

Heathkit® Manual

for the

VIDEO DISPLAY TERMINAL

Model H-29

ASSEMBLY

595-2965-03

HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

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WARNING

Federal Communications Commission requirements prescribe certification of personal computers and any interconnected peripherals in Part 15 Subpart J of the rules and regulations. This computing device will meet these requirements when constructed in strict accordance with the instructions in this manual, using only components and materials supplied with the kit or the exact equivalent thereof. You will be instructed to sign and date the enclosed FCC ID label and affix the label to the equipment certifying that you have constructed this equipment in accordance with the above mentioned instructions. In order to meet legal requirements, be certain to follow the instructions exactly as they are stated in this manual.

INTRODUCTION

The Heath Video Display Terminal Model H-29 represents a truly state-of-the-art design that is capable of satisfying both your business and personal needs.

Some of the features included in this Terminal are:

- Built-in power-up diagnostics.
- Four terminal emulation modes: Heath/Zenith, ANSI, Lear Siegler ADM 3A, and Hazeltine 1500.
- Programmable character attributes and scrolling regions.
- Advanced keyboard features: automatic key repeat, "N" key rollover, status indicators, user function keys, and full cursor control keys.
- A detached keyboard with an eight-foot coiled cable.
- No switches to set: all features are accessible through the keyboard and a non-volatile memory to remember your settings.
- Professional screen with 24 lines of 80 characters, a 25th status line, and special attributes including character-by-character inverse video, half intensity, blinking, and underlining capabilities.

With this Terminal, the future is here today. The built-in flexibility and ease-of-operation make the Model H-29 Terminal one of the most versatile units available today. It can serve as the heart, or a remote unit, of a powerful and expandable business automation package.

UNPACKING INSTRUCTIONS

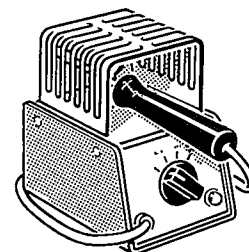
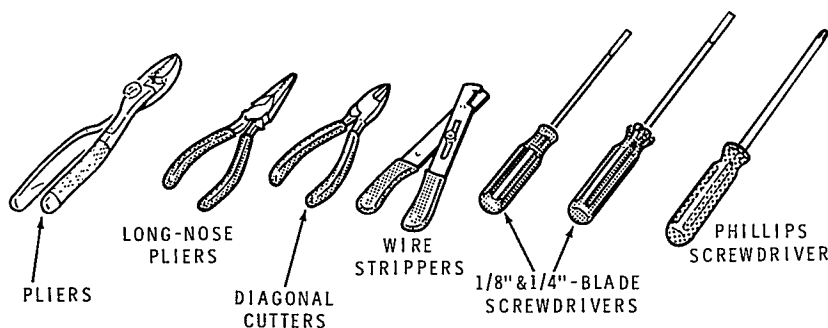
Locate the "Pack Index Sheet" that is packed inside the carton. This sheet identifies the location of each pack. Packs 1, 2, and 3 are in separate compartments and contain the circuit board parts. The remaining parts will be considered the final pack.

The Assembly Manual has four (4) Parts Lists, one for each pack. Each Parts List has its own unpacking instructions that you should read carefully. Never unpack more than one pack at a time.

ASSEMBLY NOTES

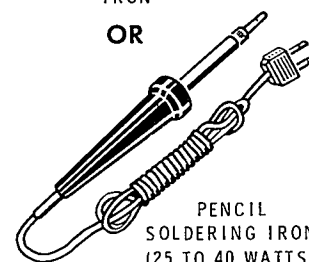
TOOLS

You will need these tools to assemble your kit.



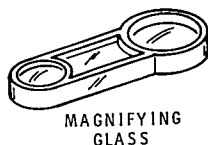
SOLDERING
IRON

OR

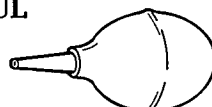


PENCIL
SOLDERING IRON
(25 TO 40 WATTS)

OTHER HELPFUL TOOLS



MAGNIFYING
GLASS



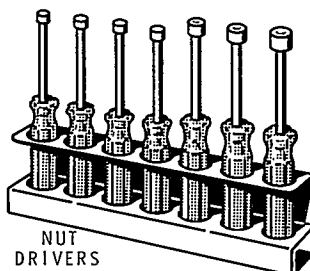
DESOLDERING
BULB*



NUT STARTER
(MAY BE SUPPLIED
WITH KIT)



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

SOLDERING

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

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

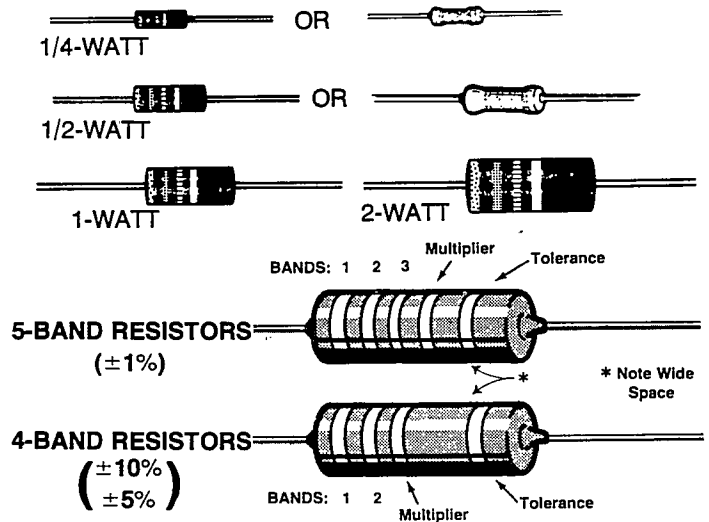
1. Use the right type of soldering iron. A 25 to 40-watt pencil soldering iron with a 1/8" or 3/16" chisel or pyramid tip works best.
2. Keep the soldering iron tip clean. Wipe it often on a wet sponge or cloth; then apply solder to the tip to give the entire tip a wet look. This process is called tinning,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

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

Heathkit®

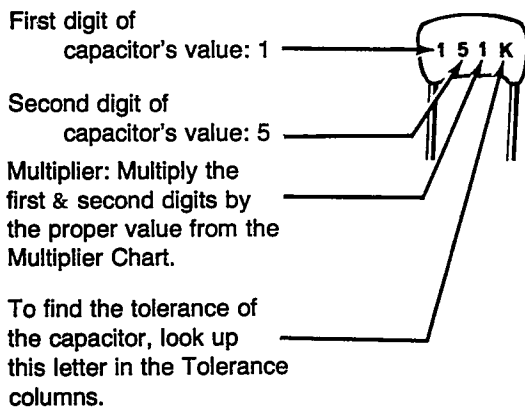
PARTS

Resistors are identified in Parts Lists and steps by their resistance value in Ω (ohms), $k\Omega$ (kilohms), or $M\Omega$ (megohms). They are usually identified by a color code and four or five color bands, where each color represents a number. These colors (except for the last band, which indicates a resistor's "tolerance") will be given in the steps in their proper order. Therefore, the following color code is given for information only. NOTE: Occasionally, a "precision" or "power" resistor may have the value stamped on it.



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

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



EXAMPLES:

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

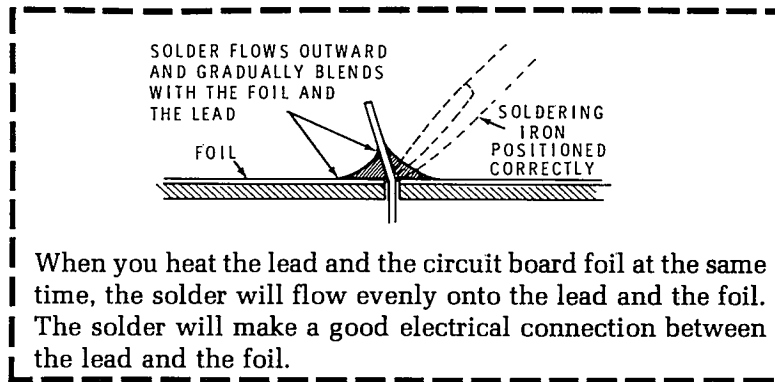
$$759 = 75 \times 0.1 = 7.5 \text{ pF}$$

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

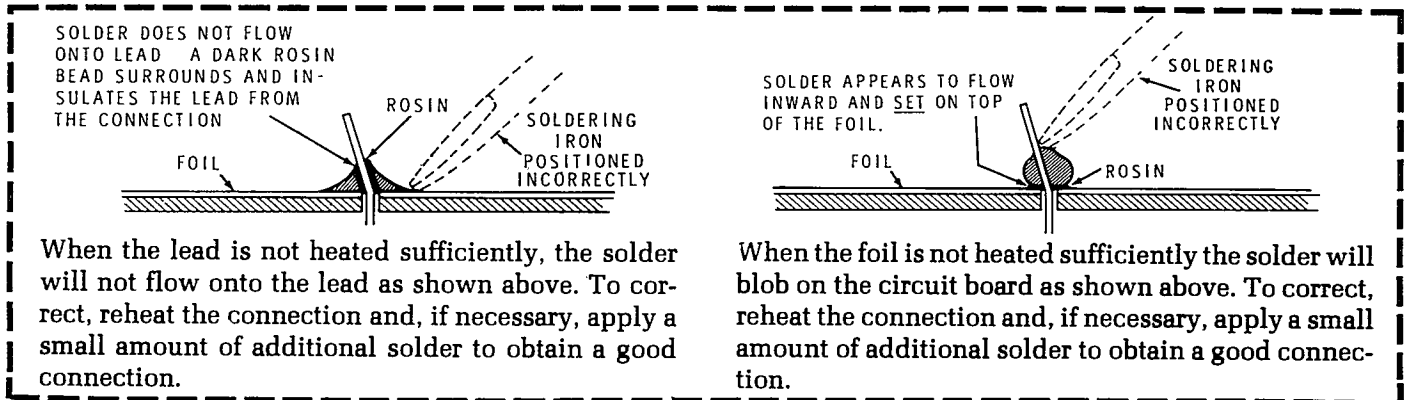
MULTIPLIER		TOLERANCE OF CAPACITOR		
FOR THE NUMBER:	MULTIPLY BY:	10 pF OR LESS	LETTER	OVER 10 pF
0	1	$\pm 0.1 \text{ pF}$	B	
1	10	$\pm 0.25 \text{ pF}$	C	
2	100	$\pm 0.5 \text{ pF}$	D	
3	1000	$\pm 1.0 \text{ pF}$	F	$\pm 1\%$
4	10,000	$\pm 2.0 \text{ pF}$	G	$\pm 2\%$
5	100,000		H	$\pm 3\%$
			J	$\pm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

*DuPont Registered Trademark

A GOOD SOLDER CONNECTION



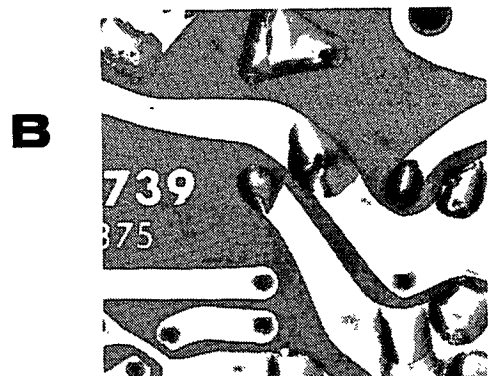
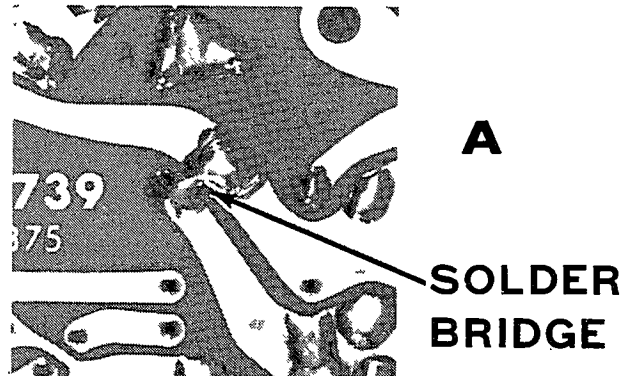
POOR SOLDER CONNECTIONS



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.



RF TRAP CIRCUIT BOARD

PARTS LIST

Refer to the "Pack Index Sheet," and locate Pack #1. Remove Pack #1 and check each part against the following list and the RF Trap Circuit Board Parts Pictorial (Illustration Booklet, Page 1). 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.

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

KEY No.	HEATH Part No.	QTY	DESCRIPTION	CIRCUIT Comp. No.
	85-2827-1	1	Circuit board	
A1	21-71	2	.001 μ F (1000 pF) ceramic capacitor	C52, C53
A2	27-127	1	.047 μ F Mylar capacitor	C51
A3	45-615	1	RF choke	L51
A4	490-185	1	Desolderwick Solder	

KEY No.	HEATH Part No.	QTY	DESCRIPTION	CIRCUIT Comp. No.
A5	390-1855-1 2	1	FCC label*	
A6	390-2401	1	CRT grounding label*	
A7	234-294	1	X-ray warning label*	
A8		1	Blue and white label*	
		1	Parts Order Form	
		1	Assembly Manual (See title page for Part Number.)	
		1	Operation Manual* (See title page for Part Number.)	

*Set these items aside until they are called for.

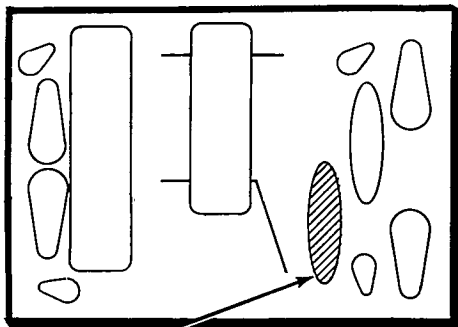
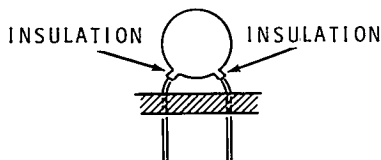
STEP-BY-STEP ASSEMBLY

START

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

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

- (✓) C53: .001 μ F (1000 pF) ceramic capacitor. NOTE: When you install ceramic capacitors, do not push the insulated portion of the leads into the circuit board holes. This could make it difficult to solder the leads to the foil.

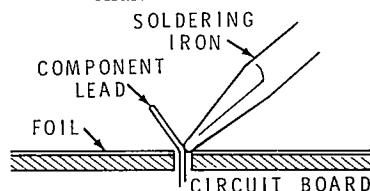


PICTORIAL 1-1

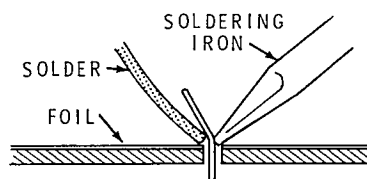
CONTINUE

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

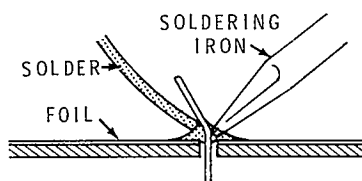
1. Push the soldering iron tip against both the lead and the circuit board foil. Heat **both** for two or three seconds.



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. Avoid excessive solder buildup on pads. 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.

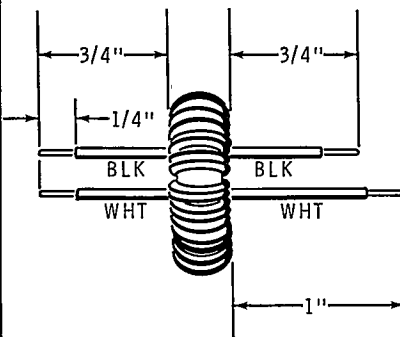
- (✓) Check the connection. Compare it to the illustrations on Page 8. After you have checked the solder connections, proceed with the assembly on Page 11. Use the same soldering procedure for each connection.

START

(✓) C52: .001 μ F (1000 pF) ceramic capacitor.

(✓) C51: .047 μ F Mylar capacitor.

(✓) Cut the leads of the RF choke to the dimensions shown. Remove 1/4" of insulation from the end of each lead.



(✓) L51: Install the RF choke with the black and white leads in their respective holes.

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

CIRCUIT BOARD CHECKOUT

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

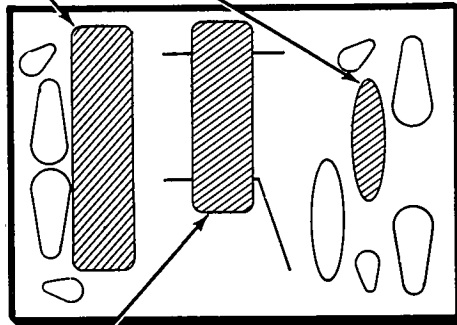
(✓) Unsoldered connections.

(✓) Poor solder connections.

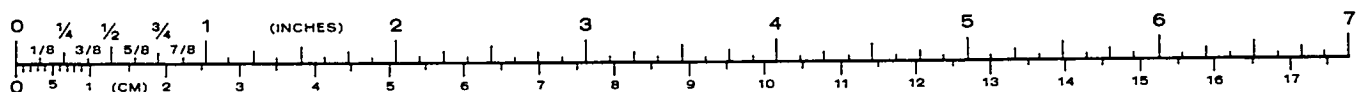
(✓) Solder bridges between foil patterns.

(✓) Protruding leads which could touch together.

This completes the RF trap circuit board assembly. Set it aside until it is called for later.



PICTORIAL 1-2



POWER SUPPLY CIRCUIT BOARD

PARTS LIST

Refer to the "Pack Index Sheet," and locate Pack #2. Remove Pack #2 and check each part against the following list and the Power Supply Circuit Board Parts Pictorial (Illustration Booklet, Page 1). 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.

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

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

RESISTORS

A1	2-759-12	1	240 Ω precision (red-yel-blk-blk-grn)	R101
A1	2-760-12	1	2.05 k Ω (2050 Ω) precision (red-blk-grn-brn-grn)	R102

CAPACITORS

B1	25-197	1	1 μ F tantalum	C103
B2	25-948	1	100 μ F electrolytic	C104
B3	25-946	1	4700 μ F electrolytic	C102
B3	25-947	1	6800 μ F electrolytic	C101

DIODES

C1	57-65	4	1N4002	D109, D110 D111, D112
C1	57-42	8	3A1	D101, D102, D103, D104, D105, D106, D107, D108

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

MISCELLANEOUS

NOTE: The following integrated circuit is marked for identification in one of the following ways:

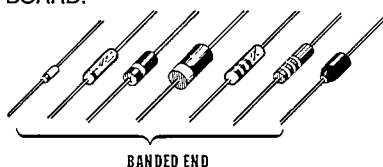
1. Part number.
2. Type number. (For integrated circuits, this refers to the numbers, the letters may be different or missing.)
3. Part number and type number.
4. Part number with a type number other than the one listed.

D1	442-739	1	LM350T IC	U101
D2	432-828	1	7-pin plug	P101
D3	432-1320	1	8-pin plug	P102
	85-2828-1	1	Circuit board	

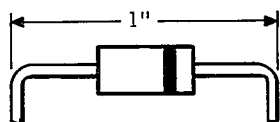
STEP-BY-STEP-ASSEMBLY

START

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



- (✓) Bend the leads of the eight 3A1 (#57-42) diodes as shown and install them in the steps below.



(✓) D104:

(✓) D102:

(✓) D103:

(✓) D101:

(✓) D108:

(✓) D106:

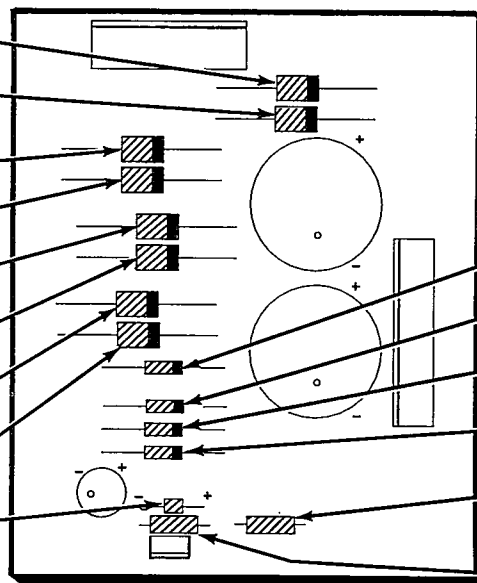
(✓) D105:

(✓) D107:

- (✓) C103: 1 μ F tantalum. Be sure to position the positive (+) marked or dot marked lead in the positive (+) marked hole.



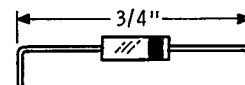
- (✓) Solder the leads to the foil and cut off the excess lead lengths.



PICTORIAL 2-1

CONTINUE

- () Bend the leads of the four 1N4002 (#57-65) diodes as shown and install them below.



(✓) D110:

(✓) D109:

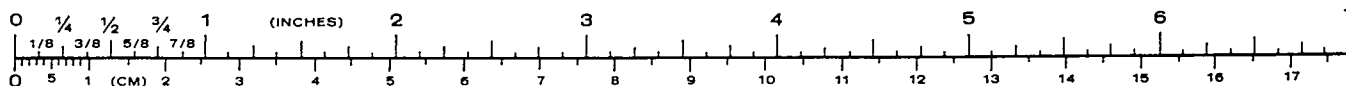
(✓) D112:

(✓) D111:

- (✓) R101: 240 Ω precision (red-yel-blk-blk-grn).

- (✓) R102: 2050 Ω precision (red-blk-grn-brn-grn).

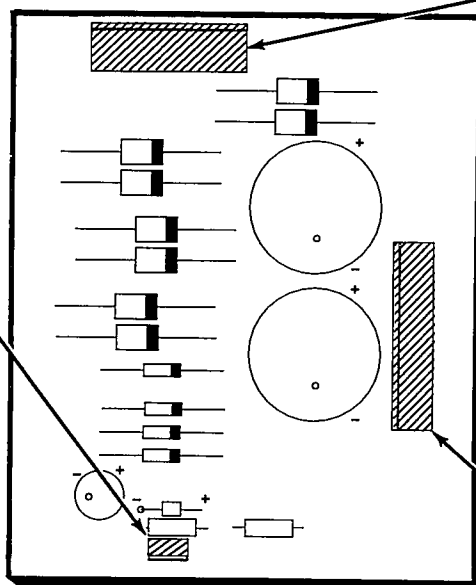
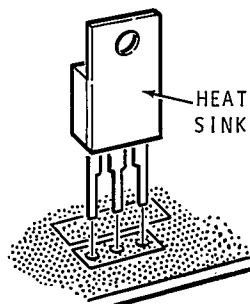
- (✓) Solder the leads to the foil and cut off the excess lead lengths.



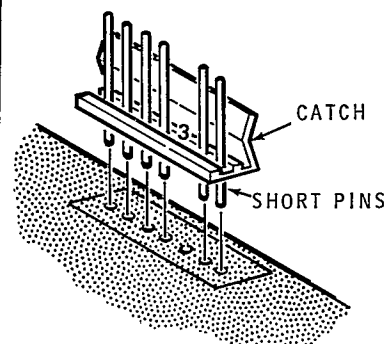
START ➡

NOTE: In the following step, **do not solder** all three leads. Read the entire step and solder only one lead, as instructed below.

- () U101: LM350T (#442-739). Position the heat sink as shown and insert the leads **just barely** through the circuit board. Then solder **just one lead** to the foil. You will adjust the position of the IC later. Then you will solder all leads to the foil.

**CONTINUE** ➡

- (✓) P101: Position the 7-pin plug with the catch as shown. Pull out pin 3. Then insert the short pins and solder them to the foil.

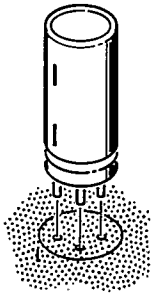


- (✓) P102: Install the 8-pin plug in the same manner, but turn the plug around so the catch is on the left. Do not pull out any pins on this plug.

PICTORIAL 2-2

START

NOTE: To install the next two electrolytic capacitors, line up the three leads with their respective holes and insert them in the board. Solder the leads to the foil and cut off the excess lengths.

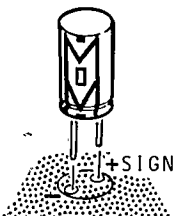


(✓) C101: 6800 μ F electrolytic.

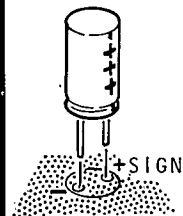
(✓) C102: 4700 μ F electrolytic.

NOTE: Before you install the next electrolytic capacitor, note the position of the identified (+ or -) lead. Be sure you connect the positive (+) lead to the positive (+) marked point on the circuit board.

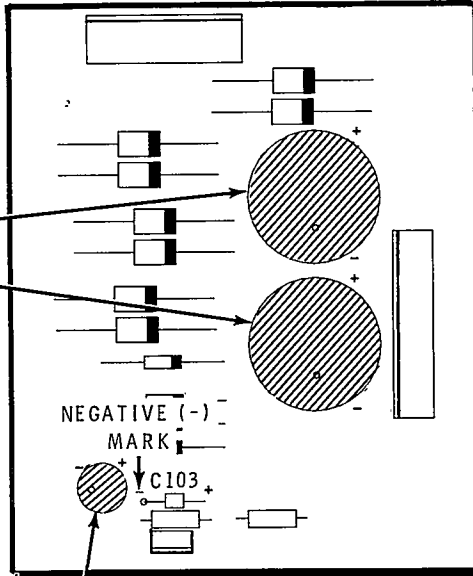
IDENTIFIED
LEAD IS
NEGATIVE (-)



IDENTIFIED
LEAD IS
POSITIVE (+)



(✓) C104: 100 μ F electrolytic. Solder the leads to the foil and cut off the excess lead lengths. NOTE: Do not confuse the negative (-) mark on the board for C104 with the negative mark for capacitor C103.



PICTORIAL 2-3

CONTINUE

CIRCUIT BOARD CHECKOUT

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

- (✓) Unsoldered connections (except for two leads of IC U101).
- (✓) Poor solder connections.
- (✓) Solder bridges between foil patterns.
- (✓) Protruding leads which could touch together.

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

- (✓) Integrated circuit for the proper installation.
- (✓) Electrolytic capacitor for the correct position of the identified (+ or -) lead.
- (✓) Diodes for the correct position of the banded end.

This completes the power supply circuit board assembly. Set it aside until it is called for later.

VIDEO DRIVER CIRCUIT BOARD

PARTS LIST

Refer to the "Pack Index Sheet," and locate Pack #3. Remove this pack and check each part against the following list and the Video Driver Circuit Board Parts Pictorial (Illustration Booklet, Page 2). The key numbers correspond to the numbers on the "Parts Pictorial."

Return any part that is packed in an individual envelope, with the part number on it, back into its envelope until that part is called for in a step. Most parts with "234-" numbers are in these separate, marked

envelopes; and their part numbers are included in the assembly steps to make your work go easier. Do not discard any packing material until you account for all the parts.

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

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

NOTES:

1. All 5% resistors have four color bands (last band gold). This last band (gold) will not be called out.
2. All color banded 1% resistors have five color bands (last band brown). This brown band is set apart from the other bands. The last band (brown) will not be called out.
3. The resistors may be packaged in more than one envelope.
4. Use a magnifying glass to identify the resistor color bands.
5. Any resistor with the Part Number beginning with the numerals "234-" should never be substituted with another resistor of the same value. These are special parts; should they ever be replaced, purchase them from Heath Company.

KEY No.	HEATH Part No.	QTY	DESCRIPTION	CIRCUIT Comp. No.
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5%, 1/4-Watt Resistors

A1	6-279-12	1	2.7 Ω (red-viol-gld)	R331
A1	234-281	1	3.3 Ω (org-org-gld)	R323
A1	234-282	4	22 Ω (red-red-blk)	RX122*, R333, R413, R416
A1	6-470-12	4	47 Ω (yel-viol-blk)	R304, R406, R409, R412
A1	6-750-12	1	75 Ω (viol-grn-blk)	R326
A1	6-820-12	1	82 Ω (gry-red-blk)	R128
A1	6-181-12	1	180 Ω (brn-gry-brn)	R127
A1	6-391-12	1	390 Ω (org-wht-brn)	R328
A1	6-681-12	2	680 Ω (blu-gry-brn)	R131, R329
A1	6-102-12	6	1000 Ω (brn-blk-red)	R101, R103, R107, R116, R403, R404
A1	6-222-12	3	2200 Ω (red-red-red)	R317, R321, R322
A1	6-332-12	1	3300 Ω (org-org-red)	R327
A1	6-562-12	1	5600 Ω (grn-blu-red)	R301
A1	6-682-12	1	6800 Ω (blu-gry-red)	R307
A1	6-103-12	2	10 k Ω (brn-blk-org)	R137, R138

* If you ever need to replace this part, be sure you purchase it from the Heath Company. You must use a direct replacement part for safety reasons.

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KEY No.	HEATH Part No.	QTY	DESCRIPTION	CIRCUIT Comp. No.
5%, 1/4 Watt Resistor (Cont'd.)				
A1	6-123-12	1	12 kΩ (brn-red-org)	R314
A1	6-153-12	2	15 kΩ (brn-grn-org)	R132, R414
A1	6-223-12	2	22 kΩ (red-red-org)	R106, R302
A1	6-273-12	3	27 kΩ (red-viol-org)	R306, R308, R316
A1	6-473-12	1	47 kΩ (yel-viol-org)	R319
A1	6-683-12	1	68 kΩ (blu-gry-org)	R147
A1	6-204-12	1	200 kΩ (red-blk-yel)	R303
A1	6-274-12	2	270 kΩ (red-viol-yel)	R144, R149
A1	6-155-12	1	1.5 MΩ (brn-grn-grn)	R311
A1	6-225-12	1	2.2 MΩ (red-red-grn)	R309

5%, 1/2-Watt Resistors

A2	234-305	1	10 Ω (brn-blk-blk)	RX124*
A2	6-221	1	220 Ω (red-red-brn)	R324
A2	6-331	1	330 Ω (org-org-brn)	R407
A2	6-222	1	2200 Ω (red-red-red)	R142
A2	6-103	1	10 kΩ (brn-blk-org)	R146
A2	6-473	1	47 kΩ (yel-viol-org)	R151
A2	6-274	1	270 kΩ (red-viol-yel)	R143

Other Resistors

A3	234-283	4	100 Ω, 10%, 1/4-watt (brn-blk-brn-slv)	RX129*, R313, R318, R337
A4	1-50-2	1	820 Ω, 5%, 2-watt (gry-red-brn)	R402
A5	6-4701-12	1	4700 Ω, 1%, 1/4-watt (yel-viol-blk-brn)	R109
A5	6-1002-12	1	10 kΩ, 1%, 1/4-watt (brn-blk-blk-red)	R113

CAPACITORS

Ceramic

B1	21-43	4	.001 μF	C119, C121, C128, C129
B2	234-285	3	150 pF (brn-grn-brn) tubular	C101, C302, C403
B2	234-286	1	1500 pF (brn-grn-red) tubular	C301

Electrolytic

B3	25-900	2	1.0 μF	C308, C309
B3	25-912	1	3.3 μF	C401
B3	25-917	4	10 μF	C307, C311, C313, C402
B4	234-284	1	10 μF nonpolarized	CX117*
B3	25-898	3	33 μF	C109, C122, C304
B3	25-884	1	47 μF	C312
B3	25-942	3	220 μF	C112, C123, C317
B3	25-905	1	470 μF	C316

* If you ever need to replace this part, be sure you purchase it from the Heath Company. You must use a direct replacement part for safety reasons.

KEY No.	HEATH Part No.	QTY	DESCRIPTION	CIRCUIT Comp. No.
Mylar**				
B5	27-105	1	.0068 μF	C107
B5	27-161	4	.01 μF	C106, C114, C126, C127
B5	27-128	2	.022 μF, 50 or 100V	C118, C314
B6	27-27	1	.022 μF, 400V	CX116*
B5	27-77	1	.1 μF	C303

SEMICONDUCTORS

Diodes

NOTE: Place the following diodes back in their envelopes after you check them so you can easily identify them during the assembly.

C1	57-27	1	1N2071	CR107
C1	234-263	2	103-323-04A	CR106, CR111
C1	234-264	1	103-298-03A	CR104
C1	234-265	1	103-339-02A	CR109
C1	234-266	1	103-279-23A	CR301
C1	234-267	3	103-254-01	CR112, CR304, CR401
C1	234-299	3	103-142-01	CR102, CR302, CR303

Transistors and Integrated Circuits

NOTE: Transistors and integrated circuits (IC's) are marked for identification in one of the following 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.
5. Part number printed on the envelope.

C2	234-270	3	121-819 transistor	Q102, Q304, Q308
C3	234-271	1	121-1035 transistor	Q307
C3	234-272	1	121-1036 transistor	Q306
C4	234-273	1	121-1058 transistor / 21-1034	Q401
C2	234-274	2	121-699 transistor	Q302, Q303
C2	234-275	2	121-975 transistor	Q104, Q301
C5	234-276	1	121-1070 transistor	Q103
C2	234-290	1	121-895 transistor	Q402
C6	234-269	1	NE555N integrated circuit (IC)	IC101

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

D1	234-287	1	2 MΩ	R148
D1	234-288	1	100 kΩ	R139
D1	234-289	1	250 kΩ	R312

COILS — TRANSFORMERS

NOTE: The following coil looks like a resistor. To avoid confusing it with the resistors, place it back in the envelope after you check it.

D2	234-258	1	6.8 μH (blu-gry-gld-gld) coil	L401
D3	234-259	1	Width coil	L101
D4	234-260	1	Linearity coil	L102
D5	234-261	1	Horizontal drive transformer	TX101
D6	234-262	1	Sweep transformer	TX102

KEY No.	HEATH Part No.	QTY	DESCRIPTION	CIRCUIT Comp. No.
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SOCKET — PLUGS

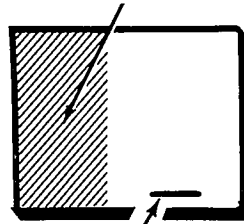
E1	234-278	1	Socket assembly
E2	234-279	1	10-pin plug
E3	234-280	2	2-pin plug
E4	434-230	1	8-pin IC socket

MISCELLANEOUS

	85-2839-1	1	Circuit board
F1	234-277	1	Heat sink
F2	250-410	2	#8 × 1/2" self-tapping screw
	340-8	48"	Bare solid wire
F3	352-31	1	Thermal compound
F4	490-111	1	IC puller

STEP-BY-STEP-ASSEMBLY

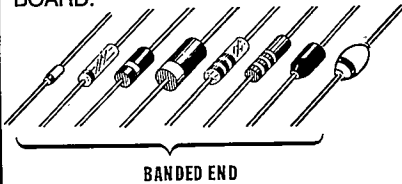
The steps performed in this Pictorial are in this area of the circuit board.



START

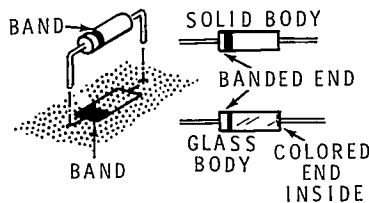
(✓) R132: 15 kΩ (brn-grn-org).

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



BANDED END

NOTE: When you install the following diodes, be sure to position the banded end as shown on the circuit board. When a diode is installed backward, the circuit WILL NOT WORK properly.



(✓) CR111: 234-263 (#103-323-04A) diode.

(✓) CR106: 234-263 (#103-323-04A) diode.

(✓) CR104: 234-264 (#103-298-03A) diode.

(✓) CR107: 1N2071 (#57-27) diode.

(✓) CR109: 234-265 (#103-339-02A) diode.

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

CONTINUE

NOTE: When you are instructed to install a jumper wire, cut the bare solid wire to the indicated length, bend the ends down 1/4" and insert the ends into the circuit board holes. Bend the wire ends out slightly to hold the wire in place.

(✓) 1" bare wire.

(✓) 1" bare wire.

(✓) RX124: 234-305, 10 Ω, 1/2-watt (brn-blk-blk).

(✓) 1" bare wire.

(✓) R128: 82 Ω (gry-red-blk).

(✓) 1-3/8" bare wire.

(✓) R137: 10 kΩ (brn-blk-org).

(✓) RX122: 234-282, 22 Ω (red-red-blk).

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

(✓) Three 3/4" bare wires.

(✓) R107: 1000 Ω (brn-blk-red).

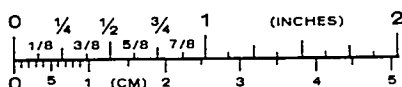
(✓) 1/2" bare wire.

(✓) R116: 1000 Ω (brn-blk-red).

(✓) R127: 180 Ω (brn-gry-brn).

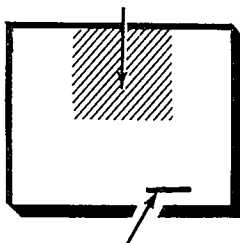
(✓) 1-1/8" bare wire.

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



PICTORIAL 3-1

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

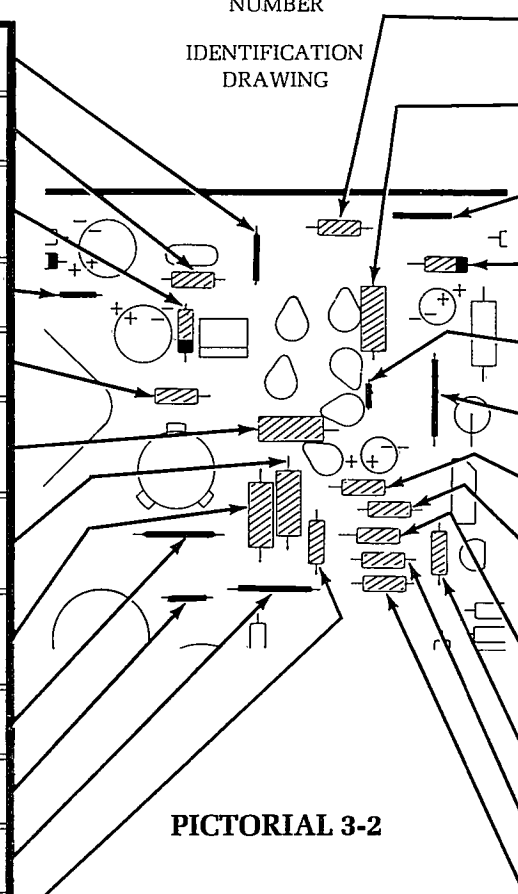


PART
NUMBER

IDENTIFICATION
DRAWING

START

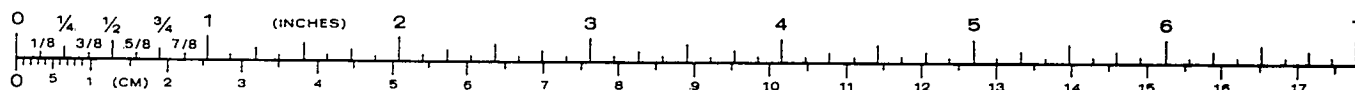
- (✓) 7/8" bare wire.
- (✓) R131: 680 Ω (blu-gry-brn).
- (✓) CR112: 234-267 (#103-254-01) diode.
- (✓) 7/8" bare wire.
- (✓) RX129: 234-283, 100 Ω (brn-blk-brn).
- (✓) R146: 10 k Ω , 1/2-watt (brn-blk-org).
- (✓) R142: 2200 Ω , 1/2-watt (red-red-red).
- (✓) R151: 47 k Ω , 1/2-watt (yel-viol-org).
- (✓) 1" bare wire.
- (✓) 7/8" bare wire.
- (✓) 1-1/8" bare wire.
- (✓) R403: 1000 Ω (brn-blk-red).
- (✓) Solder the leads to the foil and cut off the excess lead lengths.



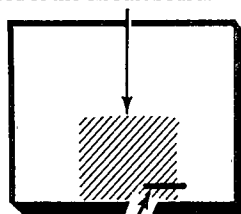
PICTORIAL 3-2

CONTINUE

- () R416: 234-282, 22 Ω (red-red-blk).
- (✓) R407: 330 Ω , 1/2-watt (org-org-brn).
- (✓) 1" bare wire.
- (✓) CR401: 234-267 (#103-254-01) diode.
- (✓) 3/4" bare wire.
- (✓) 1-1/8" bare wire.
- (✓) R404: 1000 Ω (brn-blk-red).
- (✓) R406: 47 Ω (yel-viol-blk).
- (✓) C403: 234-285, 150 pF (brn-grn-brn) tubular ceramic. NOTE: This capacitor looks like a 1/4-watt resistor.
- (✓) R414: 15 k Ω (brn-grn-org).
- (✓) R413: 234-282, 22 Ω (red-red-blk).
- (✓) R412: 47 Ω (yel-viol-blk).
- (✓) Solder the leads to the foil and cut off the excess lead lengths.



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

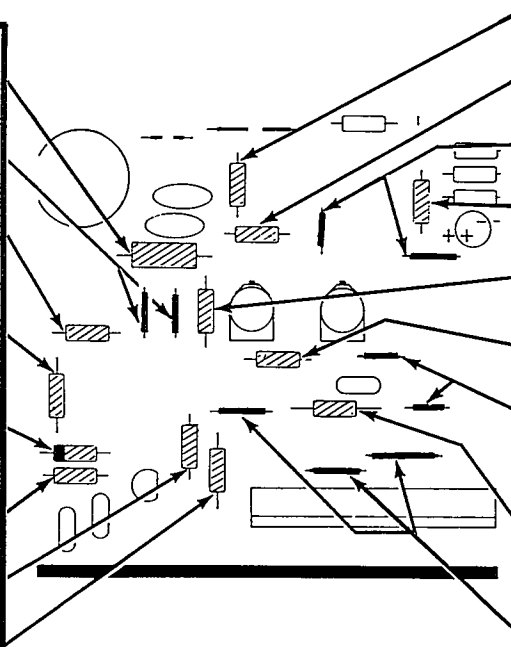


PART
NUMBER

IDENTIFICATION
DRAWING

START ➡

- (✓) R143: 270 k Ω , 1/2-watt (red-viol-yel).
- (✓) Two 7/8" bare wires.
- (✓) R109: 4700 Ω , 1% (yel-viol-blk-brn).
- (✓) R113: 10 k Ω , 1% (brn-blk-blk-red).
- (✓) CR102: 234-299 (#103-142-01) diode.
- (✓) R106: 22 k Ω (red-red-org).
- (✓) R101: 1000 Ω (brn-blk-red).
- (✓) R103: 1000 Ω (brn-blk-red).
- (✓) Solder the leads to the foil and cut off the excess lead lengths.



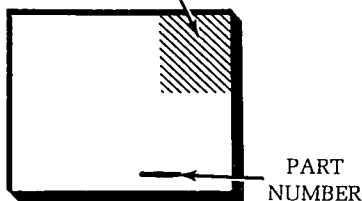
PICTORIAL 3-3

CONTINUE ➡

- (✓) R144: 270 k Ω (red-viol-yel).
- (✓) R149: 270 k Ω (red-viol-yel).
- (✓) Two 1" bare wires.
- (✓) R409: 47 Ω (yel-viol-blk).
- (✓) R147: 68 k Ω (blu-gry-org).
- (✓) R138: 10 k Ω (brn-blk-org).
- (✓) Two 7/8" bare wires.
- (✓) C101: 234-285, 150 pF (brn-grn-brn) tubular ceramic. NOTE: this capacitor looks like a 1/4-watt resistor.
- (✓) Three 1" bare wires.
- (✓) Solder the leads to the foil and cut off the excess lead lengths.



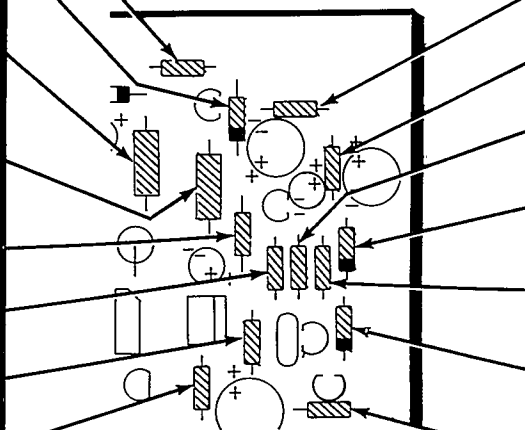
The steps performed in this Pictorial are in this area of the circuit board.



IDENTIFICATION
DRAWING

START

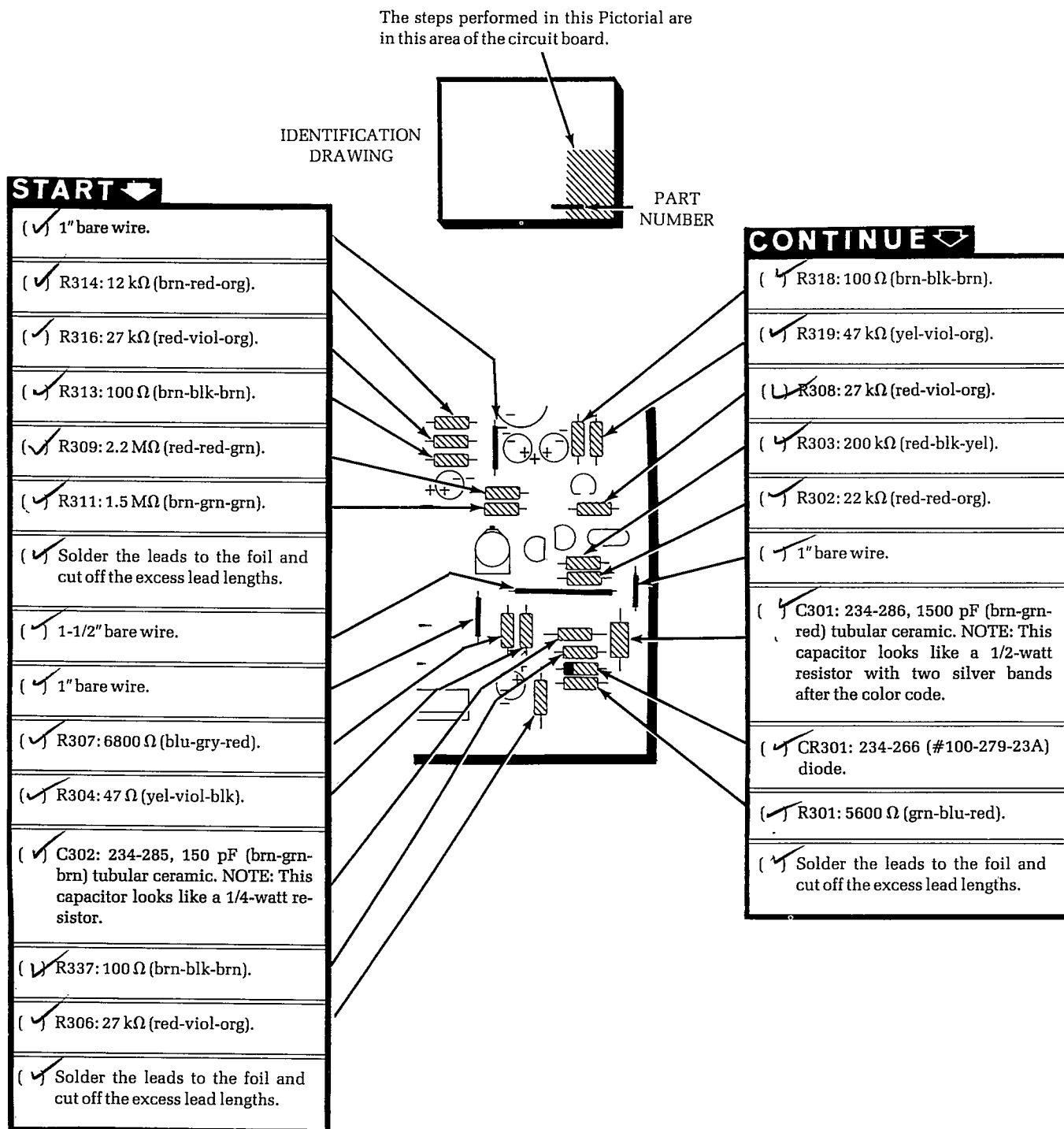
- (✓) R333: 234-282, 22 Ω (red-red-blk).
- (✓) CR304: 234-267 (#103-254-01) diode.
- (✓) L401: 234-258, 6.8 μ H (blu-gry-gld-gld) coil. NOTE: This coil looks like a 1/2-watt resistor.
- (✓) R324: 220 Ω , 1/2-watt (red-red-brn).
- (✓) R326: 75 Ω (viol-grn-blk).
- (✓) R327: 3300 Ω (org-org-red).
- (✓) R329: 680 Ω (blu-gry-brn).
- (✓) R317: 2200 Ω (red-red-red).
- (✓) Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

- (✓) R322: 2200 Ω (red-red-red).
- (✓) R321: 2200 Ω (red-red-red).
- (✓) R328: 390 Ω (org-wht-brn).
- (✓) CR302: 234-299 (#103-142-01) diode.
- (✓) R323: 234-281, 3.3 Ω (org-org-gld).
- (✓) CR303: 234-299 (#103-142-01) diode.
- (✓) R331: 2.7 Ω (red-viol-gld).
- (✓) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 3-4

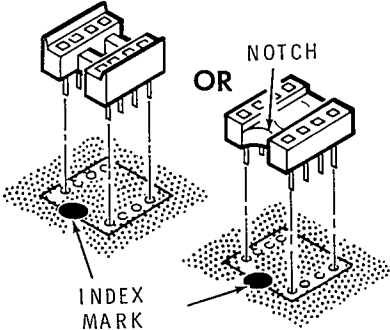


PICTORIAL 3-5



START ➡

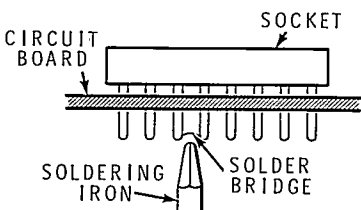
NOTE: The IC socket that you will install in the following step will have either an open or solid center strip. The socket with the solid center strip will have an identification mark on one end (an arrow, a dot, or a notch). Position this end of the socket toward the index mark on the circuit board.



Solder the socket pins to the foil after you install each socket.

NOTE: It is very easy to form a solder bridge between foils on the circuit board. After each solder step, carefully inspect the foil for solder bridges and remove any that have formed.

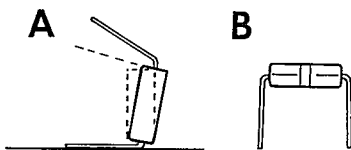
If a solder bridge exists, hold the circuit board foil-side-down as shown, and hold the soldering iron tip between the two points that are bridged. The solder will flow down the soldering iron tip.



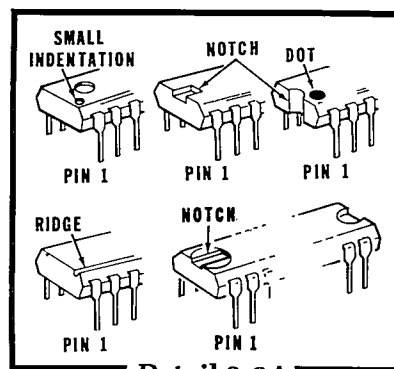
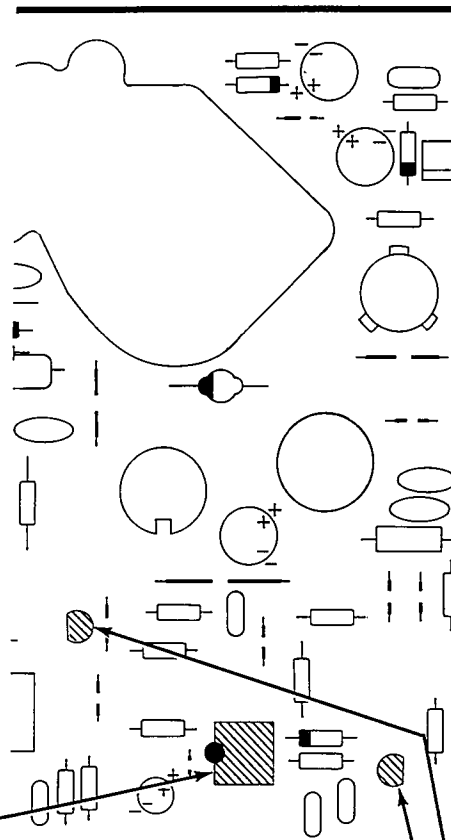
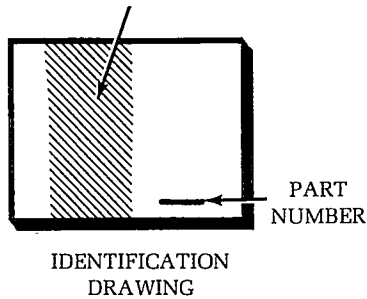
(✓) 8-pin IC socket at IC101.

To install the IC in the following steps:

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



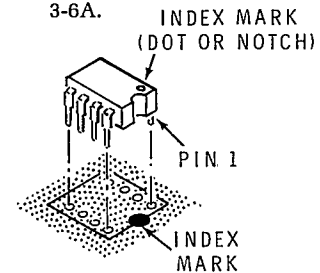
The steps performed in this Pictorial are in this area of the circuit board.



Detail 3-6A

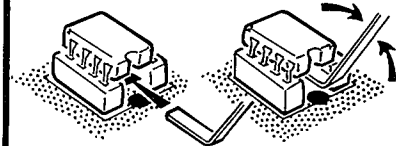
CONTINUE ➡

2. Position the pin 1 end of the IC over the index mark on the circuit board. See Detail 3-6A.



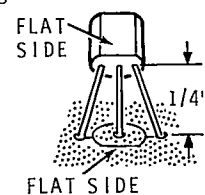
3. Be sure each IC pin is properly started into the socket. Then push the IC down. NOTE: An IC pin that is bent under the IC will look as though it is correctly installed in the socket.

4. An IC lifter has been included with this kit so you do not bend the pins in case you should have to remove an IC from its socket. To use the lifter, insert its foot beneath the IC; then gently rock the tool back and forth to lift the IC.



(✓) IC101: NE555N (#234-269) integrated circuit.

To mount transistors in the following steps, line up the flat on the transistor with the outline of the flat on the circuit board, and insert the leads into their corresponding holes. Solder the leads to the foil and cut off the excess lead lengths.



(✓) Q102: 234-270 (#121-819) transistor.

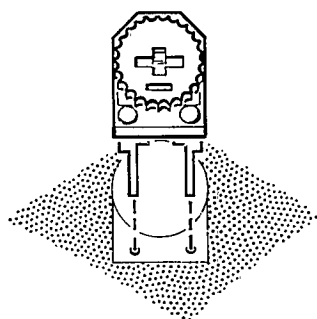
(✓) Q104: 234-275 (#121-975) transistor.

PICTORIAL 3-6

START

- (✓) Q308: 234-270 (#121-819) transistor.
- (✓) Q307: 234-271 (#121-1035) transistor. NOTE: The extra hole, which is next to the center lead of this transistor, will not be used.
- (✓) Q306: 234-272 (#121-1036) transistor. NOTE: The extra hole, which is next to the center lead of this transistor, will not be used.
- (✓) Q304: 234-270 (#121-819) transistor.
- (✓) Q402: 234-290 (#121-895) transistor.
- (✓) Q303: 234-274 (#121-699) transistor.
- (✓) Q301: 234-275 (#121-975) transistor.
- (✓) Q302: 234-274 (#121-699) transistor.

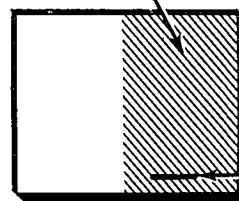
NOTE: When you install the following controls on the circuit board, insert the pins through the holes, press the control against the board, and solder the pins to the foil.



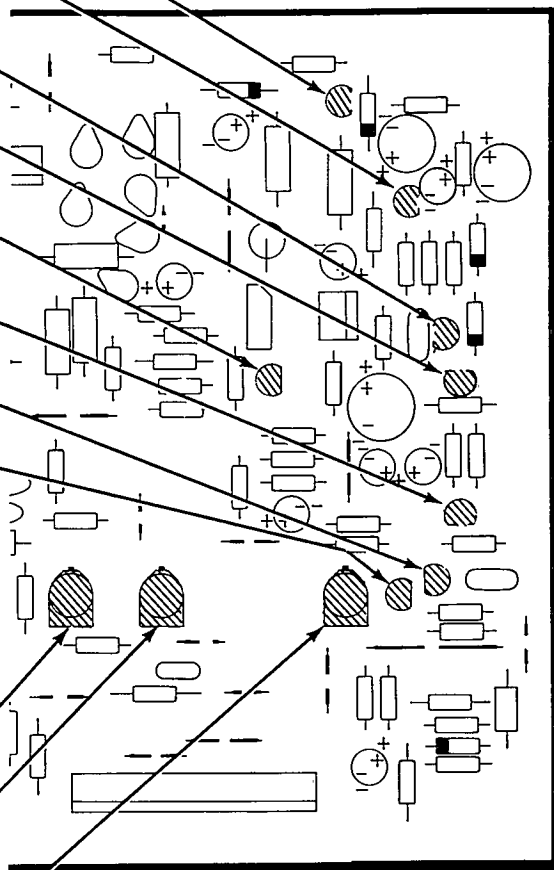
- (✓) R148: 2 MΩ (#234-287) FOCUS control (may be marked 10651-14).
- (✓) R139: 100 kΩ (#234-288) BRITE control (may be marked 10651-12).
- (✓) R312: 250 kΩ (#234-289) VERT SIZE control (may be marked 10651-13).

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

IDENTIFICATION
DRAWING



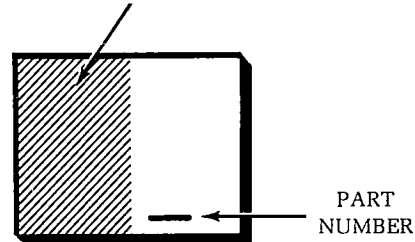
PART
NUMBER



PICTORIAL 3-7

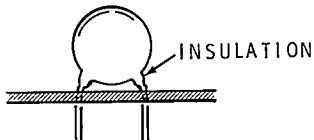
The steps performed in this Pictorial are in this area of the circuit board.

IDENTIFICATION
DRAWING



START

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



(✓) C121: .001 μ F ceramic.

(✓) C119: .001 μ F ceramic.

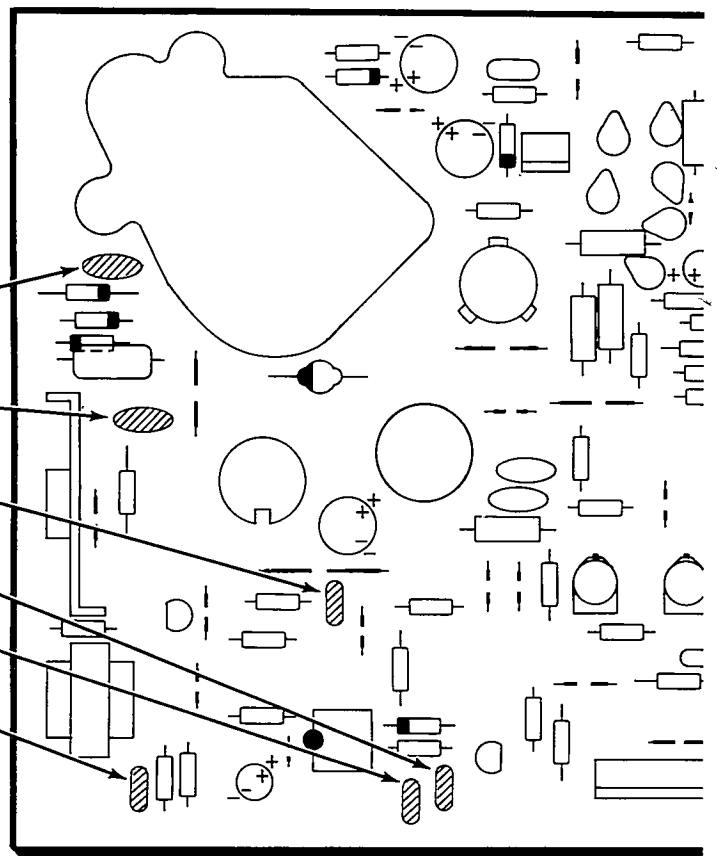
(✓) C126: .01 μ F Mylar.

(✓) C106: .01 μ F Mylar.

(✓) C107: .0068 μ F Mylar.

(✓) C114: .01 μ F Mylar.

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



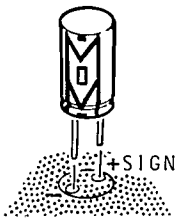
PICTORIAL 3-8

START

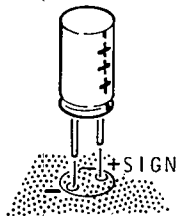
(✓) C118: .022 μ F/50 or 100V Mylar.

NOTE: Before you install an electrolytic capacitor, note the position of the identified (+ or -) lead. Be sure you connect the positive (+) lead to the positive (+) marked point on the circuit board.

IDENTIFIED
LEAD IS
NEGATIVE (-)



IDENTIFIED
LEAD IS
POSITIVE (+)



(✓) C401: 3.3 μ F electrolytic.

(✓) C311: 10 μ F electrolytic.

(✓) C313: 10 μ F electrolytic.

(✓) C402: 10 μ F electrolytic.

(✓) C314: .022 μ F/50 or 100V Mylar.

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

(✓) C128: .001 μ F ceramic.

(✓) C129: .001 μ F ceramic.

(✓) C309: 1 μ F electrolytic.

(✓) C308: 1 μ F electrolytic.

(✓) C307: 10 μ F electrolytic.

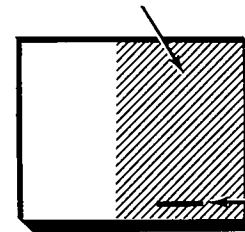
(✓) C303: .1 μ F Mylar.

(✓) C127: .01 μ F Mylar.

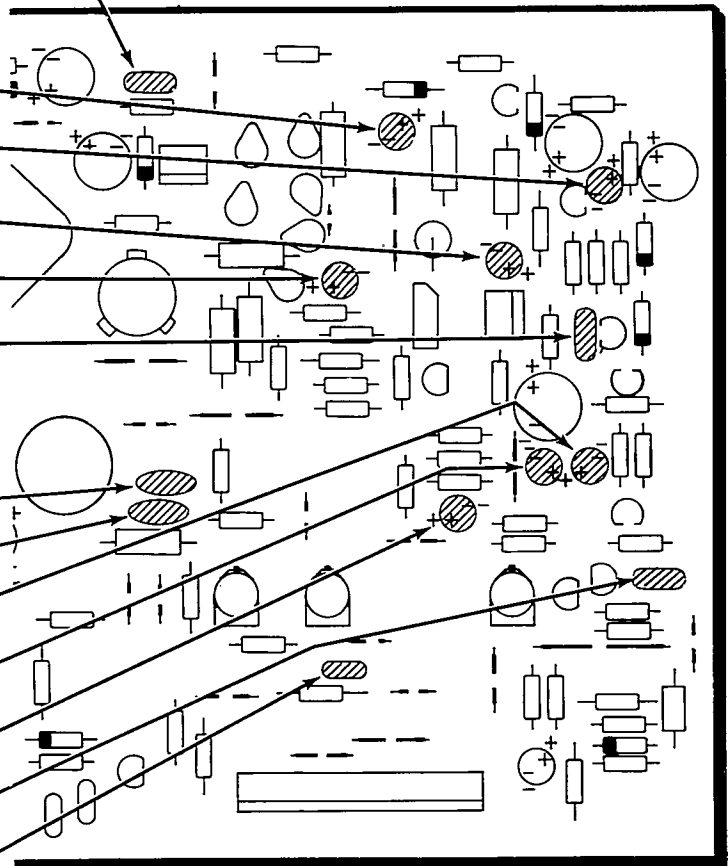
(✓) Solder the leads to the foil and cut off the excess lead lengths.

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

IDENTIFICATION
DRAWING



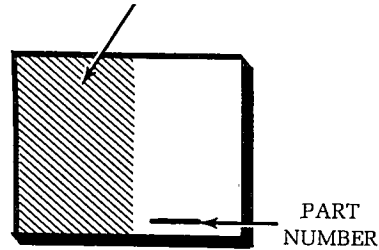
PART
NUMBER



PICTORIAL 3-9

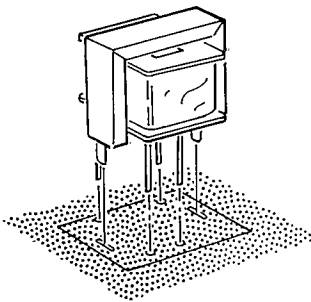
The steps performed in this Pictorial are in this area of the circuit board.

IDENTIFICATION
DRAWING

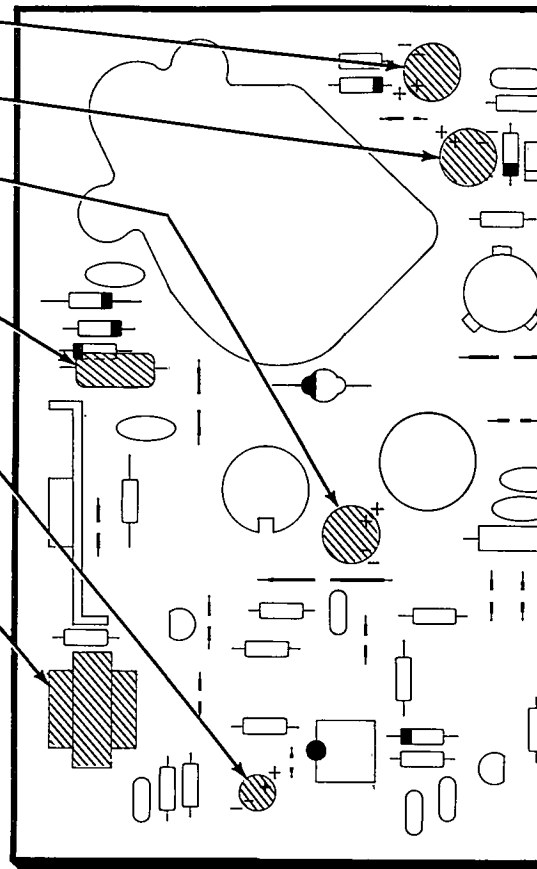


START

- (✓) C122: 33 μ F electrolytic.
- (✓) C123: 220 μ F electrolytic.
- (✓) C124: 220 μ F electrolytic.
- (✓) CX116: .022 μ F/400V Mylar.
- (✓) C109: 33 μ F electrolytic.
- (✓) TX101: Horizontal drive transformer (#234-261). Insert the transformer leads through the circuit board holes. Press the transformer against the board and solder the leads to the foil. Cut off the excess lead lengths.



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



PICTORIAL 3-10

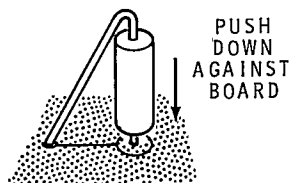
The steps performed in this Pictorial are in this area of the circuit board.

START

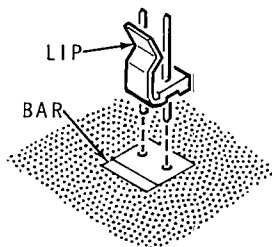
(✓) C317: 220 μ F electrolytic.

(✓) C312: 47 μ F electrolytic.

(✓) R402: 820 Ω , 2-watt (gry-red-brn). Position this resistor on end as shown. Insert the leads through the circuit board holes and press the resistor end against the board. Bend the leads outwards to hold the resistor in place.



NOTE: Position the lip of the following 2-pin plugs over the bar on the circuit board. Insert the pins through the circuit board holes and press the plug against the board. Solder the pins to the foil.



(✓) P102: 2-pin plug at P102.

(✓) P103: 2-pin plug at P103.

(✓) C316: 470 μ F electrolytic.

(✓) C304: 33 μ F electrolytic.

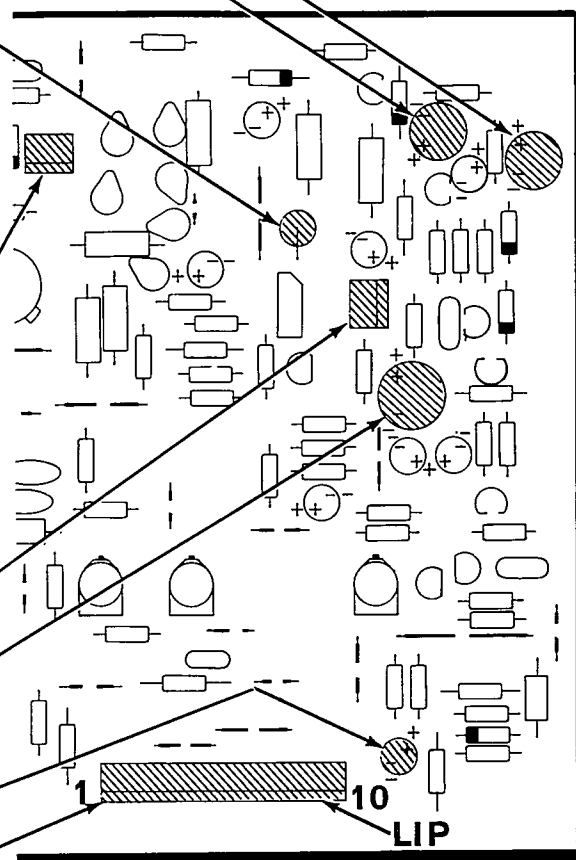
(✓) P101: 10-pin plug at P101. Position the plug as shown.

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

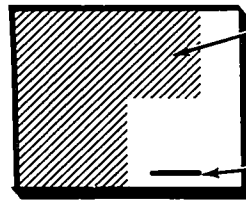
IDENTIFICATION
DRAWING



PART
NUMBER



PICTORIAL 3-11

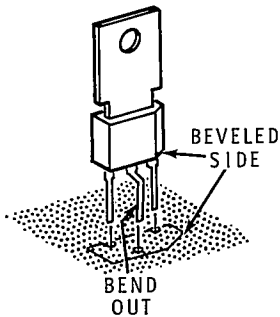
IDENTIFICATION
DRAWING

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

PART
NUMBER

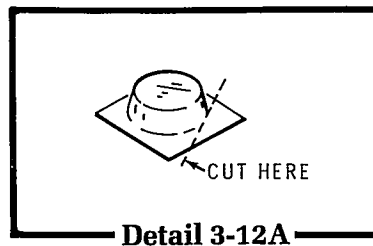
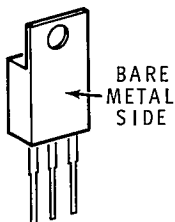
START →

- (✓) Q401: Mount the 234-273 (#121-1058) transistor to the circuit board. Position the beveled side of the case over the circuit board outline. Bend the center lead out slightly and insert the leads into the C, B, and E circuit board holes. Keep the bottom of the case spaced away from the top of the board. Bend the leads out slightly to hold the transistor in place and solder the leads to the foil. Cut off the excess lead lengths.



NOTE: The thermal compound you will use in the following step is not caustic. However, make sure you do not get it in your eyes, ears, nose, mouth, or on your clothing. Wash your hands after you use the compound. Keep this and all chemicals out of the reach of children.

- (✓) Locate the 234-276 (#121-1070) transistor and the container of thermal compound. Refer to Detail 3-12A and open the container of compound. Then spread a small amount of the compound over the bare metal side of the transistor. Save the remainder of the compound; you will need it later.

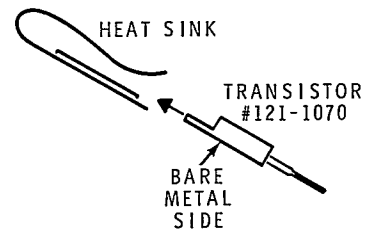


Detail 3-12A

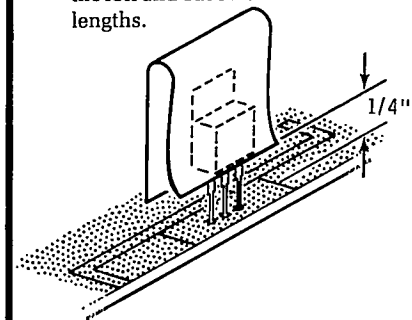
PICTORIAL 3-12

CONTINUE →

- () Insert the prepared transistor into the heat sink guides as far as it will go. Position the bare metal side of the transistor against the heat sink.

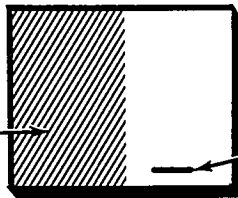


- (✓) Q103: Mount the transistor/heat sink combination to the circuit board. Insert the leads into the circuit board holes with the heat sink as shown and the bottom of the case 1/4" above the top of the board. Then solder the leads to the foil and cut off the excess lead lengths.

**FINISH**

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

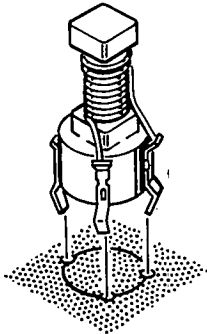
IDENTIFICATION
DRAWING



PART
NUMBER

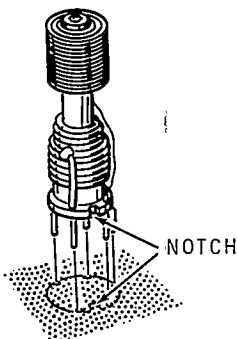
START

- (✓) L102: Mount a linearity coil at L102. Insert the lugs through the circuit board holes and press the coil body against the board. Solder the lugs to the foil and cut off the excess lug lengths.



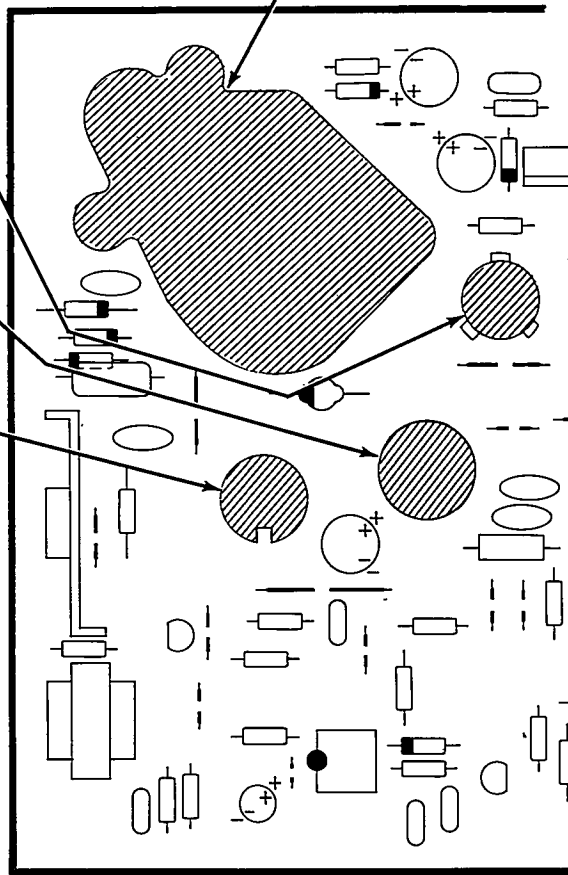
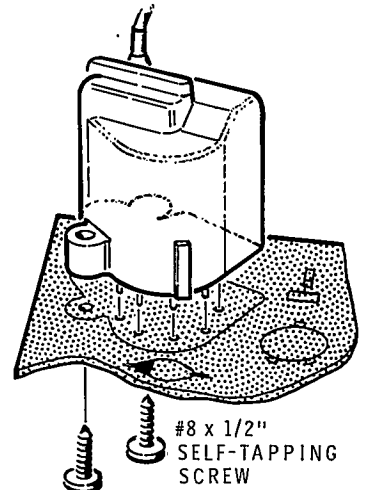
- (✓) CX117: 10 μ F nonpolarized electrolytic. You can position this capacitor with the leads in either hole. Solder the leads to the foil and cut off the excess lead lengths.

- (✓) L101: Mount a width coil at L101. Insert the coil lugs through the circuit board holes with the notch as shown. Press the coil body against the board, solder the lugs to the foil and cut off the excess lengths.



CONTINUE

- (✓) TX102: Mount the sweep transformer to the circuit board with two #8 \times 1/2" self-tapping screws. Then solder the pins to the circuit board foil.



PICTORIAL 3-13

START ➔

Connect the wires from the socket assembly to the circuit board in the order listed below. (The wire retainer at the end of each wire will prevent the wire from falling out before it is soldered to the foil). Solder each wire after you connect it and cut off the excess wire lengths.

- (✓) Small black wire to hole BLK.
- (✓) Yellow wire to hole YEL.
- (✓) Blue wire to hole BLU.
- (✓) Brown wire to hole BRN.
- (✓) Orange wire to hole ORG.
- (✓) Violet wire to hole VIO.

NOTE: You will connect the large black wire later.

CIRCUIT BOARD CHECKOUT

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

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

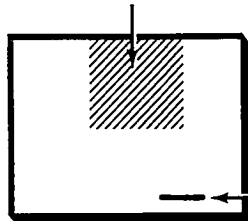
Refer to the illustrations where the parts were installed as you make the following visual checks.

- (✓) Transistors for proper type and installation.
- (✓) Integrated circuits for the proper type and installation.
- () Electrolytic capacitors for the correct position of the identified (+ or -) lead.

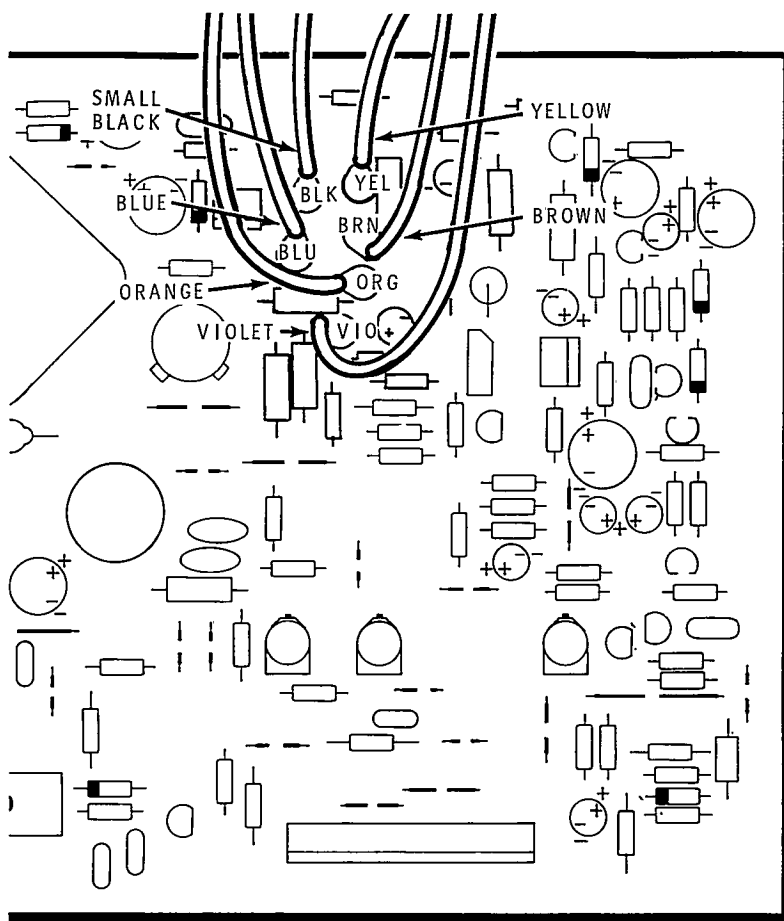
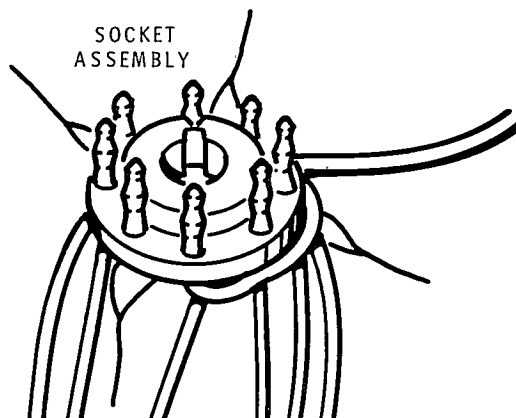
This completes the video driver circuit board assembly. Set it aside until it is called for later.

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

IDENTIFICATION
DRAWING



PART
NUMBER



PICTORIAL 3-14

CHASSIS

PARTS LIST

Check all of the remaining parts against the following list and the Chassis Parts Pictorial (Illustration Booklet, Page 3). 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.

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

KEY No.	HEATH Part No.	QTY	DESCRIPTION	CIRCUIT Comp. No.
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CABINET — CIRCUIT BOARD

A1	92-765	1	Top cover	
A2	92-766	1	Base	
A3	92-767	1	CRT mask	
A4	92-768	1	Keyboard top	
A5	92-769	1	Keyboard bottom	
A6	64-935	1	Keyboard assembly	
			consisting of:	
		1	Keyboard	
		1	Keyboard socket	
	181-4799	1	Terminal logic circuit board	
	234-307	1	CRT	

PANELS — BRACKETS — MISCELLANEOUS

B1	203-2122-1	1	Back panel	
B2	200-1439-1	1	Chassis	
B3	204-2681	2	Side bracket	
B4	204-2617	1	Bottom CRT bracket	
B5	204-2635	1	Left support bracket	
B6	204-2636	1	Right support bracket	
B7	204-2616	1	Left CRT bracket	
B8	204-2637	1	Right CRT bracket	
B9	204-2634	2	Large "L" bracket	
B10	204-1200	1	Small "L" bracket	
B11	204-2662	3	Connector bracket	
B12	234-291	1	Yoke	
B13	54-1000	1	Power transformer	
B14	75-828	1	Insulator	
B15	234-292	1	Ground spring	
B16	234-268	8	Foam magnet	
B17	266-1205	1	Tilt stand	

KEY No.	HEATH Part No.	QTY	DESCRIPTION
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CONNECTORS — SOCKETS

C1	432-866	6	Small connector
C2	432-753	24	Large connector
C3	432-1150	1	Small 8-hole socket
C4	432-750	3	Large 8-hole socket
C5	432-839	1	10-hole socket

CABLE ASSEMBLIES

C6	434-370	1	6-conductor
C7	134-1278	1	7-conductor
C8	134-1334	1	9-conductor
C9	134-1209	1	Coiled cord
	134-1212	1	RS232 serial cable
	89-54	1	Line cord

WIRE

344-2	6"	Large black
344-190	14"	Small black
344-193	14"	Orange
344-194	14"	Yellow
344-195	7"	Green
344-197	14"	Violet
344-199	14"	White
343-15	7"	Shielded cable
345-1	1'	Braided cable

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

	390-2523	1	Instruction card	
D1	391-670	1	Heath logo	
D2	60-619	1	Power switch	SW1
D3	75-736	1	Strain relief	
D4	75-204	1	Plastic insulator	
D5	261-28	8	Plastic foot	
D6	485-45	2	Plug button	
D7	438-48	1	Polarizing plug	
D8	423-11	1	Fuseholder (with hardware)	
D9	421-29	1	3/4-ampere slow-blow fuse	
D10	462-1152	1	Knob	

NOTE: The following IC is packed in a special foam material to protect it from possible damage due to static electricity. Do not remove the IC from its protective foam material until you are instructed to do so.

D12	444-100	1	8021 integrated circuit	U1
	74-4	1	Plastic tape	
D13	490-1	1	Alignment tool	
D14	490-5	1	Nut starter	

HARDWARE

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

#4 Hardware

E1	250-1413	1	4-40 × 1/2" pan head screw
E2	255-757	4	4-40 spacer
E3	252-2	1	Large 4-40 nut
E4	252-15	4	Small 4-40 nut
E5	254-9	3	#4 lockwasher
E6	253-198	2	Nylon shoulder washer
E7	259-9	2	#4 solder lug

KEY No.	HEATH Part No.	QTY	DESCRIPTION	CIRCUIT Comp. No.
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#6 Hardware

F1	250-33	1	6-32 × 1/8" setscrew
F2	250-1307	4	#6 × 1/4" sheet metal screw
F3	250-1325	10	6-32 × 1/4" pan head screw
F4	250-1280	2	6-32 × 3/8" pan head screw
F5	250-1264	8	6-32 × 3/8" hex head screw
F6	250-1434	4	#6 × 3/8" self-tapping screw
F7	250-1435	2	#6 × 1/2" self-tapping screw
F8	250-1478	6	#6 × 7/8" self-tapping screw
F9	250-1157	7	6-32 spacer
F10	252-3	10	6-32 nut
F11	254-1	10	#6 lockwasher
F12	259-1	1	#6 solder lug

#8 Hardware

G1	250-1232	15	#8 × 5/16" self-tapping screw
G2	250-1477	2	8-32 × 1-1/4" pan head screw
G3	250-1314	11	8-32 × 3/8" hex head screw
G4	250-1476	2	8-32 × 1/2" flat head screw
G5	250-1138	12	#8 × 5/8" self-tapping screw
G6	252-4	4	8-32 nut
G7	259-2	6	#8 solder lug
G8	253-45	6	#8 flat washer
G9	254-28	3	#8 lockwasher

Other Hardware

H1	208-54	2	Push-on clip
H2	253-3	3	#10 fiber flat washer
H3	253-7	3	#10 fiber shoulder washer

STEP-BY-STEP ASSEMBLY

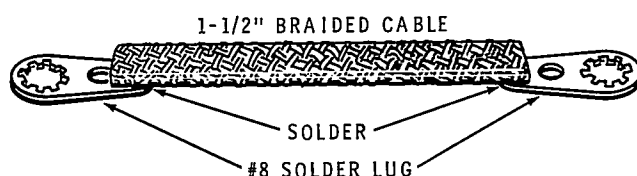
NOTE: In the remainder of this Manual, whenever a step tells you to use hardware (self-tapping screws, or nuts and screws) to connect pieces of chassis or cabinetry, use the following procedure.

First, loosely install all of the hardware; this allows you to move the pieces and align the mounting holes. Second, snug up the hardware about finger tight; this allows any stress in the pieces to be evenly distributed. Finally, tighten the hardware (only as tight as necessary; do not overtighten).

CHASSIS PARTS MOUNTING

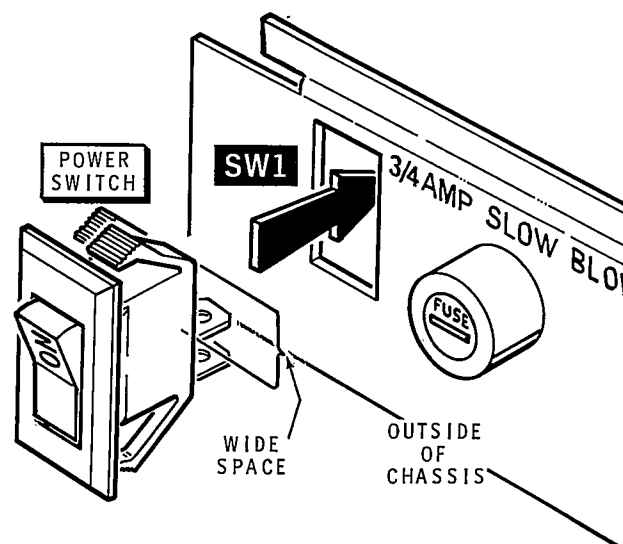
Refer to Pictorial 4-1 (Illustration Booklet, Page 6) for the following steps.

- (✓) Refer to Detail 4-1A and prepare two 1-1/2" and one 3-1/2" braided cable by soldering a #8 solder lug on each end. Set these aside temporarily.
- (✓) Position the chassis as shown.

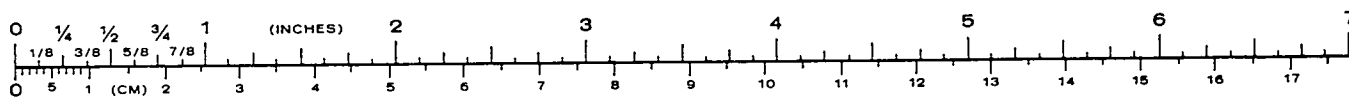


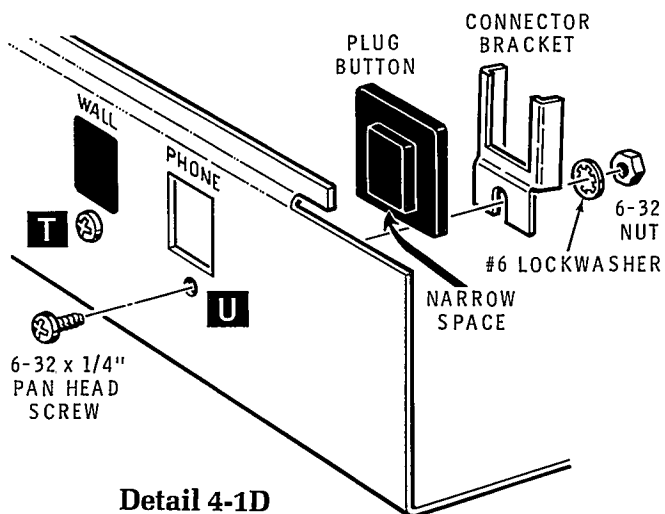
Detail 4-1A

- (✓) Refer to Detail 4-1B (Illustration Booklet, Page 6) and install the fuseholder at F1. Use the hardware supplied with the fuseholder.
- (✓) Refer again to Detail 4-1B and bend lug 2 up about 1/8" so you can solder to it later.
- (✓) Install the 3/4-ampere slow-blow fuse in the fuseholder cap. Then turn the cap into the holder with a screwdriver. Do not tighten the cap as you would a screw or you could break the plastic.
- (✓) Refer to Detail 4-1C and install the power switch at SW1. Position the switch with the ON lever toward the top and push the switch into the back panel.



Detail 4-1C





Detail 4-1D

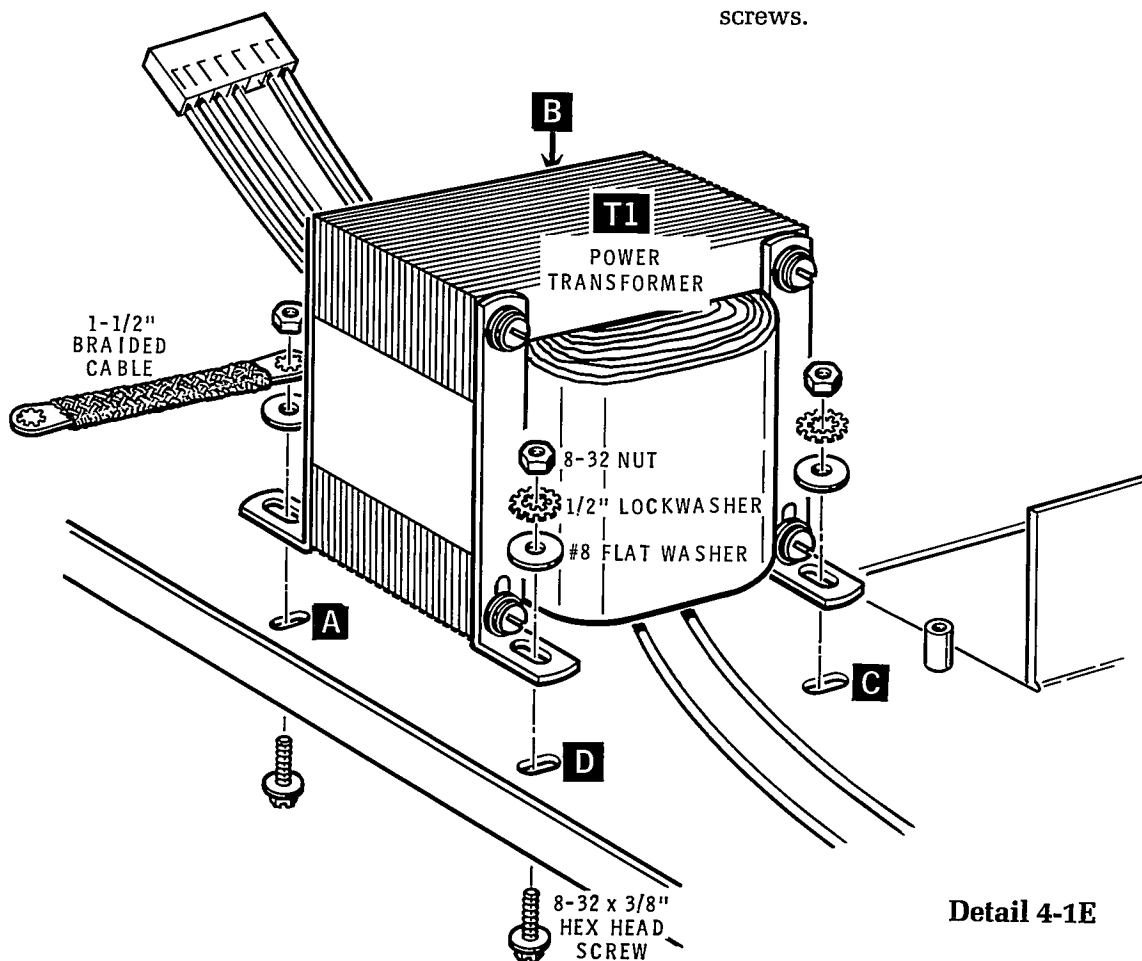
- (✓) Refer to Detail 4-1D and install 6-32 × 1/4" pan head screws, #6 lockwashers, and 6-32 nuts at T and U. Just start the nuts on the screws; do not tighten them.

- (✓) Position a plug button as shown with the raised portion out and the narrower space toward the bottom. Place the plug button on the inside of the chassis at T. While holding it in place, slide a connector bracket on the hardware at T and tighten it.

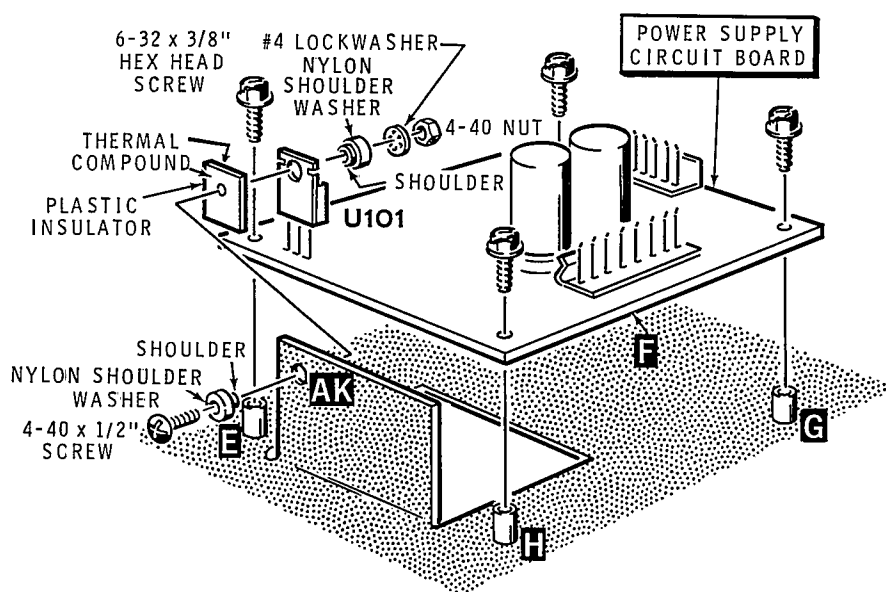
- (✓) Similarly install the other plug button and connector bracket at U.

- (✓) Refer to Detail 4-1E, position the power transformer with the leads coming out as shown, and place it over holes A, B, C, and D. Then loosely install an 8-32 × 3/8" hex head screw, #8 flat washer, #8 lockwasher, and 8-32 nut at B, C, and D. At location A, use a 1-1/2" braided cable in place of the lockwasher. Position the cable as shown. Then tighten all of the hardware.

- (✓) Refer to Detail 4-1F and place the power supply circuit board on spaces E, F, G and H as shown. Fasten the board with four 6-32 × 3/8" hex head screws.



Detail 4-1E



Detail 4-1F

NOTE: In the following, you will mount U101 against the heat sink at AK. Refer to Detail 4-1F for these steps. After the IC is properly mounted, you will finish soldering the leads to the foil.

- (✓) Tip the IC forward at about a 45° angle so you have room to assemble the mounting hardware at AK.
- (✓) Place one nylon shoulder washer on the 4-40 × 1/2" screw, with the shoulder in the direction shown. Then place the screw partway through hole AK.

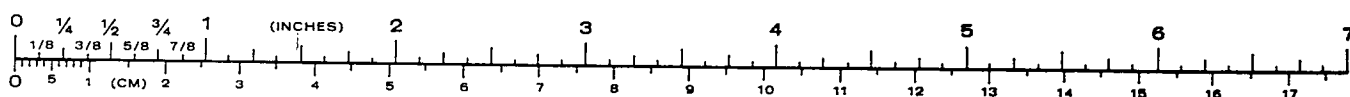
NOTE: The thermal compound you will use in the following step is not caustic. However, make sure you do not get it in your eyes, ears, nose, mouth, or on your clothing. Wash your hands after you use the compound. Keep this and all chemicals out of the reach of children.

- (✓) Apply a layer of thermal compound to both sides of the plastic insulator.
- (✓) Loosely mount these parts on the screw in order:
 - plastic insulator

- U101
- nylon shoulder washer (with shoulder in the direction shown)
- #4 lockwasher
- 4-40 nut

NOTE: If, in the following step, there is not enough "slack" in the soldered lead to allow you to position U101, use desolder wick and your iron to remove the solder (but keep the leads in their holes).

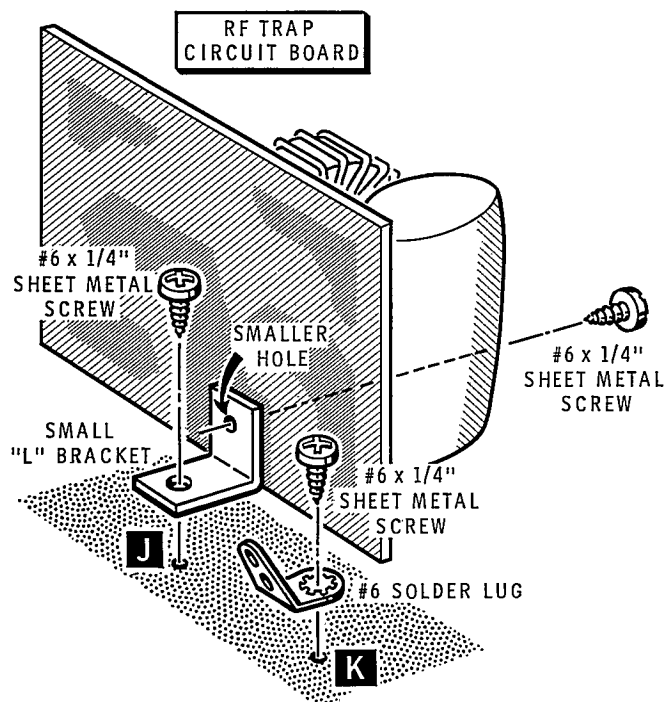
- (✓) Make sure that the two washer shoulders are seated in the heat sink and IC holes. Then position the IC flat against the heat sink, with the plastic insulator between them. This will bend the IC leads slightly, into an "S."
- (✓) Tighten the nut to finish mounting the IC.
- (✓) Turn the assembly over and solder all three leads to the foil. (Resoldering the one lead that was already soldered will help relieve the bending stress that you placed on the previous solder joint.)



Refer to Detail 4-1G for the following steps.

- (✓) Install a #6 solder lug at K with a #6 × 1/4" sheet metal screw. Position the solder lug as shown.
- (✓) Install a small "L" bracket on the RF trap circuit board with a #6 × 1/4" sheet metal screw. The screw goes into the smaller of the bracket's holes. You may have to hold the bracket with pliers and brace the board against a solid object to do this.
- (✓) Mount the circuit board on the chassis at J with a #6 × 1/4" sheet metal screw.

Set the chassis aside temporarily.

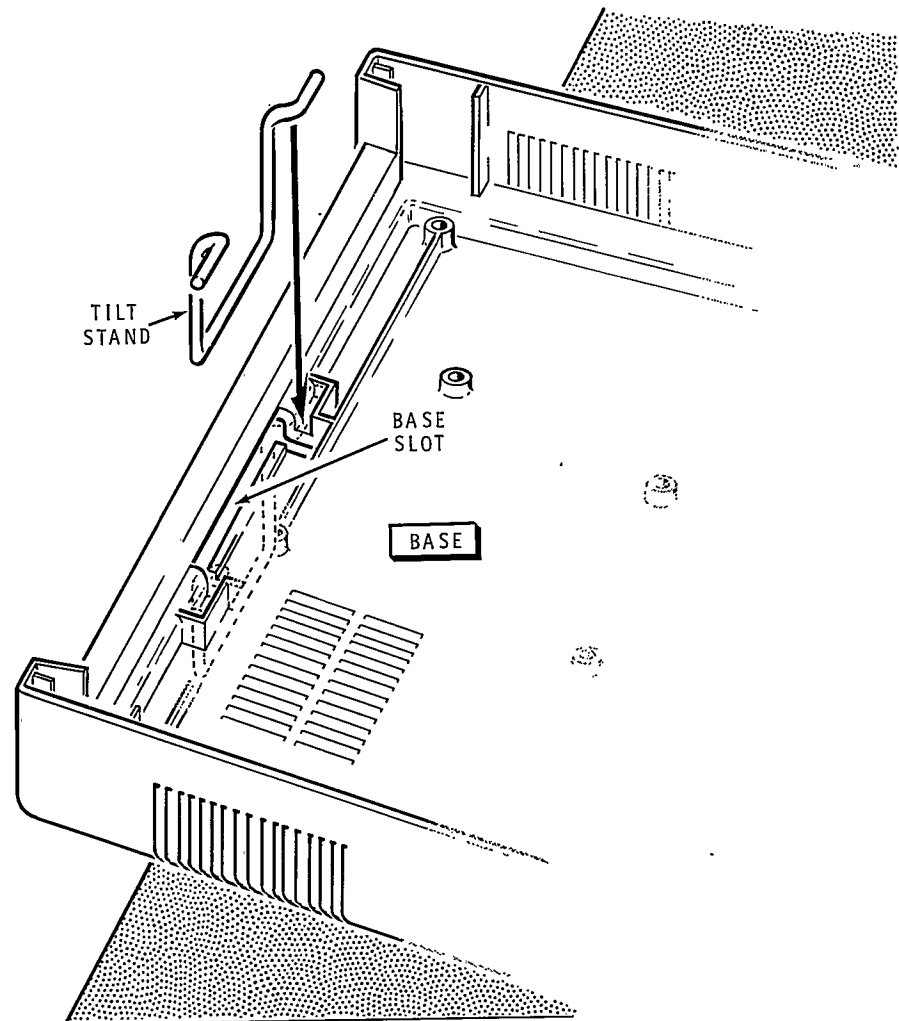


Detail 4-1G

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

- (✓) Position the base upside down on your work bench. Peel the backing from the four plastic feet and install one in the square outline at each corner.
- (✓) Refer to Detail 4-2A and position the base right-side-up, and with the edge extending off your work surface as shown.
- (✓) Refer again to Detail 4-2A and note which way the tilt stand curves; then drop the tilt stand into place through the base slot.
- (✓) Fold the tilt stand up under the base and move the base back fully onto your work surface.
- (✓) Position the chassis as shown and place it inside the base. Line up the holes with the bosses on the base. Fasten the chassis with nine #8 × 5/16" self-tapping screws at AA, AB, AC, AD, AE, AF, AG, AH, and AT. Also include the 1-1/2" braided cable at AG and position the solder lug as shown.
- (✓) Position the video driver circuit board as shown and place it on spacers L, N, P, and R. Then fasten it with four 6-32 × 3/8" hex head screws.
- (✓) Position the right support bracket as shown and install it on the base at AL with a #8 × 5/16" self-tapping screw. Include the other end of the braided cable coming from A.
- (✓) Similarly install the left support bracket at AN and include the braided cable coming from AG.

Set this assembly aside temporarily.



Detail 4-2A

INSTALLING THE CRT

Refer to Pictorial 4-3 (Illustration Booklet, Page 8) for the following steps.

- (✓) Lay the CRT mask on a soft cloth to prevent it from getting scratched. Position it as shown.
- (✓) Mount the right CRT bracket on the mask with three #8 × 5/8" self-tapping screws at BA, BB, and BD.
- (✓) Mount the left CRT bracket on the mask with three #8 × 5/8" self-tapping screws at BE, BG, and BH.
- (✓) Mount the bottom CRT bracket on the mask with six #8 × 5/8" self-tapping screws at BJ, BK, BL, BN, BP, and BZ. Include the 3-1/2" braided cable at BZ. NOTE: Push the bracket toward the top of the mask before you tighten the screws.

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

CAUTION: Use extreme care when you handle the CRT, due to its high vacuum and large glass surface area. DO NOT strike, scratch, or subject the CRT to more than moderate pressure at any time. **Never** lift the CRT by its neck. A fracture of the glass could result in an implosion of considerable violence capable of causing personal injury. When handling the CRT, be careful not to touch the second anode socket as you may get a dangerous electrical shock even though the CRT has not been used.

IMPORTANT: Do not set the CRT down so any part of its weight rests on the neck. Place a soft cloth over any surface on which the CRT will be placed; then place the CRT face down on the cloth.

- (✓) Carefully unpack the CRT. If there is a protective plastic covering on the front of the tube, remove it now.
- (✓) Place the CRT with the second anode toward the top and carefully place it on the CRT brackets.
- (✓) Refer to inset drawing #1 and mount the CRT to the brackets with an 8-32 × 3/8" screw, a #10 fiber shoulder washer, and a #10 fiber flat washer at BX and BT.

- (✓) In a similar manner, mount the CRT to the bracket at BY, but include the ground spring at this location.
- (✓) Refer to inset drawing #2 and mount the remaining corner of the CRT at BU with an 8-32 × 3/8" screw, using two #8 flat washers.
- (✓) Position one of the side brackets as shown and mount it at BR with a #8 × 5/16" self-tapping screw.
- (✓) Position the other side bracket as shown and mount it at BS with a #8 × 5/16" self-tapping screw.
- (✓) Position the yoke with the blue and red wires to the left; then slide the yoke onto the neck of the CRT. You may have to loosen the clamp screws slightly first. Make sure the yoke is positioned so the lugs that the leads are attached to are at the 3 and 9 o'clock locations. Then tighten the clamp screw; but do not overtighten it.

When you install the following labels, peel off the backing and install the labels on the CRT at the approximate locations shown.

- (✓) X-ray warning label.
- (✓) CRT grounding label.

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

NOTE: Handle the CRT assembly carefully as you install it on the base in the following steps.

- (✓) Position the base as shown. Then place the CRT assembly on the base. The bottom edge of the mask will fit into a slot near the front of the base. Also, make sure the two side brackets on the CRT assembly fit inside of both support brackets on the base.
- (✓) Loosen screws BR and BS and slide both support brackets underneath them as far as they will go. Then retighten the screws.
- (✓) Remove the screw at AB and use it to secure the remaining end of the 3-1/2" braided cable at AB.

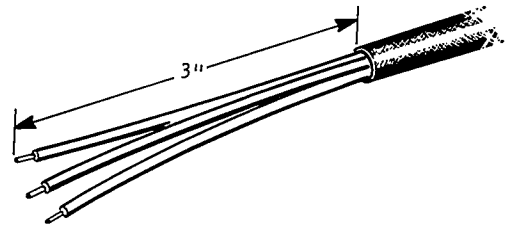
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- (✓) Install three 8-32 \times 3/8" hex head screws at EA, EB, and EC.
- (✓) Plug the connector on the end of the black wire coming from the CRT socket on the ground spring at BY.
- (✓) Discharge the CRT second anode as shown in inset drawing #1. To do this, wrap one end of a bare wire around the side bracket and the other end around the shaft of a screwdriver. Hold the screwdriver by the insulated handle and touch the blade to the second anode. You may or may not hear an arc. Remove the bare wire from the side bracket and from the shaft of the screwdriver.
- (✓) Refer to inset drawing #2 and install the second anode lead, coming from the video driver circuit board, by inserting the clips inside the hole. Then turn the plastic cap so the lead points toward the right.
- (✓) Remove the protective cap from the pins of the CRT.
- (✓) Position the CRT socket so the pin that has no lead connected to it is at the 12 o'clock position. Then install the socket on the base of the CRT.
- (✓) Position the four spark gap wires away from the neck of the CRT and the socket wires.
- (✓) Using the electrical tape supplied, wrap the exposed pins of the CRT socket. Do not wrap the four spark gap wires.
- (✓) Install the socket, with the red and blue wires coming from the yoke, onto plug P103 on the video driver circuit board. Match up the lip on the plug with the lip on the socket when you install it.
- (✓) Similarly install the socket with the black and yellow wires coming from the yoke on plug P102.

WIRING

Refer to Pictorial 4-6 (Illustration Booklet, Page 11) for the following steps.

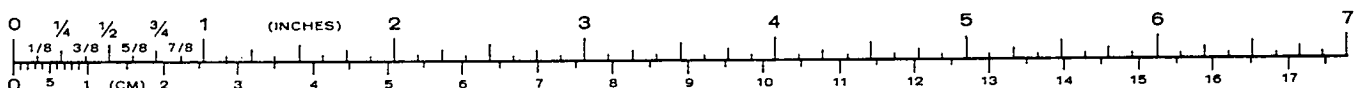
- (✓) Refer to Detail 4-6A and remove additional outer insulation from the line cord to the dimension shown. Be very careful not to cut through the insulation of the three wires. Twist the strands of wire tightly together and apply a small amount of solder to hold the strands in place.



Detail 4-6A

NOTES:

1. When you connect a lead to the switch and fuse-holder in the following steps, be sure you make a mechanically secure connection before soldering. See inset drawing #1.
2. In the following steps "S-" with a number, such as (S-1), means to solder the connection. The number following the "S" tells how many wires are at the connection.



3. Whenever you are instructed to make a connection to the circuit board, solder the wire to the foil and cut off the excess length.

Refer to Detail 4-6B for the following steps, until you are told otherwise.

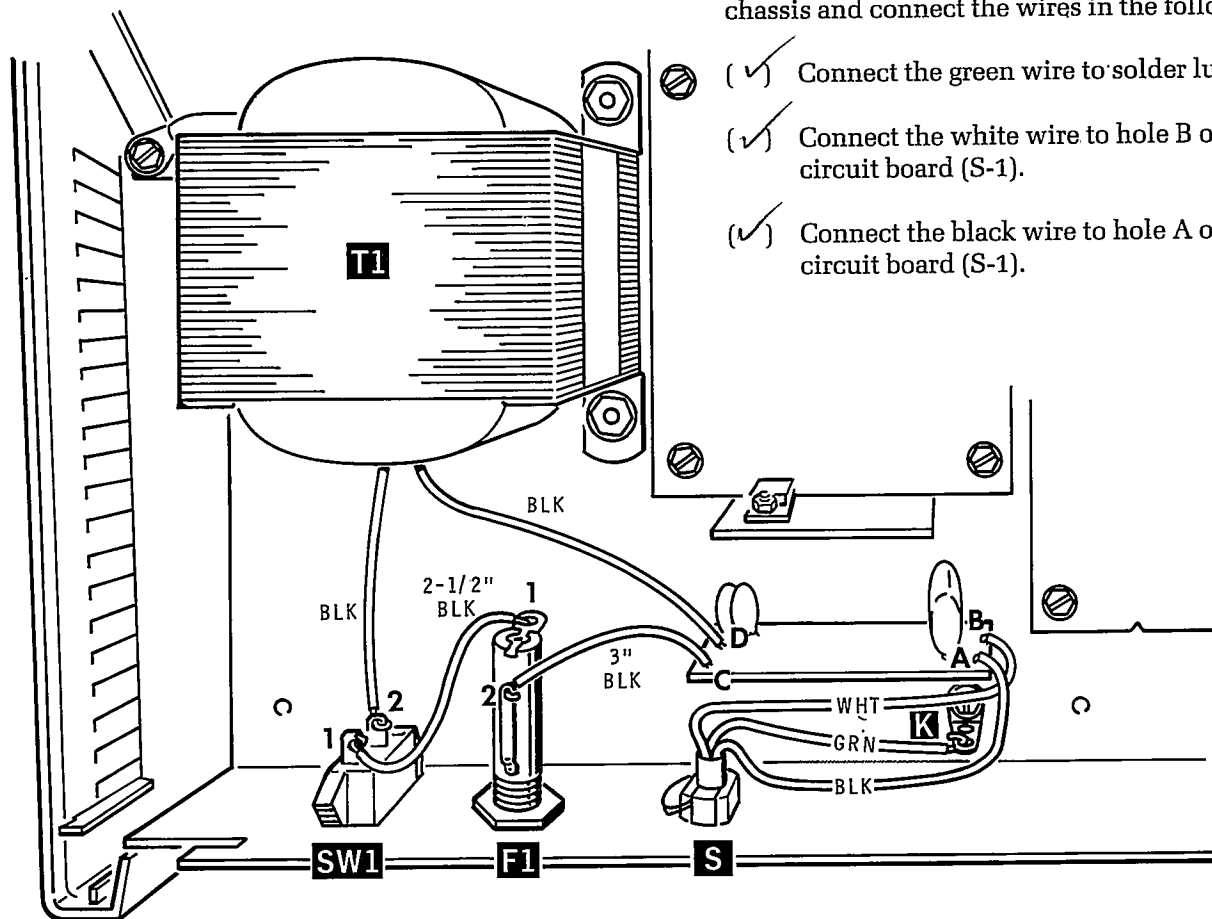
- (✓) Connect either black transformer lead to hole D of the RF trap circuit board (S-1).
- (✓) Connect the other black transformer lead to lug 2 of switch SW1 (S-1).

NOTE: To prepare the following wires, cut them to the proper length, remove 1/4" of insulation from each end, twist the fine strands of wire together, and apply a small amount of solder on the ends.

- (✓) Prepare a 2-1/2" and a 3" large black wire.
- (✓) Connect a 2-1/2" large black wire from lug 1 of switch SW1 (S-1) to lug 1 of fuse F1 (S-1).
- (✓) Connect a 3" large black wire from lug 2 of fuse-holder F1 (S-1) to hole C of the RF trap circuit board.

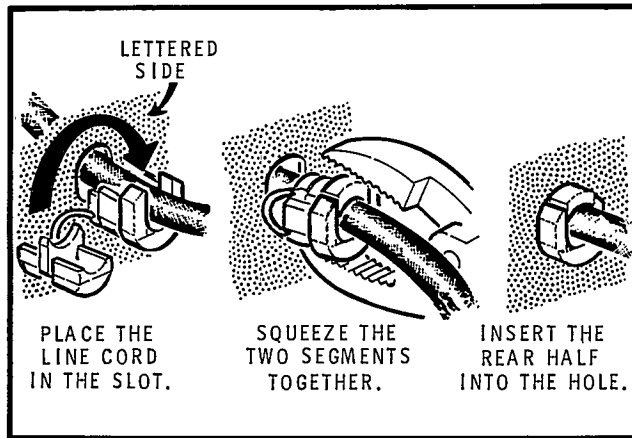
Route the three line cord wires through hole S in the chassis and connect the wires in the following steps.

- (✓) Connect the green wire to solder lug K (S-1).
- (✓) Connect the white wire to hole B of the RF trap circuit board (S-1).
- (✓) Connect the black wire to hole A of the RF trap circuit board (S-1).

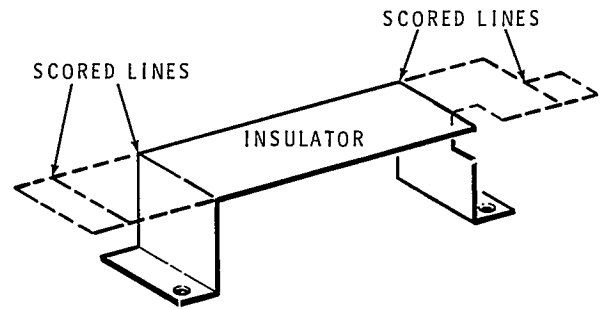


Detail 4-6B





Detail 4-6C

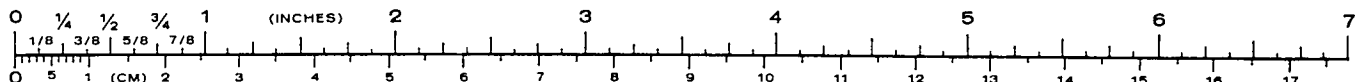


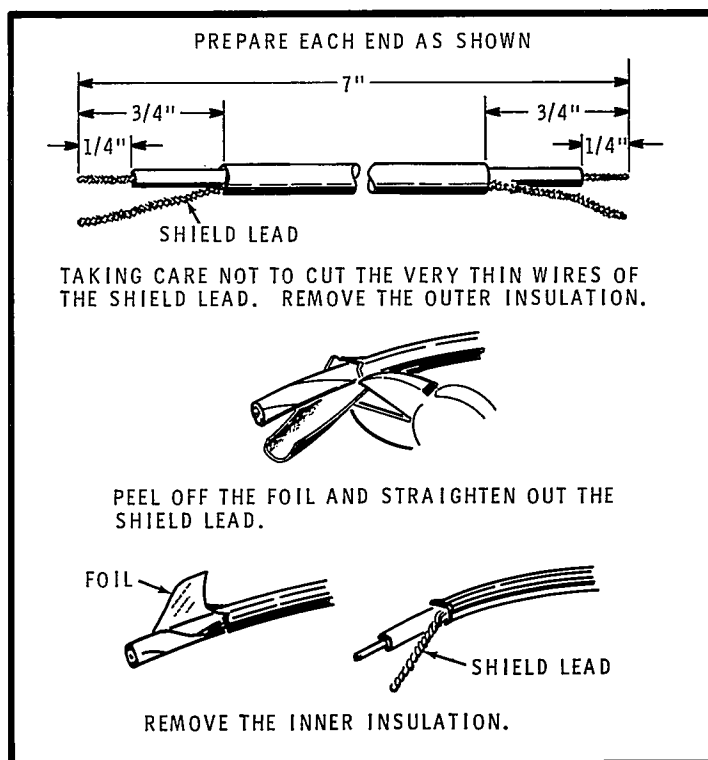
Detail 4-6D

- (✓) Refer to Detail 4-6C and secure the line cord with the strain relief in hole S.
- (✓) Refer to Detail 4-6D and bend the insulator sheet on the scored lines to form the configuration shown.
- () Mount the insulator over the switch, fuse-holder, and RF trap board and fasten it with two #8 × 5/16" self-tapping screws at AP and AR.
- () Install socket S101 coming from the power transformer on plug P101 of the power supply board.

Prepare the following lengths of wire. Cut them to the indicated length and remove 1/8" of insulation from the ends. Then twist the fine strands tightly together and apply a small amount of solder to hold the strands in place.

- (✓) Two 7" black
- (✓) Two 7" orange
- (✓) Two 7" white
- (✓) One 7" green
- (✓) Two 7" yellow
- (✓) Two 7" violet





Detail 4-6E

- (✓) Refer to Detail 4-6E and prepare both ends of a 7" shielded cable.
- (✓) Refer to Part A of Detail 4-6F Part A (Illustration Booklet, Page 12) and install a large connector on the ends of the shielded cable and 7" black wire combination. See inset drawing #1.
- (✓) Install large connectors on both ends of each of the other wires.

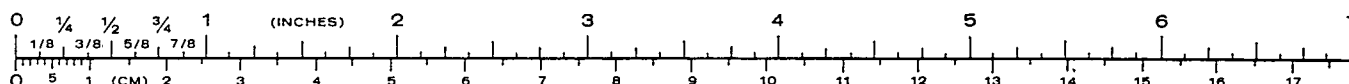
In the following steps, you will prepare one cable assembly using two large 8-hole sockets and another cable assembly using one large 8-hole and one 10-hole socket. Be sure to position the sockets with the slotted side up and the connectors with the small tab up when you insert them in the sockets. See inset drawing #2 in Part B.

- (✓) Mark one large 8-hole socket S102 and the other S405.

Socket S405 (Part B)

Insert the connectors on the end of the following wires into socket S405.

- (✓) Green to hole 1.
- (✓) Yellow to hole 2.
- (✓) Hole 3 is blank.
- (✓) Black to hole 4.
- (✓) Orange to hole 5.
- (✓) Violet to hole 6.
- (✓) White to hole 7.
- (✓) Hole 8 is blank.
- (✓) Refer to inset drawing #3 and insert a polarizing plug in hole 3.



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Socket S102 (Part B)

Insert the connectors on the other end of the wires into socket S102 in the following steps.

- (✓) Hole 1 is blank.
- (✓) White to hole 2.
- (✓) Violet to hole 3.
- (✓) Orange to hole 4.
- (✓) Black to hole 5.
- (✓) Hole 6 is blank.
- (✓) Yellow to hole 7.
- (✓) Green to hole 8.

Refer to Part C of Detail 4-6F for the following steps.

- () Mark the large 8-hole socket S404 and the 10-hole socket S101.

Socket S404 (Part C)

Insert connectors into socket S404 as follows:

- (✓) Inner lead of the shielded cable to hole 1. Shield lead and black wire to hole 4.
- (✓) Orange to hole 2.
- (✓) Yellow to hole 3.
- (✓) Hole 5 is blank.
- (✓) Violet to hole 6.
- (✓) White to hole 7.
- (✓) Hole 8 is blank.

Socket S101 (Part C)

Insert the connectors on the other end of the wires into socket S101 in the following steps.

- (✓) White to hole 1.
- (✓) Holes 2, 3, 4, and 5 are blank.
- (✓) Yellow to hole 6.
- (✓) Violet to hole 7.
- (✓) Inner lead of the shielded cable to hole 8. Shield lead and black wire to hole 10.
- (✓) Orange to hole 9.

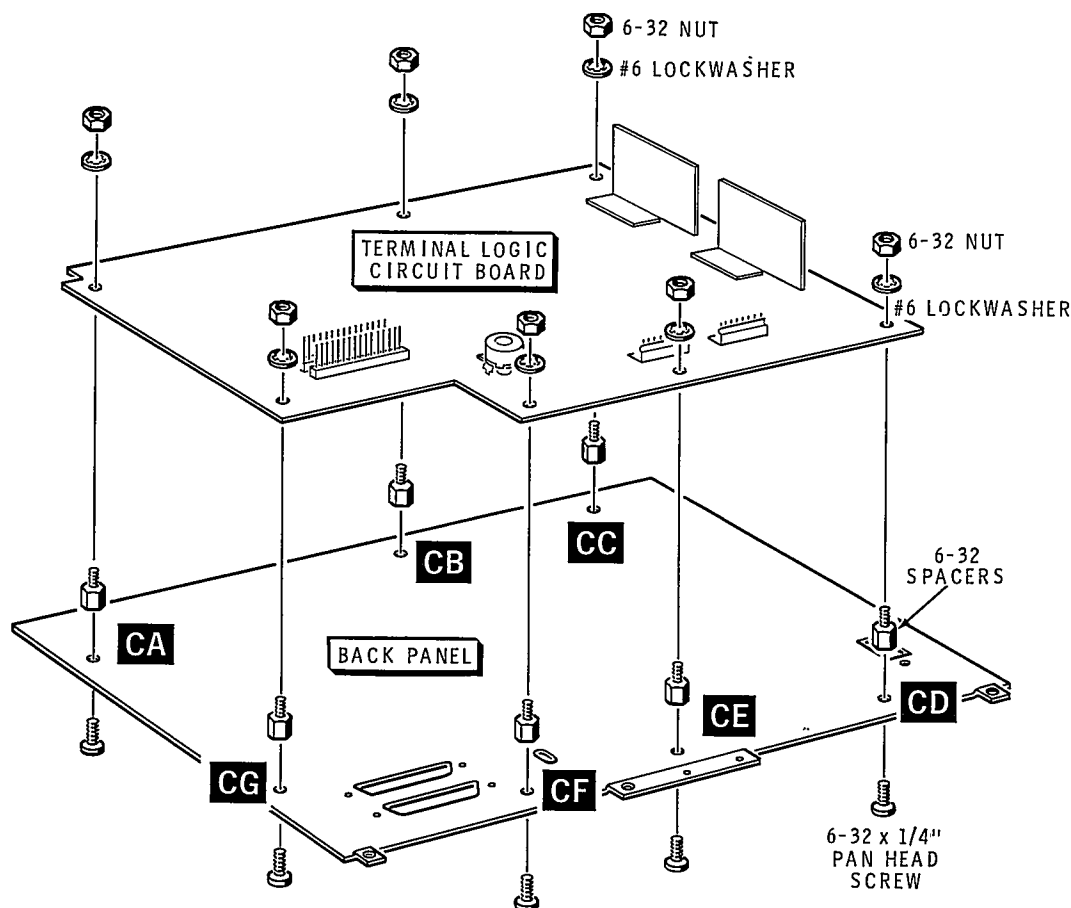
Refer to Pictorial 4-6 (Illustration Booklet, Page 11) for the following steps.

- (✓) Install socket S101 on plug P101 of the video driver board. Be sure to match up the lip on the socket with the lip on the plug.
- () Similarly install socket S102 on plug P102 of the power supply board.

The other end of these cables will be installed later.

Refer to Detail 4-6G (Illustration Booklet, Page 12) for the following steps.

- (✓) Locate the 6-conductor cable assembly. Remove 3/16" of insulation from each wire, twist the fine strands and apply a small amount of solder to the ends of each wire.
- (✓) Install a small connector on the end of each wire as you did the large connectors on the other wires.



Detail 4-7A

In the following steps, you will insert the connectors into the small 8-hole socket. Be sure to position the socket with the slotted side up and the connectors with the small tab up when you insert them.

- (✓) Blue to hole 1.
- (✓) Yellow to hole 2.
- (✓) Green to hole 3.
- (✓) Red to hole 4.
- (✓) Hole 5 is blank.
- (✓) White to hole 6.

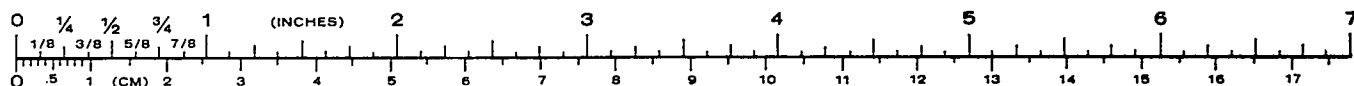
(✓) Black to hole 7.

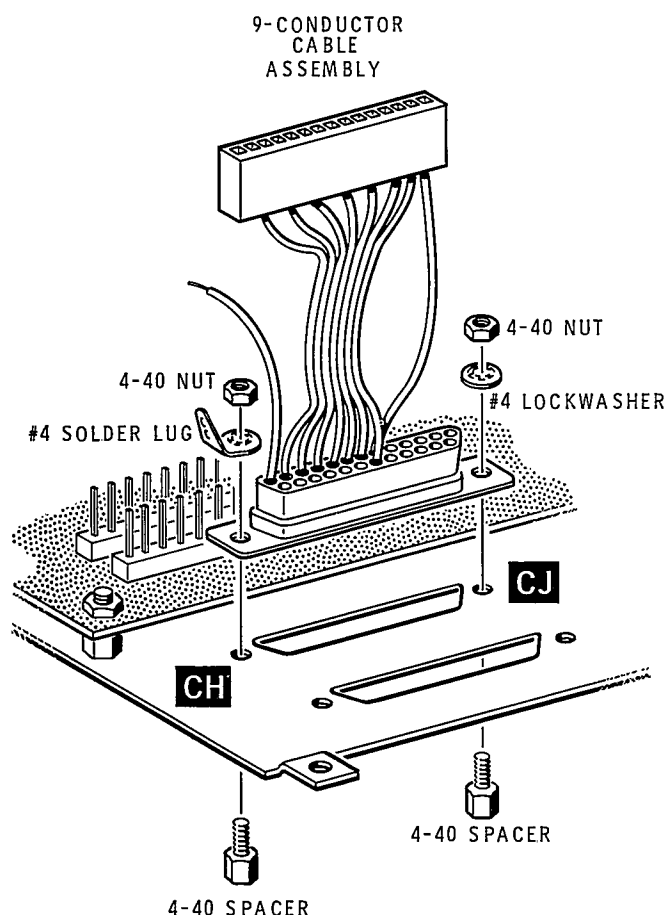
(✓) Hole 8 is blank.

BACK PANEL PARTS MOUNTING

Refer to Pictorial 4-7 (Illustration Booklet, Page 13) for the following steps.

- (✓) Position the back panel as shown.
- (✓) Refer to Detail 4-7A and mount seven 6-32 spacers at CA, CB, CC, CD, CE, CF, and CG with 6-32 x 1/4" pan head screws.
- (✓) Place the terminal logic circuit board over the spacers and fasten it with 6-32 nuts and #6 lockwashers.





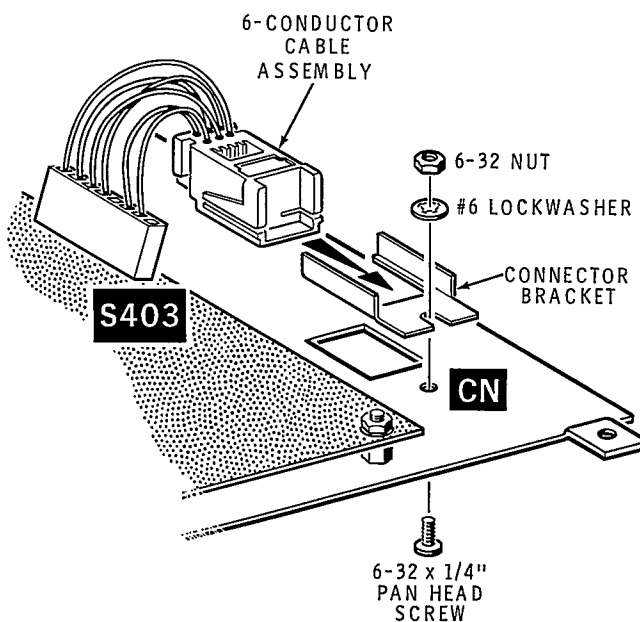
Detail 4-7B

- (✓) Refer to Detail 4-7B and mount the 9-conductor cable assembly at CH and CJ. Use a 4-40 spacer, a #4 solder lug, and a 4-40 nut at CH; use a 4-40 spacer, a #6 lockwasher, and a 4-40 nut at CJ.
- (✓) Position socket S401 at the other end of the assembly with the slotted side up, as shown and install it on plug P401.
- (✓) Connect the black wire coming from the assembly to solder lug CH (S-1).
- (✓) Similarly mount the 7-conductor cable assembly at CK and CL with a #4 solder lug at CL. Then install socket S402 on plug P402, again, with the slotted side up.
- (✓) Connect the black wire coming from the assembly to solder lug CL (S-1).

- (✓) Refer to Detail 4-7C and position the 6-conductor cable assembly and the connector bracket as shown. Slide the connector bracket onto the connector and mount it at CN with a 6-32 \times 1/4" pan head screw, #6 lockwasher and a 6-32 nut.
- (✓) Position socket S403 at the other end of the assembly with the slotted side as shown and install it on plug P403.

Refer to Pictorial 4-8 (Illustration Booklet, Page 13) for the following steps.

- (✓) Position the back panel as shown and insert the two end and center tabs into the slots in the back panel of the chassis.
- (✓) While holding the panel in place, install socket S404 on plug P404. Be sure to match up the lip on the socket and plug when you install it.
- () Similarly install socket S405 on plug P405.
- (✓) With the panel still engaged in the chassis, rotate it to a vertical position and fasten it at CP with a #6 \times 1/4" sheet metal screw.



Detail 4-7C

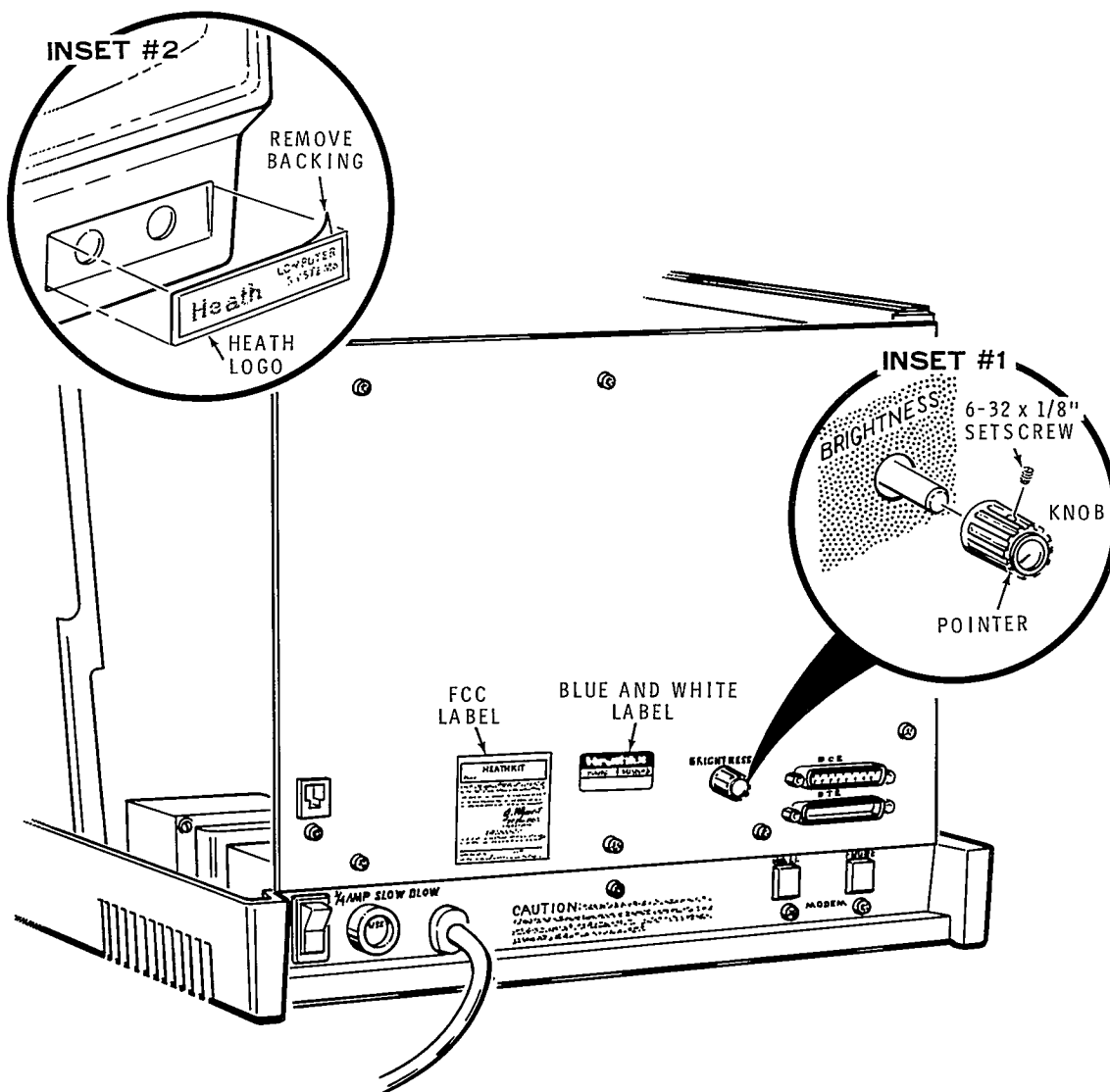
Refer to Pictorial 4-9 for the following steps.

- (✓) Turn the BRIGHTNESS control (on the back panel) fully counterclockwise.
- (✓) Refer to inset drawing #1 and turn the 6-32 × 1/8" setscrew into the knob as shown. Place the knob onto the shaft of the BRIGHTNESS control. Place the orange colored knob pointer at the 7 o'clock position; then tighten the setscrew.
- (✓) Sign and date the FCC label. Then peel off the backing and install the label on the back panel.

(✓) Similarly install the blue and white label. Be sure to refer to the numbers on this label in any communication you have with the Heath Company about this kit.

() Similarly install the Heath logo on the front of the Terminal at the location shown in inset drawing #2 on Pictorial 4-9.

Set the Terminal aside temporarily. You will assemble the keyboard next.



PICTORIAL 4-9

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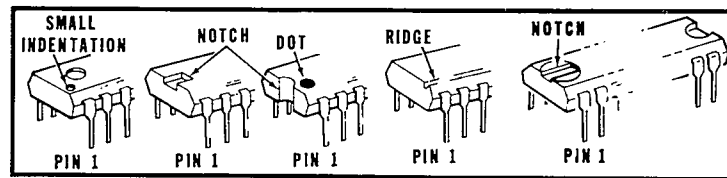
KEYBOARD

Refer to Pictorial 4-10 (Illustration Booklet, Page 14) for the following steps.

- (✓) Position the keyboard so you can view the circuit board as shown.

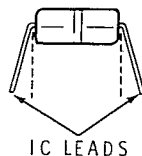
- (✓) Position the keyboard socket as shown and insert the flat cable into socket S1.

- (✓) Refer to Detail 4-10A to identify the pin 1 end of an IC. Then refer to the Pictorial and install the 8021 (#444-100) IC at U1.

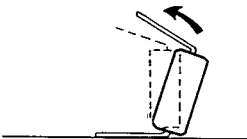


CAUTION: Integrated Circuits (IC's) are complex electronic devices that perform many complicated functions in the circuit. These devices can be damaged during installation. Read all of the following information before you install the IC's.

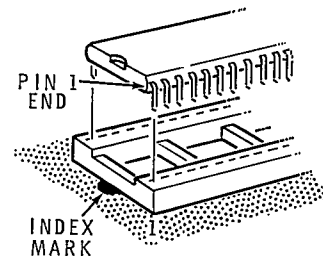
The pins on the IC's may be bent out at an angle, so they do not line up with the holes in the board. DO NOT try to install an IC without first bending the pins as described below. To do so may damage the IC pins.



Before you install an IC, lay it down on its side as shown below and very carefully roll it toward the pins to bend the lower pins into line. Then turn the IC over and bend the pins on the other side in the same manner.

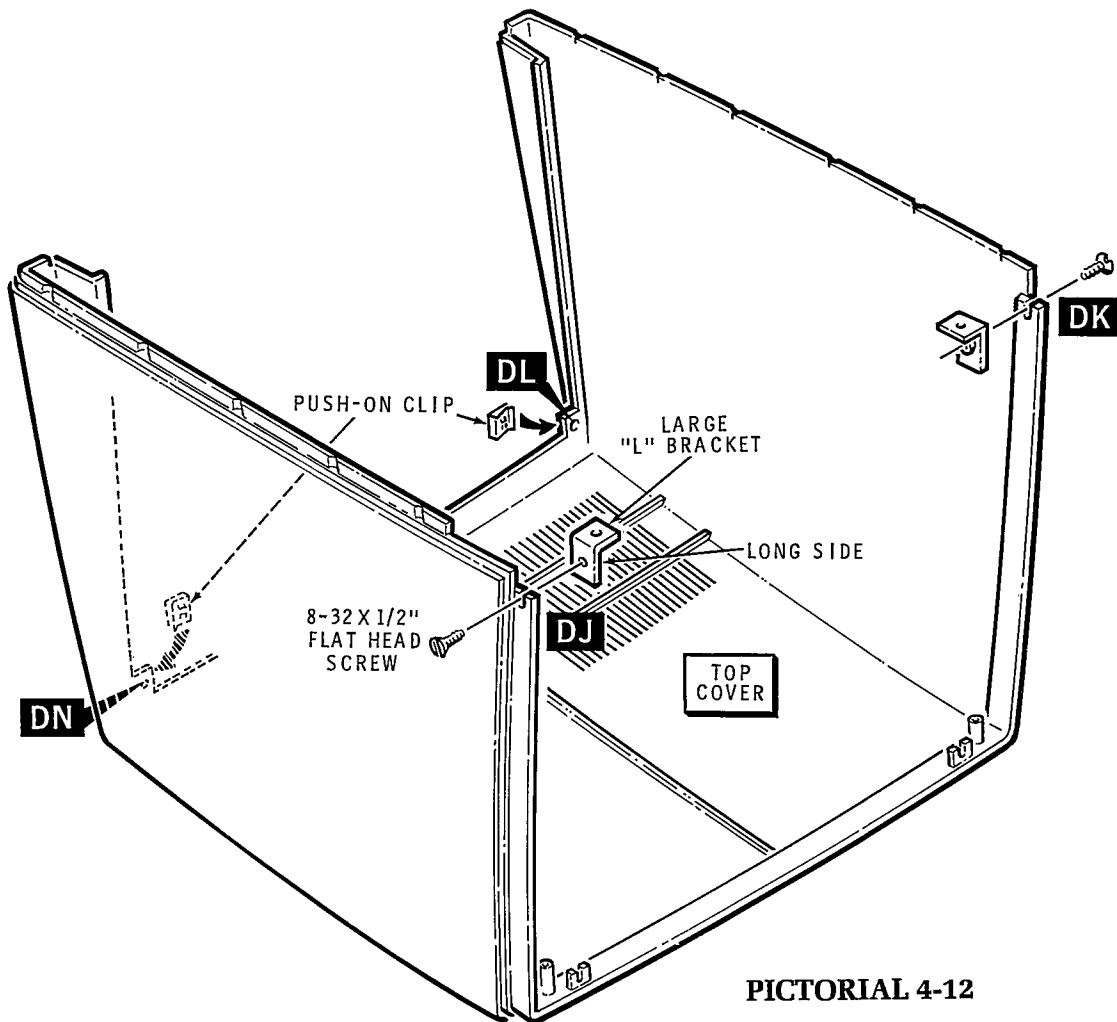


Make sure that the pin 1 end of the IC is positioned over the pin 1 end of the socket (see the detail at the top of this box). Also make sure that all of the pins are started into the socket. NOTE: An IC pin can become bent under the IC and it will appear as though it is correctly installed in the socket.



The IC is a metal oxide semi-conductor (MOS). IC's can be damaged by static electricity. Once you remove an IC from its protective foam packing, DO NOT lay the IC down or let go of it until it is installed in the board. When you bend the leads of an IC, hold the IC in one hand and place your other hand on your work surface before you touch the IC to your work surface. This will equalize the static electricity between the work surface and the IC.

Detail 4-10A



PICTORIAL 4-12

Refer to Pictorial 4-11 (Illustration Booklet, Page 15) for the following steps.

- (✓) Place the keyboard top upside down on a soft cloth to protect the finish.
- (✓) Peel the backing from the four plastic feet and install them in the square outlines at the corners of the keyboard bottom.
- (✓) Turn the keyboard upside down so the side with the socket is as shown and place it on the base. Fasten the keyboard to the keyboard top with four #6 × 3/8" self-tapping screws at CR, CS, CT, and CU.
- (✓) Position the keyboard socket as shown and slide it in place in slot CX.
- (✓) Place the keyboard bottom on the top, making sure the socket is still in the slot. Then fasten it

with two #6 × 1/2" self-tapping screws at DA and DB and six #6 × 7/8" self-tapping screws at DC, DD, DE, DF, DG, and DH.

Set the keyboard aside temporarily.

Refer to Pictorial 4-12 for the following steps.

- (✓) Position the top cover upside down on a soft cloth.
- (✓) Position the large L-brackets with the large side as shown and mount them at DJ and DK with 8-32 × 1/2" flat head screws. Do not overtighten the screws.
- (✓) Slide the two push-on clips over holes DL and DN.

Set the top cover aside temporarily and proceed to the Primary Wiring Tests.

PRIMARY WIRING TESTS

Do NOT connect the line cord plug of your Terminal to an AC outlet until you are instructed to do so.

Check the sockets of the following cables to make sure they have been installed correctly. The lip on the sockets must be engaged with the lip on the plugs.

Refer to Pictorial 5-1 (Illustration Booklet, Page 16) for the following steps.

- (✓) P101 and P102 on the power supply circuit board.
- (✓) P101 on the video driver circuit board.
- (✓) P404 and P405 on the terminal logic circuit board.

IMPORTANT: A wiring error in the primary wiring circuit of your Terminal's power supply could cause you to receive a severe electrical shock or it could damage the unit. Therefore, if you have an ohmmeter or can obtain one, be sure to make the following resistance measurements. If you can not obtain an ohmmeter, proceed to the "Video Adjustments" on Page 54.

The following resistance measurements are only intended to show whether short circuits or open circuits exist which could damage the Terminal when you first apply power to it. If you cannot obtain the correct ohmmeter indications in the following steps, refer to the "In Case of Difficulty" section in the Operation Manual. Do NOT proceed to the "Video Adjustments" section until the difficulty has been corrected.

NOTES:

1. The resistance readings in the following steps were taken with a Heathkit Model IM-5218 VTVM. Readings taken with other ohmmeters (because of different measuring voltages and currents) may be considerably different.
 2. The internal wiring of most ohmmeters is such that the positive terminal of the meter battery is connected to the positive test lead, or probe, and the negative battery terminal is connected to the negative (black) or common test lead. In some ohmmeters, this wiring is interchanged and erroneous readings may result. Interchange the ohmmeter leads if the measurements do not check out correctly the first time.
- (✓) Turn on your ohmmeter and allow it to warm up, if necessary.
 - (✓) Set the ohmmeter to the $R \times 100$ range.
 - (✓) Make sure the POWER switch is turned off.

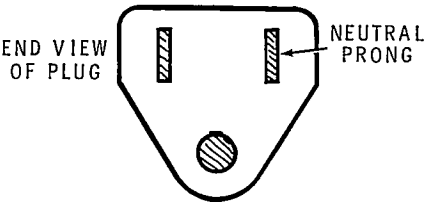
The following chart lists meter connections and readings, and possible causes if an incorrect reading is found. If a particular part is mentioned (Q401 for example) as a possible cause, check that part to be sure it is installed and/or wired correctly. It is also possible, on rare occasions, for a part to be faulty and require replacement.

LINE CORD

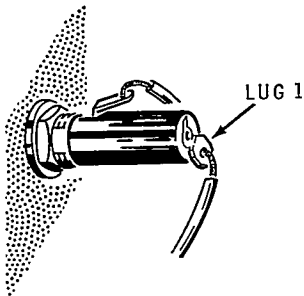
Connect the common or negative ohmmeter lead to the ground strap near the transformer for the following checks.

Positive Meter Lead	Meter Reading	Possible Cause
1. Round prong of line cord.	0 Ω	
2. Either flat prong of line cord	Infinite	1. Power transformer
3. Other flat prong of line cord	Infinite	2. Wiring error

Connect the common or negative ohmmeter lead to the neutral prong of the line cord plug.



Positive Meter Lead	Power Switch	Meter Reading	Possible Cause
1. Other flat prong of line cord.	OFF	Infinite	1. Power transformer 2. Wiring error
	ON	Less than 10 Ω	
2. Lug 1 of fuseholder	ON	Less than 10 Ω	1. Power transformer 2. Wiring error
	OFF	Infinite	



POWER SUPPLY CIRCUIT BOARD

Connect the common or negative ohmmeter lead to the ground strap near the power transformer for the following checks.

Positive Meter Lead	Meter Reading	Meter Range	Possible Cause
1. Banded end of the following diodes: D101 D102 D103 D104 D105 D106 D107	Above 20 k Ω	R \times 10k	Diode installed backwards or faulty.
2. Banded end of the following diodes: D109 D111	Over 20 k Ω	R \times 10k	Diode installed backwards or faulty.
3. Banded end of the following diodes: D110 D112	0 Ω	R \times 10	Diode installed backwards or faulty.
4. Metal tab of U101	Over 50 Ω	R \times 10	U101

VIDEO DRIVER CIRCUIT BOARD

Connect the common or negative ohmmeter lead to the ground strap near the power transformer for the following checks.

Positive Meter Lead	Meter Reading	Meter Range	Possible Cause
1. Banded end of the following diodes: CR109 CR401 CR302 CR303 CR304	Over 1000 Ω	R \times 1000	Diode installed backwards or faulty.
2. Banded end of the following diodes: CR102 CR104	Greater than 1000 Ω Greater than 50 k Ω	R \times 1000	Diode installed backwards or faulty.
CR111	Greater than 1500 Ω	R \times 1000	C122, R132.
CR112	50 Ω to 500 Ω	R \times 10	RX129, TX202
3. Metal tab of Q401.	Greater than 100 k Ω	R \times 10k	Q401, CR401, CRT.
4. Heat sink of Q103.	Greater than 100 k Ω	R \times 10k	Q103.

VIDEO ADJUSTMENTS

The following adjustment procedure assumes that the Terminal is operating properly.

Refer to Figure 1 (Illustration Booklet, Page 17) for the locations of the controls and adjustments on the video circuit board and the neck of the CRT.

- (✓) Connect the keyboard to the monitor with the coiled cable. Attach the long uncoiled end of the cable at the monitor, and run the cable out underneath the front of the monitor to connect to the keyboard.
- (✓) Preset the BRIGHTNESS control on the rear panel to the center of its rotation.

WARNING: When the Terminal is plugged in and turned on, high voltage is present on the back of the CRT and on the video driver circuit board. Take special care when you make adjustments, and use insulated or nonmetallic tools.

- (✓) Plug the line cord into the proper AC outlet.
- (✓) Push the POWER switch on the rear panel to ON. The POWER ON indicator on the keyboard should light and you should hear a short "beep."

NOTE: For the best results, perform the following adjustments in a dimly lit room.

- (✓) After the monitor has had time to warm up, turn the BRITE control, on the video driver circuit board, until a large portion of the screen becomes bright. Then turn the control counterclockwise until this bright area just disappears. At this time, you should see the cursor and the clock characters on the screen.

- (✓) Press the SET UP key on the keyboard. The bottom line of the screen will display:

```
** SETUP MENU A ** (Ver X.XX)  1. on line
MENUS -A- to -G- or -T- for TABS
```

- (✓) Press the G key on the keyboard. The bottom line of the screen will display:

```
*MENU G*  1. CHAR SET normal
          2. FILL SCREEN  3. ATTRIBUTES  4. TEST
```

NOTE: In the following step, make sure you press the key on the keyboard and not the keypad.

- (✓) Press the 2 key on the keyboard. The screen will fill with "E's."

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- (✓) Adjust the BRIGHTNESS control on the rear panel until the display is at a comfortable brightness level. Do not make the display too bright, as the screen phosphors may be damaged by too much brightness and "burn" the screen.
- (✓) If necessary, loosen the indicated screw and rotate the deflection yoke until the edges of the display are vertical and horizontal. Then retighten the screw. Do not be concerned if the display is not centered on the screen or if the edges of the display are not straight at this time.
- (✓) Adjust the centering rings on the deflection yoke to the position that best centers the display on the screen.
- (✓) Use the alignment tool to adjust the WIDTH COIL, on the video driver circuit board, until the display nearly fills the width of the screen. Allow approximately 3/4 inch of screen outside the edges of the display.
- (✓) Adjust the VERTICAL SIZE control, on the video driver circuit board, for a one-half inch border at the top and bottom of the screen.
- (✓) Locate the one area of the four edges of the display that is the least straight. Install a foam magnet on the yoke post that is nearest to the greatest bow in the display. Rotate the magnet slowly until the display is as straight as possible.
- (✓) Repeat this procedure as necessary all around the yoke at any of the eight locations which require straightening. The closer the magnets are to the CRT, the greater the effect they will have. Install only those magnets that will adequately correct the bowing and display a uniform rectangular-shaped display. NOTE: If you only want a little effect, you can reduce the magnets in size by cutting them with a pair of diagonal cutters.
- (✓) View your terminal screen again, and go through the adjustment cycle again if there is any need.
- (✓) Adjust the FOCUS control, on the video driver circuit board, until the display characters are as sharp as possible (this may be at one end of the range).
- (✓) Simultaneously press the SHIFT and RESET keys on the keyboard to clear the screen.
- () Push the POWER switch on the rear panel to OFF. Then unplug the line cord.

This completes the "Video Adjustments."

FINAL ASSEMBLY

Refer to Pictorial 6-1 (Illustration Booklet, Page 17) for the following steps.

- (✓) Make sure the Terminal line cord is unplugged, and that voltages inside the monitor have had a few minutes to subside; even then, avoid contact with the back of the CRT when you work in the monitor.
- (✓) Disconnect the keyboard's coiled cord at the back of the Terminal.
- (✓) Set the monitor on its face, on a soft cloth, as shown. Then remove screw CP from the back panel and tip the back panel away from its normal position.
- (✓) Install the top cover on the base. Slide the front of the cover under the CRT mask and the two bottom corners into the base. Then check the two L-brackets mounted in the cover to make sure they line up with the mounting holes in the base.
- (✓) Fasten the cover to the base with two 8-32 × 1-1/4" pan head screws at DP and DR.
- (✓) Close the back panel to see how the holes line up at CA and CB. If necessary, flex the side brackets slightly or reposition the push-on clips to make all holes line up. Then install two 6-32 × 3/8" pan head screws at CA and CB.
- (✓) Replace the #6 × 1/4" sheet metal screw at CP.

This completes the assembly and adjustment of your Terminal.

IN CASE OF DIFFICULTY

Begin your search for any trouble that occurs after assembly by carefully following the steps listed below in the "Visual Tests." After you complete the "Visual Tests," refer to the Troubleshooting Chart. Refer also to the Operation Manual's "In Case of Difficulty" section.

VISUAL TESTS

1. Recheck the wiring. Trace each lead with a colored pencil on the Pictorial as you check it. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something that you have consistently overlooked.
 2. About 90% of the kits that are returned to the Heath Company for repair do not function properly due to poor connections and soldering. Therefore, you can eliminate many troubles by reheating all connections to make sure they are soldered as described on Pages 5 and 6 of the Assembly Manual. Be sure there are no solder "bridges" between circuit board foils.
 3. Check to be sure all transistors and diodes are in their proper locations. Make sure each lead is connected to the proper point. Make sure that each diode band is positioned above the band printed on the circuit board.
 4. Check electrolytic capacitors to be sure their positive (+) mark is at the correct position.
 5. Check to be sure that the IC is properly installed, and that the pins are not bent out or under the IC.
 6. Check the values of the parts. Be sure in each step that you wired the correct part into the circuit, as shown in the Pictorial. It would be easy, for example, to install a 22 k Ω (red-red-orange) resistor where a 2200 Ω (red-red-red) resistor should have been installed.
 7. Check for bits of solder, wire ends, or other foreign matter which may be lodged in the wiring.
 8. Circuit Board X-Ray Views, Schematic Diagrams, and Circuit Descriptions are provided in your Operational Manual. A review of the Circuit Description may also help you determine where the trouble is.
- NOTE: In an extreme case where you are unable to resolve a difficulty, refer to the "Customer Service" information inside the rear cover of this Manual. Your Warranty is located inside the front cover.

TROUBLESHOOTING CHART

The following chart lists conditions and possible causes of several specific malfunctions. If a particular part is mentioned (Q102 for example) as a possible cause, check that part to be sure it is installed and/or

wired correctly. It is also possible, on rare occasions, for a part to be faulty and require replacement. All components that are called out in the chart are on the video driver circuit board unless stated otherwise.

SYMPTOM	POSSIBLE CAUSE
1. No high voltage (check for +50V on banded end of CR111).	1. Q102, Q103 or associated circuitry. 2. Socket is not plugged into plug P101. 3. No + 12 volts DC on violet wire at P101 on video driver board. 4. TX102.
2. No horizontal sync (screen is scrambled).	1. IC101. 2. Q104. 3. No timing pulse at base (B) of Q104.
3. No vertical sync (screen has a vertical flutter).	1. Q302 and associated circuitry. 2. No sync signal from main board (P101, orange wire).
4. No vertical deflection (row of characters on middle of screen).	1. Q301, Q302, Q303, Q304, Q306, Q307, and associated circuitry. 2. Yoke.
5. High voltage present (+ 50 V on banded end of CR111). No video (no characters on screen).	1. No video signal from main board (P101, inner lead of shielded cable). 2. Q401, Q402, and associated circuitry. 3. BRITE (R139) or BRIGHTNESS control.
6. No focus.	1. TX102, R148. 2. High voltage is too low.
7. Raster lighted area is not centered.	1. Yoke tabs are not adjusted properly.