

HEATHKIT[®] MANUAL

for the
DIGITAL COMPUTER

Model H88

ASSEMBLY

595-226



HEATH COMPANY • BENTON HARBOR, MICHIGAN

Heathkit® Manual

for the

DIGITAL COMPUTER

Model H88

ASSEMBLY

595-2267

HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

Copyright © 1979
Heath Company
All Rights Reserved
Printed in the United States of America



TABLE OF CONTENTS

INTRODUCTION	3	VIDEO CIRCUIT BOARD	
UNPACKING INSTRUCTIONS	5	Parts List	40
ASSEMBLY NOTES	6	Step-By-Step Assembly	43
		Installation And Checkout	62
MAIN PACK			
Parts List	9	TERMINAL BASE ASSEMBLY (Cont'd.)	66
Step-by-Step Assembly	12		
POWER SUPPLY CIRCUIT BOARD		VIDEO ADJUSTMENTS	76
Parts List	24		
Assembly Notes	25	POSSIBLE CIRCUIT BOARD PROBLEMS	80
Step-By-Step Assembly	26		
Installation And Checkout	36	FINAL ASSEMBLY	81



INTRODUCTION

This Heath Digital Computer is a versatile 8-bit microcomputer and professional video terminal both built into the same cabinet. The computing functions and terminal operations are both controlled by Z-80 microprocessors. The high-quality keyboard, video display, state-of-the-art logic circuitry, and plug-in accessories make this Computer outstanding.

Some features of the Computer are:

- Up to 48k bytes of user memory.
- Wired and tested terminal logic circuit board.
- Wired and tested CPU logic circuit board.
- An internal monitor that automatically sizes the memory and initializes the inputs/outputs at power-up. This utilizes 2k bytes of ROM which contains load and dump routines that eliminate the need for bootstrap and loader programs at turn-on.

The information is displayed on a 12" (diagonal), high-quality cathode-ray tube (CRT) that can display 1920 characters at one time (24 rows of 80 characters). The P4 phosphor used in the CRT provides superb character definition. Upper-case characters are formed by a 5×7 dot matrix. Lower-case characters that have descenders use a 5×9 dot matrix. The Computer can also display 33 special graphic characters that can be arranged and grouped to form any number of graphic displays and effects. The graphic symbols are formed on an 8×10 dot matrix.

Special keyboard and software-controllable escape sequences allow you to select and use thirty-two special functions. These include:

- Eight user-defined, special function keys.
- Automatic and manual line, or page, scrolling.
- Cursor control (left, right, up, down, home).



In addition to these special functions, you have the ability to:

- Address the cursor directly.
- Insert and delete characters and lines.
- Enter and exit the graphics and reverse video modes.
- Erase lines or pages of text.
- Modify baud rates.

The highly reliable, standard-size electronic keyboard uses the universally accepted, standard typewriter format. Each key stroke is affirmed by an audible click.

A 12-key keypad duplicates the numeric key in a calculator format. This lets you rapidly enter numbers in programs that call for just numbers. In addition, the shifted keypad functions allow you to insert and delete lines and characters, and move the cursor.

One cassette interface board is supplied with the computer to interface cassette recorders for easy storage of information. This includes automatic turn-on and turn-off of the cassette recorder.

Other accessories that may be added are:

- Additional memory, to expand the memory of the computer up to 48k bytes.
- A floppy disk drive unit and its interface card for storing program material.
- A serial interface card to interface the computer with another computer, a line printer or any EIA RS232 standard.

These features, along with the stylish molded cabinet, make this Heath Digital Computer a versatile and powerful computing center.



UNPACKING INSTRUCTIONS

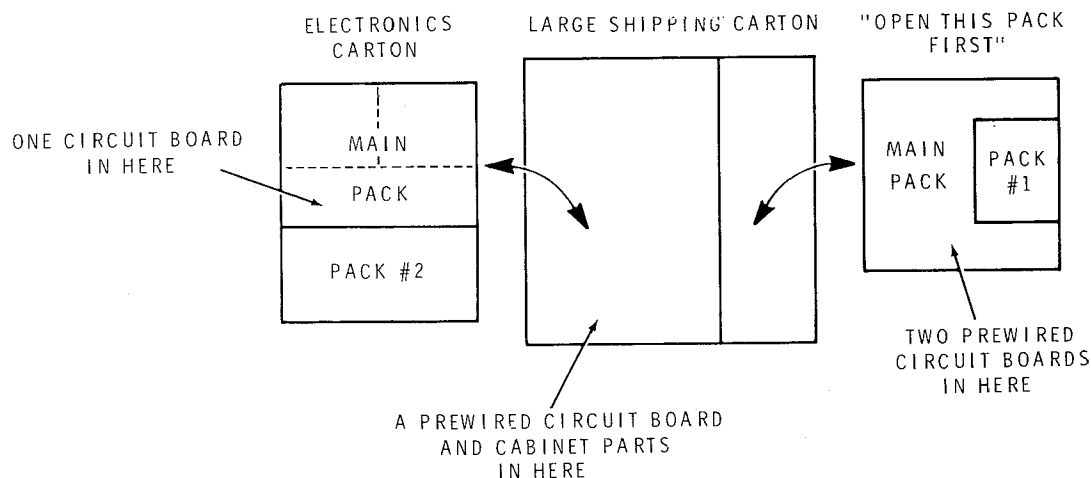
This kit is packed in two cartons. The smaller one contains the CRT (Cathode Ray Tube). Do not open this carton until you are instructed to do so.

You have already opened the large shipping carton and opened the carton marked "Open This Pack First." Remove from this carton "Pack #1" and set it aside. Also remove from this carton two prewired circuit boards and set them aside.

Next remove and open the "Electronics Carton" and remove a box marked "Pack #2." Set this aside with Pack #1. Also from this carton; remove one circuit board and set it aside.

Locate and remove a prewired circuit board from the large shipping carton and set it aside.

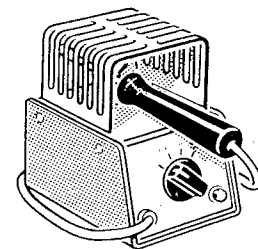
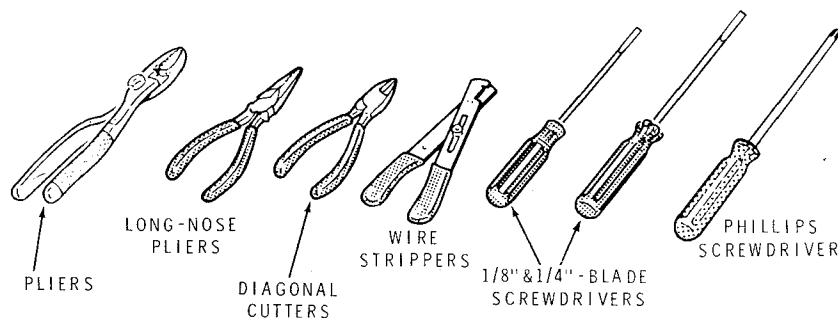
The remaining parts in the large shipping carton, the "Electronics Carton" and the "Open This Carton First" carton are all part of the Main Pack. You will work from this main pack first.



ASSEMBLY NOTES

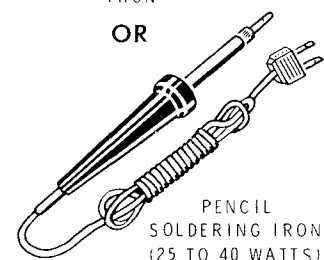
TOOLS

You will need these tools to assemble your kit.



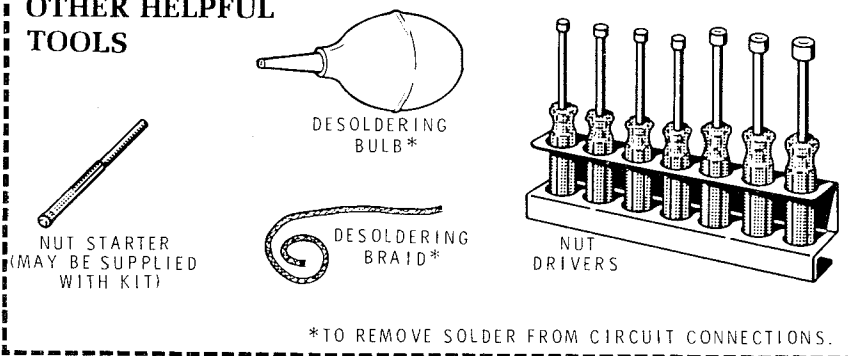
HEATHKIT
SOLDERING
IRON

OR



PENCIL
SOLDERING IRON
(25 TO 40 WATTS)

OTHER HELPFUL TOOLS



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 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 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.

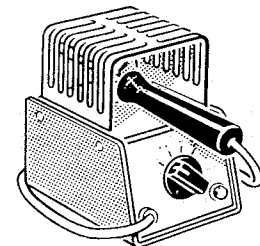
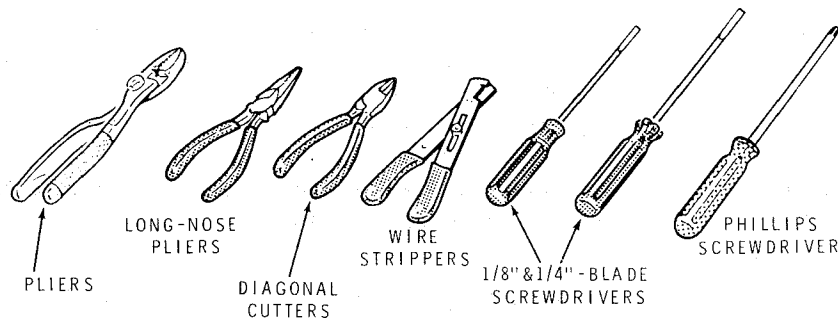
It is easy to make a good solder connection if you follow a few simple rules:

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.

ASSEMBLY NOTES

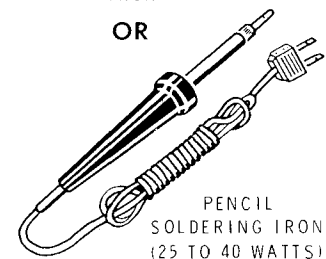
TOOLS

You will need these tools to assemble your kit.



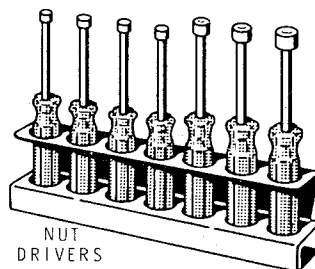
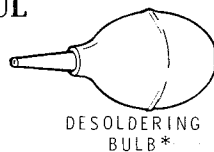
HEATHKIT
SOLDERING
IRON

OR



PENCIL
SOLDERING IRON
(25 TO 40 WATTS)

OTHER HELPFUL TOOLS



*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 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 excess lead lengths. Hold the leads so they cannot fly toward your eyes.

SOLDERING

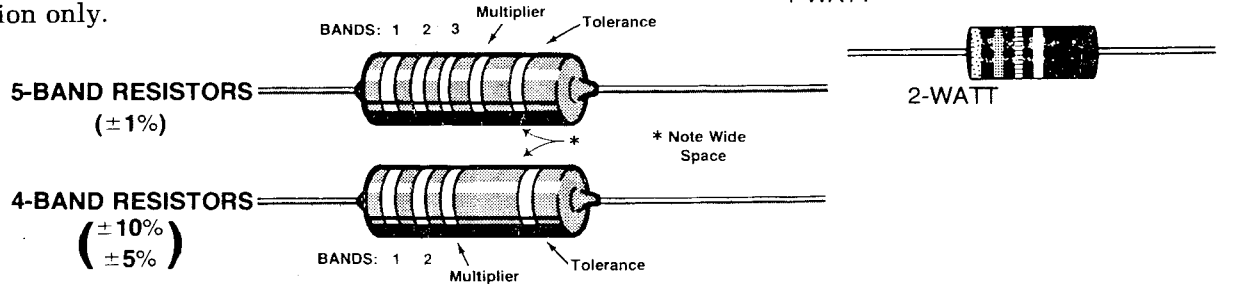
Soldering is one of the most important operations you will perform while assembling your kit. A good solder connection will form an electrical connection between two parts, such as a component lead and a circuit board foil. A bad solder connection could prevent an otherwise well-assembled kit from operating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



Band 1 1st Digit		Band 2 2nd Digit		Band 3 (if used) 3rd Digit		Multiplier		Resistance Tolerance	
Color	Digit	Color	Digit	Color	Digit	Color	Multiplier	Color	Tolerance
Black	0	Black	0	Black	0	Black	1	Silver	$\pm 10\%$
Brown	1	Brown	1	Brown	1	Brown	10	Gold	$\pm 5\%$
Red	2	Red	2	Red	2	Red	100	Brown	$\pm 1\%$
Orange	3	Orange	3	Orange	3	Orange	1,000		
Yellow	4	Yellow	4	Yellow	4	Yellow	10,000		
Green	5	Green	5	Green	5	Green	100,000		
Blue	6	Blue	6	Blue	6	Blue	1,000,000		
Violet	7	Violet	7	Violet	7	Silver	0.01		
Gray	8	Gray	8	Gray	8	Gold	0.1		
White	9	White	9	White	9				

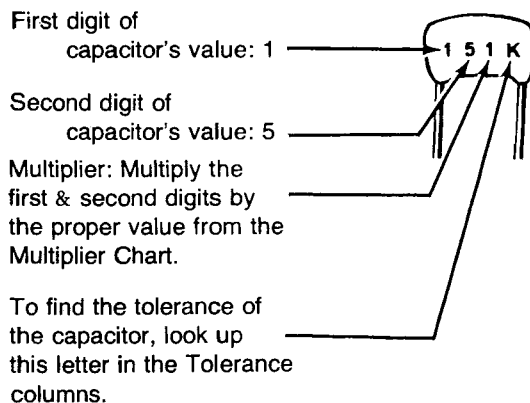
Capacitors will be called out by their capacitance value in μF (microfarads) or pF (picofarads) and type: ceramic, Mylar*, electrolytic, etc. Some capacitors may have their value printed in the following manner:

EXAMPLES:

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

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

NOTE: The letter "R" may be used at times to signify a decimal point: as in: 2R2 = 2.2 (pF or μF).



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	$\pm 20\%$



MAIN PACK

PARTS LIST

Check the parts in the main pack against this Parts List and the Parts Pictorial (Illustration Booklet, Page 1). Any part that is packed in an individual envelope with a part number on it should not be removed from its envelope until it is called for in a step. Do not discard any packing materials until all parts are accounted for.

To order a replacement part, always include the Part Number and use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover. Your Warranty is inside the front cover. For prices, refer to the separate "Heath Parts Price List."

NOTE: For packaging reasons, some parts of the same kind (such as some hardware items) have been located in both the "Electronics" carton and the "Open This Carton First" carton. For this reason, if your parts count is short, check in the other carton.

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

ELECTRICAL COMPONENTS

A1	25-857	1	1500 μ F electrolytic capacitor	B1
B1	54-969	1	Power transformer	T1
B2	58-19	1	Yoke	T2
B3	60-54	1	120/240 slide switch	SW1
B4	60-608	1	NOR/LOW slide switch	SW2
B5	60-619	1	Rocker switch	SW3
C1	432-11	1	Fuseholder	
C2	401-163	1	Speaker	
C3	420-99	1	Fan	
C4	51-196	1	Flyback transformer	T202
C5	51-197	1	Driver transformer	T201

HARNESS — CABLES — WIRE — SLEEVING

NOTE: The wire pack is located in Pack #1.

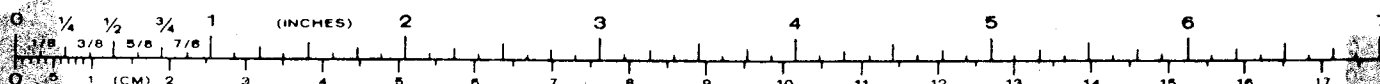
	89-54	1	Line cord
D1	134-1066	1	Flat cable
D2	134-1067	1	Harness
D3	134-1075	1	Interconnect cable
	340-8	48"	Bare wire

*Registered Trademark, DuPont

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

Harness — Cables — Wire — Sleeveing (cont'd.)

343-11	8 ft	Shielded cable
344-15	9 ft	Black stranded wire
344-33	36"	Black solid wire
344-16	36"	Red stranded wire (thin insulation)
344-183	42"	Red stranded wire (thick insulation)
344-80	45"	Orange stranded wire
344-81	7"	Violet stranded wire
344-82	7"	White stranded wire
344-126	48"	Brown stranded wire
344-154	7"	Yellow stranded wire
344-155	54"	Green stranded wire
344-156	7"	Blue stranded wire
346-64	3"	Large sleeving
346-35	5"	Black heat shrinkable sleeving
346-21	1"	White teflon* sleeving
346-26	7"	Clear sleeving
347-55	24"	8-wire ribbon cable
347-60	8 ft	2-wire gray cable





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

CIRCUIT Comp. No.

ASSEMBLIES

E1	64-864	1	12-key keyboard
E2	64-865	1	4-key keypad (off line, f ₁ , f ₂ , f ₃)
E2	64-866	1	4-key keypad (f ₁ , f ₃ , Erase, Blue)
E2	64-872	1	4-key keypad (Red, White, Reset, Break)
E3	181-3051	1	Keyboard consisting of:
		1	60-key keyboard
		1	Key circuit board
		5	#4 × 3/8" self-tapping screws

HARDWARE**NOTES:**

- The hardware may be in more than one packet. Open all the hardware packets, according to their size, before you check the hardware.
- Hardware is shown actual size. To identify a piece of hardware, place it over the illustration.

#4 Hardware

F1	250-186	10	#4 × 3/8" self-tapping screw
F2	252-2	4	4-40 nut
F3	254-9	3	#4 lockwasher
F4	255-757	4	#4 Hex spacer
F5	259-9	1	#4 solder lug

#6 Hardware

G1	250-369	4	#6 × 1/4" black sheet metal screw
G2	250-56	4	6-32 × 1/4" screw
G3	250-434	8	6-32 × 3/8" flat head screw
G4	250-89	41	6-32 × 3/8" screw
G5	250-1264	1	6-32 × 3/8" hex head screw
G6	250-162	1	6-32 × 1/2" screw
G7	250-1275	1	#6 × 5/8" black self-tapping screw
G8	250-1296	2	6-32 × 1-7/8" screw
G9	250-1287	2	Detent screw

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

CIRCUIT Comp. No.

#6 Hardware (cont'd.)

H1	252-3	7	6-32 nut
H2	253-96	4	#6 flat washer
H3	254-1	11	#6 lockwasher
H4	252-719	40	Brass insert (1 extra)
H5	259-1	6	#6 solder lug
H6	250-1157	4	#6 hex spacer

#8 Hardware

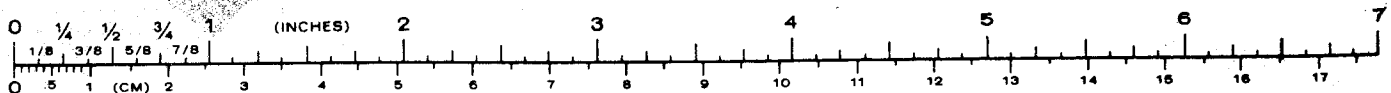
J1	250-137	1	8-32 × 3/8" screw
J2	250-72	14	8-32 × 3/4" screw
J3	252-4	8	8-32 nut
J4	253-45	10	#8 flat washer
J5	254-2	8	#8 lockwasher
J6	259-2	2	#8 solder lug
J7	255-66	1	1-3/8" spacer

#10 Hardware

K1	250-331	4	10-32 × 1" screw
K2	250-261	4	#10 × 1-1/2" self-tapping screw
K3	253-98	8	#10 flat washer
K4	259-5	3	#10 solder lug
K5	255-753	8	Beveled spacer
K6	432-1077	1	Ground connector
K7	258-33	2	Spring

BRACKETS — PLATES — CLAMP

M1	204-2362	3	Keyboard bracket
M2	204-2396	2	Circuit board mounting bracket
M3	204-2361	1	Bezel mounting plate
M4	204-2395-2	1	AC chassis
M5	205-1776-1	2	Latch plate
M6	205-1775	2	Detent plate (brass)
M7	205-1777	2	Front panel mounting plate
M8	205-1783-1	1	Connector plate
M9	207-86	1	Capacitor mounting clamp
M10	215-632	1	Video circuit board heat sink
M12	204-2456	1	Accessory mounting bracket
M13	205-1781	1	Fan mounting plate
M14	204-2454	1	Brace





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

CIRCUIT Comp. No.

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

CIRCUIT Comp. No.

CABINET PARTS

N1	90-1236-1	1	Terminal base
N2	90-1237-1	1	Cabinet shell
N3	90-1239-1	1	Front panel
N4	90-1238-1	1	Keyboard cover
N5	90-1244-1	1	Bezel cover
N6	261-6	4	Foot

CONNECTORS

P1	432-148	2	3-hole male plug
P2	432-149	1	3-hole female socket
P3	432-865	1	Small 3-hole connector shell
P4	432-954	2	4-hole connector shell
P5	432-1022	1	8-hole connector shell
P6	432-1061	2	10-hole connector shell
P7	432-1053	1	34-pin plug
P8	432-866	3	Small spring connector (1 extra)
P9	432-753	41	Large spring connector (1 extra)
P10	432-854	14	Small male socket pin
P11	432-855	15	Small female socket pin

TOOLS

Q1	205-778	1	Alignment tool blade
Q2	490-1	1	Alignment tool
Q3	490-5	1	Nut starter
Q4	490-185	1	Solder Wick*
Q5	490-189	1	IC puller

MISCELLANEOUS

	411-838	1	CRT (packed in separate carton). NOTE: Do not open this carton until you are instructed to do so.
R1	73-59	2	Rubber grommet
	73-39	31"	Long foam gasket
R2	73-92	1	3/4" x 5" foam tape
R3	75-754	1	Line cord strain relief
R4	75-785	1	Clear switch cover
R5	265-36	2	Hinge
R6	266-944	15	Nylon guide
R7	352-33	1	Vibra-Tite** sealant
R8	354-5	7	Small cable tie
R9	354-7	2	Large cable tie
R10	352-31	1	Thermo compound
	390-1674	1	Model label
	391-34	1	Blue and white label
R11	440-24	1	Insulator cap
	597-260	1	Parts Order Form
		1	Assembly Manual (see Page 1 for the part number).
		1	Operation Manual (see Page 1 for the part number).
		1	Logic Circuit Board Tester
		1	Booklet (See page 1 for part number).
			Solder

*Registered Trademark, Solder Removal Co.

**Registered Trademark, Oakland Corp.

STEP-BY-STEP ASSEMBLY

TERMINAL BASE ASSEMBLY

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

- 1) Position the terminal base on your work surface as shown.
- 2) Refer to inset drawing #1 on Pictorial 1-1 and mount a rubber foot to the underside of the cabinet base at DA with an 8-32 \times 3/4" screw, a #8 lockwasher, and an 8-32 nut.
- 3) In a similar manner mount rubber feet at DB, DC, and DD.

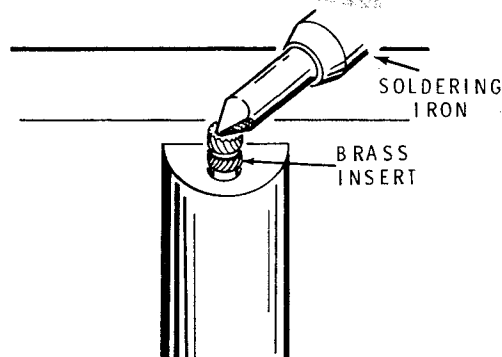
NOTE: There are two types of brass inserts supplied with this kit. Use only the type shown in Detail 1-1A. The other type will not be used.

When you install a brass insert, first place the insert into the hole and make sure it is started straight. Then heat the insert with your soldering iron while you apply a slight downward pressure. Install the insert flush with the top of the hole.

Locate 22 brass inserts. Then refer to Detail 1-1A and install these inserts at the following locations.

AA	AM
AB	AN
AC	AO
AD	AP
AE	AR
AF	AS
AG	AT
AH	AU
AJ	AV
AK	AW
AL	AX

NOTE: The Vibra-Tite sealant that you will use in the next step will stain anything it gets on. Be careful that you do not get it on your clothing or on the outside of the terminal base.

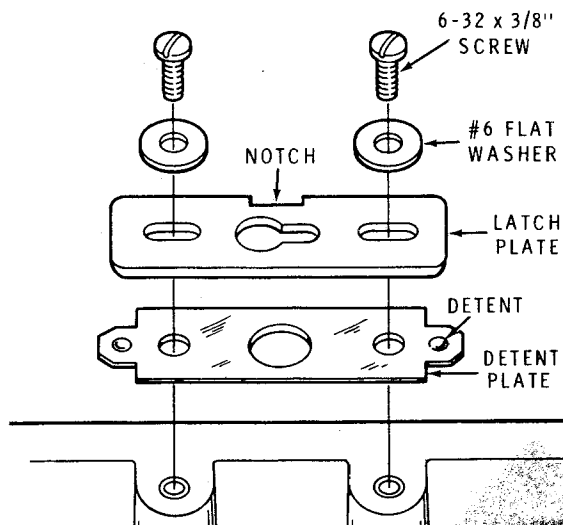


Detail 1-1A

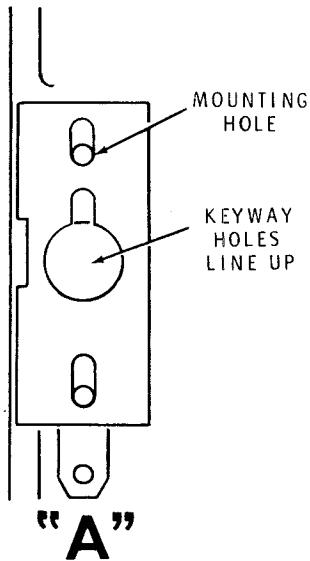
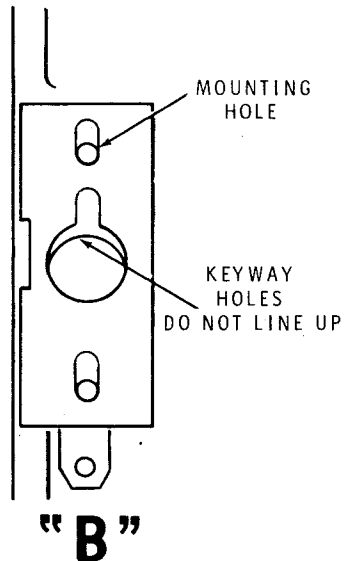
- 4) Locate a vial of Vibra-Tite sealant and cut off the tip. Then apply a liberal amount of the sealant to the inner threads of the inserts at AA, AB, AC, and AD.

WARNING: The detent plates that you will install in the following steps have sharp edges.

- 5) Refer to Detail 1-1B and locate two detent plates. Place these on the terminal base edge at AA/AB and AC/AD. Position the detents up.
- 6) Refer again to Detail 1-1B and locate two latch plates. Place these on top of the detent plates with the notch facing the outer edge, and the keyway toward the rear of the terminal base.



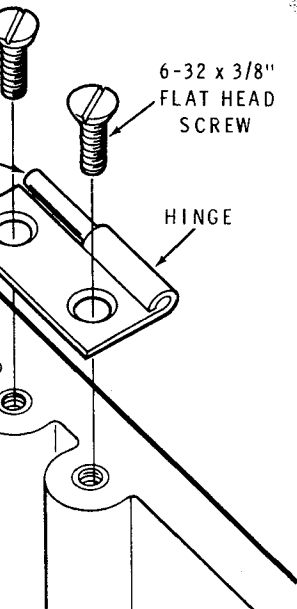
Detail 1-1B

**CORRECT****INCORRECT****Detail 1-1C**

() In the next step, before you mount the detent and latch plates, determine the correct positioning of the detent plates as follows:

() Refer to Detail 1-1C and align the mounting holes in the plates as shown. Then look at the keyway holes. If the keyway holes in the detent and latch plates are in line as in "A," the detent plate is correctly positioned. If the keyway holes do not line up, as in "B," turn the detent plate end-for-end.

() Mount the detent and latch plates with four 6-32 \times 3/8" screws and four #6 flat washers. Tighten the hardware and then turn the screw out 1/8-turn.

**Detail 1-1D**

() Locate two hinge halves with pins. Use these in the next two steps.

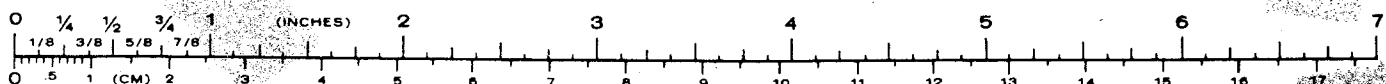
() Refer to Detail 1-1D and mount a hinge half at AN/AO with two 6-32 \times 3/8" flat head screws.

() In the same manner mount a hinge half at AP/AR.

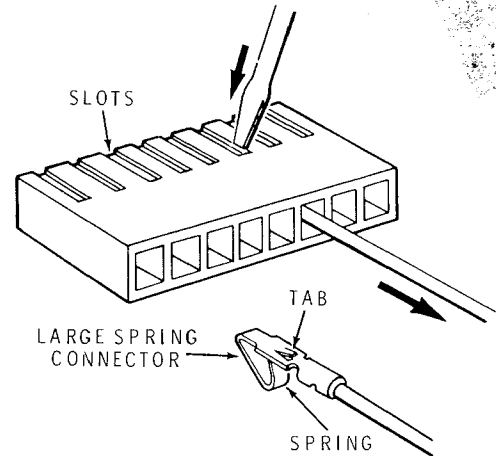
() Locate the power transformer and cut the bare lead ends to 1/8" on the following leads.

Both red leads
Both yellow leads
Both green leads

() Cut a 12" black stranded wire and remove 1/4" of insulation from both ends.



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



Detail 1-1F

NOTE: If it is ever necessary to remove a spring connector from the connector shell, use a small screwdriver to depress the tab on the connector through the slot in the connector shell while you pull on the wire. See Detail 1-1F. For this reason, always install the spring connectors with the tab toward the slotted side of the connector shell.

Refer again to Detail 1-1E and insert the spring connectors into the 8-hole connector shell as follows. Insert each connector until it locks in place.

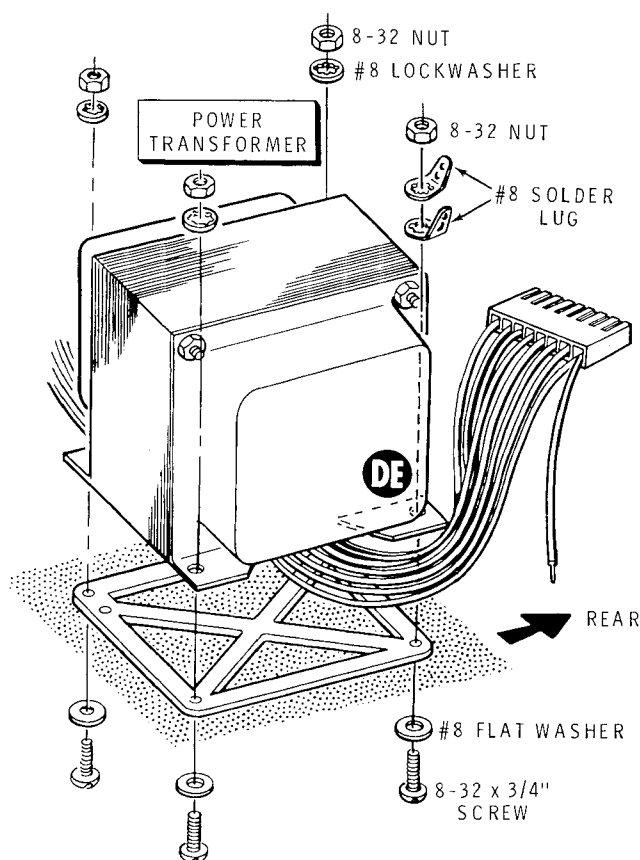
- ✓) Either red lead.
- ✓) Other red lead.
- ✓) Either green lead.
- ✓) Other green lead.
- ✓) Either yellow lead.
- ✓) Other yellow lead.

✓) Position the 8-hole connector shell as shown with the slotted side up.

- ✓) Either red lead into hole 1.
- ✓) Other red lead into hole 2.
- ✓) No lead in hole 3.
- ✓) Either yellow lead into hole 4.
- ✓) Other yellow lead into hole 5.
- ✓) Either green lead into hole 6.
- ✓) Other green lead into hole 7.
- ✓) Green-yellow lead and black wire into hole 8.

HEATHKIT®

- () Gently pull on each wire in the connector shell to make sure the spring connectors are securely locked in place.
- () Twist the fine wire strands at the other end of the 12" black wire. Then apply a small amount of solder to hold the strands in place. Cut the bare end of this wire to 1/8".
- () Refer to inset drawing #2 on Detail 1-1E and crimp and solder a small female socket pin onto the end of the black wire. This socket pin will be installed later.
- () Refer to Detail 1-1G and position the power transformer into the base at T1 with the red, yellow, and green leads next to the edge of the base. Route the leads toward the rear of the base.
- () Refer again to Detail 1-1G and mount the power transformer in the cabinet base with four 8-32 x 3/4" screws, four #8 flat washers, three #8 lockwashers, two #8 solder lugs, and four 8-32 nuts. Install all of the hardware before you tighten it. Be sure to position the two solder lugs at DE as shown.
- () Bend the solder lugs at DE up at a 45° angle.



Detail 1-1G

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

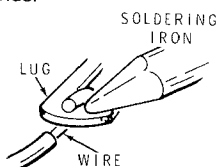
- () Prepare the following green stranded wires:

15"
13"
12" *white*

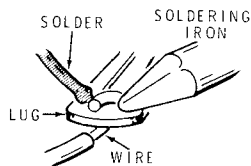
NOTE: When you are instructed to make a connection mechanically secure, as in the next step, first form a hook in the end of the wire. Then insert the hook through the lug and crimp it securely. See Detail 1-1H.

- () Refer to the following instructions and connect one end of the 15" green wire to the solder lug at DE nearest the edge of the base. Make this connection mechanically secure.

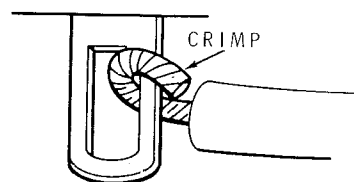
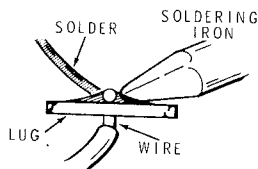
1. Push the soldering iron tip against the wire and the lug. Heat both the wire and the lug for two or three seconds.



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.

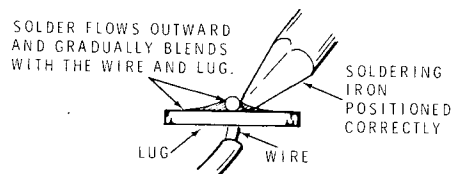


3. As the solder begins to melt, allow it to flow around the connection. Then remove the solder and the iron and let the connection cool.



Detail 1-1H

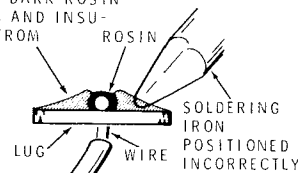
A GOOD SOLDER CONNECTION



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.

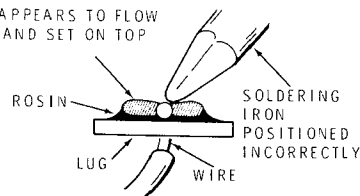
POOR SOLDER CONNECTIONS

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

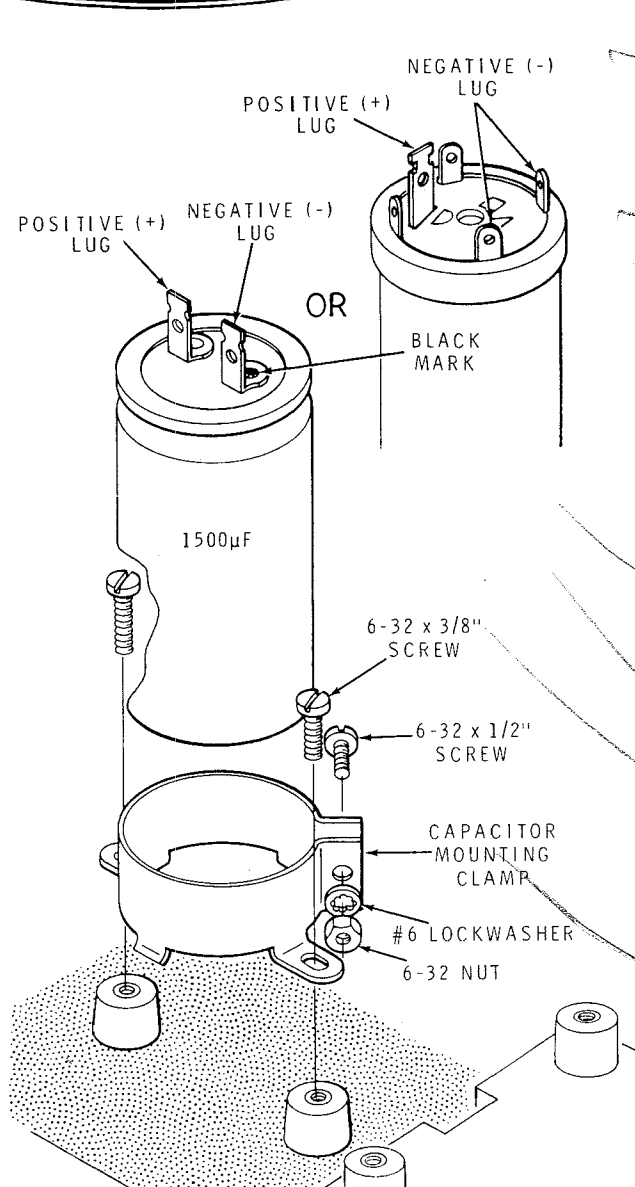


When the wire is not heated sufficiently, the solder will not flow onto the wire as shown above. To correct, reheat the connection and, if necessary, apply a small amount of additional solder to obtain a good connection.

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.



Detail 1-1J

Solder one end of both the 13" and 12" green wires to the other solder lug at DE. Then route these wires as shown. The other ends will be connected later.

Route the transformer leads (not connected to the 8-hole connector shell) and the 15" green wire through the hole in the back of the AC housing.

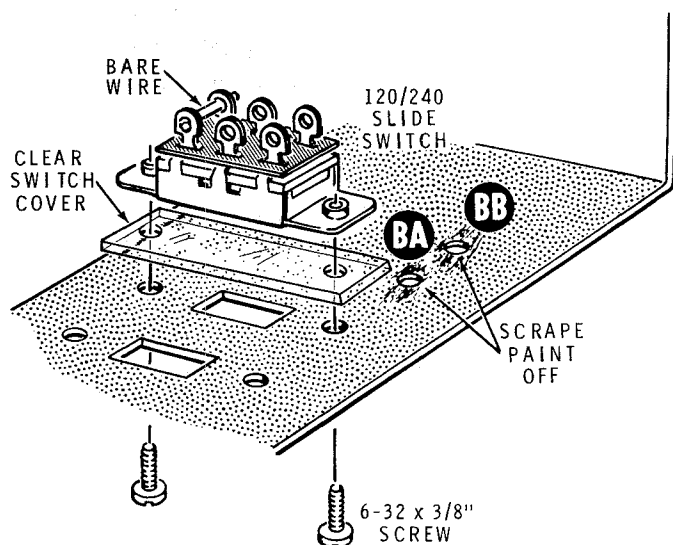
Refer to inset #2 on Pictorial 1-1 and install a small cable tie around the transformer leads and the 15" green wire. Pull the cable tie tight and cut off the excess.

NOTES:

1. In the next step, be sure to position the negative (-) marked lug of the capacitor as shown. This capacitor may look like either style shown.
 2. Use the nut starter to hold and start 6-32 and 4-40 nuts on screws.
- Refer to Detail 1-1J and install the capacitor mounting clamp on the 1500 μ F electrolytic capacitor. Use a 6-32 \times 1/2" screw, a #6 lockwasher, and a 6-32 nut. Position the clamp around the bottom of the capacitor.
- Refer again to Detail 1-1J and mount the capacitor mounting clamp at C1 with two 6-32 \times 3/8" screws.

Set the terminal base aside temporarily.





Detail 1-2A

AC CHASSIS ASSEMBLY AND WIRING

Refer to Pictorial 1-2 (Illustration Booklet, Page 4) for the following steps.

- () Locate the AC chassis and position it as shown.

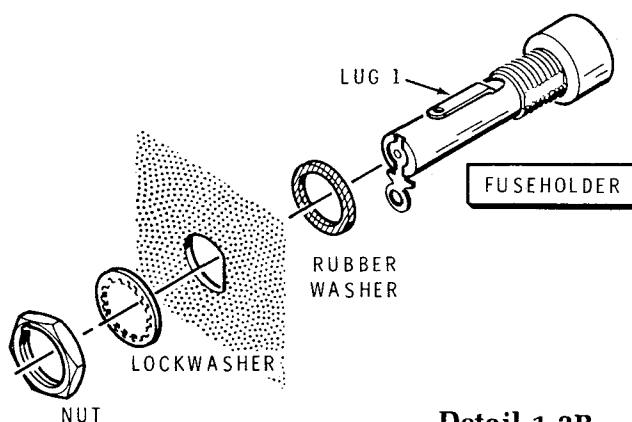
NOTE: If your supply voltage (line voltage) is 120 VAC, set the 120/240 slide switch in the next step so that "120" appears on the slider. If your supply voltage is 240 VAC, set the slider to show "240."

- () Locate the 120/240 slide switch and set the slider to the appropriate voltage setting for your area.

- () Refer to Detail 1-2A and mount the 120/240 slide switch and clear switch cover at SW1 with the bare wire positioned as shown. Use two 6-32 \times 3/8" screws.

- () In the same manner, except without the clear switch cover, mount the NOR/LOW (Normal/Low) slide switch at SW2. Set the switch slider so that "NOR" is showing. Refer to inset drawing #1 on Pictorial 1-2 for switch lug orientation.

- () Refer again to Detail 1-2A and scrape the paint off the AC chassis around holes BA and BB.



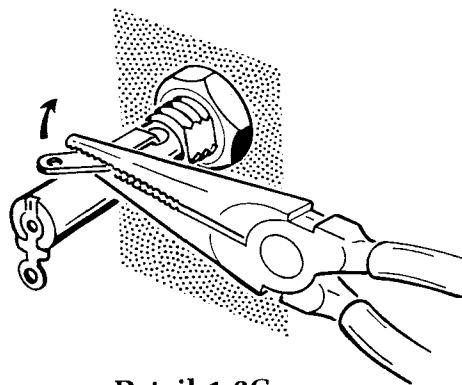
Detail 1-2B

- () Mount a #6 solder lug at BA with a 6-32 \times 3/8" screw and a 6-32 nut. Position the lug as shown.

- () In the same manner, mount a #6 solder lug at BB.

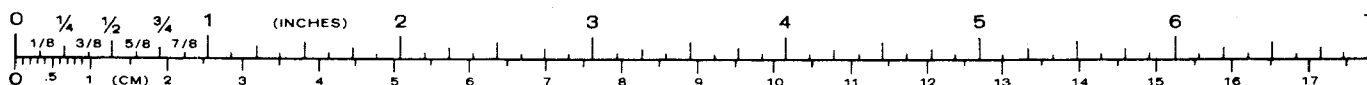
- () Refer to Detail 1-2B and install the fuseholder at F1. Use the hardware supplied with the fuseholder. Be sure to position the lugs as shown. NOTE: Do not overtighten the hardware or the fuseholder may crack.

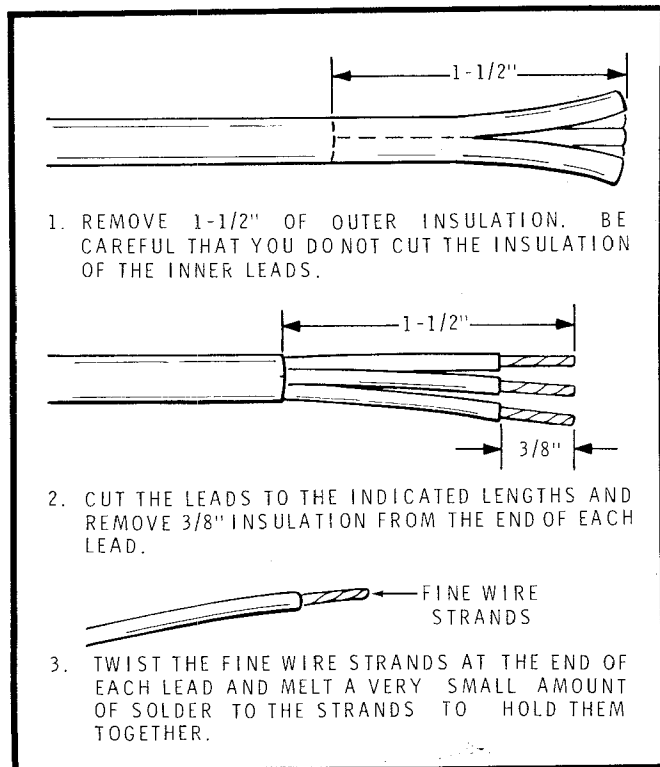
- () Refer to Detail 1-2C and bend lug 1 of the fuseholder out slightly. Be careful that you do not apply pressure to the lug where it comes out of the fuseholder.



Detail 1-2C

- () Refer to Detail 1-2D and prepare the end of the line cord as shown.

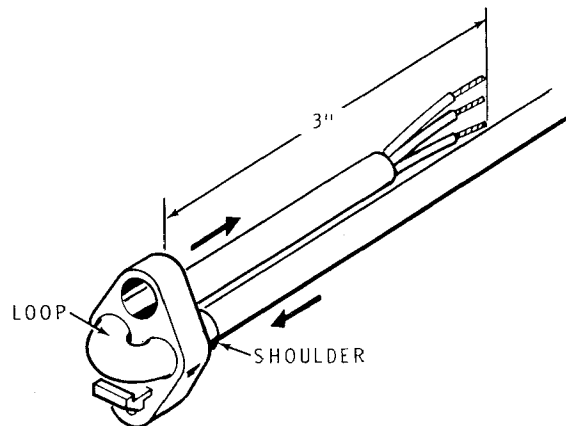




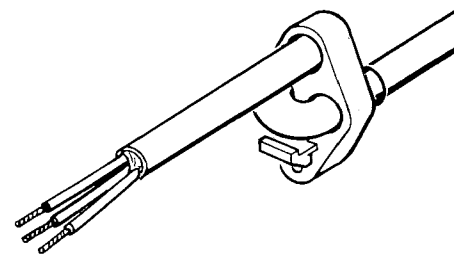
Detail 1-2D

1. Insert the prepared end of the line cord through hole BC from the outside of the AC chassis. Then refer to Detail 1-2E and install the line cord strain relief on the line cord.
2. Refer to inset drawing #2 on Pictorial 1-2 and mount the strain relief to the inside of the chassis with a #6 \times 5/8" black self-tapping screw. Position the shoulder of the strain relief into the hole in the chassis.
3. Refer to Detail 1-2F and install the rocker switch in the AC chassis at SW3 from the outside. Make sure the lugs are positioned as shown.
4. Connect the black line cord lead to fuseholder F1 lug 2. Make this connection mechanically secure and then solder the connection.
5. Connect the green line cord lead to solder lug BB. Make this connection mechanically secure and then solder the connection.
6. Connect the white line cord lead to switch SW1 lug 6. Make this connection mechanically secure but **do not** solder the connection.

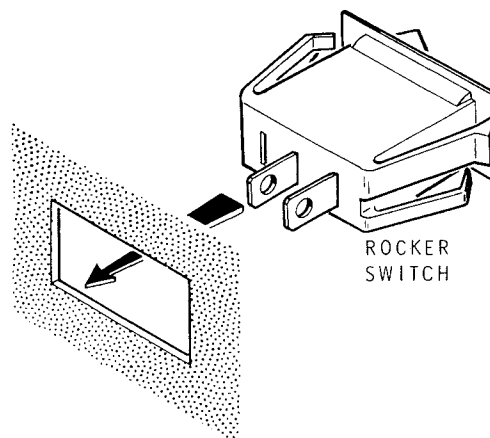
1. INSERT THE PREPARED END OF THE CABLE THROUGH THE SHOULDER ON THE STRAIN RELIEF AND BACK THROUGH THE SIDE HOLE.



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



Detail 1-2E

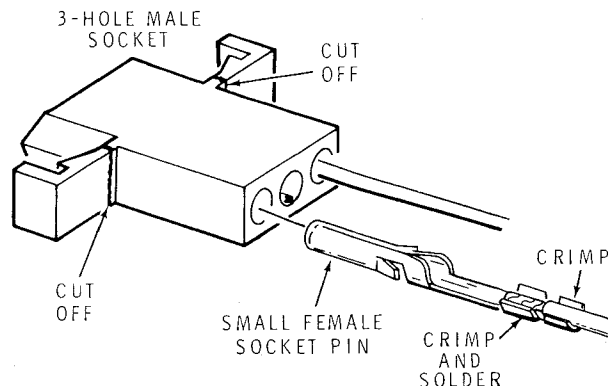


Detail 1-2F

- () Prepare the following black solid wires:

1-1/2"
1-1/2"
3"
2"

NOTE: In the following steps, (NS) means not to solder the connection because other wires or leads will be added later. (S-) with a number such as (S-3) means to solder the connection. The number following the "S" tells how many wires are in the connection.



Detail 1-3A

Make the connections in the next four steps mechanically secure.

- () Connect a 1-1/2" black wire between SW2 lug 2 (S-1) and SW1 lug 2 (S-1).
- () Connect a 1-1/2" black wire between SW2 lug 5 (S-1) and SW1 lug 5 (NS).
- () Connect a 3" black wire between SW1 lug 3 (NS) and SW3 lug 3 (S-1).
- () Connect a 2" black wire between SW3 lug 2 (S-1) and fuseholder F1 lug 1 (S-1).

Refer to Pictorial 1-3 (Illustration Booklet, Page 5) for the following steps.

NOTE: There are two sizes of red stranded wire in this kit. (Note that the insulation on one wire is thicker than on the other.) When red stranded wire is called for, use the red wire with the thinner insulation unless otherwise specified as in the next step.

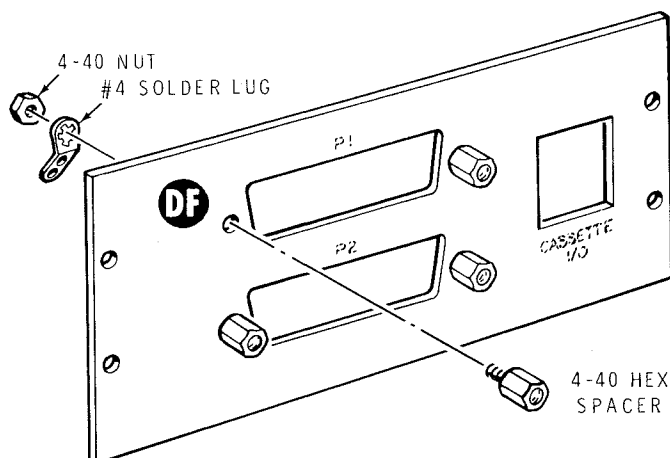
- () Prepare two 15" red stranded wires (thick insulation). Remove 1/4" of insulation from one end of each wire and 1/8" of insulation from the other.
- () Locate a 3-hole male socket. Then refer to Detail 1-3A and cut off the ears. Use this socket in the next step.

Refer to Detail 1-3A and crimp and solder a small female socket pin onto the 1/8" end of each red wire. Then insert these pins into the two outside holes of a 3-hole male socket.

Insert the other end of these two red wires through the small hole in the back of the AC housing (same as the power transformer leads).

Position the AC chassis under the right rear corner of the base and connect the two red wires and the power transformer leads as follows. Make these connections mechanically secure.

- () Connect either one of the two 15" red wires to SW1 lug 5 (S-2).
- () Connect the other 15" red wire to SW1 lug 3 (NS).
- () Black-gray transformer lead to SW2 lug 1 (S-1). NOTE: Do not use the black-white lead by mistake.
- () Black-yellow transformer lead to SW2 lug 3 (S-1).
- () Black-white lead to SW2 lug 4 (S-1).



1 Screw Missing!!

Detail 1-4A

() Black-green lead to SW2 lug 6 (S-1).

() Black-red lead to SW1 lug 3 (S-3).

() Black lead to SW1 lug 6 (S-2).

() Connect the green wire to solder lug BA (S-1).

Refer to Pictorial 1-4 (Illustration Booklet, Page 5) for the following steps.

() Mount the AC chassis into the AC housing with three 6-32 \times 3/8" screws. Be careful that you do not pinch any wires between the AC chassis and the housing.

NOTE: If the hex spacers that will be mounted next have extra hardware with them, this can be discarded.

() Refer to Detail 1-4A and install a 4-40 hex spacer, a #4 solder lug and a 4-40 nut at DF on the connector plate. Do not use a 6-32 hex spacer by mistake.

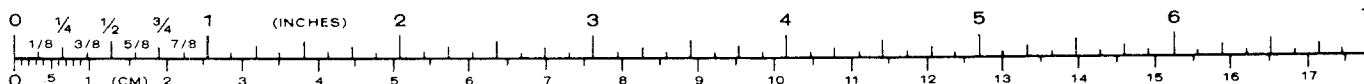
() Install 4-40 hex spacers at the other three locations on the connector plate with #4 lockwashers and 4-40 nuts.

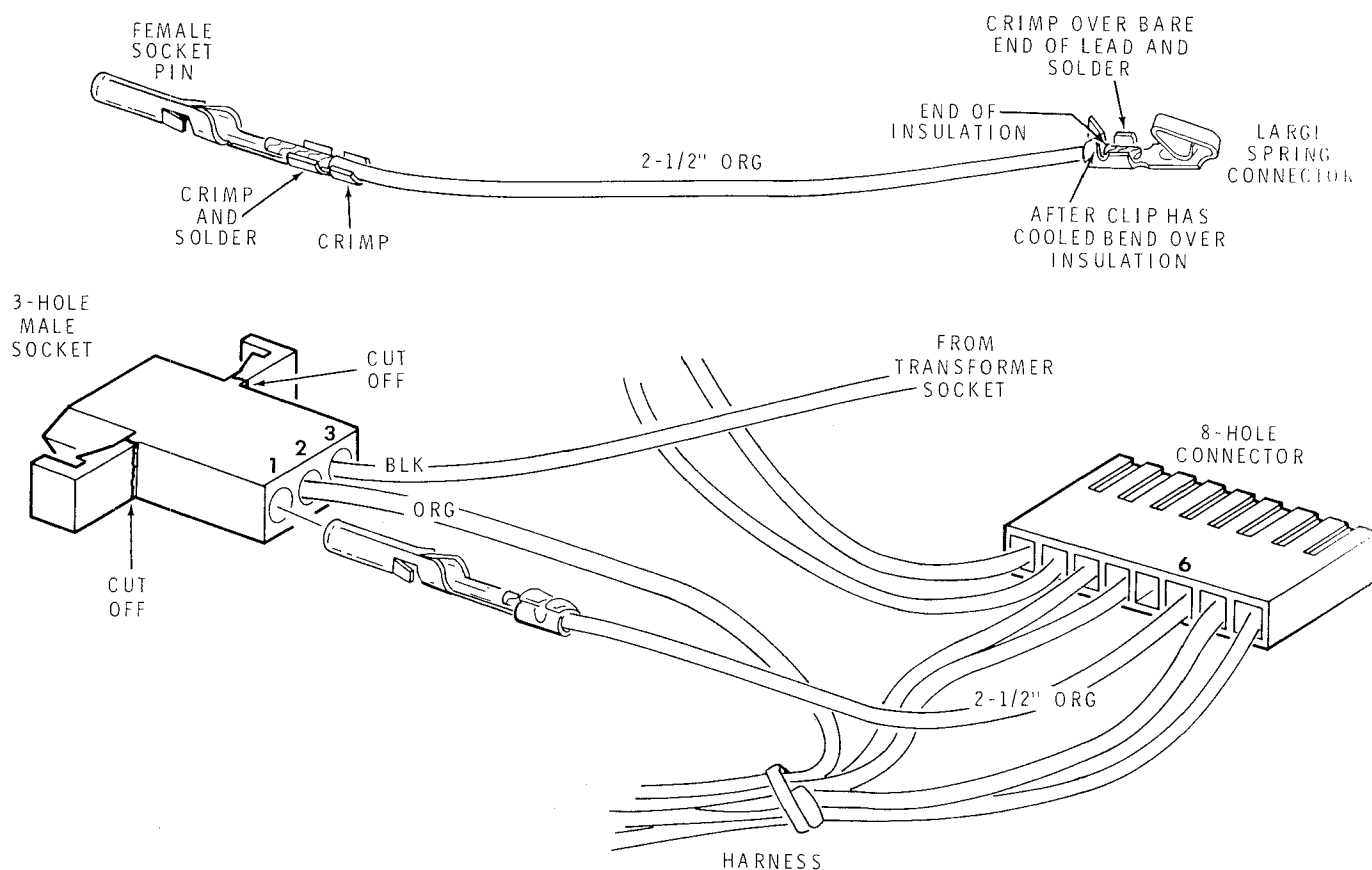
() Route the 13" green wire coming from the solder lug on the power transformer through the opening in the rear of the terminal base. Then solder it to solder lug DF on the connector plate.

() Mount the connector plate to the rear of the terminal base with four #6 \times 1/4" black sheet metal screws. Position the plate so the printing is right side up.

() Install a small cable tie around the wires and leads approximately 1" from where they go through the small hole in the AC housing.

() Install a small cable tie around the transformer leads and two ~~black~~ ^{RED} wires approximately 2" from the fan plug. Do not include the black stranded wire (female connector pin on one end) in this tie.





Detail 1-5A

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

Refer to Detail 1-5A for the following steps.

- 1) Locate the harness. Then locate the 8-hole connector on the harness. Refer back to Detail 1-1F on Page 14 and remove the orange wire from this connector.
- 2) Cut the spring connector off the end of this orange wire. Then remove 1/8" of insulation from the wire end and apply a small amount of solder to the bare strands.
- 3) Crimp and solder a small female socket pin onto the end of the orange harness wire.
- 4) Prepare a 2-1/2" orange stranded wire. Remove 1/8" of insulation from each end. Then crimp and solder a female socket pin onto one end of this wire.
- 5) Crimp and solder a large spring connector onto the other end of this wire.
- 6) Locate a 3-hole male socket and cut off the ears. Use this socket in next step.





- () Insert the female socket pin on the 2-1/2" orange wire into hole #1 of a 3-hole male socket.
- () Insert the pin on the orange harness wire into hole 2 of this socket.
- () Locate the black wire coming from the transformer lead socket. Insert this pin into hole 3 of the 3-hole male socket.
- () Insert the spring connector on the 2-1/2" orange wire into hole 6 of the 8-hole harness connector (same hole the orange wire was removed from).
- () Place the harness in the terminal base. The two blue and two black wires (not connected to a socket) will be connected to capacitor C1 in the following steps.

NOTE: Since capacitor C1 may be one of two different styles, refer to Pictorial 1-5 or to inset drawing #1 in the next two steps for the style you received.

- () Connect both black wires to the negative lug of capacitor C1 (S-2).
- () Connect both blue wires to the positive lug of capacitor C1 (S-2).
- () Refer to inset drawing #2 on Pictorial 1-5 and push the insulator cap down over capacitor C1.

Set the remaining parts aside temporarily; you will use them later. If you need hardware, parts or wire to complete a circuit board assembly, remove the needed parts from the main pack.

Proceed to "Power Supply Circuit Board."



POWER SUPPLY CIRCUIT BOARD (Pack #1)

PARTS LIST

Locate Pack #1 and check each part against the following list and the Parts Pictorial (Illustration Booklet, Page 7). Any part that is packed in an individual envelope with the part number on it should not be removed from its envelope until it is called for in a step. Do not discard any packing materials until all parts are accounted for.

To order a replacement part, always include the Part Number and use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover. Your Warranty is inside the front cover. For prices, refer to the separate "Heath Parts Price List."

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

ELECTROLYTIC CAPACITORS

A1	25-197	3	1 μ F tantalum	C105, C106, C107
A2	25-891	1	470 μ F	C104
A3	25-906	1	4700 μ F	C102
A4	25-902	2	10,000 μ F	C101, C103

DIODES — REGULATOR

B1	57-42	4	3A1 diode	D101, D102, D103, D104
B1	57-65	4	1N4002 diode	D109, D110, D111, D112
B2	57-67	1	10A20 bridge rectifier	BR101
B3	442-30	1	LM309K regulator	U101

SOCKETS — CONNECTORS — PINS

C1	434-117	3	Transistor socket	
C2	432-149	1	3-hole female socket	
C3	434-319	1	4-hole male plug	
C4	432-954	1	Small 4-hole connector shell	
C5	432-1070	1	Large 4-hole connector shell	
C6	432-1069	1	4-pin plug	P103

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

Sockets — Connectors — Pins (cont'd.)

C7	432-876	2	8-pin plug	
C8	432-1002	4	Large female socket pin	

HARDWARE

D1	250-89	3	6-32 \times 3/8" screw	
D2	250-162	6	6-32 \times 1/2" screw	
D3	252-3	3	6-32 nut	
D4	254-1	4	#6 lockwasher	
D5	259-1	4	#6 solder lug	

MISCELLANEOUS

E1	73-80	1	Foam pad	
	85-2173-2	1	Power supply circuit board	
E2	204-182	1	Capacitor support bracket	
E3	354-7	1	Large cable tie	
E4	354-5	7	Small cable tie	
E5	215-637	1	Power supply heat sink	
E6	421-23	1	1-ampere fuse	
E6	421-25	1	1.5-ampere fuse	



ASSEMBLY NOTES

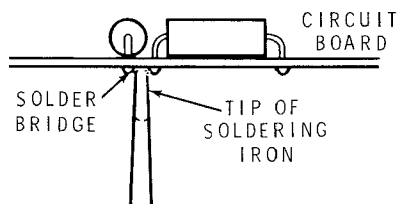
ASSEMBLY

1. Position all parts as shown in the Pictorials.
2. Solder a part or a group of parts only when you are instructed to do so.

SOLDERING

1. 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.
2. Do not create solder bridges between adjacent circuit board foils. A solder bridge usually occurs when you use too much solder and then drag the soldering iron across the board when you remove it from the connection. Always use

just 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. See the drawing below. You can also place the desoldering wick (braid) on a solder bridge. Then heat the wick with the soldering iron and the wick will soak up the excess solder. If you suspect a solder bridge exists, but are not sure, compare the foil side of the circuit board with the "X-Ray View" of that circuit board (located in the Operation Manual).



STEP-BY-STEP ASSEMBLY

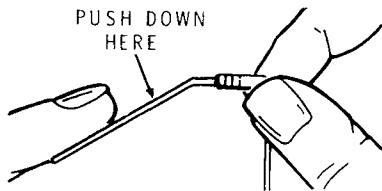
POWER SUPPLY CIRCUIT BOARD ASSEMBLY

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.

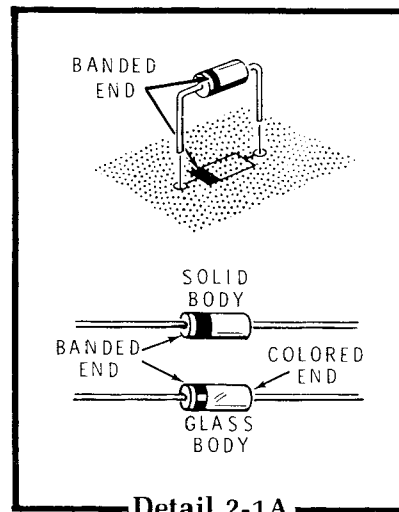
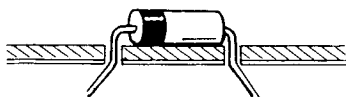
- () Position the circuit board as shown with the printed side (not the foil side) up.

- () D101: Hold a 3A1 diode (#57-42) by the body as shown and bend the leads straight down.

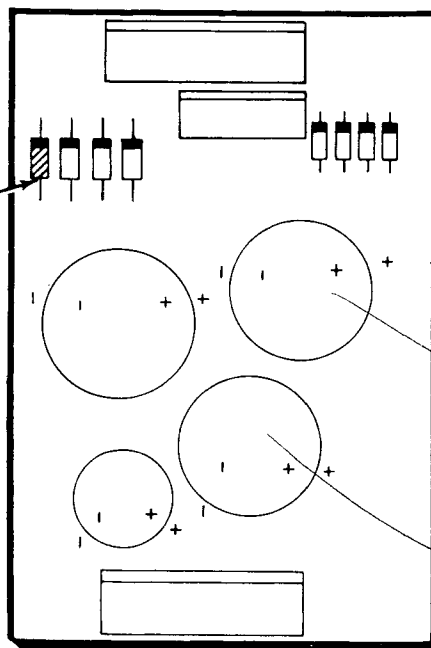


- () Push the leads through the holes at the indicated location on the circuit board. Match the band mark on the circuit board. See Detail 2-1A. THE CIRCUITRY WILL NOT WORK PROPERLY IF A DIODE IS INSTALLED BACKWARDS.

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



Detail 2-1A

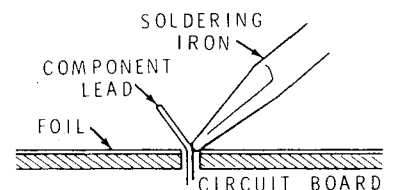


PICTORIAL 2-1

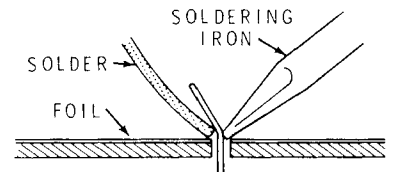
CONTINUE

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

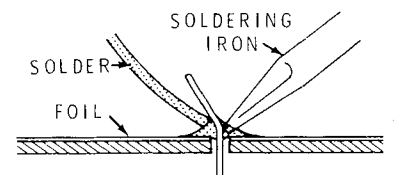
1. Push the soldering iron tip against both the lead and the circuit board foil. Heat both for two or three seconds.



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 27. After you have checked the solder connections, proceed with the assembly on Page 28. Use the same soldering procedure for each connection.

FINISH