

# HEATHKIT<sup>®</sup> MANUAL

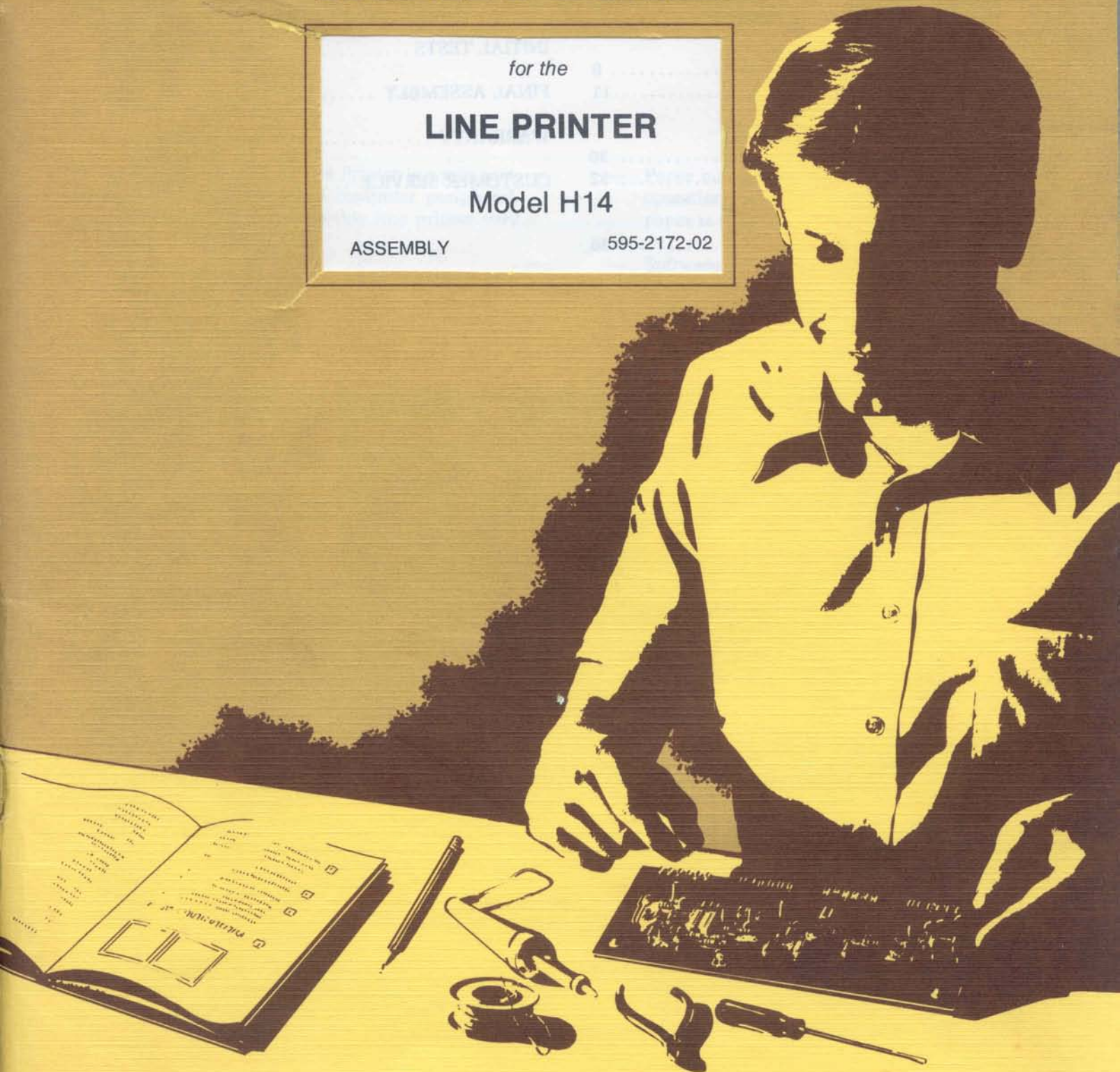
for the

## LINE PRINTER

Model H14

ASSEMBLY

595-2172-02



HEATH COMPANY • BENTON HARBOR, MICHIGAN

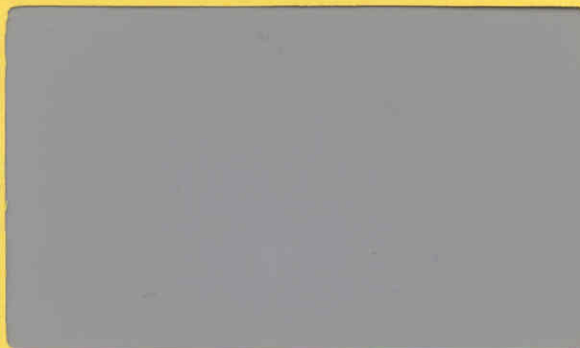
# HEATH COMPANY PHONE DIRECTORY

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

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

## Technical Assistance Phone Numbers

8:00 A.M. to 12 P.M. and 1:00 P.M. to 4:30 P.M., EST, Weekdays Only  
R/C, Audio, and Electronic Organs ..... (616) 982-3310  
Amateur Radio ..... (616) 982-3296  
Test Equipment, Weather Instruments and  
Home Clocks ..... (616) 982-3315  
Television ..... (616) 982-3307  
Aircraft, Marine, Security, Scanners, Automotive,  
Appliances and General Products ..... (616) 982-3496  
Computers — Hardware ..... (616) 982-3309  
Computers — Software:  
Operating Systems, Languages, Utilities ..... (616) 982-3860  
Application Programs ..... (616) 982-3884  
Heath Craft Wood Works ..... (616) 982-3423



## 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.

# Heathkit® Manual

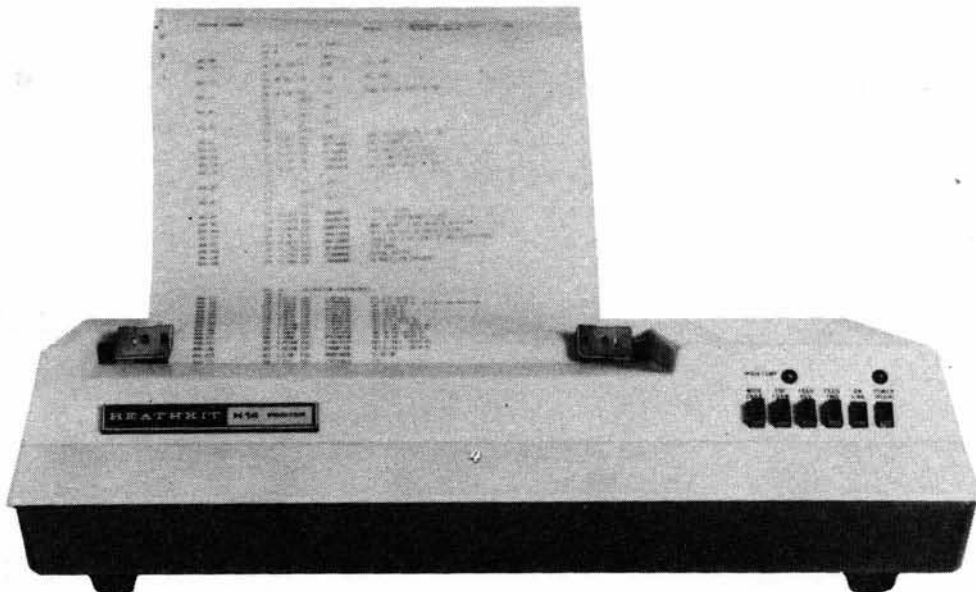
for the

## LINE PRINTER

Model H14

ASSEMBLY

595-2172-02



**HEATH COMPANY**  
BENTON HARBOR, MICHIGAN 49022

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# INTRODUCTION

The Heathkit Model H14 Line Printer is a compact, easy-to-built and easy-to-use computer peripheral. The following features make this line printer very versatile:

- Eight selectable baud rates.
- Operation for either 50 Hz or 60 Hz power line frequency (selectable).
- Selectable automatic line feed on receipt of carriage return.
- Provision for self-testing.
- Paper out/paper jam detector shuts down operation when printer is out of paper or if paper is jammed.
- Software selectable 10, 12.5, or 16.5 characters per inch for a maximum of 80, 96, or 132 characters per line respectively.
- Electronic form controls to feed paper forward one line, reverse one line, and feed paper to the top of the next form.

The modern, digital design assures reliability, and the handsome styling complements the Heath Computer Series.

# UNPACKING INSTRUCTIONS

**DO NOT UNPACK ANY PARTS UNTIL YOU ARE INSTRUCTED TO DO SO.**

The packaging consists of the main carton which contains a package marked Pack #1 and some other parts. These other parts will be considered the Final Pack, even though they may not be marked "Final Pack."

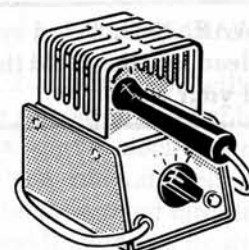
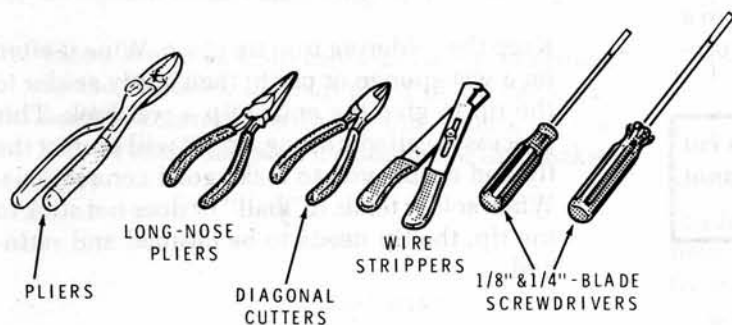
Return any part, or group of parts, that is packaged in a bag or envelope with a part number on it to its container after you identify it. Leave it there until you actually use it in a step. This will prevent intermixing of parts and help you identify parts.



# ASSEMBLY NOTES

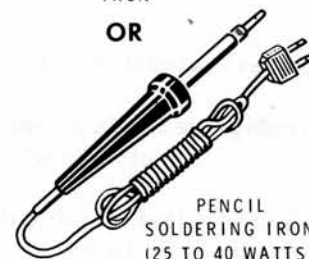
## TOOLS

You will need these tools to assemble your kit.



HEATHKIT  
SOLDERING  
IRON

OR

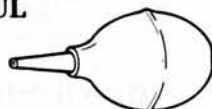


PENCIL  
SOLDERING IRON  
(25 TO 40 WATTS)

### OTHER HELPFUL TOOLS



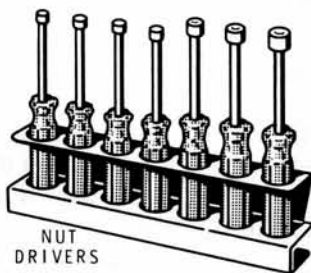
NUT STARTER  
(MAY BE SUPPLIED  
WITH KIT)



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 (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.

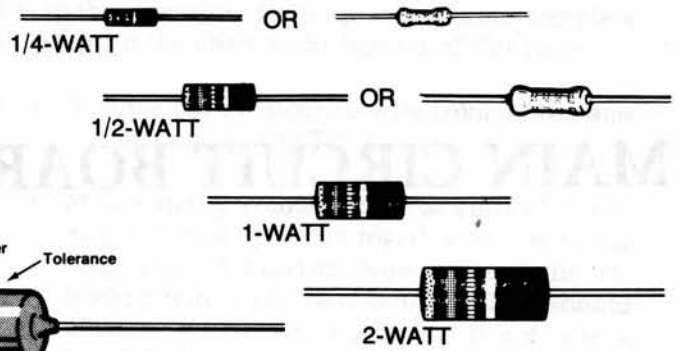
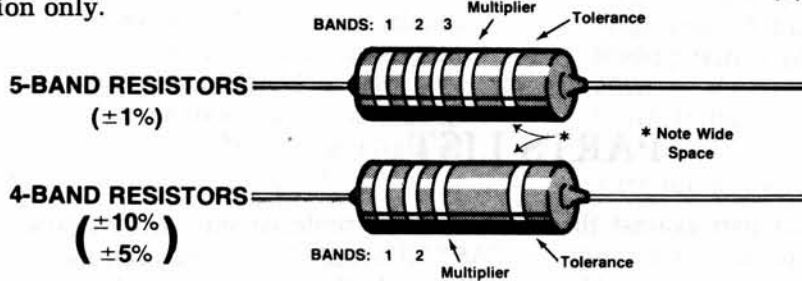






**PARTS**

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



Band 1 1st Digit	
Color	Digit
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Gray	8
White	9

Band 2 2nd Digit	
Color	Digit
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Gray	8
White	9

Band 3 (if used) 3rd Digit	
Color	Digit
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Gray	8
White	9

Multiplier	
Color	Multiplier
Black	1
Brown	10
Red	100
Orange	1,000
Yellow	10,000
Green	100,000
Blue	1,000,000
Silver	0.01
Gold	0.1

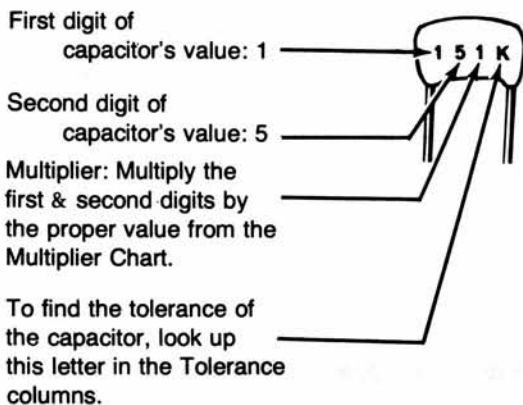
Resistance Tolerance	
Color	Tolerance
Silver	$\pm 10\%$
Gold	$\pm 5\%$
Brown	$\pm 1\%$

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

**EXAMPLES:**

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

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



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	$\pm 20\%$

\*DuPont Registered Trademark

# MAIN CIRCUIT BOARD

## PARTS LIST

Unpack 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 Pictorials" in the separate "Illustration Booklet."

To order a replacement part: Always include the PART NUMBER. Use the Parts Order Form furnished with the kit. If one is not available, see "Replacement Parts" inside the rear cover of the Manual. Your Warranty is located inside the front cover. For prices, refer to the separate "Heath Parts Price List."

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

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

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

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

### RESISTORS

#### NOTES:

- All resistors are 5% tolerance (gold fourth band) unless otherwise noted. A fourth color band of silver indicates a 10% tolerance.
- 1% precision resistors have five color bands. The fifth color band will be brown and will not be called out.
- The resistors may be packed in more than one envelope. Open all resistor envelopes in this pack before you check them against the Parts List.

#### 1/4-Watt

A1	6-101-12	2	100 $\Omega$ (brown-black-brown)	R190, R197
A1	6-221-12	1	220 $\Omega$ (red-red-brown)	R110
A1	6-561-12	1	560 $\Omega$ (green-blue-brown)	R111
A1	6-681-12	4	680 $\Omega$ (blue-gray-brown)	R137, R139, R142, R170

### Resistors (cont'd.)

A1	6-122-12	38	1200 $\Omega$ (brown-red-red)	R108, R109, R112, R113, R114, R116, R117, R119, R121, R123, R124, R126, R127, R129, R131, R133, R134, R136, R152, R153, R154, R155, R156, R157, R158, R159, R161, R162, R164, R167, R168, R174, R177, R180, R185, R187, R198, R199
A1	6-222-12	4	2200 $\Omega$ (red-red-red)	R138, R141, R143, R173
A1	6-272-12	2	2700 $\Omega$ (red-violet-red)	R105, R175
A1	6-392-12	2	3900 $\Omega$ (orange-white-red)	R178, R179
A1	6-472-12	1	4700 $\Omega$ (yellow-violet-red)	R186



KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
<b>Resistors (cont'd.)</b>				
A1	6-562-12	3	5600 $\Omega$ (green-blue-red)	R184, R188, R196
A1	6-103-12	1	10 k $\Omega$ (brown-black-orange)	R165
A1	6-183-12	1	18 k $\Omega$ (brown-gray-orange)	R166
A1	6-683-12	1	68 k $\Omega$ (blue-gray-orange)	R106
A1	6-104-12	1	100 k $\Omega$ (brown-black-yellow)	R151
A1	6-105-12	2	1 M $\Omega$ (brown-black-green)	R182, R183

### Precision Resistors, 1%, 1/4-Watt

A2	6-2109-12	1	21 $\Omega$ (red-brown-black white) <b>GOLD</b>	R192
A2	6-4709-12	1	47 $\Omega$ (yellow-violet-black-white) <b>GOLD</b>	R193
A2	6-3300-12	1	330 $\Omega$ (orange-orange-black-black)	R194
A2	6-1001-12	1	1000 $\Omega$ (brown-black-black-brown)	R171
A2	6-6001-12	1	6000 $\Omega$ (blue-black-black-brown)	R172
A2	6-1002-12	1	10 k $\Omega$ (brown-black-black-red)	R191

### 1/2-Watt

A3	6-391	2	390 $\Omega$ (orange-white-brown)	R148, R149
A3	6-471	8	470 $\Omega$ (yellow-violet-brown)	R101, R102, R103, R104, R107, R165, R176, R181

### Other Resistors

A4	1-20-1	7	330 $\Omega$ , 1-watt, 10% (orange-orange-brown)	R115, R118, R122, R125, R128, R132, R135
A4	3-2-2	1	0.33 $\Omega$ , 2-watt (orange-orange-silver)	R169
A5	3-26-5	1	390 $\Omega$ , 5-watt	R189

### CONTROL

A6	11-90	1	200 $\Omega$	R195
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### CAPACITORS

B1	21-6	1	27 pF ceramic	C108
B1	21-722	7	330 pF ceramic	C101 through C107
B1	21-36	1	.002 $\mu$ F ceramic	C110
B1	21-143	3	.05 $\mu$ F ceramic	C109, C111, C112
B1	21-199	9	0.1 $\mu$ F ceramic	C114, C116, C117, C118, C119, C121, C122, C123, C124

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
<b>Capacitors (Cont'd.)</b>				
B2	25-220	1	10 $\mu$ F (10 M) tantalum	C115
B2	25-281	1	39 $\mu$ F (39 k) tantalum	C127
B3	25-262	1	250 $\mu$ F electrolytic	C126
B3	25-901	1	220 $\mu$ F electrolytic	C113
B4	25-824	1	500 $\mu$ F electrolytic	C125

### DIODES

C1	56-50	1	DO-7 zener (3.6 V)	ZD109
C1	56-56	7	1N4149	D101, D102, D111, D112, D113, D126, D127
C1	56-605	7	1N4746A (18 V) zener	ZD101, ZD102, ZD103, ZD104, ZD105, ZD106, ZD107
C1	56-612	1	1N5229 (4.3 V) zener	ZD108
C1	57-42	6	3A1	D118, D119, D121, D122, D123, D125
C1	57-65	8	1N4002	D103, D104, D105, D106, D107, D108, D109, D124, LED101, LED102
C2	412-616	2	LED	

### TRANSISTORS

NOTE: Transistors 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	417-263	7	SJE607	Q104, Q106, Q108, Q110, Q112, Q114, Q116
D2	417-801	1	MPSA20	Q128
D2	417-864	9	MPSA05	Q103, Q105, Q107, Q109, Q111, Q113, Q115, Q126, Q127
D2	417-865	4	MPSA55	Q101, Q124, Q125, Q129
D2	417-897	1	Selected	Q102
D3	57-612	3	T2302F or H103SG triac	Q117, Q118, Q119



KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
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**SWITCHES**

E1	60-621	1	Switch assembly	SW102
E2	64-838	1	Pushbutton switch	SW101

**INTEGRATED CIRCUITS****NOTES:**

- Integrated circuits are marked for identification in one of the following four ways:
  - Part number.
  - Type number. (This refers only to the numbers; the letters may be different or missing.)
  - Part number and type number.
  - Part number with a type number other than the one listed.
- Some of the IC's may be packed in conductive foam. Do not remove the IC's from the foam until you are instructed to do so.

F1	442-616	1	LM3302N or LM2901	U117
F1	443-6	1	SN7474N	U107
F1	443-73	3	SN7416N	U114, U115, U116
F1	443-728	1	SN74LS00N	U108
F1	443-794	1	SN75188N or 1488	U104
F1	443-795	1	SN75189N or 1489	U103
F2	443-721	2	2112-2 P7810	U112, U113
F3	443-791	2	SN74LS244N	U109, U110
F3	443-805	1	SN74LS273N	U111
F4	443-808	2	4N26	U101, U102
F5	443-874	1	8250D	U105
F5	444-31	1	3870 (custom)	U106

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

**MISCELLANEOUS**

G1	75-159	3	Transistor insulator	
G2	260-65	2	Fuse clip	
G3	404-536	1	4 MHz crystal	Y101
G4	421-63	1	6/10-ampere slow-blow fuse	F101
G5	432-921	1	3-pin connector	S103
G6	432-932	21	Connector pin	J101 through J119, TP101, TP102
G7	432-1039	1	15-pin connector	S102
G8	434-253	2	40-pin IC socket	
G9	434-298	8	14-pin IC socket	
G10	434-299	3	16-pin IC socket	
G11	434-311	3	20-pin IC socket	
G12	434-315	2	6-pin IC socket	
	490-185	1	Solder braid	
G13	490-189	1	IC puller	

**PARTS FROM FINAL PACK**

85-2147-1	1	Circuit board
340-2	8"	Bare wire (in the wire pack)
346-21	4"	Small clear sleeving
597-260	1	Parts Order Form
	1	Assembly Manual (See Page 1 for part number)
		Solder

# STEP-BY-STEP ASSEMBLY

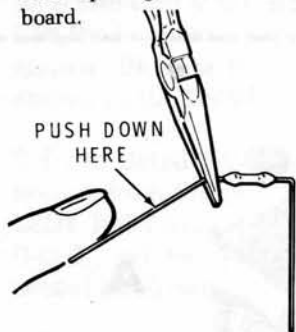
## CONTINUE

### 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.

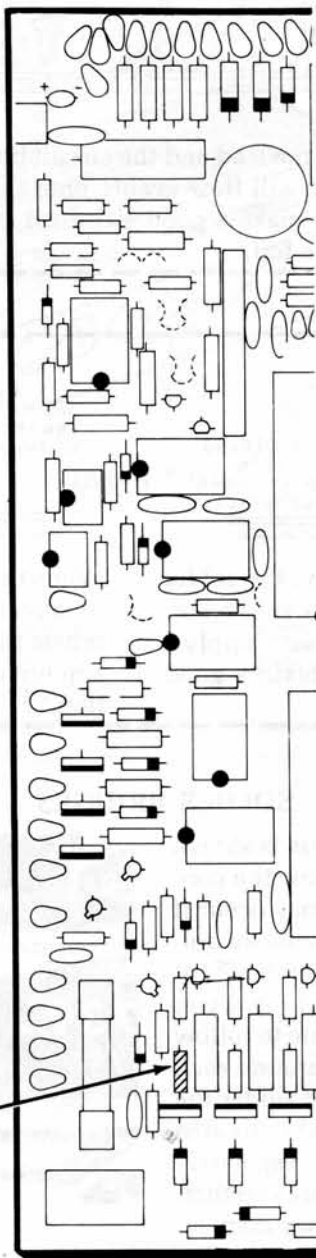
- ( ) Position the circuit board as shown with the printed side up.

- ( ) R136: Hold a 1200 Ω (brown-red-red) resistor as shown and bend the leads straight down with long-nose pliers to fit the hole spacing on the circuit board.



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

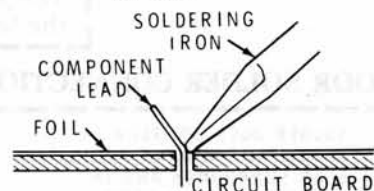
- ( ) Press the resistor against the circuit board. Then bend the leads outward slightly to hold the resistor in place.



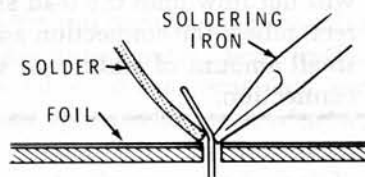
PICTORIAL 1-1

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

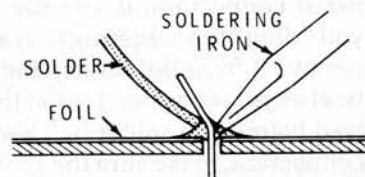
1. Push the soldering iron tip against both the lead and the circuit board foil. Heat both for two or three seconds.



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



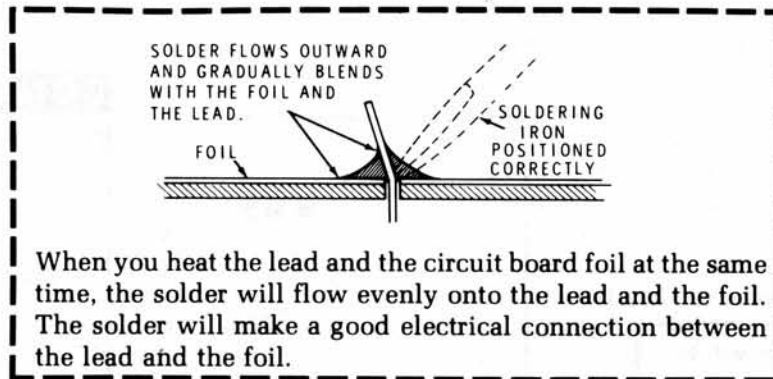
3. As the solder begins to melt, allow it to flow around the connection. Then remove the solder and the iron and let the connection cool.



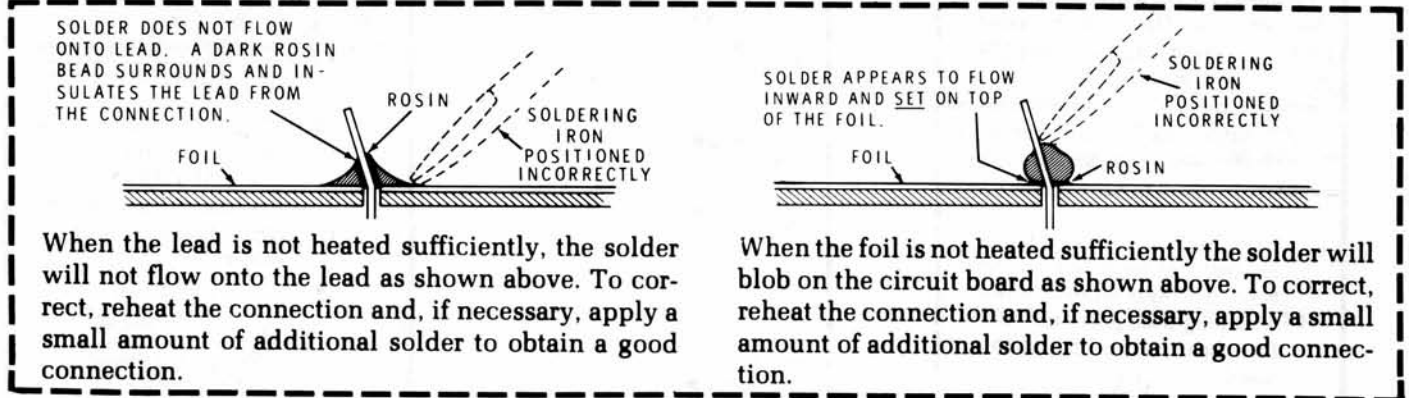
- ( ) Cut off the excess lead lengths close to the connection. WARNING: Clip the leads so the ends will not fly toward your eyes.

- ( ) Check each connection. Compare it to the illustration on Page 12. After you have checked the solder connections, proceed with the assembly on Page 13. Use the same soldering procedure for each connection.

## A GOOD SOLDER CONNECTION



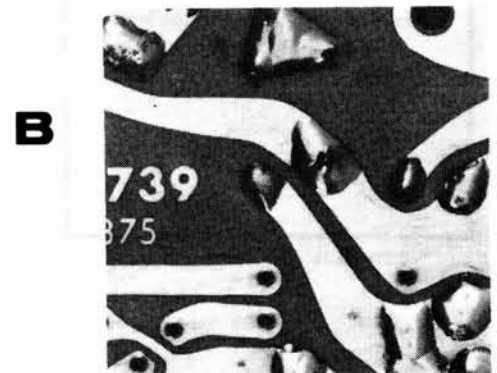
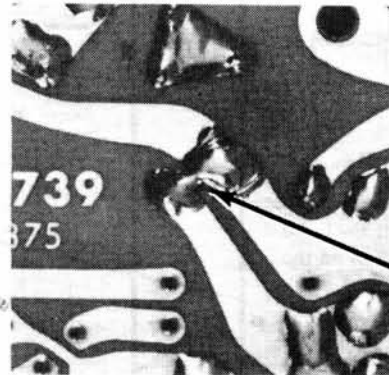
## POOR SOLDER CONNECTIONS



## SOLDER BRIDGES

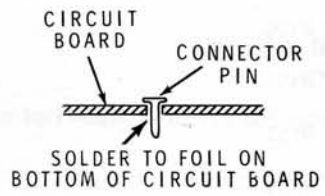
A solder bridge between two adjacent foils is shown in photograph A. Photograph B shows how the connection should appear. A solder bridge may occur if you accidentally touch an adjacent previously soldered connection, if you use too much solder, or if you "drag" the soldering iron across other foils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

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

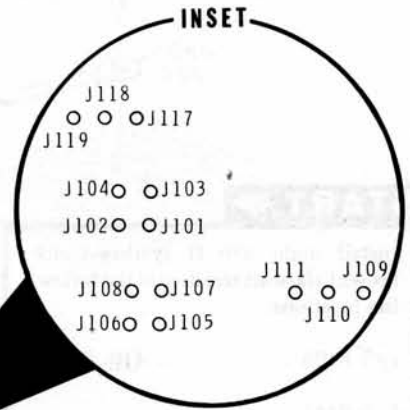
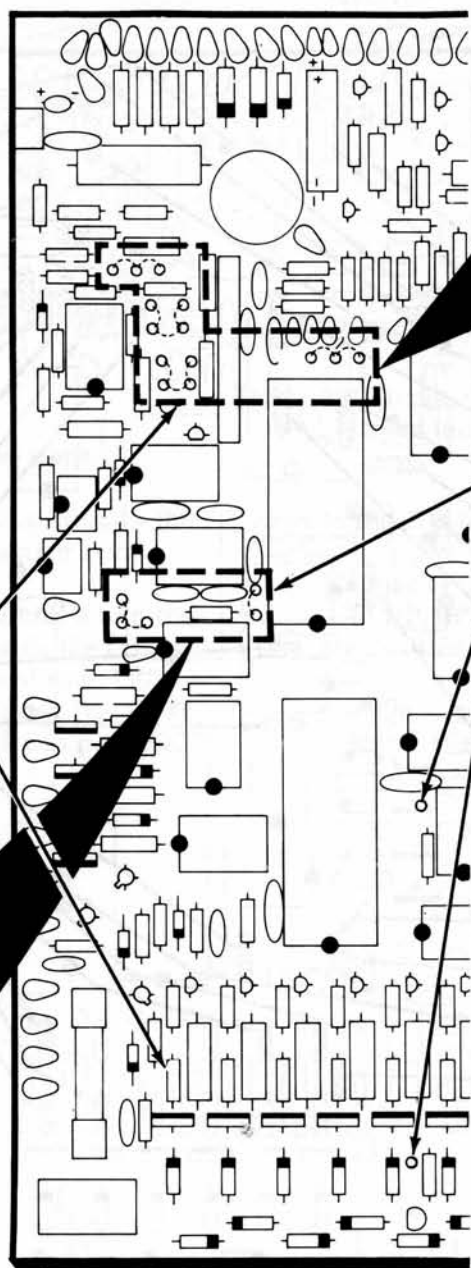
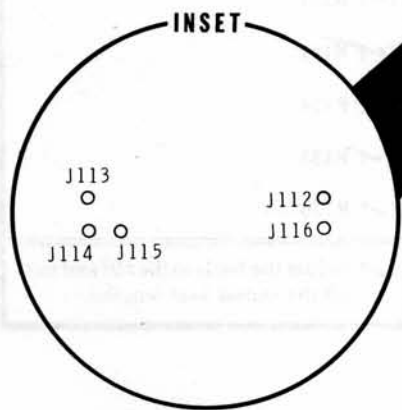


**START** ↘

In the following steps, install connector pins (#432-932) one at a time and solder each as it is installed. DO NOT cut the pins off.



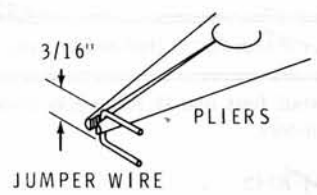
- (✓) Install fourteen connector pins at J101 through J111, and J117 through J119.
- (✓) Make sure you installed this resistor in Pictorial 1-1.



**CONTINUE** ↘

- (✓) Install five connector pins at J112 through J116.
- (✓) Install connector pins at TP101 and TP102.

( ) Cut five 5/8" bare wires. Bend each wire into a "U" shape as shown below:



Install jumper wires between the following connector pins:

- (↗) J117-J118.
- (↗) J101-J102.
- (↖) J105-J106.
- (↗) J109-J110.
- (↖) J114-J115.

PICTORIAL 1-2



**START** ↘

Install eight 470 Ω (yellow-violet-brown) 1/2-watt resistors at the following locations.

- ( ↘ ) R165 .....
- ( ↘ ) R181 .....
- ( ↘ ) R176 .....
- ( ↘ ) R101 .....
- ( ↘ ) R102 .....
- ( ↘ ) R104 .....
- ( ↘ ) R107 .....
- ( ↘ ) R103 .....

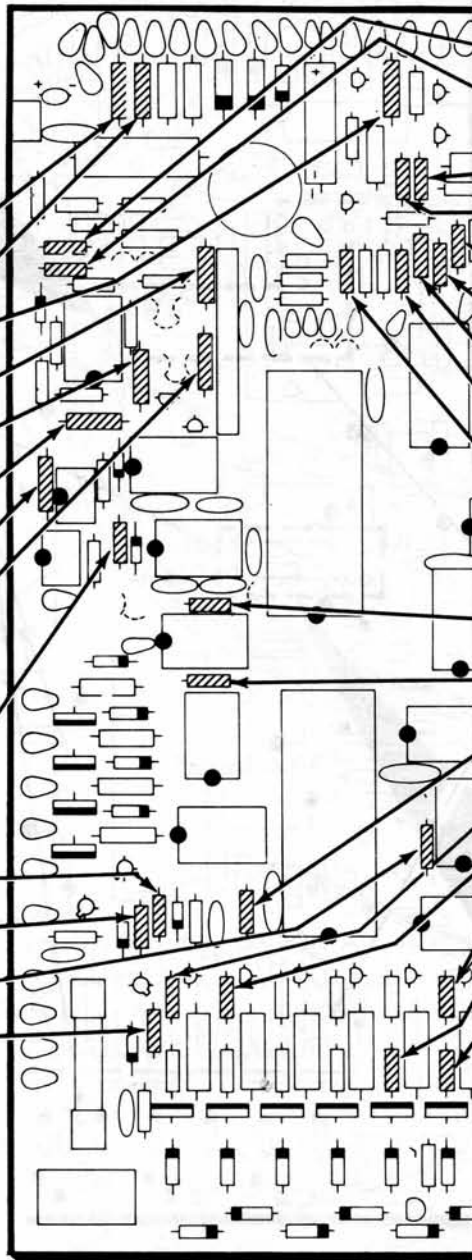
( ↘ ) Solder the leads to the foil and cut off the excess lead lengths.

( ↘ ) R110: 220 Ω (red-red-brown).

Install four 680 Ω (blue-gray-brown) resistors.

- ( ↘ ) R142 .....
- ( ↘ ) R137 .....
- ( ↘ ) R170 .....
- ( ↘ ) R139 .....

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



**CONTINUE** ↘

Install thirty-seven 1200 Ω (brown-red-red) resistors at the following locations.

- ( ↘ ) R185.
- ( ↘ ) R187.
- ( ↘ ) R174.
- ( ↘ ) R167.
- ( ↘ ) R158.
- ( ↘ ) R156.
- ( ↘ ) R157.
- ( ↘ ) R152.
- ( ↘ ) R155.

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

( ↘ ) R108.

( ↘ ) R177.

( ↘ ) R109.

( ↘ ) R134.

( ↘ ) R121.

( ↘ ) R124.

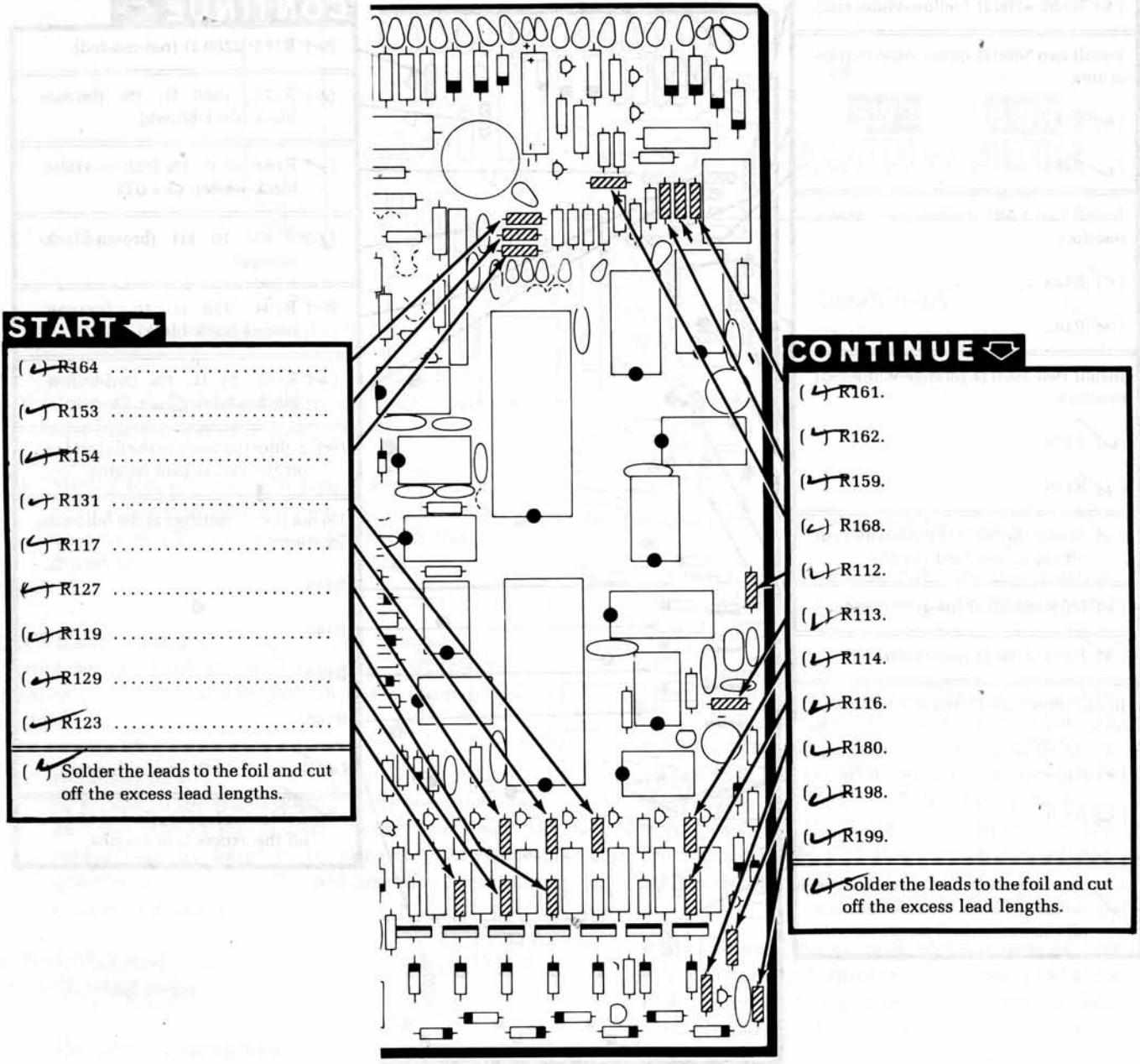
( ↘ ) R133.

( ↘ ) R126.

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

PICTORIAL 1-3





**START** ↘

- (✓) R164 .....
  - (✓) R153 .....
  - (✓) R154 .....
  - (✓) R131 .....
  - (✓) R117 .....
  - (✓) R127 .....
  - (✓) R119 .....
  - (✓) R129 .....
  - (✓) R123 .....
- 
- (✓) Solder the leads to the foil and cut off the excess lead lengths.

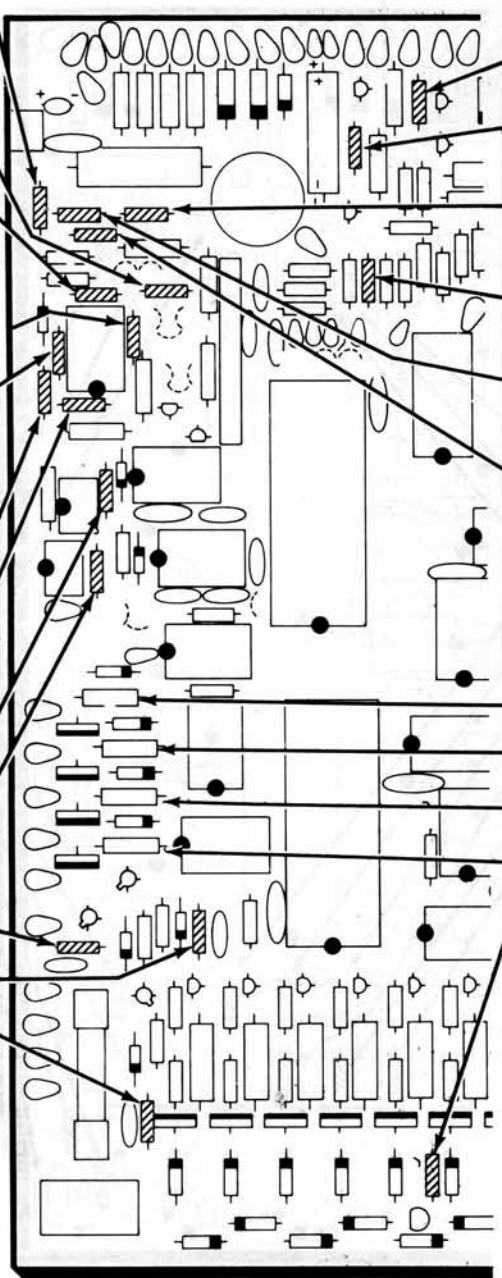
**CONTINUE** ↘

- (✓) R161.
  - (✓) R162.
  - (✓) R159.
  - (✓) R168.
  - (✓) R112.
  - (✓) R113.
  - (✓) R114.
  - (✓) R116.
  - (✓) R180.
  - (✓) R198.
  - (✓) R199.
- 
- (✓) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 1-4

**START** ↘

- (  ) R186: 4700 Ω (yellow-violet-red).
- Install two 5600 Ω (green-blue-red) resistors.
- (  ) R184 .....
- (  ) R188 .....
- Install two 1 MΩ (brown-black-green) resistors.
- (  ) R183 .....
- (  ) R182 .....
- Install two 3900 Ω (orange-white-red) resistors.
- (  ) R178 .....
- (  ) R179 .....
- (  ) Solder the leads to the foil and cut off the excess lead lengths.
- (  ) R106: 68 kΩ (blue-gray-orange).
- (  ) R105: 2700 Ω (red-violet-red).
- Install three 2200 Ω (red-red-red) resistors.
- (  ) R138 .....
- (  ) R143 .....
- (  ) R141 .....
- (  ) Solder the leads to the foil and cut off the excess lead lengths.



**CONTINUE** ↘

- (  ) R173: 2200 Ω (red-red-red).
- (  ) R171: 1000 Ω, 1% (brown-black-black-brown)
- (  ) R193: 47 Ω, 1% (yellow-violet-black-white). **GOLD**
- (  ) R165: 10 kΩ (brown-black-orange).
- (  ) R194: 330 Ω, 1% (orange-orange-black-black).
- (  ) R192: 21 Ω, 1% (red-brown-black-white). **GOLD**
- (  ) Solder the leads to the foil and cut off the excess lead lengths.
- Do not install resistors at the following locations.
- R145.
- R144.
- R147.
- R146.
- (  ) R196: 5600 Ω (green-blue-red).
- (  ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 1-5

**START** ↘

Install two 390 Ω (orange-white-brown), 1/2-watt, 5% resistors.

(↘) R149 .....

(↘) R148 .....

(↘) R191: 10 kΩ, 1% (brown-black-black-red).

Install seven 330 Ω (orange-orange-brown), 1-watt, 10% resistors.

(↘) R115 .....

(↘) R125 .....

(↘) R132 .....

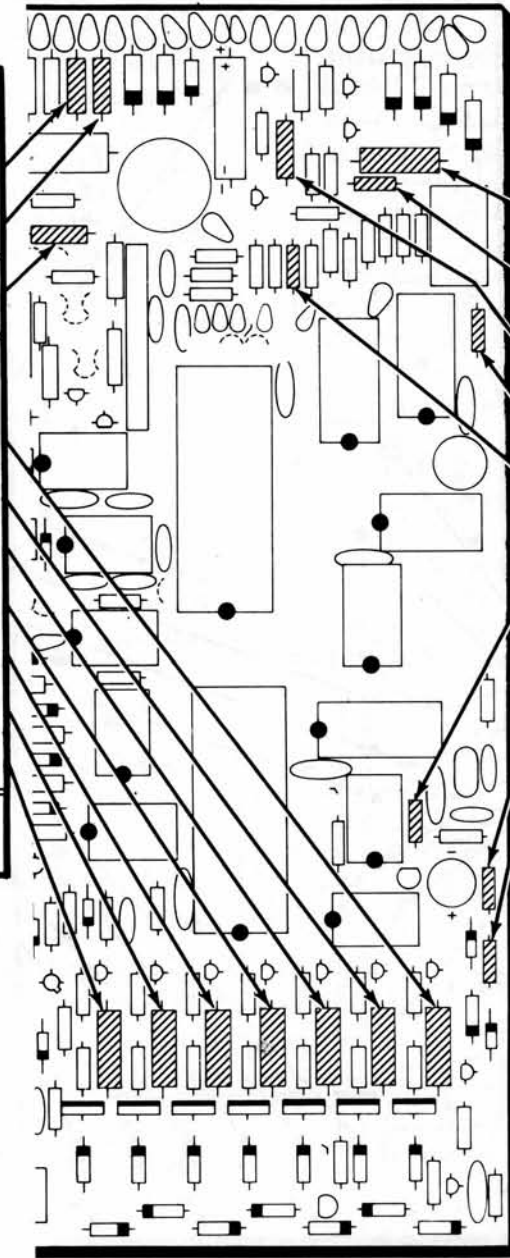
(↘) R118 .....

(↘) R128 .....

(↘) R122 .....

(↘) R135 .....

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



**CONTINUE** ↘

(↘) R169: 0.33 Ω (orange-orange-silver), 2-watt, 10%.

(↘) R175: 2700 Ω (red-violet-red).

(↘) R172: 6000 Ω, 1% (blue-black-black-brown).

(↘) R166: 18 kΩ (brown-gray-orange).

(↘) R151: 100 kΩ (brown-black-yellow).

(↘) R111: 560 Ω (green-blue-brown).

Install two 100 Ω (brown-black-brown) resistors.

(↘) R190.

(↘) R197.

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

NOTE: The 390 Ω, 5-watt resistor will be installed later.

PICTORIAL 1-6

**START** →

**NOTE:** When you install a diode, always match the band on the diode with the band mark on the circuit board. A DIODE WILL NOT WORK IF IT IS INSTALLED BACKWARDS. See Detail 1-7A at the bottom of this column.

If your diode has a solid body, the band is clearly defined. If your diode has a glass body, do not mistake the colored end inside the diode for the banded end. Look for a band painted on the outside of the glass.

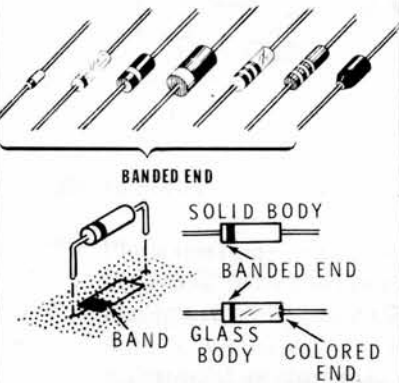
(✓) ZD108: 1N5229 zener diode (#56-612).

Install five 1N4149 diodes (#56-56).

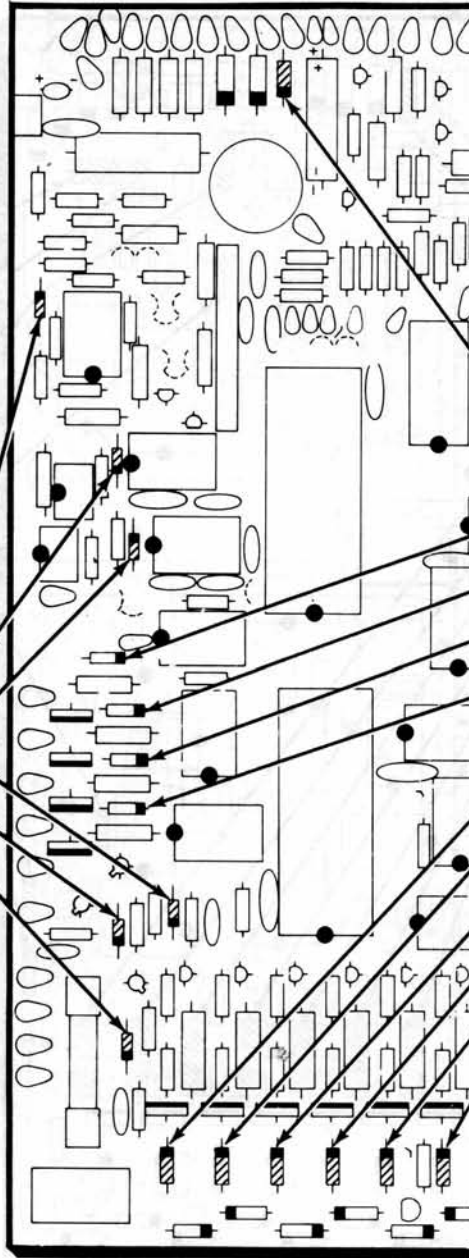
- (✓) D102 .....
- (✓) D101 .....
- (✓) D113 .....
- (✓) D111 .....
- (✓) D112 .....

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

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



**Detail 1-7A**



**CONTINUE** →

( ) D124: 1N4002 diode (#57-65).

Do not install parts at the following locations.

- D115.
- D114.
- D117.
- D116.

Install six 1N4002 diodes (#57-65).

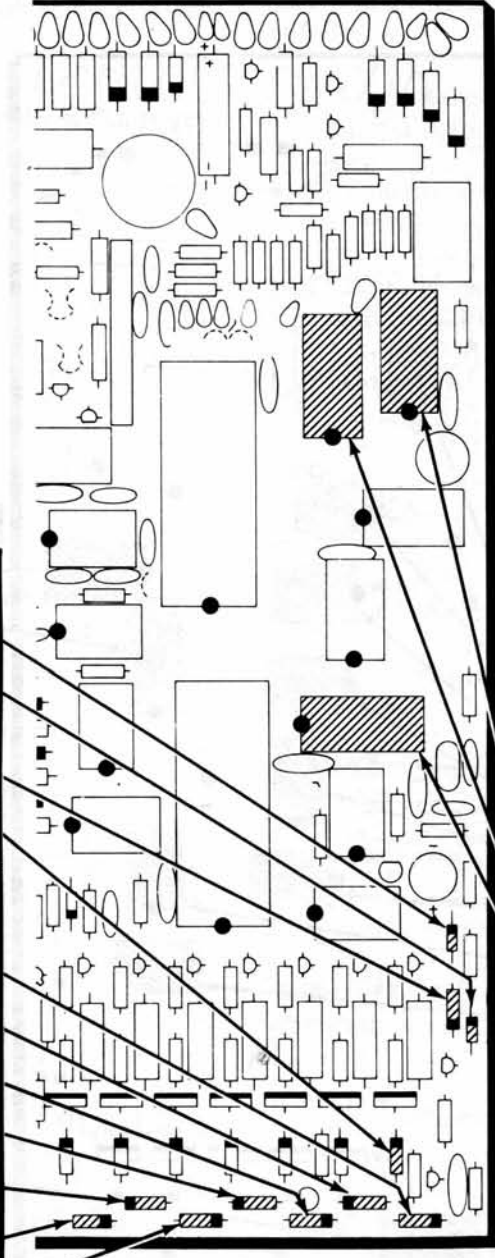
- (✓) D109.
- (✓) D105.
- (✓) D107.
- (✓) D104.
- (✓) D108.
- ( ) D106.

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

**PICTORIAL 1-7**

**START** ↘

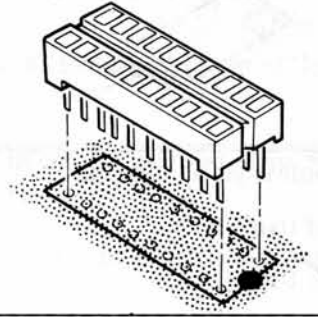
- Install two 1N4149 diodes (#56-56).
- (✓) D126 .....
- (✓) D127 .....
- 
- (✓) ZD109: DO-7 zener diode (#56-50).
- 
- ( ) D103: 1N4002 diode (#57-65).
- 
- Install seven 1N4746A zener diodes (#56-605).
- (✓) ZD104 .....
- (✓) ZD101 .....
- (✓) ZD102 .....
- (✓) ZD106 .....
- (✓) ZD105 .....
- (✓) ZD107 .....
- (✓) ZD103 .....
- 
- (✓) Solder the leads to the foil and cut off the excess lead lengths.



**CONTINUE** ↘

NOTE: When you install an IC socket, use the following procedure:

1. Be sure all the pins are straight.
2. Insert the pins into the holes.
3. Turn the circuit board over and be sure the correct number of pins extend from the board. If not, one or more pins may be bent under the socket. Remove the socket, straighten the pins, and reinstall the socket.
4. Solder the pins to the foil as you install each socket.



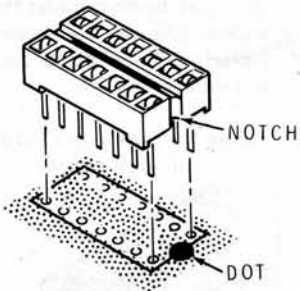
Install three 20-pin IC sockets at the following locations:

- (✓) U110.
- (✓) U109.
- (✓) U111.

PICTORIAL 1-8

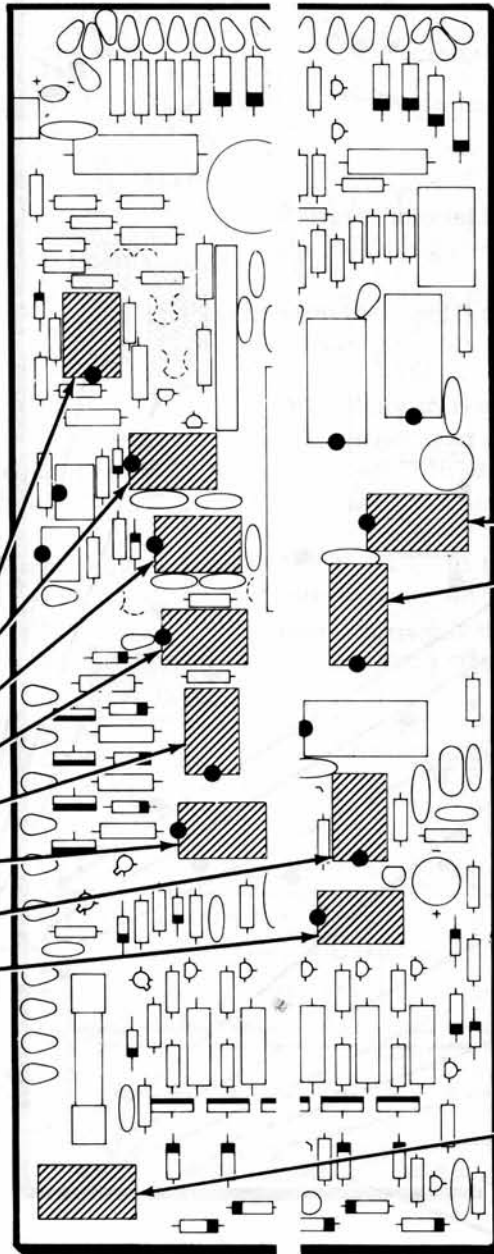
**START** →

NOTE: Make sure the notch on each IC socket is positioned as shown when you install the following IC sockets.



Install 14-pin IC sockets at:

- ( / ) U117 .....
- ( / ) U104 .....
- ( / ) U103 .....
- ( / ) U107 .....
- ( / ) U116 .....
- ( / ) U115 .....
- ( / ) U108 .....
- ( / ) U114 .....

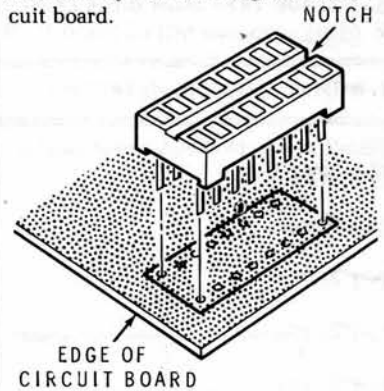


**CONTINUE** →

( / ) 16-pin IC socket at U113.

( / ) 16-pin IC socket at U112.

NOTE: When you install the following IC socket, position the notch on the socket away from the edge of the circuit board.

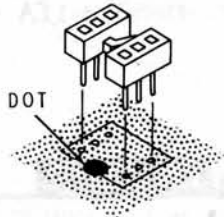


( ) 16-pin IC socket at S101.

PICTORIAL 1-9

**START** ↘

NOTE: When you install the next two IC sockets, make sure the sockets are positioned as shown:



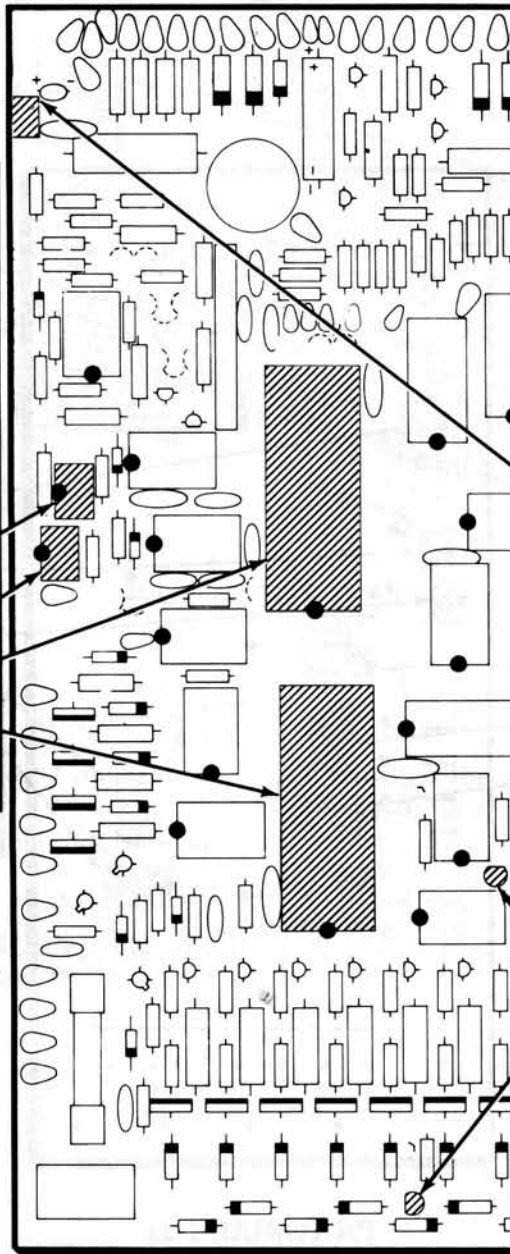
✓ 6-pin IC socket at U102.

✓ 6-pin IC socket at U101.

✓ 40-pin IC socket at U105.

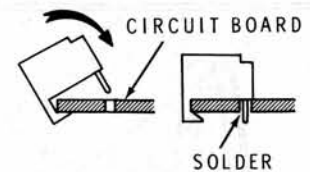
✓ 40-pin IC socket at U106.

NOTE: Do not install IC's at this time.



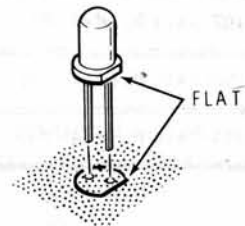
**CONTINUE** ↘

NOTE: When you install the 3-pin connector in the following step, place the edge mount retainers under the edge of the circuit board and then rotate the connector to insert the solder terminals through the circuit board holes.



✓ S103: 3-pin connector (#432-921).

IMPORTANT: As you install LED's in the following steps, be sure to match the flat on each LED with the outline of the flat on the circuit board as shown.



✓ LED102: Push the LED down against the circuit board; then solder the leads to the foil and cut off the excess lead lengths.

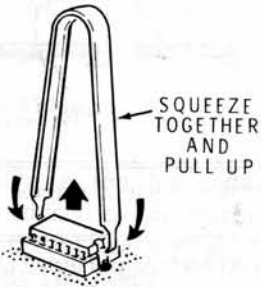
✓ LED101: Push the LED down against the circuit board; then solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 1-10

**START** 

**NOTES:**

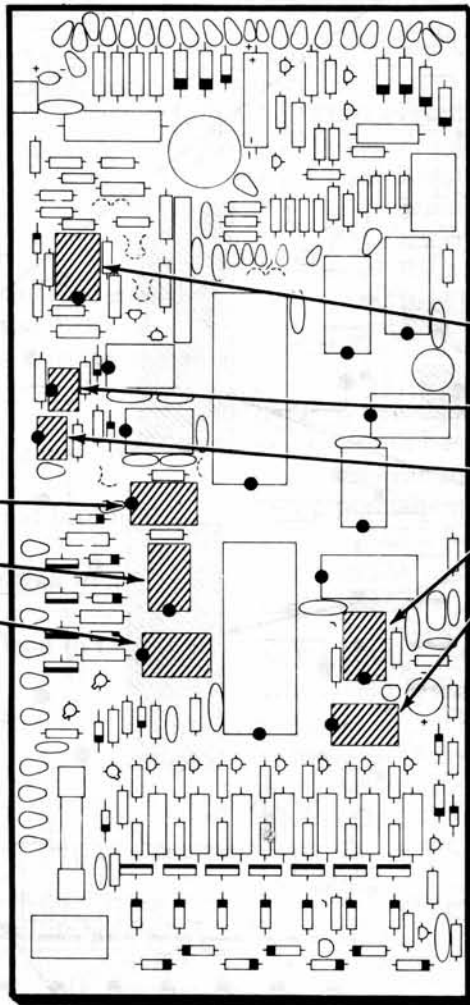
1. Refer to Detail 1-11A and, as you install each IC in the following steps, position the pin 1 end (as shown in Part A of the Detail) toward the index mark on the circuit board (see Part B). Then insert the IC leads into the socket and push the IC down into place.
2. If you need to remove an IC from its socket, use the IC puller furnished with your kit, as shown below.



U107: 7474 IC (#443-6).

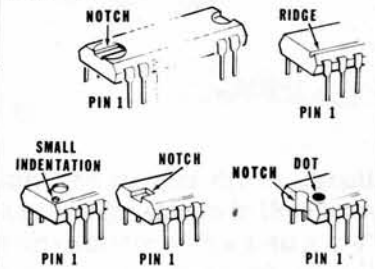
U116: 7416 IC (#443-73).

U115: 7416 IC (#443-73).

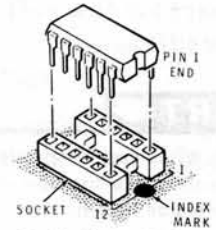


**PICTORIAL 1-11**

**PART A**



**PART B**



**Detail 1-11A**

**CONTINUE** 

U117: 2901 (or 3301) IC (#442-616).

U102: 4N26 IC (#443-808).

U101: 4N26 IC (#443-808).

U108: 74LS00 IC (#443-728).

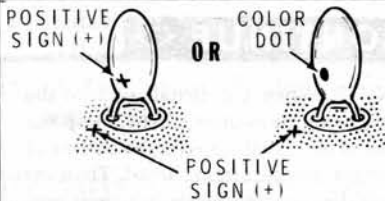
U114: 7416 IC (#443-73).

**NOTE:** Do not install any other IC's at this time.

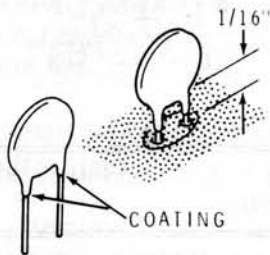


**START** →

( ) C115: 10  $\mu$ F (10 M) tantalum. Be sure to install the lead marked with the positive (+) mark or color dot on the capacitor in the positive (+) marked hole on the circuit board.



NOTE: A coating on ceramic capacitor leads next to the capacitor body will sometimes make soldering difficult. When you install one of these capacitors, position it 1/16" off the circuit board. This will prevent the coating from protruding through the circuit board.



(✓) C114: .1  $\mu$ F ceramic.

(✓) C123: .1  $\mu$ F ceramic.

(✓) C103: 330 pF ceramic.

(✓) C101: 330 pF ceramic.

(✓) C102: 330 pF ceramic.

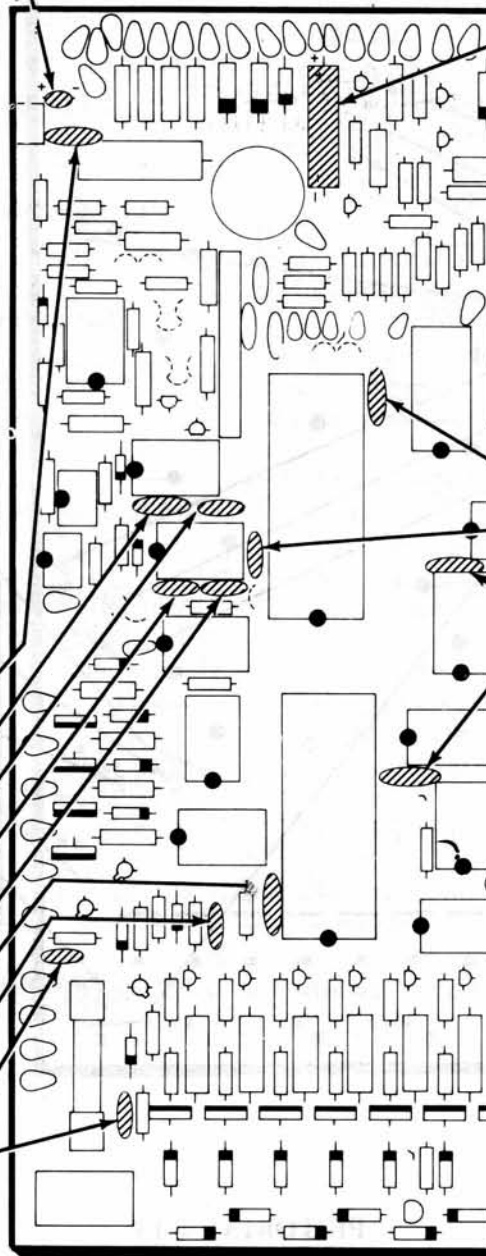
(✓) C116: .1  $\mu$ F ceramic.

(✓) C112: .05  $\mu$ F ceramic.

(✓) C109: .05  $\mu$ F ceramic.

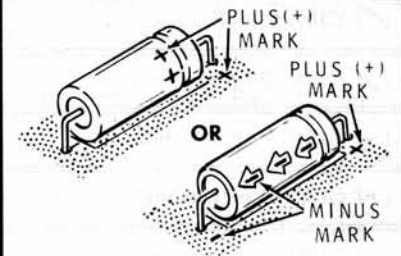
(✓) C111: .05  $\mu$ F ceramic.

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



**CONTINUE** →

(✓) C113: 220  $\mu$ F electrolytic. The circuit board may be marked "250." Be sure to install the lead marked with the positive (+) mark in the positive (+) marked hole on the circuit board, or install the minus (-) marked lead in the minus marked hole.



(✓) C122: .1  $\mu$ F ceramic.

(✓) C104: 330 pF ceramic.

(✓) C119: .1  $\mu$ F ceramic.

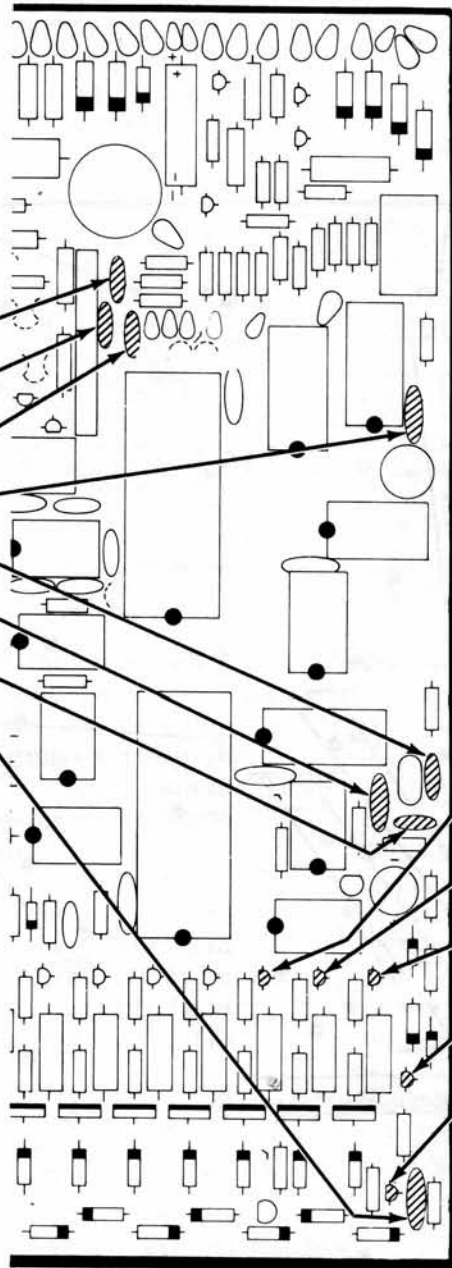
(✓) C117: .1  $\mu$ F ceramic.

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

PICTORIAL 1-12

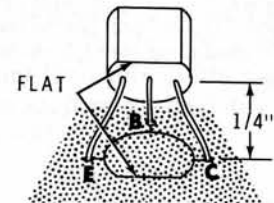
**START**

- (  ) C106: 330 pF ceramic.
- (  ) C107: 330 pF ceramic.
- (  ) C105: 330 pF ceramic.
- (  ) C121: .1  $\mu$ F ceramic.
- (  ) C108: 27 pF ceramic.
- (  ) C118: .1  $\mu$ F ceramic.
- (  ) C110: .002  $\mu$ F ceramic.
- (  ) C124: .1  $\mu$ F ceramic.
- (  ) Solder the leads to the foil and cut off the excess lead lengths.



**CONTINUE**

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



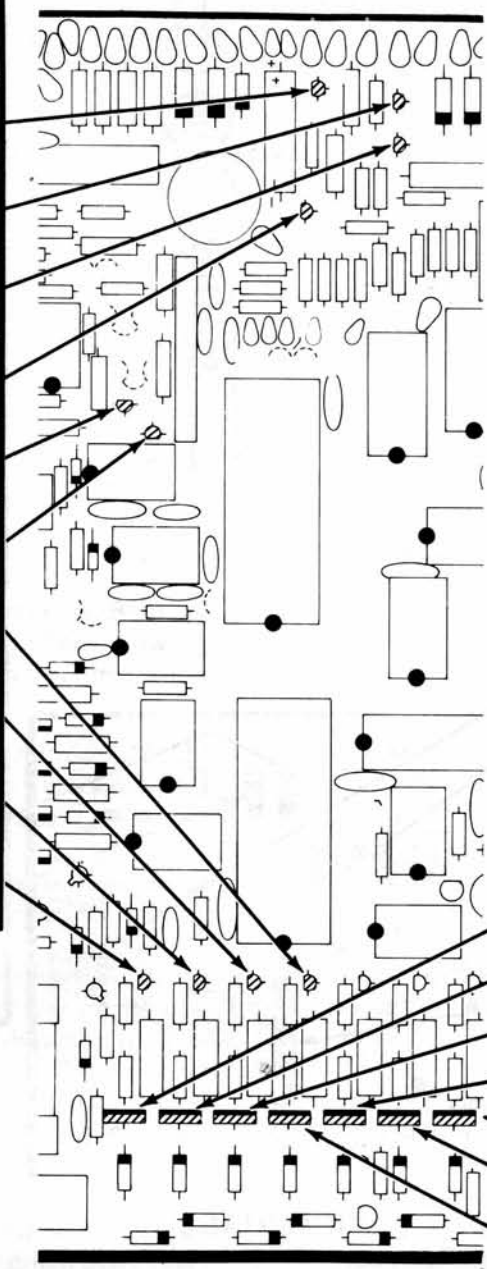
- (  ) Q113: MPSA05 transistor (#417-864).
- (  ) Q109: MPSA05 transistor (#417-864).
- (  ) Q103: MPSA05 transistor (#417-864).
- (  ) Q128: MPS-A20 (#417-801).
- (  ) Q129: MPSA55 transistor (#417-865).

PICTORIAL 1-13

**START** ▾

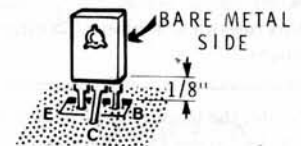
NOTE: In the following steps, be careful not to intermix the #417-865 and #417-864 transistors.

- (✓) Q125: MPSA55 transistor (#417-865).
- (✓) Q126: MPSA05 transistor (#417-864).
- (✓) Q127: MPSA05 transistor (#417-864).
- (✓) Q124: MPSA55 transistor (#417-865).
- (✓) Q101: MPSA55 transistor (#417-865).
- (✓) Q102: Selected transistor (#417-897).
- (✓) Q105: MPSA05 transistor (#417-864).
- (✓) Q111: MPSA05 transistor (#417-864).
- (✓) Q107: MPSA05 transistor (#417-864).
- (✓) Q115: MPSA05 transistor (#417-864).



**CONTINUE** ▾

Install seven SJE607 transistors (#417-263). Solder each transistor as it is installed and cut off the excess lead lengths.

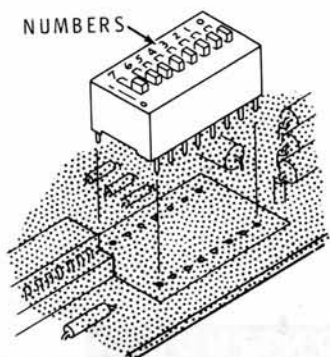


- (✓) Q116.
- (✓) Q108.
- (✓) Q112.
- (✓) Q114.
- (✓) Q104.
- (✓) Q110.
- (✓) Q106.

PICTORIAL 1-14

**START** →

NOTE: In the next step be sure to position the switch assembly with the numbers as shown. (It may have slide or rocker switches.)

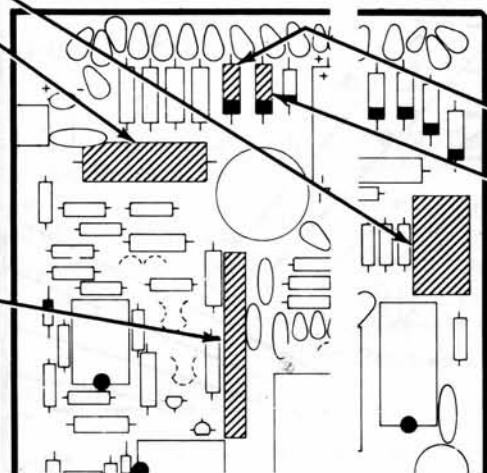
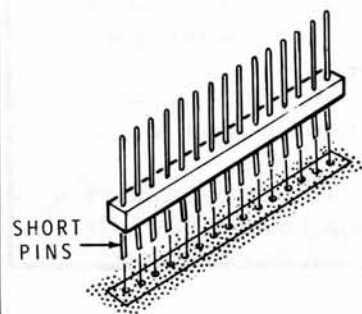


(✓) SW102: Switch assembly (#60-621).

(✓) R189: 390 Ω, 5-watt, 5%. Position this resistor 1/8" above the circuit board.

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

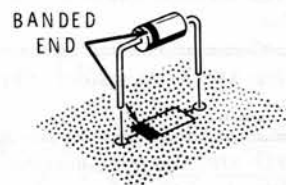
(✓) S102: 15-pin connector (#432-1039). Make sure you solder the **short** pins to the circuit board.



PICTORIAL 1-15

**CONTINUE** →

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



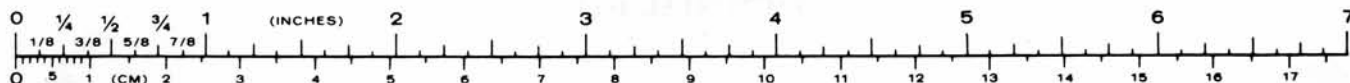
(✓) Cut four 5/16" pieces of small clear sleeving. Place one piece on each diode lead in the following two steps to space the diodes above the circuit board.



(✓) D125: 3A1 diode (#57-42).

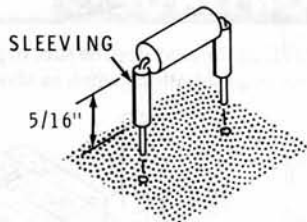
(✓) D123: 3A1 diode (#57-42).

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



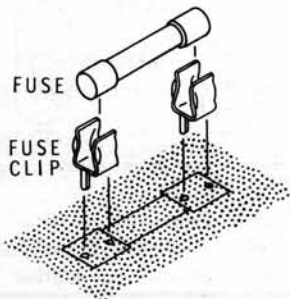
**START**

- ( ) Cut eight 5/16" pieces of small clear sleeving. Place the sleeving over the leads of the next four diodes.



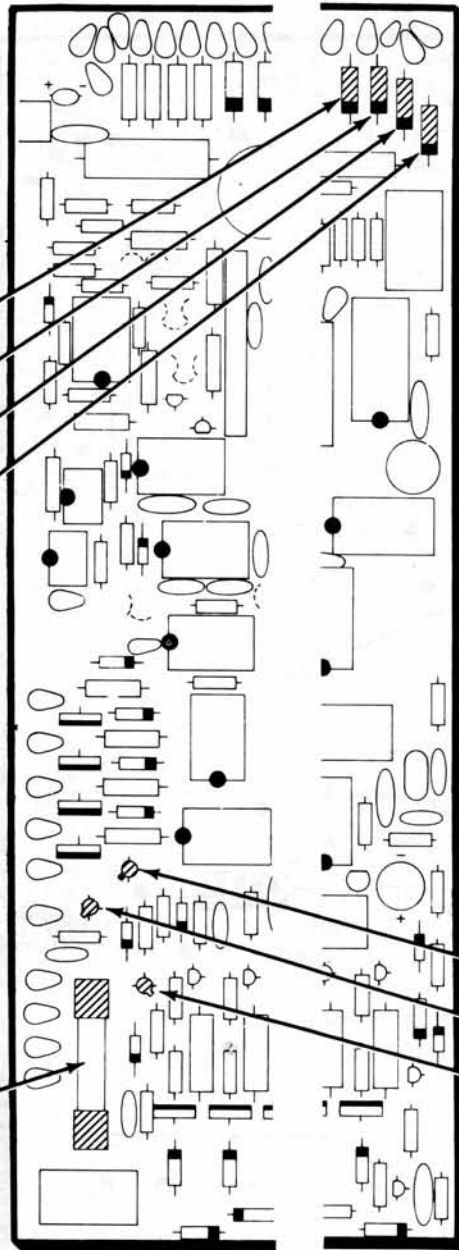
- ( ) D122: 3A1 diode (#57-42).
- ( ) D118: 3A1 diode (#57-42).
- ( ) D121: 3A1 diode (#57-42).
- ( ) D119: 3A1 diode (#57-42).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.

- ( ) Install a fuse clip (#260-65) on each end of the 6/10-ampere slow-blow fuse (#421-63) as shown.



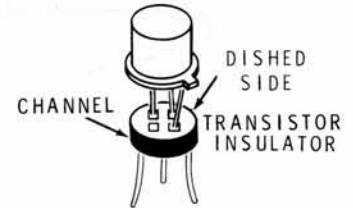
- ( ) F101: Install the fuse clips and fuse at the area marked 1 AMP.

- ( ) Solder the fuse clips to the foil. NOTE: Do not use excessive heat. Excessive heat will damage the fuse.

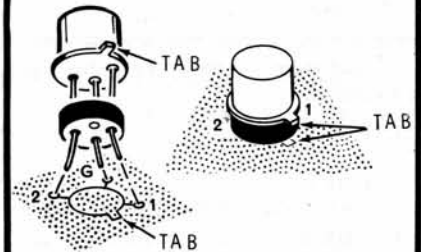


**CONTINUE**

- ( ) Install transistor insulators (#75-159) on three T2302F (H103SG) triacs (#57-612). Make sure the transistor insulator is installed as shown below:



NOTE: When you install each of the following three transistors, line up the tab on the transistor with the outline of the tab on the circuit board. Then install the leads in their correct 2, G, and 1 holes. Push the transistor down until the insulator touches the circuit board. Solder the leads to the foil and cut off the excess lead lengths.



- ( ) Q119: T2302F triac (#57-612).
- ( ) Q117: T2302F triac (#57-612).
- ( ) Q118: T2302F triac (#57-612).

PICTORIAL 1-16



PART 1

PART 2

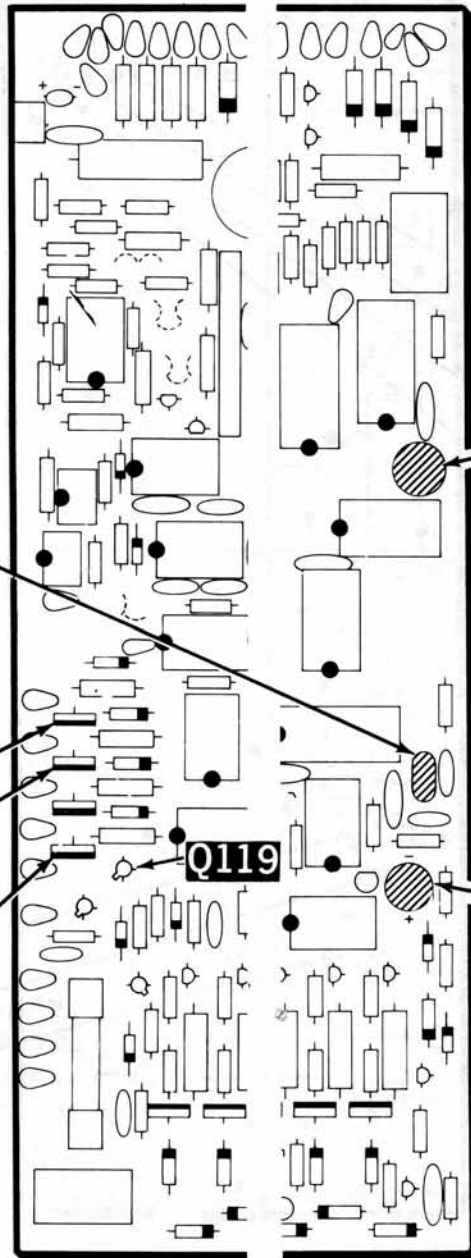
**START** ▾

(✓) Y101: 4 MHz crystal (#404-536).

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

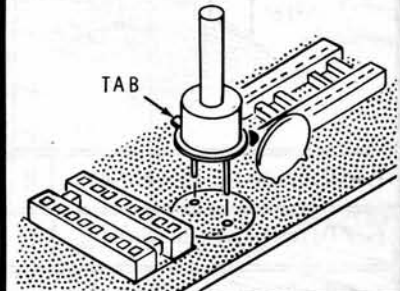
Do not install parts at the following locations.

- ( ) Q121 .....
- ( ) Q120 .....
- ( ) Q123 .....
- ( ) Q122 .....



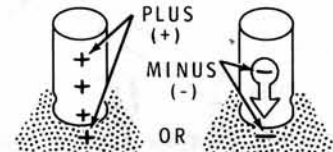
**CONTINUE** ▾

NOTE: In the next step, be sure to position the pushbutton switch as shown.



(✓) SW101: Pushbutton switch (#64-838).

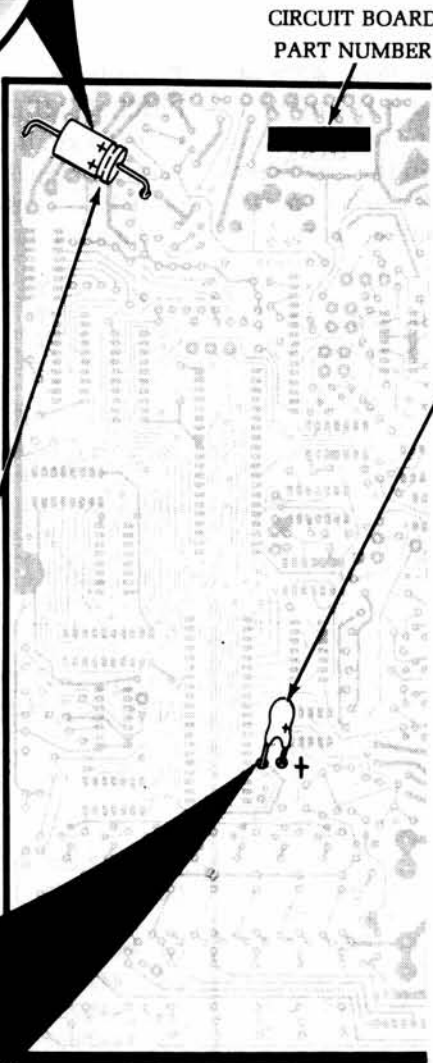
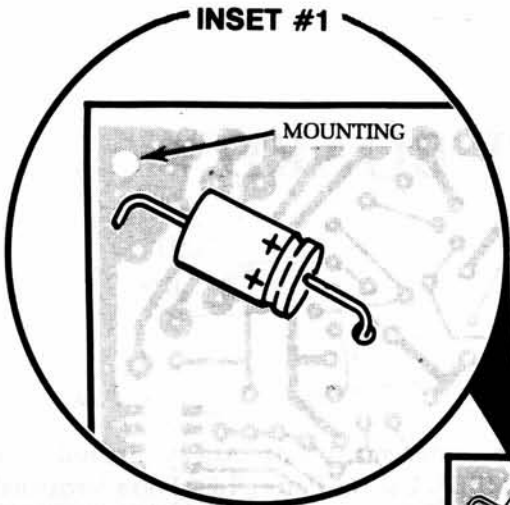
NOTE: When you install electrolytic capacitors, always match the positive (+) mark on the capacitor with the positive (+) mark on the circuit board OR match the minus (-) mark on the capacitor with the minus (-) mark on the circuit board.



(✓) C25: 500  $\mu$ F electrolytic.

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

PICTORIAL 1-17



**START** →

( ) Turn the circuit board component side down and position it as shown. The parts in the following steps will be installed on this side of the board.

NOTE: No circuit board holes are provided for the following parts. Solder the leads directly to the foil.

( ) Cut both leads of a 250  $\mu$ F electrolytic capacitor to 1/2".

( ) C126: Refer to inset drawing #1 and solder the positive (+) lead of the capacitor to the indicated foil.

( ) Solder the negative (-) lead to the ground foil as shown. Make sure the capacitor does not obstruct the circuit board mounting hole.

( ) Cut off any excess lead lengths, and make sure the leads do not touch any other foils.

**CONTINUE** ↘

( ) Cut the leads of a 39  $\mu$ F tantalum capacitor to 3/8".

( ) C127: Refer to inset drawing #2 and solder the positive (+) lead of the capacitor to the indicated foil. Then solder the negative (-) lead to the indicated foil.

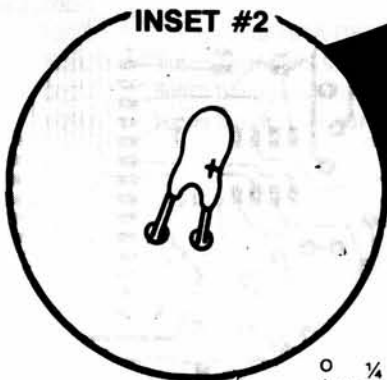
( ) Cut off any excess lead lengths; make sure the leads do not touch any other foils. Then push the capacitor down flat against the circuit board.

Carefully inspect the circuit board for the following conditions.

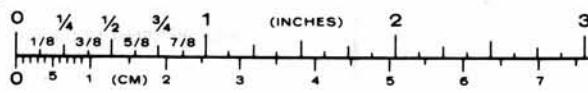
- ( ) Unsoldered connections.
- ( ) Poor solder connections.
- ( ) Solder bridges between foils.
- ( ) Protruding leads which could touch together.
- ( ) Transistors for the proper type and installation.
- ( ) Electrolytic and tantalum capacitors for the correct position of the positive (+) end.
- ( ) Diodes for the correct position of the banded end.

NOTE: The 200  $\Omega$  control will be installed later.

Set the main circuit board aside temporarily and proceed to "Stepper Driver Circuit Board."



PICTORIAL 1-18



# STEPPER DRIVER CIRCUIT BOARD

## PARTS LIST

Unpack the following parts from the Pack #2 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 Pictorials" in the separate "Illustration Booklet."

To order a replacement part: Always include the PART NUMBER. Use the Parts Order Form furnished with the kit. If one is not available, see "Replacement Parts" inside the rear cover of the Manual. Your Warranty is located inside the front cover. For prices, refer to the separate "Heath Parts Price List."

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
<b>RESISTORS</b>				
NOTE: All resistors have a 5% tolerance (gold fourth band).				
A1	6-121-12	2	120 $\Omega$ , 1/4-watt (brown-red-brown)	R203, R205
A1	6-122-12	6	1200 $\Omega$ , 1/4-watt (brown-red-red)	R201, R202, R204, R206, R213, R215
A1	6-473-12	1	47 k $\Omega$ , 1/4-watt (yellow-violet-orange)	R207
A2	6-471	4	470 $\Omega$ , 1/2-watt (yellow-violet-brown)	R208, R209, R211, R212
A3	3-41-10	2	33 $\Omega$ , 10-watt, wire-wound	R216, R217
A4	3-26-5	1	390 $\Omega$ , 5-watt, wire-wound	R214

### CAPACITORS

B1	21-46	2	.005 $\mu$ F ceramic	C201, C202
B1	21-199	1	.1 $\mu$ F ceramic	C203
B2	27-62	1	.68 $\mu$ F Mylar*	C204

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
<b>DIODES — TRANSISTORS — INTEGRATED CIRCUITS</b>				
C1	57-65	5	1N4002 diode	D201, D202, D203, D204, D205
C2	417-263	1	SJE607 transistor	Q205
C3	417-852	4	TIP31 transistor	Q201, Q202, Q203, Q204
C4	417-864	1	MPS-A05 transistor	Q206
C5	443-23	1	74122 integrated circuit	U202
C5	443-73	1	7416N integrated circuit	U203
C5	443-698	1	7486N integrated circuit	U201

\* DuPont registered trademark





KEY HEATH QTY. DESCRIPTION  
No. Part No.

CIRCUIT  
Comp. No.

KEY HEATH QTY. DESCRIPTION  
No. Part No.

CIRCUIT  
Comp. No.

### MISCELLANEOUS

344-50	6"	Large black solid wire
344-52	6"	Large red solid wire
344-53	6"	Large orange solid wire
344-54	6"	Large yellow solid wire
344-55	6"	Large green solid wire
344-58	6"	Large gray solid wire
344-74	6"	Large white-yellow solid wire

### Miscellaneous (cont'd.)

	344-78	6"	Large white-gray solid wire
	344-163	24"	Small black solid wire
D1	434-298	3	14-pin IC socket
	85-2355-1	1	Stepper driver circuit board

## STEP-BY-STEP ASSEMBLY

### START

Position the circuit board as shown in the Pictorial. Then perform the following steps.

**NOTE:** When you install a diode, always match the band on the diode with the band mark on the circuit board. THE CIRCUIT WILL NOT WORK IF A DIODE IS INSTALLED BACKWARDS. See Detail 1A at the bottom of this column.

If your diode has a solid body, the band is clearly defined. If your diode has a glass body, do not mistake the colored end inside the diode for the banded end. Look for a band painted on the outside of the glass.

D205: 1N4002 diode (#57-65).

R205: 120  $\Omega$  (brown-red-brown).

**NOTE:** Use the small black wire to make jumper wires in the following steps. Cut each wire to the indicated length and remove 1/4" of insulation from each end.

1" jumper wire.

1-3/4" jumper wire.

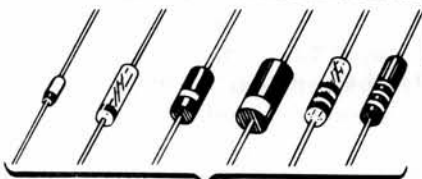
1-1/2" jumper wire.

3/4" jumper wire.

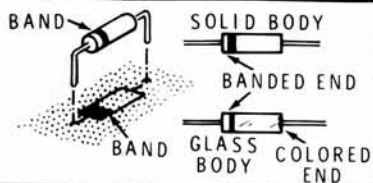
1" jumper wire.

### Detail 2-1A

**NOTE:** DIODES MAY BE SUPPLIED IN ANY OF THE FOLLOWING SHAPES. ALWAYS POSITION THE BANDED END AS SHOWN ON THE CIRCUIT BOARD.



**BANDED END**



**PICTORIAL 2-1**

### CONTINUE

R215: 1200  $\Omega$  (brown-red-red).

Install four 1200  $\Omega$  (brown-red-red) resistors at:

R201.

R206.

R204.

R202.

R203: 120  $\Omega$  (brown-red-brown).

R209: 470  $\Omega$  (yellow-violet-brown).

D202: 1N4002 diode (#57-65).

D203: 1N4002 diode (#57-65).

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

R211: 470  $\Omega$  (yellow-violet-brown).

1" jumper wire.

D201: 1N4002 diode (#57-65).

1" jumper wire.

D204: 1N4002 diode (#57-65).

R208: 470  $\Omega$  (yellow-violet-brown).

R213: 1200  $\Omega$  (brown-red-red).

R212: 470  $\Omega$  (yellow-violet-brown).

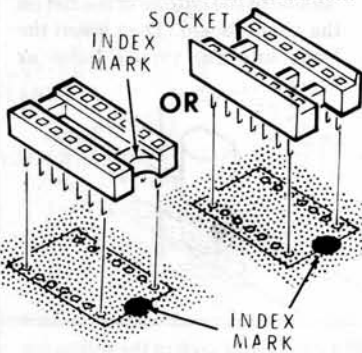
R207: 47 k $\Omega$  (yellow-violet-orange).

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

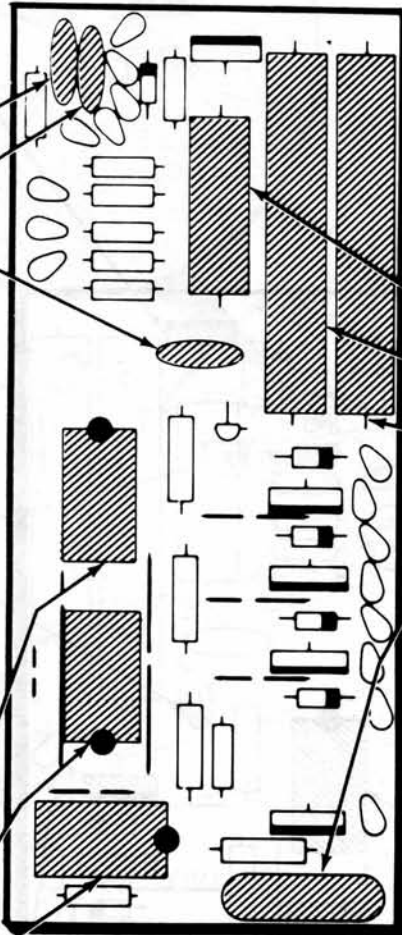
**START** →

- C202: .005  $\mu$ F ceramic.
- C203: .1  $\mu$ F ceramic.
- C201: .005  $\mu$ F ceramic.
- Solder the leads to the foil and cut off the excess lead lengths.

As you install the IC sockets in the following steps: make sure the leads are straight, insert the leads into the holes and then solder the leads to the foil.



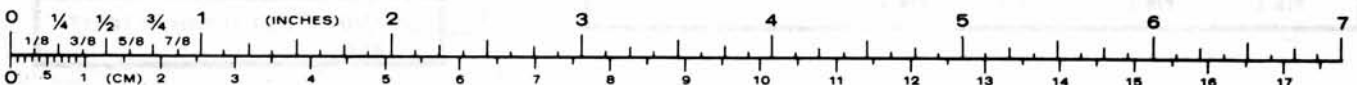
- 14-pin IC socket at U201.
- 14-pin IC socket at U203.
- 14-pin IC socket at U202.



**CONTINUE** →

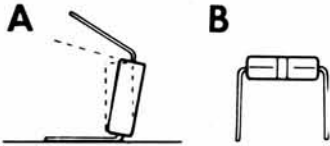
- R214: 390  $\Omega$ , 5-watt.
- R217: 33  $\Omega$ , 10-watt.
- R216: 33  $\Omega$ , 10-watt.
- C204: .68  $\mu$ F Mylar.
- Solder the leads to the foil and cut off the excess lead lengths.

**PICTORIAL 2-2**

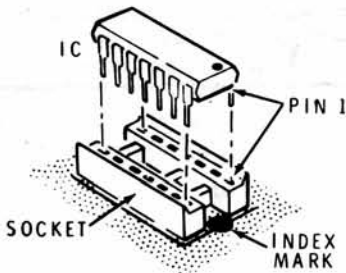


**START**

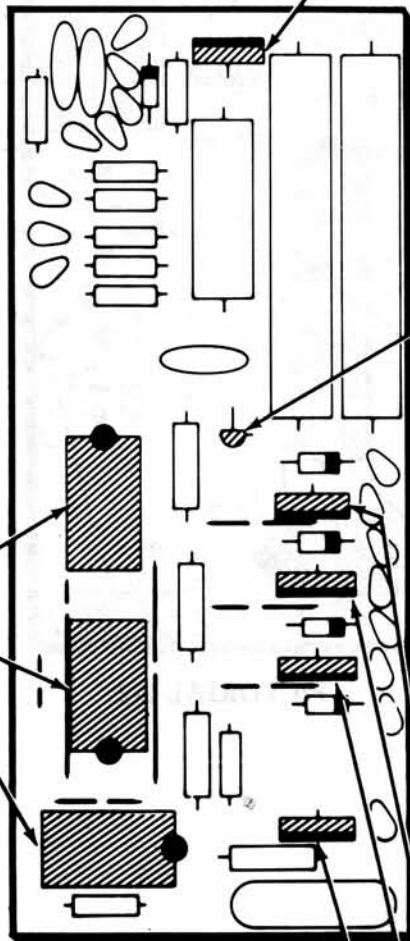
Before you install an IC, first be sure the pins are straight. Then lay it down on one of its rows of pins, as shown at A below and roll the IC over until the pins are at right angles or are bent in slightly as shown at B. Repeat this process for the other row of pins.



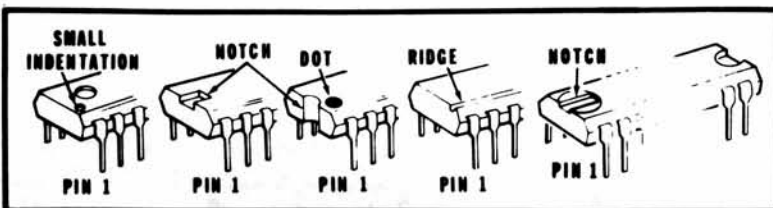
**NOTE:** To install an integrated circuit (IC), be sure the leads are straight. Refer to Detail 3A (at the bottom of this page) and identify the pin 1 end of the integrated circuit. Then position the pin 1 end toward the index mark on the circuit board and carefully install the integrated circuit. Make sure all the pins are in their respective holes.



- (✓) U201: 7486N IC (#443-698).
- (✓) U203: 7416N IC (#443-73).
- (✓) U202: 74122 IC (#443-23).



**PICTORIAL 2-3**



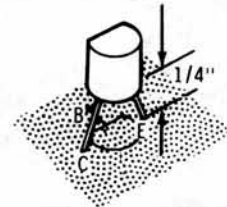
**CONTINUE**

Solder the leads to the foil and cut off the excess lead lengths as you install each part in the following steps.

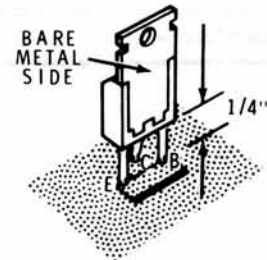
- (✓) Q205: SJE607 transistor (#417-263). Position the bare metal side of the transistor toward the heavy black line on the circuit board. Then insert the leads into the proper holes as shown.



- (✓) Q206: MPSA05 transistor (#417-864). Line up the flat on the transistor with the outline of the flat on the circuit board. Then insert the leads into the proper holes as shown.



When you install each of the following transistors, position the bare metal side toward the heavy black line on the circuit board. Then insert the leads into the proper holes as shown.



- (✓) Q202: TIP31 transistor (#417-852).
- (✓) Q203: TIP31 transistor (#417-852).
- ( ) Q201: TIP31 transistor (#417-852).
- (✓) Q204: TIP31 transistor (#417-852).

**START** 

(  ) Remove 1/4" of insulation from each end of the eight 6" wires.  
NOTE: Discard any leftover **small** black wire; it will not be used.

Connect one end of each wire to the circuit board in the following steps. Solder each wire to the foil and cut off any excess wire lengths.

(  ) Black to hole E .....

(  ) Red to hole G .....

(  ) Orange to hole F .....

(  ) Green to hole AE .....

(  ) Yellow to hole A .....

(  ) Gray to hole D .....

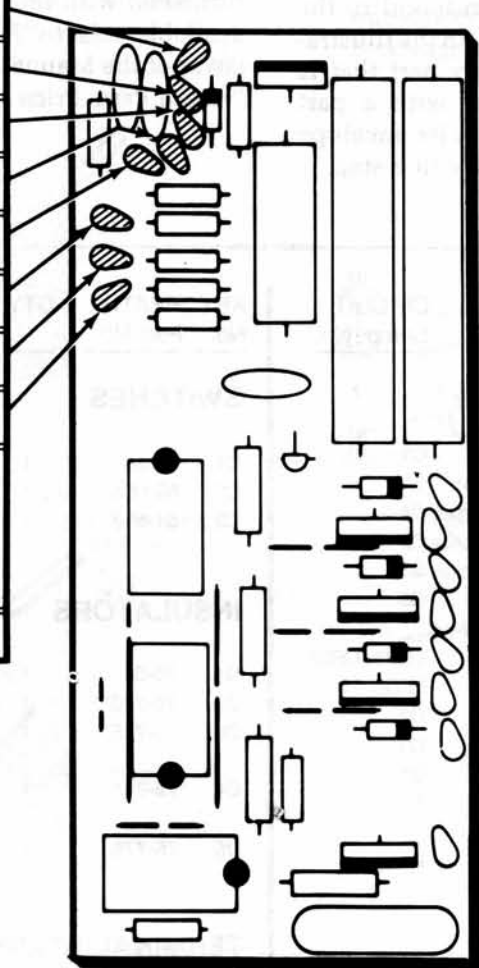
(  ) White-gray to hole C .....

(  ) White-yellow to hole B .....

(  ) Check the circuit board over carefully to make sure all connections are properly soldered. Also check for solder bridges, especially around IC sockets.

Set the circuit board aside temporarily.

**FINISH**



**PICTORIAL 2-4**

# CHASSIS

## PARTS LIST

Unpack the final pack and check each part against the following list. The key numbers correspond to the numbers on the Chassis Parts Pictorial (in the Illustration Booklet, Pages 3 through 5). Any part that is packaged in an individual envelope with a part number on it should be placed back in its 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 "Replacement Parts" inside the rear cover of the Manual. For prices, refer to the separate "Heath Parts Price List."

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
<b>ELECTRICAL PARTS</b>				
A1	21-70	1	.01 $\mu$ F ceramic capacitor	C1
A2	25-836	1	17 $\mu$ F electrolytic capacitor	C5
A3	25-208	1	1500 $\mu$ F electrolytic capacitor	C4
A3	25-272	1	6000 $\mu$ F electrolytic capacitor	C2
A4	25-854	1	5600 $\mu$ F electrolytic capacitor	C3
A5	150-74	1	OPB 813, SPX 1874-1, or EOS-2A1 optical switch	Q3
A6	412-616	2	FLV177 LED (red)	LED1, LED2
A7	412-635	1	TIL-32 (clear)	LED3
A7	417-919	1	TIL-78 transistor (clear)	Q2
A8	417-892	1	MJ2941 transistor	Q1
A9	442-54	1	UA7805 integrated circuit	U1
A10	421-20	1	3AG, 1/2-ampere, slow-blow fuse	F1
A10	421-23	1	3AG, 1-ampere, slow-blow fuse	F1
A11	423-11	1	Fuseholder	
A12	266-996	1	Print head	
A13	54-962	1	Power transformer	T1

### MOTORS

B1	420-94	1	Head motor
B2	420-603	1	Paper drive motor
B3	420-602	1	Ribbon motor

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
<b>SWITCHES</b>				
C1	60-54	1	Slide switch, 120/240	SW2
C2	60-608	1	Slide switch, NOR/LOW	SW3
C3	64-860	1	Switch assembly	

### INSULATORS

D1	75-88	1	Insulator case
D2	75-140	1	Transistor insulator
D3	75-715	1	Insulating paper 1-1/2" $\times$ 1-7/8"
D4	75-741	1	Insulating paper, 2-1/2" $\times$ 4-1/8"
D5	75-775	1	Insulating paper, 4-3/8" $\times$ 5"

### TERMINAL STRIPS — CONNECTORS

E1	431-3	1	Large 3-lug terminal strip
E2	431-15	2	1-lug terminal strip
E3	431-16	1	Small 2-lug terminal strip
E4	431-41	1	Large 2-lug terminal strip
E5	431-604	1	3-lug terminal strip
E6	432-866	4	Connector pin
E7	432-1030	2	Connector shell



KEY No.	HEATH Part No.	QTY.	DESCRIPTION
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### SPACERS — SPRINGS

F1	255-29	2	7/32" spacer
F2	255-74	2	1/16" spacer
F3	255-78	4	5/8" spacer
F4	255-717	2	1" spacer
F5	255-742	9	9/64" spacer
F6	255-743	3	Brass spacer
F7	255-725	1	3/32" shoulder spacer
F8	258-4	2	Ribbon guide spring
F9	258-103	2	Paper hold-down spring
F10	258-719	1	Pawl spring
F11	258-720	2	Ribbon tension spring
F12	258-724	1	Pulley spring

### HARDWARE

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

#### #2 Hardware

F13	250-1172	2	2-56 × 1/4" screw
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#### #4 Hardware

G1	250-52	27	4-40 × 1/4" screw
G2	250-156	4	4-40 × 1/8" setscrew
G3	250-273	16	4-40 × 3/8" screw
G4	250-366	2	4-40 × 3/16" screw
G5	250-375	8	4-40 × 5/16" flat head screw
G6	250-1184	2	#4 × 1/4" self-tapping screw
G7	250-1218	2	#4 × 7/16" self-tapping screw
G8	252-15	13	4-40 nut
G9	252-192	11	4-40 brass insert
G10	253-80	7	#4 flat washer
G11	254-9	2	#4 lockwasher

#### #6 Hardware

H1	250-48	3	6-32 × 1/2" screw
H2	250-56	15	6-32 × 1/4" screw
H3	250-89	8	6-32 × 3/8" screw
H4	250-116	13	6-32 × 1/4" black screw
H5	250-206	2	6-32 × 11/16" screw
H6	250-13	4	6-32 × 1" screw
H7	250-434	3	6-32 × 3/8" flat head screw
H8	250-1275	1	#6 × 5/8" black self-tapping screw
H9	252-3	10	6-32 nut

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

### #6 Hardware (cont'd.)

H10	253-27	14	#6 thick flat washer
H11	253-60	13	#6 thin flat washer
H12	253-89	4	#6 D-washer
H13	254-1	25	#6 lockwasher
H14	259-1	1	#6 solder lug
H15	250-270	1	6-32 × 3/8" black screw
H16	254-6	3	#6 external tooth lockwasher

### #8 Hardware

J1	250-92	4	8-32 × 5/8" screw
J2	250-105	6	8-32 × 1/8" setscrew
J3	250-1281	1	8-32 × 3/8" knurled thumbscrew
J4	252-4	8	8-32 nut
J5	254-2	8	#8 lockwasher

### Other Hardware

K1	252-7	2	3/8-32 nut
K2	252-708	2	Push-on nut
K3	253-711	1	1/4" flat washer
K4	253-85	2	Felt washer
K5	253-167	2	Teflon washer
K6	253-51	2	E-washer
K7	253-710	2	Cork washer
K8	254-5	2	3/8" lockwasher
K9	257-1	1	Cord retaining clip
K10	257-11	1	Eyelet
K11	259-5	2	#10 solder lug
K12	259-29	2	Long lug
K13	455-26	2	Threaded bushing
K14	262-4	2	Spring retainer pin

### SHAFTS — COLLARS — PULLEYS

L1	453-294	1	11-3/4" × 5/16" diameter shaft
L2	453-302	1	10-5/8" × 1/8" diameter shaft
L3	453-296	1	Grooved shaft
L4	453-297	1	12-1/4" × 1/4" diameter support shaft
L5	453-298	2	1-1/4" shaft
L6	453-295	1	Cable guide shaft
L7	455-15	3	Small shaft collar
L8	455-647	1	Medium shaft collar
L9	455-649	1	Large shaft collar
L10	100-1769	2	Nylon pulley
L11	466-59	1	Pulley
L12	466-60	4	Ribbon guide



KEY No.	HEATH Part No.	QTY.	DESCRIPTION
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**PLASTIC PARTS**

M1	266-998	1	Left ratchet
M2	266-997	1	Right ratchet
M3	266-999	1	Pawl
M4	266-1042	1	Left reverse lever
M5	266-1043	1	Right reverse lever
M6	454-27	1	Ribbon motor cam
M7	390-1488	1	Mylar paper guide
M8	266-1003	2	Paper hold-down
M9	266-1041	2	Paper lifter
M10	75-754	1	Strain relief

**BRACKETS**

N1	204-2341	1	Curved paper guide bracket
N2	204-2342	1	Switch bracket
N3	204-2343	1	Motor mounting bracket
N4	204-2344	1	Left paper drive bracket
N5	204-2345	1	Right paper drive bracket
N6	204-2424	1	Right paper hold-down bracket
N7	204-2425	1	Left paper hold-down bracket
N8	204-2348	1	Platen bracket
N9	204-2349	1	Head drive bracket
N10	204-2402-1	2	Hold-down pivot bracket
N11	204-2364	1	Wide paper guide bracket

**PLATES — CHASSIS**

P1	201-66	1	Chassis
P2	205-1761-1	1	Bottom plate
P3	205-1762	1	Ribbon actuator plate
P4	205-1763	6	Shaft retainer

**GROMMETS — CLAMPS**

Q1	73-53	1	Rubber grommet
Q2	73-46	1	Plastic grommet
Q3	260-89	2	LED grommet
Q4	207-3	2	Small cable clamp
Q5	207-19	1	Large cable clamp
Q6	207-607	1	Capacitor mounting clamp

**LABELS — NAME PLATE**

R1	390-1471	1	Model label
R2	390-1472	1	Set-up instruction label
R3	390-1487	1	Warning label
R4	391-34	1	Blue and white model label
R5	391-611	1	Name plate
R6	390-1501	1	Clear plastic guard label

KEY No.	HEATH Part No.	QTY.	DESCRIPTION
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**CORD — WIRE — SLEEVING**

349-1	42"	1	Print head string
349-8	8"	1	Lanyard cord
344-2	57"	1	Large black stranded wire
344-90	27"	1	Small black stranded wire
134-1057	1	1	Wire harness
347-55	24"	1	8-wire ribbon cable
346-51	10-5/8"	1	Clear sleeving
346-66	3-1/2"	1	Black sleeving

**TOOLS**

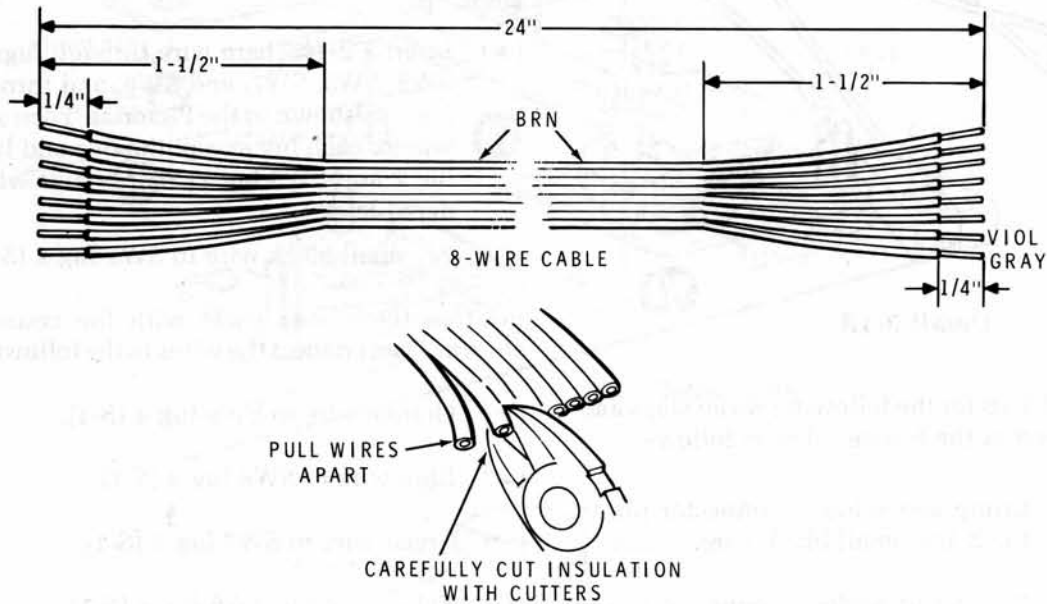
S1	266-1004	1	Feeler gauge
S2	490-5	1	Nut starter
S3	490-6	1	Large allen wrench
S4	490-23	1	Small allen wrench

**MISCELLANEOUS**

T1	89-54	1	Line cord
T2	95-638	1	Cabinet cover
T3	134-1035	1	Cable assembly
T4	260-90	2	Retainer ring
T5	261-20	4	Mounting foot
T6	265-37	2	Hinge
T7	266-47	2	Gear stop dog
T8	266-1002	1	Paper tray
T9	266-1005	1	Platen
T10	266-1007	1	Ribbon
T11	266-1017	2	Hold-down clip
T12	352-14	1	Grease
T13	352-31	1	Thermal compound (white)
T14	354-6	10	Cable tie
T15	434-336	1	Transistor socket
T16	451-605	1	Spur gear
T17	451-606	2	Sprocket
T18	455-44	2	Snap-in nylon bearing
		1	Paper pack
	595-2173	1	Operation Manual (See Page 1 for part number.)



## STEP-BY-STEP ASSEMBLY



**Detail 3-1A**

### SWITCH ASSEMBLY

Refer to Pictorial 3-1 (Illustration Booklet, Page 6) for the following steps.

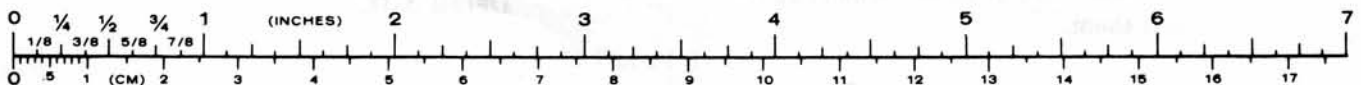
**NOTE:** When stranded wire is called for, twist the small wire strands tightly together and then melt a small amount of solder on the bare wire ends to hold the wire strands together.

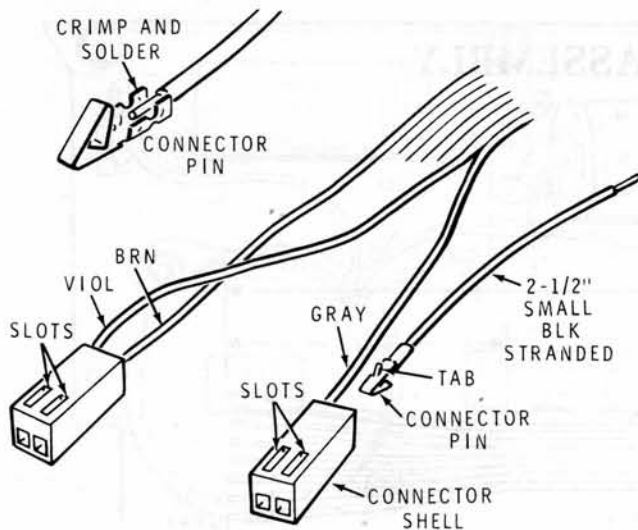
- (✓) Refer to Detail 3-1A and prepare both ends of the 8-wire ribbon cable as shown.
- (✓) Temporarily set the cable aside.

**NOTE:** When wiring this kit, you will be instructed to prepare hookup wires ahead of time, as in the following step. To prepare a wire, cut it to the indicated length and remove 1/4" of insulation from each end. The wires are listed in the order in which they will be used.

- (✓) Prepare the following wires:

2-1/2" small black stranded  
 24" small black stranded  
 Two 21" large black stranded





Detail 3-1B

Refer to Detail 3-1B for the following seven steps and prepare one end of the 8-wire cable as follows.

1. (✓) Crimp and solder a connector pin to the 2-1/2" small black wire.
2. (✓) Crimp and solder a connector pin to the ribbon cable gray wire.
3. (✓) Crimp and solder a connector pin to the ribbon cable brown wire.
4. (✓) Crimp and solder a connector pin to the ribbon cable violet wire.
5. (✓) At the end of the cable that does not have the connector pins, separate the violet and gray wires from the other wires for an additional 3/4" (total 2-1/4").
6. (✓) Insert the connector pins on the black and gray wires into a connector shell; be sure the connector pins are positioned as shown when you insert them.
7. (✓) Insert the connector pins on the brown and violet wires into a connector shell; be sure the connector pins are positioned as shown when you insert them.

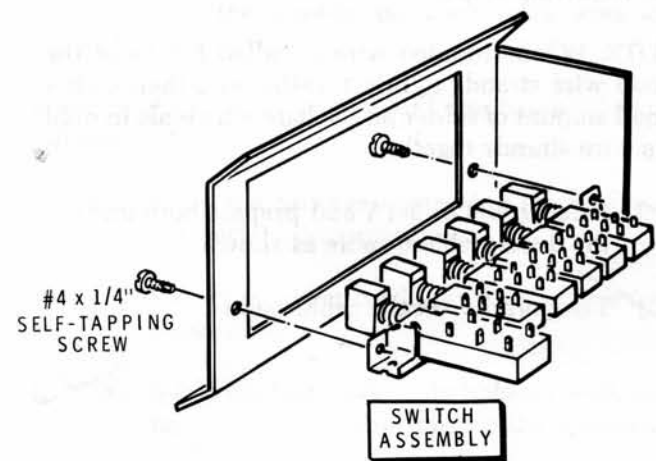
NOTE: In the following steps, (NS) means not to solder the connections because other wires will be added later. (S-) with a number, such as (S-3), means to solder the connection. The number tells how many wires are in the connection.

Refer to Pictorial 3-1 and connect the wires to the open lugs of the switch assembly in the following steps.

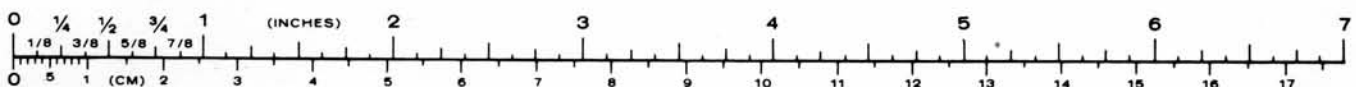
- (✓) Insert a 2-1/2" bare wire through lugs 2 and 5 SW5, SW8, SW7, and SW6, and through SW4 lug 2 as shown in the Pictorial. Then solder the wire to each lug except the two end lugs (SW4 lug 2 and SW5 lug 2). These lugs will be soldered later.
- (✓) 24" small black wire to SW5 lug 2 (S-2).

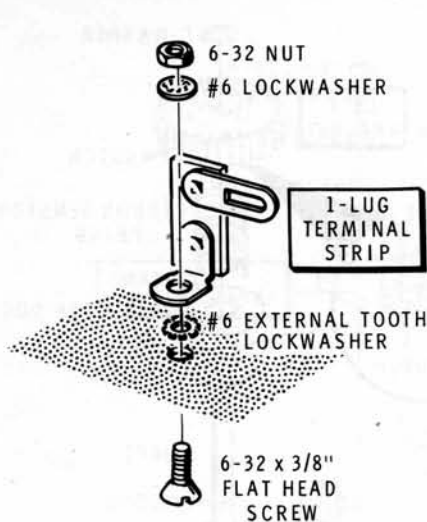
Position the ribbon cable with the connectors as shown. Then connect the wires in the following steps.

- (✓) Orange wire to SW5 lug 4 (S-1).
- (✓) Blue wire to SW8 lug 4 (S-1).
- (✓) Green wire to SW7 lug 4 (S-1).
- (✓) Yellow wire to SW6 lug 4 (S-1).
- (✓) Red wire to SW4 lug 3 (S-1).
- (✓) 2-1/2" black wire coming from the connector to SW4 lug 2 (S-2).



Detail 3-1C





Detail 3-2A

- (✓) Either 21" large black wire to SW1 lug 4 (S-1).
- (✓) Other 21" large black wire to SW1 lug 5 (S-1).
- (✓) Refer to Detail 3-1C and mount the switch assembly to the switch bracket with two #4 x 1/4" self-tapping screws; make sure the wires and ribbon cable are routed as shown in the Pictorial.

Set the switch assembly aside; it will be called for later.

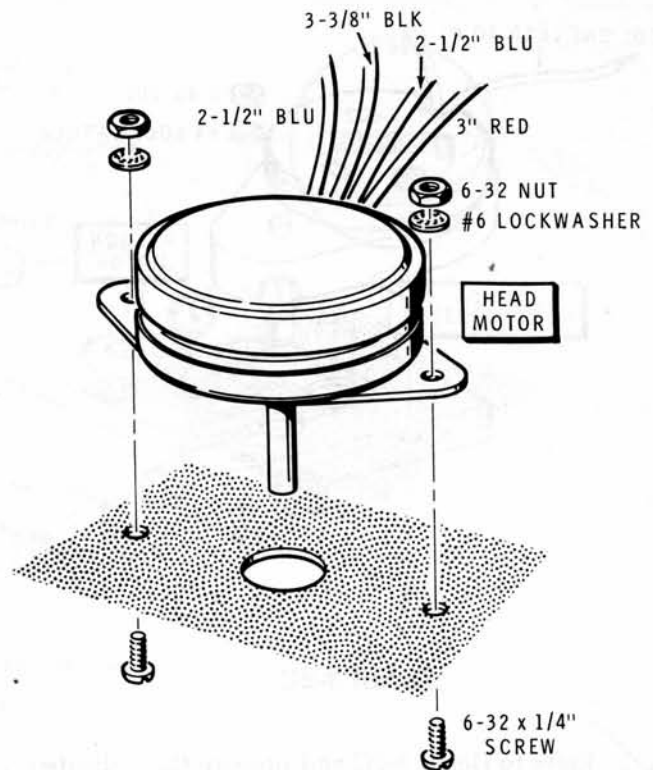
### MOTOR MOUNTING BRACKET

Refer to Pictorial 3-2 (Illustration Booklet, Page 6) for the following steps.

- (✓) Position the motor mounting bracket on your work area as shown.

#### NOTES:

1. In the next four steps, make sure you position the terminal strips as shown in the Pictorial.
  2. Use the plastic nut starter supplied with this kit to hold and start 6-32 and 4-40 nuts on screws.
  3. Use black screws **only** in steps where they are specifically called for.
- (✓) Refer to Detail 3-2A and mount a 1-lug terminal strip at hole AA with a 6-32 x 3/8" flat head screw, a #6 external tooth lockwasher, a #6 lockwasher, and a 6-32 nut.



Detail 3-2B

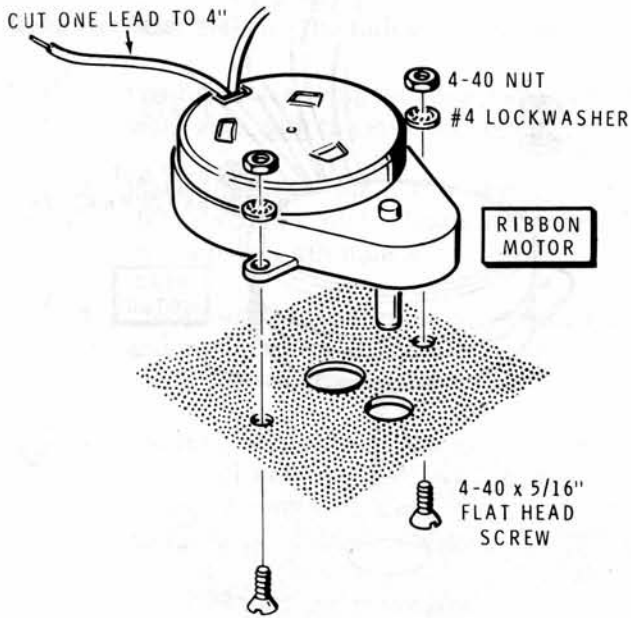
- (✓) In a similar manner, mount a small 2-lug terminal strip at hole AB with a 6-32 x 3/8" flat head screw, a #6 external tooth lockwasher, a #6 lockwasher, and a 6-32 nut.

- (✓) Mount a large 3-lug terminal strip at hole AC with a 6-32 x 3/8" flat head screw, a #6 external tooth lockwasher, a #6 lockwasher, and a 6-32 nut.

- (✓) Mount a 1-lug terminal strip at hole AD with a 6-32 x 1/4" screw, two #6 lockwashers, and a 6-32 nut. (Do not use an external tooth lockwasher here.)

- (✓) Locate the head motor (red, blue, and black leads). Then refer to Detail 3-2B and prepare the leads as shown.

- (✓) Again refer to Detail 3-2B and mount the head motor at hole AE with two 6-32 x 1/4" screws, #6 lockwashers, and 6-32 nuts.



Detail 3-2C

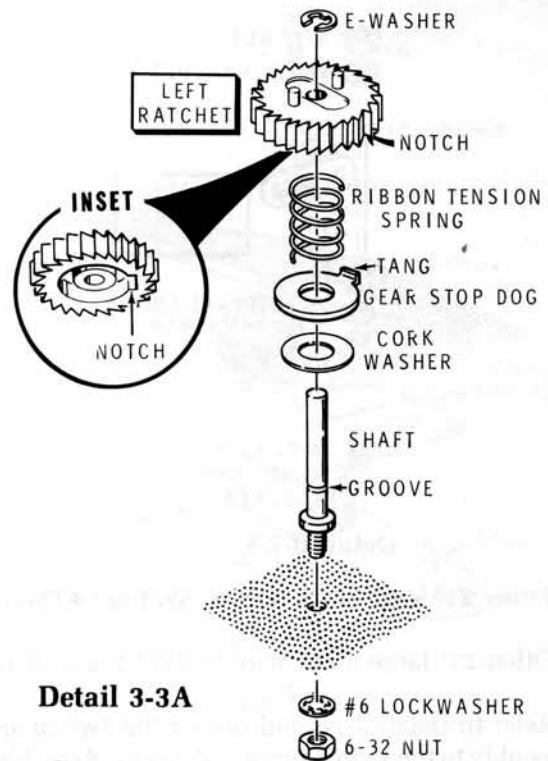
- (✓) Refer to Detail 3-2C and prepare the indicated lead of the ribbon motor as shown; then mount the ribbon motor at hole AF with two 4-40 × 5/16" flat head screws, #4 lockwashers, and 4-40 nuts.

Refer to Pictorial 3-3 (Illustration Booklet, Page 6) for the following steps.

- (✓) Position the motor mounting bracket on your work area as shown.

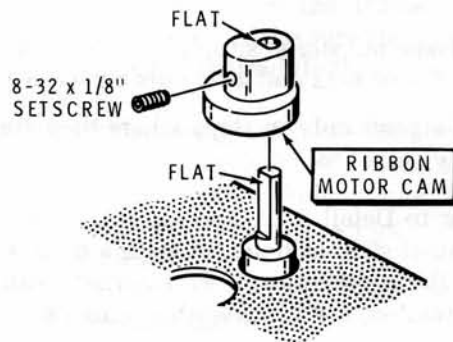
Refer to Detail 3-3A for the next five steps. Read the steps through to become familiar with the procedure. Then go back and perform them.

- (✓) 1. Mount two 1-1/4" shafts at holes AG and AH with a #6 lockwasher, and a 6-32 nut on each shaft.
- (✓) 2. Place a cork washer, a gear stop dog (position the protruding tang upward), and a ribbon tension spring on each shaft.
- (✓) 3. Locate an E-washer and the left ratchet. Make sure you have the left ratchet. Notice the direction of the teeth on the left ratchet when the ratchet is positioned as shown in the Pictorial.

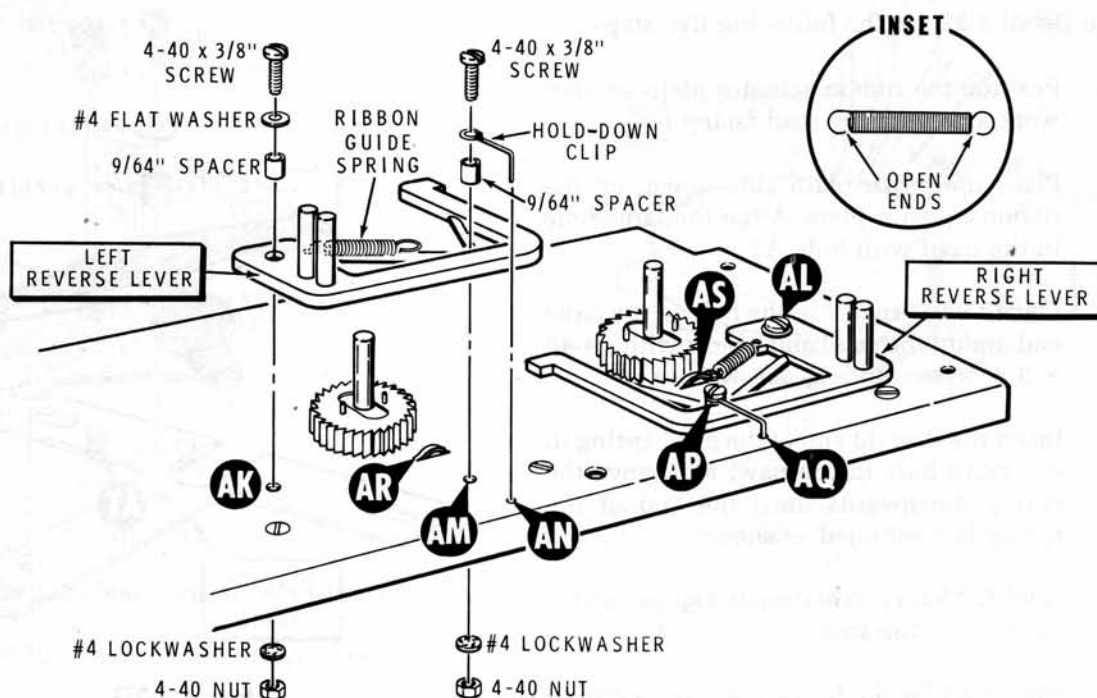


Detail 3-3A

- (✓) 4. On the shaft at AG, center the spring on the gear stop dog. Then push the ratchet down onto the shaft, making sure the tang fits into the notch on the bottom of the ratchet.
- (✓) 5. Press the E-washer into the groove on the shaft to hold the ratchet in place.
- (✓) Using the same procedure, install the right ratchet on the shaft at AH.
- (✓) Refer to Detail 3-3B and install an 8-32 × 1/8" setscrew in the ribbon motor cam; then slide the cam all the way onto the shaft of the ribbon motor at AJ as shown in the Pictorial. Use the large allen wrench to tighten the setscrew. Do not overtighten the setscrew or the threads may strip.



Detail 3-2B

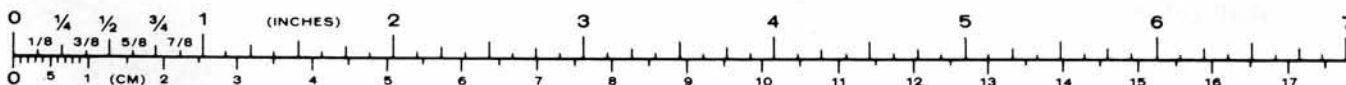


Detail 3-3C

Refer to Detail 3-3C for the following nine steps.

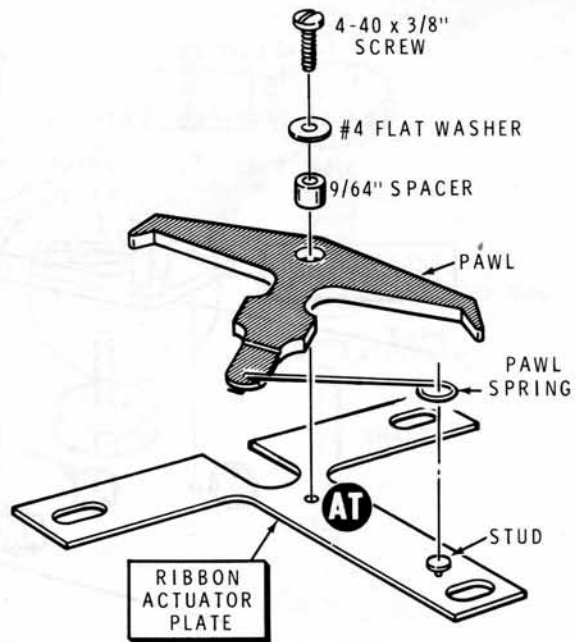
1. Place the left reverse lever with its hole over hole AK on the motor mounting bracket and place a 9/64" spacer in the hole over hole AK.
2. Mount the left reverse lever and spacer at hole AK with a 4-40 × 3/8" screw, #4 flat washer, #4 lockwasher, and a 4-40 nut.
3. Place the right reverse lever with its hole over hole AL on the motor mounting bracket, and place a 9/64" spacer in the hole over hole AL.
4. Mount the right reverse lever and spacer at hole AL with a 4-40 × 3/8" screw, #4 flat washer, #4 lockwasher, and a 4-40 nut.
5. Mount a hold-down clip at hole AM with a 9/64" spacer, 4-40 × 3/8" screw, a #4 lockwasher, and a 4-40 nut. Insert the end of the clip in hole AN.
6. Mount the other hold-down clip at hole AP with a 9/64" spacer, 4-40 × 3/8" screw, #4 lockwasher, and a 4-40 nut. Insert the end of the clip in hole AQ.
7. Refer to the inset drawing and open the ends of the ribbon guide springs slightly. NOTE: The ribbon guide springs are longer than the other springs.
8. Hook one end of a ribbon guide springs to the chassis lug at AR and the other end of the spring through the hole in the left reverse lever.
9. Hook one end of the other ribbon guide spring to the chassis lug at AS and the other end of the spring through the hole in the right reverse lever.

NOTE: The reverse levers should move freely without binding. If necessary, bend the hold-down clip slightly.



Refer to Detail 3-3D for the following five steps.

- (✓) 1. Position the ribbon actuator plate on your work area with the stud facing up.
- (✓) 2. Place the pawl, plain side down, on the ribbon actuator plate. Align the large hole in the pawl with hole AT.
- (✓) 3. Place a 9/64" spacer in the hole in the pawl and mount the pawl and spacer with a 4-40 x 3/8" screw, and #4 flat washer.
- (✓) 4. Insert the straight end of the pawl spring in the small hole in the pawl and move the spring downwards until the end of the spring is positioned as shown.
- (✓) 5. Hook the loop end of the pawl spring under the head of the stud.



Detail 3-3D

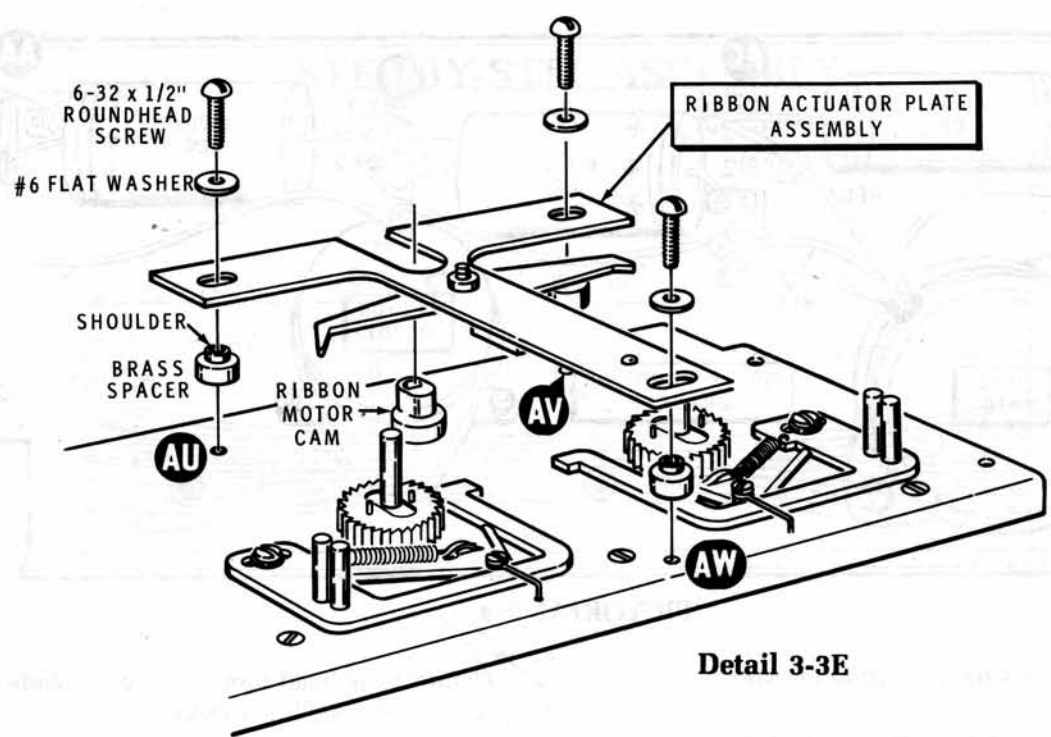
Refer to Detail 3-3E for the following three steps.

- (✓) 1. Place three brass spacers with their shoulders up on the motor mounting bracket at holes AU, AV, and AW.
- (✓) 2. Place the assembled ribbon actuator plate with the oblong hole over the ribbon motor cam on the three brass spacers and position the pawl so that it engages one of the ratchets.
- (✓) 3. Mount the ribbon actuator plate and brass spacers at holes AU, AV, and AW with three 6-32 x 1/2" round head screws, and #6 flat washers as shown. Do not overtighten the screws.

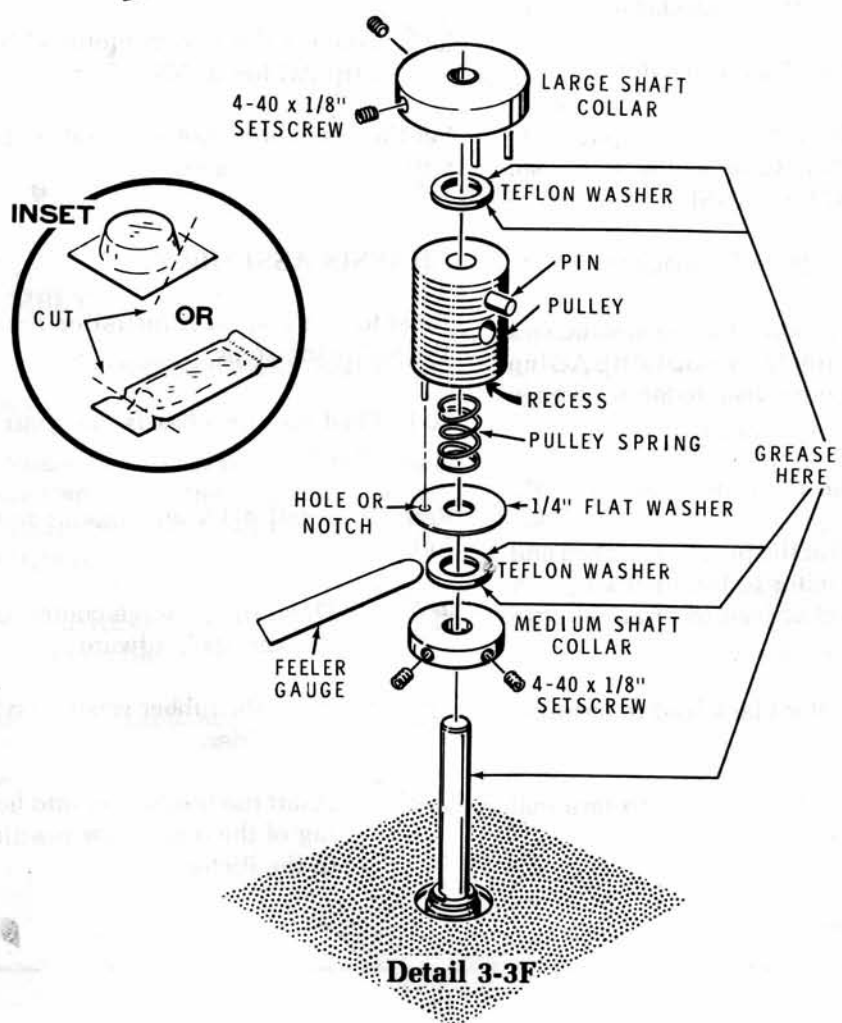
Refer to Detail 3-3F for the following ten steps.

- (✓) 1. Refer to the inset drawing and open the container of grease. Make sure you use the correct grease. The part number (352-14) is stamped on the bottom of the container.
- (✓) 2. Apply a thin layer of grease to the motor shaft and both sides of both teflon washers. (Save the remaining grease for use later.)
- (✓) 3. Install two 4-40 x 1/8" setscrews in the large shaft collar and in the medium shaft collar; do not install the setscrews all the way into the shaft collars.

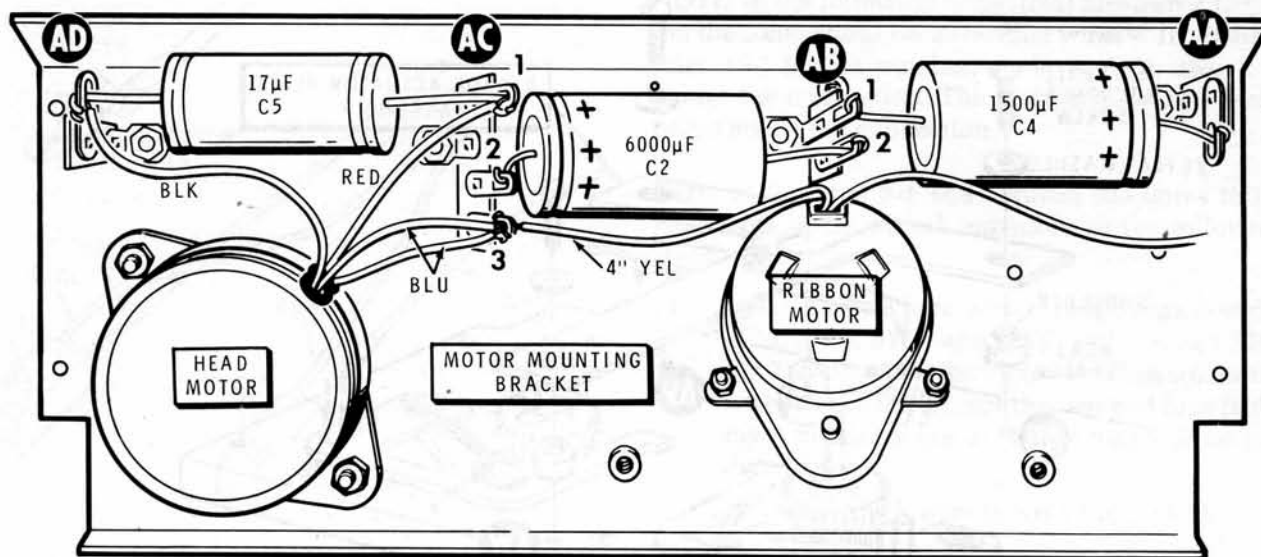
- (✓) 4. Install the medium shaft collar all the way down on the head motor shaft at AX in Pictorial 3-3 and tighten the setscrews.
- (✓) 5. Install a Teflon washer and the 1/4" flat washer with hole (or notch) on the shaft collar.
- (✓) 6. Place the pulley spring on the head motor shaft.
- (✓) 7. Place the pulley, recessed end down, on the head motor shaft over the pulley spring. Make sure the pin on the bottom of the pulley goes into the hole in the flat washer.
- (✓) 8. Place a Teflon washer on the head motor shaft and then place the large shaft collar (with the pins down) over the Teflon washer on the motor shaft. Make sure the pins on the large shaft collar straddle the pin on the pulley.
- (✓) 9. Slide the edge of the feeler gauge in between the medium shaft collar and the flat washer so the pin hits the feeler gauge. Then press the large shaft collar down tight and tighten the setscrews.
- (✓) 10. Remove the feeler gauge.



Detail 3-3E



Detail 3-3F



PICTORIAL 3-4

Refer to Pictorial 3-4 for the following steps.

- (✓) Position the motor mounting bracket as shown.
- (✓) Cut both leads of the 17  $\mu\text{F}$  capacitor to 1".
- (✓) C5: Connect either lead of the 17  $\mu\text{F}$  capacitor to terminal strip AD (NS). Connect the other lead to terminal strip AC lug 1 (NS).
- (✓) Cut both leads of the 6000  $\mu\text{F}$  capacitor to 3/4".
- (✓) C2: Connect the lead at the plus (+) marked end of the 6000  $\mu\text{F}$  capacitor to terminal strip AC lug 2 (NS). Connect the other lead to terminal strip AB lug 2 (NS).
- (✓) Cut both leads of the 1500  $\mu\text{F}$  capacitor to 1".
- (✓) C4: Connect the lead at the plus (+) marked end of the 1500  $\mu\text{F}$  capacitor to terminal strip AA (NS). Connect the other lead to terminal strip AB lug 1 (NS).
- (✓) Connect the head motor black lead to terminal strip AD (NS).
- (✓) Connect the head motor red lead to terminal strip AC lug 1 (NS).

- (✓) Connect the head motor two blue leads to terminal strip AC lug 3 (NS).
- (✓) Connect the ribbon motor 4" lead to terminal strip AC lug 3 (NS).

Set the assembled motor mounting bracket aside; it will be called for later.

### CHASSIS ASSEMBLY

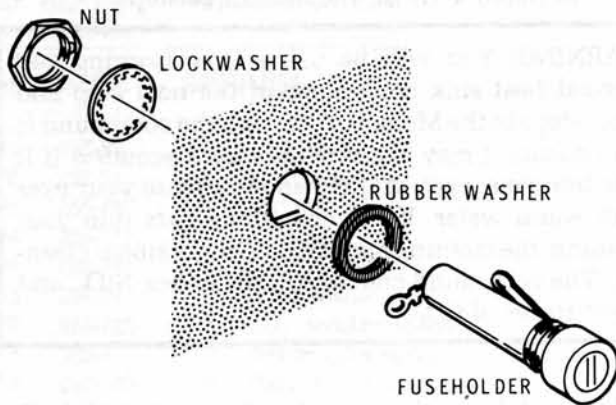
Refer to Pictorial 4-1 (Illustration Booklet, Page 7) for the following steps.

- (✓) Position the chassis on your work area as shown.

Refer to Detail 4-1A and mount the fuseholder as follows:

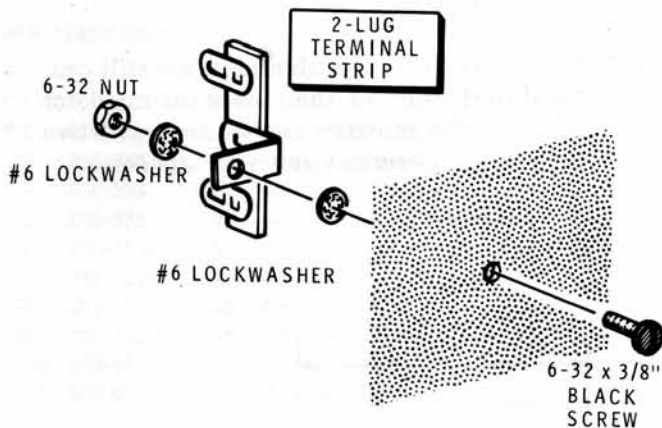
- (✓) 1. Open the package containing the fuseholder and its hardware.
- (✓) 2. Place the rubber washer on the body of the fuseholder.
- (✓) 3. Insert the fuseholder into hole BA with the lug of the fuseholder positioned as shown in the Pictorial.





Detail 4-1A

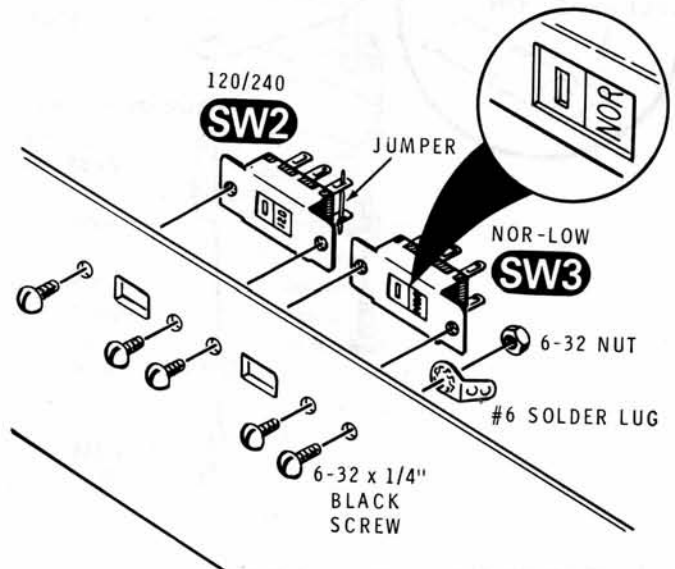
4. Mount the fuseholder to the chassis with the lockwasher and nut furnished with the fuseholder. Do not overtighten the nut, or the fuseholder may break.
- Refer to Detail 4-1B and mount the large 2-lug terminal strip at hole BB with a 6-32 x 3/8" black screw, two #6 lockwashers, and a 6-32 nut.



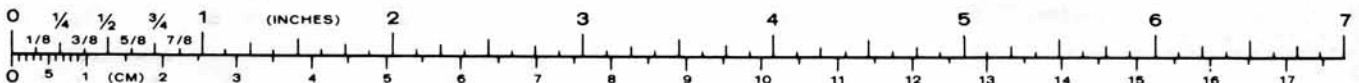
Detail 4-1B

Refer to Detail 4-1C for the next three steps.

1. SW2: Mount the 120/240 switch with two 6-32 x 1/4" black screws. Be sure the jumper is positioned as shown in the Pictorial.
2. SW3: Mount the NOR/LOW switch with two 6-32 x 1/4" black screws. Be sure the letters NOR and LOW are positioned as shown in the Detail.
3. Scrape the paint from around hole BC on the inside of the chassis. Then mount the #6 solder lug at hole BC with a 6-32 x 1/4" black screw, and a 6-32 nut. Be sure the solder lug is positioned as shown in the Pictorial.

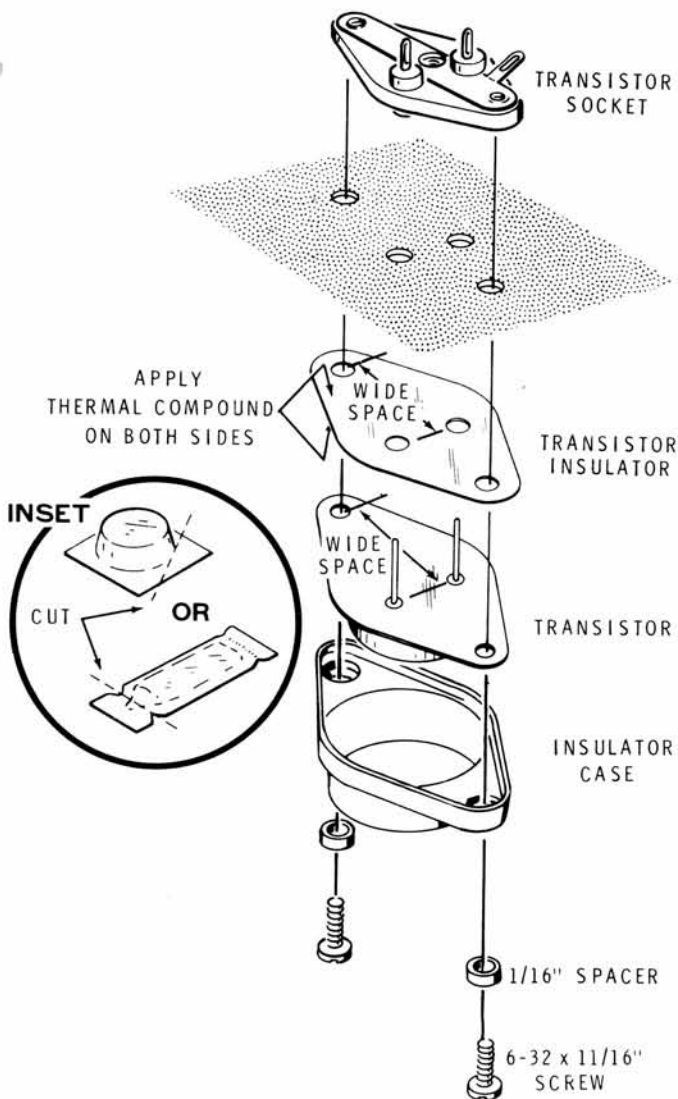


Detail 4-1C



Refer to Detail 4-1D for the next three steps.

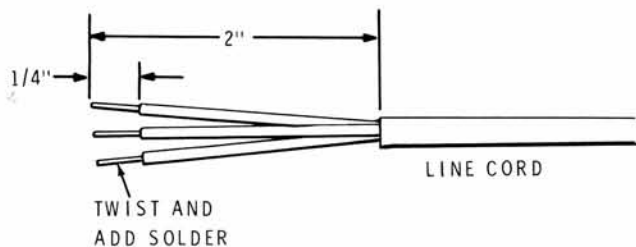
**WARNING:** You will be using Dow Corning 340 thermal heat sink compound in the next step and other steps in the Manual. Although the compound is not caustic, it may cause temporary discomfort if it gets into your eyes. If this happens, rinse your eyes with warm water. If the compound gets into your clothing, the clothing may require professional cleaning. The compound contains Zinc Oxides, SiO<sub>2</sub>, and slight traces of CO<sub>2</sub>.



- ( ) 1. Refer to the inset drawing on Detail 4-1D and open the container of thermal compound. Apply a thin coating to both sides of the transistor insulator. Place the insulator on the transistor with the wide space positioned as shown.
- ( ) 2. Q1: Carefully observe the wide spacing on the transistor holes in the chassis at Q1 and place the socket on the underside of the chassis as shown in the Detail. Be sure the shoulders of the socket are centered in the two end holes. Then push the pins of the transistor into the socket through the holes in the chassis.
- ( ) 3. Make sure the socket shoulders are still centered in their holes, then place the insulator case over the transistor and secure it with two 6-32 × 11/16" screws and 1/16" spacers.

( ) Locate the following items:

- MJ2941 transistor (#417-892)
- Transistor insulator
- Transistor insulator case
- Transistor socket
- Thermal compound (#352-31)
- Two 6-32 × 11/16" screws
- Two 1/16" spacers



Detail 4-1E

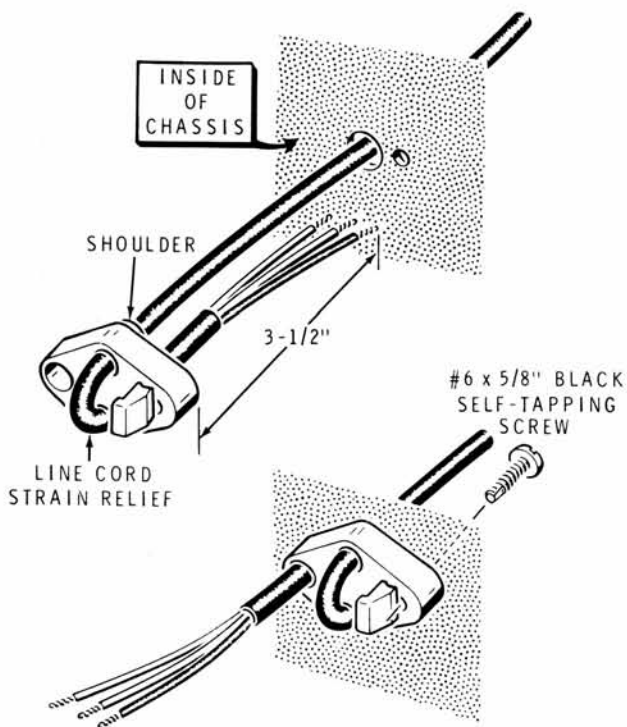




(✓) Refer to Detail 4-1E and prepare the line cord as shown. Twist the bare ends and add a small amount of solder to hold the fine strands together.

(✓) Refer to Detail 4-1F and install the line cord and strain relief as follows:

1. Insert the prepared end of the line cord through hole BD in the chassis and through the hole in the shoulder of the strain relief.
2. Route the end of the line cord back through the lower hole of the strain relief and pull it through for a distance of 3-1/2" as shown in the Detail.



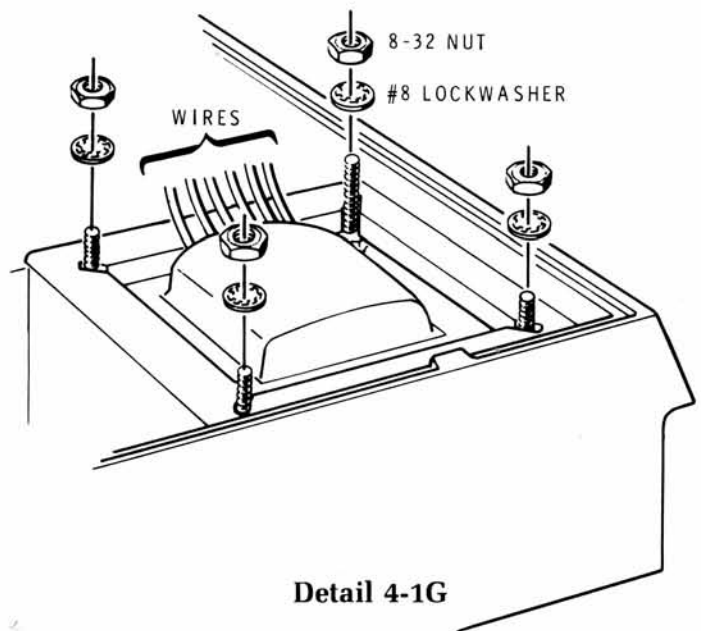
Detail 4-1F

3. Now route the end of the line cord through the hole in the side of the strain relief and pull it tight.

4. Mount the strain relief to the chassis with a #6 x 5/8" black self-tapping screw. Make sure the shoulder of the strain relief is centered in the chassis hole.

(✓) If necessary, remove 1/4" of insulation from the lead ends of the power transformer.

(✓) T1: Refer to Detail 4-1G and route the leads on the **bottom** of the transformer through the rectangular hole in the chassis and mount the transformer to the chassis with four #8 lockwashers and four 8-32 nuts.



Detail 4-1G

NOTE: When you connect the wires shown in Pictorials 4-1 and 4-2 in the following steps, make mechanically secure connections. Refer to the inset drawing in Pictorial 4-1.

- (✓) Connect the black line cord wire to fuseholder BA lug 1 (S-1).
- (✓) Connect the white line cord wire to terminal strip BB lug 2 (NS).
- (✓) Connect the green line cord wire to the #6 solder lug (S-1).
- (✓) Prepare two 2-1/2" large black wires.
- (✓) Connect one end of a 2-1/2" large black wire to SW2 lug 2 (S-1); connect the other end to SW3 lug 2 (S-1).
- (✓) Connect one end of the other 2-1/2" large black wire to SW2 lug 5 (S-1); connect the other end to SW3 lug 5 (S-1).

Refer to Pictorial 4-2 (Illustration Booklet, Page 7) for the following steps.

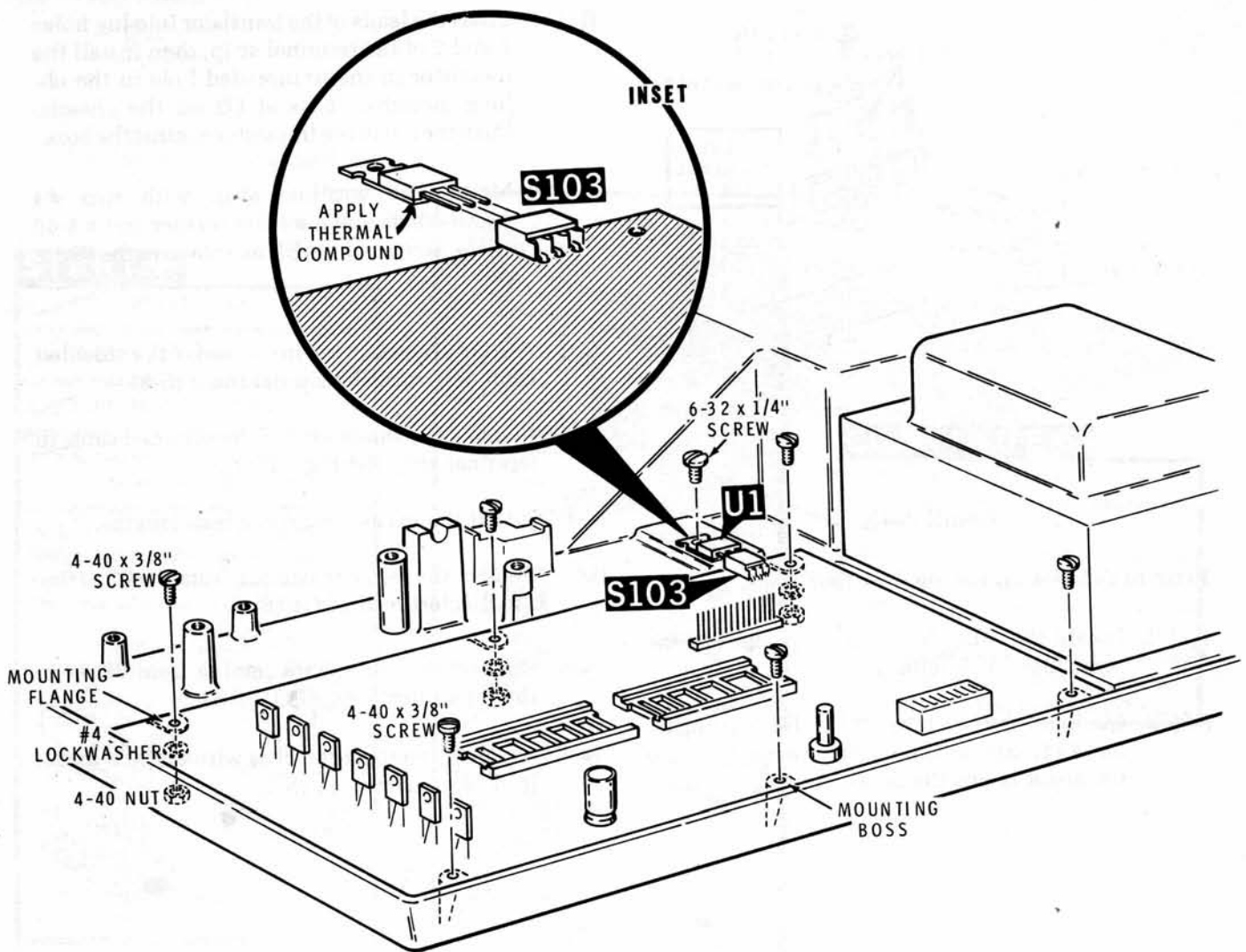
- (✓) Cut both leads of a .01  $\mu$ F capacitor to 3/4".
- (✓) C1: Connect one lead of the .01  $\mu$ F capacitor to terminal strip BB lug 1 (NS); connect the other lead to lug 2 (NS).
- (✓) Prepare the following wires.
  - 4-1/2" large black
  - 5" large black
- (✓) Connect one end of the 4-1/2" large black wire to SW2 lug 1 (S-1); connect the other end to terminal strip BB lug 1 (NS).
- (✓) Connect one end of the 5" large black wire to SW2 lug 6 (S-1); connect the other end to terminal strip BB lug 2 (NS).

- (✓) Loosely twist the six black transformer leads together and route them between the fuseholder and the strain relief close to the side of the chassis.
- (✓) Connect the black lead (no color stripe) coming from the transformer to terminal strip BB lug 1 (NS).
- (✓) Connect the black-red lead from the transformer to terminal strip BB lug 2 (S-4).
- (✓) Connect the black-white lead (not the black-gray) from the transformer to SW3 lug 3 (S-1).
- (✓) Connect the black-green lead from the transformer to SW3 lug 1 (S-1).
- (✓) Connect the black-gray lead from the transformer to SW3 lug 4 (S-1).
- (✓) Connect the black-yellow lead from the transformer to SW3 terminal 6 (S-1).

Refer to Pictorial 4-3 for the following steps.

- (✓) Position the chassis on your work area as shown.
- (✓) With a knife or other sharp tool, scrape the surfaces of the three mounting flanges and the three mounting bosses as shown. This will provide a good circuit board ground.
- (✓) U1: Refer to the inset drawing on the Pictorial and install the  $\mu$ A7805 integrated circuit (#442-54) in connector S103 on the circuit board. Make sure the IC is positioned as shown.
- (✓) Apply a thin coating of thermal compound to the bottom (metal side) of the IC.
- (✓) Mount the circuit board on the chassis with six 4-40  $\times$  3/8" screws, three #4 lockwashers and three 4-40 nuts.
- (✓) Fasten U1 to the chassis with a 6-32  $\times$  1/4" screw as shown.





PICTORIAL 4-3

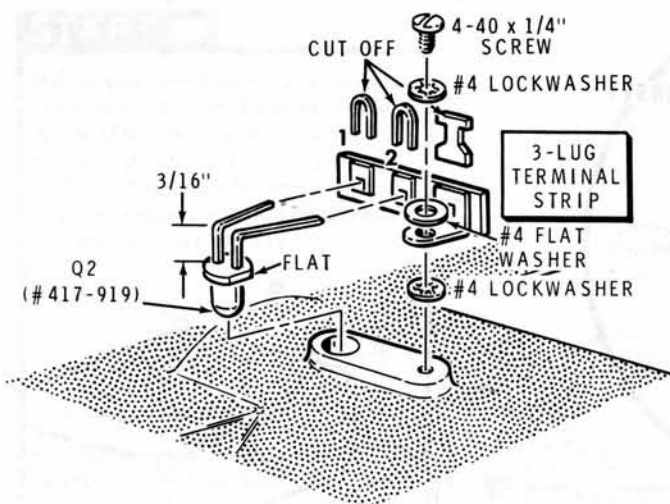
Refer to Pictorial 4-4 (Illustration Booklet, Page 8) for the following steps.

- (✓) Position the chassis on your work area as shown.
- (✓) Refer to Detail 4-4A (Illustration Booklet, Page 9) and shape the wiring harness as shown.

NOTE: In the following steps, the term "BO" (break-out) refers to a place where a group of wires come out of the harness. Each breakout is identified by a number, such as "BO#1."

- ( ) Route the wiring harness and the transformer long orange lead as shown in the Pictorial.

- (✓) Route the connector at BO#1 through hole BF in the chassis; the connector should extend 6" through the hole.
- (✓) Route the two connectors from BO#2 through hole BG in the chassis; the two connectors should extend 1" through the hole.
- (✓) Route all the wires from BO#8 through the hole between the transformer and the circuit board to the other side of the chassis.
- (✓) Route the wires from BO#6 over the top of the chassis to the circuit board.



Detail 4-4B

Refer to Detail 4-4B for the next four steps.

- ✓ 1. Locate the 3-lug terminal strip and cut the three lugs flush with the top.
- ✓ 2. Q2: Bend the two leads of the TIL-78 transistor (#417-919) as shown; be sure the flat of the transistor is positioned as shown.

✓ 3. Insert the leads of the transistor into lug holes 1 and 2 of the terminal strip, then install the transistor in the unthreaded hole in the oblong mounting boss at Q2 on the chassis. Push the flat of the transistor against the boss.

✓ 4. Mount the terminal strip with two #4 lockwashers and a #4 flat washer and a 4-40 x 1/4" screw at hole BH as shown in the Pictorial.

✓ At BO#2, connect the inner lead of the shielded cable to terminal strip BH lug 2 (S-2).

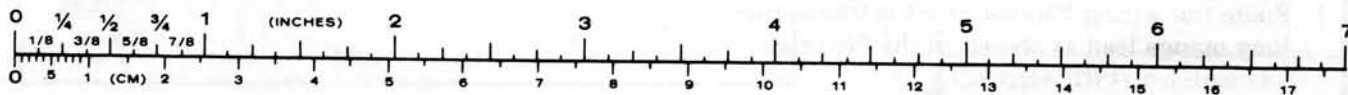
✓ Connect the shield lead of the shielded cable to terminal strip BH lug 1 (S-2).

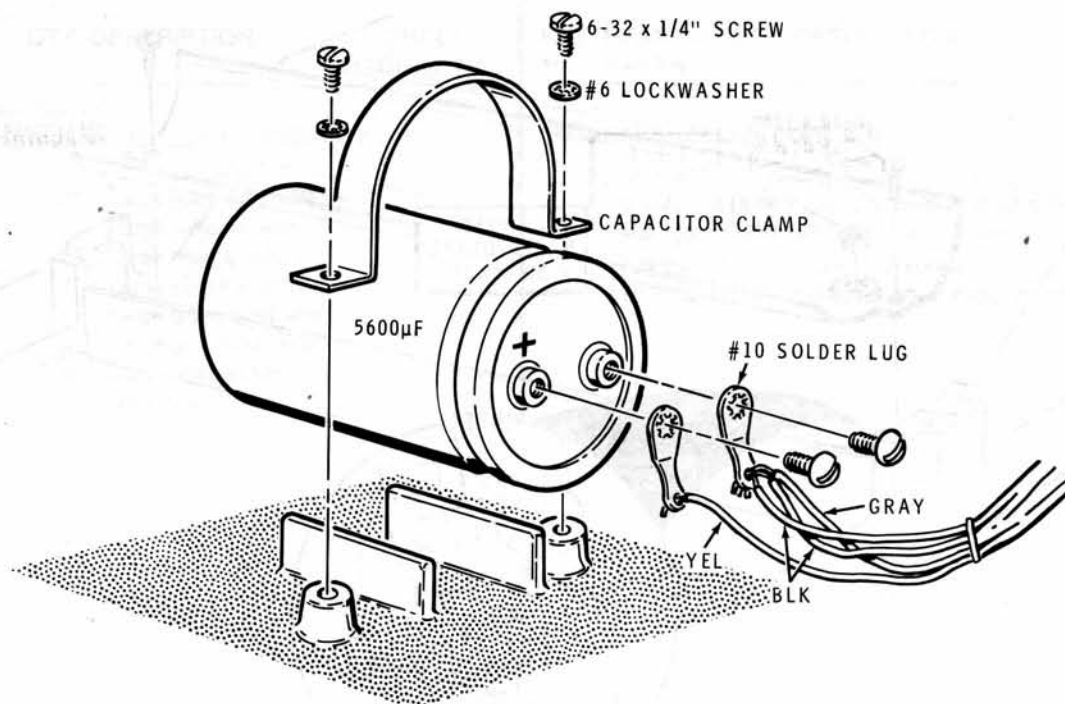
✓ Cut off the excess transistor lead lengths.

✓ Connect the red wire coming from BO#7 to the C (collector) lead of Q1 (S-1).

✓ Connect the violet wire coming from BO#7 to the E (emitter) lead of Q1 (S-1).

✓ At BO#7, connect the blue wire to the B (base) lead of transistor Q1 (S-1).





Detail 4-4C

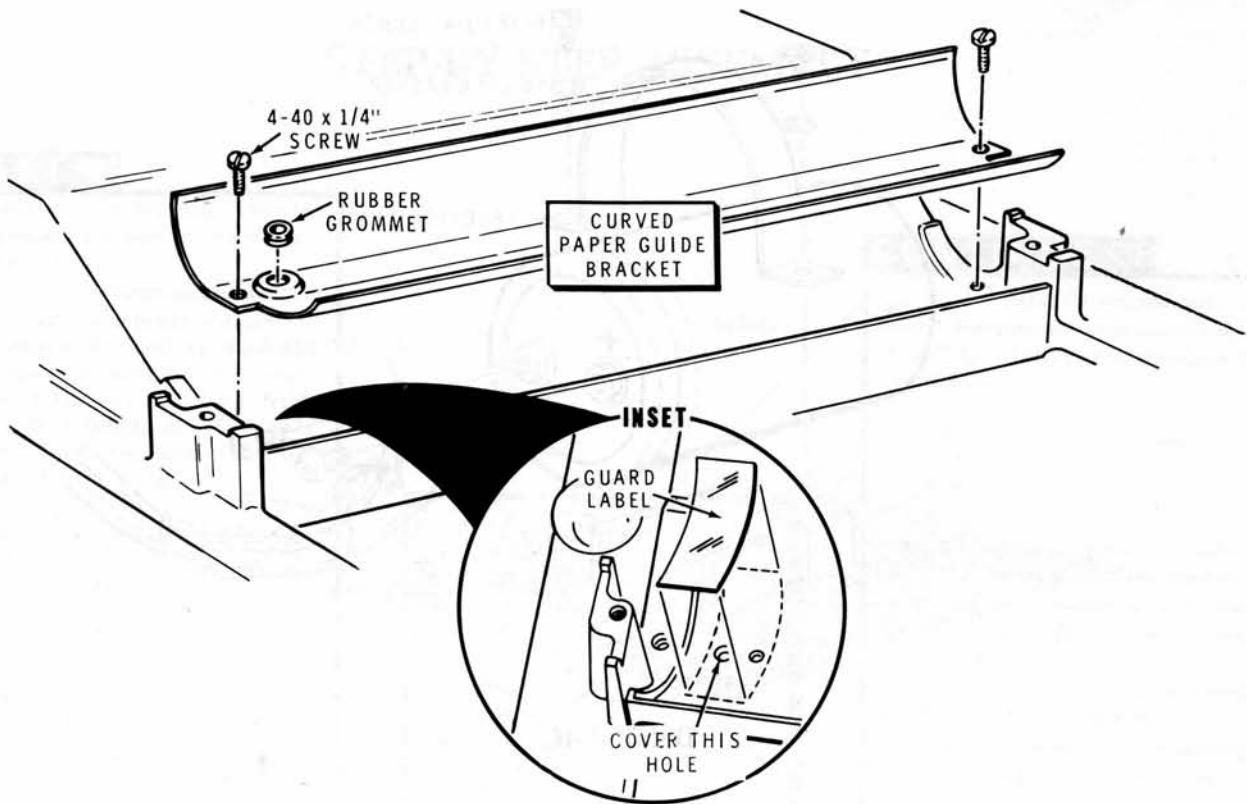
Refer to Detail 4-4C for the next three steps.

1. Connect the yellow wire coming from BO#7 of the wiring harness to a #10 solder lug (S-1). Then remove the screw from the plus (+) marked lug of the 5600  $\mu$ F capacitor and mount the solder lug to the capacitor lug with the screw just removed. Discard any lockwashers supplied with the capacitor.
2. Connect the gray and two black wires coming from BO#7 to a #10 solder lug (S-3). Then remove the screw from the negative lug of the 5600  $\mu$ F capacitor, and mount the solder lug to the capacitor with the screw just removed.

3. C3: Place the 5600  $\mu$ F capacitor on the two embossed ridges on the chassis. Place the capacitor clamp over the capacitor and secure it with two 6-32  $\times$  1/4" screws and #6 lockwashers. Be sure the capacitor is centered under the clamp and the solder lugs are positioned as shown. Also make sure that the solder lugs are not touching other solder joints or the chassis.

Refer to Pictorial 4-5 (Illustration Booklet; Page 10) for the following steps.

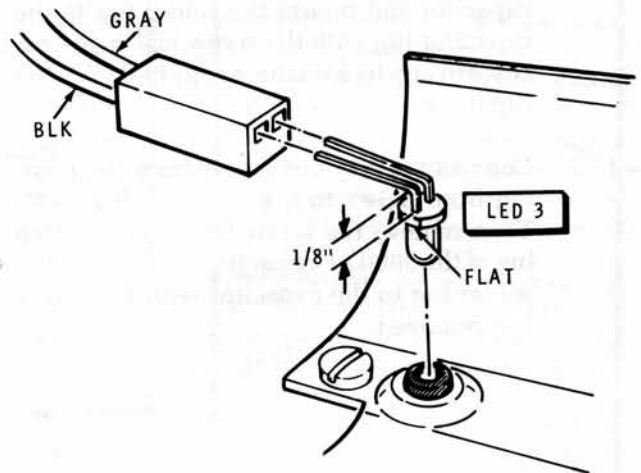
- Position the chassis on your work area as shown.



Detail 4-5A

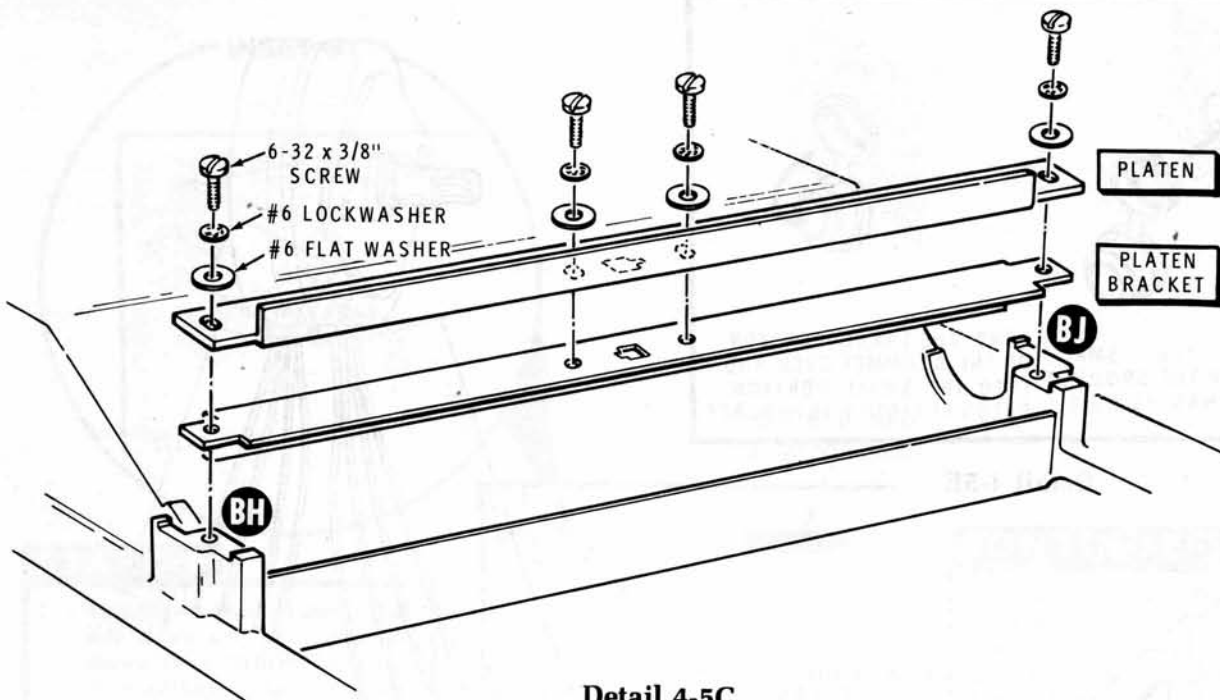
Refer to Detail 4-5A for the next three steps.

- ✓ Remove the adhesive backing from the clear plastic guard label. Then refer to the inset drawing in Detail 4-5A and press the label into place on the chassis. Make sure the label covers the hole shown.
- ✓ Install a rubber grommet in the large hole in the curved paper guide bracket.
- ✓ Mount the curved paper guide bracket on the chassis with two 4-40 × 1/4" screws.
- ✓ LED3: Refer to Detail 4-5B and bend the leads of the LED (#412-635) as shown; be sure the flat of the LED is positioned as shown. Insert the leads of the LED into the connector coming from hole BF. Be sure the LED leads are not touching each other and that the lead on the flat side of the LED is installed in the connector side with the black wire. Then, install the LED into the grommet on the curved paper guide bracket.



Detail 4-5B

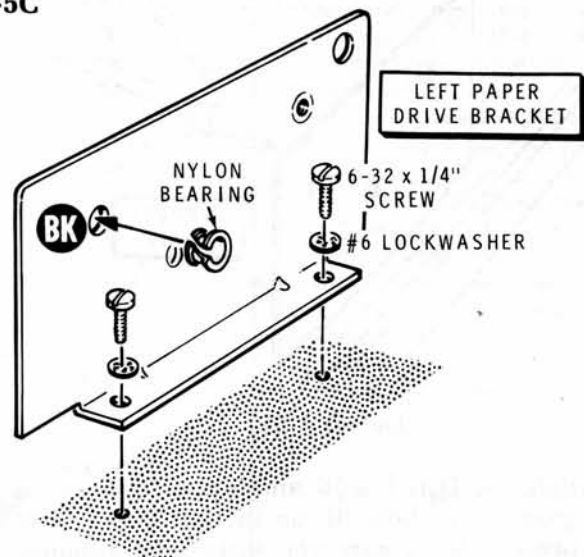




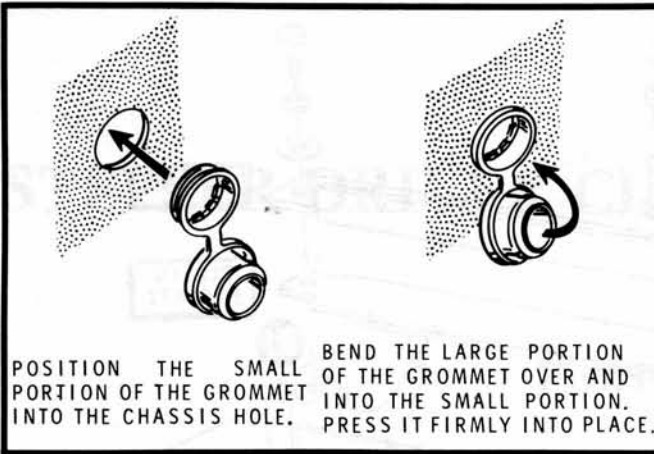
Detail 4-5C

Refer to Detail 4-5C for the next two steps:

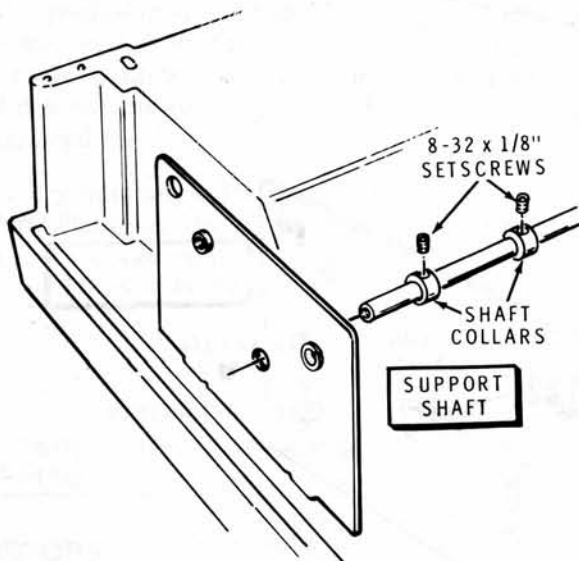
- ( ) Mount the platen to the platen bracket with two 6-32  $\times$  3/8" screws, #6 lockwashers, and #6 flat washers. Do not tighten the hardware at this time.
- ( ) Mount the assembled platen and platen bracket at holes BH and BJ with two 6-32  $\times$  3/8" screws, #6 lockwashers, and #6 flat washers. Be sure the platen and platen bracket are positioned as far to the rear of the chassis as possible.
- ( ) Refer to Detail 4-5D and install a snap-in nylon bearing in hole BK on the left paper drive bracket.
- ( ) Mount the left paper drive bracket with two 6-32  $\times$  1/4" screws, and #6 lockwashers.



Detail 4-5D

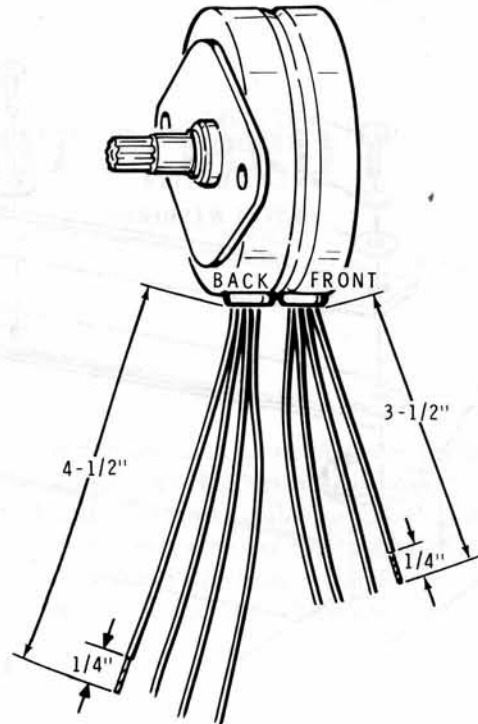


Detail 4-5E



Detail 4-5F

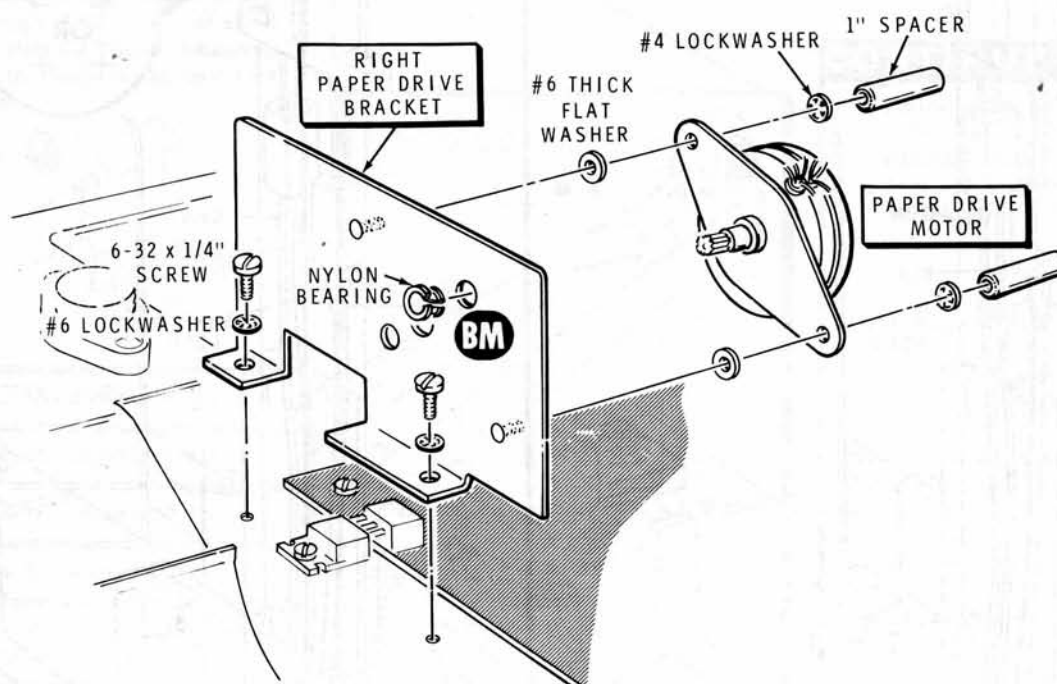
- ✓ Refer to Detail 4-5E and install the plastic grommet in hole BL on the left paper drive bracket. Make sure you install the grommet from the inside of the bracket as shown in the Pictorial.



Detail 4-5G

- ✓ Refer to Detail 4-5F and install 8-32 x 1/8" setscrews in the two small shaft collars. Position the small shaft collars midway on the 12-1/4" x 1/4" support shaft and just tighten the setscrews. Insert the end of the shaft through the lower hole in the left paper drive bracket; allow the shaft to extend 1" through the hole.
- ✓ Locate the paper drive motor. Then refer to Detail 4-5G and cut the **front** leads to 3-1/2" and the **back** leads to 4-1/2". Measure the leads from where they come out of the motor. Then remove 1/4" of insulation from the end of all leads.





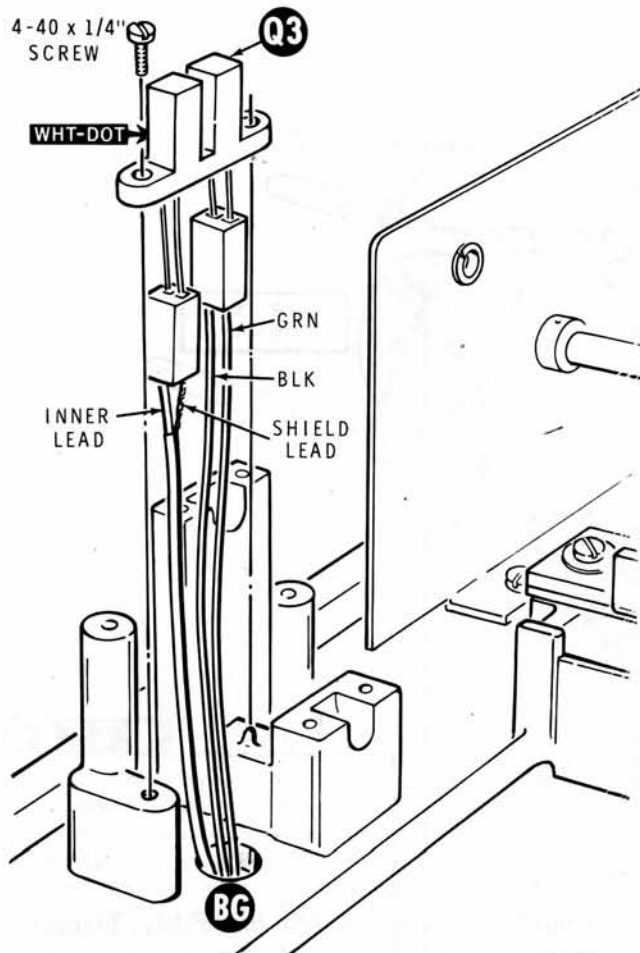
### Detail 4-5H

Refer to Detail 4-5H for the next three steps:

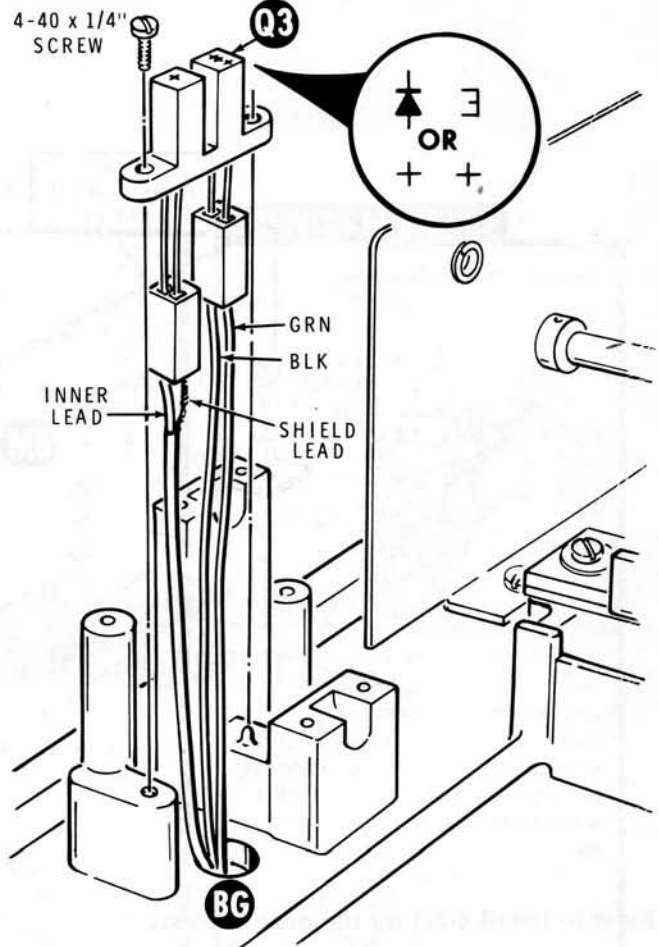
- (✓) Install a snap-in nylon bearing in hole BM on the right paper drive bracket.
- (✓) Mount the paper drive motor with two #6 thick flat washers, #4 lockwashers, and 1" spacers. Be sure the paper drive motor is positioned as shown. Tighten the hardware only finger tight at this time.

- (✓) Mount the assembled right paper drive bracket with two 6-32 × 1/4" screws, and #6 lockwashers.
- (✓) Install the support shaft with the two small shaft collars into the bottom hole on the right paper drive bracket until it just touches the paper drive motor. Loosen the setscrews in the shaft collars and position the shaft collars against the left and right paper drive brackets and then tighten the setscrews.

## PART 1



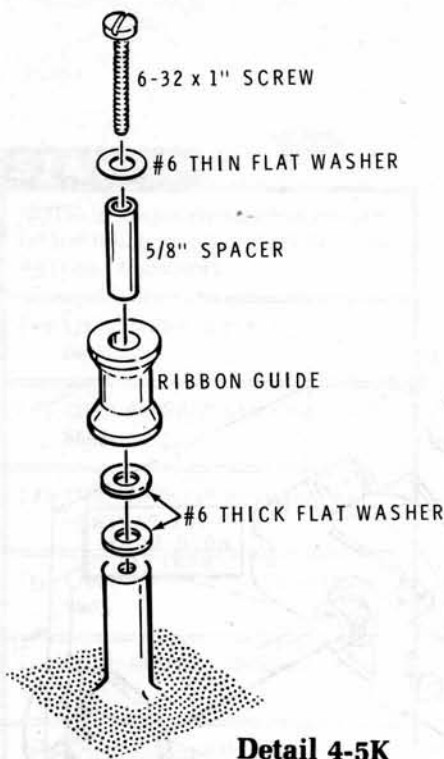
## PART 2



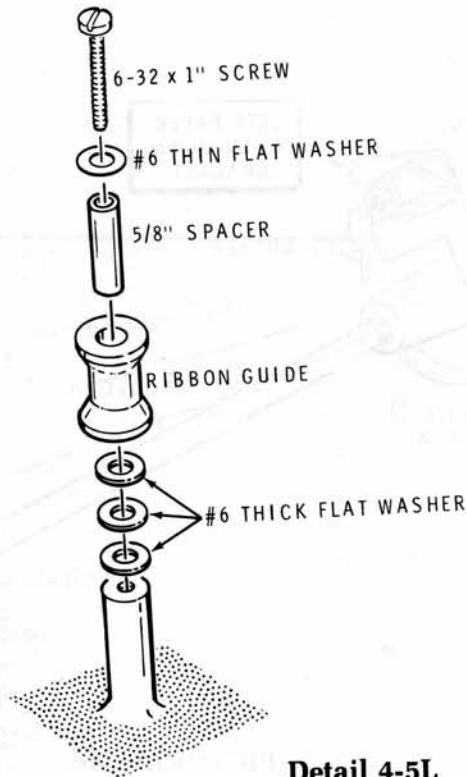
## Detail 4-5J

NOTE: In the next step, if the optical switch (#150-74) has a white dot on its side, refer to Detail 4-5J Part 1; if it has plus (+) markings on its top, refer to Detail 4-5J Part 2.

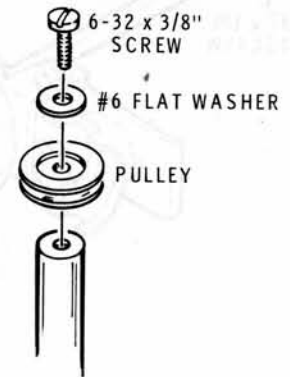
- ( ) Q3: Cut the leads of the optical switch to 3/8". Then insert the leads into the two connectors routed through hole BG; be sure the connectors are positioned as shown in the appropriate Detail.
- ( ) Push the optical switch and the connectors down while pulling the connector wires through hole BG until the connectors are positioned between the mounting bosses, and the optical switch is seated on the mounting bosses. Be sure the raised circular boss is inserted in the mounting hole.
- ( ) Secure the optical switch with a 4-40 × 1/4" screw.
- ( ) Refer to Detail 4-5K and install ribbon guides on mounting bosses BP and BN. Use two #6 thick flat washers, a 5/8" spacer, a #6 thin flat washer, and a 6-32 × 1" screw at each location.
- ( ) Refer to Detail 4-5L and install ribbon guides on mounting bosses BQ and BR. Use three #6 thick flat washers, a 5/8" spacer, a #6 thin flat washer, and a 6-32 × 1" screw at each location.
- ( ) Refer to Detail 4-5M and mount a pulley at BS and BT with 6-32 × 3/8" screws, and #6 flat washers.
- ( ) Refer to Detail 4-5N and mount the two spring retainer pins at holes BU and BV with 1/16" thick flat washers as shown.



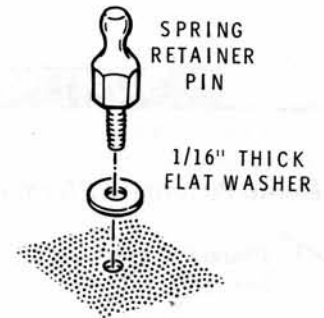
Detail 4-5K



Detail 4-5L



Detail 4-5M



Detail 4-5N

Refer to Part A of Pictorial 4-6 (Illustration Booklet, Page 11) for the following steps. NOTE: The following Details are also shown on Page 11 in the Illustration Booklet.

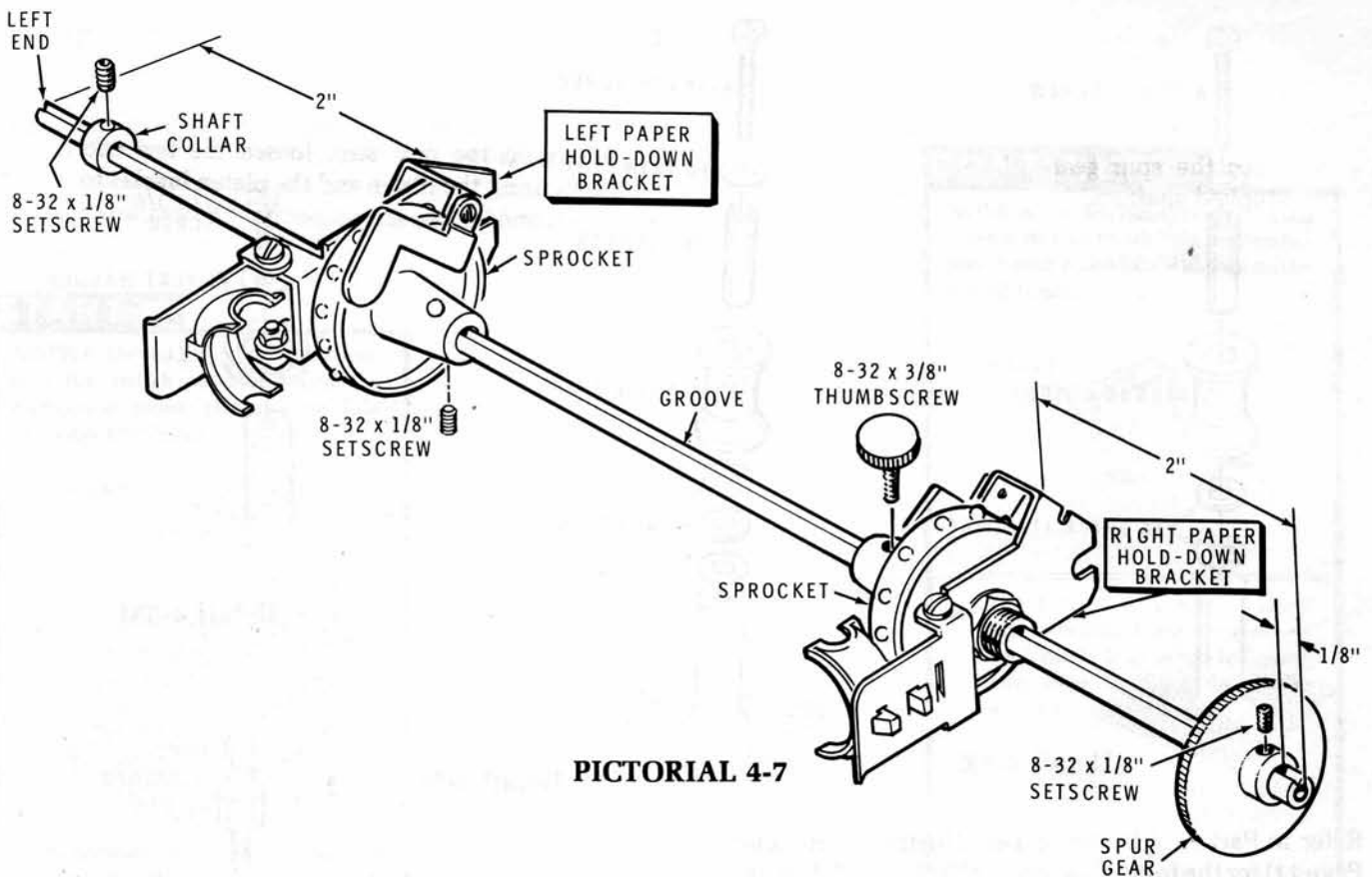
- (✓) Refer to Detail 4-6A and mount a threaded bushing on the right paper hold-down bracket with a 3/8" lockwasher, and a 3/8-32 nut.

NOTE: In the next step, make sure one of the spacers on the pivot bracket is half way through its hole.

- (✓) Refer to Detail 4-6B and place a 9/64" spacer in each hole on a hold-down pivot bracket. Be sure the spacers are positioned as shown in the Pictorial. Mount the hold-down pivot bracket and the spacers to the right paper hold-down bracket with two 4-40 x 3/8" screws, #4 lockwashers, and 4-40 nuts.
- (✓) Using long-nose pliers, hook one end of a paper hold-down spring to the hold-down pivot bracket as shown. Then hook the free end of the spring to the right paper hold-down bracket as shown in the Pictorial.

- (✓) Operate the pivot bracket (and readjust it if necessary) to be sure it snaps smoothly back and forth.
- (✓) Refer to Detail 4-6C and install a paper lifter with a 2-56 x 1/4" screw as shown.
- (✓) Refer to Detail 4-6D and install a paper hold-down on the hold-down pivot bracket.
- (✓) Refer to Part B of Pictorial 4-6 and in a similar manner, assemble the left paper hold-down bracket.





PICTORIAL 4-7

Refer to Pictorial 4-7 for the following steps.

- ✓ Place the sprocket in the left paper hold-down brackets.
- ✓ Make sure the sprocket hub is positioned as shown in the Pictorial. Mount the sprocket, the left paper hold-down bracket and the hold-down pivot bracket as an assembly on the left end of the grooved shaft. Note that the sprocket is "keyed" to fit correctly onto the shaft in only one position.
- ✓ Install an 8-32 × 1/8" setscrew into the underside of the sprocket as shown.
- ✓ Position the assembly 2" from the end of the shaft and tighten the setscrew just slightly. Be sure the sprocket hub is positioned as shown.
- ✓ Place the other sprocket (with the hub positioned as shown in the Pictorial) in the right paper hold-down bracket.
- ✓ Mount the sprocket, the right paper hold-down bracket, and the hold-down pivot bracket as an assembly on the right end of the grooved shaft. Position the assembly 2" from the right end of the shaft.
- ✓ Install the 3-32 × 3/8" knurled thumbscrew in the other sprocket and tighten the thumbscrew. Be sure the sprocket is positioned so the thumbscrew is over the groove in the shaft.



- (✓) Install an 8-32 × 1/8" setscrew in the hub of the spur gear; do not thread the setscrew all the way into the spur gear.
- (✓) Place the spur gear on the right end of the grooved shaft and be sure the setscrew is over the groove in the shaft. Position the spur gear 1/8" from the end of the shaft and tighten the setscrew.
- (✓) Install an 8-32 × 1/8" setscrew in the small shaft collar and install the shaft collar on the left end of the grooved shaft. Do not tighten the setscrew.

Set the paper drive assembly aside until it is called for later.

Refer to Pictorial 4-8 (Illustration Booklet, Page 12) for the following steps,

Position the chassis as shown in the Pictorial.

- ( ) Carefully remove the print head from its container and unwind the cable assembly from the print head.

Refer to Detail 4-8A (Illustration Booklet, Page 12) for the next five steps.

- (✓) 1. Remove the packing material from the print head package and place the print head with the print face down on the packing material.
- (✓) 2. Mount the head drive bracket to the print head with two #4 × 7/16" self-tapping screws and 7/32" spacers.
- (✓) 3. Insert the 10-5/8" × 1/4" shaft through the bottom hole of the print head.
- (✓) 4. Insert the 11-3/4" × 5/16" shaft through the top hole of the print head.

- ( ) 5. Place a felt washer on each end of the 10-5/8" × 1/4" shaft.

CAUTION: To prevent damage to the printing mechanism in the next step, loosen the two end screws securing the platen and the platen bracket to the chassis and the two screws securing them to each other. Then move the platen and the platen bracket to the rear of the chassis away from you.

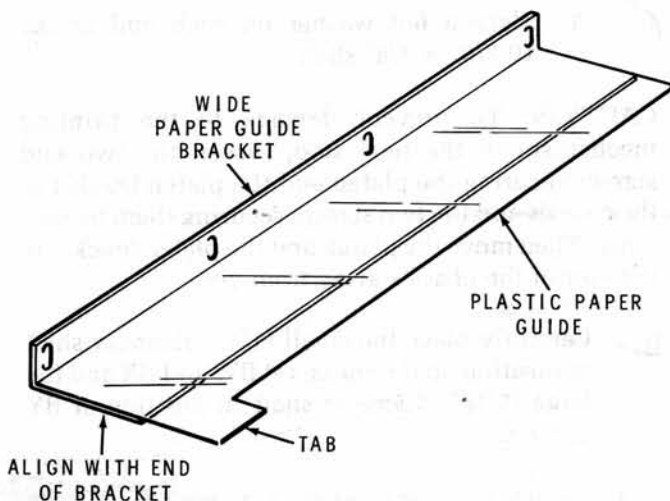
- (✓) Carefully place the small (1/4") diameter shaft in position on the chassis at BW and BX and the large (5/16") diameter shaft in position at BY and BZ.

- (✓) Mount the print head shafts to the chassis with four shaft retainer plates and eight 4-40 × 1/4" screws and then position the felt washers against the mounting bosses.

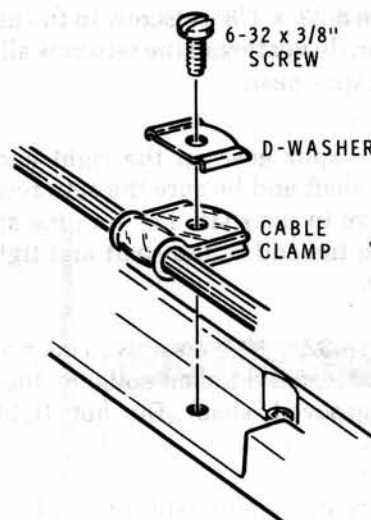
Refer to Pictorial 4-9 (Illustration Booklet, Page 12) for the following steps.

NOTE: In the next step, the platen mounting screws must be snug, but just loose enough to allow the platen to be moved with a screwdriver.

- (✓) Loosen the end two platen mounting screws. Using the .015" feeler gauge, adjust the spacing between the nose of the print head and the platen at each end of the print head travel. Then retighten the screws.
- (✓) Loosen the two screws securing the platen and the platen bracket together. Carefully move the print head to the center of the platen and, using the .015" feeler gauge, adjust the spacing between the platen and the nose of the print head. Tighten the two screws securely.
- (✓) Recheck, and if necessary, readjust the spacing between the nose of the print head and the platen at each end and the center of the print head travel. Then tighten all the screws securely.



Detail 4-10A

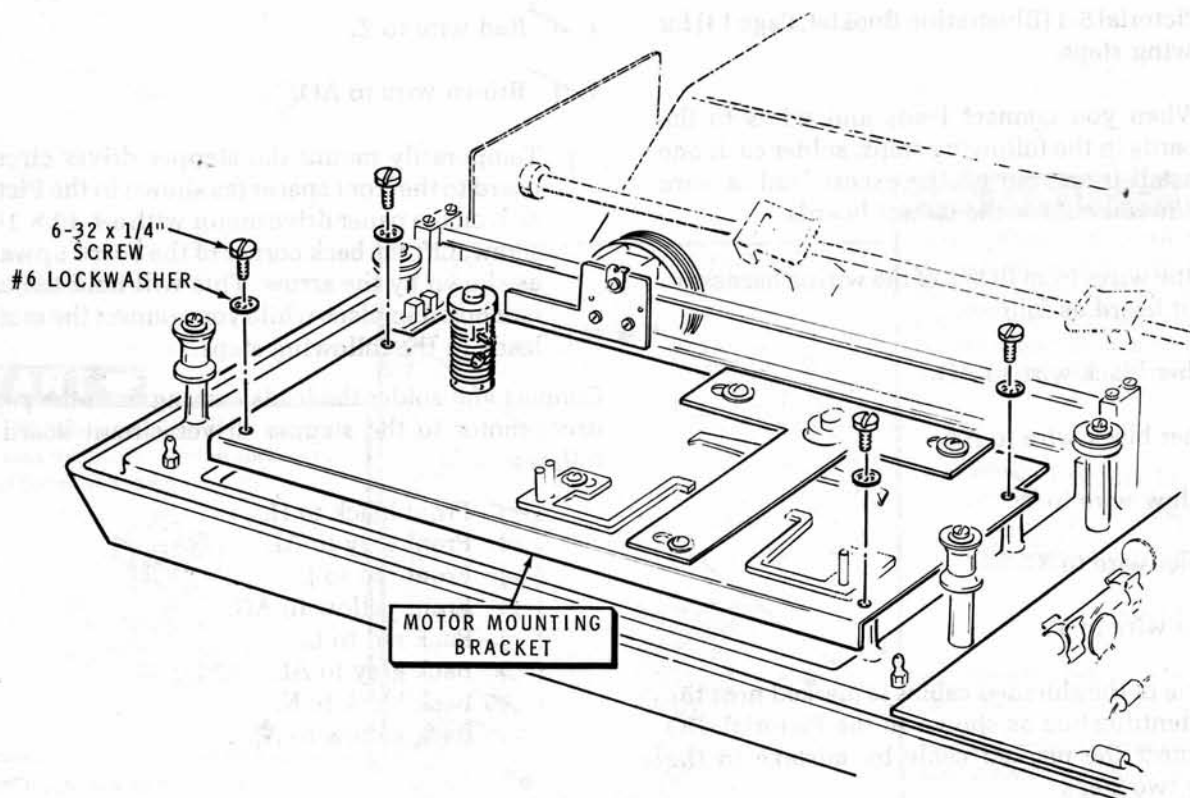


Detail 4-10B

Refer to Pictorial 4-10 (Illustration Booklet, Page 13) for the following steps.

- ( ) Position the chassis on your work area as shown.
- ( ) Cut a 10" length of clear sleeving and install it on the 10-5/8" x 1/8" cable guide shaft. Be sure the sleeving is centered on the cable guide shaft. NOTE: If the sleeving does not slip on easily, apply a small amount of liquid soap to the shaft. Then grip the sleeving with a paper towel and install it on the shaft.
- ( ) Place a piece of tape (any kind) around the print head cable 13" from the print head as shown in the inset drawing on the Pictorial. NOTE: Do not place the tape on the cable wrap. Cut off part of the cable wrap if necessary. Be careful not to cut any of the cable wires.
- ( ) Wind the print head cable assembly six turns (in the direction shown) on the cable guide shaft. Then mount the cable guide shaft at CA and CB with two shaft retainer plates and four 4-40 x 1/4" screws.
- ( ) Refer to Detail 4-10A and position the wide paper guide bracket on your work area as shown. Remove the protective strip from the plastic paper guide and press the paper guide on the wide paper guide bracket with the tab positioned as shown in the Detail. Make sure the paper guide is aligned and even with the end of the bracket as shown.
- ( ) Mount the wide paper guide bracket with four 4-40 x 1/4" screws and #4 lockwashers. Position it as far to the rear as possible before you tighten the screws.
- ( ) Place the small cable clamp on the print head cable assembly over the tape. Then refer to Detail 4-10B and mount the cable clamp at hole CC with a D-washer and a 6-32 x 3/8" screw.





**PICTORIAL 4-11**

Refer to Pictorial 4-11 for the following steps.

- 1) Position the chassis on your work area as shown.

- 2) Position the motor mounting bracket on the chassis as shown in the Pictorial. Mount the motor mounting bracket with four 6-32 × 1/4" screws and #6 lockwashers.

**NOTE:** In the next step, be sure that the wires are not pinched between the motor mounting bracket and the bosses on the chassis.

## WIRING

Refer to Pictorial 5-1 (Illustration Booklet, Page 14) for the following steps.

NOTE: When you connect leads and wires to the circuit boards in the following steps, solder each one as you install it and cut off the excess lead or wire ends on the foil side of the circuit boards.

Connect the wires from BO#8 of the wiring harness to the circuit board as follows:

- (  ) Either black wire to AD.
- (  ) Other black wire to AA.
- (  ) Yellow wire to W.
- (  ) Violet wire to X.
- (  ) Blue wire to Y.

NOTE: One of the shielded cables is marked near the end for identification as shown in the Pictorial. DO NOT connect the marked cable by mistake in the following two steps.

- (  ) Unmarked shielded cable inner lead to C.
- (  ) Unmarked shielded cable shield lead to D.
- (  ) Marked shielded cable shield lead to K.
- (  ) Marked shielded cable inner lead to J.
- (  ) Green wire to A.
- (  ) Gray wire to B.
- (  ) Orange wire to AH.
- (  ) Route the ribbon motor yellow lead between the two motor mounting plate mounting bosses and connect this lead to circuit board hole AM (S-1).

Connect the wires from BO#6 of the wiring harness to the circuit board as follows:

- (  ) Violet wire to AQ.
- (  ) Black wire to AP.

(  ) Blue wire to AN.

(  ) Red wire to Z.

(  ) Brown wire to AO.

- (  ) Temporarily mount the stepper driver circuit board to the front spacer (as shown in the Pictorial) on the paper drive motor with a 4-40 × 1/4" screw. Lift the back corner of the board upward as shown by the arrow. This will hold the circuit board in place while you connect the motor leads in the following steps.

Connect and solder the leads coming from the paper drive motor to the stepper driver circuit board as follows:

- (  ) Front black to H.
- (  ) Front gray to AI.
- (  ) Front red to J.
- (  ) Front yellow to AG.
- (  ) Back red to L.
- (  ) Back gray to AL.
- (  ) Back black to K.
- (  ) Back yellow to AJ.

- (  ) Loosen the screw that holds the stepper driver circuit board to the front spacer. Then position the rear corner of the circuit board down to its permanent location as shown in the Pictorial. Install a 4-40 × 1/4" screw in the back spacer. Leave both mounting screws **slightly** loose at this time.

NOTE: In the following steps, you will connect the wires coming from the stepper drive circuit board to the main circuit board. Most of the wires will connect to holes that were previously intended for component leads. Make sure you connect each wire to the correct hole.

- (  ) Green to hole AE.
- (  ) Yellow to B (base) hole of Q121.
- (  ) Orange to the hole at the **banded** end of D114.
- (  ) Black to E (Emitter) hole of Q120.
- (  ) White-yellow to B (base) hole of Q120.
- (  ) Gray to B (base) hole of Q123.





- ( ) White-gray to B (base) hole of Q122.
- ( ) Solder the red wire to the foil on the top (component) side of the main circuit board at hole Z. There is another red wire soldered in the hole at this location.

Refer to Pictorial 5-2 (Illustration Booklet, Page 14) for the following steps.

Connect the six short leads coming from the transformer to the circuit board as follows:

- ( ) Green-yellow lead to N.
- ( ) Either red lead to O.
- ( ) Other red lead to P.
- ( ) Either green lead to Q.
- ( ) Other green lead to R.
- ( ) Orange lead to M.

Connect the wires of the 8-wire cable and the single black wire coming from the switch assembly to the circuit board as follows:

- ( ) Violet wire to AC.
- ( ) Gray wire to L.
- ( ) Brown wire to AB.
- ( ) Small black wire to AR.
- ( ) Red wire to E.
- ( ) Orange wire to F.
- ( ) Yellow wire to G.
- ( ) Green wire to H.
- ( ) Blue wire to I.
- ( ) Refer to the inset drawing on the Pictorial and tie the nine wires with a cable tie positioned as shown in the Pictorial, then cut off the excess cable tie length.

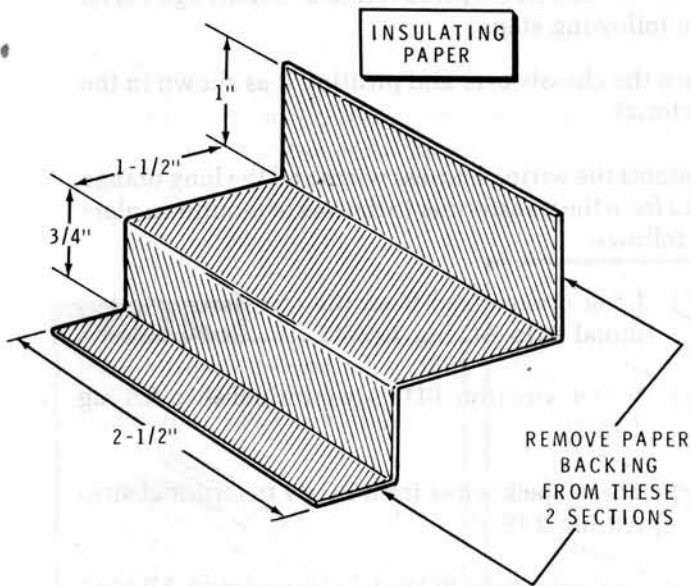
NOTE: Some circuit board holes are not used.

Refer to Pictorial 5-3 (Illustration Booklet, Page 15) for the following steps.

Turn the chassis over and position it as shown in the Pictorial.

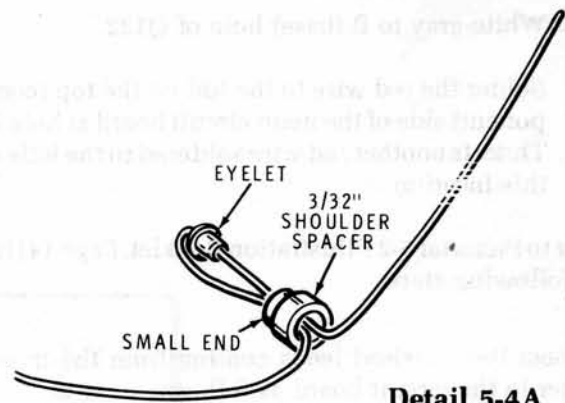
Connect the wiring harness wires and the long orange lead from the transformer to the motor mounting plate as follows:

- ( ) Long orange lead from the transformer to terminal strip AC lug 3 (S-4).
  - ( ) Violet wire from BO#5 to terminal strip AA lug 1 (S-2).
  - ( ) Three black wires from BO#4 to terminal strip AB lug 2 (S-4).
  - ( ) Gray wire from BO#4 to terminal strip AB lug 1 (S-2).
  - ( ) Brown wire from BO#3 to terminal strip AC lug 1 (S-3).
  - ( ) Orange wire from BO#3 to terminal strip AC lug 2 (S-2).
  - ( ) Blue wire from BO#3 to terminal strip AD lug 1 (S-3).
  - ( ) Tie the orange lead from the transformer into the wiring harness using seven cable ties spaced evenly along the cable harness as shown in the Pictorial. Cut off the excess cable tie lengths after they are installed. Position the cable harness neatly on the chassis.
- Refer to the inset drawing on the Pictorial for the next three steps.
- ( ) Place the switch assembly near the chassis and route the two large black wires coming from the switch assembly up through chassis hole BE.
  - ( ) Connect either of the large black wires to fuseholder BA lug 2 (S-1).
  - ( ) Connect the other large black wire to terminal strip BB lug 1 (S-4).



**Detail 5-3A**

- (✓) Refer to Detail 5-3A and prepare the 2-1/2" × 4-1/8" insulating paper as shown.
- (✓) Install the prepared insulating paper over transistor Q1 socket as shown in the Pictorial.



**Detail 5-4A**

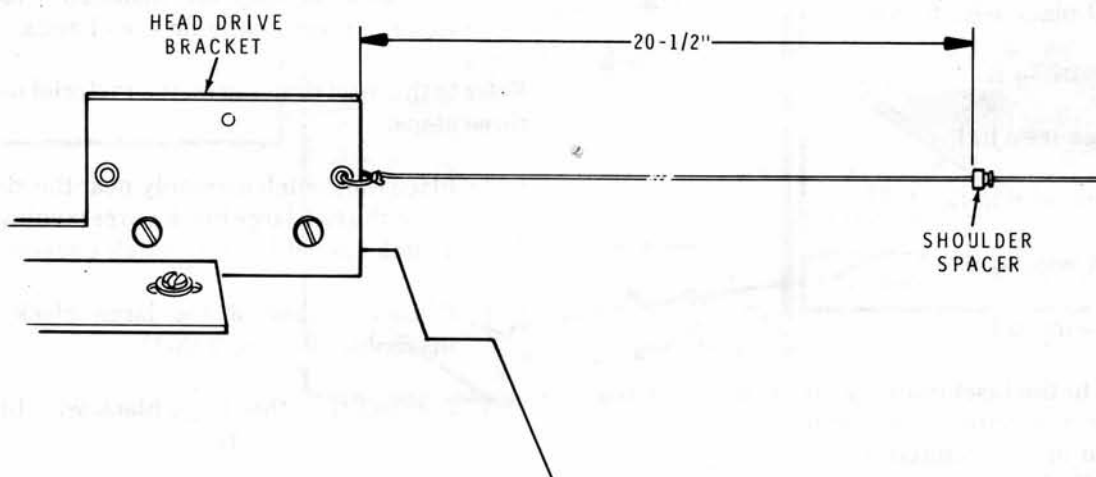
Refer to Pictorial 5-4 (Illustration Booklet, Page 16) for the following steps.

Turn the chassis over and position it as shown in the Pictorial.

- (✓) Refer to Detail 5-4A and insert one end of the print head string through the eyelet. Then insert both ends of the string through the 3/32" shoulder spacer.

NOTE: Refer to the Pictorial and read through the following seven steps to become familiar with the procedure for installing the string. Then go back and perform each step.

- (✓) 1. Move the print head to the extreme right of the platen.



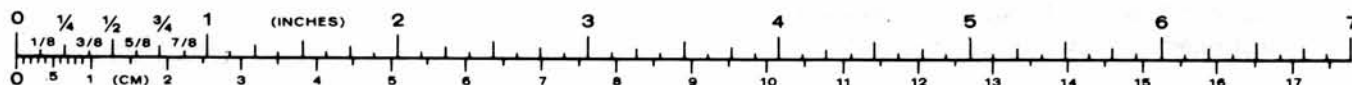
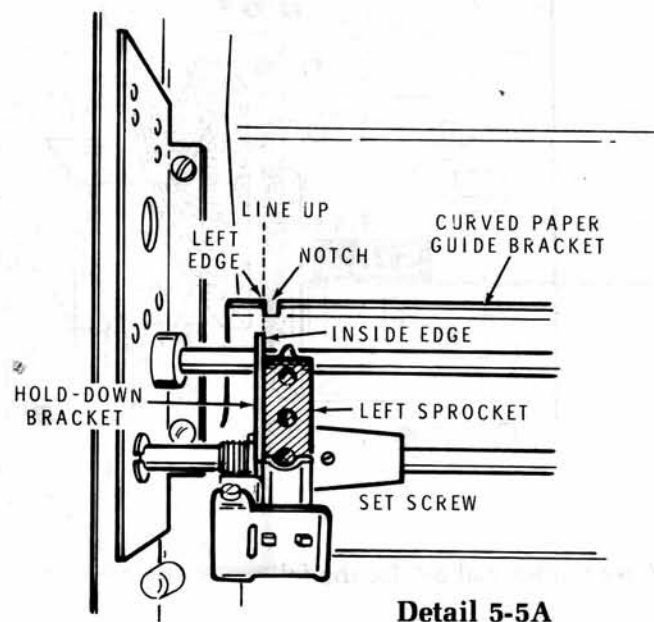
**Detail 5-4B**

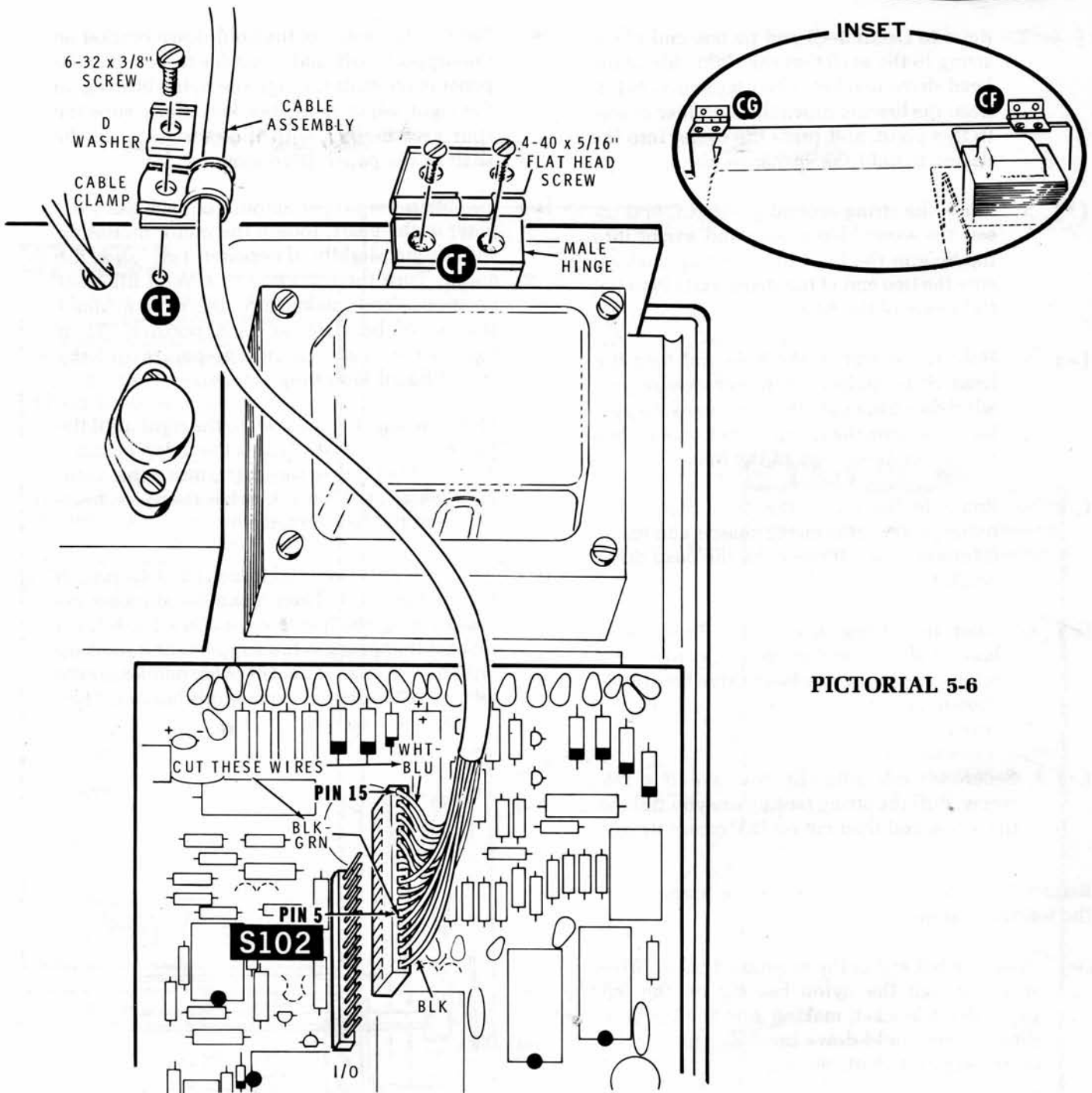
- (✓) 2. Refer to Detail 5-4B and tie one end of the string to the eyelet on the right side of the head drive bracket. Then measure 20-1/2" from the bracket, move the shoulder spacer to this point, and press the eyelet into the spacer to hold the spacer in place.
- (✓) 3. Route the string around pulley CC and insert the assembled spacer and eyelet into the hole in the head drive pulley, making sure the free end of the string exits from the right side of the hole.
- (✓) 4. Hold the spacer in the hole and turn the head drive pulley counterclockwise and wind the string onto the grooves of the pulley. Make sure the string starts in the groove located on the center of the hole.
- (✓) 5. Route the free end of the string around the nylon pulley at CD on the chassis and insert it through the left eyelet on the head drive bracket.
- (✓) 6. Hold the string against the head drive bracket above the threaded hole, place the retaining clip on the head drive bracket as shown in the inset drawing to hold the string.
- (✓) 7. Secure the retaining clip with a 4-40 × 1/4" screw. Pull the string taut before you tighten the screw and then cut off the excess string.

Refer to Pictorial 5-5 (Illustration Booklet, Page 16) for the following steps.

- (✓) Insert the left end of the assembled paper drive shaft through the nylon bearing on the left paper drive bracket, making sure the notch in the left paper hold-down bracket is positioned on the support shaft.
- (✓) Continue inserting the paper drive shaft through the nylon bearing until the right end of the shaft clears the right paper drive bracket.

- (✓) Position the notch of the hold-down bracket on the support shaft, and insert the right end of the paper drive shaft through the nylon bearing on the right paper drive bracket. Make sure the spur gear meshes with the gear teeth on the shaft of the paper drive motor.
- (✓) To obtain the proper amount of backlash (free play) in the gears, loosen the motor mounting spacers just slightly (if necessary) and slide the motor. Turn the sprockets to several different positions, and make sure there is a small amount of backlash at each position. Then tighten the motor mounting spacers and the circuit board mounting screws.
- (✓) Move the paper drive shaft to the right until the hub of the gear just touches the nylon bearing. At the other end of the shaft, move the small shaft collar until it just touches the nylon bearing, then tighten the setscrew.
- (✓) Refer to Detail 5-5A and loosen the setscrew on the left sprocket. Then move the sprocket assembly until the inside edge of the hold-down bracket that engages the support shaft lines up with the left edge of the 1/8" wide notch near the left end of the curved paper guide bracket. Then tighten the setscrew.



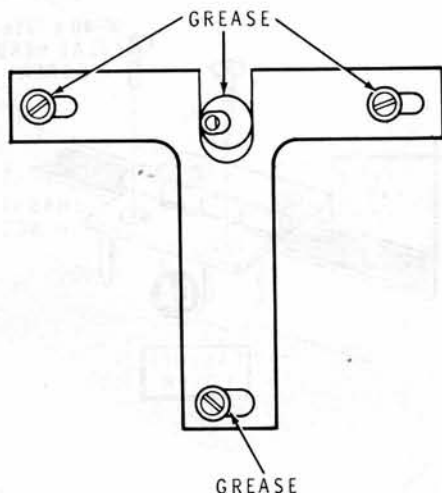


PICTORIAL 5-6

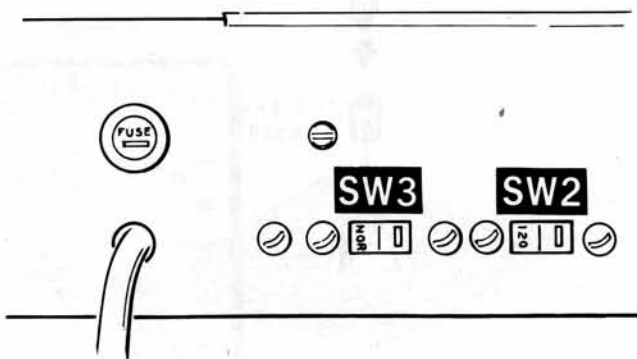
Refer to Pictorial 5-6 for the following steps.

- (1) Place the large cable clamp on the cable assembly 6-3/4" from the connector. Mount the cable clamp to the chassis at CE with a D-washer and a 6-32 x 3/8" screw. Be sure the cable clamp is positioned as shown in the Pictorial.

NOTE: In the following step, be sure that the cable connector mates properly with circuit board connector I/O S102. Position the connector with the black and white-blue wires as shown.



PICTORIAL 5-7



Detail 5-8A

- Connect the cable assembly connect to the circuit board connector I/O S102.
- Mount the hinges with two 4-40 × 5/16" flat head screws on each hinge to the top rear of the chassis at CF, and CG as shown in the inset drawing.

**CAUTION:** In the following step, be sure to use the correct grease (not thermal compound). The part number (#352-14) is stamped on the bottom of the container.

- Refer to Pictorial 5-7 and apply a liberal coating of grease to the three brass shouldered spacers and the ribbon motor cam. Rotate the ribbon motor cam by hand to be sure the grease is distributed evenly. (Do **not** use the thermal compound, #352-31.)

Refer to Pictorial 5-8 (Illustration Booklet, Page 17) for the following steps.

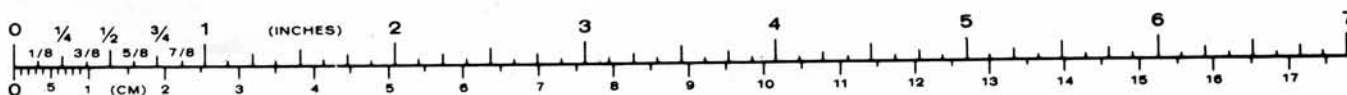
- Remove the two protective strips from the caution label and mount the label to the chassis in the area shown in the Pictorial.
- Remove the protective backing from the blue and white model label and mount the label to the chassis in the area shown in the Pictorial.

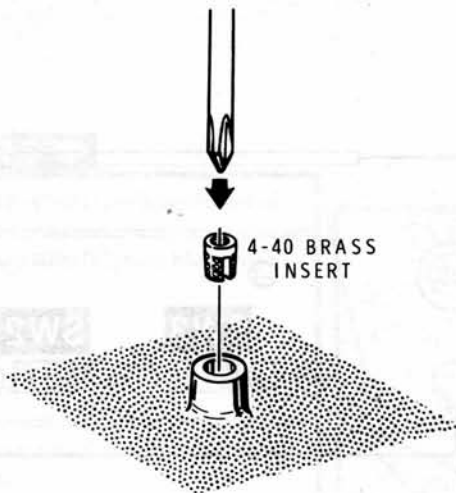
Refer to Detail 5-8A for the next two steps.

- Set the 120/240 switch (SW2) to the position corresponding to the power line voltage in your area.
- Measure the power line voltage with a voltmeter. If the voltage is 110 VAC or more (or 220 VAC for 240-volt operation), set the NOR/LOW switch (SW3) to the NOR position. If the voltage is less than 110 VAC (or 220 VAC for 240-volt operation), set the NOR/LOW switch to the LOW position. **NOTE:** If no meter is available, set the switch to the NOR position.
- If the power line voltage in your area is 120 VAC, install the 1-ampere slow-blow fuse in the fuseholder. If the power line voltage is 240 VAC, install the 1/2-ampere slow-blow fuse.

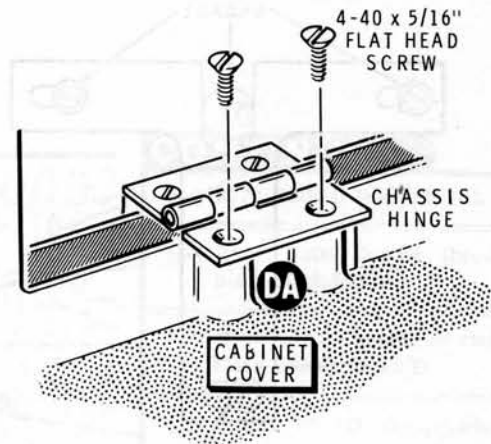
Refer to the inset drawing in Pictorial 5-8 and,

- Refer to the inset drawing in Pictorial 5-8 and, if your power line frequency is 60 Hz, set switch SW102 section 2 to "1." If your power line frequency is 50 Hz, set it to "0."





Detail 5-9A



Detail 5-9B

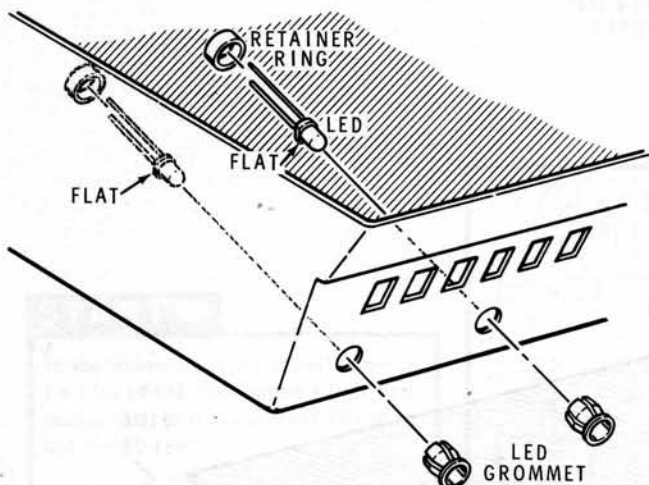
Refer to Pictorial 5-9 (Illustration Booklet, Page 18) for the following steps.

- ( T ) Position the cabinet cover on your work area as shown.
- ( T ) Refer to Detail 5-9A and install the eleven 4-40 brass inserts in holes DA through DJ by pushing

down on them with a phillips screwdriver or similar tool. Press the inserts down until they are flush with the top of the bosses.

- ( T ) Secure the chassis hinges to the cabinet cover at DA and DD with two 4-40 x 5/16" flat head screws on each hinge as shown in Detail 5-9B.

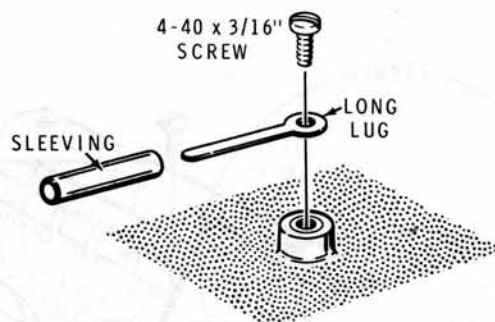




Detail 5-9C

Refer to Detail 5-9C for the next three steps:

- (✓) 1. Install the two LED retaining clips in the holes on the front of the cabinet cover.
- (✓) 2. LED1 and LED2: Insert the LED's into the retaining clips from the inside the cabinet cover; be sure the flat side of each LED is positioned as shown and push the LED's into the retaining clips as far as possible.

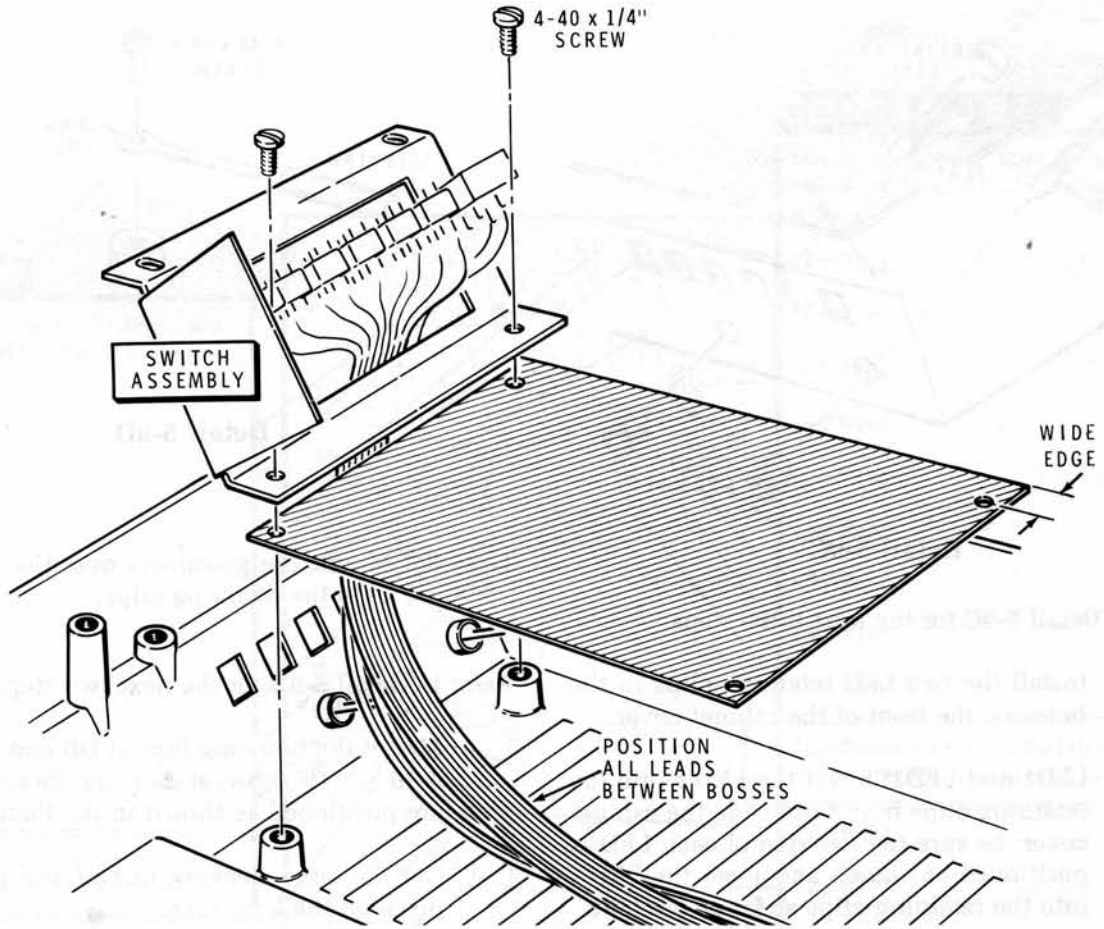


Detail 5-9D

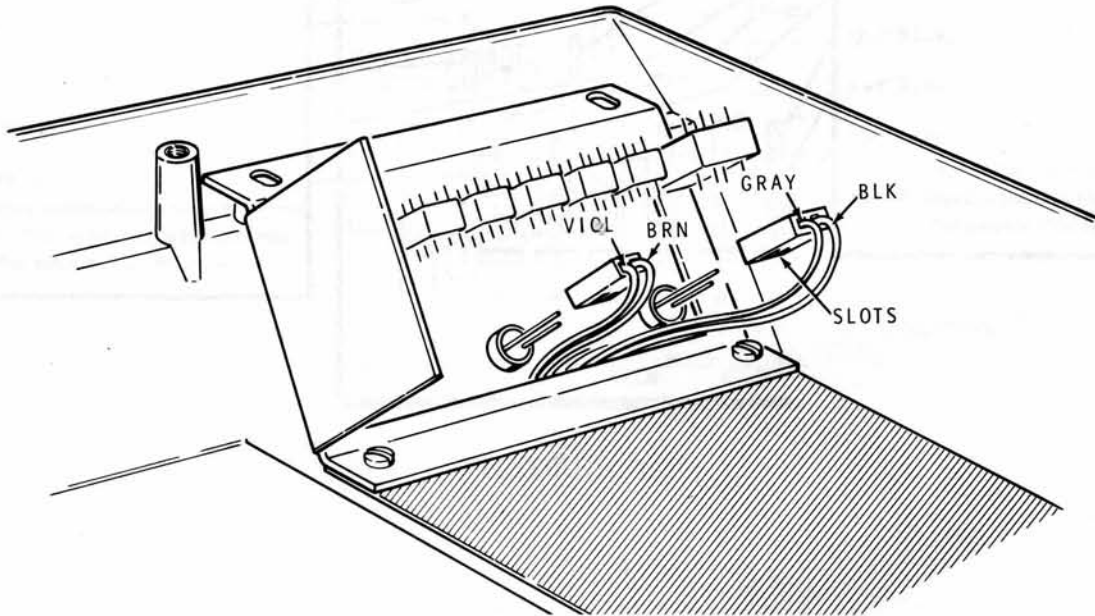
- (✓) 3. Mount the grommets over the LED's and onto the retaining clips.

Refer to Detail 5-9D for the next two steps:

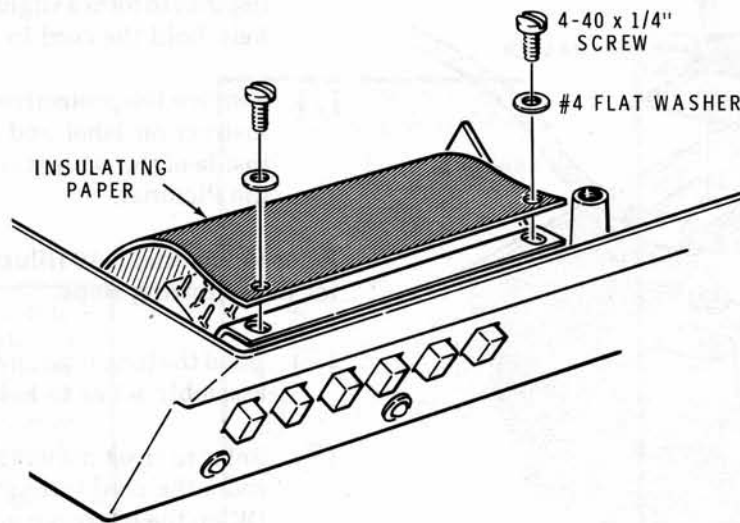
- (✓) Mount the two long lugs at DB and DC with a 4-40 x 3/16" screw at each lug. Be sure the lugs are positioned as shown in the Pictorial.
- ( ) Cut the large sleeving in half and place each piece on the long lugs.



Detail 5-9E

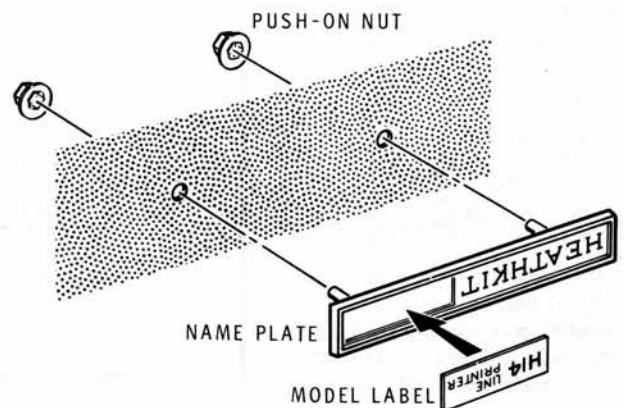


Detail 5-9F

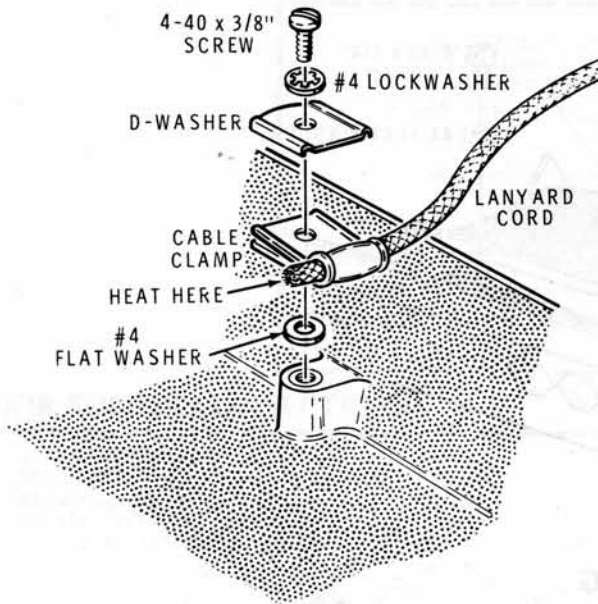


Detail 5-9G

- (✓) Refer to Detail 5-9E and mount the switch assembly and the insulating paper to the cover with two 4-40 × 1/4" screws at DF and DJ. Position the insulating paper with the wide edge as shown. Be sure the leads are positioned as shown in the Detail.
- (✓) Refer to Detail 5-9F and connect the two connectors from the switch assembly to LED1 and LED2. Refer to the wire colors called out in the Detail, and be sure the connectors are connected as shown.
- (✓) Refer to Detail 5-9G and bend the insulating paper over the switch assembly as shown. Secure the insulating paper and the switch assembly to the cover with two 4-40 × 1/4" screws and #4 flat washers at DG and DH as shown in the Pictorial.
- (✓) Tie the three black wires to the ribbon cable using the remaining two cable ties; space the ties evenly along the length of the wires between the switch assembly and the long lug. Cut the excess cable tie lengths after the cable ties are installed.
- ( ) Refer to Detail 5-9H and remove the protective backing from the orange model identification label. Install the label on the nameplate and then mount the nameplate to the cover with two push-on nuts as shown. Turn the nuts as you push on them to make them easier to install.



Detail 5-9H



**Detail 5-9J**

- ( ) Refer to Detail 5-9J and install the small cable clamp on one end of the lanyard cord. Mount the cable clamp at DE with a #4 flat washer, a D-washer, a #4 lockwasher, and a 4-40 × 3/8" screw.

- ( ) Heat the end of the lanyard cord as shown in Detail 5-9J for a few seconds with your soldering iron to form a slight ball at the end. This will help hold the cord in place.
- ( ) Remove the protective backing from the set-up instruction label and mount the label on the inside of the cabinet cover in the area shown in the Pictorial.

Refer to Pictorial 5-10 (Illustration Booklet, Page 19) for the following steps.

- ( ) Bend the long lugs under and around the switch assembly wires to hold the wires in place.
- ( ) Refer to inset drawing #2 on the Pictorial and route the cord through the plastic grommet at DK on the left paper guide bracket. Arrange the cord in the groove of a D-washer and mount the D-washer with a 6-32 × 1/4" screw.
- ( ) Close the cabinet cover.

This completes the "Step-by-Step Assembly" of your kit. Proceed to "Initial Tests."



# INITIAL TESTS

Refer to Pictorial 6-1 (Illustration Booklet, Page 20) for the following steps.

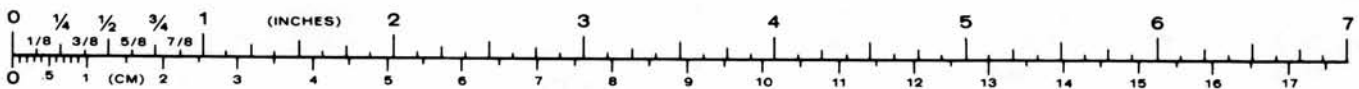
If you have an ohmmeter, complete the following resistance tests.

NOTE: If you do not obtain the indicated resistance readings in the following steps, check the associated parts for solder bridges, parts installed incorrectly, or incorrect wiring. Also, try reversing the meter leads.

- ( ) Press the POWER switch to the off (out) position.
- ( ) Prepare a 5" small solid black hookup wire and insert one end into the pin connector at J112.
- ( ) Connect the common lead of the ohmmeter to the free end of the 5" hookup wire. NOTE: Leave the lead connected to the hookup wire for the following steps.
- ( ) Connect the ohmmeter test lead to either lead of resistor R169 (.33  $\Omega$ , orange-orange-silver). The ohmmeter should increase to greater than 1000 ohms.

- ( ) Connect the ohmmeter test lead to the lead on the **banded** end of diode D123. The ohmmeter should read greater than 400 ohms.
- ( ) Connect the ohmmeter test lead to the lead on the **non-banded** end of diode D124. The ohmmeter should read greater than 400 ohms.
- ( ) Connect the ohmmeter lead to the round prong on the line cord plug. The ohmmeter should read 0 (zero) ohms.
- ( ) Connect the common ohmmeter lead to the round prong on the power plug. Push the POWER switch to the on (in) position; then alternately connect the ohmmeter test lead to each flat prong on the power plug. The ohmmeter should read  $\infty$  (infinity) for both tests.

This completes the resistance test, disconnect the ohmmeter from the power plug.



- ( ) Check to make sure the print head plug is not plugged into socket S101.

NOTE: In the following step, you will turn the Printer on and check for overheating of parts. If there is evidence of overheating, disconnect the power plug immediately and check for short circuits in the circuitry where the overheating occurred.

WARNING: When the line cord is plugged in, the full AC line voltage is present at the POWER switch.

- ( ) Plug the line cord into an AC outlet and push the POWER switch to the ON position. The POWER indicator should light and the HIGH TEMP light may or may not light.

If you have a voltmeter, complete the three following voltage tests.

- ( ) Connect the meter common lead to the 5" hookup wire. Leave the lead connected to the 5" hookup wire for the three following voltage tests.
- ( ) Connect the voltmeter test lead to either lead of resistor R169 (.33  $\Omega$ , orange-orange-silver). The meter should read between 45 to 60 volts. If not, check D118, D119, D121, D122, C3, and the wiring of transformer T1.
- ( ) Connect the voltmeter test lead to either clip of fuse F101. The voltmeter should read between 32 to 38 volts DC. If not, check Q1, Q124, Q125, Q126, D127, and U101 (5-volt supply).
- ( ) Connect the voltmeter test lead to pin 40 of U106. The voltmeter should read between 4.7 to 5.3 volts DC. If not, check C2, D123, D125 (12-volt supply), U101, and C115.

This completes the voltage tests. Disconnect the voltmeter.

- ( ) If not already done, push the print head to the left side of the unit.

- ( ) Momentarily connect the free end of the 5" hookup wire to pin 31 of U106. The print head should move from left to right. If not, check U115D, D118, D112, C5, T1, and the head motor.

- ( ) Momentarily connect the free end of the 5" hookup wire to pin 32 of U106. The print head should move from right to left. If not, check U115A, Q117, D111, C5, and the head motor.

- ( ) Momentarily connect the free end of the 5" hookup wire to pin 33 of U106. The ribbon motor should run. If not, check U115B, Q119, D113, T1, and the ribbon motor.

- ( ) Prepare an 11" hookup wire and insert one end into the pin connector at TP-101.

- ( ) Momentarily touch the free end of the 11" hookup wire to the collector of Q201, Q202, Q203, Q204. As you touch each collector, LED101 should not glow.

- ( ) Connect the free end of the 5" hookup wire coming from J112 to pin 29 of U106; then connect the free end of the 11" hookup wire to the collector (C) lead of Q203. LED101 should light. If it does not, check U115F and Q203.

- ( ) Connect the 5" hookup wire to pin 28 of U106; then connect the 11" hookup wire to the collector (C) lead of Q202. LED101 should light. If it does not, check U116F and Q202.

- ( ) Connect the 5" hookup wire to pin 27 of U106; then connect the 11" hookup wire to the collector (C) lead of Q204. LED101 should light. If it does not, check U116A and Q204.



- ( ) Connect the 5" hookup wire to pin 26 of U106; then connect the 11" hookup wire to the collector (C) lead of Q201. LED101 should light. If it does not, check U116B and Q201.

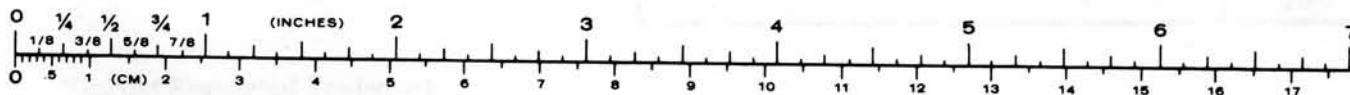
NOTE: Control R195 (HIGH TEMP ADJ control) should not be installed on the circuit board yet.

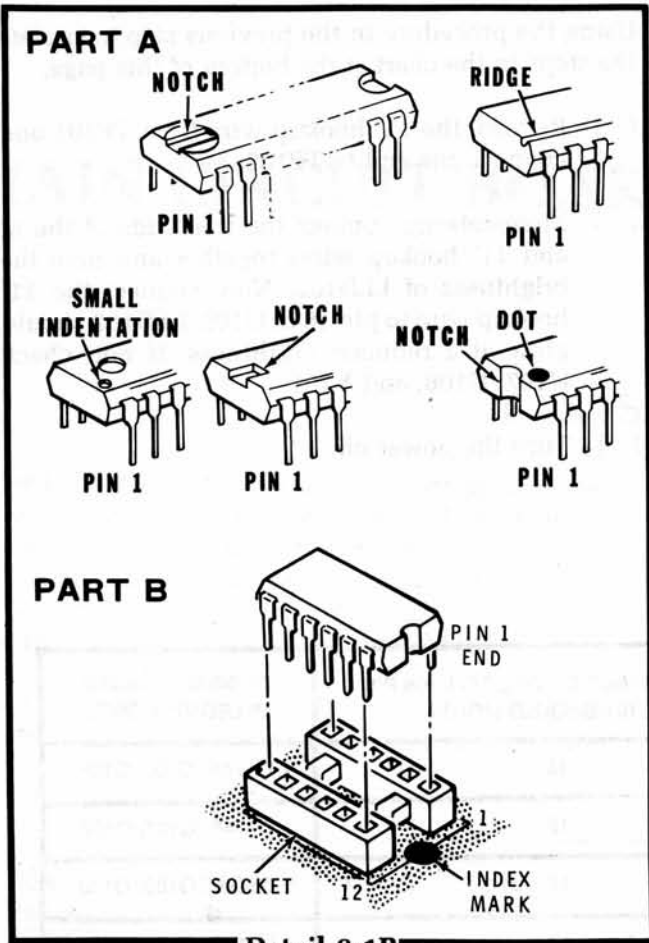
- ( ) Connect the free end of the 11" hookup wire to pin 9 of print head socket S101. LED101 should not light. Then, with the 11" hookup wire still connected, connect the free end of the hookup wire to pin 14 of U106. LED101 should light. If not, check U114D, Q103, and Q104.

Using the procedure in the previous step, complete the steps in the chart at the bottom of this page.

- ( ) Remove the 11" hookup wire from TP101 and connect one end to TP102.
- ( ) Momentarily connect the free ends of the 5" and 11" hookup wires together and note the brightness of LED102. Now connect the 11" hookup wire to pin 16 of U105. LED102 should glow at a reduced brightness. If not, check U107, U108, and Y101.
- ( ) Turn the power off.

	CONNECT 11" WIRE TO S101 PIN (LED101 SHOULD NOT LIGHT)	THEN CONNECT 5" WIRE TO U106 PIN (LED101 SHOULD LIGHT)	POSSIBLE CAUSE IF LED101 LIGHTS
( )	10	13	U114E, Q105, Q106
( )	14	12	U114F, Q107, Q108
( )	15	11	U114C, Q109, Q110
( )	13	10	U114B, Q111, Q112
( )	12	9	U114A, Q113, Q114
( )	11	8	U115C, Q115, Q116





NOTE: Refer to Detail 6-1B and, as you install each IC in the following steps, position the pin 1 end (as shown in Part A of the Detail) toward the index mark on the circuit board (see Part B). Then insert the IC leads into the socket and push the IC down into place.

- ( ) U109: Install a 74LS244N IC (#443-791) at U109.
- ( ) U110: Install a 74LS244N IC (#443-791) at U110.
- ( ) Turn the power on.

- ( ) Connect the 5" hookup wire to pin 37 of U106, connect the 11" hookup wire to pin 16 of U106, and manually push the print head to the left stop. LED102 should not light. Then move the print head at least 2" to the right. LED102 should now light. If not check U109 and Q3.
- ( ) Connect the 11" hookup wire to U106 pin 5 (with the 5" hookup wire still connected to U106 pin 37) LED102 should light. Now insert a piece of paper, with the sprocket holes removed, into the paper feed channel. Push the paper as far to the left as possible. LED102 should now go off. If it does not, check LED3, Q2, and U109.
- ( ) With the 5" hookup wire still connected to pin 37 of U106, connect the 11" hookup wire to pin 17 of U106 and press the ON LINE switch. LED102 should light. Release the ON LINE switch and LED102 should go off. If not check U109 and SW4.
- ( ) Connect the 5" hookup wire to pin 36 of U106, connect the 11" hookup wire to pin 17 of U106, and press the ON LINE switch. LED102 should light. Release the ON LINE switch and LED102 should go off. If not, check U110 or SW4.
- ( ) With the 5" hookup wire still connected to pin 36 of U106, connect the 11" hookup wire to pin 19 of U106 and place section 4 of SW102 in the 1 position. LED102 should be off. Press TEST switch SW101; LED102 should light. If not, check U110, SW101, and SW102.



**Detail 6-1C**





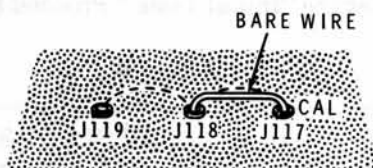
- ( ) Press the POWER switch to the OFF position.
- ( ) R195: Refer to Detail 6-1C and install a 200  $\Omega$  control at R195 on the circuit board. Solder the tabs to the foil on the underside of the circuit board.
- ( ) Turn R195 fully counterclockwise (CCW).

Refer to Pictorial 6-2 (Illustration Booklet, Page 20) for the following two steps.

- ( ) Position the chassis on your work area as shown.

NOTE: In the following step, check the print head cable assembly connector for bent pins. If any pins are bent, straighten them using long-nose pliers.

- ( ) Route the print head cable assembly as shown in the Pictorial. Line up pin 1 of the cable assembly connector with the pin 1 mark on the circuit board and plug the connector into socket S101.



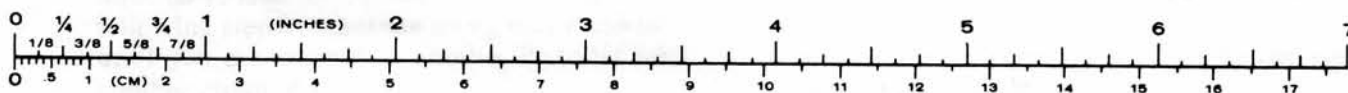
**Detail 6-1D**

- ( ) Refer to Detail 6-1D and be sure there is a wire between J118 and J117 on the circuit board.
- ( ) Press the POWER switch to the ON position. The HIGH TEMP indicator (LED2) on the front panel should be off. Slowly rotate R195 clockwise until the HIGH TEMP indicator lights.

- ( ) Press the POWER switch to the OFF position and reconnect the bare wire between J118 and J119.
- ( ) Press the POWER switch to the ON position. The HIGH TEMP indicator should not light. If it does light, check U117, U116D, and U116E.
- ( ) Connect the 5" hookup wire to pin 37 of U106. Then alternately connect the 11" hookup wire to pin 3 and pin 4 of U106. LED102 should not light for either of these tests.
- ( ) Unplug the print head plug and repeat the tests in the previous step. Now LED102 indicator should light for both tests. If not, check U109.
- ( ) Press the POWER switch to the OFF position.
- ( ) Plug the print head plug into socket S101.
- ( ) Remove the 5" and 11" hookup wires.

NOTE: The integrated circuits that you will install in the following steps are rugged and reliable components. However, normal static electrical discharge from your body, through an integrated circuit pin, to an object can damage the integrated circuits. Therefore when you install these integrated circuits, use the following numbered procedure. Perform each step carefully without interruption.

1. Remove the IC from the conductive foam.
2. Hold the IC in one hand and straighten any bent pins with the other hand.
3. Continue holding the IC, being careful not to touch it to anything while you touch the circuit board with your other hand.
4. Install the IC in its socket. See Pictorial 6-1 and Detail 6-1B.



- ( ) U103: Install a 1489 IC (#443-795) at U103.
- ( ) U104: Install a 75188N IC (#443-794) at U104.
- ( ) U105: Install an 8250 IC (#443-874) at U105.
- ( ) U106: Install a 3870 IC (#444-31) at U106.
- ( ) U111: Install a 74LS273 IC (#443-805) at U111.
- ( ) U112: Install a 2112-2 IC (#443-721) at U112.
- ( ) U113: Install a 2112-2 IC (#443-721) at U113.
- ( ) Set the top panel switches as follows:
 

POWER	OFF (out)
ON LINE	OFF (out)
WIDE CHAR	WIDE (out)
- ( ) Refer to the Operation Manual (Pages 10, 11, and 12) and install the paper and ribbon in your Printer.
- ( ) Set all the sections of SW102 to "1," except for section 2, it should have been set to match your power line earlier. Refer to the inset drawing in Pictorial 5-8.
- ( ) Press the POWER switch to the ON position. The print head should move from left to right for a short period of time; then it should return to the left margin and stop. If not, check U106.
- ( ) Press the TEST switch (SW101) momentarily. A line of test information should be printed. If not, check U106.
- ( ) Momentarily press the FEED FWD switch. The paper should move forward approximately .02 inches (one step). Then hold the FEED FWD switch down. The paper should continue to advance in full-line steps after a short delay. If not, check U109, U106, and SW6.
- ( ) Press the FEED REV switch. The paper should move back in the same mode as it moved forward. If not, check U106, U109, and SW7.
- ( ) Momentarily press the TOP FORM switch. The paper should advance 11". If not, check SW7, U110, and U106.
- ( ) Press the POWER switch to the OFF position.

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



## FINAL ASSEMBLY

Refer to Pictorial 7-1 (Illustration Booklet, Page 21) for the following steps.

- ( ) Remove the protective backing from the small sheet of insulating paper. Refer to Detail 7-1A (Illustration Booklet, Page 20) and mount the insulating paper on the bright (unpainted) side of the bottom plate in the area shown in the Detail.
- ( ) Mount the four mounting feet on the painted side of the bottom plate with an 8-32  $\times$  5/8" screw, #8 lockwasher, and an 8-32 nut on each foot at the locations shown in the Pictorial.
- ( ) Turn the chassis over on its top and place the bottom plate on the chassis as shown with the rectangular cut-out over the print head. Secure the bottom plate to the chassis with eight 6-32  $\times$  1/4" black screws.







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

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