lugs on AC line filter FL1 and switches SW2 and SW3.

- ( ) Connect a 1-3/4" solid black wire from switch SW2 lug 3 (S-1) to SW3 lug 3 (S-1).
- ( ) Connect a 1-3/4" solid black wire from switch SW2 lug 4 (S-1) to SW3 lug 4 (S-1).

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

- ( ) Locate the power transformer and cut the green-yellow and both green leads to 7-1/2", as measured from the point where they leave the transformer. Remove 1/4" of insulation from the ends of these leads. Do not shorten any other leads.
- ( ) Pass the six black transformer primary leads through grommet D.

- ( ) Prepare the following lengths of solid black wire:

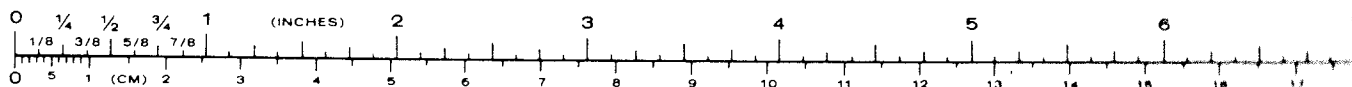
2"  
2"  
2-1/2"

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

- ( ) Connect a 2" solid black wire from switch SW2 lug 1 (NS) to AC line filter FL1 lug 3 (S-1).
- ( ) Connect the black transformer lead to switch SW2 lug 1 (S-2).
- ( ) Connect the black-red transformer lead to switch SW2 lug 2 (NS).
- ( ) Connect a 2" solid black wire from switch SW2 lug 2 (S-2) to AC line filter FL1 lug 4 (S-1).

NOTE: The black-white lead (called for in the next step) may be difficult to distinguish from the black-gray lead. Be careful.

- ( ) Connect the black-white transformer lead to switch SW3 lug 5 (S-1). NOTE: Do not use the black-gray lead by mistake.
- ( ) Connect the black-gray transformer lead to switch SW3 lug 6 (S-1).
- ( ) Connect the black-green transformer lead to switch SW3 lug 1 (S-1).
- ( ) Connect the black-yellow transformer lead to switch SW3 lug 2 (S-1).
- ( ) Connect one end of the 2-1/2" solid black wire to AC line filter lug 2 (S-1). The other end will be connected later.
- ( ) Carefully inspect the switch lugs to make sure that none of the connections touch another lug or bare wire.



Refer to Pictorial 1-5 (Illustration Booklet, Page 4) and position the chassis as shown.

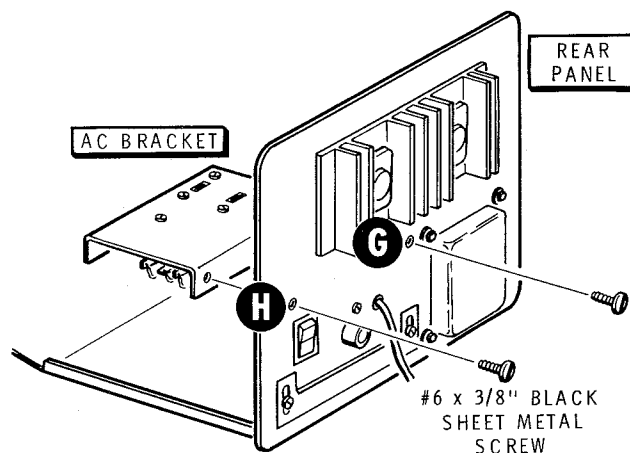
- ( ) T1: Refer to Detail 1-5A and mount the transformer to the rear panel at T1. Use four #8 flat washers and four 8-32 locknuts.
- ( ) NOTE: When hardware is called for in a step, only the screw size will be given. For instance, if 6-32  $\times$  1/4" hardware is called for, use a 6-32  $\times$  1/4" screw, one or more #6 lockwashers, and a 6-32 nut. The Pictorial or Detail will show the proper number of lockwashers.
- ( ) Mount the transformer legs to the bottom of the chassis at E and F with two sets of 8-32  $\times$  1/2" hardware as shown in Detail 1-5A.
- ( ) Refer to Detail 1-5B and mount the AC bracket at G and H with two #6  $\times$  3/8" black sheet metal screws. Route the transformer leads as shown in the Pictorial 1-5.

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

- ( ) Position the rear panel as shown in the Pictorial.

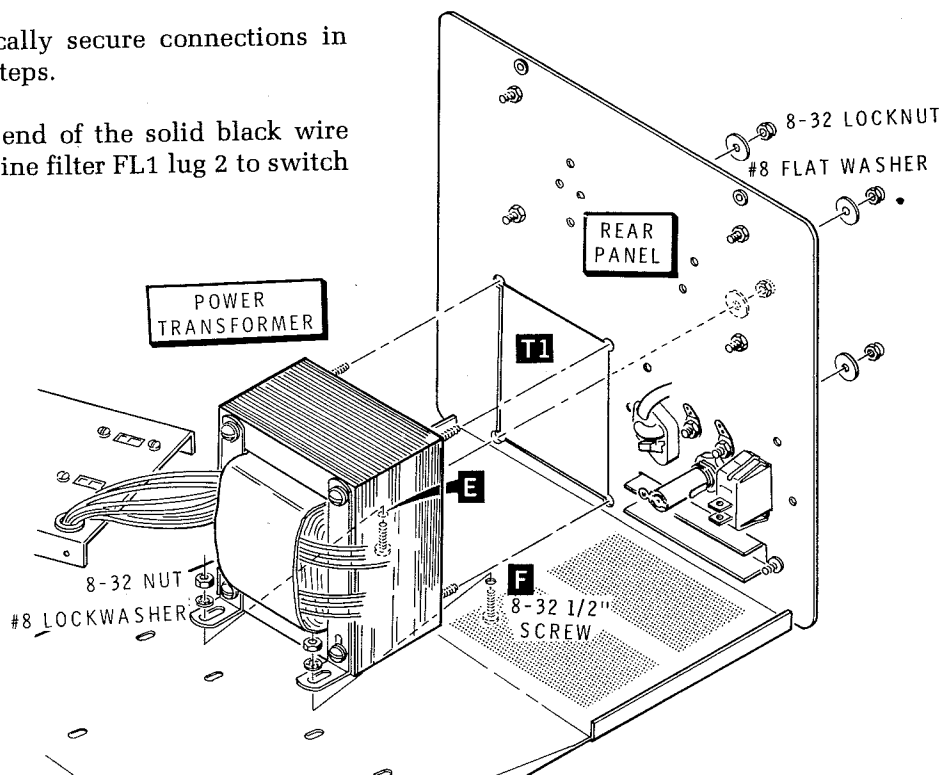
NOTE: Make mechanically secure connections in each of the next three steps.

- ( ) Connect the free end of the solid black wire coming from AC line filter FL1 lug 2 to switch SW1 lug 2 (S-1).

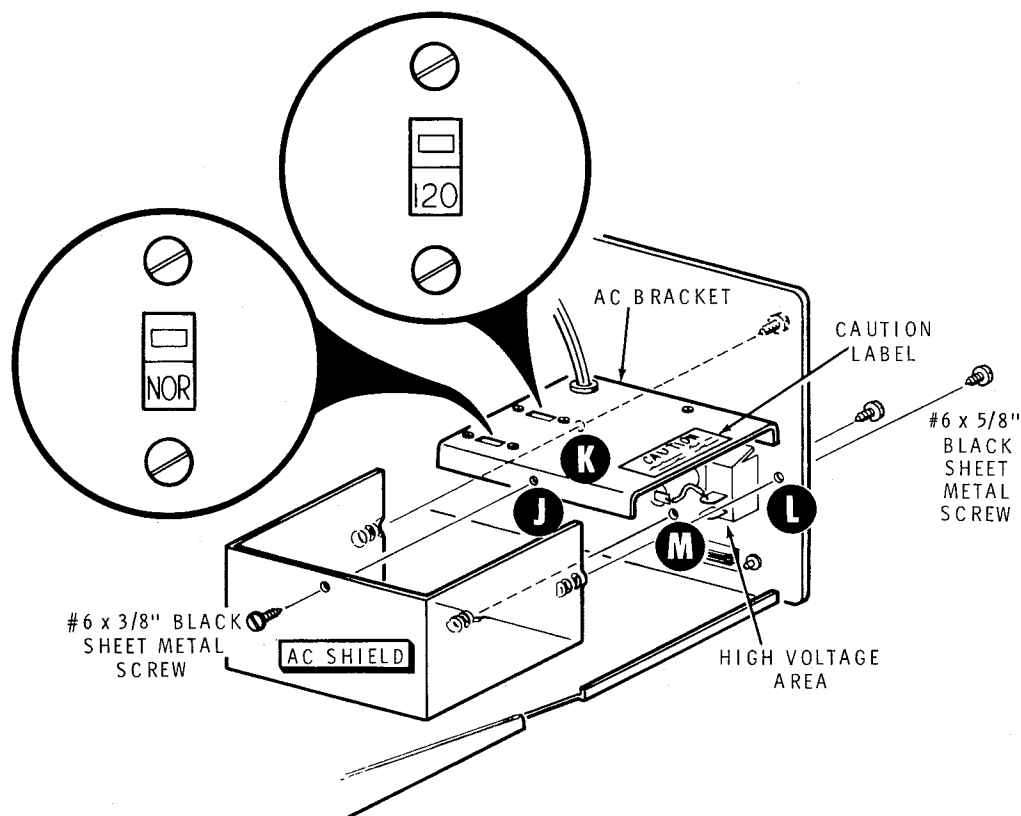


**Detail 1-5B**

- ( ) Connect the white line cord lead to AC line filter FL1 lug 1 (S-1).
- ( ) Connect the solid black wire coming from solder lug C to AC line filter FL1 lug 5 (S-1).



**Detail 1-5A**



PICTORIAL 1-7

Refer to Pictorial 1-7 for the following steps.

- ( ) Mount the AC shield over the high voltage area with a #6 × 3/8" black sheet metal screw at J and three #6 × 5/8" black sheet metal screws at K, L, and M.

NOTE: Refer to the inset drawings on Pictorial 1-7 and if the line voltage in your area is 240 volts AC, position the 120/240 switch slider so it reads 240. If the line voltage is 120 volts AC, position the switch slider so it reads 120. Position the Nor/Low switch slider so it reads Nor.

- ( ) Carefully peel away the backing paper from the Caution label and press the label on top of the AC shield as shown in the Pictorial.

Set the chassis aside and proceed to the "Power Supply Circuit Board." The remaining parts will be used later.

# POWER SUPPLY CIRCUIT BOARD

## PARTS LIST

Unpack the pack marked #2 and check each part against the following list. The key numbers correspond to the numbers on the Power Supply Circuit Board Parts Pictorial (Illustration Booklet, Page 5). Any part that is packaged in an individual envelope with a part number on it should be placed back in the envelope after it is identified until it is called for in a step.

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.
------------	-------------------	------	-------------	----------------------

### CAPACITORS

A1	25-221	3	2.2 $\mu$ F tantalum	C103, C106, C107
A1	25-276	1	4.7 $\mu$ F tantalum	C102
A2	25-870	1	100 $\mu$ F electrolytic	C104
A3	25-904	1	2200 $\mu$ F electrolytic	C101
A3	25-903	1	6800 $\mu$ F electrolytic	C105

### HARDWARE

B1	250-381	4	6-32 $\times$ 3/8" black screw
B2	254-1	4	#6 lockwasher
B3	255-142	4	Threaded spacer

### CONNECTOR—SOCKETS—TIES

C1	432-1002	8	Female connector pin (two extra)
C2	434-319	2	Connector housing
C3	434-210	2	Socket
C4	354-5	10	Small cable tie (one extra)
C4	354-7	1	Large cable tie

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

### INTEGRATED CIRCUITS (IC's)

NOTE: Integrated circuits are marked for identification in one of the following four ways:

1. Part number.
2. Type number.
3. Part number and type number.
4. Part number with a type number other than the one listed.

D1	442-650	1	78H12 12V regulator	U101
D1	442-651	1	78H05 5V regulator	U102

### MISCELLANEOUS

D2	57-42	4	3A1 diode	D101, D102, D103, D104
	85-2107-3	1	Power supply circuit board (located in PK#1.)	

## STEP-BY-STEP ASSEMBLY

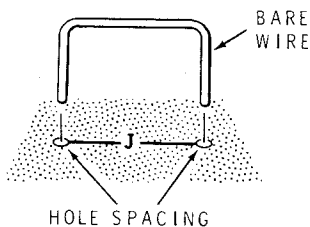
**START** ➡

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.

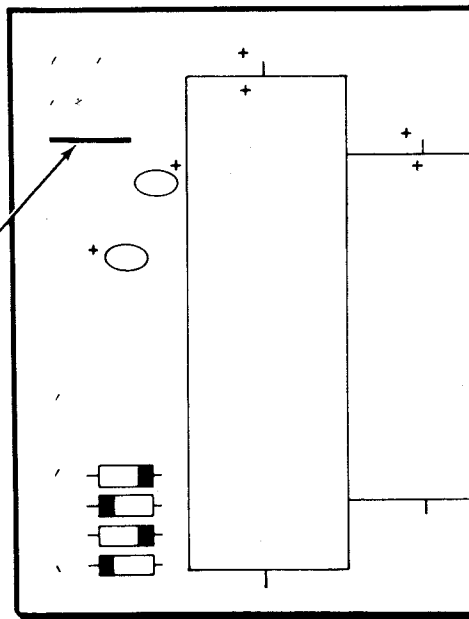
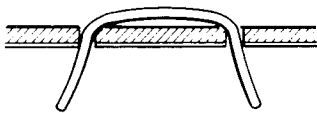
( ) Position the circuit board as shown with the printed side (not the foil side) up.

( ) Locate the bare wire and cut two 1" lengths. Use one of these wires in the next step.

( ) Form the bare wire to fit the hole spacing on the circuit board. Then install the bare wire at the indicated location.

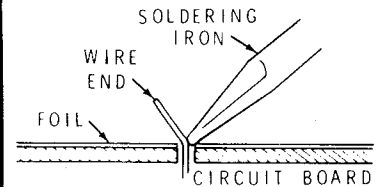


( ) Press the bare wire against the circuit board. Then bend the leads outward slightly to hold the wire in place.

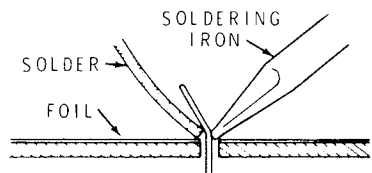
**CONTINUE** ➡

( ) Solder the wire ends to the circuit board as follows:

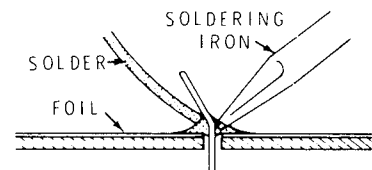
1. Push the soldering iron tip against both the wire and the circuit board foil. Heat **both** for two or three seconds.



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



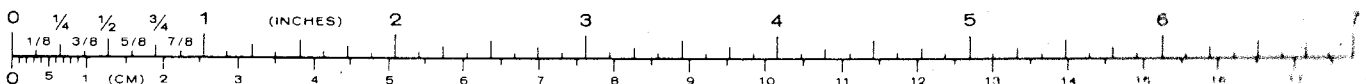
3. As the solder begins to melt, allow it to flow around the connection. Then remove the solder and the iron and let the connection cool.



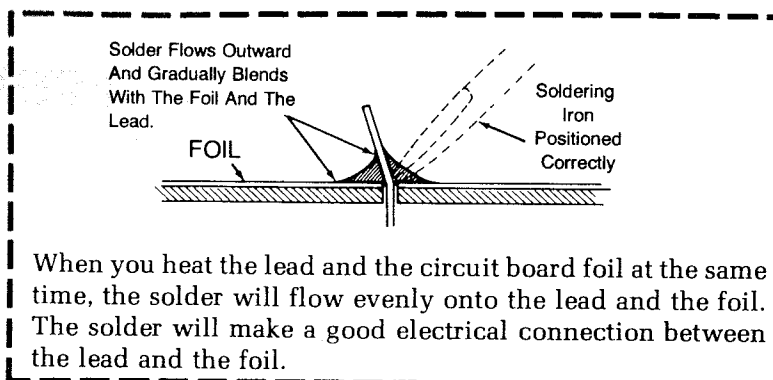
( ) Cut off the excess wire ends close to the connection. **WARNING:** Clip the wires so the ends will not fly toward your eyes.

( ) Check the connection. Compare it to the illustrations on Page 22. After you have checked the solder connections, proceed with the assembly on Page 23. Use the same soldering procedure for each connection.

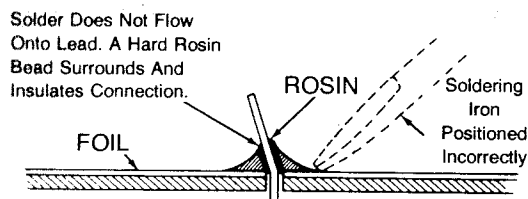
PICTORIAL 2-1



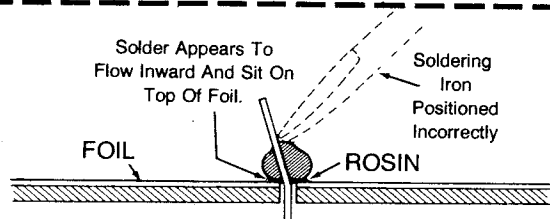
### A GOOD SOLDER CONNECTION



### POOR SOLDER CONNECTIONS



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

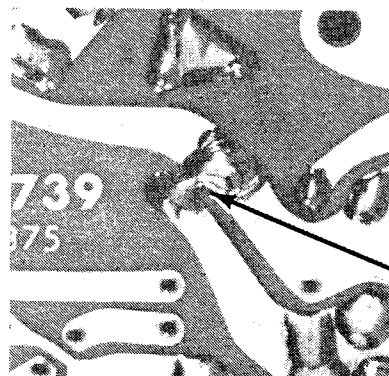


When the foil is not heated sufficiently the solder will blob on the circuit board as shown above. To correct, reheat the connection and, if necessary, apply a small amount of additional solder to obtain a good connection.

### 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.



A

**SOLDER BRIDGE**

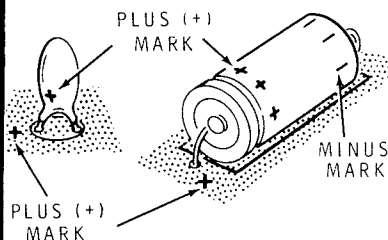
B



## START

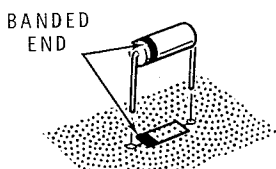
**IMPORTANT:** Make sure you installed the bare wire in Pictorial 2-1.

**NOTE:** When you install electrolytic and tantalum capacitors, be sure to **always** insert the plus (+) marked lead into the plus (+) marked hole. If the capacitor has only a minus (-) mark on it, position this **away** from the plus mark on the circuit board.

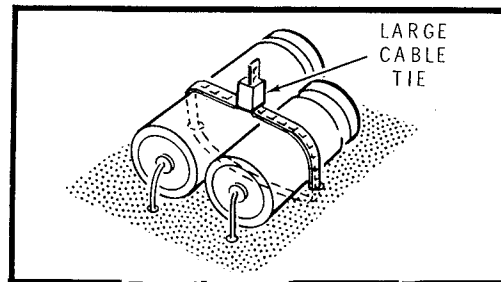


- ( ) C103: 2.2  $\mu$ F tantalum.
- ( ) C102: 4.7  $\mu$ F tantalum.
- ( ) Solder the leads to the foil and cut off the excess lead lengths.

**NOTE:** When you install the following diodes, be sure to position the banded end of the diode as shown on the circuit board.



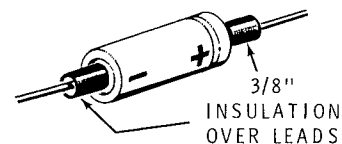
- ( ) D101: 3A1 diode (#57-42).
- ( ) D102: 3A1 diode (#57-42).
- ( ) D103: 3A1 diode (#57-42).
- ( ) D104: 3A1 diode (#57-42).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.



Detail 2-2A

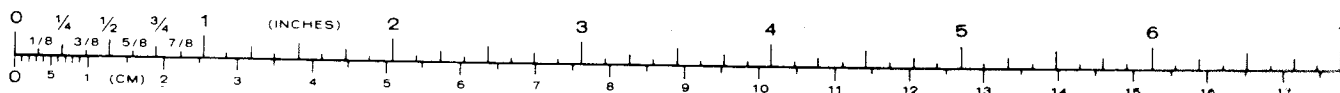
## CONTINUE

- ( ) 1" bare wire.
- ( ) C106: 2.2  $\mu$ F tantalum.
- ( ) C107: 2.2  $\mu$ F tantalum.
- ( ) Locate the two black stranded wire and remove two 3/8" pieces of insulation from one end.
- ( ) Slide the 3/8" black insulation over both leads of the 100  $\mu$ F electrolytic capacitor as shown; then mount the prepared capacitor above the board in the next step.

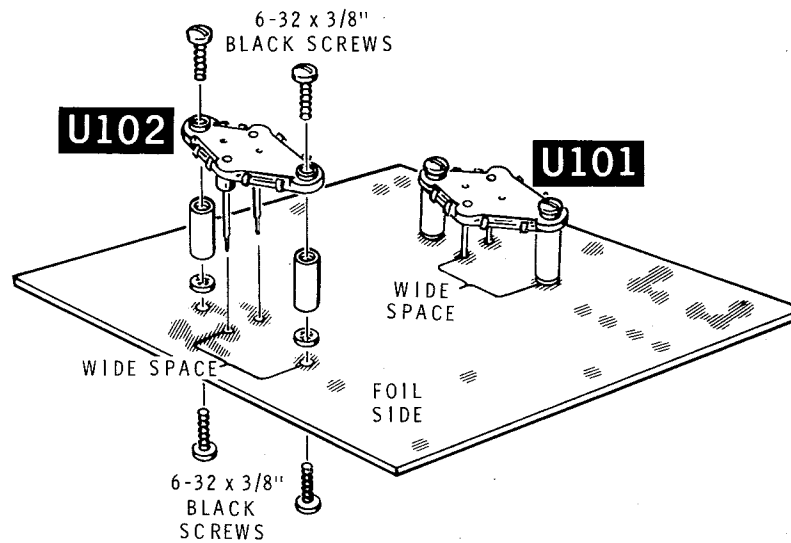


- ( ) C104: 100  $\mu$ F electrolytic.
- ( ) C105: 6800  $\mu$ F electrolytic.
- ( ) C101: 2200  $\mu$ F electrolytic.
- ( ) Solder the leads to the foil and cut off the excess lead lengths.
- ( ) Route a large cable tie through the holes in the circuit board and around the two large electrolytic capacitors. Refer to Detail 2-2A on this Page. Pull the tie tight and cut off the excess.

PICTORIAL 2-2





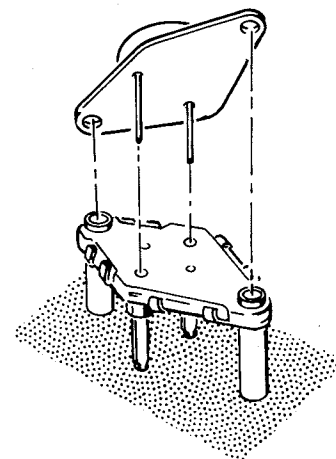


PICTORIAL 2-3

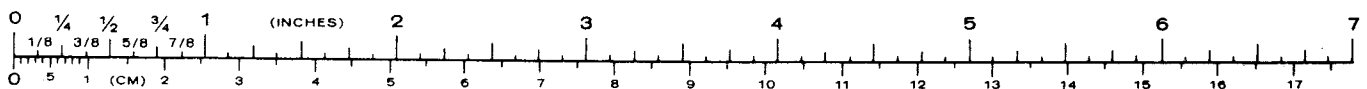
Refer to Pictorial 2-3 for the following steps.

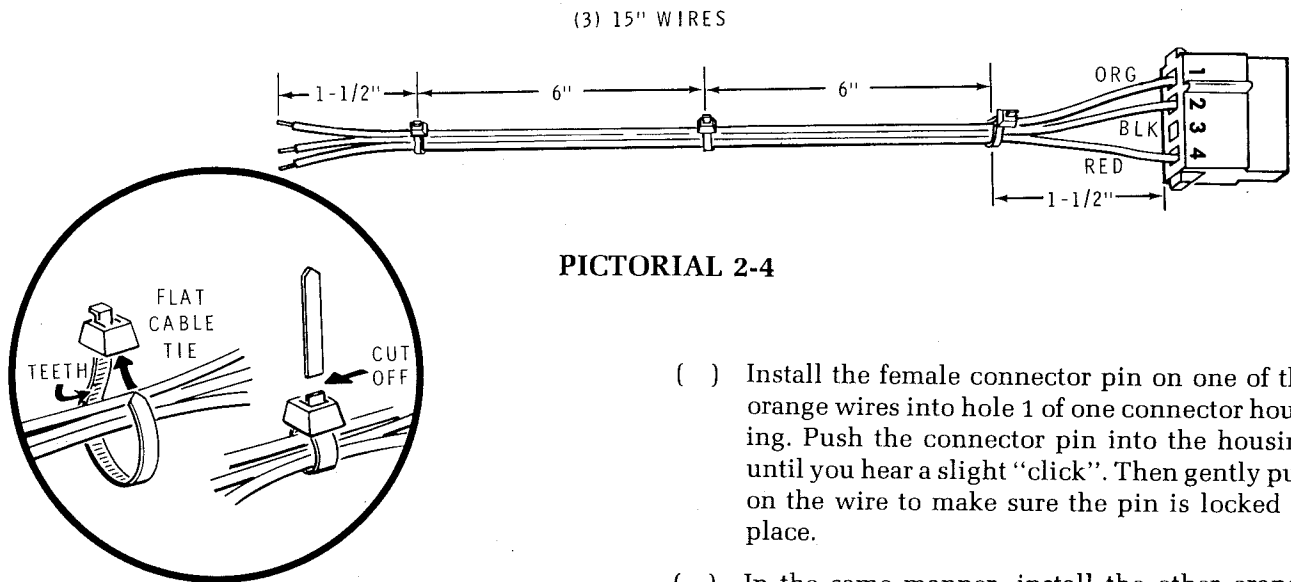
- ( ) Install two threaded spacers on the foil side of the circuit board at U101 as shown in the Pictorial. Use two 6-32  $\times$  3/8" black screws and two #6 lockwashers.
- ( ) Place a socket on the spacers with the socket lugs inserted into the holes in the circuit board. Note that the socket lugs and the holes in the circuit board are off-center to one end. Be sure to position the socket so that the lugs are directly over the holes.
- ( ) Mount the socket to the spacers with two 6-32  $\times$  3/8" black screws. Finger tighten only.
- ( ) Solder the socket lugs to the foil. Then remove the two black screws and use them in the next step.
- ( ) In the same manner, install a socket a U102 as shown in the Pictorial. Then remove the two black screws and set them aside temporarily.

- ( ) Refer to Detail 2-3A and temporarily install the integrated circuits (IC's) in the sockets. IC 78H05 (#442-651) in socket U102 and IC 78H12 (#442-650) in socket U101. Note that if the IC's are installed backward in their sockets, the mounting holes will not line up. Do not install any hardware in the sockets at this time.



Detail 2-3A

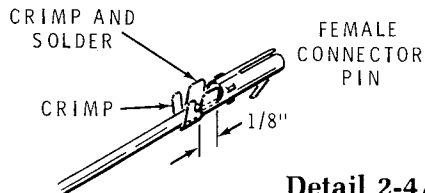




PICTORIAL 2-4

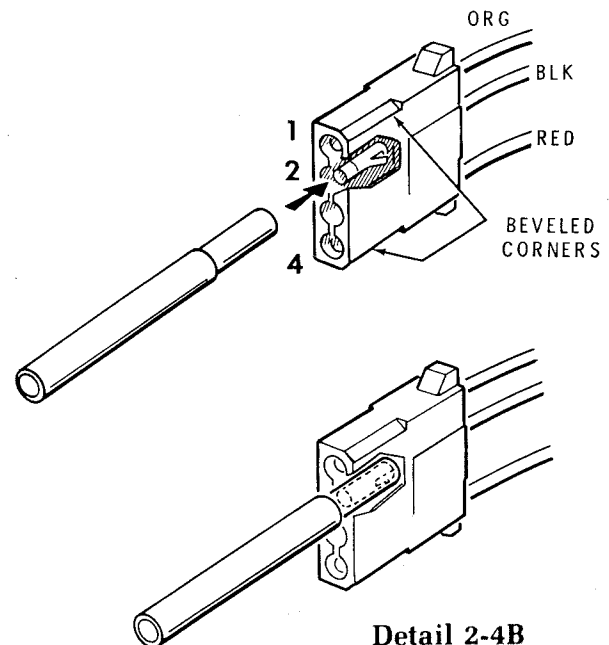
Refer to Pictorial 2-4 for the following steps.

- ( ) Cut the stranded orange, black, and red wires into two 15" lengths (each), so that you have two sets of wires.
- ( ) Remove 1/8" of insulation from one end of each wire and 1/4" of insulation from the other end. Then twist the fine wire strands and apply a small amount of solder to each bare wire end.
- ( ) Locate two 4-hole connector housings and six female connector pins. Use these in the following steps.
- ( ) Refer to Detail 2-4A and crimp and solder a female connector pin onto the 1/8" end of each wire.
- ( ) Install the female connector pin on one of the orange wires into hole 1 of one connector housing. Push the connector pin into the housing until you hear a slight "click". Then gently pull on the wire to make sure the pin is locked in place.
- ( ) In the same manner, install the other orange wire in hole 1 of the other connector housing.
- ( ) In the same manner, install the black wires into hole 2 in each connector housing and the red wires into holes 4. **Hole 3** in each housing will **not** be used.
- ( ) Group the three wires from each connector housing together and install cable ties at intervals of approximately every 6". Install three cable ties on each group of three wires. See the inset drawing on Pictorial 2-4. Cut off the excess cable tie lengths.

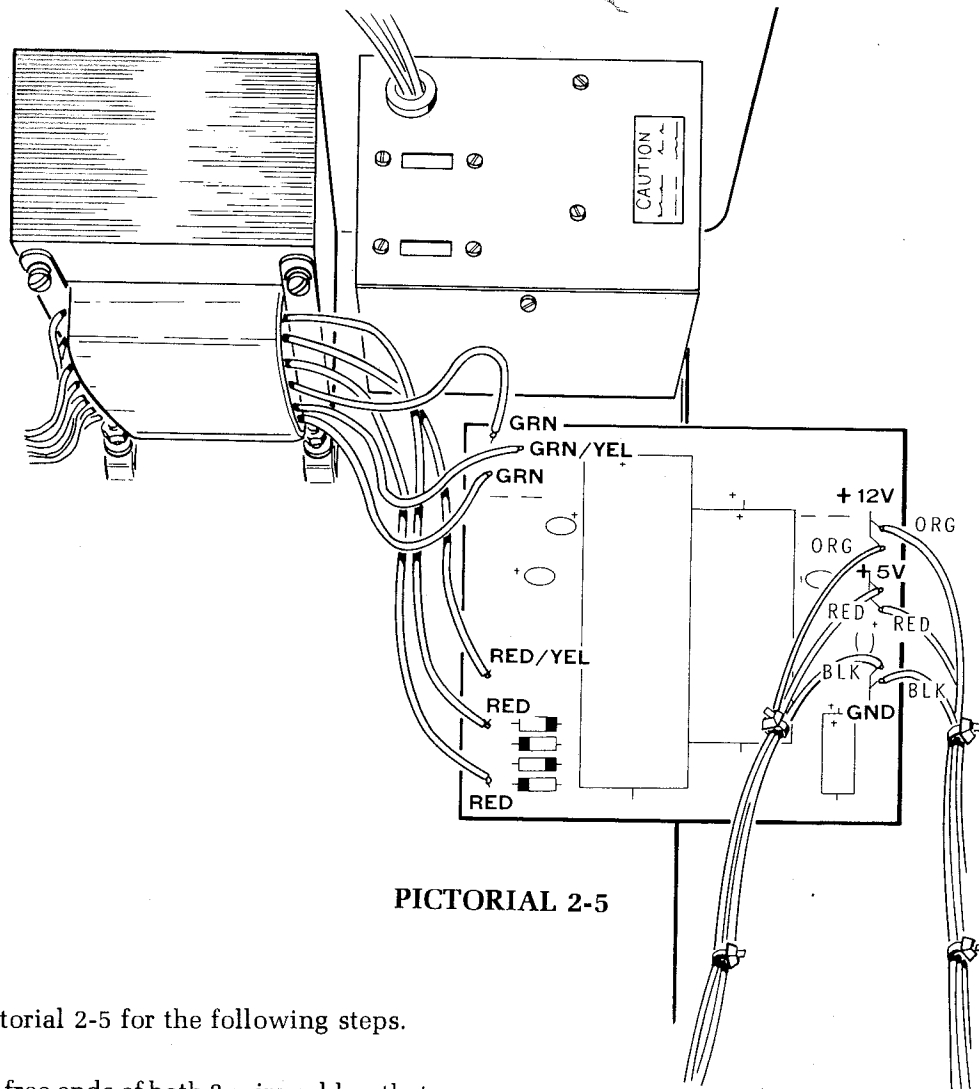


Detail 2-4A

NOTE: An extractor tool has been supplied for the removal of a connector pin if it should ever become necessary. (See Detail 2-4B). Insert the extractor tool into the connector housing to depress the locking tab on the pin and pull on the wire.



Detail 2-4B



PICTORIAL 2-5

Refer to Pictorial 2-5 for the following steps.

Connect the free ends of both 3-wire cables, that were just prepared, to the power supply circuit board as follows. Solder each wire to the foil and cut off the excess wire end.

( ) Both orange wires to the holes marked +12V.

( ) Both red wires to the holes marked +5V.

( ) Both black wires to the holes marked GND.

Place the power supply circuit board into the chassis as shown and connect the following power transformer leads. Solder each lead to the foil and cut off the excess lead end.

( ) Connect either red transformer lead to the either hole marked RED.

( ) Connect the other red transformer lead to the other hole marked RED.

( ) Connect the red-yellow transformer lead to the hole marked RED/YEL.

( ) Connect either green transformer lead to either hole marked GRN.

( ) Connect the other green transformer lead to the other hole marked GRN.

( ) Connect the green-yellow transformer lead to the hole marked GRN/YEL.

# Heathkit®

Refer to Pictorial 2-6 (Illustration Booklet, Page 6) for the following steps.

- ( ) Remove IC U101 and U102 from their sockets.
- ( ) Refer to the inset drawing on Pictorial 2-6 and open the silicone grease container. Then coat the flat side of each IC with grease. Discard the remaining silicone grease.
- ( ) Route the black transformer leads against the rear of the chassis. They should be between the chassis and the circuit board after you complete the next two steps.
- ( ) U101, U102: Position the sockets (on the power supply circuit board) against the rear panel. Then reinstall IC 78H05 (#442-651) at U102 and IC 78H12 (#442-650) at U101.
- ( ) Make sure the ridges in the sockets are seated in the holes in the rear panel. Then secure the IC's and sockets to the rear panel with four 6-32  $\times$  11/16" screws.
- ( ) Install the IC covers over the IC's with two 6-32  $\times$  1/2" black screws in each cover.
- ( ) Refer to Pictorial 2-7 (Illustration Booklet, Page 8) and install three cable ties on the transformer leads as shown.

## POWER SUPPLY CHECKOUT

NOTE: The check out procedure that follows is designed to help protect your investment by making sure that your unit is properly wired and will not be damaged when power is applied. These resistance measurements are very important. If you do not have or cannot obtain an ohmmeter to use, proceed to "Installation and Testing."

If you do not obtain the correct meter indication in any step, refer to the following "Possible Area of Trouble" chart and also the "In Case of Difficulty" section of this Manual. Correct a problem before you proceed to the next step.

### PRIMARY WIRING TESTS

- ( ) Set your ohmmeter range switch to  $R \times 10$ .

Refer to Pictorial 2-7 (Illustration Booklet, Page 6) for the following steps.

- ( ) Connect the negative ohmmeter lead to the chassis.
- ( ) Set the AC POWER switch on the rear panel to OFF.
- ( ) Connect the positive ohmmeter lead to first one and then the other flat prong of the line cord plug. The ohmmeter should indicate INFINITE.

- ( ) Connect the positive meter lead to the round prong on the line cord plug. The meter should indicate zero resistance.
- ( ) Connect the negative ohmmeter lead to one flat prong on the line cord plug and the positive ohmmeter lead to the other flat prong. The ohmmeter should indicate INFINITE.
- ( ) Set the ohmmeter to  $R \times 1$ .
- ( ) With the ohmmeter leads still connected to the line cord plug prongs, set the AC POWER switch to the ON position. The ohmmeter should indicate approximately from 2 to 7 ohms.
- ( ) Disconnect the ohmmeter leads and place the AC POWER switch in the OFF position.

### POSSIBLE AREA OF TROUBLE

1. Fuseholder (fuse not installed).
2. Wiring on the NOR/LOW and 120/240 switches.
3. AC POWER switch (wrong wires connected to switch lugs).
4. Ohmmeter is connected to round plug prong in place of flat prong.

**VOLTAGE TESTS**

- ( ) Set your meter to allow a 15 VDC reading.
- ( ) Connect the negative meter lead to the negative (-) marked lead of the 2200  $\mu$ F electrolytic capacitor. (Refer to the inset drawing on Pictorial 2-7.)
- ( ) Make sure that the NOR/LOW switch is in the NOR (normal) position. Do not use the LOW setting of this switch unless you experience operating difficulties due to low AC line voltage.
- ( ) Connect the line cord to the AC outlet and set the AC POWER switch to ON.
- ( ) Touch the meter probe to pin 1 (orange wire) inside either power harness plug. The meter should read 12 volts  $\pm$  .5 V.
- ( ) Touch the meter probe to pin 4 (red wire) inside either power harness plug. The meter should read 5 volts  $\pm$  .25V.
- ( ) Push the AC POWER switch to OFF and disconnect the line cord plug.
- ( ) Disconnect the meter leads.

This completes the "Power Supply Checkout".

**POSSIBLE AREA OF TROUBLE****Cannot Obtain Any Voltages**

1. Wiring error inside the AC shield.
2. Power transformer incorrectly wired. (Check wiring on power supply circuit board.)
3. Fuse open.
4. Power transformer faulty.

**Cannot Obtain +5 Volts**

1. Diodes D101, D102, D103, or D104 may be incorrectly installed or faulty.
2. IC U102 may be incorrectly installed or faulty.
3. Capacitors C105, C106, or C107 may be incorrectly installed or faulty.

**Cannot Obtain +12 Volts**

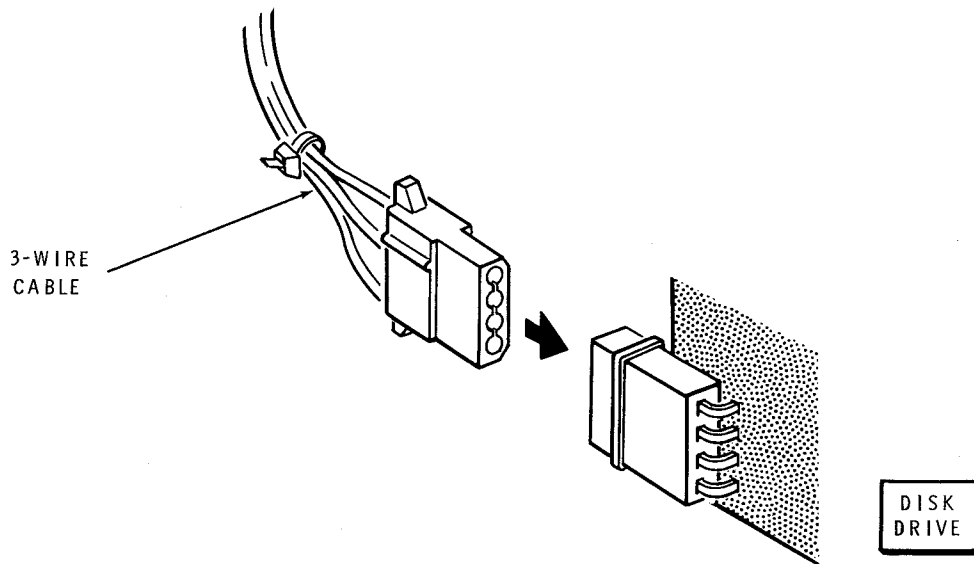
1. Diodes D101, D102, D103, or D104 may be incorrectly installed or faulty.
2. IC U101 may be incorrectly installed or faulty.
3. Capacitor C101, C102, C103, or C104 may be incorrectly installed or faulty.

## INSTALLATION AND TESTING

If not already done, refer to the "Modification Instructions for the H89/H77," and complete the steps in that booklet before you continue with the following steps.

NOTE: You received one disk drive unit with your H89 Computer. If you purchased two disk drive units for your H77 Floppy Disk, you will have three disk drives; thus, the "third" drive indicated in the following steps.

- ( ) Unpack both disk drives (unpack one if you did not purchase the third drive).
  - ( ) Unplug your Computer.
  - ( ) Remove the cabinet shell from your Computer as follows:
    - Unlatch the two side latch plates.
    - Tilt back the cabinet shell.
    - Unplug the fan.
    - Remove the cabinet shell.
- Refer to Pictorial 2-8 (Illustration Booklet, Page 7) for the following steps.
- ( ) Remove the four indicated screws and lockwasher.
  - ( ) Slide the disk drive unit forward far enough to unplug the flat cable. Then unplug the flat cable and slide the drive back into place.
  - ( ) Loosely reinstall the screws to temporarily hold the drive and metal parts in place.



Detail 2-9A

Refer to Pictorial 2-9 (Illustration Booklet, Page 8) for the following steps.

- ( ) Locate the floppy drive flat cable (#134-1087).

NOTE: The flat cable is marked with a contrasting stripe along one side. This is the pin 1 side of the cable.

- ( ) The flat cable has three plugs: two plugs near one end and a single plug at the other end. Route this single-plug end of the cable out through the cable clamp in the rear of the chassis. Position the cable so the striped side is toward the side of the chassis shown in the Pictorial.

- ( ) Plug the single-plug end of the flat cable into your computer as shown in Pictorial 2-10. Be **sure** to note and match the key or striped side of the cables.

- ( ) Position a disk drive as shown in Pictorial 2-9 and plug a 3-wire cable into it. (It will only go in one way as shown in Detail 2-9A).

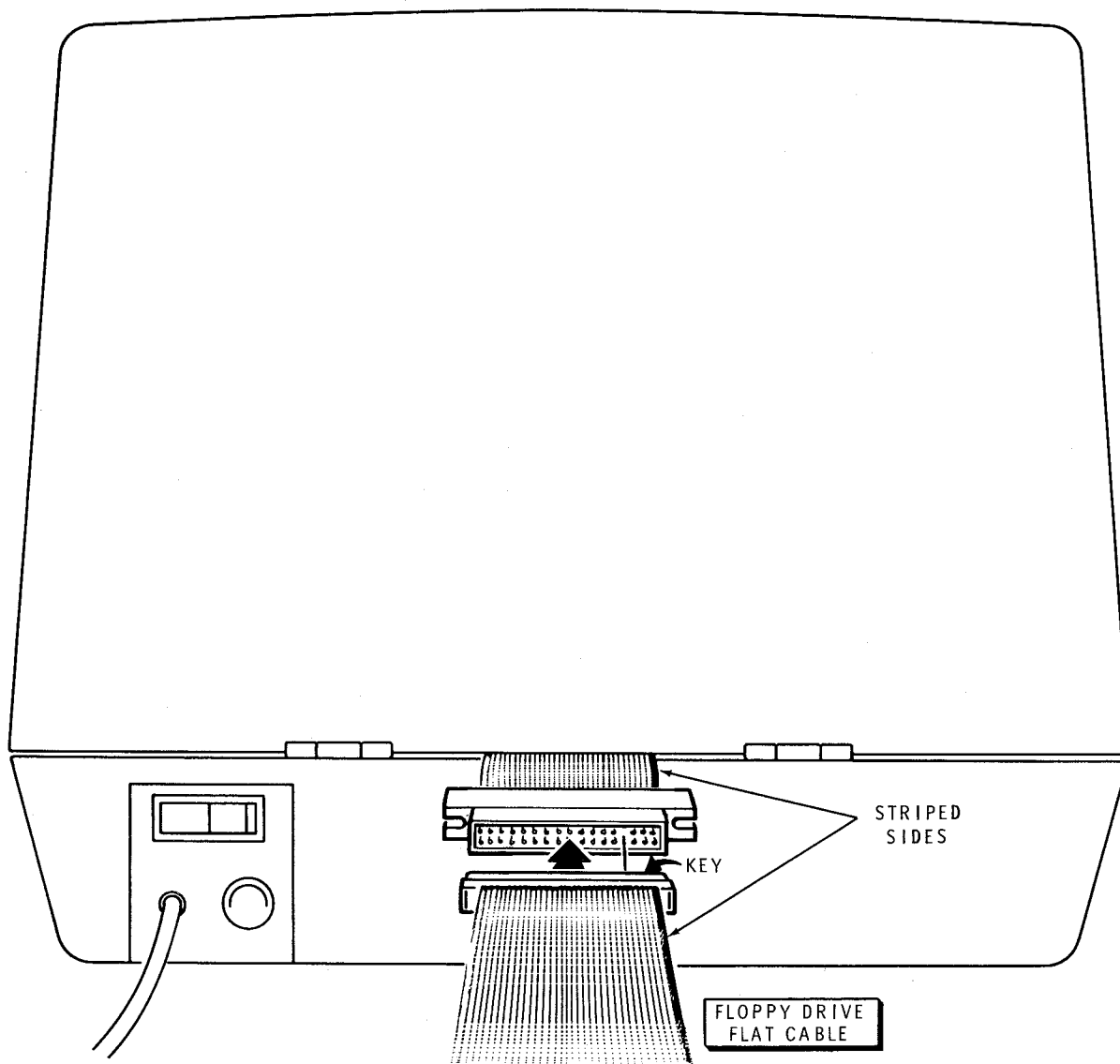
- ( ) Plug the flat cable into the drive as shown. Be sure the striped edge of the flat cable is up. See the inset drawing.

- ( ) Plug in and turn on the Computer and Floppy Disk.

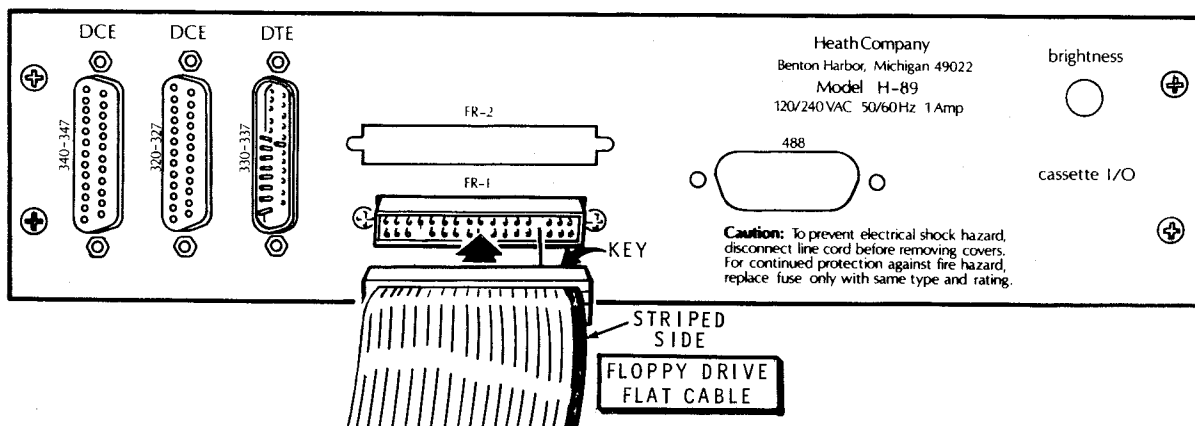
### CAUTION

DO NOT OPERATE YOUR H89 COMPUTER UNLESS THE H77 FLOPPY DISK IS TURNED ON. TO DO SO MAY ERASE THE INFORMATION ON THE MAIN DISK SECTOR THAT IS UNDER THE HEAD AT THE TIME.

# Heathkit®



OR



PICTORIAL 2-10



## ROTATIONAL SPEED TEST

This test will check the rotational speed of the floppy disk drive. After the test starts, it will display the disk drive speed test message and a "speed equals" message as follows:

Disk drive rotational speed test

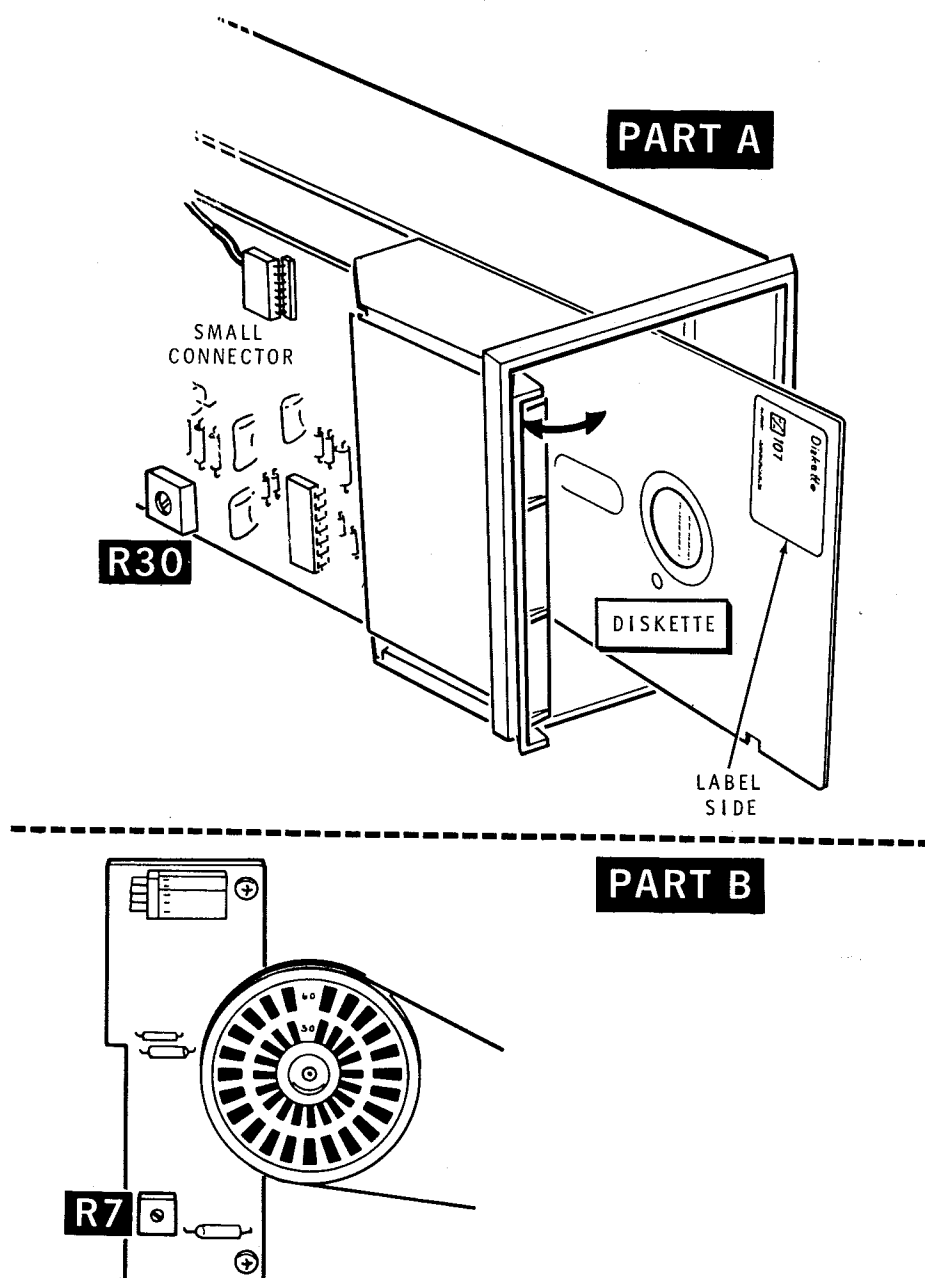
Drive speed =

The word "Working" will be flashed on and off at the home position and a drive speed number (in octal), which should be as close to 200 as possible, will update with each flash on the screen. The rotational speed tolerance is one percent. The displayed value should be between 166 and 212 (remember, octal numbers jump from 177 to 200). Do not adjust the speed unless it is out of tolerance.

Your drive unit has a control labeled R30 or R7 which is used to vary the drive speed. This control is located near the lower edge of the circuit board as shown in Part A of Pictorial 2-11, or on the other side of the drive if your drive is like the one shown in Part B of Pictorial 2-11. This adjustment may be extremely sensitive so if an adjustment is necessary; do not turn it far in either direction. Less than one degree of rotation in either direction should bring the drive speed into tolerance. Turn the control clockwise to decrease the speed or counterclockwise to increase it.

You may have to perform this test again at some future time, depending upon how heavily your floppy is used. As the drive bearings wear, the speed may change slightly. Fluctuations within the tolerance are normal and may be attributed to variations in temperature and humidity.

- ( ) Refer to Pictorial 4-1 (Page 41), install a diskette into the drive as shown, and close the door. The test will not start until this is done. Also, the test will **not** damage the data on the diskette.
- ( ) Be sure the OFF LINE key is up (out). Then obtain the "H:" prompt. (Simultaneously push the right-hand SHIFT and RESET keys if necessary.)
- ( ) Type G7372Ⓢ. The total entry will be:  
H: Go 7372 Ⓢ  
and the test will start.
- ( ) If the drive speed is less than 166 or greater than 212, carefully adjust R30 or R7 with a small screwdriver until the speed is within tolerance and as close to 200 as possible.
- ( ) Simultaneously push the right-hand SHIFT and RESET keys to stop the test.
- ( ) Remove the diskette from the drive unit.
- ( ) If you have another untested drive (the third drive), install and test its rotational speed as before.
- ( ) Be sure the diskette is removed from the drive unit. Then turn off the Computer and unplug the line cord.
- ( ) Unplug the Floppy Disk system and the disk drive unit.
- ( ) Refer to Pictorial 2-8 (Illustration Booklet, Page 7) and reconnect the flat cable to the disk drive unit inside your computer. Then reinstall the drive with the hardware you removed earlier.
- ( ) Replace the cabinet shell. Be sure to reconnect the fan.



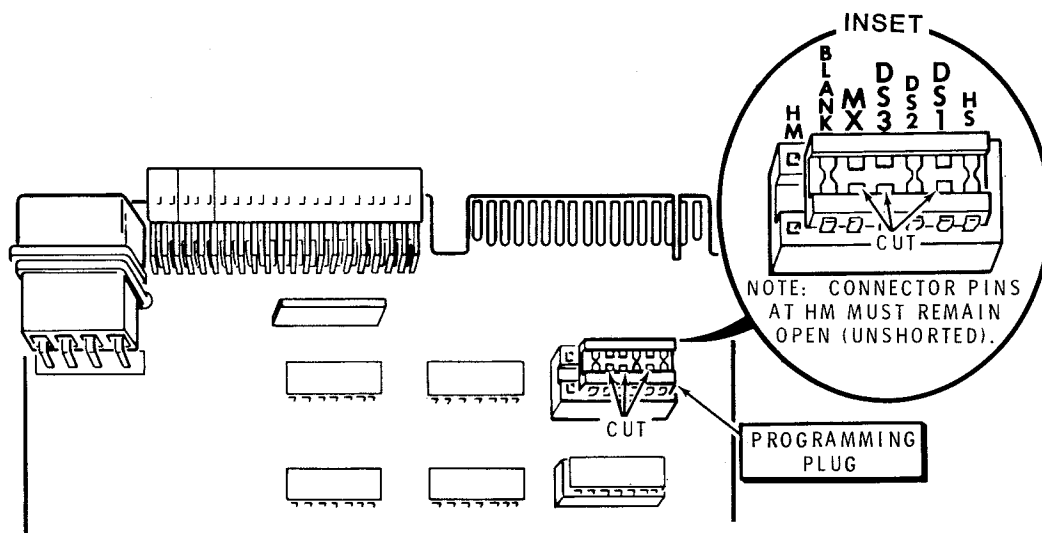
PICTORIAL 2-11

## SY1: PROGRAMMING

Refer to Pictorial 2-12 for the following steps.

- ( ) Use a piece of masking tape to mark this drive (either one, if you have two drives for the H77) as SY1:.
- ( ) Set the disk drive marked SY1: on your work surface with the circuit board facing up.
- ( ) Use a knife or other suitable tool and cut strips DS1, DS3, and MX of the programming plug. NOTE: You may bend the pins upward if you do not wish to cut them.
- ( ) Temporarily set this disk drive aside.

If you did not purchase the second drive, for your H77, disregard the references to SY2:.

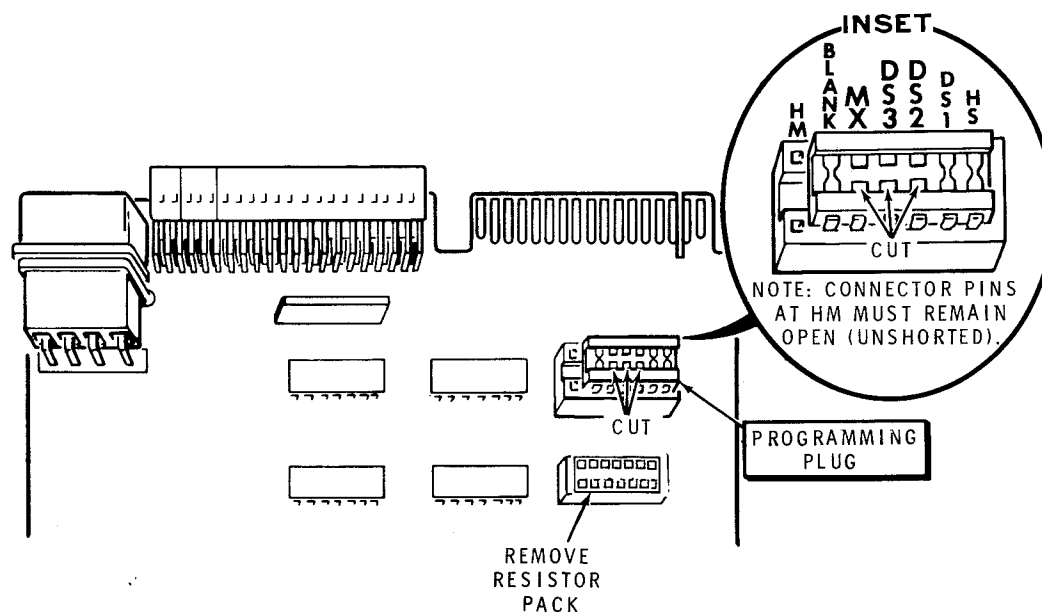


PICTORIAL 2-12

## SY2: PROGRAMMING

Refer to Pictorial 2-13 for the following steps.

- ( ) Use a piece of masking tape to mark this drive as SY2:.
- ( ) Set the disk drive marked SY2: on your work surface with the circuit board facing up.
- ( ) Use a knife or other suitable tool and cut strips DS2, DS3, and MX of the programming plug.
- ( ) Remove the resistor pack from this drive.  
NOTE: Only the **last** disk drive **on the cable** (SY1:) should have a resistor pack installed.
- ( ) Temporarily set this disk drive aside.



PICTORIAL 2-13

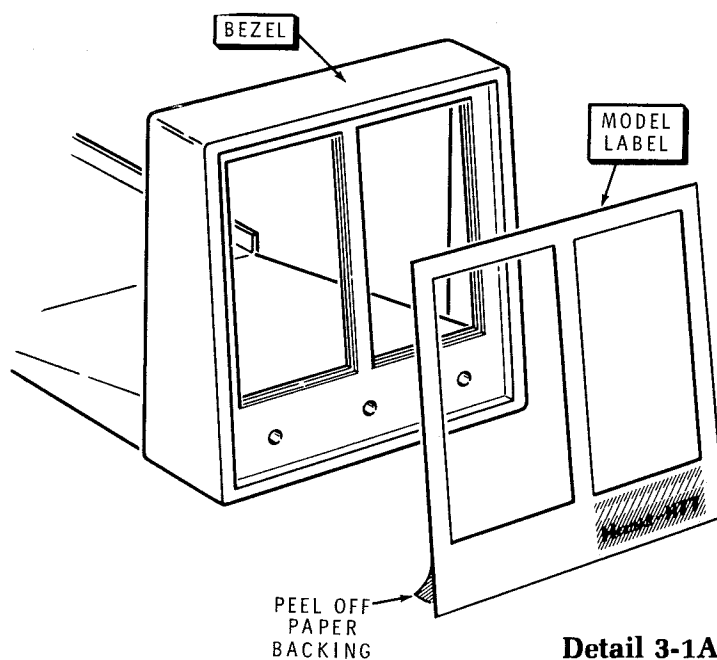
## FINAL ASSEMBLY

Refer to Pictorial 3-1 (Illustration Booklet, Page 9) for the following steps.

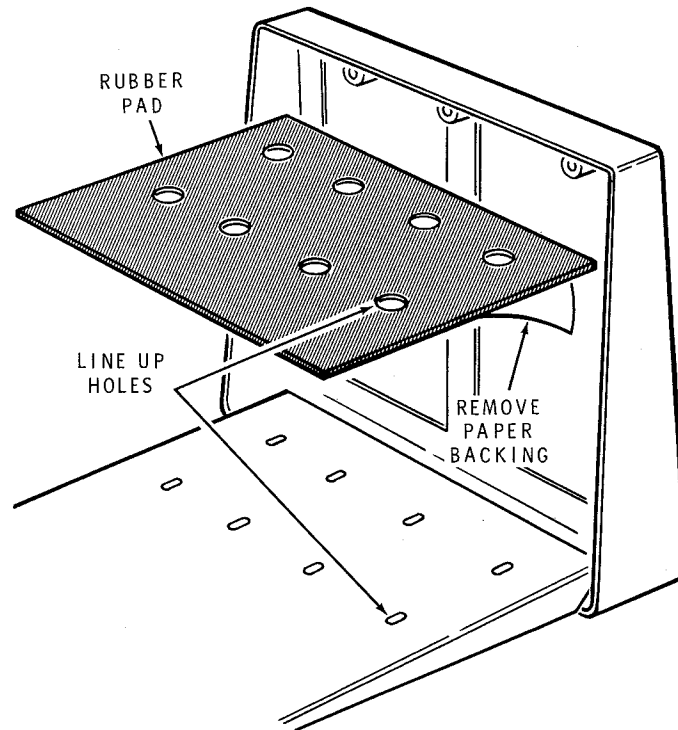
**CAUTION:** In the next step, you will open the capsule of locking compound. Treat this substance with care because it contains 1,1,1-TRICHLOROETHANE. If swallowed, induce vomiting and call a physician. Avoid contact with the skin and eyes. Use with adequate ventilation. In case of eye contact, flush thoroughly with water.

- ( ) Use a sharp knife or scissors to clip off the nipple on the locking compound capsule.

- ( ) Refer to the inset drawing on Pictorial 3-1 and apply a small dab of locking compound to each of the indicated points.
- ( ) Discard the remaining locking compound in a safe place.
- ( ) Mount the bezel to the front of the chassis with three 6-32  $\times$  3/8" black screws. Tighten these three screws firmly.
- ( ) Refer to Detail 3-1A and peel the backing paper from the model label. Carefully line up the label with the drive cutouts and press the label in place.



Detail 3-1A



**Detail 3-1B**

- ( ) Refer to Detail 3-1B and peel the backing paper from the rubber pad. Line up the eight holes in the pad with the chassis holes. Then press the rubber pad in place.
- ( ) Slide the SY1: disk drive into the left bezel cutout with the open door toward the left.
- ( ) Connect either one of the 3-wire cables coming from the power supply to the circuit board connector on the disk drive.
- ( ) Push the end-of-cable flat cable plug onto the disk drive circuit board with the striped side toward the top of the chassis.

If you are not installing the third disk drive, disregard the next three steps and proceed to "Disk Box."

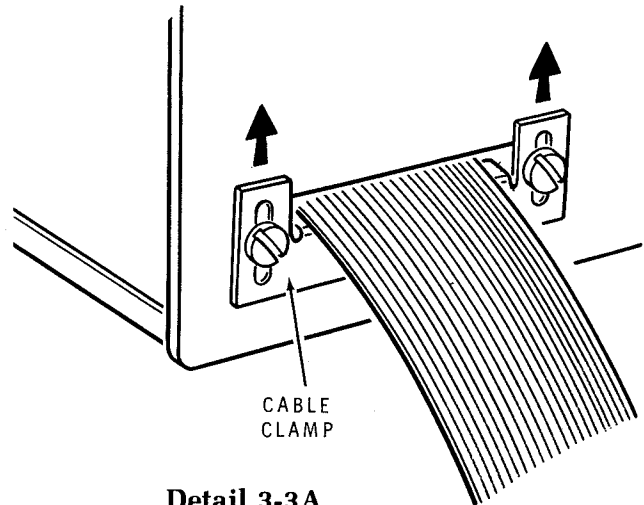
- ( ) Slide the SY2: disk drive into the right bezel cutout with the open door toward the left.
- ( ) Connect the remaining 3-wire cable coming from the power supply to the floppy drive circuit board.
- ( ) Push the midcable flat cable plug onto the disk drive circuit board with the striped side toward the top of the chassis.

If you installed the third disk drive, disregard the following four steps that refer to "Disk Box."

**DISK BOX**

Refer to Pictorial 3-2 for the following steps.

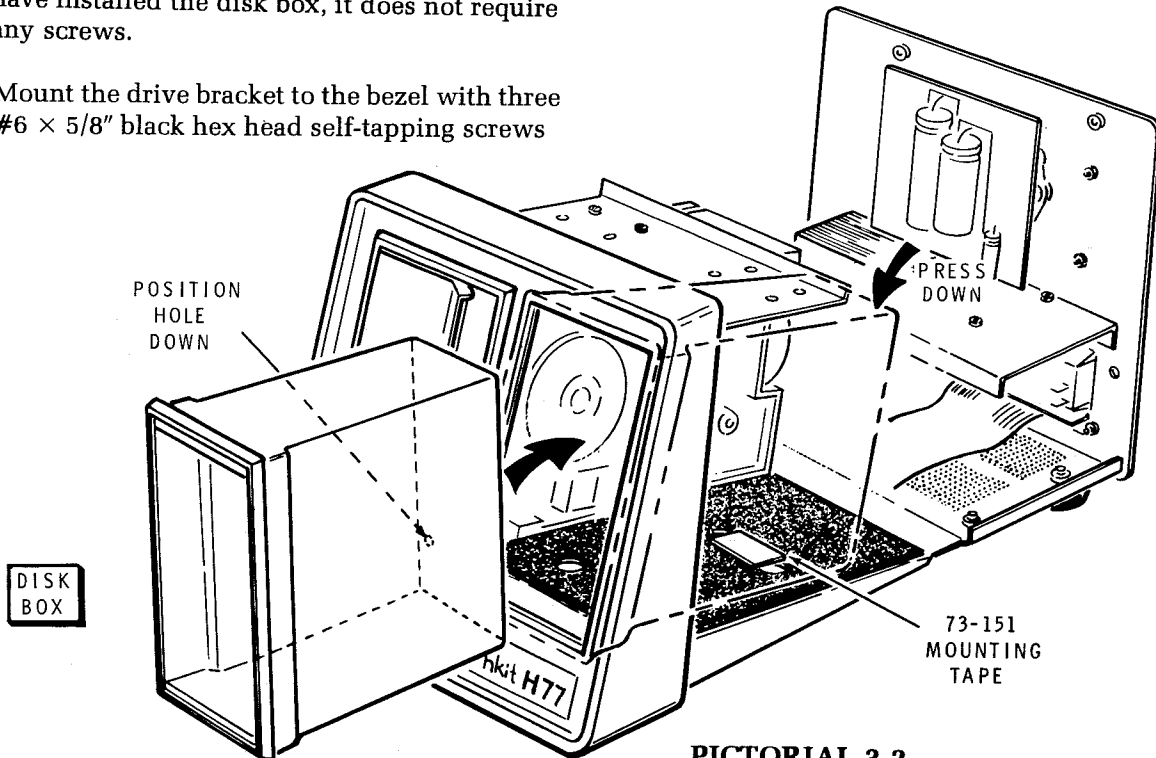
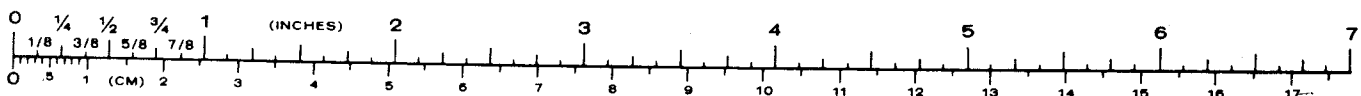
- ( ) Locate the mounting tape, 73-151.
- ( ) Remove the protective paper backing from one side of the tape and press the tape to the chassis between the holes as shown.
- ( ) Remove the paper backing from the top surface of the tape.
- ( ) Slide the disk box into the right bezel cutout with the hole in the back of the box positioned down, and press it down against the mounting tape.

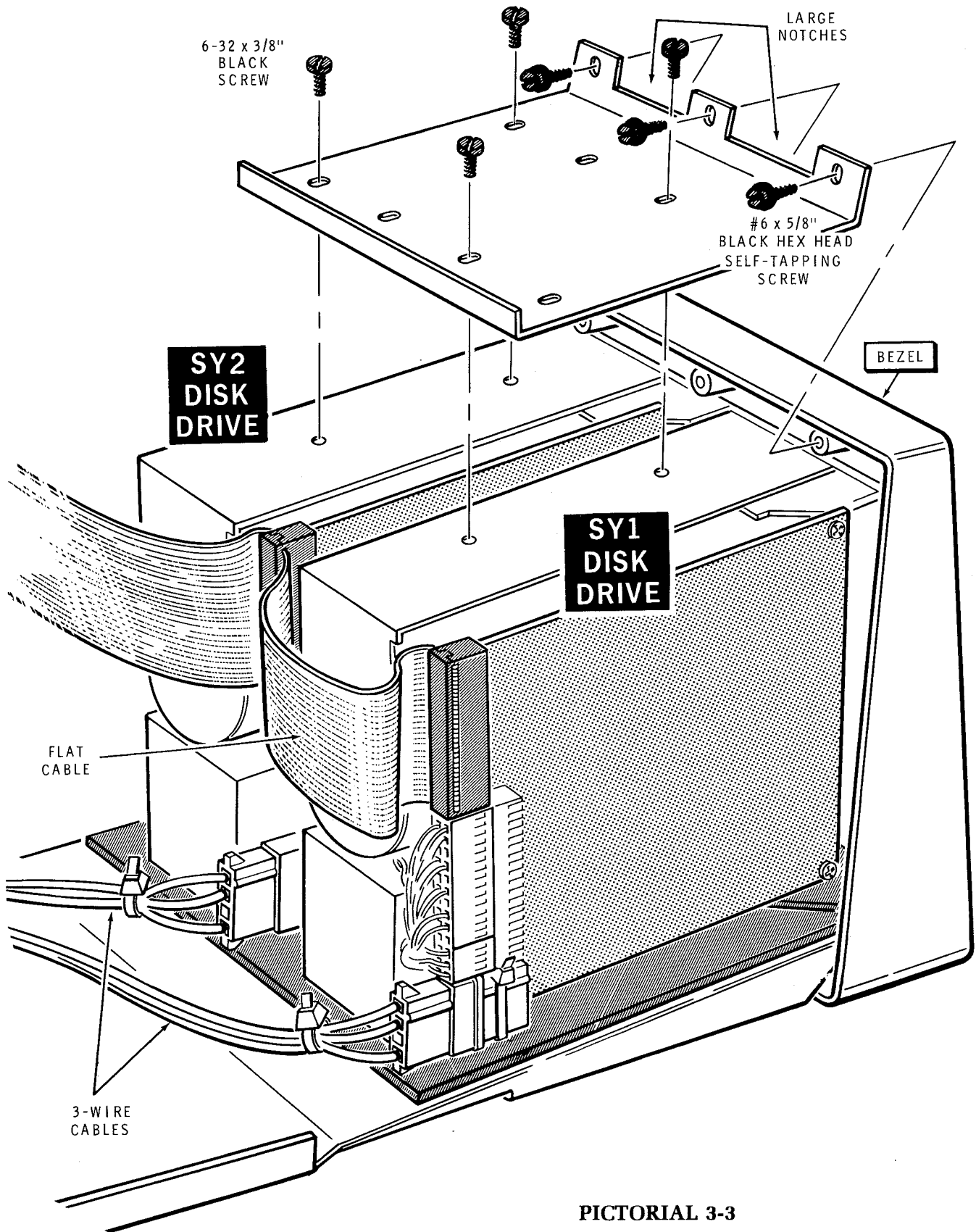
**Detail 3-3A**

- ( ) Refer to Detail 3-3A and pull the excess cable through the rear panel cable clamp until there is only a small loop of excess cable inside the chassis. Push the cable clamp tightly against the flat cable and tighten the clamp screws.
- ( ) Position all cables away from the stepper motor at the rear of the disk drive. It is normal for this motor to get hot to the touch when it is running.

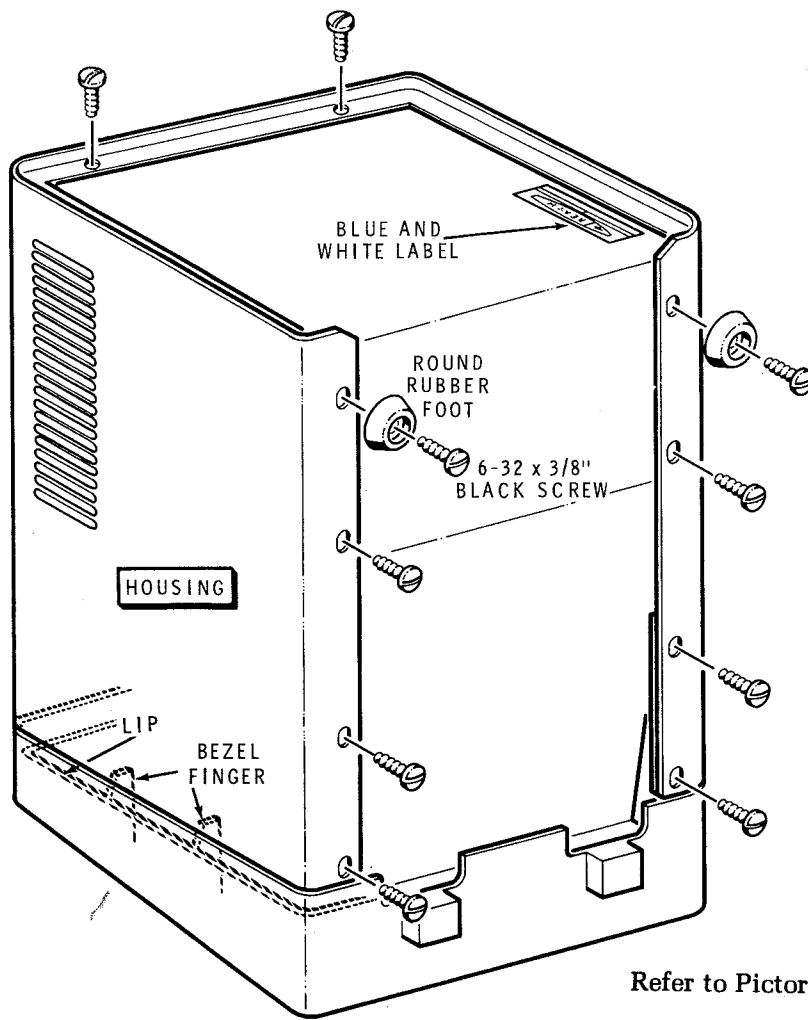
Refer to Pictorial 3-3 for the following steps.

- ( ) Install the drive bracket over the disk drives with the two large notches toward the bezel. Use two 6-32  $\times$  3/8" black screws for each drive unit. Do not tighten the screws. NOTE: If you have installed the disk box, it does not require any screws.
- ( ) Mount the drive bracket to the bezel with three #6  $\times$  5/8" black hex head self-tapping screws

**PICTORIAL 3-2**







PICTORIAL 3-5

Refer to Pictorial 3-5 for the following steps.

Refer to Pictorial 3-4 (Illustration Booklet, Page 10) for the following steps.

- ( ) Close the doors on the disk drives.
- ( ) Place a clean rag on your work surface to protect the bezel and drive doors.
- ( ) Stand the chassis up on the bezel.
- ( ) Install four 6-32  $\times$  3/8" black screws to hold the disk drives in place. NOTE: Install two screws if you have only one drive.
- ( ) Tighten the drive bracket screws.
- ( ) Peel the paper backing from a square foot and press it in place.
- ( ) Mount a square foot on the other bezel leg in the same manner.
- ( ) Slide the housing over the chassis and align the lip with the bezel fingers. Be careful not to scratch the heat sink while you do this.
- ( ) Install eight 6-32  $\times$  3/8" black screws and two round feet as shown.
- ( ) Set the chassis on its feet and open the drive doors.
- ( ) Install two 6-32  $\times$  3/8" black screws in the back edge of the housing.
- ( ) Remove the paper backing from the blue and white label. Then press this label onto the rear of the chassis next to the power transformer as shown. NOTE: Be sure to refer to the numbers on this label in any communications you may have with the Heath Company about this kit.

This completes the assembly of your H77 Floppy Disk.

# DISK OPERATION

## DISKETTE LOADING

Refer to Pictorial 4-1, open the front panel door and insert the diskette label to the left. Then close the door.

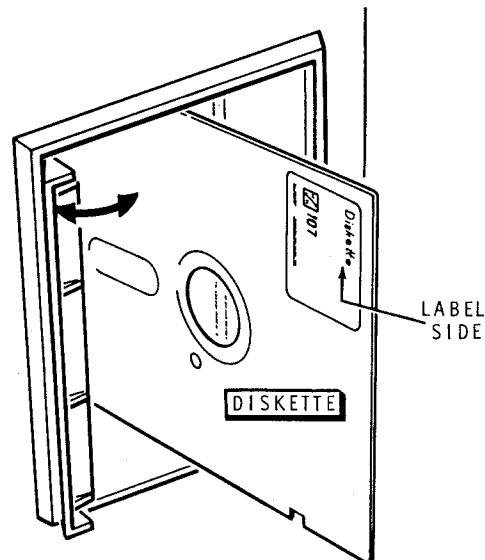
## DISKETTE HANDLING

The diskette can be easily damaged. Handle it carefully as follows:

1. Keep the diskette in its storage envelope whenever it is not in the Floppy Disk.
2. Keep the diskette away from magnetic fields. Magnetic fields can distort the recorded data on the diskette.
3. Replace damaged or worn storage envelopes.
4. Write on the plastic jacket only with a felt-tip pen. Do not use a lead pencil or ball-point pen.
5. Keep the diskette away from hot or contaminating materials.
6. Do not expose the diskette to sunlight.
7. Do not touch or clean the surface of the diskette. Abrasions can alter stored data.

## CAUTION

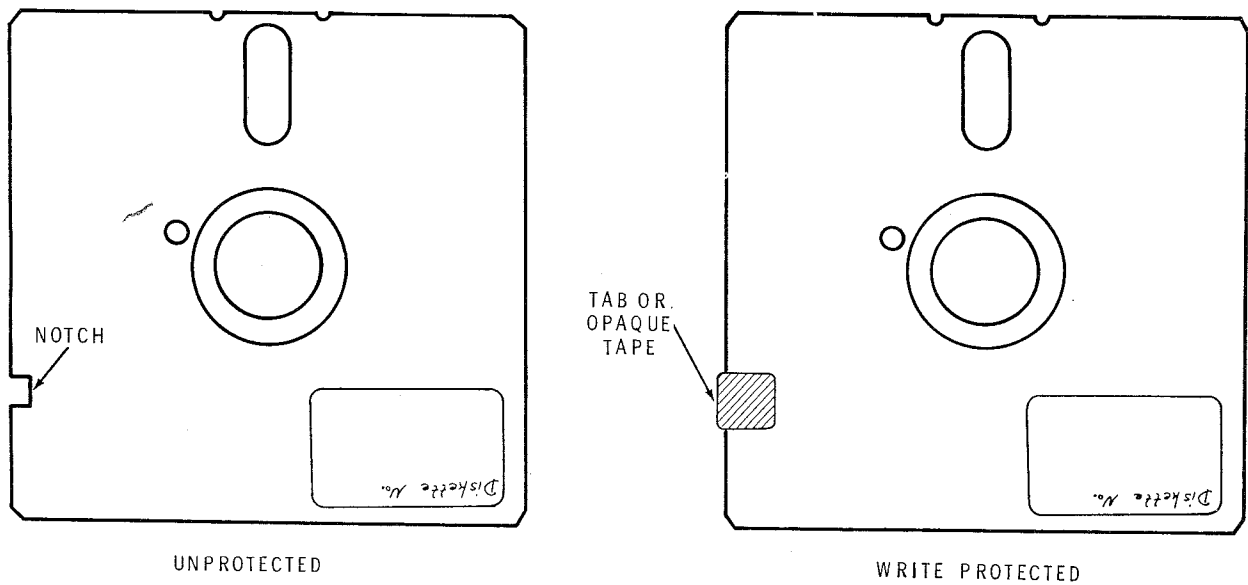
DO NOT OPERATE YOUR H89 COMPUTER UNLESS THE H77 FLOPPY DISK IS TURNED ON. TO DO SO MAY ERASE THE INFORMATION ON THE MAIN DISK SECTOR THAT IS UNDER THE HEAD AT THE TIME.



PICTORIAL 4-1

**WRITE-PROTECT**

This diskette can be write-protected so that it cannot be written on. To do this, cover the side notch with a tab (supplied with diskettes) or opaque tape. See Pictorial 4-2.

**PICTORIAL 4-2**

## IN CASE OF DIFFICULTY

If your Floppy Disk does not operate properly right after you assemble it, make the following checks. These checks will be most effective if you apply them to one part of the kit at a time. Refer to the "X-Ray View" on Page 47, to identify parts on the power supply circuit board.

1. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as you check it. It is frequently helpful to have a friend check your work. Some one who is not familiar with the unit may notice something you have consistently overlooked.
2. About 90% of the kits that are returned for repair do not function properly due to poor connections and soldering. Therefore, you can eliminate many troubles by carefully inspecting the connections to make sure they are soldered as described in the soldering information on Page 6, 13, 21, and 22. Reheat any doubtful connections. Be sure all wires are soldered at places where several wires are connected.
3. Check each circuit board foil to be sure there are no solder bridges between adjacent connections. Remove any solder bridges by holding a clean soldering iron tip between the two points that are bridged until the excess solder flows down onto the tip of the soldering iron.
4. Check each capacitor value carefully. Be sure the proper part is wired into the circuit at each capacitor location. Check each electrolytic and tantalum capacitor to be sure the lead at the positive (+) end is in the correct position.
5. Check all component leads connected to the circuit boards. Make sure the leads do not extend through the circuit board and come in contact with other connections or parts.
6. Also look for:
  - Parts installed incorrectly or backwards. This pertains especially to electrolytic and tantalum capacitors, and integrated circuits.
  - Unsoldered or inadequately soldered parts. Reheat the connections in the area of a problem.
  - Incorrect or interchanged parts. Check the part numbers on the integrated circuits.

NOTE: In an extreme case where you are unable to resolve a difficulty, refer to the "Customer Service Information" inside the rear cover of the Manual. Your "Warranty" is located inside the front cover.

## SPECIFICATIONS

Number of Tracks .....	40.
Sectors Per Track .....	10.
Formatted Bytes Per Sector .....	256.
Spindle Motor Speed .....	300 rpm $\pm$ 1%.
Data Transfer Rate .....	128 kHz.
Motor Start Time .....	1 Sec.
Power Requirements:	
Drive Unit .....	120 VAC (100-135 VAC), 50/60 Hz, 75 watts. 240 VAC (200-270 VAC), 50/60 Hz, 75 watts.
Operating Temperature .....	0° to 40° C.
Dimensions .....	8-7/8" W $\times$ 15" D $\times$ 8-5/8" H. (22.5 $\times$ 38.1 $\times$ 21.9 cm)
Weight .....	22-1/2 lbs. (10.2 kg).

NOTE: Refer to the Manufacturer's manual for more detailed specifications on the drive.

---

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

# CIRCUIT DESCRIPTION

## INTRODUCTION

The Floppy disk drive, the floppy disk interface circuit board, and the software allow the H89 computer to store and retrieve large quantities of data and programs. The Floppy Disk unit houses the Floppy disk drives and provides the necessary power for their operation. The disk interface circuit board selects the correct drive when more than one drive is used for a write or a read operation and properly handles the flow of data to or from the drive. The CPU logic board includes read only memory (ROM) that operates the system and random access memory (RAM) that serve as a buffer memory. The ROM memory is write protected to prevent inadvertent damage to its contents. All data and address exchanges between the disk interface circuit board and the H89 bus are buffered to protect the H89 bus from spurious signals. Refer to the H89 Manual for descriptions of the CPU and disk interface circuits.

## DISK UNIT

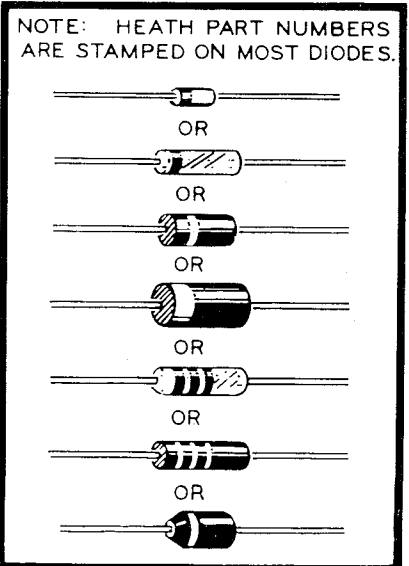
The disk unit is designed to operate with two Floppy disk drives. Each drive requires both +5-volts DC and +12-volts DC. These voltages are provided by the disk

unit power supply. Transformer T1 converts primary voltage to 20-volts AC. A bridge rectifier, formed by diodes D101, D102, D103, and D104 produces two unregulated DC voltages; +9-volts, which is filtered by capacitor C105, and +18-volts, which is filtered by C101. Integrated circuit U102, a 5-volt regulator capable of sourcing five amperes, regulates the output voltage at +5-volts DC. Bypass capacitors C106 and C107 insure stability of the regulator. This regulated +5-volt DC source provides logic power for the Floppy disk drives. Integrated circuit U101, a +12-volt regulator also capable of sourcing five amperes, regulates the output voltage at +12-volts DC. Bypass capacitors C102 and C103 insure stability of this regulator. Since this 12-volt DC source powers the drive motors, capacitor C104 is used to filter the transients generated when the motors start and stop.

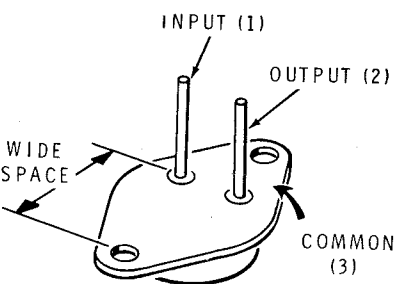
All of the control and data signals between the Floppy disk drive and the disk interface circuit board in the computer are carried by a 34-conductor flat cable. A ground wire between each signal-carrying wire in the flat cable provides signal insulation and a low impedance ground path between the disk drives and the disk interface circuit board.

# SEMICONDUCTOR IDENTIFICATION

## DIODES

HEATH PART NUMBER	MAY BE REPLACED WITH	DESCRIPTION	IDENTIFICATION
57-42	3A1	SI RECT 3A. 100 V	<p>NOTE: HEATH PART NUMBERS ARE STAMPED ON MOST DIODES.</p>  <p>The identification section shows eight different diode packages, each with a Heath part number stamped on it. The numbers are: 57-42, 3A1, 1N4001, 1N4002, 1N4003, 1N4004, 1N4005, and 1N4006. Each package is shown with its leads and the stamping location.</p>

## INTEGRATED CIRCUITS

HEATH PART NUMBER	MAY BE REPLACED WITH	DESCRIPTION	IDENTIFICATION
442-650	78H12	12-VOLT REGULATOR	 <p>The diagram shows a 3-pin integrated circuit package. The pins are labeled: INPUT (1), OUTPUT (2), and COMMON (3). A 'WIDE SPACE' is indicated between the input and output pins.</p>
442-651	78H05	5-VOLT REGULATOR	

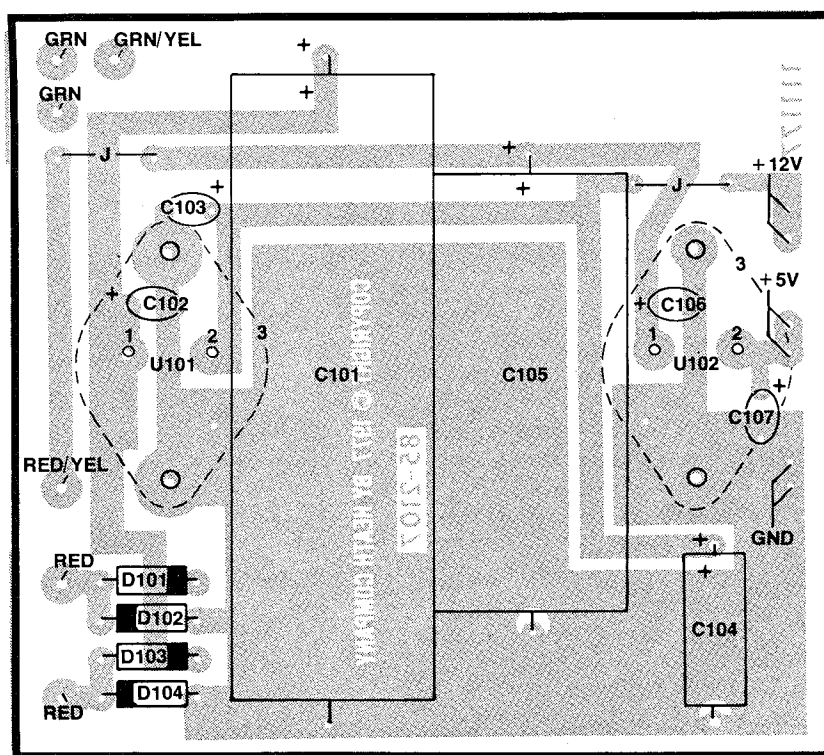
## CIRCUIT BOARD X-RAY VIEW

NOTE: To find the PART NUMBER of a component for the purpose of ordering a replacement part:

- A. Find the circuit component number (C101, C104, etc) on the X-Ray View.
- B. Locate this same number in the "Circuit Component Number" column of the

"Power Supply Circuit Board Parts List" (Page 20).

- C. Adjacent to the circuit component number, you will find the PART NUMBER and DESCRIPTION which must be supplied when you order a replacement part.



**POWER SUPPLY CIRCUIT BOARD**  
(Viewed from the component side.)



11  
3

11/11/11



# 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

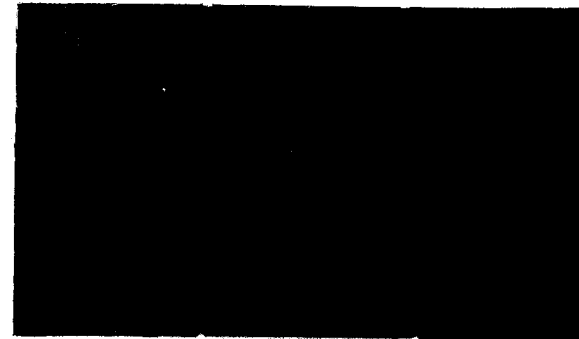
## HEATH COMPANY PHONE DIRECTORY

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  
Aircraft, Marine, Security, Scanners, Automotive,  
Appliances and General Products ..... (616) 982-3496  
Computers ..... (616) 982-3309



## YOUR HEATHKIT 90-DAY LIMITED WARRANTY

### Consumer Protection Plan for Heathkit Consumer Products

Welcome to the Heath family. We believe you will enjoy assembling your kit and will be pleased with its performance. Please read this Consumer Protection Plan carefully. It is a "LIMITED WARRANTY" as defined in the U.S. Consumer Product Warranty and Federal Trade Commission Improvement Act. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

#### Heath's Responsibility

**PARTS** — Replacements for factory defective parts will be supplied free for 90 days from date of purchase. Replacement parts are warranted for the remaining portion of the original warranty period. You can obtain warranty parts direct from Heath Company by writing or telephoning us at (616) 982-3571. And we will pay shipping charges to get those parts to you . . . anywhere in the world.

**SERVICE LABOR** — For a period of 90 days from the date of purchase, any malfunction caused by defective parts or error in design will be corrected at no charge to you. You must deliver the unit at your expense to the Heath factory, any Heathkit Electronic Center (units of Veritechnology Electronics Corporation), or any of our authorized overseas distributors.

**TECHNICAL CONSULTATION** — 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.

**NOT COVERED** — The correction of assembly errors, adjustments, calibration, and damage due to misuse, abuse, or negligence are not covered by the warranty. Use of corrosive solder and/or the unauthorized modification of the product or of any furnished component will void this warranty in its entirety. This warranty does not include reimbursement for inconvenience, loss of use, customer assembly, set-up time, or unauthorized service.

This warranty covers only Heath products and is not extended to other equipment or components that a customer uses in conjunction with our products.

SUCH REPAIR AND REPLACEMENT SHALL BE THE SOLE REMEDY OF THE CUSTOMER AND THERE SHALL BE NO LIABILITY ON THE PART OF HEATH FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO ANY LOSS OF BUSINESS OR PROFITS, WHETHER OR NOT FORSEEABLE.

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.

#### Owner's Responsibility

**EFFECTIVE WARRANTY DATE** — Warranty begins on the date of first consumer purchase. You must supply a copy of your proof of purchase when you request warranty service or parts.

**ASSEMBLY** — Before seeking warranty service, you should complete the assembly by carefully following the manual instructions. Heathkit service agencies cannot complete assembly and adjustments that are customer's responsibility.

**ACCESSORY EQUIPMENT** — Performance malfunctions involving other non-Heath accessory equipment, (antennas, audio components, computer peripherals and software, etc.) are not covered by this warranty and are the owner's responsibility.

**SHIPPING UNITS** — Follow the packing instructions published in the assembly manuals. Damage due to inadequate packing cannot be repaired under warranty.

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



**HEATH COMPANY • BENTON HARBOR, MICHIGAN**  
***THE WORLD'S FINEST ELECTRONIC EQUIPMENT IN KIT FORM***

LITHO IN U.S.A.