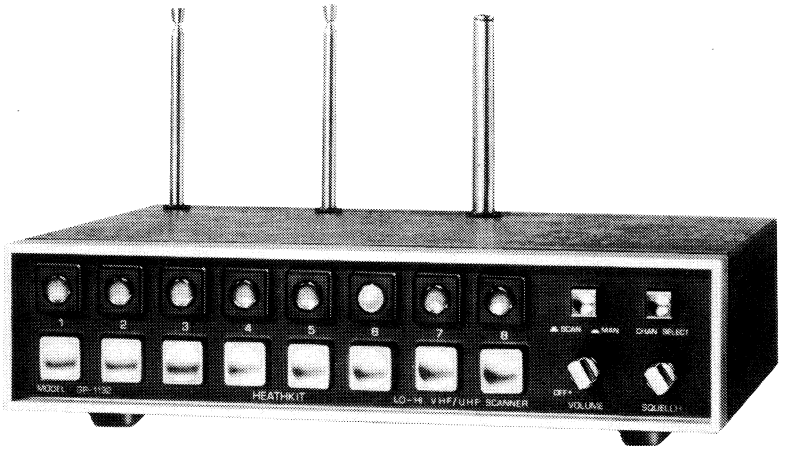
Heathkit® Manual

for the

LO-HI
VHF/UHF SCANNER

Model GR-1132

595-1832



HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

TABLE OF CONTENTS

HOW TO ORDER CRYSTALS

Your Scanner will need a crystal for each channel you intend to use. Determine your crystal requirements and obtain the necessary crystals in the following manner.

First, decide what stations you want to listen to. Note that, although this Scanner will operate from 30 MHz to 50 MHz, 145 MHz to 174 MHz, and 450 MHz to 500 MHz, all of the stations you want to hear must be within 10 MHz on the 30 — 50 MHz band and within 8 MHz on the 146 — 174 MHz and 450 — 500 MHz bands (that is, they must not be separated from each other by more than 10 MHz or 8 MHz). You could, for example, use frequencies between 154.55 MHz and 162.55 MHz, or between 146 MHz and 154 MHz on the HI VHF band.

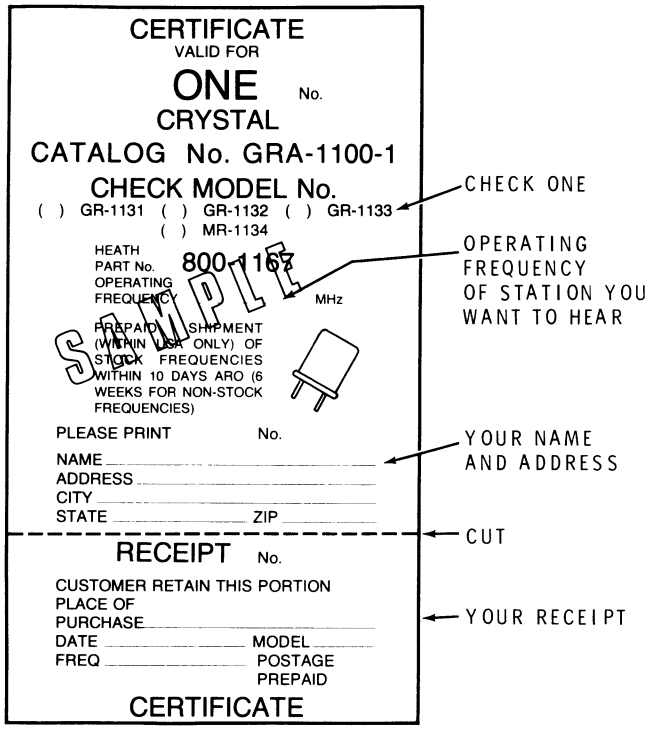


Figure A

Nine Radio Frequency Directories (Model Numbers GRA-1100-10 through GRA-1100-18) are available from Heath Company. Each directory lists the frequencies and call letters used in a specific region of the United States of America. Refer to a current Heathkit Catalog for the Model Number and the price of the directories you need.

Then order the crystals in the following manner:

1. Order a "Crystal Certificate" (Model Number GRA-1100-1) from the Heath Company for each crystal. Consult a recent Heathkit catalog for price information.

2. When you receive your Crystal Certificates, fill in one for each crystal as shown in Figure A. Then cut off the receipt, place a stamp on the card, and mail it to the address shown on the card. Your crystals will be promptly mailed back to you.

NOTE: If you wish to obtain crystals from another source, you will have to provide the following information:

Holder	HC-25U.
Frequency Tolerance:	
UHF	.001%.
HI VHF	.002%.
LO VHF	.003%.
Type:	
UHF	Third overtone at series resonance minus 1000 Hz.
HI VHF	Third overtone at series resonance minus 500 Hz.
LO VHF	Third overtone at series resonance minus 500 Hz.
Series Resistance (Rs)	40 ohms maximum.
Drive Level	2 milliwatts at 40 ohms reference.
Crystal Frequency (MHz)	See "Determining Crystal Frequency."

DETERMINING CRYSTAL FREQUENCY

To determine the crystal frequency when you know the operating frequency, use one of the following formulas:

For LO VHF, crystal frequency = (Desired channel frequency) + (10.7 MHz).

Example:

Desired channel frequency = 42.58 MHz
Crystal frequency = 42.58 + 10.7
Crystal frequency = 53.28 MHz

For HI VHF, crystal frequency = $\frac{\text{(Desired channel frequency)} - \text{(10.7 MHz)}}{3}$

Example:

Desired channel frequency = 155.37 MHz.

Crystal frequency = $\frac{155.37}{3} = \frac{144.67}{3}$

Crystal frequency = 48.223333 MHz.

For UHF (450-470 MHz), crystal frequency = $\frac{\text{(Desired channel frequency)} + \text{(10.7 MHz)}}{9}$

Example:

Desired channel frequency = 460.1 Mhz

Crystal frequency = $\frac{460.1 - 10.7}{9} = \frac{449.4}{9}$

Crystal frequency = 49.933333 MHz.

For UHF (470-500 MHz), crystal frequency = $\frac{\text{(Desired channel frequency)} - \text{(10.7 MHz)}}{10}$

Example:

Desired channel frequency = 485.05 MHz

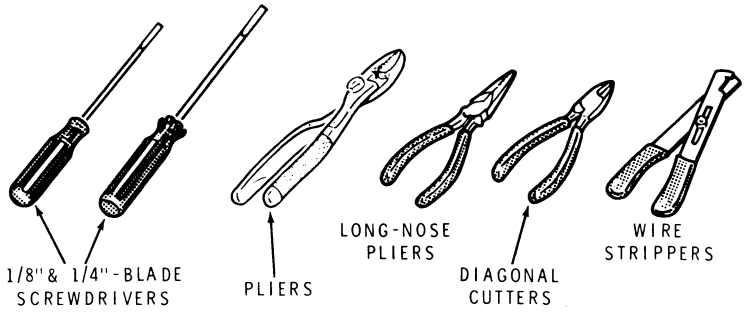
Crystal frequency = $\frac{485.05 - 10.7}{10} = \frac{474.35}{10}$

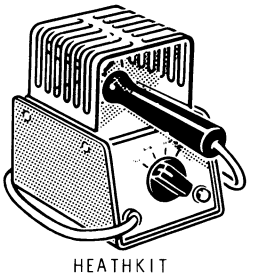
Crystal frequency = 47.435 MHz

ASSEMBLY NOTES

TOOLS

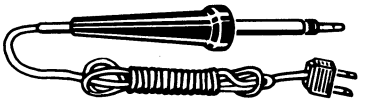
You will need these tools to assemble your kit.





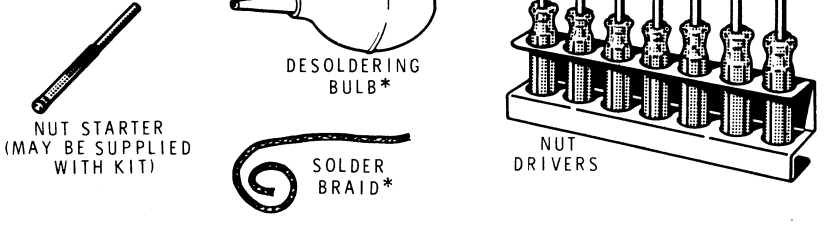
HEATHKIT SOLDERING IRON

OR



PENCIL SOLDERING IRON (25 TO 40 WATTS)

OTHER HELPFUL TOOLS



*TO REMOVE SOLDER FROM CIRCUIT BOARDS.

ASSEMBLY

1. Follow the instructions carefully, and read the entire step before you perform the operation.

2. Position all parts as shown in the Pictorials.

3. 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.

4. A separate "Illustration Booklet" contains illustrations (Pictorials, Details, etc.) that are too large for the Assembly Manual. When the Manual says to refer to a certain Pictorial or Detail, and that illustration is not on the same page or the page across from it, refer to the "Illustration Booklet."

   Keep the "Illustration Booklet" with the Assembly Manual. The illustrations in it are arranged in Pictorial number sequence.

5. Solder a part or a group of parts only when you are instructed to do so.

6. Resistors will be called out by their resistance value in Ω (ohms), kΩ (kilohms), or MΩ (megohms), and color code. Use 1/2-watt resistors unless directed otherwise.

7. Capacitors will be called out by their capacitance value (in pF or μF) and type (ceramic, Mylar*, or electrolytic).

8. Each circuit part in this 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 sections at the rear of the Manual.

9. When you are instructed to cut something to a partiucular length, use the scales (rulers) provided at the bottom of the Manual pages.

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

SOLDERING

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

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

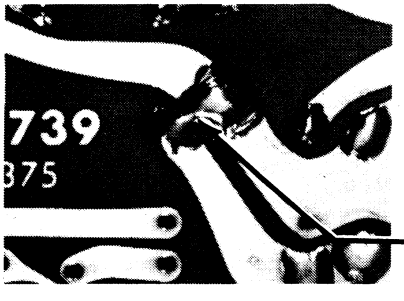
1. Use the right type of soldering iron. A good quality, 25 to 40-watt, pencil soldering iron with a 1/8″ or 3/16″ chisel or pyramid tip works best.

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.

3. Due to the small foil area around the circuit board holes and the small areas between foils, you must use the utmost care to prevent solder bridges between adjacent foil areas.

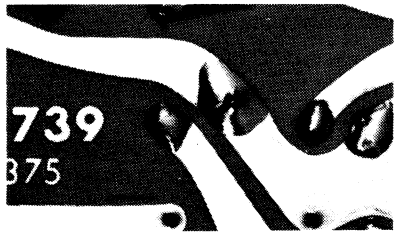
A solder bridge between two adjacent foils is shown in photograph A below. Photograph B shows how the connection should appear. A solder bridge may occur if you accidentally touch an adjacent previously soldered connection, if you use too much solder, or if you "drag" the soldering iron across other 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 each circuit board has a coating on it called "solder resist." This is a protective insulation to help prevent solder bridges.



A

SOLDER BRIDGE



B

*DuPont Registered Trademark.

ALIGNMENT GENERATOR CIRCUIT BOARD

PARTS LIST

( ) Inside the shipping carton for your Scanner is a large box marked "PKS #1 — #3." Remove this large box.

( ) Set the shipping carton aside.

( ) Open the large box marked "PKS #1 — #3," but do not disturb or unpack the parts at this time.

( ) Locate the Pack Index Sheet. Notice that this box is divided into compartments (packs). Each compartment contains a group of parts you will need to build a specific portion of this kit. The Pack Index Sheet shows the location of each compartment and how each compartment is numbered.

( ) Refer to the Pack Index Sheet and locate and remove all the parts from compartment #1 (Alignment Generator).

( ) Unpack these parts. Check each part against the following list. The key numbers correspond to the numbers on the "Alignment Generator Circuit Board Parts Pictorial" (Illustration Booklet, Page 1).

NOTE: When you check parts against a Parts List, return any part or group of parts that is packaged in a bag or envelope, with a part number, to its container after you identify it. Leave it there until you actually use it in a step. This will prevent intermixing of parts and aid in part identification. Some parts, however, have been placed in a bag or envelope that is not marked with the actual part number, but with a packaging number that begins with the number "171-" or "172-". These numbers are used for packaging purposes only and do not appear in the Manual Parts Lists. Open each bag or envelope that is marked with only a "171-" or "172-" packaging number to identify the parts it contains.

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

NOTE: Never use a "171-" or "172-" packaging number if you must order a replacement part. Use only the part numbers listed in the Manual Parts Lists for this purpose.

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

RESISTORS, 1/2-Watt

NOTE: The following resistors have a tolerance of 10% unless they are listed otherwise. 10% is indicated by a fourth color band of silver; 5% is indicated by a gold fourth color band.

A1	1-62	3	51 Ω, 5% (green-brown-black)	R601, R602, R609
A1	1-44	1	2200 Ω (red-red-red)	R605
A1	1-14	1	3300 Ω (orange-orange-red)	R607
A1	1-16	1	4700 Ω (yellow-violet-red)	R610
A1	1-20	2	10 kΩ (brown-black-orange)	R603, R606
A1	1-22	1	22 kΩ (red-red-orange)	R604

CAPACITORS

B1	28-1	2	2.2 pF (red-red-white) phenolic	C601, C608
B2	21-168	1	4.7 pF ceramic	C605
B2	21-22	2	220 pF ceramic	C602, C604
B2	21-143	6	.05 μF ceramic	C603, C606, C607, C609, C610, C611

CONTROL - INDUCTOR

C1	10-383	1	10 kΩ control	R608
C2	40-487	1	300 μH (orange-black-brown) inductor	L601

DIODE - TRANSISTORS

D1	56-26	1	1N191 (brown-white-brown) diode	D601

NOTE: Transistors 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.

D2	417-91	1	2N5232A transistor	Q601
D2	417-888	1	2N5222 transistor	Q602

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

WIRE - SLEEVING - SOLDER

The solder and only the wires marked with an asterisk (*) will be used when you assemble the alignment generator circuit board. Set the other wires aside, they will be used later.

	343-15	66″	Shielded cable*
	344-15	48″	Black stranded
	344-16	16″	Red stranded
	344-50	36″	Black solid
	344-51	24″	Brown solid
	344-52	36″	Red solid*
	344-53	28″	Orange solid
	344-54	48″	Yellow solid*
	344-55	48″	Green solid*
	344-56	28″	Blue solid
	344-57	12″	Violet solid
	344-58	18″	Gray solid
	344-59	18″	White solid
	346-1	3″	Small sleeving
	346-50	2″	Medium sleeving (heat shrinkable)
	346-20	2″	Large sleeving (heat shrinkable)
			Solder

SOCKET - PLUG - LAMP

E1	434-301	1	Lamp socket	
E2	438-4	1	Phono plug	P601
E3	412-618	1	Lamp	PL601

MISCELLANEOUS

F1	134-977	2	Lamp socket lead	
F2	404-402	1	10.7 MHz crystal	Y601
F3	73-64	1	Foam pad	
	85-1866-2	1	Alignment generator circuit board	
F4	390-1342	1	Channel frequency label	
	391-34	1	Blue and white label	
	390-1302	1	FCC Certification label	
	597-260	1	Parts Order Form	
		1	Manual (See Page 1 for part number and price.)	
	390-1392	1	Trimmer capacitor preset label	

STEP-BY-STEP ASSEMBLY

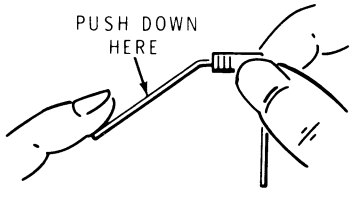
CIRCUIT BOARD ASSEMBLY

START

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

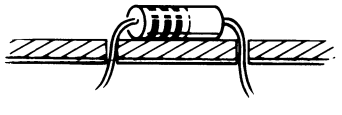
( ) Position the circuit board as shown with the printed side (not the foil side) up.

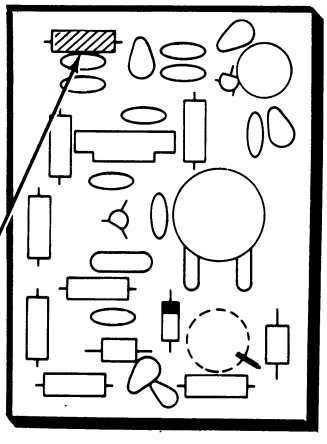
( ) R606: Hold a 10 kΩ (brown-black-orange) resistor by the body as shown and bend the leads straight down.



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

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





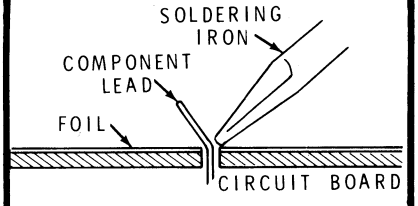
PICTORIAL 1-1

PICTORIAL 1-1

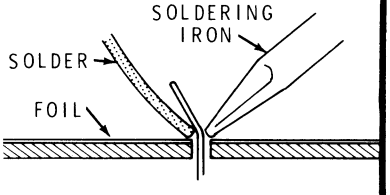
CONTINUE

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

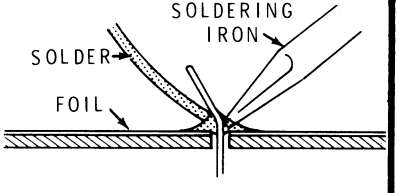
1. Push the soldering iron tip against both the lead and the circuit board foil. Heat **both** for two or three seconds.



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



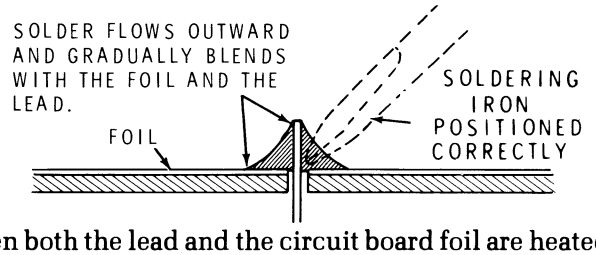
3. As the solder begins to melt, allow it to flow around the connection. Then remove the solder and the iron and let the connection cool.



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

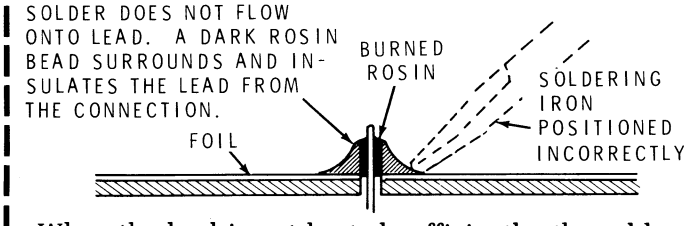
( ) Check each connection. Compare it to the illustrations on the next page. After you have checked the solder connections, proceed with the assembly on Page 12. Use the same soldering procedure for each connection.

A GOOD SOLDER CONNECTION

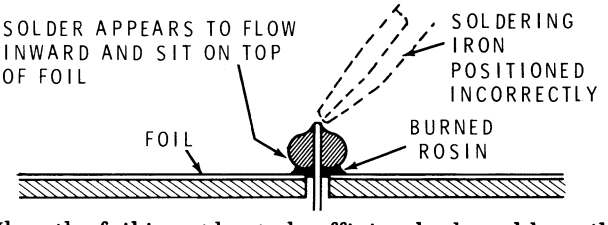


When both the lead and the circuit board foil are heated at the same time, the solder will flow onto the lead and the foil evenly. The solder will make a good electrical connection between the lead and the foil.

POOR SOLDER CONNECTIONS



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



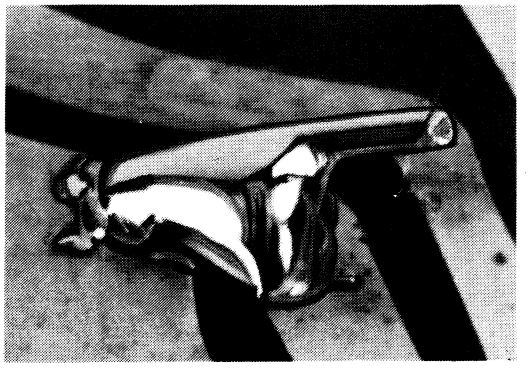
When the foil is not heated sufficiently the solder will blob on the circuit board as shown above. To correct, reheat the connection and, if necessary, apply a small amount of additional solder to obtain a good connection.

SOLDER CONNECTIONS TO WATCH OUT FOR

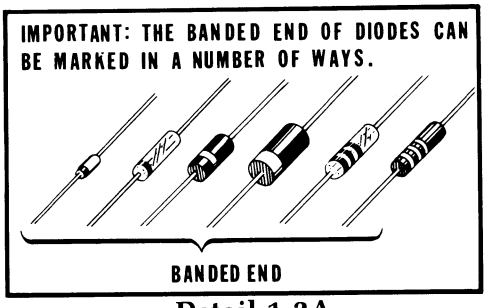
The following photographs show examples of the types of bad solder connections that are the most common cause of trouble. If you locate any of these bad solder connections in your kit, correct them as instructed.

Here, hot solder has been dropped onto the foil and the solder connected or bridged (or crossed) three foils. To correct, hold the circuit board above the soldering iron and reheat the solder. As the solder melts, it will flow down the iron.

NOTE: Solder that bridges two connections on the SAME FOIL is alright and should not be corrected.



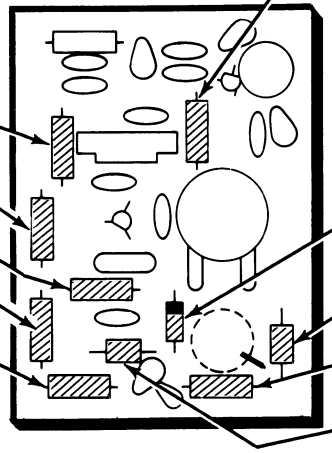
Here, solder has flowed along a lead and bridged to another foil. To correct, hold the circuit board above the soldering iron and reheat the solder. As the solder melts, it will flow down the iron. Then cut off the excess lead lengths. PROTECT YOUR EYES.



Detail 1-2A

START

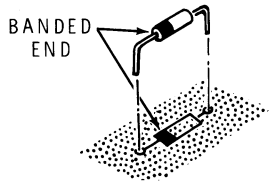
- ( ) R607: 3300 Ω (orange-orange-red).
- ( ) R604: 22 kΩ (red-red-orange).
- ( ) R605: 2200 Ω (red-red-red).
- ( ) R603: 10 kΩ (brown-black-orange).
- ( ) R602: 51 Ω (green-brown-black).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

- ( ) R610: 4700 Ω (yellow-violet-red).

NOTE: When you install diodes, be sure to position the banded end as shown on the circuit board. See Detail 1-2A.

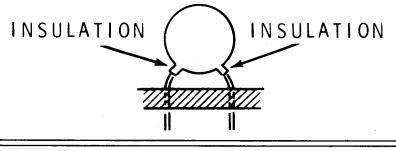


- ( ) D601: 1N191 diode (brown-white-brown, #56-26).
- ( ) C608: 2.2 pF (red-red-white) phenolic.
- ( ) R609: 51 Ω (green-brown-black).
- ( ) C601: 2.2 pF (red-red-white) phenolic.
- ( ) Solder the leads to the foil and cut off the excess lead lengths.

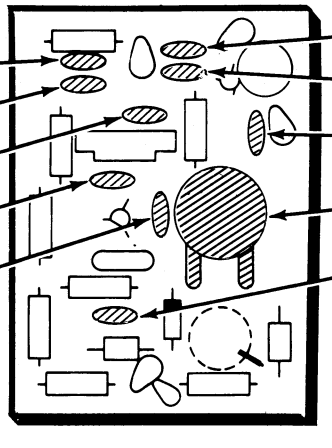
PICTORIAL 1-2

START

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



- ( ) C606: .05 μF ceramic.
- ( ) C607: .05 μF ceramic.
- ( ) C604: 220 pF ceramic.
- ( ) C602: 220 pF ceramic.
- ( ) C605: 4.7 pF ceramic.
- ( ) Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

- ( ) C610: .05 μF ceramic.
- ( ) C609: .05 μF ceramic.
- ( ) C611: .05 μF ceramic.
- ( ) R608: 10 kΩ control. Solder the four lugs to the foil.
- ( ) C603: .05 μF ceramic.
- ( ) Solder the leads to the foil and cut off the excess lead lengths.

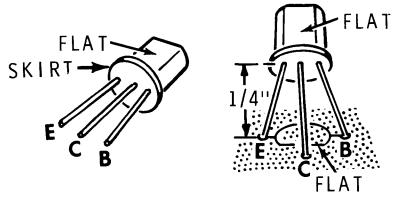
PICTORIAL 1-3

START

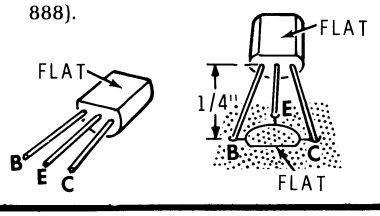
In the following steps, install each of the transistors as follows:

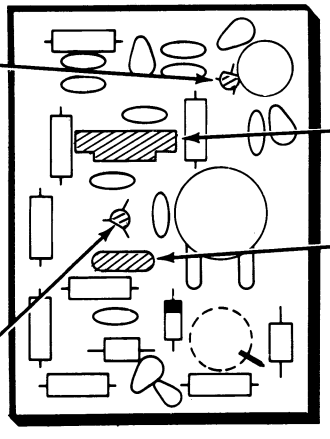
1. Line up the flat on the transistor with the outline of the flat on the circuit board.
2. Insert the leads into their correct E, C, and B holes.
3. Then solder the leads to the foil and cut off the excess lead lengths.

( ) Q601: 2N5232A transistor (#417-91). NOTE: The transistor may not have the skirt shown.



( ) Q602: 2N5222 transistor (#417-888).





PICTORIAL 1-4

CONTINUE

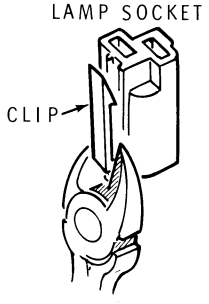
( ) L601: 300 μH (orange-black-brown, #40-487) coil. Solder the leads to the foil.

( ) Y601: 10.7 MHz crystal. Solder the leads to the foil and cut off the excess lead lengths.

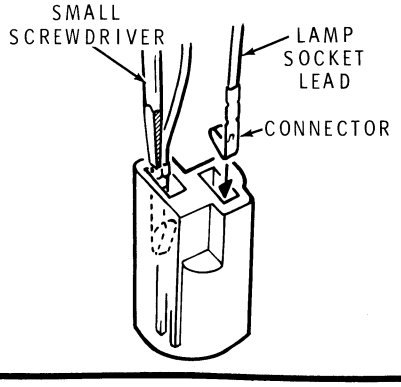
START

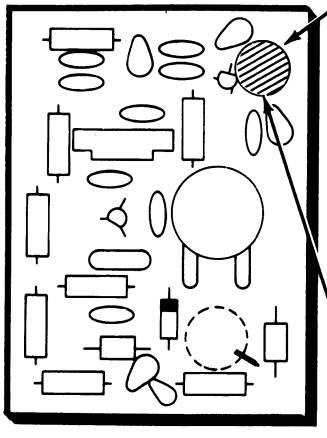
( ) Prepare and install the lamp socket as follows:

1. Cut off the clip close to the socket.



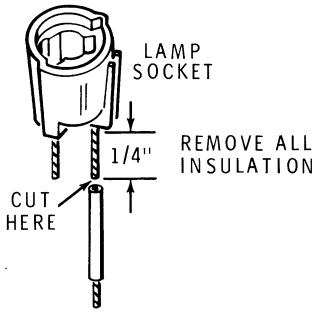
2. Position the connector (at the end of the lamp socket lead) as shown and push it into the socket. Then use a small screwdriver and push the connector further into the socket until it "clicks" into place. Likewise, install the other lamp socket lead.



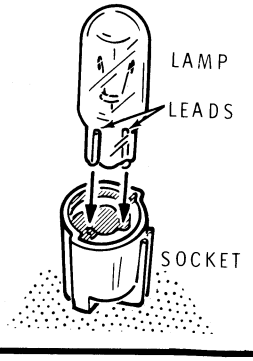


CONTINUE

3. Cut off each lamp socket lead 1/4" below the base of the lamp socket. Then remove all of the insulation from each lead. Twist the wire strands of each lead tightly together and apply a small amount of solder to each lead. Insert the lamp socket leads into the circuit board holes. Solder the leads to the foil and cut off the excess lead lengths.



( ) PL601: lamp. Carefully examine the lamp leads. Make sure both leads are straight and positioned as shown. Then push the lamp into the socket.



PICTORIAL 1-5

START

As you wire this kit, you will be instructed to prepare wires ahead of time, as in the next step. To prepare a wire, cut it to the indicated length and then remove 1/4" of insulation from each end. Always use solid wire unless **stranded** wire is specifically called for. The wires are listed in the order in which they will be used.

( ) Prepare the following wires:

9-1/4" red
8-3/4" green
9" yellow

NOTE: As you connect each wire in the following steps, solder it to the foil and cut off the excess lead length. The free ends of these wires will be connected later.

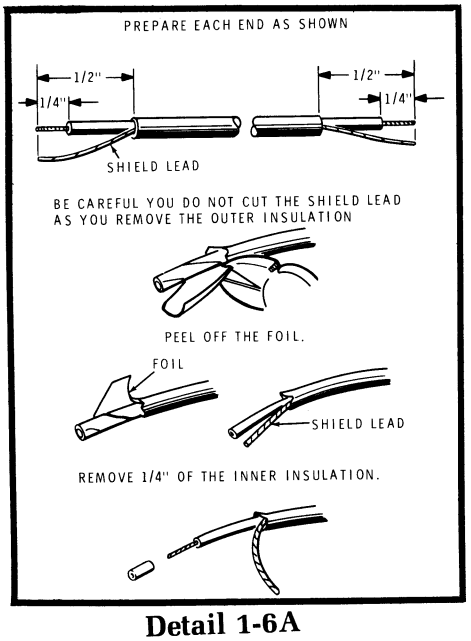
( ) Connect a 9-1/4" red wire to the circuit board hole marked RED.

( ) Connect an 8-3/4" green wire to the circuit board hole marked GRN.

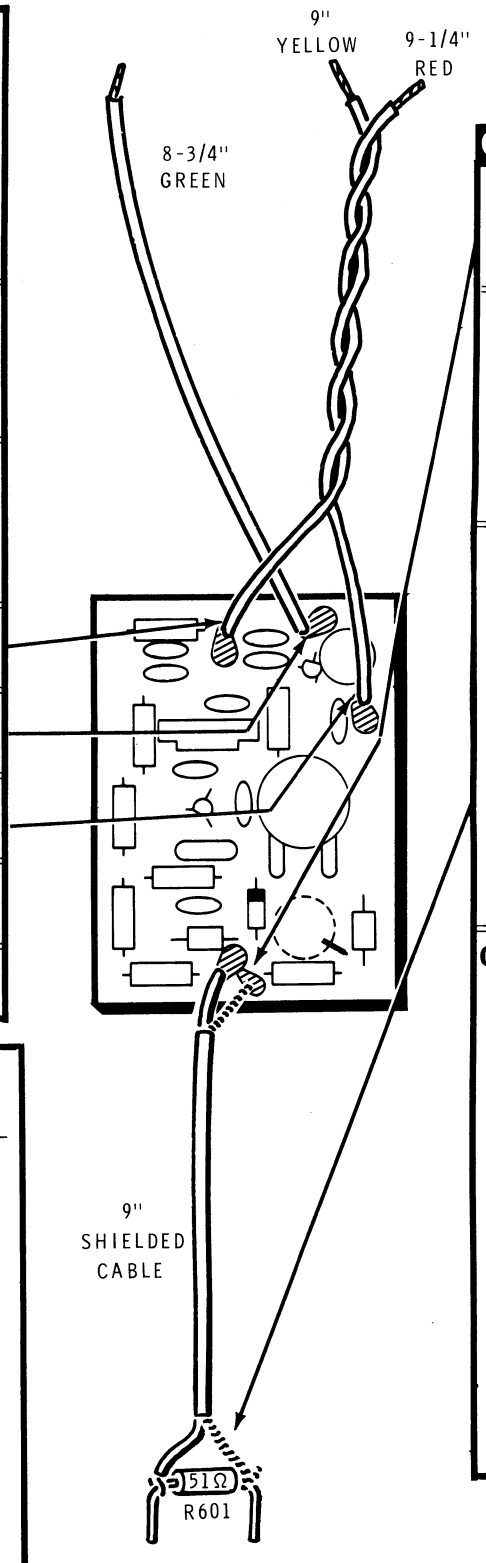
( ) Connect a 9" yellow wire to the circuit board hole marked YEL.

( ) Twist the red and yellow wires together as shown.

( ) Refer to Detail 1-6A below and prepare a 9" shielded cable.



Detail 1-6A

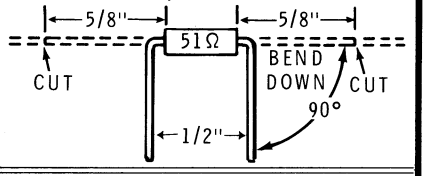


PICTORIAL 1-6

CONTINUE

( ) Connect the inner lead at one end of the shielded cable to the circuit board hole marked CLR. Connect the shield lead to hole S.

( ) R601: Prepare a 51 Ω (green-brown-black) resistor as shown.



( ) Connect the free end of the 9" shielded cable to resistor R601 as follows:

1. Wrap the inner lead around one lead of resistor R601 as close to the body as possible. Then solder the connection.

2. Wrap the shield lead around the other lead of resistor R601 as close to the body as possible. Then solder the connection.

CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions.

( ) Unsoldered connections.

( ) Poor solder connections.

( ) Solder bridges between foils.

( ) Protruding leads which could touch together.

( ) Transistors for the proper type and installation.

( ) Diode for the correct position of the banded end.

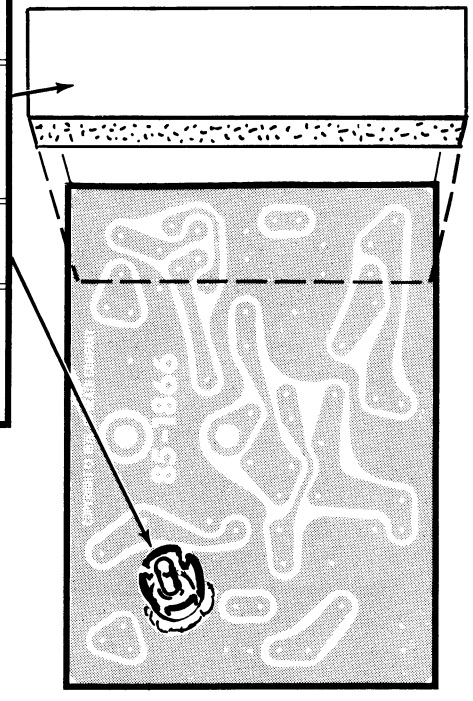
START

Turn the circuit board foil-side-up and position it as shown.

( ) Remove the paper backing from one side of the foam pad. Then press the foam pad onto the circuit board.

( ) P601: Install the phono plug, and solder it to the foil as shown.

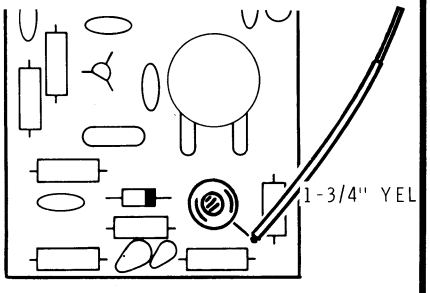
( ) Cut a 1-3/4" yellow wire. Remove 1/4" of insulation from one end and 1/2" of insulation from the other end.



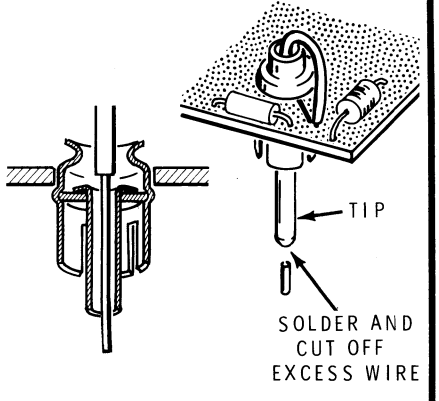
PICTORIAL 1-7

CONTINUE

( ) Position the circuit board as shown. Insert the 1/4" bare end of the yellow wire into the indicated hole in the circuit board, and solder the wire to the foil. Cut off the excess wire length.



( ) Insert the other end of the yellow wire into the phono plug until the bare end of the wire extends approximately 1/8" out of the tip. Solder the wire by applying heat to the tip of the pin only long enough for the solder to be drawn up into the pin by capillary action. Then cut off the excess wire length.



( ) Set the alignment generator circuit board aside.

SCANNER CIRCUIT BOARD

PARTS LIST

( ) Refer to the Pack Index Sheet and locate and remove all the parts from compartment #2 (Scanner Circuit Board).

( ) Unpack these parts. Check each part against the following list. The key numbers correspond to the numbers on the "Scanner Circuit Board Parts Pictorial" (Illustration Booklet, Page 1).

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

RESISTORS

NOTES:

1. The following resistors have a tolerance of 10% unless they are listed otherwise. 10% is indicated by a fourth color band of silver; 5% is indicated by a gold fourth color band.

2. These resistors may be packed in more than one envelope.

1/2-Watt

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
A1	1-112	2	180 Ω, 5% (brown-gray-brown)	R134, R129
A1	1-45	1	220 Ω (red-red-brown)	R127
A1	1-4	1	330 Ω (orange-orange-brown)	R115
A1	1-6	2	470 Ω (yellow-violet-brown)	R103, R135
A1	1-9	7	1000 Ω (brown-black-red)	R101, R105, R106, R109, R111, R116, R128
A1	1-13	1	2700 Ω (red-violet-red)	R102
A1	1-16	4	4700 Ω (yellow-violet-red)	R104, R114, R119, R121

Resistors (cont'd.)

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
A1	1-20	1	10 kΩ (brown-black-orange)	R124
A1	1-69	1	18 kΩ (brown-gray-orange)	R131
A1	1-22	1	22 kΩ (red-red-orange)	R117
A1	1-23	1	27 kΩ (red-violet-orange)	R113
A1	1-25	2	47 kΩ (yellow-violet-orange)	R108, R118
A1	1-188	1	56 kΩ, 5% (green-blue-orange)	R125
A1	1-128	1	62 kΩ, 5% (blue-red-orange)	R126
A1	1-50	1	68 kΩ, 5% (blue-gray-orange)	R112
A1	1-104	1	100 kΩ, 5% (brown-black-yellow)	R107

Other Resistors

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
A2	1-70-1	1	56 Ω, 1-watt (green-blue-black)	R123
A2	3-2-2	2	.33 Ω, 5%, 2-watt (orange-orange-silver)	R132, R133
A3	1-20-2	1	100 Ω, 2-watt (brown-black-brown)	R122

CAPACITORS

Ceramic

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
B1	21-54	1	75 pF	C115
B1	21-176	1	.01 μF	C104
B1	21-143	5	.05 μF	C101, C103, C109, C111, C116

Tantalum - Electrolytic

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
B2	25-200	1	.68 μF tantalum	C105
B3	25-149	1	5 μF electrolytic	C106
B3	25-115	3	10 μF electrolytic	C112, C113, C114
B2	25-282	1	68 μF tantalum	C102
B3	25-117	1	100 μF electrolytic	C117
B3	25-160	1	250 μF electrolytic	C107
B3	25-164	1	1000 μF electrolytic	C108

DIODES - TRANSISTORS - INTEGRATED CIRCUITS

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
C1	56-16	1	1N751 zener diode	ZD103
C1	56-19	1	VR-9.1 zener diode	ZD104
C1	56-56	3	1N4149 diode	D101, D102, D109
C1	56-57	1	1N716A zener diode	ZD105
C1	57-65	3	1N4002 diode	D106, D107, D108

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

1. Part number.
2. Type number. (For integrated circuits, this refer 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.

Diodes - Transistors - Integrated Circuits (cont'd.)

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
D1	417-91	4	2N5232A transistor	Q103, Q105, Q111, Q112
D1	417-94	1	2N3416 transistor	Q110
D1	417-201	4	X29A829 transistor	Q104, Q106, Q109, Q113
D1	417-801	3	MPSA20 transistor	Q102, Q107, Q108
D1	417-864	1	MPSA05 transistor	Q101
D2	417-818	1	MJE181 transistor	Q114
D2	417-819	1	MJE171 transistor	Q115
D3	443-87	1	SN74145N integrated circuit	IC101
D4	443-640	1	SN7493AN integrated circuit	IC102

HARDWARE

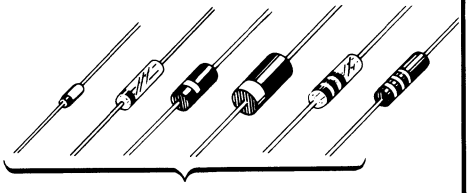
KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
E1	250-273	2	4-40 × 3/8″ screw	
E2	252-15	2	4-40 nut	
E3	254-9	2	#4 lockwasher	

MISCELLANEOUS

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
F1	45-98	1	RF choke	RFC101
	85-1730-2	1	Scanner circuit board	
F2	215-85	2	Heat sink	
F3	352-13	1	Silicone grease	
F4	432-72	2	Male pin	
F5	432-134	6	Test point pin (includes 1 extra)	
F6	432-907	1	Socket shell	
F7	434-298	1	14-pin socket	
F8	434-299	1	16-pin socket	
F9	64-794	1	8-switch assembly	SW101-SW108

STEP-BY-STEP ASSEMBLY

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



BANDED END

Detail 2-1A

START

Positon the scanner circuit board as shown. Then complete each step on the following Pictorials.

NOTE: When wires are called for in the following steps, cut the specified color wire to the indicated length. Then remove 1/4" of insulation from each end. Form the wires directly over the outlines and as close to the circuit board as possible. Be especially careful with the bare wires so they will not short to the pins of the sockets (at IC101 and IC102) that will be installed over them later.

( ) 1" red wire.

( ) 1-3/8" green wire.

( ) 4-1/4" red wire.

NOTE: Whenever bare wire is called for, as in the next step, cut the solid black wire to the indicated lengths. Then remove all of the insulation.

( ) 1" bare wire.

( ) Solder the wires to the foil and cut off the excess wire lengths.

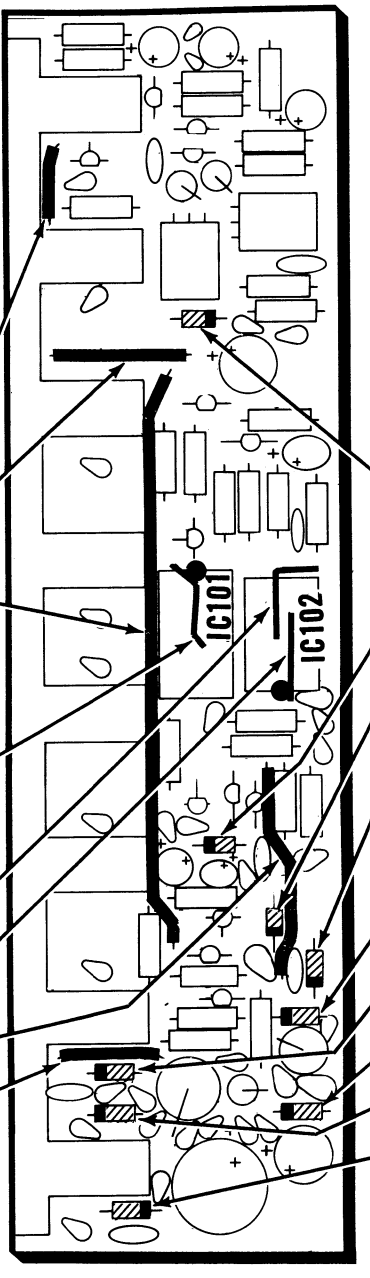
( ) 1" bare wire.

( ) 1" bare wire.

( ) 2" red wire.

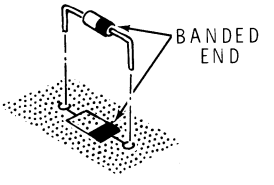
( ) 1-1/4" red wire.

( ) Solder the wires to the foil and cut off the excess wire lengths.



CONTINUE

NOTE: When you install diodes, be sure to position the banded end as shown on the circuit board. See Detail 2-1A.



( ) D109: 1N4149 diode (#56-56).

( ) D102: 1N4149 diode (#56-56).

( ) D101: 1N4149 diode (#56-56).

( ) ZD103: 1N751 zener diode (#56-16).

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

( ) ZD105: 1N716A zener diode (#56-57).

( ) D107: 1N4002 diode (#57-65).

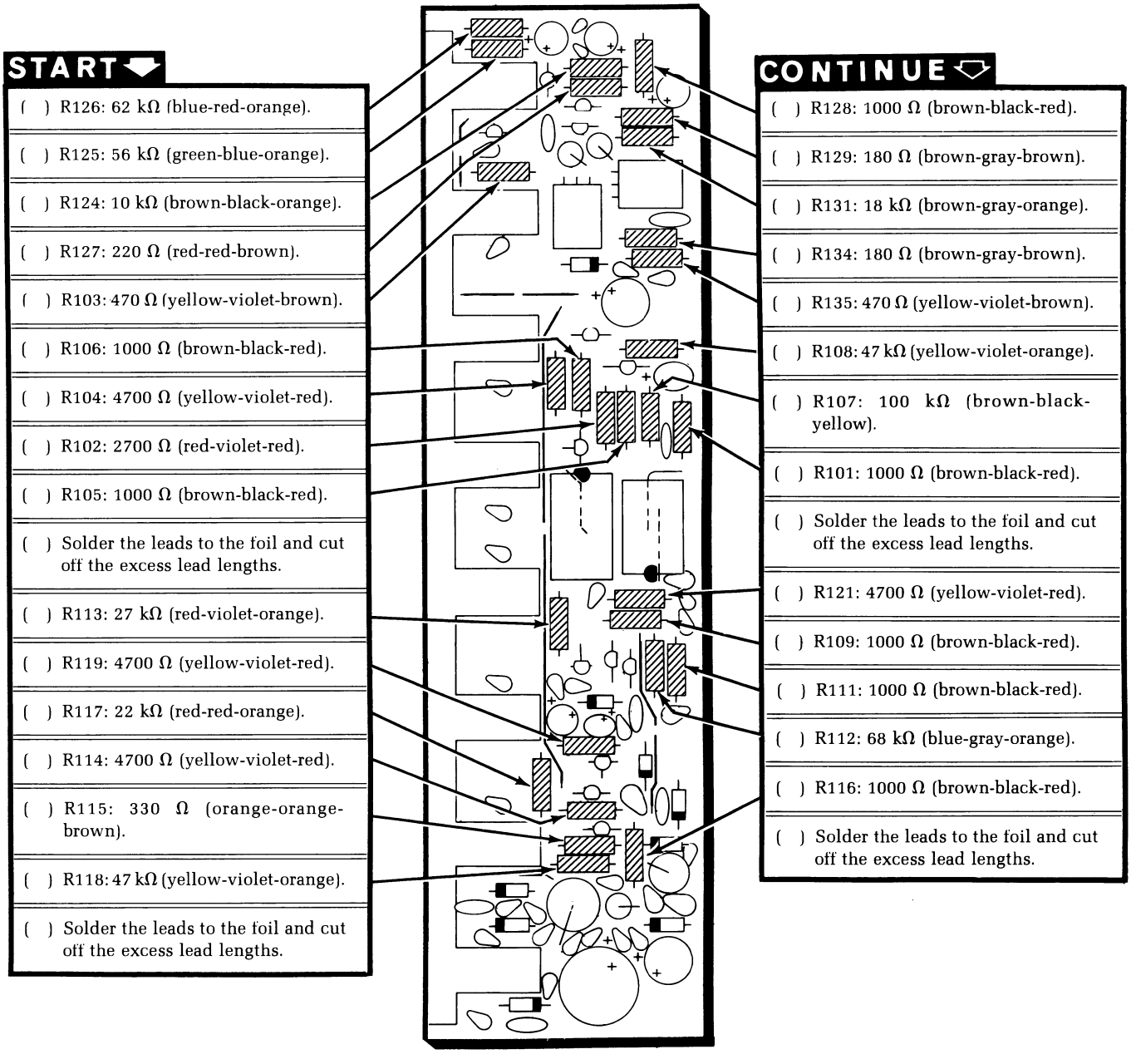
( ) ZD104: VR9.1 zener diode (#56-19).

( ) D108: 1N4002 diode (#57-65).

( ) D106: 1N4002 diode (#57-65).

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

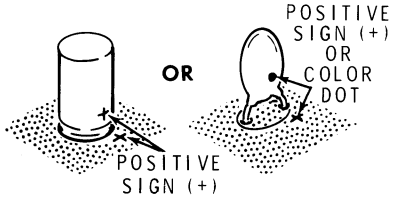
PICTORIAL 2-1



PICTORIAL 2-2

START

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



( ) C113: 10 μF electrolytic.

( ) C112: 10 μF electrolytic.

( ) C114: 10 μF electrolytic.

( ) C115: 75 pF ceramic.

( ) C116: .05 μF ceramic.

( ) C102: 68 μF tantalum.

( ) C101: .05 μF ceramic.

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

( ) C105: .68 μF tantalum.

( ) C106: 5 μF electrolytic.

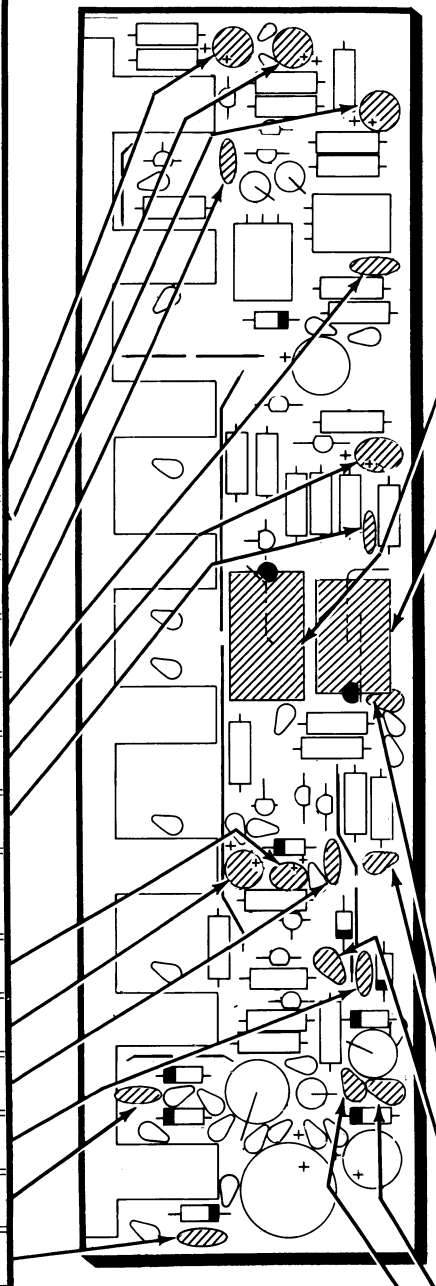
( ) C104: .01 μF ceramic.

( ) C103: .05 μF ceramic.

This capacitor will be installed later.

( ) C111: .05 μF ceramic.

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

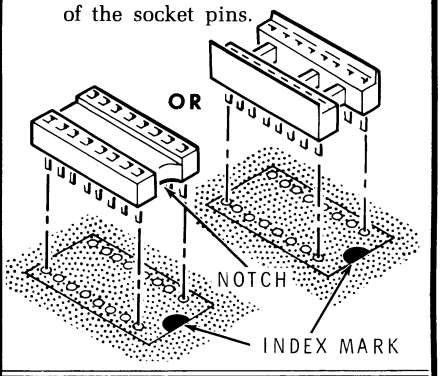


PICTORIAL 2-3

CONTINUE

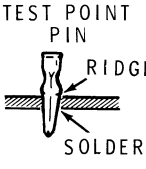
( ) 16-pin socket at IC101 as follows:

Be sure the socket pins are straight. Insert the socket pins into the holes. The index mark on the circuit board should still be visible after it is installed. Solder the pins to the foil. Make sure the bare jumper wires under the sockets do not touch any of the socket pins.

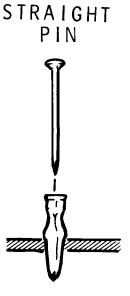


( ) 14-pin socket at IC102.

NOTE: In the following steps, install the test point pins as follows:



1. Insert the pin until the ridge is seated against the circuit board.
2. Make sure the pin is straight; then solder it to the foil. Be careful you do not fill the pin with solder, as a wire must be inserted into the pin later.



3. After the pin has cooled, insert an ordinary straight pin (not supplied) into the test point pin. Work the straight pin in and out several times to slightly open the test point pin. This will make it easier to insert a wire into the test point pin later.

( ) TP4: Test point pin.

( ) TP5: Test point pin.

( ) TP3: Test point pin.

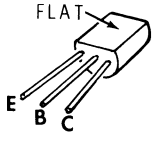
( ) TP2: Test point pin.

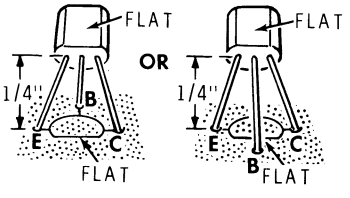
( ) TP1: Test point pin.

START

In the following steps, install each of the transistors as follows:

1. Line up the flat on the transistor with the outline of the flat on the circuit board.
2. Insert the leads into their correct E, B, and C holes.
3. Then solder the leads to the foil and cut off the excess lead lengths.



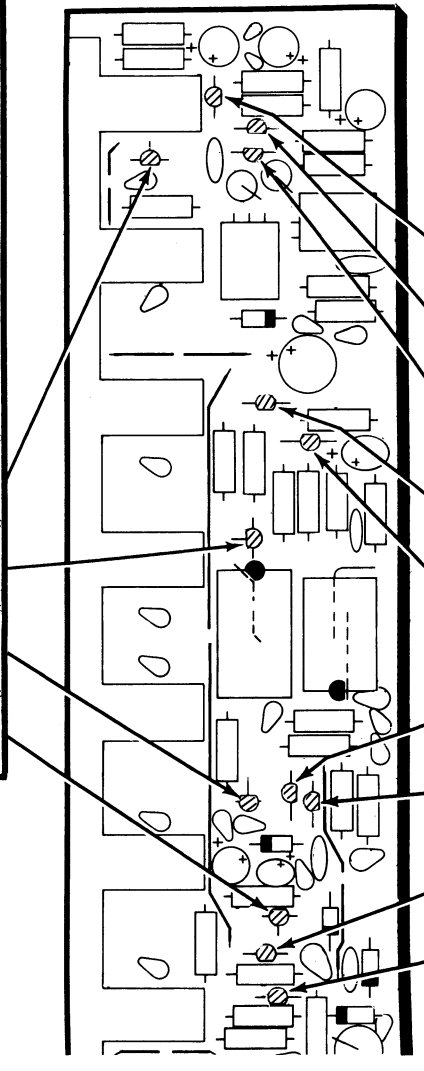


( ) Q101: MPSA05 transistor (#417-864).

( ) Q102: MPSA20 transistor (#417-801).

( ) Q107: MPSA20 transistor (#417-801).

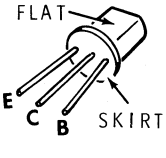
( ) Q108: MPSA20 transistor (#417-801).

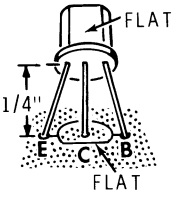


CONTINUE

In the following steps, install each of the transistors as follows:

1. Line up the flat.
2. Insert the leads into the correct holes.
3. Solder them to the foil and cut off the excess lead lengths.





NOTE: The transistor may not have the skirt shown.

( ) Q111: 2N5232A transistor (#417-91).

( ) Q112: 2N5232A transistor (#417-91).

( ) Q113: X29A829 transistor (#417-201).

( ) Q103: 2N5232A transistor (#417-91).

( ) Q104: X29A829 transistor (#417-201).

( ) Q105: 2N5232A transistor (#417-91).

( ) Q106: X29A829 transistor (#417-201).

( ) Q109: X29A829 transistor (#417-201).

( ) Q110: 2N3416 transistor (#417-94).

PICTORIAL 2-4

START

NOTE: Install the next two transistors as follows:

To avoid possible damage to the transistors. DO NOT bend or spread the wide portion of the transistor leads.

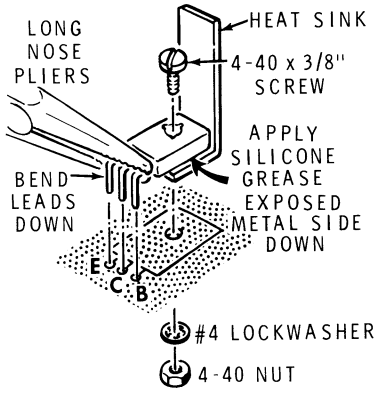
1. Position the transistor with the exposed metal side of the case facing down. Grasp the wide portion of the transistor leads with long-nose pliers and bend the narrow portion of the leads with your fingers as shown.

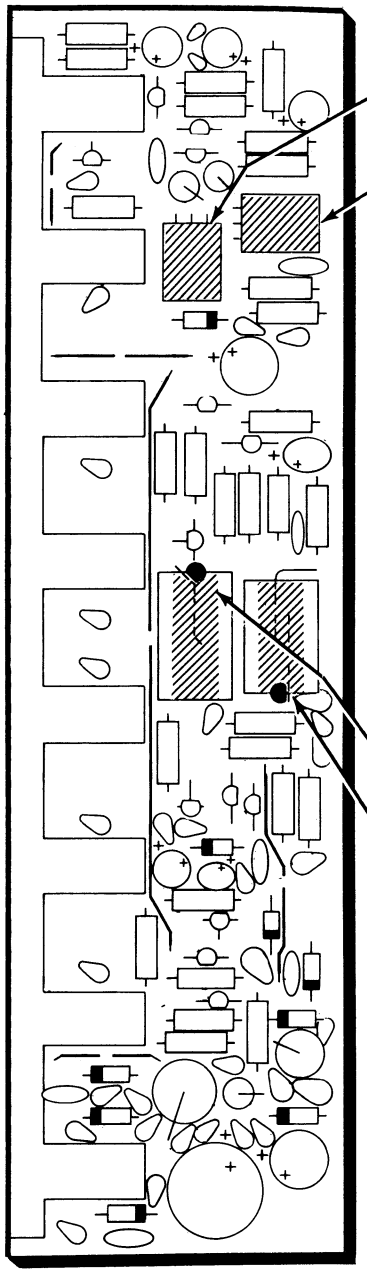
2. Cut a small slit in the silicone grease pod. Then apply a liberal amount of grease on the exposed metal side of the transistor.

3. Place the transistor on the heat sink so the mounting holes align. Then insert the transistor leads into holes E, C, and B, and push the heat sink against the circuit board.

4. Mount the heat sink and transistor to the circuit board with a 4-40 × 3/8" screw, #4 lockwasher, and 4-40 nut. Do not let the transistor or heat sink twist when you tighten the hardware.

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





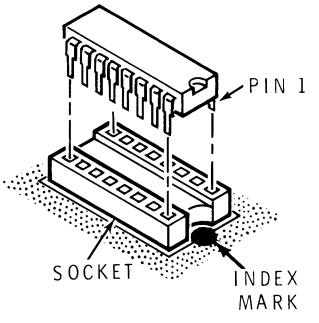
PICTORIAL 2-5

CONTINUE

( ) Q114: MJE181 transistor (#417-818).

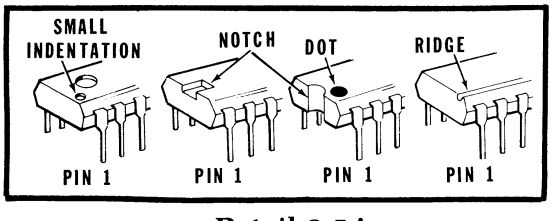
( ) Q115: MJE171 transistor (#417-819).

NOTE: Refer to Detail 2-5A. Then, as you install each IC in the following steps, position the pin 1 end of the IC toward the index mark on the circuit board. Then insert the IC leads into the socket and push the IC down into place.



( ) IC101: SN74145N integrated circuit (#443-87).

( ) IC102: SN7493AN integrated circuit (#443-640).



Detail 2-5A

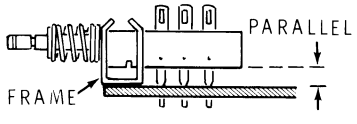
START

( ) 8-switch assembly. Install the switch assembly as follows:

1. Carefully examine the switch lugs and straighten any that are bent.

2. Align the switch over the holes on the circuit board. Then insert the switch lugs into the circuit board holes. Make sure you do not pinch any of the jumper wires between the switch assembly and the circuit board.

3. Press the switch frame against the circuit board and make sure the switch body is parallel with the circuit board; then turn the circuit board over and solder one lug at each end of the switch assembly to the foil.

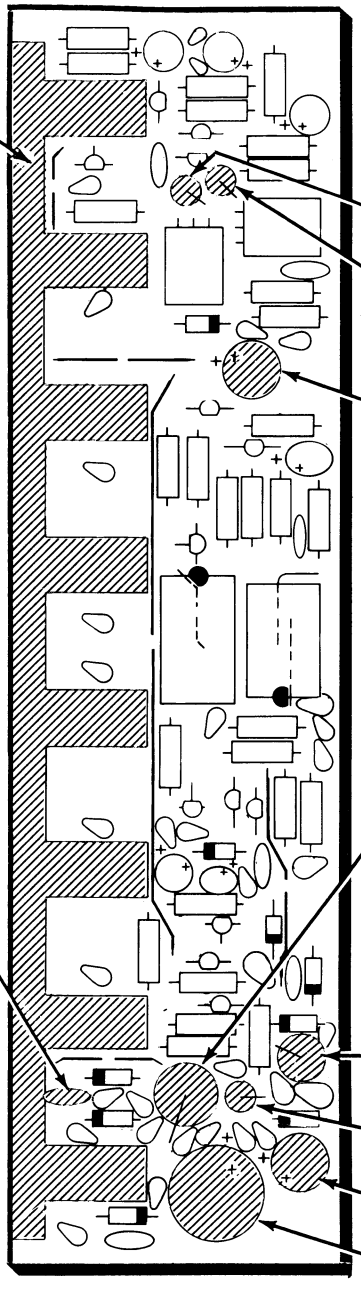


4. Re-examine the switch to make sure the frame is still seated against the circuit board and the switch body is parallel to the circuit board.

5. Then solder the remaining lugs to the circuit board foil.

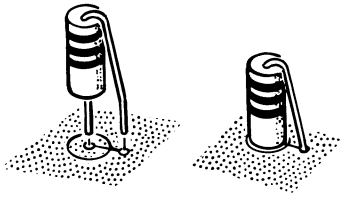
( ) C109: .05 μF ceramic.

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



CONTINUE

NOTE: You will mount some resistors vertically, as in the following step. Bend one resistor lead along the side of the resistor body. Then mount the resistor over the circuit board outline and push it down against the circuit board as shown.



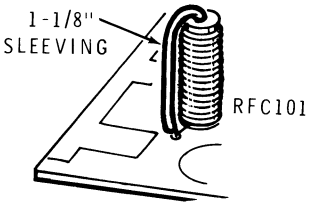
( ) R132: .33 Ω, **2-watt** (orange-orange-silver).

( ) R133: .33 Ω, **2-watt** (orange-orange-silver).

( ) C117: 100 μF electrolytic. Be sure to position the positive (+) mark on the capacitor next to the positive mark on the circuit board.

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

( ) RFC101: Place a 1-1/8" length of small sleeving on one lead of an RF choke (#45-98). Bend this lead along the side of the choke. Then position the choke over the circuit board outline and push it down against the circuit board as shown.



( ) R122: 100 Ω, **2-watt** (brown-black-brown).

( ) R123: 56 Ω, **1-watt** (green-blue-black).

( ) C107: 250 μF electrolytic.

( ) C108: 1000 μF electrolytic.

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

PICTORIAL 2-6

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

( ) Refer to Detail 2-7A and prepare an 11″ shielded cable.

NOTE: 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. (NS) means not to solder because other wires will be added later.

( ) Connect one end of the 11″ shielded cable as follows:

Inner lead to scanner circuit board hole J (S-1).
Shield lead to scanner circuit board hole K (S-1).

The free end of this cable will be connected later.

( ) Prepare the following wires:

6″ brown
6″ red
6-1/2″ orange
7-3/4″ yellow
8″ green
7-1/2″ green
8-3/8″ blue
5-1/4″ yellow

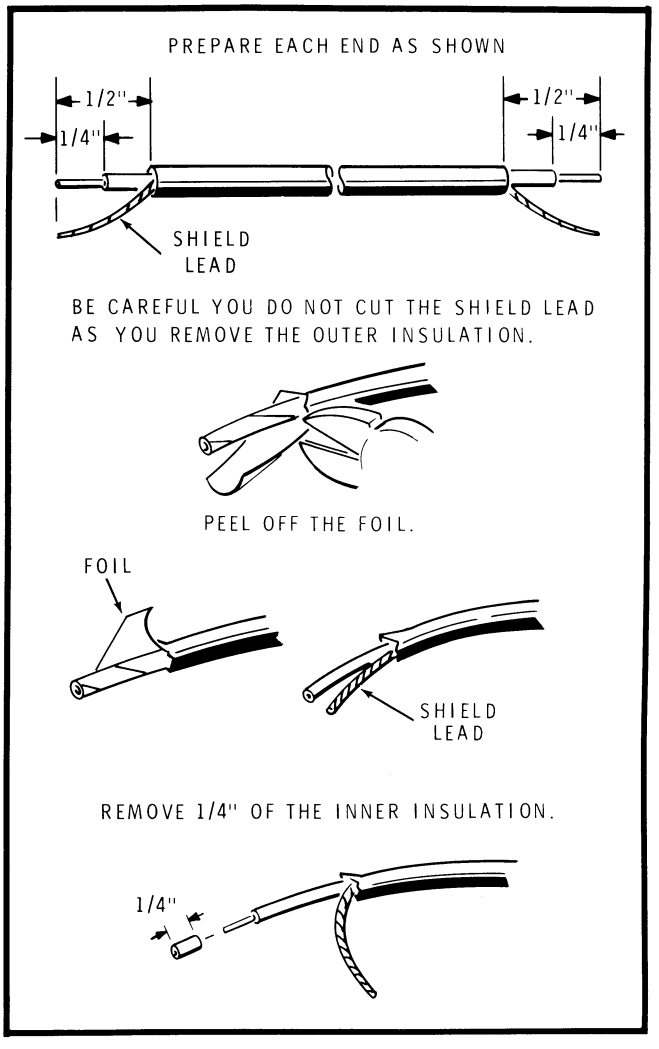
Connect one end of the prepared wires to the scanner circuit board in the following steps. The free ends of these wires will be connected later.

( ) Connect one end of a 6″ brown wire to hole 1 (S-1).

( ) Connect one end of a 6″ red wire to hole 2 (S-1).

( ) Connect one end of a 6-1/2″ orange wire to hole 3 (S-1).

( ) Connect one end of a 7-3/4″ yellow wire to hole 4 (S-1).



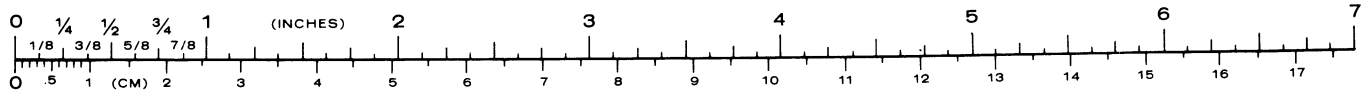
Detail 2-7A

( ) Connect one end of an 8″ green wire to hole 5 (S-1).

( ) Connect one end of a 7-1/2″ green wire to hole E (S-1).

( ) Connect one end of an 8-3/8″ blue wire to hole 6 (S-1).

( ) Connect one end of a 5-1/4″ yellow wire to hole B (S-1).



( ) Prepare the following wires:

5-1/2″ orange
8-3/4″ violet
10″ gray
9″ white
9″ black
8-1/4″ brown
5-3/4″ blue

Connect one end of the prepared wires to the scanner circuit board in the following steps. The free ends of these wires will be connected later.

( ) Connect one end of a 5-1/2″ orange wire to hole C (S-1).

( ) Connect one end of an 8-3/4″ violet wire to hole 7 (S-1).

( ) Connect one end of a 10″ gray wire to hole 8 (S-1).

( ) Connect one end of a 9″ white wire to hole X (S-1).

( ) Connect one end of a 9″ black wire to hole Y (S-1).

( ) Connect one end of an 8-1/4″ brown wire to hole F (S-1).

( ) Connect one end of a 5-3/4″ blue wire to hole A (S-1).

NOTE: When you are instructed to prepare **stranded** wire, as in the next step, cut the wire to the specified length and remove 1/4″ of insulation from each end. Then twist the fine strands together at each end and melt a small amount of solder onto them to hold the fine strands together.

( ) Prepare the following wires:

5-1/4″ gray
6-1/2″ black
two 3-1/2″ red **stranded**
7-1/4″ red **stranded**
7-1-/2″ black **stranded**

Connect one end of the prepared wires to the scanner circuit board in the following steps. The free end of these wires will be connected later.

( ) Connect one end of a 5-1/4″ gray wire to hole D (S-1).

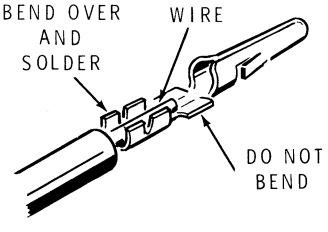
( ) Connect one end of a 6-1/2″ black wire to hole G (S-1).

( ) Connect one end of a 3-1/2″ red **stranded** wire to hole M (S-1).

( ) Connect one end of a 3-1/2″ red **stranded** wire to hole N (S-1).

( ) Connect one end of a 7-1/4″ red **stranded** wire to hole T (S-1).

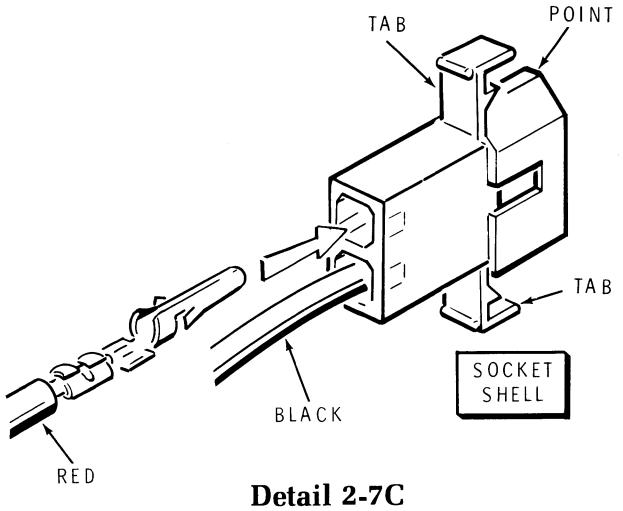
( ) Connect one end of a 7-1/2″ black **stranded** wire to hole U (S-1).



Detail 2-7B

( ) Refer to Detail 2-7B and install and solder a male pin on the free end of the 7-1/4″ red **stranded** wire coming from circuit board hole T.

( ) Likewise, install a male pin on the free end of the 7-1/2″ black **stranded** wire coming from circuit board hole U.



Detail 2-7C

( ) Refer to Detail 2-7C and position the socket shell as shown. Insert the male pin at the end of the 7-1/4" red stranded wire into the socket hole nearest the point. Then push the pin into the socket shell until it snaps into place.

( ) Likewise, install the male pin at the end of the 7-1/2" black stranded wire into the other hole in the socket shell.

CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions:

( ) Unsoldered connections.

( ) Poor solder connection.

( ) Solder bridges between foils.

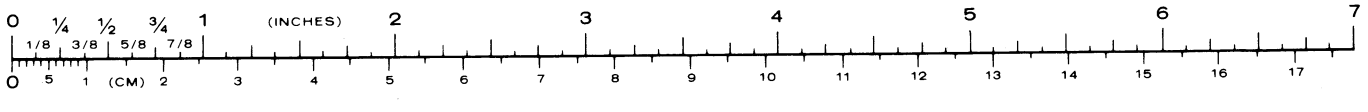
( ) Protruding leads which could touch together.

( ) Transistors and integrated circuits for proper type and installation.

( ) Electrolytic and tantalum capacitors for the correct position of the positive (+) mark.

( ) Diodes for correct position of the banded end.

( ) Set the Scanner circuit board aside temporarily.



CHASSIS

PARTS LIST

( ) Refer to the Pack Index Sheet and locate and remove all the parts from compartment #3 (Chassis).

( ) Unpack these parts. Check each part against the following list. The key numbers correspond to the numbers on the "Chassis Parts Pictorial" (Illustration Booklet, Pages 2 and 3).

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

RESISTOR - CONTROLS - SWITCHES

NOTE: The following resistor has a tolerance of 10%. This is indicated by a fourth color band of silver.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
A1	1-37	1	2.2 MΩ, 10% (red-red-green) resistor	R1
A2	10-1078	1	10 kΩ control	R2
A3	19-725	1	10 kΩ control with switch	R3/SW1
A4	64-85	1	DPDT switch (push on - push off)	SW2
A4	64-827	1	DPDT switch (momentary contact)	SW3

CAPACITORS

B1	21-71	1	.001 μF, 1400 V (1.4 kV) ceramic	C1
B1	21-163	1	.001 μF, 500 V ceramic	C2
B1	21-143	1	.05 μF ceramic (used for test purposes only)	
B2	31-8	1	1-8 pF trimmer	C5

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).

#2 Hardware

C1	250-1172	6	2-56 × 1/4" screw
C2	252-51	6	2-56 nut
C3	254-7	6	#2 lockwasher

#4 Hardware

C4	250-52	21	4-40 × 1/4" screw
C5	252-15	19	4-40 nut
C6	252-192	2	4-40 push-in nut
C7	254-9	21	#4 lockwasher

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

Hardware (cont'd.)

#6 Hardware

C8	250-170	4	#6 × 1/4" sheet metal screw
C9	250-587	11	6-32 × 5/16" screw
C10	250-434	8	6-32 × 3/8" flat head screw
C11	252-3	12	6-32 nut
C12	253-60	4	#6 flat washer
C13	254-1	12	#6 lockwasher
C14	259-1	1	#6 solder lug

#8 Hardware

C15	250-137	2	8-32 × 3/8" screw
C16	252-4	2	8-32 nut
C17	254-2	2	#8 lockwasher

Control Hardware

C18	252-7	2	Control nut
C19	254-5	2	Control lockwasher

FUSEHOLDER - CONNECTORS - SOCKETS

D1	423-10	1	In-line fuseholder	
D2	432-4	1	AC connector	S1
D3	432-73	2	Female pin	
D4	432-196	1	Plug shell	S2
D5	434-301	8	Lamp socket	
D6	434-42	1	Phono socket	S3

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

KNOBS

E1	462-970	2	Small square knob
E2	462-966	8	Large square knob
E3	462-971	2	Bar knob

METAL PARTS

F1	200-1255-1	1	Chassis
F2	203-1904	1	Subpanel
F3	204-2151	2	Center bracket
F4	204-2152	1	Angle bracket
F5	204-2153	1	Side bracket
F6	204-9	3	L bracket
F7	205-1730	1	Bottom cover
F8	210-91	1	Bezel
F9	260-67	3	Clip

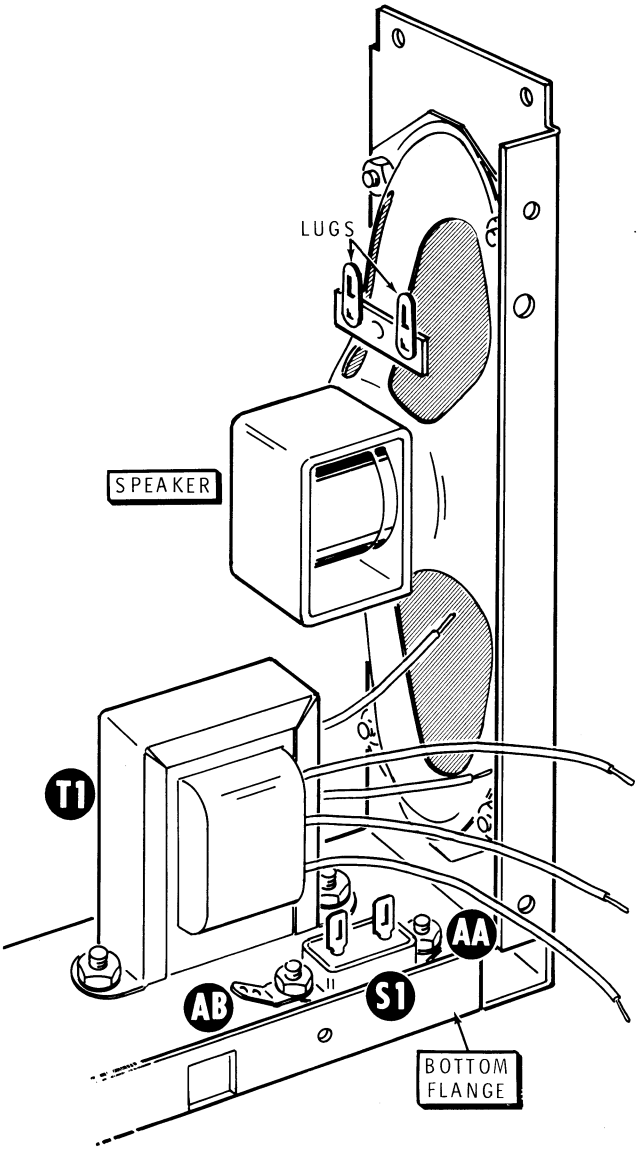
MISCELLANEOUS

	54-914	1	Power transformer	T1
G1	73-3	8	Grommet	
G2	75-108	1	Insulating paper	
G3	134-977	16	Lamp socket lead	
G4	259-22	2	Spade lug	
G5	261-44	4	Foot	
	89-3	1	Line cord	
G6	354-6	10	Cable tie	
	401-181	1	Speaker	
G7	412-618	8	Lamp (GE-73, 12-14 V)	PL1-PL8
G8	413-41	8	Red lens	
G9	413-42	8	Lens holder	
G10	421-1	1	1-1/2 ampere fuse	F1
G11	490-5	1	Nut starter	
G12	490-109	1	Alignment tool	

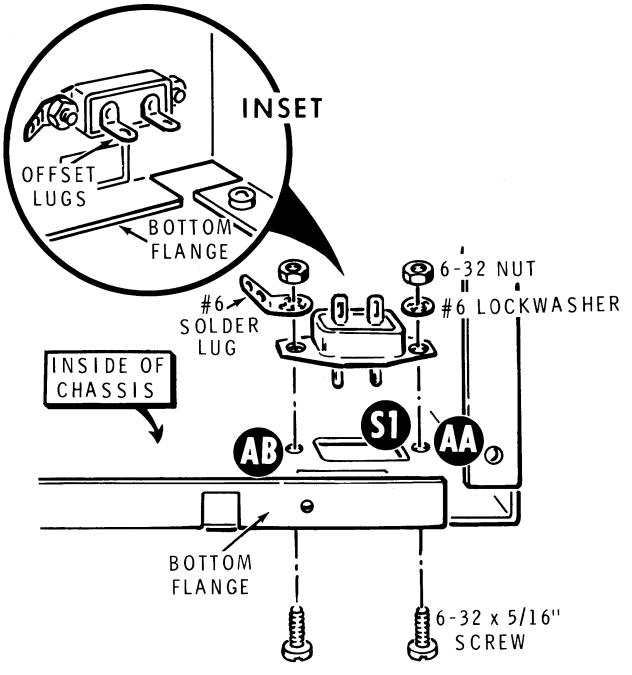
NOTE: The following parts are packed in the bottom of the shipping carton.

H1	203-1746	1	Trim label
H2	75-138	2	Rubber pad (packed in a small envelope)

STEP-BY-STEP ASSEMBLY



PICTORIAL 3-1



Detail 3-1A

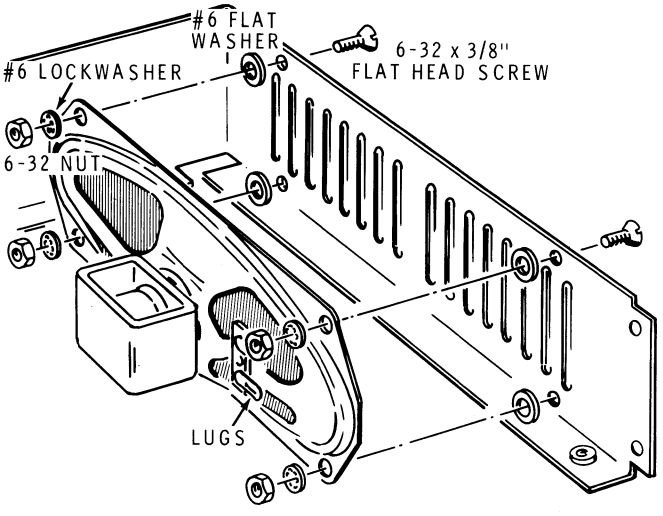
ASSEMBLY AND WIRING

Refer to Pictorial 3-1 for the following steps.

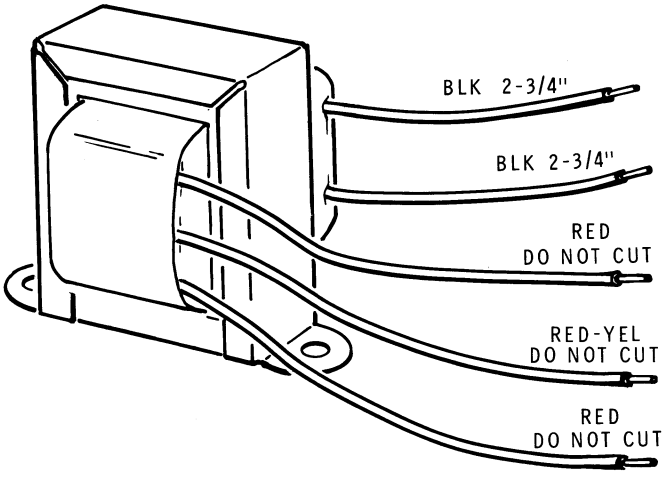
( ) Locate the chassis and position it as shown.

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

( ) S1: Refer to Deail 3-1A and mount an AC connector on the inside of the chassis at S1. Use a 6-32 × 5/16″ screw, #6 lockwasher, and 6-32 nut at AA. Use a 6-32 × 5/16″ screw, #6 solder lug, and 6-32 nut at AB. Position the solder lug as shown. NOTE: The AC connector supplied with your kit may have offset lugs as shown in the inset drawing. Mount this connector so the offset portion of the lugs is towards the bottom flange of the chassis.



Detail 3-1B



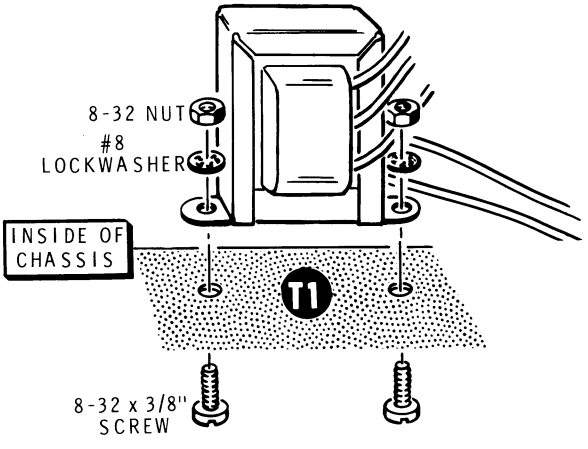
Detail 3-1C

( ) Refer to Detail 3-1B and mount the speaker to the side of the chassis. Use 6-32 × 3/8″ flat head screw, #6 flat washers, #6 lockwashers, and 6-32 nuts. Install the flat washers between the speaker and the side of the chassis. Make sure you install the speaker so the lugs are positioned as shown.

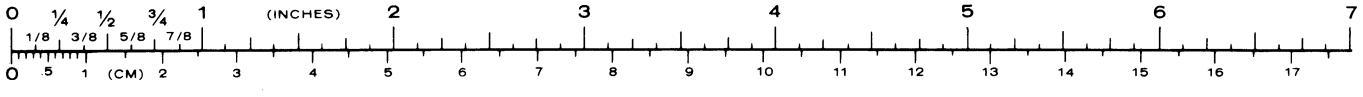
( ) Refer to Detail 3-1C and cut the power transformer leads to the indicated lengths. Measure the leads from where they come out of the transformer. Remove 1/4″ of insulation from the ends of the cut leads. Then, if necessary, melt a small amount of solder onto the exposed end of each lead to hold the small wire strands together.

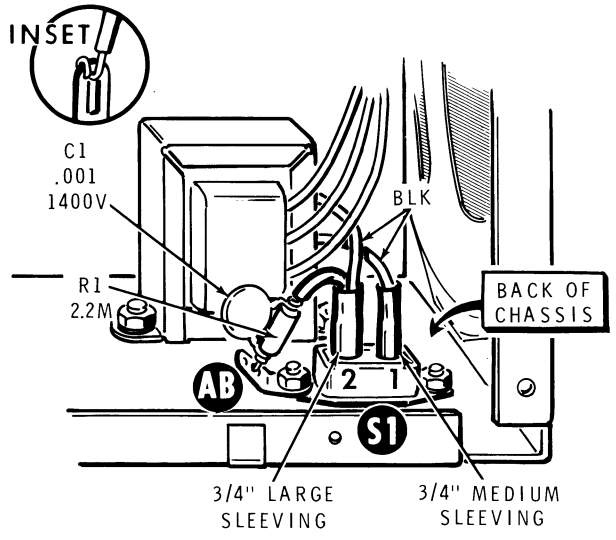
NOTE: The term "hardware" will be used to refer to screws, nuts, and lockwashers when parts are being mounted in some of the following steps. The phrase "Use 8-32 × 3/8″ hardware," for example, means to use an 8-32 × 3/8″ screw, a #8 lockwasher, and an 8-32 nut. Refer to the Pictorial or Detail for the correct way to install the hardware.

( ) T1: Refer to Detail 3-1D and mount the power transformer on the inside of the chassis at T1. Use 8-32 × 3/8″ hardware. Position the transformer so the wires are on the right as shown.



Detail 3-1D





PICTORIAL 3-2

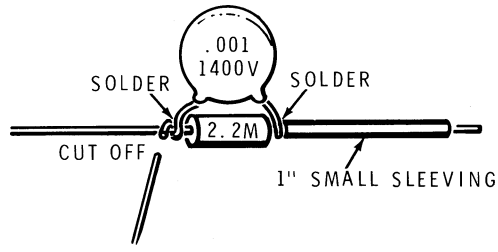
Refer to Pictorial 3-2 for the following steps.

( ) Slide a 3/4" length of medium sleeving (heat shrinkable) onto the black transformer lead that is closest to the back of the chassis.

NOTE: In some of the following steps, you will be instructed to "make a mechanically secure connection." To do this, insert the wire through and wrap it around the lug before you solder it. See the inset drawing on Pictorial 3-2.

( ) Connect the black transformer lead with the medium sleeving to AC connector S1 lug 1 (S-1). Make a mechanically secure connection.

( ) After the connection has cooled, push the sleeving over the connection and onto lug 1 until the entire lug is covered. Then hold your soldering iron near, but not touching, the sleeving. The heat from the soldering iron will cause the sleeving to shrink around the connection. Reposition your soldering iron as necessary to get the sleeving to shrink on all sides.



Detail 3-2A

( ) Slide a 3/4" length of large sleeving (heat shrinkable) onto the other black transformer lead.

( ) Connect this transformer lead to AC connector S1 lug 2 (NS). Make a mechanically secure connection. Do not push the sleeving onto the lug at this time.

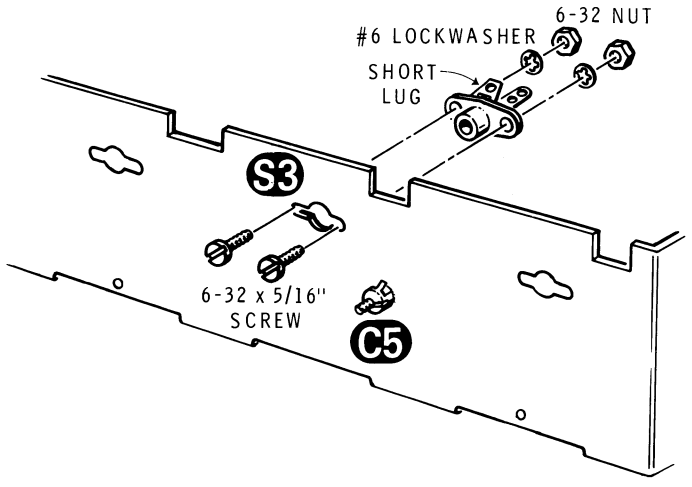
( ) Refer to Detail 3-2A and prepare a resistor capacitor combination. Use a 2.2 MΩ (red-red-green) resistor and a .001 μF, 1400 V ceramic capacitor. Solder the leads together. Then cut off the excess capacitor leads.

( ) Slide a 1" length of small sleeving onto either lead of the resistor-capacitor combination.

( ) R1/C1: Insert this lead with the sleeving through the large sleeving on the black transformer lead. Then connect it to AC connector S1 lug 2 (S-2). Make a mechanically secure connection.

( ) Wait until the connection is cool; then push the large sleeving over the connection and onto lug 2 until the entire lug is covered. Again, use your soldering iron to shrink the large sleeving.

( ) Connect the other lead of the resistor-capacitor combination to solder lug AB (S-1). Make a mechanically secure connection.



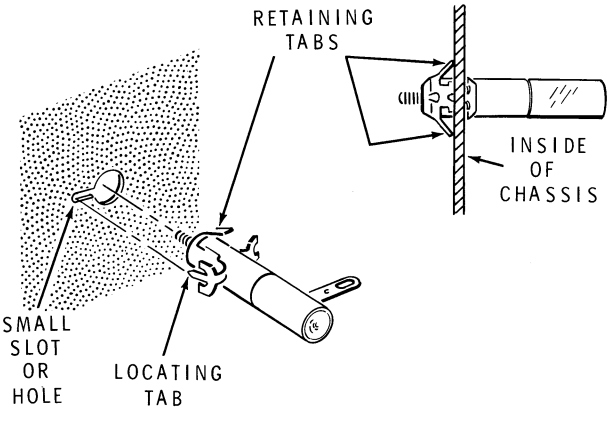
PICTORIAL 3-3

Refer to Pictorial 3-3 for the following steps.

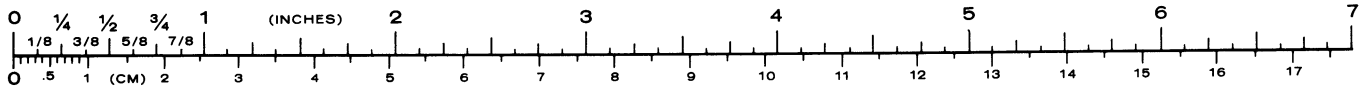
( ) Reposition the chassis as shown.

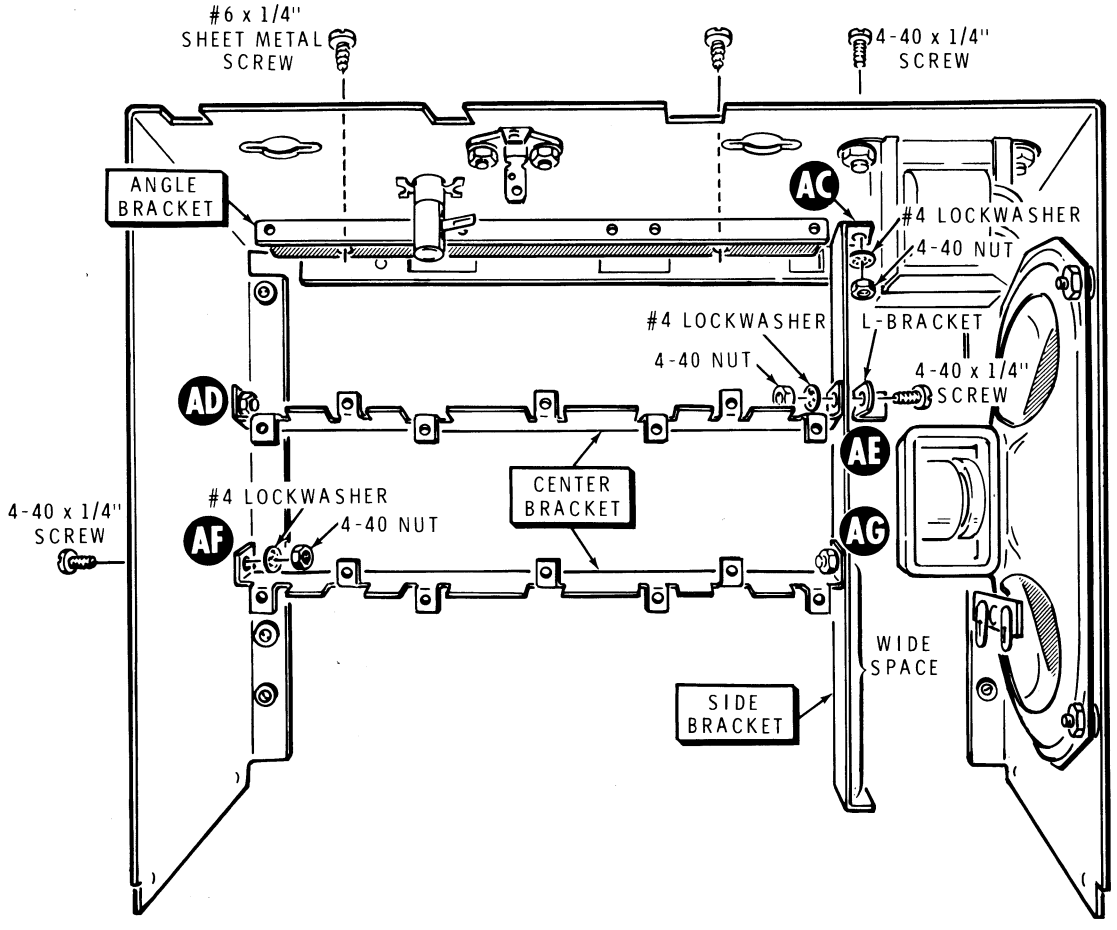
( ) S3: Mount a phono socket on the inside of the back panel at S3 with 6-32 × 5/16" hardware. Position the socket so the short lug faces upward as shown.

( ) C5: Refer to Detail 3-3A and install a 1-8 pF trimmer capacitor in hole C5 in the back panel. Place the locating tab in the small hole; then push on the trimmer until both retaining tabs snap into place.



Detail 3-3A





PICTORIAL 3-4

Refer to Pictorial 3-4 for the following steps.

NOTE: When you mount the brackets in the following steps, make sure you position them as shown in the Pictorial.

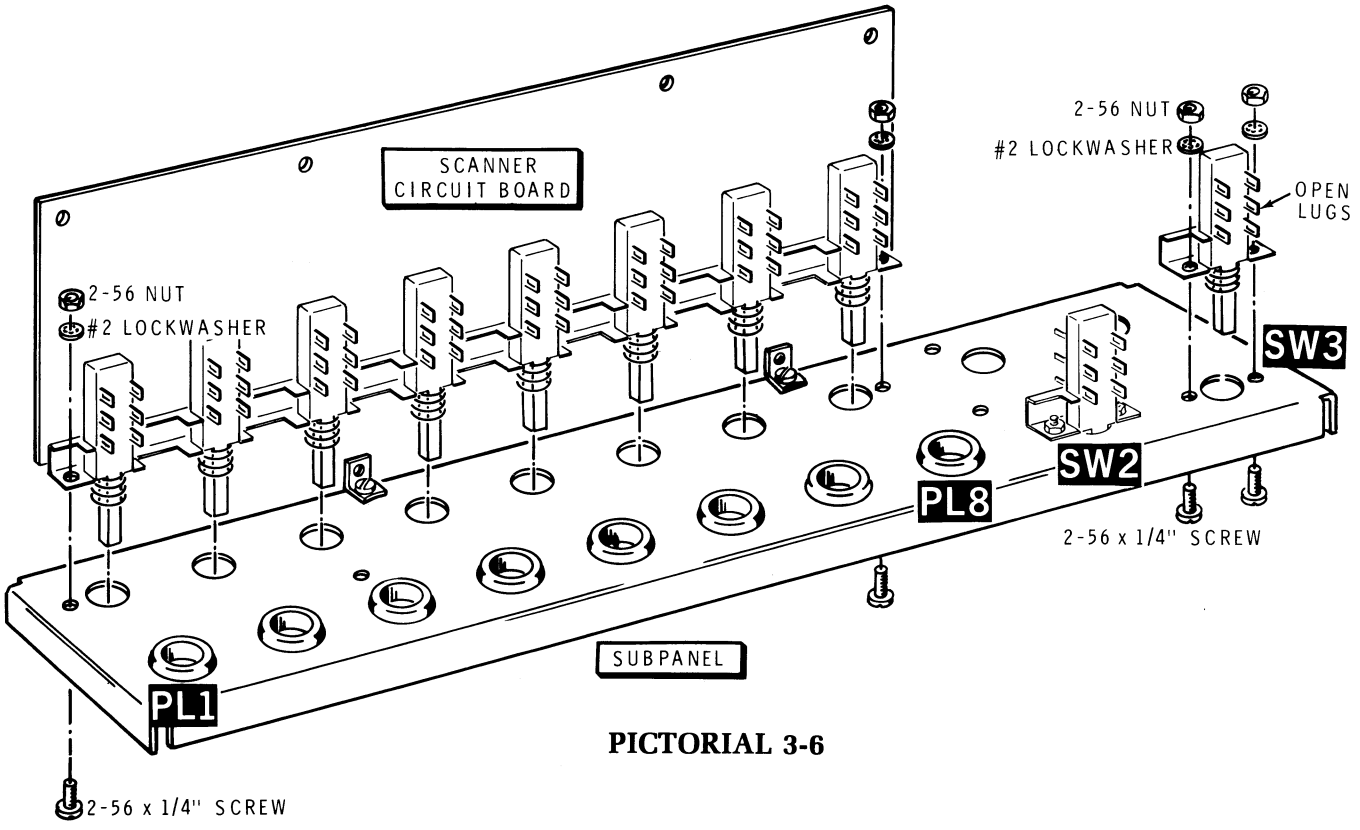
( ) Mount an angle bracket to the back of the chassis with two #6 × 1/4" sheet metal screws.

( ) Examine the side bracket and notice that the holes are closer to one end than the other. Position the wide space as shown in the Pictorial; then mount the side bracket to the back of the chassis at AC with 4-40 × 1/4" hardware.

( ) Mount a center bracket from the side of the chassis at AD to the side bracket at AE. Use 4-40 × 1/4" hardware at AD. Use 4-40 × 1/4" hardware and an L bracket at AE. Insert the screw through the nonthreaded hole in the L bracket.

( ) Mount a center bracket from the side of the chassis at AF to the side bracket at AG. Use 4-40 × 1/4" hardware.

( ) Set the chassis aside temporarily.

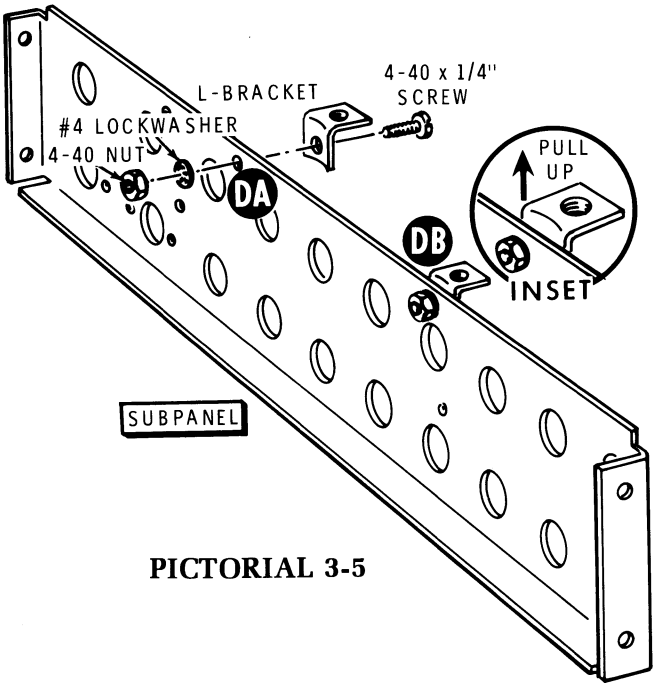


PICTORIAL 3-6

Refer to Pictorial 3-5 for the following steps.

( ) Locate the subpanel and position it as shown.

( ) Mount an L bracket at DA with 4-40 × 1/4" hardware. Refer to the inset drawing and pull up on the L bracket as you tighten the hardware.



PICTORIAL 3-5

( ) Likewise, mount an L bracket at DB with 4-40 × 1/4" hardware.

Refer to Pictorial 3-6 for the following steps.

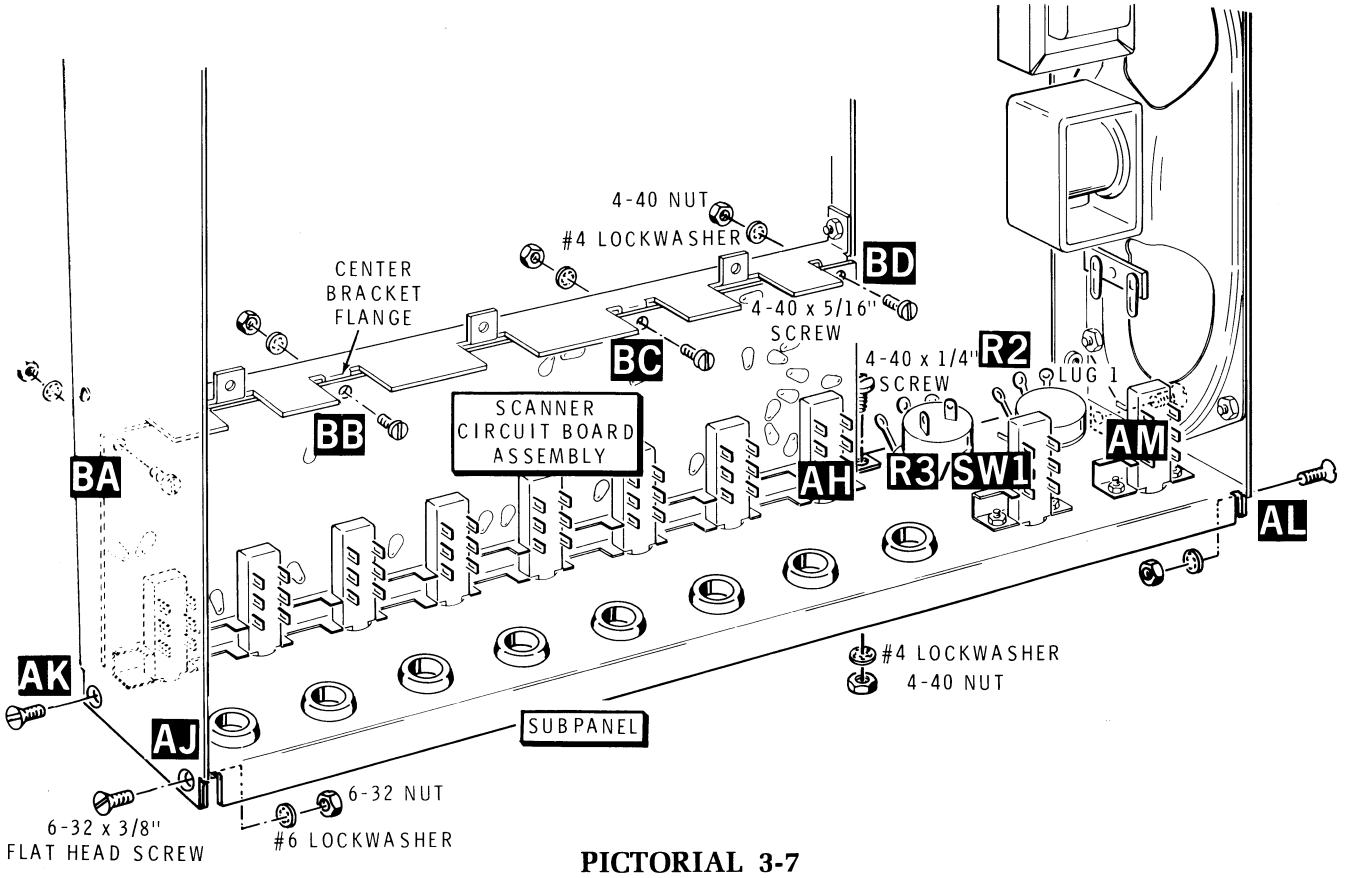
( ) Reposition the subpanel as shown.

( ) Install grommets in holes PL1 through PL8 in the subpanel.

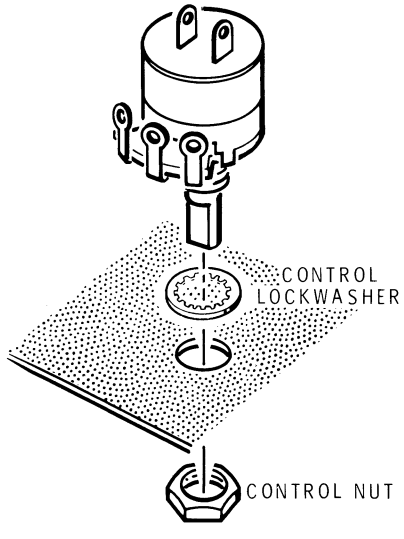
( ) Mount the previously assembled scanner circuit board to the subpanel. Use 2-56 × 1/4" hardware. Make sure you do not pinch any of the wires coming from the circuit board between the switch assembly and the subpanel.

( ) SW3: Mount a DPDT switch (momentary contact) at SW3 with 2-56 × 1/4" hardware. Position the switch so the open lugs face as shown. Also, position the switch frame parallel to the edge of the subpanel before you tighten the hardware.

( ) SW2: Mount a DPDT switch (push on-push off) at SW2 with 2-56 × 1/4" hardware. Position the switch so the open lugs face as shown. Also, position the switch frame parallel to the edge of the subpanel before you tighten the hardware.



PICTORIAL 3-7



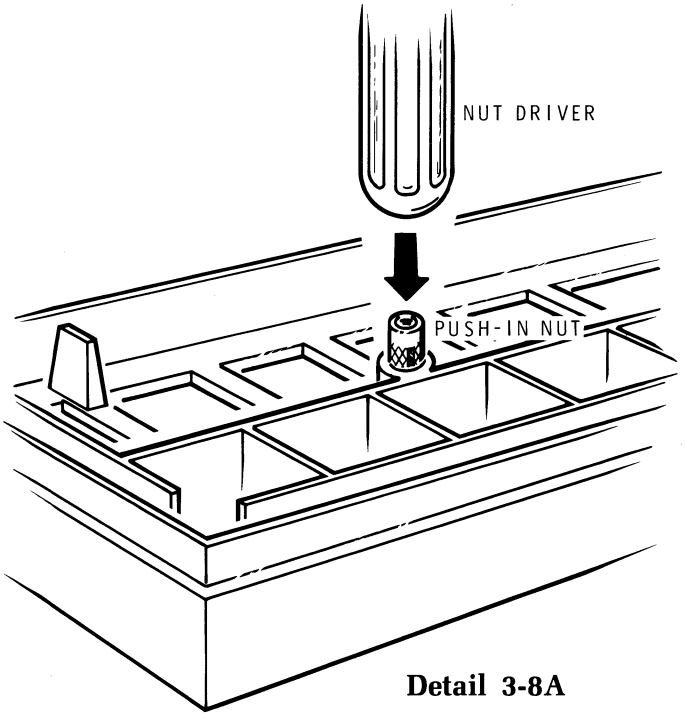
Detail 3-7A

Refer to Pictorial 3-7 for the following steps.

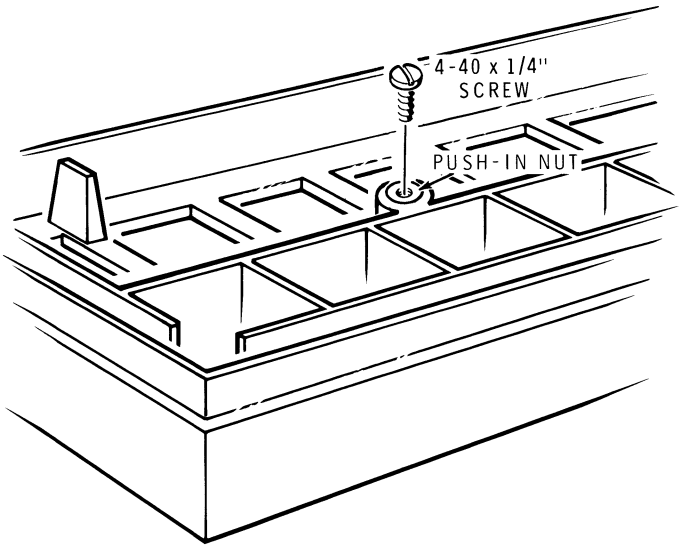
( ) Carefully mount the subpanel and scanner circuit board assembly in the chassis. Position the circuit board on top of the center bracket flanges. Again, be careful you do not pinch any of the wires between the circuit board and the chassis. Then install 6-32 × 3/8″ flat head hardware at AJ, AK, AL, and AM. Install 4-40 × 1/4″ hardware at AH. Make sure you install this hardware as shown. Mount the circuit board to the center bracket with 4-40 × 1/4″ hardware at BA, BB, BC, and BD.

( ) R3/SW1: Refer to Detail 3-7A and install a 10 kΩ control with switch (#19-725) at R3/SW1. Use a control lockwasher and a control nut. Position the control as shown.

( ) R2: Install a 10 kΩ control (#10-1078) at R2. Use a control lockwasher and a control nut. NOTE: Do not be concerned if lug 1 touches the chassis.



Detail 3-8A



Detail 3-8B

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

( ) Locate the bezel and place it on your work surface. Place it on a soft cloth to prevent it from being scratched when you perform the following steps.

( ) Refer to Detail 3-8A and install 4-40 press-in nuts in the bezel at AN and AO as follows:

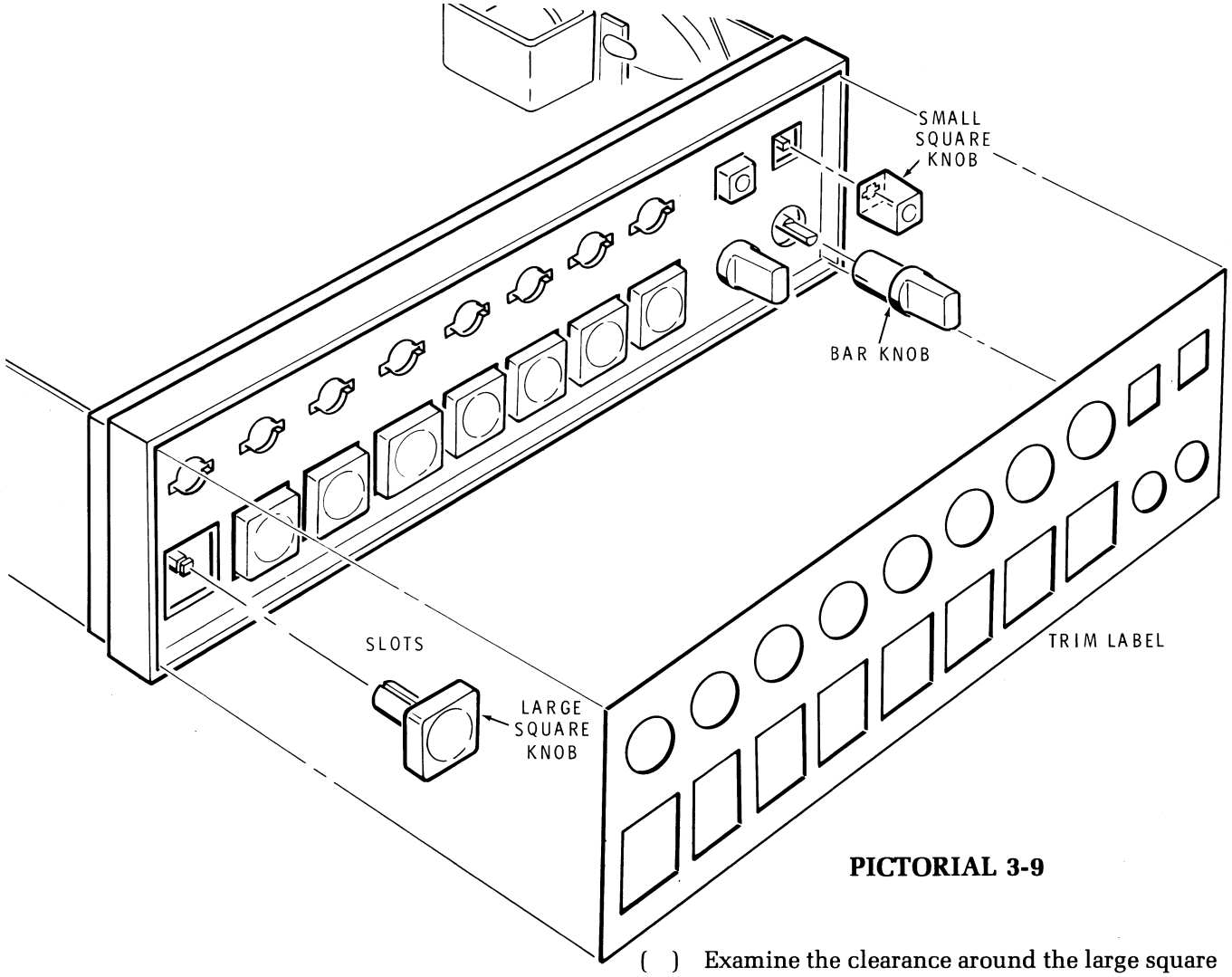
1. Start the split (slotted) end of the press-in nut into the bezel.
2. Place a small block of wood or other suitable support against the bezel directly behind the press-in nut.
3. Then use the handle of a nut driver (or screwdriver) to push the nut all the way into the bezel.

( ) Refer to Detail 3-8B and install a 4-40 × 1/4" screw all the way into either press-in nut. Then remove the screw and set it aside. This seats the press-in nut in the bezel and makes it easier to reinstall the screw later.

( ) Likewise, install a 4-40 × 1/4" screw all the way into the other press-in nut. Then remove it.

NOTE: Use a short, small screwdriver when you install the screws in the next step. These screws are more difficult than normal to install.

( ) Install the bezel on the subpanel with two 4-40 × 1/4" screws and two #4 lockwashers at AN and AO.



PICTORIAL 3-9

Refer to Pictorial 3-9 for the following steps.

( ) Install large square knobs onto the channel switches as follows:

1. Position the knob so the slots are above and below the switch shaft (not on the sides of it).

2. Then push the knob onto the switch shaft until it snaps into place.

( ) Likewise, install small square knobs on the Scan-Man and the Channel Select switches.

( ) Install bar knobs on the Volume and the Squelch controls as follows:

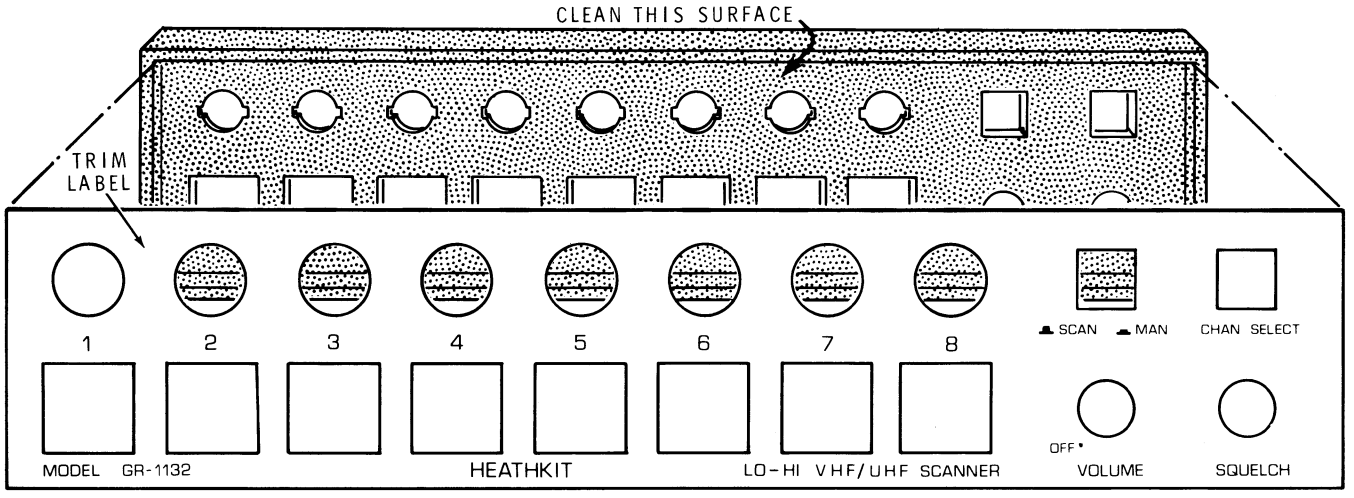
1. Line up the flat in the knob with the flat on the control shaft.

2. Then push the knob onto the shaft as far as it will go.

( ) Examine the clearance around the large square knobs, the small square knobs, and the bar knobs. If the clearance is not uniform, you will have to remove the bezel and reposition the switch assemblies and controls as necessary. To do this you will have to loosen the screws that hold the switch assemblies to the subpanel. Then replace the bezel on the subpanel and recheck the clearance. It may take several attempts to obtain the best appearance.

( ) Temporarily lay the trim label (do not remove the paper backing) on the bezel. Adjust and hold the trim label against the bezel to obtain uniform clearance around all of the knobs. Do not be concerned about the clearance around the holes at the top of the bezel. These holes will be completely covered later. If necessary, reposition the switches and controls as you did before to obtain uniform clearance. Look along the edges of the trim label and remember this exact spacing (between the trim label and the bezel). Then remove the trim label and set it aside.

( ) Remove the bezel from the chassis.



Detail 3-9A

( ) Refer to Detail 3-9A and dampen a cloth with cleaning solvent (such as rubbing alcohol). Then clean the indicated surface of the bezel. This will provide a clean, oil-free surface for the trim label you will install in the next step.

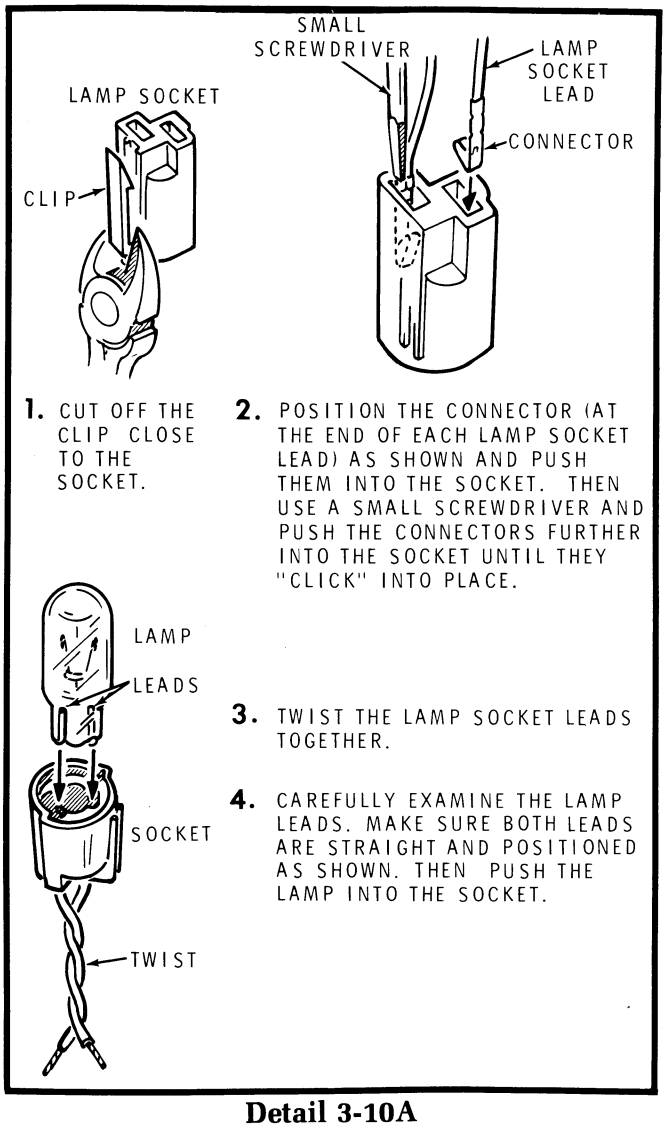
( ) Again, refer to Detail 3-9A and remove the backing paper from the trim label. Then press the label onto the bezel. NOTE: Make sure you install the trim label on the bezel exactly as you had it positioned before.

( ) Install the bezel on the subpanel with two 4-40 ×1/4" screws and two #4 lockwashers at AN and AO.

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

( ) Refer to Detail 3-10A and prepare eight lamp and socket assemblies.

( ) PL1 — PL8: Push the lamp and socket assemblies into grommets PL1 through PL8 until the back of each socket is about 3/16" from the grommet.



Detail 3-10A

Refer to Pictorial 3-11 (Illustration Booklet, Page 5) for the following steps.

NOTE: Position the free ends of the wires coming from the scanner circuit board out of the way so you do not burn them when you perform the following steps.

Connect the wires coming from lamps PL1 through PL8 to switches SW101 through SW108 on the scanner circuit board in the following steps.

IMPORTANT: Make sure you DO NOT connect all of the lamp leads to switch lugs 4 and 5. LAMPS PL1 — PL4 CONNECT TO SWITCH LUGS 4 AND 5, BUT LAMPS PL5 — PL8 CONNECT TO SWITCH LUGS 1 AND 2.

( ) Either lead of lamp PL1 to switch SW101 lug 4 S-1).

( ) Other lead of lamp PL1 to switch SW101 lug 5 (S-1).

( ) Either lead of lamp PL2 to switch SW102 lug 4 (S-1).

( ) Other lead of lamp PL2 to switch SW102 lug 5 (S-1).

( ) Either lead of lamp PL3 to switch SW103 lug 4 (S-1).

( ) Other lead of lamp PL3 to switch SW103 lug 5 (S-1).

( ) Either lead lamp of PL4 to switch SW104 lug 4 (S-1).

( ) Other lead of lamp PL4 to switch SW104 lug 5 (S-1).

( ) Either lead of lamp PL5 to switch SW105 lug 1 (S-1).

( ) Other lead of lamp PL5 to switch SW105 lug 2 (S-1).

( ) Either lead of lamp PL6 to switch SW106 lug 1 (S-1).

( ) Other lead of lamp PL6 to switch SW106 lug 2 (S-1).

( ) Either lead of lamp PL7 to switch SW107 lug 1 (S-1).

( ) Other lead of lamp PL7 to switch SW107 lug 2 (S-1).

( ) Either lead of lamp PL8 to switch SW108 lug 1 (S-1).

( ) Other lead of lamp PL8 to switch SW108 lug 2 (S-1).

Refer to Pictorial 3-12 (Illustration Booklet, Page 6) for the following steps.

( ) Position the wires and socket S2 under the transformer as shown. Socket S2 will be installed later.

( ) Connect the red-yellow transformer lead to circuit board hole R (S-1).

( ) Connect either red transformer lead to circuit board hole S (S-1).

( ) Connect the other red transformer lead to circuit board hole P (S-1).

( ) Connect the red stranded wire coming from circuit board hole N to switch SW1 lug 2 (S-1).

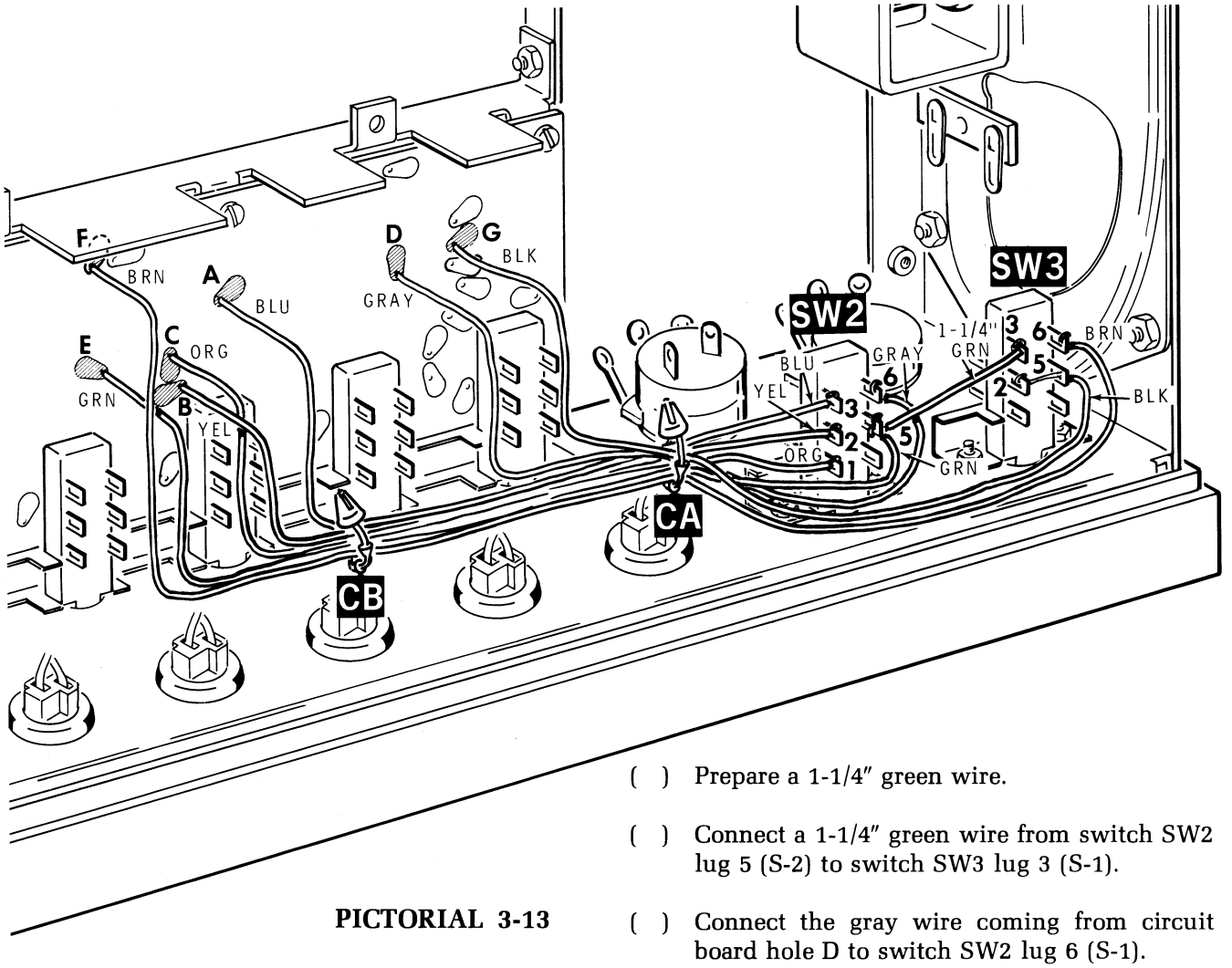
( ) Connect the red stranded wire coming from circuit board hole M to switch SW1 lug 1 (S-1).

( ) Route the free end of the shielded cable coming from circuit board holes J and K to the other end of the circuit board near the lugs of control R3. The free end of this cable will be connected later.

( ) Bend and shape the wires coming from circuit board holes 1 through 8 as shown. Make the first bend in each wire about 3/4" above the circuit board. Group them as neatly as possible. Route wire ties around the wires and shielded cable at CC, CD, CE, and CF. Insert the pointed end of the tie through the locking collar and pull it tight around the wires as shown in the inset drawing. Cut off the excess tie.

( ) Connect the black wire coming from circuit board hole Y to speaker lug 1 (S-1).

( ) Connect the white wire coming from circuit board hole X speaker lug 2 (S-1).



PICTORIAL 3-13

Refer to Pictorial 3-13 for the following steps.

NOTE: As you connect each wire in the following steps, bend and shape it as shown.

( ) Connect the blue wire coming from circuit board hole A to switch SW2 lug 3 (S-1).

( ) Connect the yellow wire coming from circuit board hole B to switch SW2 lug 2 (S-1).

( ) Connect the orange wire coming from circuit board hole C to switch SW2 lug 1 (S-1).

( ) Connect the green wire coming from circuit board hole E to switch SW2 lug 5 (NS).

( ) Prepare a 1-1/4" green wire.

( ) Connect a 1-1/4" green wire from switch SW2 lug 5 (S-2) to switch SW3 lug 3 (S-1).

( ) Connect the gray wire coming from circuit board hole D to switch SW2 lug 6 (S-1).

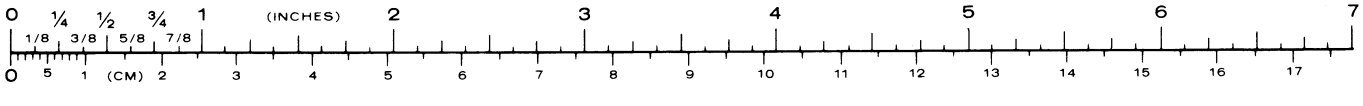
( ) Remove an additional 1/4" of insulation (1/2" total) from the free end of the black wire coming from circuit board hole G.

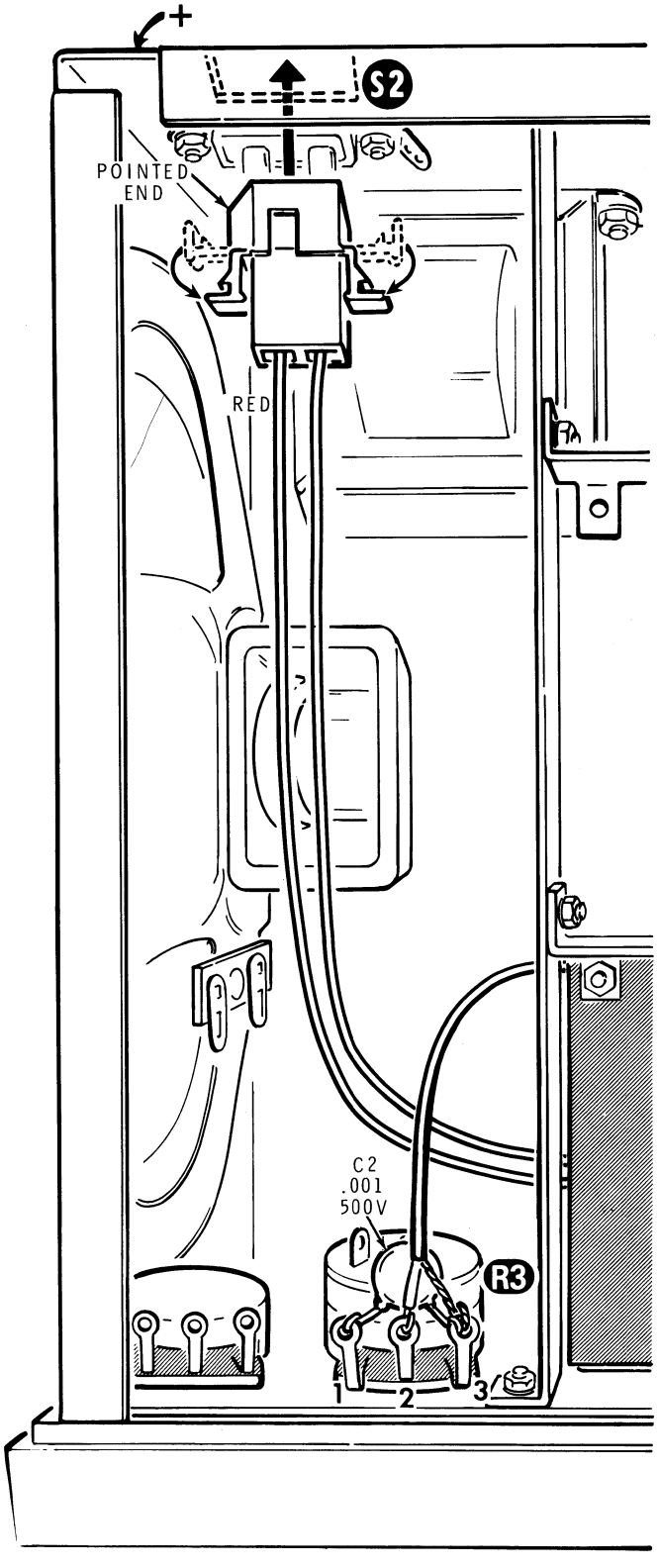
NOTE: Where a wire passes through a connection and then goes to another point, as in the next step, it will count as two wires in the solder instructions (S-2), one entering and one leaving the connection.

( ) Connect the end of the black wire to switch SW3 through lug 5 (S-2) to lug 2 (S-1).

( ) Connect the brown wire coming from circuit board hole F to switch SW3 lug 6 (S-1).

( ) Group the wires neatly together and install wire ties at CA and CB.





PICTORIAL 3-14

Refer to Pictorial 3-14 for the following steps.

( ) Reposition the chassis as shown.

( ) S2: Install socket S2 in chassis hole S2. Bend the tabs back and then push the socket into the hole. Make sure the red wire (and the pointed end of the socket) are toward the plus (+) mark printed on the back of the chassis.

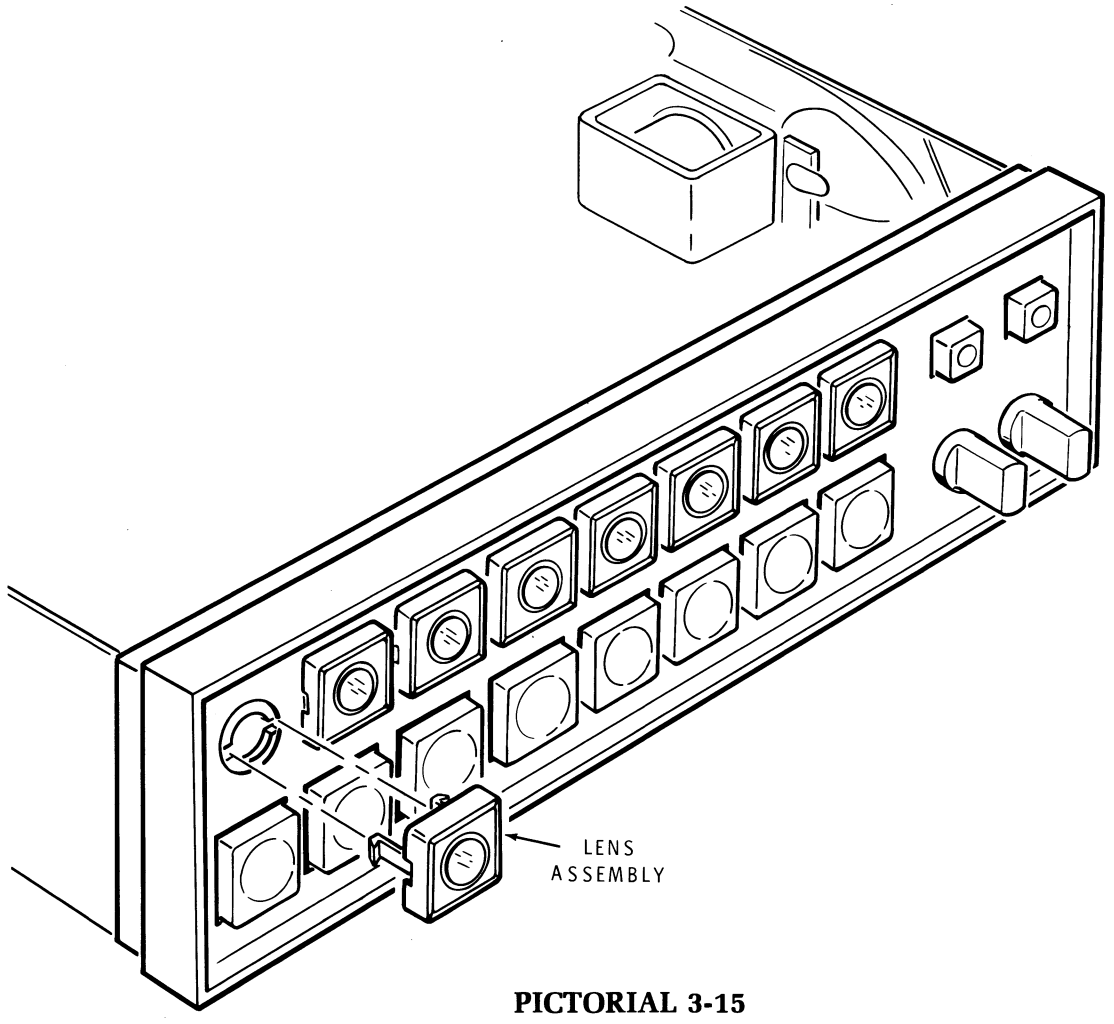
( ) Locate the shielded cable that is near control R3.

( ) Connect the shielded cable to control R3 as follows:

Inner lead to lug 2 (S-1).

Shield lead to lug 3 (NS).

( ) C2: Connect a .001 μF, 500 V ceramic capacitor to control R3 between lugs 1 (NS) and 3 (NS).



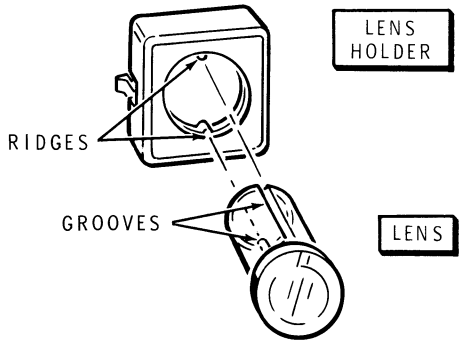
PICTORIAL 3-15

Refer to Pictorial 3-15 for the following steps.

( ) Refer to Detial 3-15A and examine a red lens and a lens holder. Notice that the lens has two grooves and the lens holder has two ridges. IMPORTANT: Make sure you position the ridges of the lens holder into the grooves in the lens when you assemble these parts in the next step.

( ) Carefully assemble eight lens assemblies. Push the lens into the lens holder as far as it will go.

( ) Line up the tabs on the lens assemblies with the notches in the front panel; then push the lens assemblies into place.



Detail 3-15A

DC POWER CABLE ASSEMBLY

Refer to Pictorial 3-16 for the following steps.

( ) Open the in-line fuseholder by twisting the two halves in opposite directions.

( ) Cut the fuseholder lead 6″ from the indicated end as shown.

( ) Insert a 1-1/2″ ampere fuse in the fuseholder; then close the fuseholder.

( ) Locate the remaining length of black **stranded** wire.

( ) Prepare each end of the fuseholder leads and each end of the balck stranded wire.

( ) Install and solder female pins on the end of the 6″ fuseholder lead and on one end of the black stranded wire.

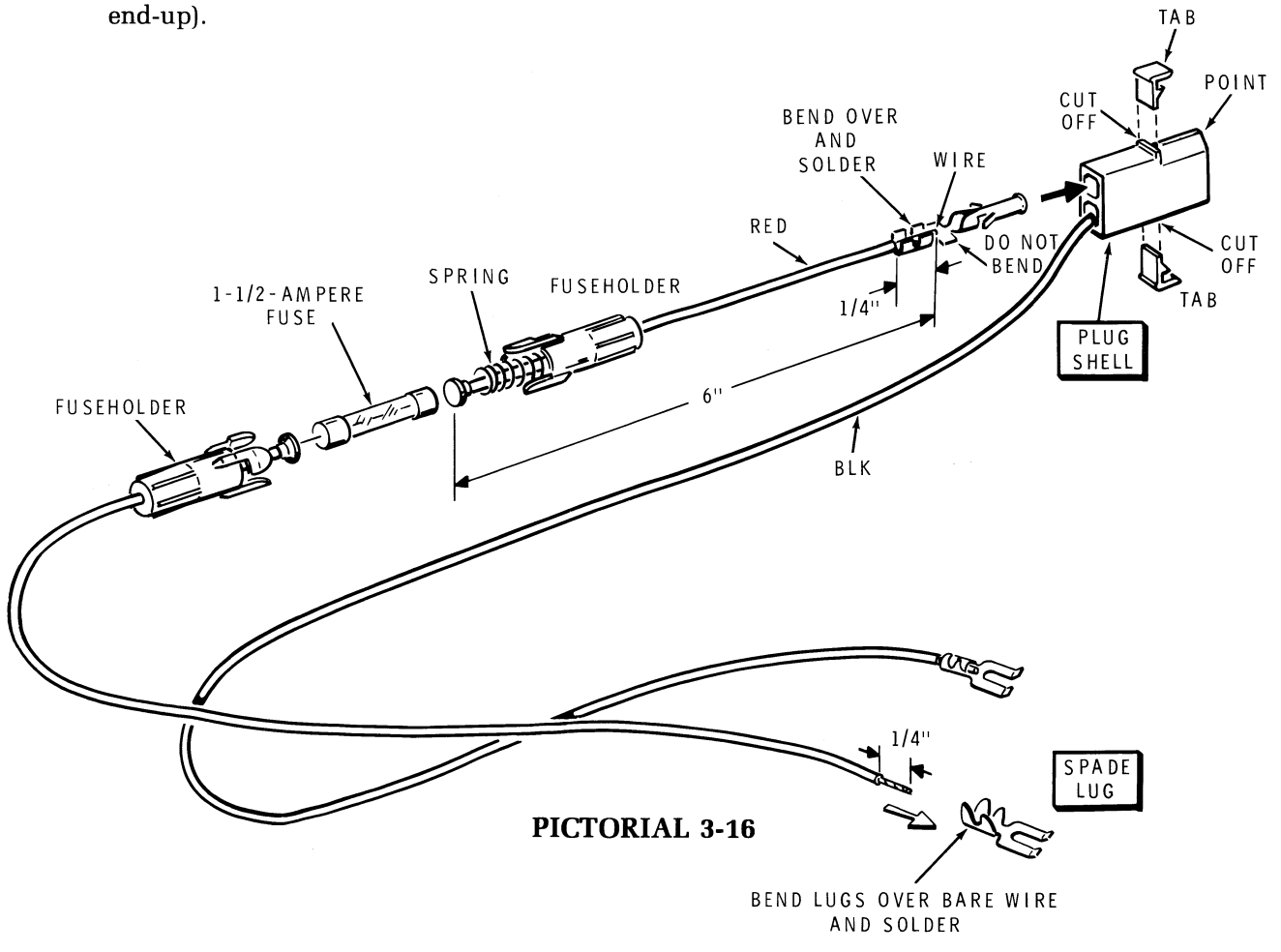
( ) Position the plug shell as shown (pointed-end-up).

( ) Insert the female pin into the end of the fuseholder lead into the plug shell hole nearest the point. Push the pin into the hole until it snaps into place.

( ) Likewise, insert the female pin at the end of the black stranded wire into the other plug shell hole.

( ) Cut off both tabs from the plug shell.

( ) Install and solder spade lugs on the other ends of the fuseholder lead and the black stranded wire. NOTE: Since you will use the DC power cable if you install the Scanner in your vehicle, you can skip this step until after you have installed the Scanner. See "Mobile Installation." This lets you install the spade lug **after** you have routed the wires and cut them to the desired lengths.



PICTORIAL 3-16

PRIMARY WIRING TESTS

A wiring error in the primary wiring circuit (AC connector) of your kit could cause you to receiver a severe electrical shock. These tests will assure you that no wiring errors exist.

( ) Make sure the line cord is not plugged into the back of the Scanner.

If you do not have an ohmmeter, carefully check the AC connector wiring with that shown in Pictorial 3-2 on Page 32. Make sure there are no fine wire strands of wire or solder blobs touching adjacent terminals or the chassis. Then proceed to the "Scanner Circuit Operation Tests."

If you have an ohmmeter, perform the following resistance measurements.

( ) Place the ohmmeter in the "×10 ohms" position.

METER CONNECTIONS		METER READING	POSSIBLE CAUSE OF TROUBLE
RED LEAD	BLACK LEAD		
1. Either prong of the AC connector.	Ground	INFINITE (greater than 2.2 MΩ).	A. AC connector wiring. B. Transformer.
2. Other prong of the AC connector.	Ground	INFINITE (greater than 2.2 MΩ).	A. AC connector wiring. B. Transformer.
3. Either prong of the AC connector.	Other prong of the AC connector.	100 Ω (approximately).	A. Transformer. B. AC connector wiring.

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

SCANNER CIRCUIT OPERATIONAL TESTS

If you do not get the proper results as you perform the following tests, unplug the line cord anf refer to the indicated "Troubleshooting Chart" in the "In Case of Difficulty" section. The components listed in the charts are the most likely causes (but not necessarily the only causes) of a problem. When you check these components, look first for the following items:

— Parts installed incorrectly or backwards. This pertains especially to diodes, electrolytic and tantalum capacitors, and transistors.

— Unsoldered or inadequately soldered parts. Reheat the connections in the area of a problem.

— Incorrect or interchanged parts. Check the part numbers on the diodes and transistors.

If you are still unable to correct the problem, refer to the "In Case of Difficulty" section and read all of the information given there. DO NOT proceed with the next test until the problem has been corrected.

Refer to Pictorial 3-17 (on Page 7 in the Illustration Booklet) for the following steps.

( ) Push all eight CHANNEL pushbuttons in (on).

( ) Turn the VOLUME control off.

( ) Release the SCAN-MAN pushbutton to the out (SCAN) position.

( ) Prepare a 3" yellow jumper wire. Set this jumper wire aside; it will be used later.

( ) Plug the alignment generator into HI VHF socket S3 on the back panel.

( ) Insert the free end of the yellow wire coming from the alignment generator into test point TP1 (13.8V).

( ) Position the eight wires coming from the scanner circuit board so the bare wire ends do not touch anything.

( ) Connect the line cord to AC connector S1 on the back panel.

( ) Connect the line cord plug to an AC outlet.

CAUTION: The power transformer in your Scanner has a built-in thermal fuse in the primary winding. If the transformer secondary wiring (the red wires) becomes shorted, it will take only three minutes for the transformer temperature to rise enough to open the thermal fuse. Once the thermal fuse opens, the transformer must be replaced. If the test lamp or the channel indicator lamps do not light as specified in the following steps, a short circuit may exist in the secondary wiring of the transformer. If this happens, or if you suspect that a short circuit exists, unplug the AC line cord immediately to avoid opening the thermal fuse. Then locate and correct the problem. If the transformer feels hot after you have located a problem, allow it to cool down before you re-apply power. You can peform the "Primary Wiring Tests" on Page 45 to check the thermal fuse to see if it has opened.

( ) Turn the VOLUME control on.

( ) Momentarily touch the green wire coming from the alignment generator to test point TP1 (13.8V). The test lamp (PL601) should light.
[Troubleshooting Chart 1]

( ) Momentarily touch the green wire to test point TP2 (9V). The test lamp should light.
[Troubleshooting Chart 2]

( ) Insert the green wire to test point TP3 (5V). The test lamp should light.
[Troubleshooting Chart 2]

( ) Connect the yellow jumper wire from test point TP4 to test point TP5. The channel indicator lamps should scan in sequence from cahnnel 1 through channel 8.
[Troubleshooting Chart 3]

( ) Remove the jumper wire from test point TP5 when channel indicator lamps 4, 5, or 6 are on. Scanning should stop and, after a brief period, the channel 1 indicator lamp should light and stay lit.
[Troubleshooting Chart 4]

( ) Reinsert the jumper wire into test point TP5. The channel indicator lamps should resume scanning.

( ) Push the SCAN-MAN pushbutton to the in (MANUAL) position. The indicator lamps should stop scanning.
[Troubleshooting Chart 4]

( ) Push and hold the CHANNEL SELECT pushbutton (SW3). The Scanner should scan, but at a much slower rate.
[Troubleshooting Chart 5]

( ) Release the CHANNEL SECLECT pushbutton when the channel 5 indicator lamp comes on. Notice that the channel 5 indicator lamp flashes approximately every 3 to 5 seconds.
[Troubleshooting Chart 4]

( ) Release the SCAN-MAN pushbutton to the out (SCAN) position. The channel indicator lamps should resume scanning.

( ) Release the CHANNEL pushbuttons, one at a time, starting with channel 1 and working up to channel 6. Notice that, as you release each pushbutton, the scanning action bypasses the corresponding channel indicator lamp. Even though the scanning appears to be at a faster rate, it is actually scanning less channels at the same scan rate.
[Troubleshooting Chart 6]

( ) Turn the VOLUME control off.

( ) Disconnect the line cord plug from the AC outlet.

( ) Remove the yellow jumper wire from test points TP4 and TP5. Save this wire; it will be used again later.

Refer to Pictorial 3-18 (on Page 7 in the Illustration Booklet) for the following steps.

( ) Reposition the chassis as shown.

NOTE: When you are instructed to tack solder a component at a specific location, as in the next step, use only a small amount of solder. Also do not bend the lead around the lug as the component will be removed later.

( ) Tack solder one lead of a .05 μF ceramic capacitor to lug 1 of VOLUME control R3.

( ) Connect the line cord plug to an AC outlet.

( ) Turn the VOLUME control on.

( ) Touch the other lead of the capacitor to the indicated circuit board foil. You should hear a buzzing sound from the speaker as you turn the VOLUME control clockwise.
[Troubleshooting Chart 7]

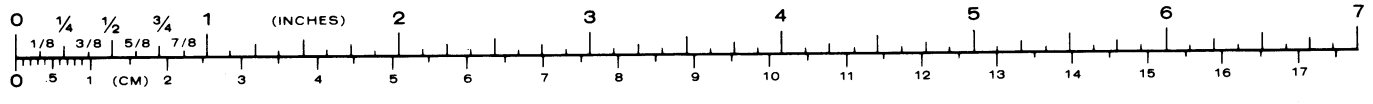
( ) Turn the VOLUME control off.

( ) Disconnect the line cord plug from the AC outlet.

( ) Unsolder and remove the .05 μF ceramic capacitor. Set the capacitor aside; it will be used again later.

( ) Disconnect the alignment generator and its wires from the Scanner.

Save all of the remaining parts; they will be used throughout the rest of the assembly.



IF CIRCUIT BOARD

PARTS LIST

( ) Locate and remove all of the parts from the pack marked #4 (IF).

( ) Unpack these parts. Check each part against the following list. The key numbers correspond to the numbers on the "IF Circuit Board Parts Pictorial" (Illustration Booklet, Page 7).

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

RESISTORS

NOTES:

1. The following resistors have a tolerance of 10% unless they are listed otherwise. 10% is indicated by a fourth color band of silver; 5% is indicated by a gold fourth band.

2. These resistors may be packed in more than one envelope.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
A1	1-62	1	51 Ω, 5% (green-brown-black)	R239
A1	1-112	1	180 Ω, 5% (brown-gray-brown)	R237
A1	1-45	1	220 Ω (red-red-brown)	R238
A1	1-157	4	470 Ω, 5% (yellow-violet-brown)	R212, R229, R234, R249
A1	1-9	1	1000 Ω (brown-black-red)	R224
A1	1-10	8	1200 Ω (brown-red-red)	R201, R202, R203, R204, R205, R206, R207, R208

Resistors (cont'd.)

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
A1	1-11	2	1500 Ω (brown-green-red)	R244, R247
A1	1-57	1	2200 Ω (red-red-red)	R226
A1	1-122	2	3300 Ω, 5% (orange-orange-red)	R231, R243
A1	1-16	8	4700 Ω (yellow-violet-red)	R216, R218, R221, R223, R232, R233, R236, R248
A1	1-18	1	5600 Ω (green-blue-red)	R241
A1	1-116	1	6200 Ω, 5% (blue-red-red)	R255
A1	1-19	2	6800 Ω (blue-gray-red)	R251, R253
A1	1-73	2	8200 Ω (gray-red-red)	R252, R254
A1	1-105	5	10 kΩ, 5% (brown-black-orange)	R209, R217, R219, R222, R242
A1	1-21	1	15 kΩ (brown-green-orange)	R256
A1	1-23	1	27 kΩ (red-violet-orange)	R235
A1	1-67	4	39 kΩ (orange-white-orange)	R211, R213, R214, R246
A1	1-159	3	82 kΩ, 5% (gray-red-orange)	R215, R225, R227
A1	1-29	1	220 kΩ (red-red-yellow)	R245

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
CAPACITORS				
Ceramic				
B1	21-33	1	3.3 pF	C209
B1	21-111	1	15 pF	C206
B1	21-169	1	6 pF	C225
B1	21-167	2	39 pF	C228, C229
B1	21-32	1	47 pF	C222
B1	21-121	1	56 pF	C207
B1	21-96	1	85 pF	C216
B1	21-11	2	150 pF	C204, C211
B1	21-56	1	470 pF	C203
B1	21-163	4	.001 μF	C212, C213, C217, C251
B1	21-176	2	.01 μF	C245, C248
B1	21-143	19	.05 μF	C205, C214, C215, C281, C219, C223, C224, C231, C232, C233, C234, C235, C236, C238, C239, C241, C242, C252, C255
B1	21-95	1	.1 μF	C247
B1	21-99	2	.2 μF	C244, C246
Electrolytic — Tantalum				
B2	25-149	2	5 μF electrolytic	C221, C254
B2	25-115	2	10 μF electrolytic	C249, C253
B3	25-221	1	2.2 μF tantalum	C243
Other				
B4	28-3	1	.56 pF (green-blue-gray phenolic	C202
B4	28-1	1	2.2 pF (red-red-white) phenolic	C237
B4	28-9	1	3 pF (orange-black-white) phenolic	C208
B5	31-68	1	1-8 pF trimmer	C201
COILS - CHOKES - TRANSFORMER				
C1	40-1908	1	Oscillator coil (2-1/2 turns, red)	L201
C2	45-39	1	4.65 μH choke	RFC209
C2	45-51	8	15 μH choke	RFC201, RFC202, RFC203, RFC204, RFC205, RFC206, RFC207, RFC208

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
Coils - Chokes - Transformer (cont'd.)				
C3	45-73	1	2.2 μH (red-red-gold) choke	RFC210
C4	52-120	1	10.7 MHz IF transformer	T201
C4	52-177	2	10.7 MHz matching coil	L203, L204
C4	52-178	1	Quadrature coil	L205
DIODES - TRANSISTORS - INTEGRATED CIRCUIT				
D1	56-56	18	1N4149 diode	D201, D202, D203, D204, D205, D206, D207, D208, D209, D210, D211, D212, D213, D214, D215, D216, D217, D218
D2	56-640	1	MV2110 varactor diode	D219

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

1. Part number.
2. Type number. (For integrated circuits, this refers 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.
5. Color code in addition to the part number and/or type number.

D3	417-91	2	2N5232A transistor	Q206, Q210
D3	417-293	1	2N5770 transistor	Q201
D4	417-154	1	2N2369 transistor	Q209
D3	417-201	4	X29A829 transistor	Q203, Q204, Q205, Q208
D3	417-258	1	TIS87 transistor	Q202
D3	417-801	3	MPSA20 transistor	Q207, Q211, Q212
D5	442-92	1	CA-3089 integrated circuit (IC)	IC201
MISCELLANEOUS				
E1	10-312	1	10 kΩ control	R228
	85-1727-10	1	IF circuit board	
E2	404-574	2	Crystal filter	FL201, FL202
E3	432-134	33	Test point pin (includes 2 extra)	
E4	432-878	16	Crystal socket pin	
E5	475-10	3	Ferrite bead	

STEP-BY-STEP ASSEMBLY

START

Position the IF circuit board as shown. Then complete each step on the following Pictorials.

IMPORTANT: You will install many components on this circuit board. Many of them are very close together. Therefore, take your time and work carefully to avoid making a mistake.

NOTE: When you install a diode, always match the band or bands on the diode with the band mark on the circuit board.

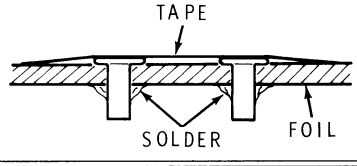
( ) D211-D218: Install eight 1N4149 diodes (#56-56) at D211 through D218.

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

( ) D201-D208: Install eight 1N4149 diodes (#56-56) at D201 through D208.

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

( ) Install 16 crystal socket pins at Y201 through Y208. Insert each pin until it is seated against the circuit board. Place a length of tape over the pins to hold them against the circuit board. Turn the circuit board over and solder the pins to the foil. Remove the tape after the connections have cooled.



( ) C208: 3 pF (orange-black-white) phenolic.

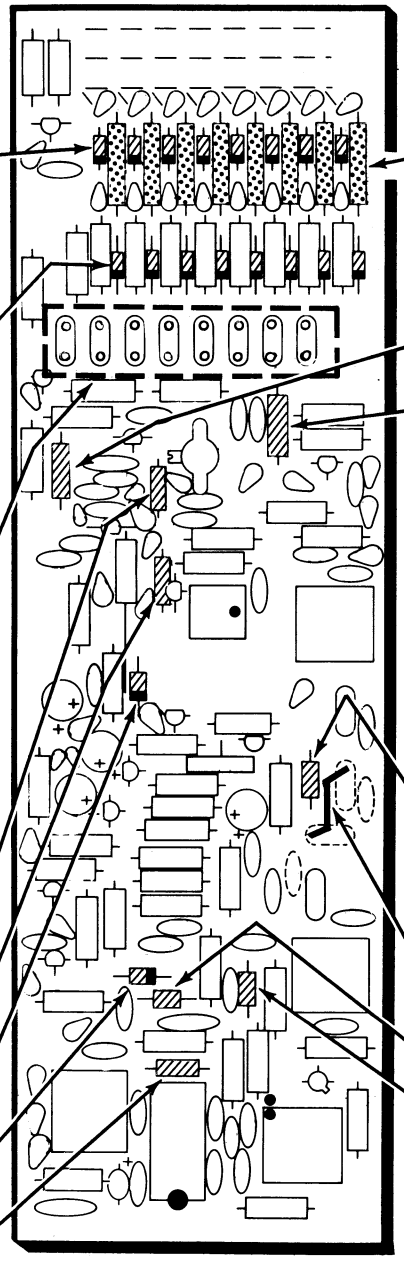
( ) C202: .56 pF (green-blue-gray) phenolic.

( ) D209: 1N4149 diode (#56-56).

( ) D210: 1N4149 diode (#56-56).

( ) C237: 2.2 pF (red-red-white) phenolic.

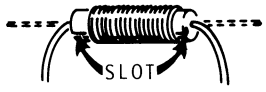
( ) Solder the leads to the foil and cut off the excess lead lengths.



PICTORIAL 4-1

CONTINUE

NOTE: When you install a choke, always bend the leads toward the slots in the coil form.



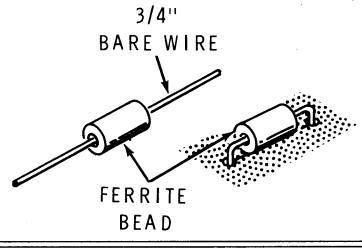
( ) RFC201-RFC208: Install eight 15 μH chokes (#45-51) at RFC201 through RFC208.

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

( ) RFC210: 2.2 μH (red-red-gold) choke (#45-73).

( ) RFC209: 4.65 μH choke (#45-39).

NOTE: When you install a ferrite bead, insert a 3/4" bare wire through the bead and bend the ends down to fit into the circuit board holes.



( ) Ferrite bead.

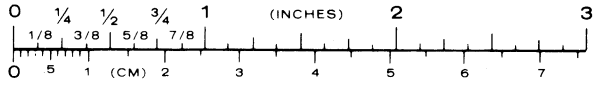
NOTE: If you have purchased the optional GRA-1100-2 crystal filter, disregard the next step.

( ) 1" bare wire.

( ) Ferrite bead.

( ) Ferrite bead.

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



START

( ) R217: 10 kΩ (brown-black-orange).

( ) R218: 4700 Ω (yellow-violet-red).

( ) R205: 1200 Ω (brown-red-red).

( ) R206: 1200 Ω (brown-red-red).

( ) R207: 1200 Ω (brown-red-red).

( ) R208: 1200 Ω (brown-red-red).

( ) R221: 4700 Ω (yellow-violet-red).

( ) R219: 10 kΩ (brown-black-orange).

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

( ) R213: 39 kΩ (orange-white-orange).

( ) R212: 470 Ω (yellow-violet-brown).

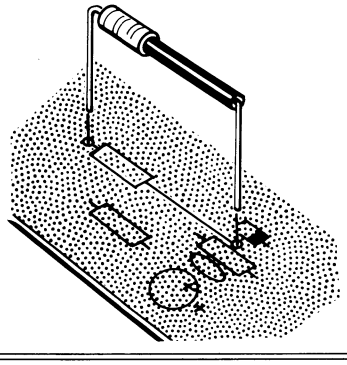
( ) R211: 39 kΩ (orange-white-orange).

( ) R209: 10 kΩ (brown-black-orange).

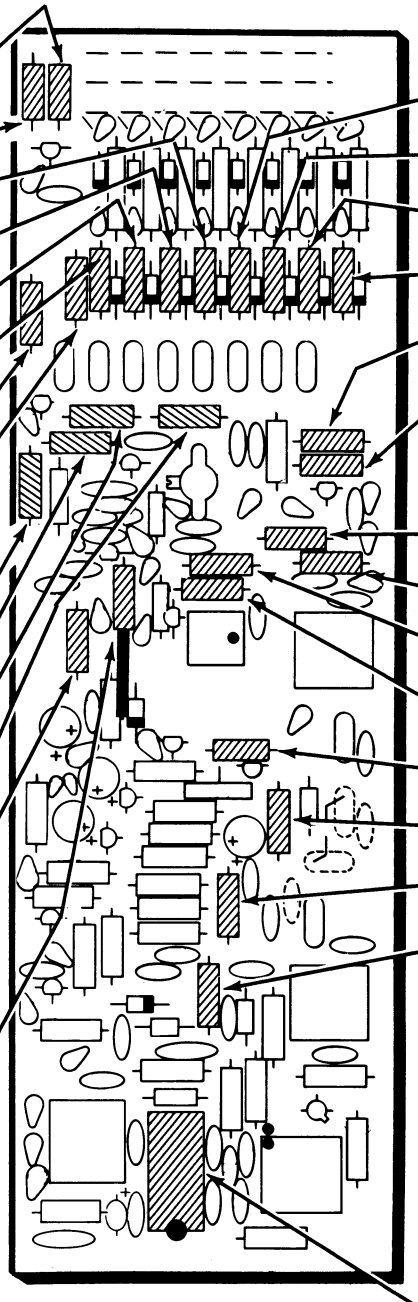
( ) R227: 82 kΩ (gray-red-orange).

( ) Place a 1/2" length of sleeving on one lead of a 39 kΩ (orange-white-orange) resistor.

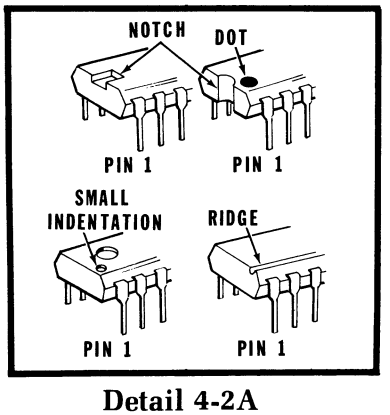
( ) R214: 39 kΩ (orange-white-orange). Insert the lead with sleeving in the hole between the diode and resistor as shown.



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



PICTORIAL 4-2



Detail 4-2A

CONTINUE

( ) R204: 1200 Ω (brown-red-red).

( ) R203: 1200 Ω (brown-red-red).

( ) R202: 1200 Ω (brown-red-red).

( ) R201: 1200 Ω (brown-red-red).

( ) R222: 10 kΩ (brown-black-orange).

( ) R223: 4700 Ω (yellow-violet-red).

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

( ) R224: 1000 Ω (brown-black-red).

( ) R234: 470 Ω (yellow-violet-brown).

( ) R215: 82 kΩ (gray-red-orange).

( ) R216: 4700 Ω (yellow-violet-red).

( ) R232: 4700 Ω (yellow-violet-red).

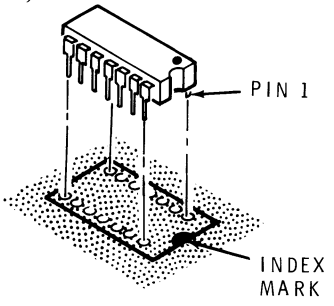
( ) R225: 82 kΩ (gray-red-orange).

( ) R247: 1500 Ω (brown-green-red).

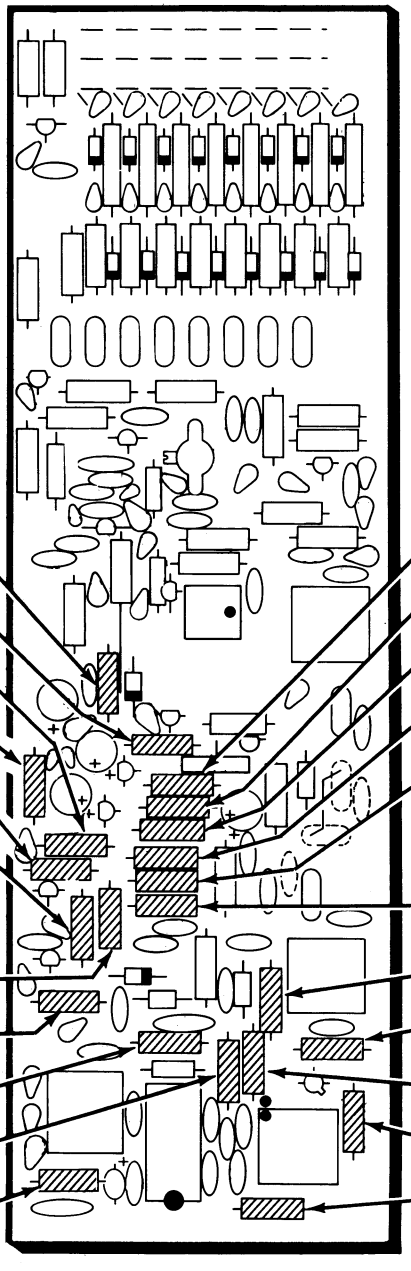
( ) R244: 1500 Ω (brown-green-red).

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

NOTE: Refer to Detail 4-2A. Then, as you install the IC in the following step, position the pin 1 end toward the index mark on the circuit board. Insert the IC leads into the circuit board holes, push it down against the circuit board, and solder the leads (those with foil around them) to the foil.



( ) IC201: CA-3089 integrated circuit (#442-92).



START

( ) R226: 2200 Ω (red-red-red).

( ) R231: 3300 Ω (orange-orange-red).

( ) R246: 39 kΩ (orange-white-orange).

( ) R249: 470 Ω (yellow-violet-brown).

( ) R255: 6200 Ω (blue-red-red).

( ) R253: 6800 Ω (blue-gray-red).

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

( ) R256: 15 kΩ (brown-green-orange).

( ) R251: 6800 Ω (blue-gray-red).

( ) R241: 5600 Ω (green-blue-red).

( ) R243: 3300 Ω (orange-orange-red).

( ) R242: 10 kΩ (brown-black-orange).

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

PICTORIAL 4-3

CONTINUE

( ) R229: 470 Ω (yellow-violet-brown).

( ) R233: 4700 Ω (yellow-violet-red).

( ) R248: 4700 Ω (yellow-violet-red).

( ) R245: 220 kΩ (red-red-yellow).

( ) R254: 8200 Ω (gray-red-red).

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

( ) R252: 8200 Ω (gray-red-red).

( ) R235: 27 kΩ (red-violet-orange).

( ) R236: 4700 Ω (yellow-violet-red).

( ) R237: 180 Ω (brown-gray-brown).

( ) R238: 220 Ω (red-red-brown).

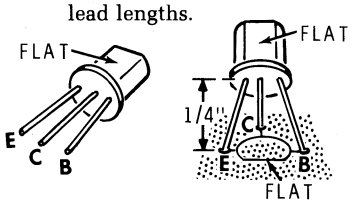
( ) R239: 51 Ω (green-brown-black).

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

START

In the following steps, install each of the transistors as follows:

1. Line up the flat on the transistor with the outline of the flat on the circuit board.
2. Insert the leads into their correct E, C, and B holes.
3. Then solder the leads to the foil and cut off the excess lead lengths.



NOTE: The transistor may not have the skirt shown.

( ) Q203: X29A829 transistor (#417-201).

( ) Q204: X29A829 transistor (#417-201).

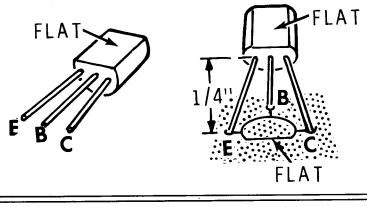
( ) Q205: X29A829 transistor (#417-201).

( ) Q208: X29A829 transistor (#417-201).

( ) Q206: 2N5232A transistor (#417-91).

( ) Q210: 2N5232A transistor (#417-91).

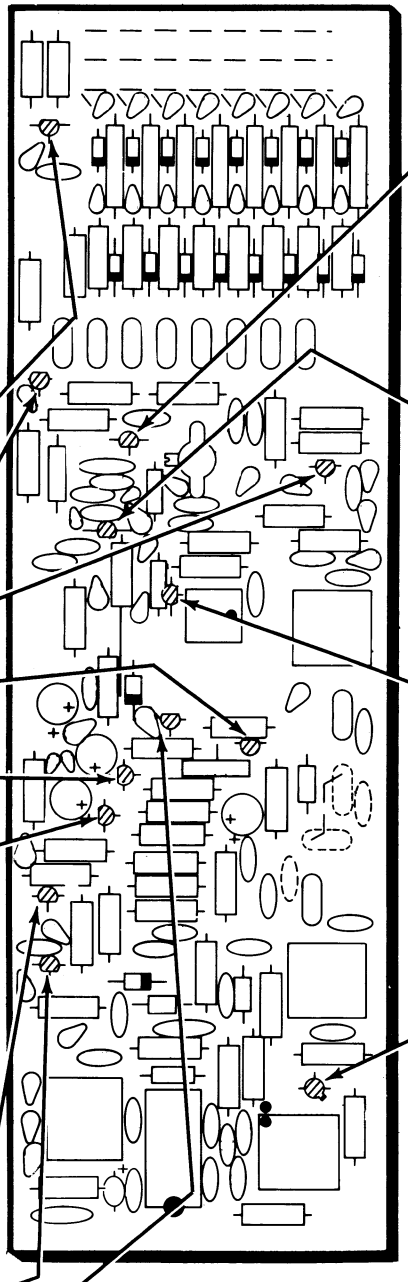
Refer to the illustration below when you install the next three transistors.



( ) Q212: MPSA20 transistor (#417-801).

( ) Q211: MPSA20 transistor (#417-801).

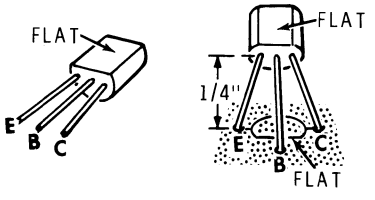
( ) Q207: MPSA20 transistor (#417-801).



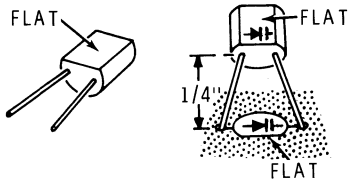
PICTORIAL 4-4

CONTINUE

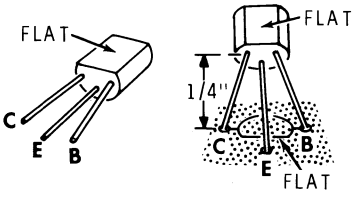
( ) Q201: 2N5770 transistor (#417-293).



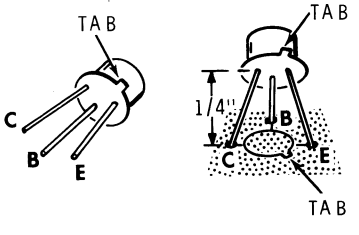
( ) D219: MV2110 diode (#56-640).



( ) Q202: TIS87 transistor (#417-258).



( ) Q209: 2N2369 transistor (#417-154).



START

( ) C218: .05 μF ceramic.

( ) C217: .001 μF ceramic.

( ) C216: 85 pF ceramic.

( ) C212: .001 μF ceramic.

( ) C209: 3.3 pF ceramic.

( ) C211: 150 pF ceramic.

( ) C213: .001 μF ceramic.

( ) C215: .05 μF ceramic.

( ) C214: .05 μF ceramic.

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

( ) C248: .01 μF ceramic.

( ) C242: .05 μF ceramic.

( ) C255: .05 μF ceramic.

( ) C235: .05 μF ceramic.

( ) C239: .05 μF ceramic.

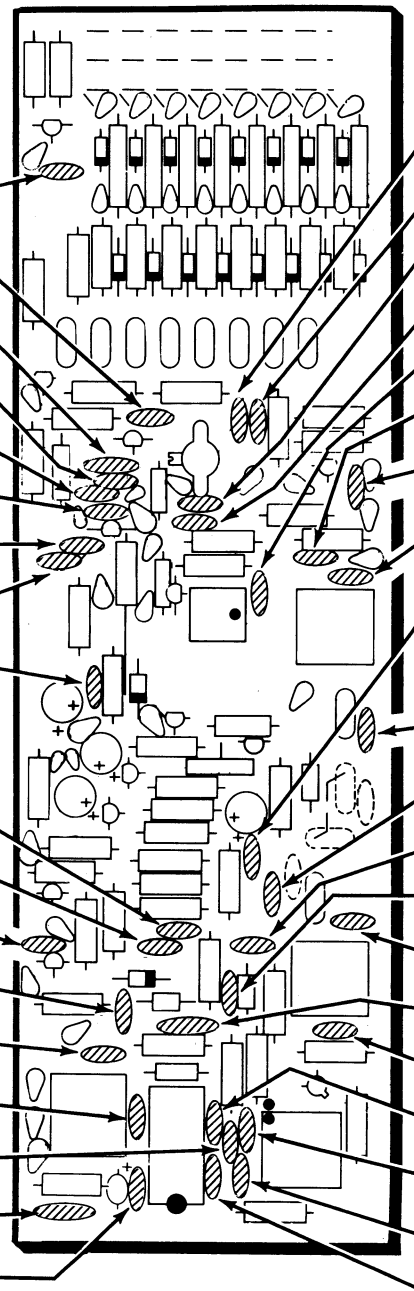
( ) C236: .05 μF ceramic.

( ) C245: .01 μF ceramic.

( ) C244: .2 μF ceramic.

( ) C238: .05 μF ceramic.

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



PICTORIAL 4-5

CONTINUE

( ) C205: .05 μF ceramic.

( ) C204: 150 pF ceramic.

( ) C207: 56 pF ceramic.

( ) C206: 15 pF ceramic.

( ) C203: 470 pF ceramic.

( ) C223: .05 μF ceramic.

( ) C219: .05 μF ceramic.

( ) C222: 47 pF ceramic.

( ) C252: .05 pF ceramic.

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

( ) C225: 6 pF ceramic.

( ) C224: .05 μF ceramic.

( ) C247: .1 μF ceramic.

( ) C234: .05 μF ceramic.

( ) C228: 39 pF ceramic.

( ) C246: .2 μF ceramic.

( ) C229: 39 pF ceramic.

( ) C241: .05 μF ceramic.

( ) C231: .05 μF ceramic.

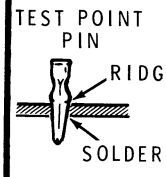
( ) C232: .05 μF ceramic.

( ) C233: .05 μF ceramic.

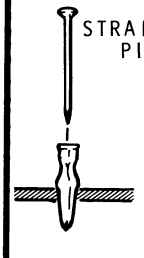
( ) Solder the leads to the foil and cut off the excess lead lengths.

START

NOTE: In the following steps, install the test point pins as follows:



1. Insert the pin until the ridge is seated against the circuit board.
2. Make sure the pin is straight; then solder it to the foil. Be careful you do not fill the pin with solder, as a wire must be inserted into the pin later.
3. After the pin has cooled, insert an ordinary straight pin (not supplied) into the test point pin. Work the straight pin in and out several times to slightly open the test point pin. This will make it easier to insert a wire into the test point pin later.



( ) Install 24 test point pins.

( ) Test point pin at TP6.

( ) Test point pin at TP7.

( ) Test point pin at TP8.

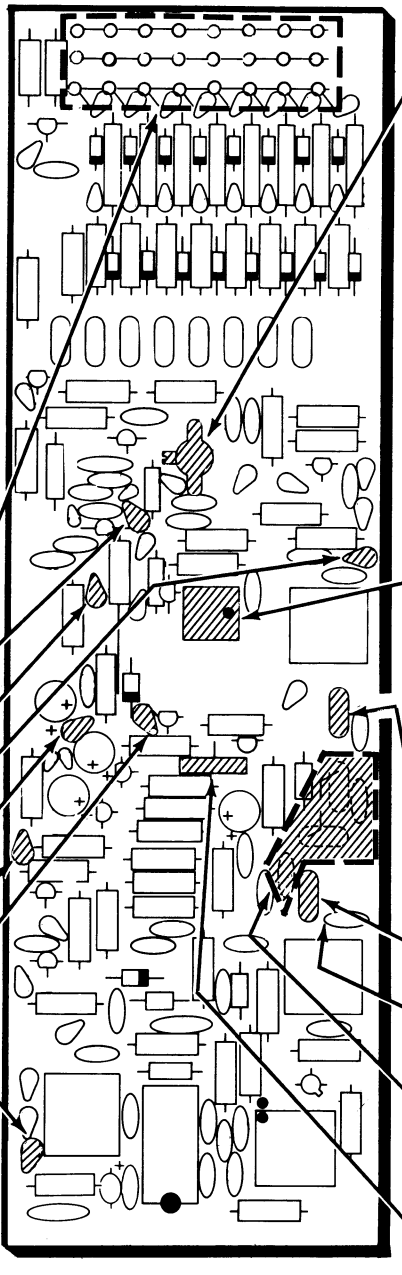
( ) Test point pin at TP12.

( ) Test point pin at TP11.

( ) Test point pin at TP10.

( ) Test point pin at TP9.

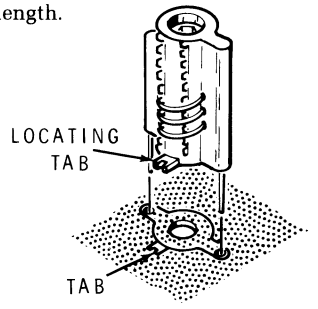
( ) In the same manner as before, insert a straight pin into these test point pins to open them slightly.



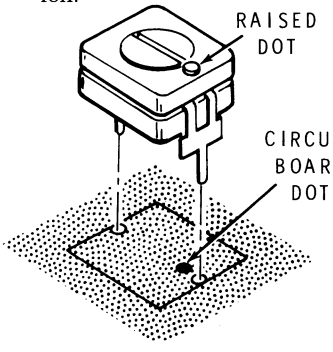
PICTORIAL 4-6

CONTINUE

( ) L201: Oscillator coil (red, #40-1908). Position the locating tab over the outline of the tab on the circuit board. Insert the leads into the holes and push the coil against the circuit board. Then solder the leads to the foil and cut off the excess lead length.



( ) C201: 1-8 pF trimmer. Position the raised dot on the trimmer over the dot shown on the circuit board. Insert the leads into the holes and push the trimmer against the circuit board. Then solder the leads to the foil.



( ) FL201: Crystal filter (#404-574).

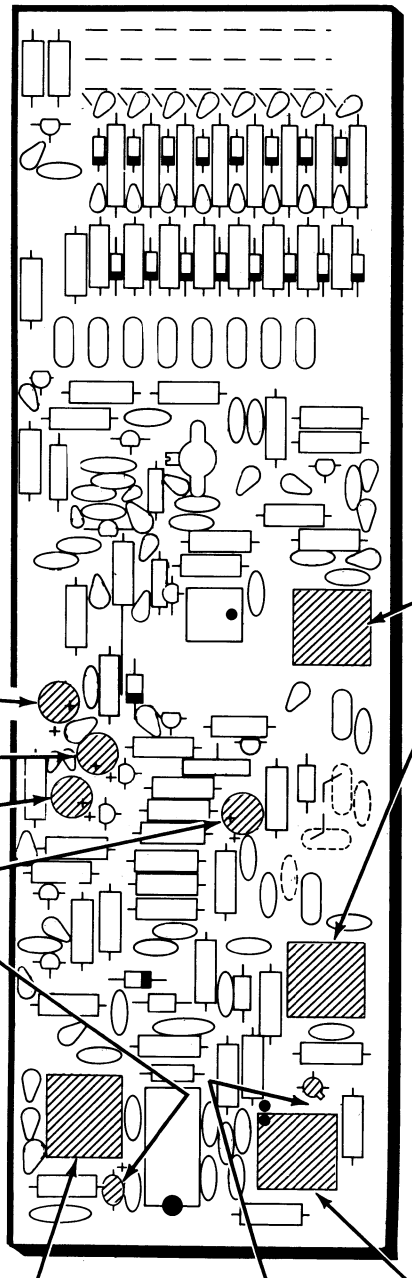
( ) FL202: Crystal filter (#404-574).

NOTE: make sure the metal case on the crystal filter does not touch the lead of the 39 pF ceramic capacitor.

NOTE: If you purchased the optional GRA-1100-2 crystal filter, install it at this time. Refer to the instructions supplied with the filter.

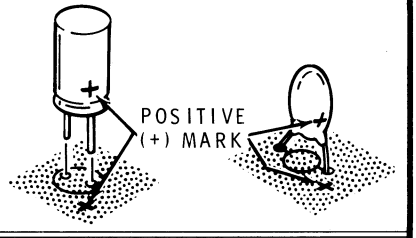
( ) R228: 10 kΩ control (#10-312).

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



START

NOTE: When you install electrolytic and tantalum capacitors, be sure to match the positive (+) marking on the capacitor with the positive (+) marking on the circuit board.



( ) C254: 5 μF electrolytic.

( ) C221: 5 μF electrolytic.

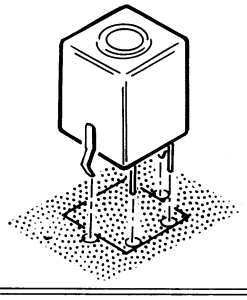
( ) C253: 10 μF electrolytic.

( ) C249: 10 μF electrolytic.

( ) C243: 2.2 μF tantalum.

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

NOTE: The lugs of the following coils are spaced so they can be mounted only one way. Push the coil against the circuit board; then solder the lugs to the foil and cut off the excess lug lengths.



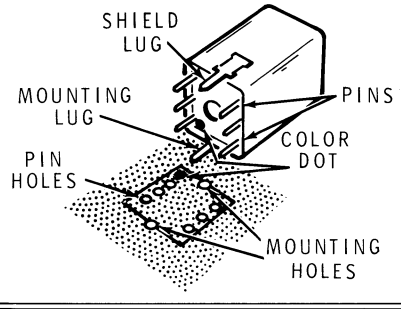
( ) L205: Quadrature coil (#52-178).

CONTINUE

( ) L203: 10.7 MHz matching coil (#52-177).

( ) L204: 10.7 MHz matching coil (#52-177).

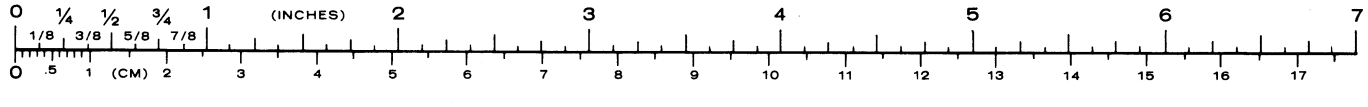
NOTE: When you install the following transformer line up the color dot on the underside of the transformer with the dot on the circuit board. Push the transformer firmly down onto the surface of the circuit board; then solder all lugs and pins that have foil around them. Cut off the shield lugs and pins from the transformers.



( ) T201: 10.7 MHz IF transformer (#52-120).

NOTE: Make sure the body of transistor Q209 does not touch the shield of IF transformer T201. Reposition the transistor if necessary.

PICTORIAL 4-7



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

NOTE: When you prepare the wires in the next step, remove an additional 1/4" of insulation (1/2" total) from one end of each wire.

( ) Prepare the following wires:

2" brown
2" red
2" orange
2" yellow
2" green
2" blue
2" violet
2" gray

NOTE: There are four rows of small holes at the top of the circuit board. Make sure you use the holes in the row nearest the diodes. Each of these holes has a "pear shaped" outline around it.

Connect the 1/4" end of the prepared wires to the IF circuit board in the following steps. The 1/2" prepared end of each wire will be connected later.

( ) Connect a 2" brown wire to hole 1 (S-1).

( ) Connect a 2" red wire to hole 2 (S-1).

( ) Connect a 2" orange wire to hole 3 (S-1).

( ) Connect a 2" yellow wire to hole 4 (S-1).

( ) Connect a 2" green wire to hole 5 (S-1).

( ) Connect a 2" blue wire to hole 6 (S-1).

( ) Connect a 2" violet wire to hole 7 (S-1).

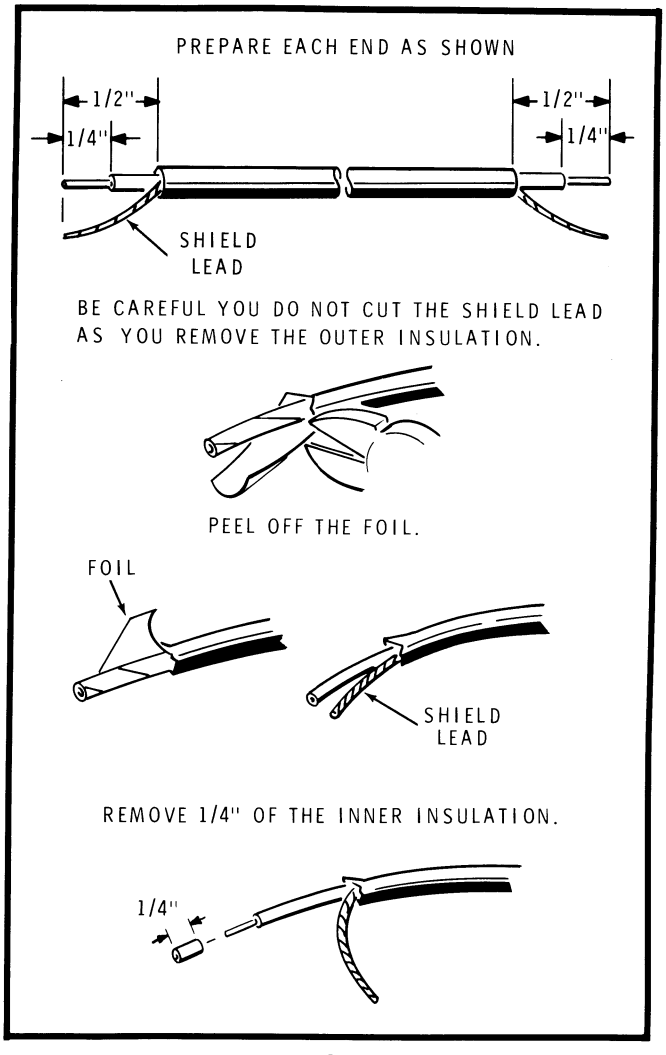
( ) Connect a 2" gray wire to hole 8 (S-1).

( ) Prepare the following wires:

5-3/4" red
2" brown
1" black
5" white
4-1/4" black
4" green

Connect one end of each prepared wire to the IF circuit board in the following steps. The free ends of these wires will be connected later.

( ) Connect a 5-3/4" red wire to hole M (S-1).



Detail 4-8A

( ) Connect a 2" brown wire to hole T (S-1).

( ) Connect a 1" black wire to hole N (S-1).

( ) Connect a 5" white wire to hole R (S-1).

( ) Connect a 4-1/4" black wire to hole S (S-1).

( ) Connect a 4" green wire to hole P (S-1).

( ) Refer to Detail 4-8A and prepare a 6-3/4" shielded cable.

Connect one end of the shielded cable to the IF circuit board in the following step. The other end will be connected later.

( ) Connect the inner lead of the 6-3/4" shielded cable to hole U (S-1). Connect the shield lead to hole W (S-1).

START

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

( ) Cut each lead of a .001 μF ceramic capacitor to 1/4". Then bend each lead as shown.

( ) C238: Connect and solder the leads of the .001 μF ceramic capacitor to the indicated foils. Solder the upper lead to the indicated foil; do not insert the lead into the hole. Then solder the lower lead to the indicated foil (other component leads have already been soldered here). Make sure the capacitor leads do not touch the other nearby foils. Push the body of the capacitor down near the foil.

( ) Prepare a 1-7/8" black wire.

( ) Solder the ends of the 1-7/8" black wire to the two indicated foils.

CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions.

( ) Unsoldered connections.

( ) Poor solder connections.

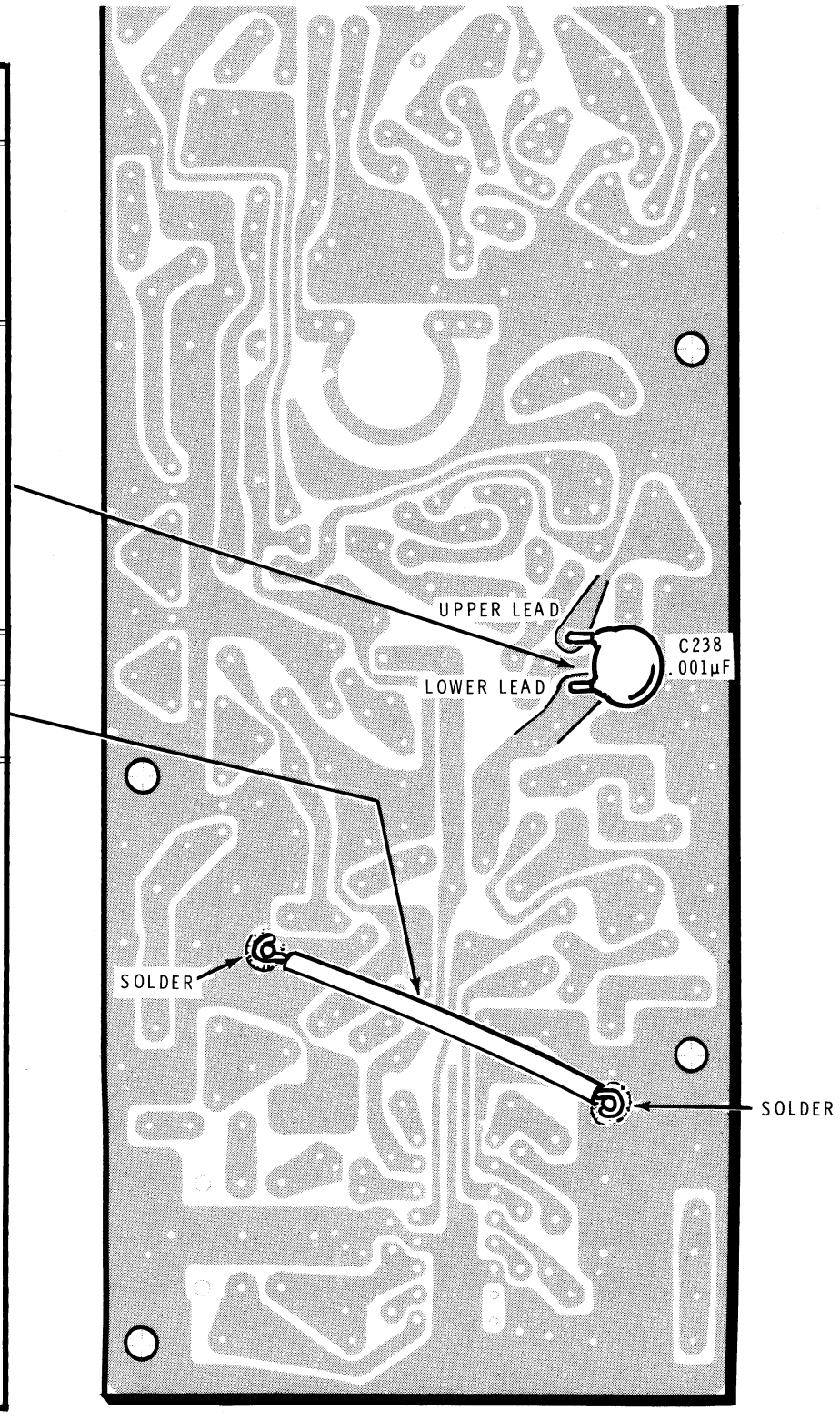
( ) Solder bridges between foils.

( ) Protruding leads which could touch together.

( ) Transistors and IC for the proper type and installation.

( ) Electrolytic and tantalum capacitors for the correct position of the positive (+) end.

( ) Diodes for the correct position of the banded end.



PICTORIAL 4-9

INSTALLATION

Refer to Pictorial 4-10 (Illustration Booklet, Page 9) for the following steps.

( ) Refer to Detail 4-10A and install the IF circuit board in the chassis with 4-40 × 1/4" hardware (seven places). Make sure you do not pinch any of the wires coming from the circuit boards between the chassis and the IF circuit board.

Connect the eight wires coming from the scanner circuit board to the IF circuit board in the following steps.

( ) Gray wire to hole 18 (S-1).

( ) Violet wire to hole 17 (S-1).

( ) Blue wire to hole 16 (S-1).

( ) Green wire to hole 15 (S-1).

( ) Yellow wire to hole 14 (S-1).

( ) Orange wire to hole 13 (S-1).

( ) Red wire to hole 12 (S-1).

( ) Brown wire to hole 11 (S-1).

Connect the wires coming from the IF circuit board in the following steps.

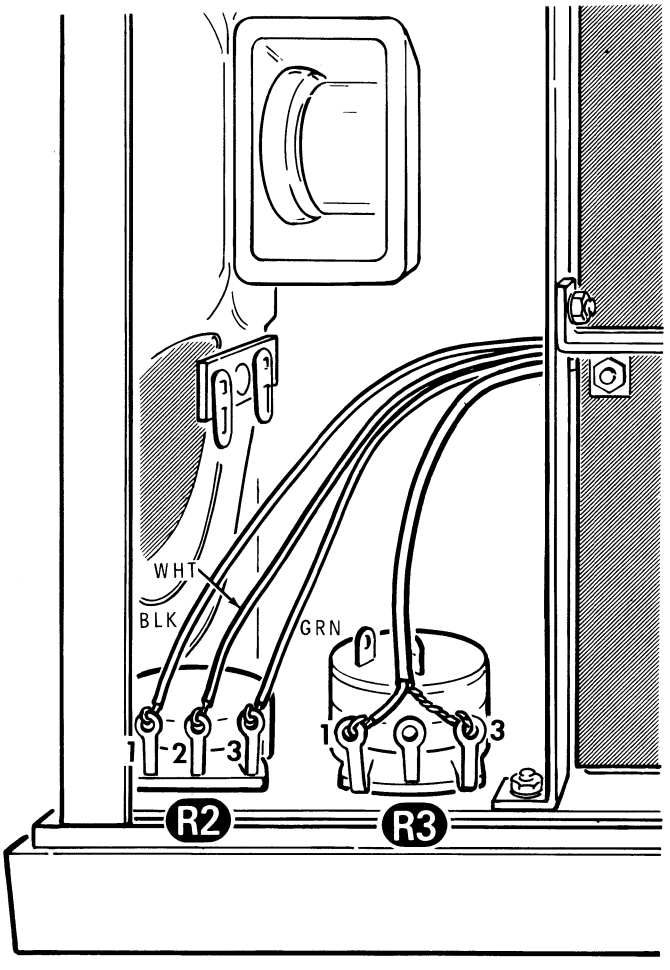
( ) Black wire coming from hole N to scanner circuit board hole W (S-1).

( ) Brown wire coming from hole T to scanner circuit board hole H (S-1).

( ) Red wire coming from hole M to scanner circuit board hole L (S-1).

( ) Route the following wires out through the bottom of the chassis near control R2 and R3:

Green wire coming from hole P.
Black wire coming from hole S.
White wire coming from hole R.
Shielded cable coming from holes U and V.



PICTORIAL 4-11

Refer to Pictorial 4-11 for the following steps.

( ) Reposition the chassis as shown.

( ) Connect the inner lead of the shielded cable to control R3 lug 1 (S-2). Connect the shield lead to control R3 lug 3 (S-3).

( ) Connect the black wire to control R2 lug 1 (S-1). NOTE: Do not be concerned if this lug touches the chassis.

( ) Connect the white wire to control R2 lug 2 (S-1).

( ) Connect the green wire to control R2 lug 3 (S-1).

OPERATIONAL TEST AND ALIGNMENT

Refer to Pictorial 4-12 (Illustration Booklet, Page 10) for the following steps.

( ) Tack solder one lead of a .05 μF ceramic capacitor (the one you used before) to phono socket S3 lug 1. Insert the other lead into test point TP8. NOTE: Shorten the lead, if necessary, to keep this connection as short as possible.

( ) Plug the alignment generator into HI VHF socket S3 on the back panel.

( ) Connect the wires coming from the alignment generator to the scanner circuit board as follows:

Yellow wire to test point TP1 (13.8 V).
Green wire to test point TP2 (9 V).

NOTE: The red wire and the shielded cable are not connected at this time.

( ) Insert the free ends of the wires coming from the IF circuit board holes 1 through 8 into the indicated test point pins as follows:

Brown wire into UHF pin 1.
Red wire into UHF pin 2.
Orange wire into UHF pin 3.
Yellow wire into HI VHF pin 4.
Green wire into HI VHF pin 5.
Blue wire into HI VHF pin 6.
Violet wire into LO VHF pin 7.
Gray wire into LO VHF pin 8.

( ) Connect the line cord plug to an AC outlet.

( ) Make sure the SQUELCH control is turned fully clockwise.

( ) Make sure all eight CHANNEL pushbuttons are pushed in (on).

( ) Make sure the SCAN-MAN pushbutton is released to the out (SCAN) position.

( ) Turn the VOLUME control on. The test lamp should light.

[Troubleshooting Chart 8]

( ) Remove the green wire from test point TP2.

( ) Insert the green wire into test point TP9 on the IF circuit board. The test lamp should light.

[Troubleshooting Chart 9]

( ) Turn the VOLUME control clockwise. You should hear noise (a rushing sound) from the speaker.

[Troubleshooting Chart 10]

( ) Turn the SQUELCH control fully counterclockwise. The Scanner should start scanning and the rushing noise coming from the speaker should stop.

[Troubleshooting Chart 11]

( ) Turn the SQUELCH control fully clockwise. Scanning should stop, and after a brief period, the channel 1 indicator lamp should light.

( ) Insert the red wire into test point TP2 (9 V) on the scanner circuit board.

NOTES:

1. In the following steps, the test lamp will be used as a signal level indicator. You will be instructed to make an adjustment to produce the minimum brightness in the test lamp. If the lamp goes out, turn the RF LEVEL control counterclockwise until the filament in the test lamp just starts to glow; then continue with your adjustment. Slight changes in the test lamp brightness will be easier to see if you dim the room lights.

2. The alignment generator is either connected to the 5-volt supply (TP3) to operate at a low output level, or to the 9-volt supply (TP2) to operate at a high output level. For the first part of the alignment, when the Scanner circuits are significantly misadjusted, the higher output level is necessary to obtain the desired test lamp indications. However, as the alignment progresses and the Scanner circuits become more sensitive, less signal is needed to obtain the same results. Therefore, the adjustments are made first using the high output level (red wire to TP2), and then repeated using the low output level (red wire to TP3). If you cannot adjust the RF LEVEL control to make the test lamp filament turn on when the red wire is connected to TP2, move the red wire to TP3. Then readjust the RF LEVEL control.

( ) Turn the RF LEVEL control clockwise to 3/4 of its maximum clockwise rotation or, until the test lamp just lights.

( ) Adjust quadrature coil L205 for minimum brightness.
[Troubleshooting Chart 12]

( ) Adjust 10.7 MHz IF transformer T201 for minimum brightness.
[Troubleshooting Chart 12]

( ) Readjust quadrature coil L205 for minimum brightness.

( ) Adjust 10.7 MHz matching coil L204 for minimum brightness.
[Troubleshooting Chart 12]

( ) Adjust 10.7 MHz matching coil L203 for minimum brightness.
[Troubleshooting Chart 12]

( ) Insert the red wire into test point TP3 (5 V). Then repeat the five previous steps until no further improvement can be made. Adjust quadrature coil L205 last. This coil is the most critical adjustment and it should be adjusted carefully for minimum lamp brightness.

( ) Turn the RF LEVEL control fully counterclockwise.

( ) Turn the SQUELCH control counterclockwise until the speaker noises quiets. The Scanner should start scanning. NOTE: If the Scanner stops on one of the channels and you hear a rushing noise from the speaker, turn the SQUELCH control further counterclockwise until the Scanner scans all channels without stopping.
[Troubleshooting Chart 13]

( ) Slowly adjust the RF LEVEL control clockwise until the squelch circuit "opens" (when noise is heard from the speaker). Scanning should stop and you should hear noise from the speaker. One of the channel indicator lamps should light; then after a brief period, the channel 1 indicator lamp should light.

( ) Remove the green wire from test point TP9. The test lamp will go out.

( ) Remove the red wire from test point TP3.

( ) Turn the SQUELCH control fully clockwise.

( ) Touch the green wire to the indicated lead (indicated by the arrow) of choke RFC201. The test lamp should not light.

( ) Release the CHANNEL 1 pushbutton to the out (off) position. The test lamp should light.
[Troubleshooting Chart 14]

( ) Repeat the two previous steps for channels 2 through 8. Move the green wire to RFC202 for channel 2, etc.
[Troubleshooting Chart 15]

( ) Push all CHANNEL pushbuttons in (on).

( ) Touch the green wire to the indicated lead of resistor R212 (470 Ω yellow-violet-brown). The test lamp should light.
[Troubleshooting Chart 16]

( ) Release CHANNEL pushbuttons 2, 3, 5, 6, and 8.

( ) Touch the green wire to the indicated lead of resistor R224 (1000 Ω brown-black-red). The test lamp should light.
[Troubleshooting Chart 17]

( ) Release the CHANNEL 1 pushbutton. The test lamp should go out.
[Troubleshooting Chart 17]

( ) Touch the green wire to the collector (C) of transistor Q204. The test lamp should light.
[Troubleshooting Chart 18]

( ) Release the CHANNEL 4 pushbutton. The test lamp should go out.
[Troubleshooting Chart 19]

( ) Touch the green wire to the collector (C) of transistor Q203. The test lamp should light.
[Troubleshooting Chart 19]

( ) Release the CHANNEL 7 pushbutton. The test lamp should go out.
[Troubleshooting Chart 19]

( ) Push the CHANNEL 1 pushbutton.

( ) Turn control R228 (on the IF circuit board) fully counterclockwise (viewed from the speaker side of the chassis).

( ) Insert the green wire into test point TP12. The test lamp should light.
[Troubleshooting Chart 20]

( ) Turn control R228 fully clockwise. The test lamp should go out.

[Troubleshooting Chart 21]

( ) Connect the yellow jumper wire from test point TP10 to test point TP11. Observe and remember the brightness of the test lamp.

( ) Remove the jumper wire from test point TP11. Adjust control R228 counterclockwise to obtain the same lamp brightness you had in the previous step.

[Troubleshooting Chart 20]

( ) Perform the two previous steps until the lamp brightness does not change when the jumper wire is removed from test point TP11.

( ) Remove the jumper wire.

( ) Turn the VOLUME control off.

( ) Disconnect the line cord plug from the AC outlet.

( ) Disconnect the alignment generator and its wires from the Scanner. Set the alignment generator aside.

( ) Unsolder and remove the .05 μF ceramic capacitor. Set the capacitor aside, it will be used again later.

( ) Set the Scanner aside.

HI VHF CIRCUIT BOARD

PARTS LIST

( ) Locate and remove all of the parts from the pack marked #5 (HI VHF).

( ) Unpack these parts. Check each part against the following list. The key numbers correspond to the numbers on the "HI VHF Circuit Board Parts Pictorial."

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

RESISTORS

NOTE: The following resistors have a tolerance of 10% unless they are listed otherwise. 10% is indicated by a fourth color band of silver; 5% is indicated by a gold fourth band.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
A1	1-41	1	10 Ω (brown-black-black)	R304
A1	1-1	1	47 Ω (yellow-violet-black)	R308
A1	1-45	1	220 Ω (red-red-brown)	R303
A1	1-9	2	1000 Ω (brown-black-red)	R4, R302
A1	1-97	1	1100 Ω, 5% (brown-brown-red)	R307
A1	1-44	1	2200 Ω (red-red-red)	R301
A1	1-20	1	10 kΩ (brown-black-orange)	R306
A1	1-22	1	22 kΩ (red-red-orange)	R305

CAPACITORS

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
B1	28-3	1	.56 pF (green-blue-gray) phenolic	C303
B1	28-2	1	1.0 pF (brown-black-white) phenolic	C311
B1	28-9	1	3 pF (orange-black-white) phenolic	C318
B2	21-168	1	4.7 pF ceramic	C312
B2	21-169	2	6 pF ceramic	C301, C304
B2	21-181	1	7.7 pF ceramic	C308
B2	21-3	1	10 pF ceramic	C309
B2	21-6	2	27 pF ceramic	C302, C305
B2	21-163	1	.001 μF ceramic	C306
B2	21-176	1	.01 μF ceramic	C313
B2	21-143	4	.05 μF ceramic	C307, C314, C315, C316
B2	21-95	1	.1 μF ceramic	C317

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

COILS - CHOKES

C1	40-1906	1	Orange RF coil (3-1/2 turns tapped)	L304
C1	40-1907	3	Yellow RF coil (4-1/2 turns)	L301, L302, L303
C2	45-74	1	.47 μH choke	L1
C2	45-39	1	4.65 μH choke	RFC301
C3	52-176	1	10.7 MHz IF coil	L305
C4	475-10	1	Ferrite bead	

TRANSISTORS

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

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

D1	417-887	1	MPSH10 transistor	Q301
D1	417-888	1	2N5222 transistor	Q302

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

HARDWARE

#4 Hardware

E1	250-52	3	4-40 × 1/4" screw
E2	252-15	3	4-40 nut
E3	254-9	3	#4 lockwasher

1/4" Hardware

E4	455-31	1	1/4-32 threaded bushing
E5	252-39	1	1/4-32 nut
E6	254-14	1	1/4" internal tooth lockwasher
E7	254-12	1	1/4" external tooth lockwasher

MISCELLANEOUS

	85-1726-5	1	HI VHF circuit board
F1	438-4	1	Phono plug

NOTE: The following part is located in the bottom of the shipping carton.

F2	142-128	1	HI VHF antenna (6-section)

STEP-BY-STEP ASSEMBLY

START

Position the circuit board as shown. Then complete each step on the Pictorial.

( ) R304: 10 Ω (brown-black-black).

( ) R301: 2200 Ω (red-red-red).

( ) R303: 220 Ω (red-red-brown).

( ) RFC301: 4.65 μH choke (#45-39).

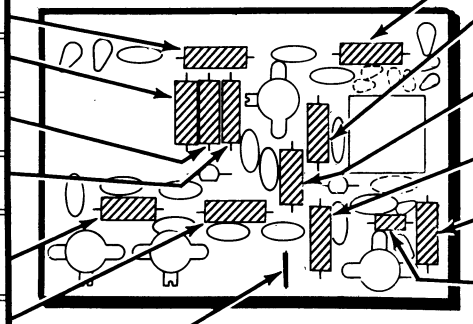
( ) C303: .56 pF (green-blue-gray) phenolic.

( ) R302: 1000 Ω (brown-black-red).

( ) Prepare a 3/4" length of bare wire.

( ) 3/4" jumper wire.

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



PICTORIAL 5-1

CONTINUE

( ) R308: 47 Ω (yellow-violet-black).

( ) R305: 22 kΩ (red-red-orange).

( ) C311: 1.0 pF (brown-black-white) phenolic.

( ) R306: 10 kΩ (brown-black-orange).

( ) R307: 1100 Ω (brown-brown-red).

( ) C318: 3 pF (orange-black-white) phenolic.

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

NOTE: You will have a 1000 Ω (brown-black-red) resistor left over. It will be used later.

START

( ) C307: .05 μF ceramic.

( ) C309: 10 pF ceramic.

( ) C305: 27 pF ceramic.

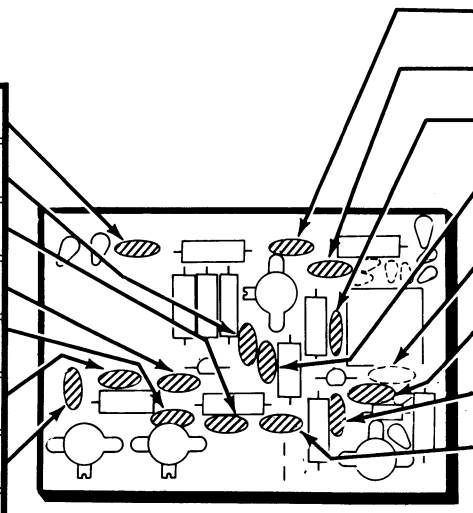
( ) C306: .001 μF ceramic.

( ) C304: 6 pF ceramic.

( ) C301: 6 pF ceramic.

( ) C307: 27 pF ceramic.

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



CONTINUE

( ) C314: .05 μF ceramic.

( ) C317: .1 μF ceramic.

( ) C315: .05 μF ceramic.

( ) C308: 7.7 pF ceramic.

Do not install a capacitor at this location.

( ) C316: .05 μF ceramic.

( ) C313: .01 μF ceramic.

( ) C312: 4.7 pF ceramic.

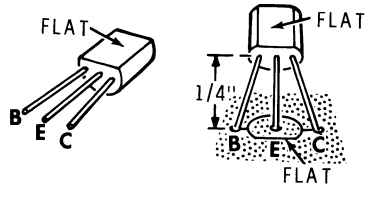
( ) Solder the leads to the foils and cut off the excess lead lengths.

PICTORIAL 5-2

START

In the following steps, install each transistor as follows:

1. Line up the flat on the transistor with the outline of the flat on the circuit board.
2. Insert the leads into their correct B, E, and C holes.
3. Solder the leads to the foil and cut off the excess lead lengths.



( ) Q301: MPSH10 transistor (#417-887).

( ) Q302: 2N5222 transistor (#417-888).

NOTES:

1. **When you install the coils in the following steps, make sure you align the coils with the coil outlines on the circuit board.**
2. **Solder the leads to the foil and cut of the excess lead lengths as you install each of the following components.**

( ) L301: Yellow RF coil (#40-1907).

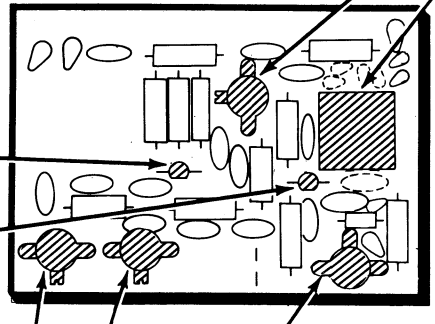
( ) L302: Yellow RF coil (#40-1907).

( ) L304: Orange RF coil (#40-1906).

CONTINUE

( ) L303: Yellow RF coil (#40-1907).

( ) L305: 10.7 MHz IF coil (#52-176).

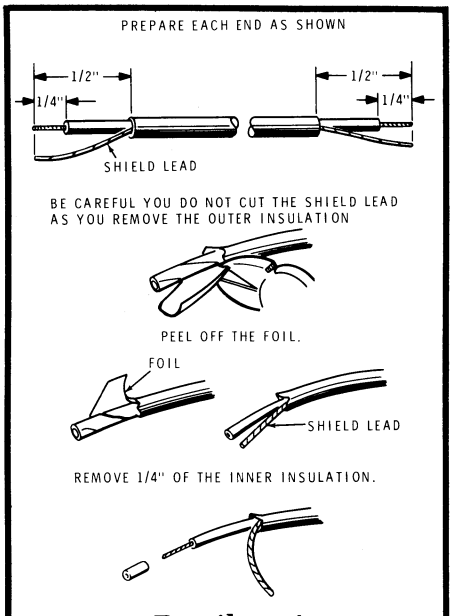


PICTORIAL 5-3

START

( ) Refer to Detail 5-4A below and prepare the following shielded cables:

2-1/2"
two 4-1/4"



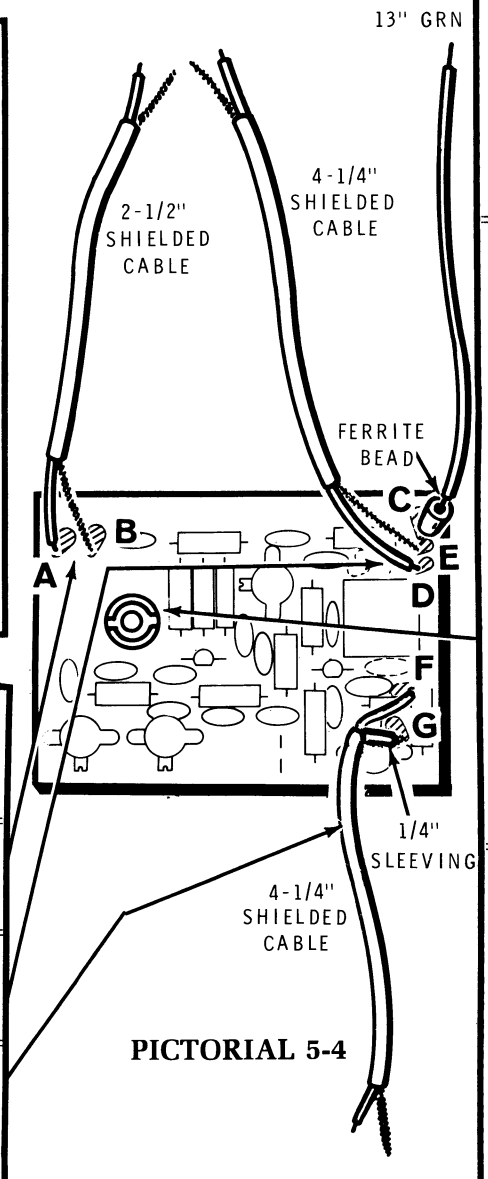
Detail 5-4A

NOTE: Only one end of each cable will be connected to the circuit board in the following steps. The other end will be connected later.

( ) Connect the inner lead of a 2-1/2" shielded cable to hole A (S-1). Connect the shield lead to hole B (S-1).

( ) Connect the inner lead of a 4-1/4" shielded cable to hole D (S-1). Connect the shield lead to hole E (S-1).

( ) Connect the inner lead of a 4-1/4" shielded cable to hole F (S-1). Slide a 1/4" length of small sleeving onto the shield lead. Then connect the shield lead to hole G (S-1).



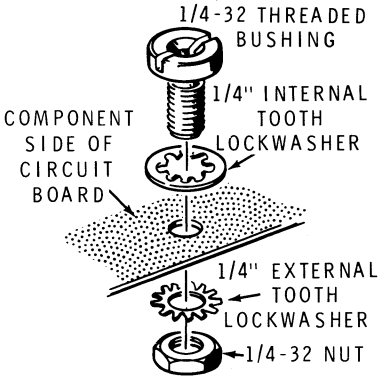
PICTORIAL 5-4

CONTINUE

( ) Prepare a 13" green wire. Then remove an additional 1/4" of insulation (1/2" total) from one end.

( ) Slide a ferrite bead onto the 1/2" prepared end of the green wire. Then connect the wire to circuit board hole C (S-1).

( ) Install a 1/4-32 threaded bushing with a 1/4" internal tooth lockwasher, a 1/4" external tooth lockwasher, and a 1/4-32 nut. Be sure you install the external tooth lockwasher on the foil side of the circuit board. DO NOT overtighten the nut.



CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions.

( ) Unsoldered connections.

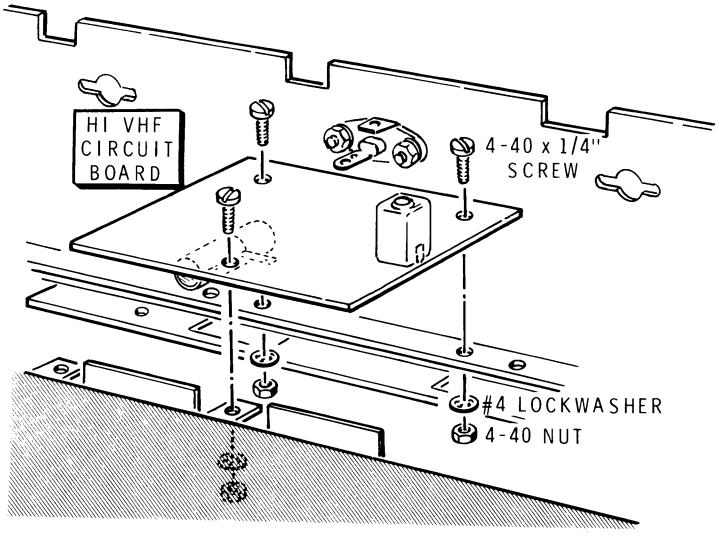
( ) Poor solder connections.

( ) Solder bridges between foils.

( ) Protruding leads which could touch together.

( ) Transistors for the proper type and installation.

INSTALLATION



PICTORIAL 5-5

Refer to Pictorial 5-5 for the following step.

( ) Install the HI VHF circuit board in the chassis with 4-40 × 1/4" hardware.

Refer to Pictorial 5-6 for the following steps.

( ) Connect the free end of the shielded cable coming from HI VHF circuit board holes F and G to the IF circuit board as follows:

Inner lead to hole D (S-1).
Shield lead to hole E (S-1).

( ) Connect the free end of the shielded cable coming from HI VHF circuit board holes D and E to the IF circuit board as follows:

Inner lead to hole K (S-1).
Shield lead to hole L (S-1).

( ) Connect the free end of the shielded cable coming from HI VHF circuit board holes A and B to phono socket S3 as follows:

Inner lead to lug 1 (NS).
Shield lead to lug 2 (NS).

( ) Connect the free end of the green wire coming from HI VHF circuit board hole C to IF circuit board hole B (S-1). Route this wire as shown.

( ) R4: Connect a 1000 Ω (brown-black-red) resistor to phono socket S3 between lugs 1 (NS) and 2 (S-2).

( ) L1: Connect a .47 μH choke (#45-74) from trimmer capacitor C5 lug 1 (S-1) to phono socket S3 lug 1 (NS).

( ) Set the Scanner aside.

( ) Set the antenna aside until it is called for later. The phono plug you have left will only be used if you use an external antenna (not supplied). See "Antennas" on Page 97.

UHF CIRCUIT BOARD

PARTS LIST

( ) Locate and remove all of the parts from the pack marked #6 (UHF).

( ) Unpack these parts. Check each part against the following list. The key numbers correspond to the numbers on the "UHF Circuit Board Parts Pictorial."

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

RESISTORS

NOTE: The following resistors have a tolerance of 10%. This is indicated by a fourth color band of silver.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
A1	1-1	1	47 Ω (yellow-violet-black)	R507
A1	1-8	1	820 Ω (gray-red-brown)	R503
A1	1-9	2	1000 Ω (brown-black-red)	R6, R502
A1	1-44	1	2200 Ω (red-red-red)	R506
A1	1-18	1	5600 Ω (green-blue-red)	R501
A1	1-20	1	10 kΩ (brown-black-orange)	R505
A1	1-22	1	22 kΩ (red-red-orange)	R504

CAPACITORS

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
B1	28-1	1	2.2 pF (red-red-white) phenolic	C3
B2	21-158	1	3.9 pF ceramic	C511
B2	21-3	1	10 pF ceramic	C503
B2	21-163	3	.001 μF ceramic	C505, C506, C507
B2	21-143	5	.05 μF ceramic	C508, C509, C510, C512, C513
B2	21-95	1	.1 μF ceramic	C514
B3	31-68	2	1-8 pF trimmer	C501, C502

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

TRANSISTORS

NOTE: Transistors 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.

C1	417-887	1	MPSH10 transistor	Q501
C1	417-888	1	2N5222 transistor	Q502

HARDWARE

#4 Hardware

D1	250-52	3	4-40 × 1/4″ screw
D2	252-15	3	4-40 nut
D3	254-9	3	#4 lockwasher

#6 Hardware

D4	250-587	2	6-32 × 5/16″ screw
D5	252-3	2	6-32 nut
D6	254-1	2	#6 lockwasher

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

Hardware (cont'd.)

1/4″ Hardware

D7	455-31	1	1/4-32 threaded bushing
D8	254-14	2	1/4″ lockwasher
D9	252-39	1	1/4-32 nut

MISCELLANEOUS

E1	45-39	1	4.65 μH choke	RFC501
E2	475-10	1	Long ferrite bead	
E2	475-15	1	Short ferrite bead	
	85-1725-2	1	UHF circuit board	
E3	434-42	1	Phono socket	S4
E4	438-4	1	Phono plug	

NOTE: The following part is located in the bottom of the shipping carton.

E5	142-726	1	UHF antenna (2-section)

STEP-BY-STEP ASSEMBLY

START

Position the circuit board as shown. Then complete each step as shown in the Pictorial.

NOTE: Make sure you mount all of the components as close to the circuit board as possible. The added capacitance caused by excessive lead lengths can affect the UHF operation.

( ) R503: 820 Ω (gray-red-brown).

( ) RFC501: 4.65 μF choke (#45-39).

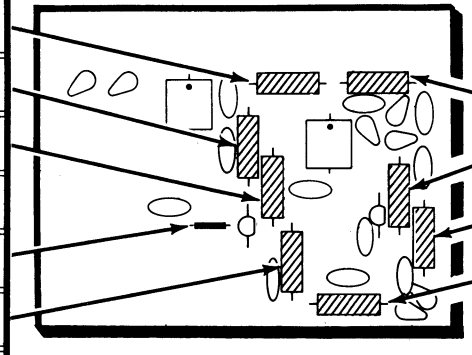
( ) R501: 5600 Ω (green-blue-red).

( ) Prepare a 3/4" bare wire.

( ) 3/4" jumper wire.

( ) R502: 1000 Ω (brown-black-red).

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



CONTINUE

( ) R507: 47 Ω (yellow-violet-black).

( ) R504: 22 kΩ (red-red-orange).

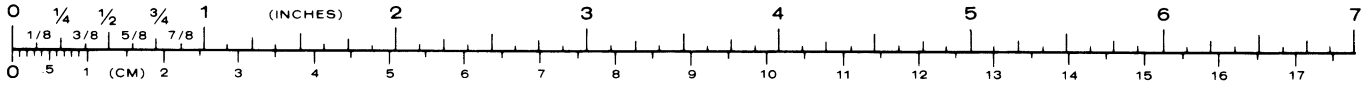
( ) R506: 2200 Ω (red-red-red).

( ) R505: 10 kΩ (brown-black-orange).

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

NOTE: You will have a 1000 Ω (brown-black-red) resistor left over. Set it aside temporarily. It will be used later.

PICTORIAL 6-1



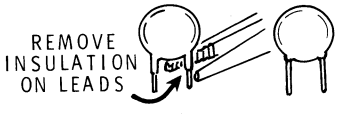
START

NOTE: When you install the trimmer capacitors in the next two steps, make sure you match the raised dot on the trimmer to the dot shown on the circuit board. Solder the lugs to the foil as you install each trimmer.

( ) C502: 1-8 pF trimmer.

( ) C501: 1-8 pF trimmer.

NOTE: Before you install the next twelve ceramic capacitors, use long-nose pliers to remove the excess insulation from the capacitor leads.



( ) C508: .05 μF ceramic.

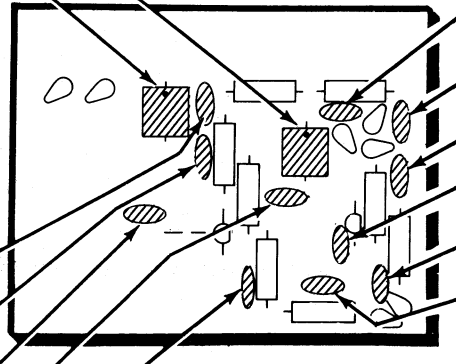
( ) C509: .05 μF ceramic.

( ) C503: 10 pF ceramic.

( ) C506: .001 μF ceramic.

( ) C505: .001 μF ceramic.

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



PICTORIAL 6-2

CONTINUE

( ) C510: .05 μF ceramic.

( ) C514: .1 μF ceramic.

( ) C513: .05 μF ceramic.

( ) C512: .05 μF ceramic.

( ) C517: 3.9 pF ceramic.

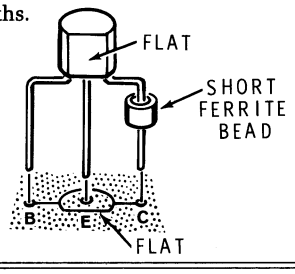
( ) C507: .001 μF ceramic.

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

NOTE: You will have a 2.2 pF (red-red-white) phenolic capacitor left over. It will be used later.

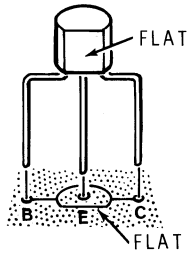
START

NOTE: Before you install the next transistor, carefully form the leads as shown. To do this, first bend each lead up 90° as shown. Make this bend as close to the transistor body as possible. Then bend each lead down 90° so the leads can be inserted into the circuit board holes. Slide a short ferrite bead onto the collector (C) lead of the transistor. Install the transistor as close to the circuit board as the ferrite bead will permit. Solder the leads to the foil and cut off the excess lead lengths.

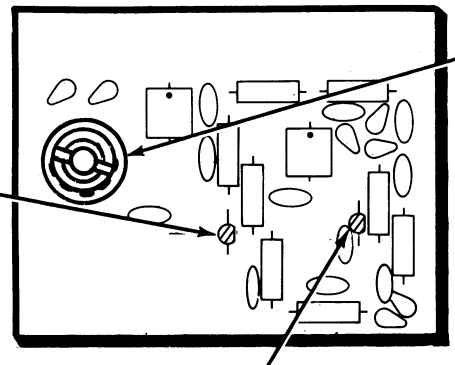


( ) Q501: MPSH10 transistor (#417-887).

NOTE: Before you install the next transistor, carefully form the leads as shown. To do this, first bend each lead up 90° as shown. Make this bend as close to the transistor body as possible. Then bend each lead down 90° so the leads can be inserted into the circuit board holes. Install the transistor as close to the circuit board as possible. Solder the leads to the foil and cut off the excess lead lengths.

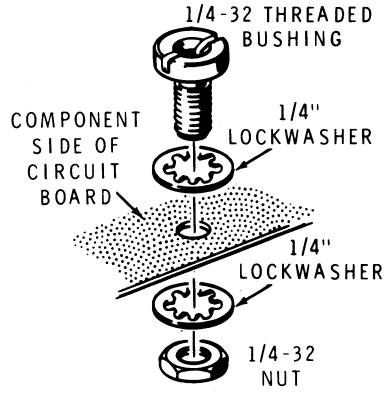


( ) Q502: 2N5222 transistor (#417-888).



CONTINUE

( ) Install a 1/4-32 threaded bushing with two 1/4" lockwashers and a 1/4-32 nut. DO NOT overtighten the nut.

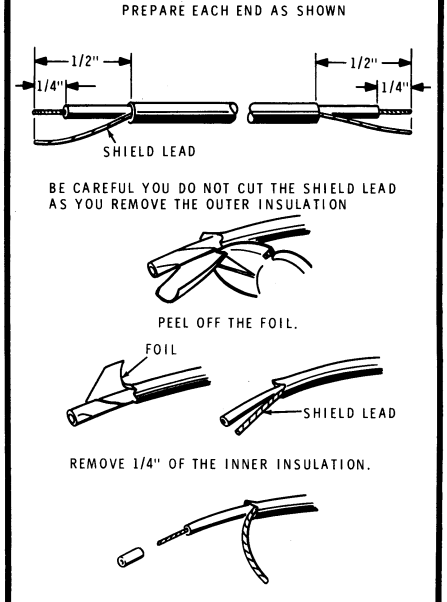


PICTORIAL 6-3

START

( ) Refer to Detail 6-4A below and prepare the following shielded cables:

2-1/2"
4-3/4"
3-1/4"



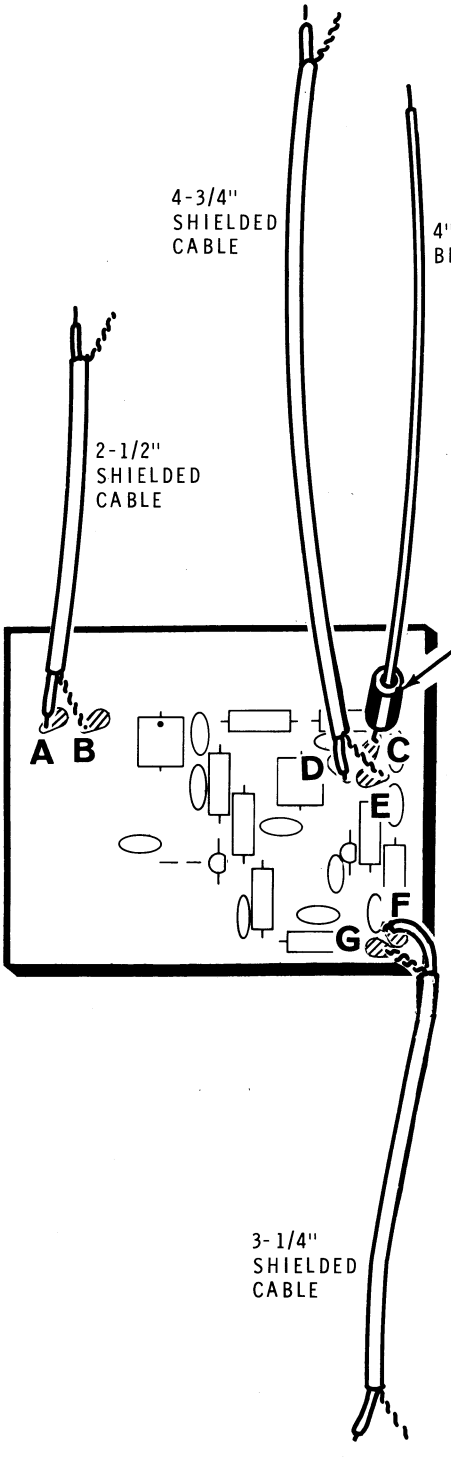
Detail 6-4A

NOTE: Only one end of each cable will be connected to the circuit board in the following steps. The other end will be connected later.

( ) Connect the inner lead of a 2-1/2" shielded cable to hole A (S-1). Connect the shield lead to hole B (S-1).

( ) Connect the inner lead of a 4-3/4" shielded cable to hole D (S-1). Connect the shield lead to hole E (S-1).

( ) Connect the inner lead of a 3-1/4" shielded cable to hole F (S-1). Connect the shield lead to hole G (S-1).



PICTORIAL 6-4

CONTINUE

( ) Prepare a 4" blue wire. Then remove an additional 1/4" of insulation (1/2" total) from one end.

( ) Slide a long ferrite bead onto the 1/2" prepared end of the blue wire. Then connect the wire to circuit board hole C (S-1).

CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions.

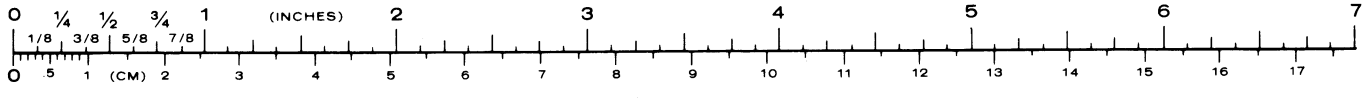
( ) Unsoldered connections.

( ) Poor solder connections.

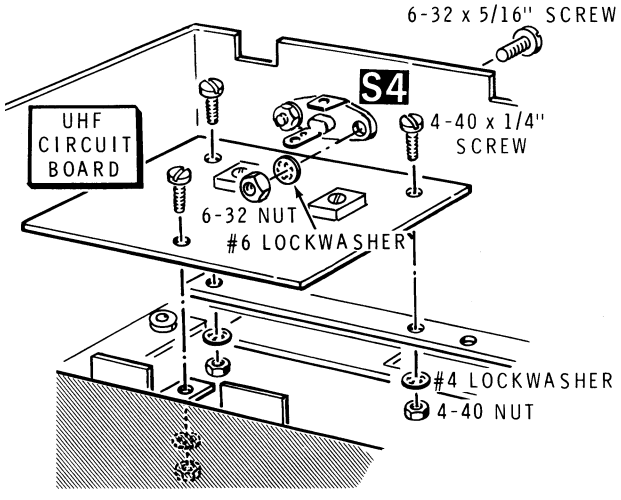
( ) Solder bridges between foils.

( ) Protruding leads which could touch together.

( ) Transistors for the proper type and installation.



INSTALLATION



PICTORIAL 6-5

Refer to Pictorial 6-5 for the following steps.

( ) Install the UHF circuit board in the chassis with 4-40 × 1/4" hardware.

( ) S4: Mount a phono socket to the back of the chassis at S4 with 6-32 × 5/16" hardware. Position the socket so the short lug faces up as shown.

Refer to Pictorial 6-6 for the following steps.

( ) Connect the free end of the shielded cable coming from UHF circuit board holes F and G to the IF circuit board as follows:

Inner lead to hole H (S-1).
Shield lead to hole J (S-1).

( ) Connect the free end of the shielded cable coming from UHF circuit board holes D and E to the HI VHF circuit board as follows:

Inner lead to hole K (S-1).
Shield lead to hole L (S-1).

( ) Connect the free end of the blue wire coming from UHF circuit board hole C to IF circuit board hole C (S-1).

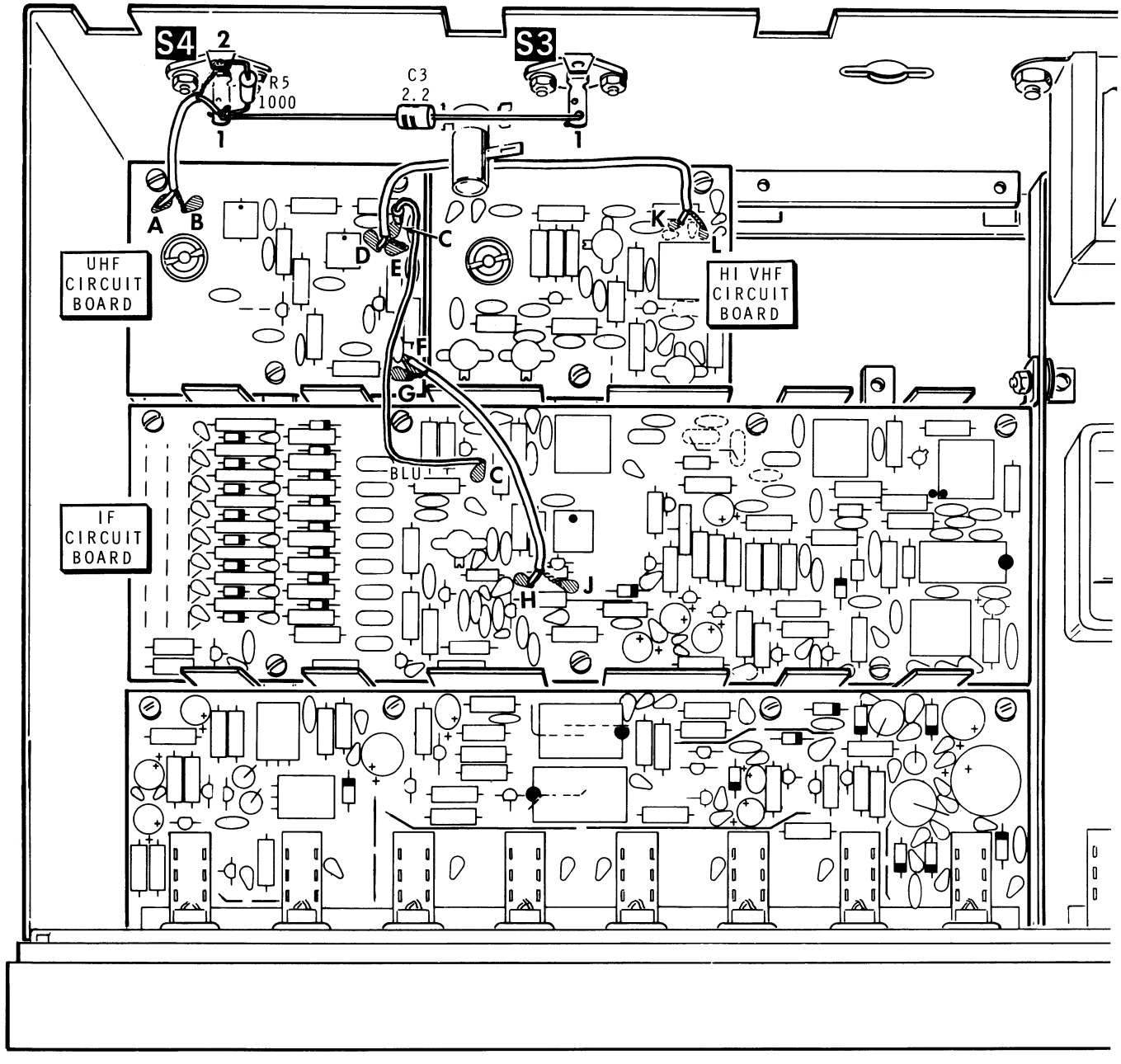
( ) Connect the free end of the shielded cable coming from UHF circuit board holes A and B to phono socket S4 as follows:

Inner lead to lug 1 (NS).
Shield lead to lug 2 (NS).

( ) R5: Connect a 1000 Ω (brown-black-red) resistor to phono socket S4 between lugs 1 (NS) and 2 (S-2).

( ) C3: Connect a 2.2 pF (red-red-white) phenolic capacitor from phono socket S4 lug 1 (S-3) to phono socket S3 lug 1 (NS).

( ) Set the antenna aside until it is called for later. The phono plug you have left will only be used if you use an external antenna (not supplied). See "Antennas" on Page 97.



PICTORIAL 6-6

LO VHF CIRCUIT BOARD

PARTS LIST

( ) Locate and remove all of the parts from the pack marked #7 (LO VHF).

( ) Unpack these parts. Check each part against the following list. The key numbers correspond to the numbers on the "LO VHF Circuit Board Parts Pictorial."

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

RESISTORS

NOTE: The following resistors have a tolerance of 10%. This is indicated by a fourth color band of silver.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
A1	1-41	1	10 Ω (brown-black-black)	R406
A1	1-1	1	47 Ω (yellow-violet-black)	R411
A1	1-3	1	100 Ω (brown-black-brown)	R403
A1	1-45	1	220 Ω (red-red-brown)	R404
A1	1-7	1	680 Ω (blue-gray-brown)	R405
A1	1-9	3	1000 Ω (brown-black-red)	R5, R402, R409
A1	1-44	1	2200 Ω (red-red-red)	R401
A1	1-20	1	10 kΩ (brown-black-orange)	R408
A1	1-22	1	22 kΩ (red-red-orange)	R407

CAPACITORS

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
B1	21-3	1	10 pF ceramic	C404
B1	21-6	1	27 pF ceramic	C401
B1	21-7	1	33 pF ceramic	C409
B1	21-32	1	47 pF ceramic	C4
B2	20-109	1	62 pF mica	C412
B2	20-141	2	82 pF mica	C402, C405
B2	20-183	2	120 pF mica	C403, C406
B1	21-22	1	220 pF ceramic	C414
B1	21-176	1	.01 μF ceramic	C413
B1	21-143	5	.05 μF ceramic	C407, C408, C411, C415, C416
B1	21-95	1	.1 μF ceramic	C417

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
COILS - CHOKES				
C1	40-1855	2	Blue RF coil (6-1/2 turns)	L402, L403
C1	40-1856	1	Green RF coil (5-1/2 turns)	L404
C2	45-75	1	.68 μH choke (on 1500 Ω resistor)	L401
C3	475-10	1	Ferrite bead	
TRANSISTORS				
NOTE: Transistors 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.	
D1	417-888	2	2N5222 transistor	Q401, Q402
HARDWARE				
#4 Hardware				
E1	250-52	3	4-40 × 1/4" screw	
E2	252-15	3	4-40 nut	
E3	254-9	3	#4 lockwasher	

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
Hardware (cont'd.)				
#6 Hardware				
E4	250-587	2	6-32 × 5/16" screw	
E5	252-3	2	6-32 nut	
E6	254-1	2	#6 lockwasher	
1/4" Hardware				
E7	455-31	1	1/4-32 threaded bushing	
E8	254-14	2	1/4" lockwasher	
E9	252-39	1	1/4-32 nut	
MISCELLANEOUS				
	85-1724-1	1	LO VHF circuit board	
F1	434-42	1	Phono socket	S5
F2	438-4	1	Phono plug	
NOTE: The following part is located in the bottom of the shipping carton.				
F3	142-42	1	LO VHF antenna (10-section)	

STEP-BY-STEP ASSEMBLY

START

Position the circuit board as shown. Then complete each step on the following Pictorials.

( ) R401: 2200 Ω (red-red-red).

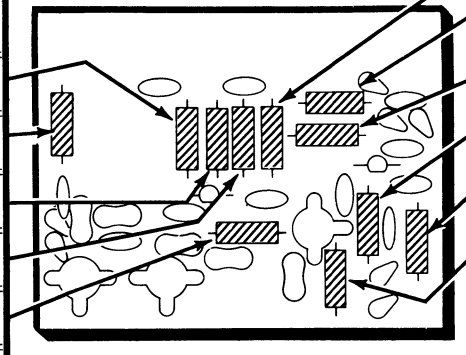
( ) L401: .68 μH choke (#45-75).

( ) R404: 220 Ω (red-red-brown).

( ) R403: 100 Ω (brown-black-brown).

( ) R402: 1000 Ω (brown-black-red).

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



PICTORIAL 7-1

CONTINUE

( ) R406: 10 Ω (brown-black-black).

( ) R403: 47 Ω (yellow-violet-black).

( ) R407: 22 kΩ (red-red-orange).

( ) R408: 10 kΩ (brown-black-orange).

( ) R409: 1000 Ω (brown-black-red).

( ) R405: 680 Ω (blue-gray-brown).

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

NOTE: You will have a 1000 Ω (brown-black-red) resistor left over. It will be used later.

START

( ) C411: .05 μF ceramic.

( ) C407: .05 μF ceramic.

( ) C409: 33 pF ceramic.

( ) C408: .05 μF ceramic.

( ) C401: 27 pF ceramic.

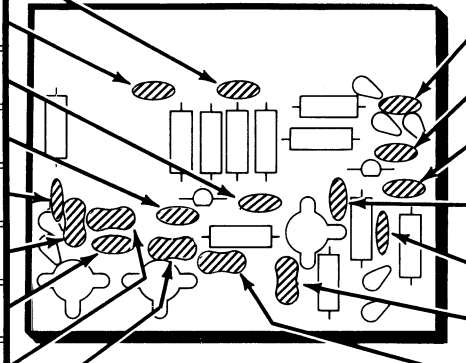
( ) C403: 120 pF mica.

( ) C404: 10 pF ceramic.

( ) C402: 82 pF mica.

( ) C405: 82 pF mica.

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



PICTORIAL 7-2

CONTINUE

( ) C417: .1 μF ceramic.

( ) C416: .05 μF ceramic.

( ) C415: .05 μF ceramic.

( ) C413: .01 μF ceramic.

( ) C414: 220 pF ceramic.

( ) C412: 62 pF mica.

( ) C406: 120 pF mica.

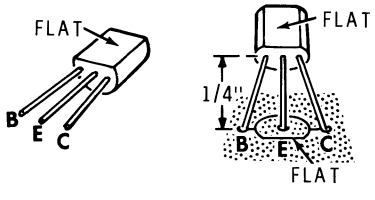
( ) Solder the leads to the foil and cut off the excess lead lengths.

NOTE: You will have a 47 pF ceramic capacitor left over. It will be used later.

START

In the following step install each transistor as follows:

1. Line up the flat on the transistor with the outline of the flat on the circuit board.
2. Insert the leads into their correct B, E, and C holes.
3. Solder the leads to the foil and cut off the excess lead lengths.



( ) Q402: 2N5222 transistor (#417-888).

( ) Q401: 2N5222 transistor (#417-888).

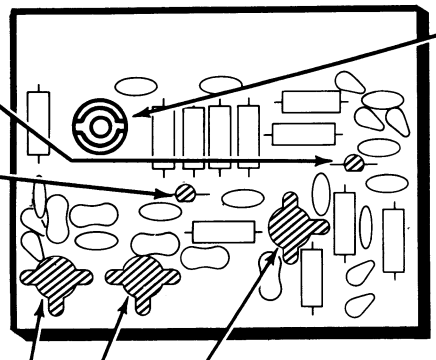
NOTES:

1. When you install the coils in the following steps, make sure you align the coils with the coil outlines on the circuit board.
2. Solder the leads to the foil and cut of the excess lead lengths as you install each of the following components.

( ) L402: Blue RF coil (#40-1855).

( ) L403: Blue RF coil (#40-1855).

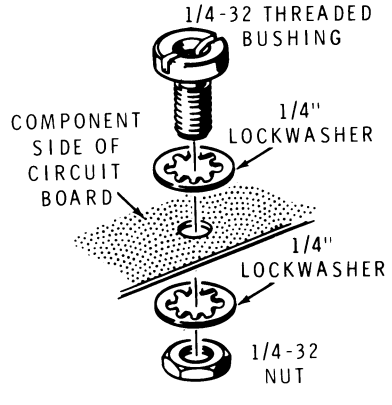
( ) L404: Green RF coil (#40-1856).



PICTORIAL 7-3

CONTINUE

( ) Install a 1/4-32 threaded bushing with two 1/4" lockwashers and a 1/4-32 nut. DO NOT overtighten the nut.



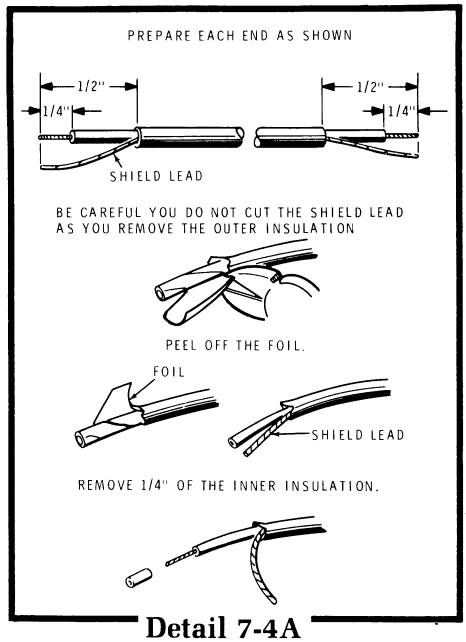
START

( ) Prepare a 13″ yellow wire. Then remove an additional 1/4″ of insulation from one end (1/2″ total).

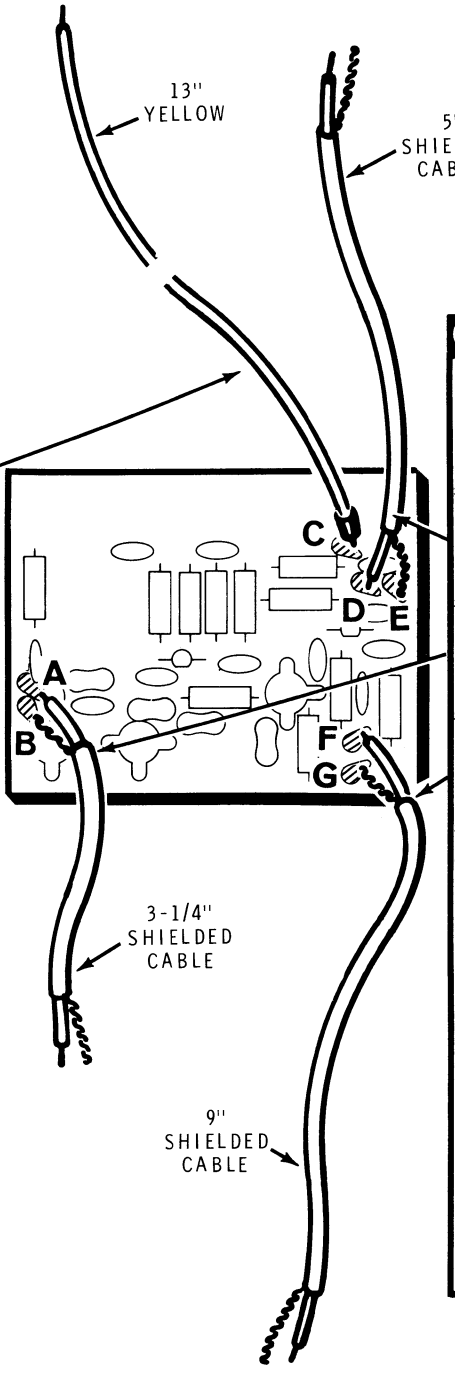
( ) Slide a ferrite bead onto the 1/2″ end of the yellow wire. Then connect the wire to circuit board hole C (S-1).

( ) Refer to Detail 7-4A below and prepare the following shielded cables:

5″
3-1/4″
9″



Detail 7-4A



PICTORIAL 7-4

CONTINUE

NOTE: Only one end of each cable will be connected to the circuit board in the following steps. The other end will be connected later.

( ) Connect the inner lead of a 5″ shielded cable to hole D (S-1). Connect the shield lead to hole E (S-1).

( ) Connect the inner lead of a 3-1/4″ shielded cable to hole A (S-1). Connect the shield lead to hole B (S-1).

( ) Connect the inner lead of a 9″ shielded cable to hole F (S-1). Connect the shield lead to hole G (S-1).

CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions.

( ) Unsoldered connections.

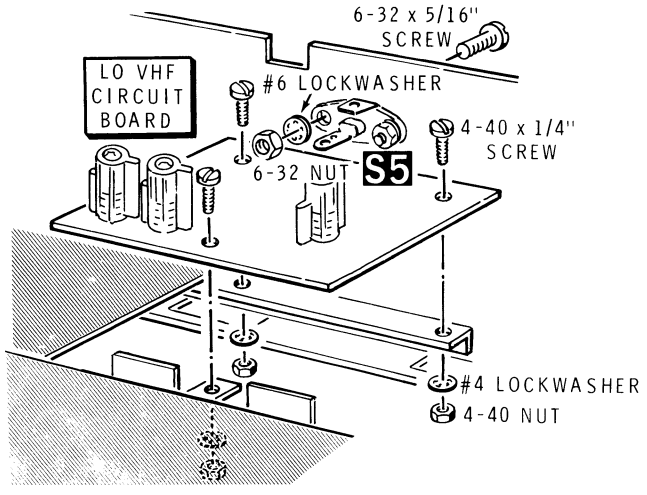
( ) Poor solder connections.

( ) Solder bridges between foils.

( ) Protruding leads which could touch together.

( ) Transistors for the proper type and installation.

INSTALLATION



PICTORIAL 7-5

Refer to Pictorial 7-5 for the following steps.

( ) Install the LO VHF circuit board in the chassis with 4-40 × 1/4" hardware.

( ) S5: Mount a phono socket to the back of the chassis at S5 with 6-32 × 5/16" hardware. Position the socket so the short lug faces up as shown.

Refer to Pictorial 7-6 for the following steps.

( ) Connect the free end of the shielded cable coming from LO VHF circuit board holes D and E to the HI VHF circuit board as follows:

Inner lead to hole H (S-1).
Shield lead to hole J (S-1).

( ) Connect the free end of the shielded cable coming from LO VHF circuit board holes F and G to the IF circuit board as follows:

Inner lead to hole F (S-1).
Shield lead to hole G (S-1).

( ) Connect the free end of the yellow wire coming from LO VHF circuit board hole C to IF circuit board hole A (S-1).

( ) Connect the free end of the shielded cable coming from LO VHF circuit board holes A and B to phono socket S5 as follows:

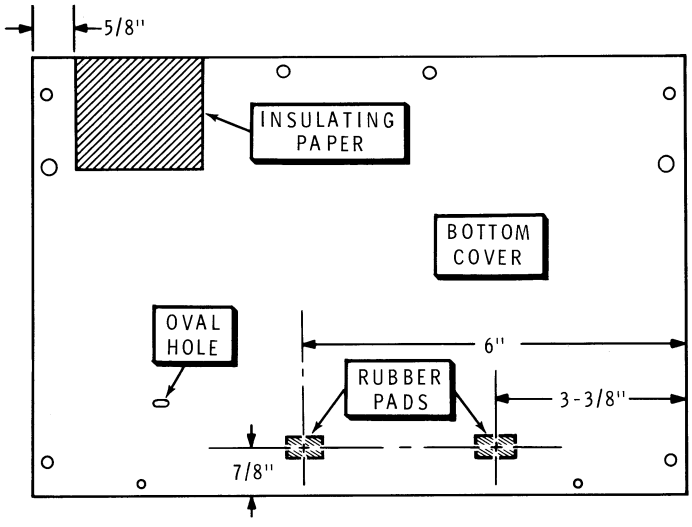
Inner lead to lug 1 (NS).
Shield lead to lug 2 (NS).

( ) R6: Connect a 1000 Ω (brown-black-red) resistor to phono socket S5 between lugs 1 (NS) and 2 (S-2).

( ) C4: Connect a 47 pF ceramic capacitor from phono socket S3 lug 1 (S-5) to phono socket S5 lug 1 (S-3).

( ) Install cable ties around the wires at CG, CH, and CJ.

( ) Set the antenna aside until it is called for later. The phono plug you have left will only be used if you use an external antenna (not supplied). See "Antennas" on Page 97.



PICTORIAL 7-7

Refer to Pictorial 7-7 for the following steps.

( ) Locate the bottom cover and position it so the oval hole is on the left as shown.

( ) Carefully remove the paper backing from the insulating paper. Then press the insulating paper onto the bottom cover as shown.

( ) Remove the paper backing from the two rubber pads and install them on the bottom cover at the locations shown.

Refer to Pictorial 7-8 for the following steps.

( ) Turn the Scanner upside down. Position it so the bezel faces away from you.

( ) Install the bottom cover of the Scanner with two #6 × 1/4" sheet metal screws and three 6-32 × 5/16" screws.

( ) Remove the paper backing from the feet and install them on the bottom cover using the dimensions shown.

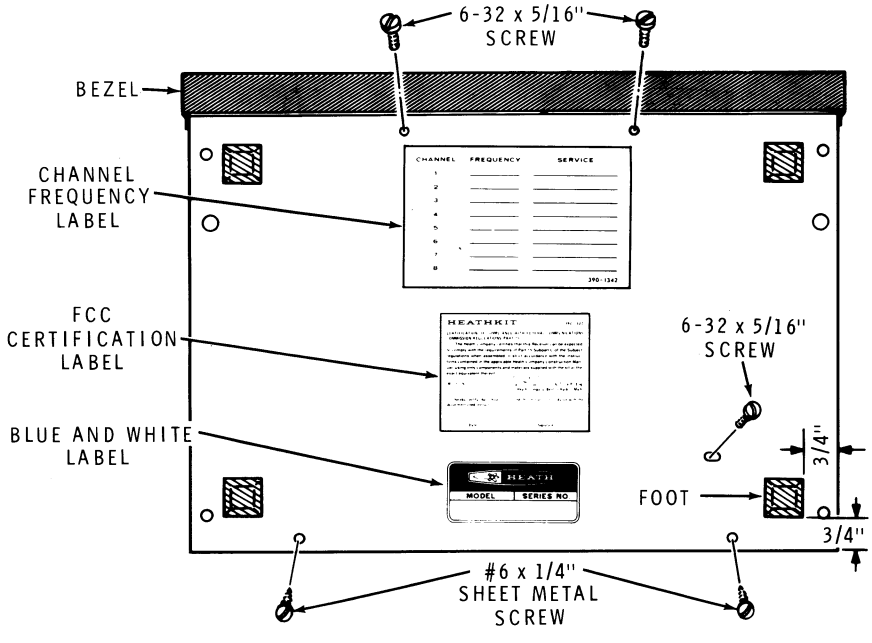
NOTE: The blue and white label that you will install in the next step shows the Model Number and Production Series Number of your kit. Refer to these numbers in any communications with the Heath Company. This assures you that you will receive the most complete and up-to-date information in return.

( ) Remove the paper backing from the blue and white label. Then press the label onto the bottom cover as shown.

( ) Read, date, and sign the FCC certification label. Then remove the paper backing from the label and press the label onto the bottom cover.

( ) Remove the paper backing from the channel frequency label. Then press the label onto the bottom cover. Be sure you position the label as shown.

( ) Turn the Scanner right-side-up.



PICTORIAL 7-8

UHF/HI VHF/LO VHF TEST AND ALIGNMENT

TESTING

Refer to Pictorial 8-1 (Illustration Booklet, Page 13) for the following steps.

( ) Plug the alignment generator into HI VHF socket S3 on the back panel.

( ) Insert the free end of the yellow wire coming from the alignment generator circuit board into test point TP1 (13.8 V) on the scanner circuit board.

( ) Position the free ends of the red wire, green wire, and the shielded cable so they do not touch anything.

( ) Connect the line cord to AC connector S1 on the back panel.

( ) Connect the line cord plug to an AC outlet.

( ) Turn the SQUELCH control fully counterclockwise.

( ) Turn the VOLUME control on.

( ) Make sure the SCAN-MAN pushbuttons is in the SCAN (out) position.

( ) Push CHANNEL pushbuttons 1, 2, and 3.

( ) Release CHANNEL pushbuttons 4, 5, 6, 7, and 8. The Scanner should scan channels 1, 2, and 3.

( ) Touch the green wire to the indicated lead (indicated by the arrow) of choke RFC501 on the UHF circuit board. The test lamp should light as each channel (1, 2, and 3) is scanned.

[Troubleshooting Chart 22]

( ) Release CHANNEL pushbuttons 1, 2, and 3.

( ) Push CHANNEL pushbuttons 4, 5, and 6. The Scanner should scan channels 4, 5, and 6.

( ) Touch the green wire to the indicated lead of choke RFC301 on the HI VHF circuit board. The test lamp should light as each channel (4, 5, and 6) is scanned.

[Troubleshooting Chart 23]

( ) Touch the green wire to collector (C) lead of transistor Q302 on the HI VHF circuit board. The test lamp should light as each channel (4, 5, and 6) is scanned.

[Troubleshooting Chart 24]

( ) Release channel pushbuttons 4, 5, and 6.

( ) Push CHANNEL pushbuttons 7 and 8. The Scanner should scan channels 7 and 8.

( ) Touch the green wire to the indicated lead of resistor R403 on the LO VHF circuit board. The test lamp should light as each channel (7 and 8) is scanned.

[Troubleshooting Chart 25]

ALIGNMENT

NOTE: To complete these adjustments, you must have crystals. If you still have not ordered crystals, or for additional information, see "How to Order Crystals" on Page 3.

( ) Select the UHF crystal that you will use in the next steps, based on the following information:

1. Use the crystal for the station farthest from your location. This does not noticeably affect the reception of nearby stations, but it does improve the reception of stations farthest from you, or;

2. Use the crystal nearest the center frequency range of the crystals that you have. Subtract the lowest UHF crystal frequency from the highest UHF crystal frequency. Divide this difference by two to obtain the center frequency. Then select the crystal whose frequency is nearest the center frequency, or;

3. Use the crystal for the station that you will listen to most.

( ) Install the UHF crystal you have selected into the crystal socket pins at Y201. See Figure 1-1.

( ) Locate the HI VHF crystal with the highest frequency and install it in the crystal socket pins at Y204.

( ) Locate the LO VHF crystal with the lowest frequency and install it in the crystal socket pins at Y207.

( ) Push the CHANNEL 4 pushbutton in.

( ) Release all other CHANNEL pushbuttons.

( ) Release the SCAN-MAN pushbutton to the SCAN (out) position.

( ) Turn the SQUELCH control fully clockwise.

( ) Make sure the alignment generator is still plugged into HI VHF socket S3.

( ) Connect the wires coming from the alignment generator as follows:

Yellow wire to test point TP1 (13.8 V).
Red wire to test point TP2 (9 V).
Green wire to test point TP9 (on the IF circuit board).

NOTE: The shielded cable is not connected at this time.

( ) Tack solder one lead of a .05 μF ceramic capacitor (the one used before) to socket S3 lug 1. The other lead will be connected later.

( ) Use the alignment tool to turn the slug in coil L201 (on the IF circuit board) counterclockwise until the top of the slug is even with the top of the coil form as shown in the inset drawing.

( ) Position the free end of the .05 μF ceramic capacitor against the base (B) lead of transistor Q302 (on the HI VHF circuit board) so that it stays there when you remove your hand.

( ) Turn the VOLUME control on.

NOTES:

1. Use only the nonmetallic alignment tool when you make any of the following adjustments, even when you adjust the RF LEVEL control on the alignment generator circuit board. Also, keep your hands as far away as possible from the coils and trimmer capacitors when you adjust them.

2. As explained before, the test lamp will be used as a signal level indicator. You will be instructed to make adjustments that produce the minimum brightness ("null" indication) in the test lamp. If the lamp goes out, turn the RF LEVEL control counterclockwise (viewed from the component side of the circuit board) until the filament in the test lamp just starts to glow; then continue with your adjustment. Changes in the test lamp brightness will be easier to see if you dim the room lights.

Turn the RF LEVEL control clockwise to 3/4 of its maximum rotation or until the lamp is dimly lit. NOTE: This is the maximum output signal position. Turning the control further clockwise will not increase the output signal strength from the alignment generator; it may even cause distortion.

NOTE: The alignment generator is either connected to the 5 volt supply (TP3) to operate at a low output level, or to the 9 volt supply (TP2) to operate at a high output level. For the first part of the alignment, when the Scanner circuits are significantly misadjusted, the higher output level is necessary to obtain the desired test lamp indications. However, as the alignment progresses and the Scanner circuits become more sensitive, less signal is needed to obtain the same results. Therefore, the adjustments are made furst using the high output level (red wire to TP2), and then repeated using the low output level (red wire to TP3). If at any time you cannot adjust the RF LEVEL control to make the test lamp filament turn on when the red wire is connected to TP2, move it to TP3 and readjust the RF LEVEL control.

( ) Adjust coil L305 (on the HI VHF circuit board) for minimum brightness of the test lamp.
[Troubleshooting Chart 26]

( ) Connect the red wire coming from the alignment generator to test point TP3 (5 V). Then repeat the previous step.

( ) Turn the VOLUME control off.

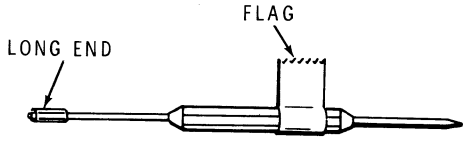
( ) Unsolder and remove the .05 μF ceramic capacitor.

UHF ALIGNMENT

Refer to Pictorial 8-1 for the following steps.

( ) Refer to Detail 8-1A and place a small tape "flag" on the short end of the alignment tool. This will help you count the number of turns of the tool during alignment.

( ) Turn the slug in oscillator coil L201 so the top of the slug is even with the top of the coil form as shown in the inset drawing on Pictorial 8-1.



Detail 8-1A

( ) Refer to Detail 8-1B and locate the frequency range of the UHF crystal you installed earlier. Then turn the slug of coil L201 clockwise the indicated number of turns.

Frequency Range (MHz)	Turns Clockwise
450-455	7
455-460	6-1/2
460-465	6
465-470	5-1/2
470-480	5
480-490	4-1/2
490-500	4

L201 Preset Chart
Detail 8-1B

( ) Locate the trimmer capacitor preset chart (#390-1392).

( ) In the column "Channel Frequency Range," locate the frequency that is nearest the frequency of the UHF crystal you installed earlier.

For channel frequencies:

450-455 MHz use 450 MHz.

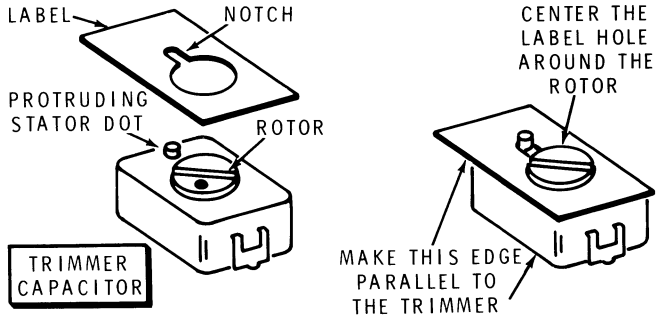
455-465 MHz use 460 MHz.

465-475 MHz use 470 MHz.

475-485 MHz use 480 MHz.

485-495 MHz use 490 MHz.

495-500 MHz use 500 MHz.



Detail 8-1C

IMPORTANT: In the following steps, you will use the three labels to the right of the frequency range you have just selected. You will install them on trimmer capacitors C501, C502, and C201. Since the placement of the labels on the trimmer capacitors is critical to the ultimate UHF alignment, you must install them correctly.

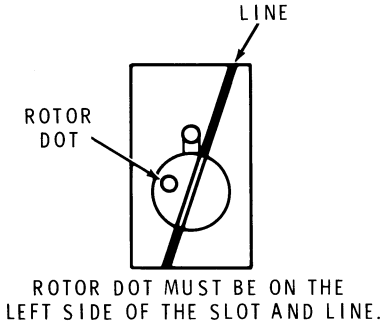
Refer to Detail 8-1C and use the following procedure when you install a label:

1. Position the label so the notch fits over the protruding stator dot.

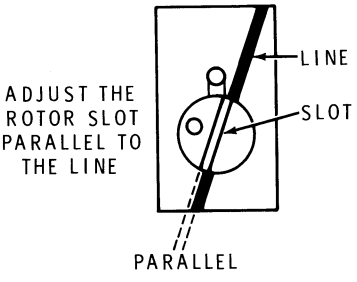
2. Line up the edges of the label parallel to the edges of the trimmer capacitor and center the circular hole in the label around the rotor of the capacitor.

3. Then gently press the label into place.

( ) Adjust each rotor so the slot lines up with the line on the label. Make sure the rotor dot is on the left side of the rotor slot (and the line on the label) as shown in Detail 8-1D. If the line on the label does not appear to pass through the slot in the rotor due to a slight misregistration of the label, adjust the rotor so the slot is parallel to the line on the label. See Detail 8-1E.



Detail 8-1D



Detail 8-1E

( ) Go back and double check the installation of each label and the settings of the rotor slots. Examine these items closely because a very slight misalignment or misadjustment can significantly reduce the UHF sensitivity.

( ) Install the 2-section UHF antenna in the UHF circuit board. Pull the top section of the antenna up halfway.

( ) Turn the SQUELCH control fully clockwise.

( ) Push the CHANNEL 1 pushbutton in.

( ) Release all other CHANNEL pushbuttons.

( ) Turn the VOLUME control on and adjust it for a comfortable listening level.

NOTE: The amount of "radio traffic" you will hear in the following steps, depends on where you live, your proximity to large cities, and the activity of the particular UHF frequency you are listening to. In some cases, you will hear considerable communications, while in other cases, you may have to wait for a long time before you hear anything.

( ) Listen to the UHF stations. If the communications you hear are strong and clear, further UHF alignment is not necessary. However, if you hear a weak signal (usually one coming from more than 20-30 miles away), you can try and obtain greater UHF sensitivity by making the following "UHF On-The-Air Alignment."

UHF On-The-Air Alignment

( ) Plug the alignment generator into UHF socket S4.

( ) Insert the green wire coming from the alignment generator into test point TP9 on the IF circuit board.

( ) Insert the yellow wire coming from the alignment generator into test point TP1 on the scanner circuit board.

( ) Position the rest of the wires coming from the alignment generator circuit board out of the way; they will not be used.

( ) Make sure the SQUELCH control is turned fully clockwise.

( ) Make sure the CHANNEL 1 pushbutton is pushed in and all other CHANNEL pushbuttons are released.

( ) Listen for a weak UHF station.

( ) If the signal is strong enough to cause the test lamp to go out, turn the slug in IF transformer T201 four (4) turns counterclockwise. This will decrease the sensitivity of the IF circuits and turn the test lamp on again.

( ) As a station is being received, readjust trimmer capacitor C501 for minimum test lamp brightness.

[Troubleshooting Charts 27 & 28]

( ) As a station is being received, readjust trimmer capacitor C502 for minimum test lamp brightness.

[Troubleshooting Charts 27 & 28]

( ) As a station is being received, readjust trimmer capacitor C201 for minimum test lamp brightness.

[Troubleshooting Charts 27 & 28]

( ) Examine the positions of the rotor slots in the three trimmer capacitors. They should be **very** close to the lines on their respective label. If they are not close, you have probably adjusted the trimmers to the wrong position. If this happens, preset the rotor slots as you did earlier. Then repeat these adjustments.

( ) As a station is being received, readjust the slug in coil L201 for minimum test lamp brightness. No more than one-half turn of the slug is normally required.

[Troubleshooting Chart 29]

( ) When **no** station is being received, readjust the slug in IF transformer four turns clockwise or for minimum test lamp brightness.

( ) Listen carefully to the UHF station. If the signal is noisy and the audio is distorted, adjust control R228 (on the IF circuit board) until the signal is clear and sharp.

[Troubleshooting Chart 30]

NOTE: Further improvement of UHF sensitivity can only be acheived by using sophisticated alignment equipment. Your local two-way communications service shop or your local Heathkit Customer Service Center will have the necessary equipment.

( ) Turn the VOLUME control off.

( ) Remove the labels from trimmer capacitors C501, C502, and C201. Replace them at their corresponding locations on the trimmer capacitor preset chart. Save the preset chart. You will need it again if you decide to realign the UHF circuits.

HI VHF ALIGNMENT

( ) Plug the alignment generator into HI VHF socket S3. Then push it down behind the back of the chassis.

( ) Connect the wires coming from the alignment generator as follows:

Yellow wire to test point TP1 (13.8 V).
Red wire to test point TP2 (9 V).
Green wire to test point TP9.
Shielded cable:
  Inner lead to test point TP6.
  Shield lead to test point TP7.

( ) Push the CHANNEL 4 pushbutton in.

( ) Release all other CHANNEL pushbuttons.

( ) Turn the VOLUME control on.

( ) Turn the slugs in coils L301, L302, L303, and L304 until they are even with the top of the coil forms.

( ) Turn the RF LEVEL control to 3/4 of its maximum clockwise rotation, or until the test lamp just lights. If the test lamp will not light, move the red wire to TP3. Then repeat this step. If the test lamp still does not light, you will have to decrease the sensitivity of the IF circuits as follows: Count the turns as you turn the slug in IF transformer T201 counterclockwise until the

test lamp lights. IMPORTANT: Remember the exact number of turns so you can return the slug to its original position later. Then repeat this step.

NOTE: Proper adjustment of some of the following coils may occur when the slugs extend above the top of the coil form. This usually occurs only on higher frequency channels.

( ) Adjust coil L304 for minimum brightness.
[Troubleshooting Chart 31]

( ) Adjust coil L303 for minimum brightness.
[Troubleshooting Chart 31]

( ) Adjust coil L302 for minimum brightness.
[Troubleshooting Chart 31]

( ) Adjust coil L301 for minimum brightness.
[Troubleshooting Chart 31]

( ) Connect the red wire coming from the alignment generator to test point TP3 (5 V) if it is not already connected there. Then repeat the previous four steps until no further improvement can be made. Readjust the RF LEVEL control as necessary to keep the test lamp brightness at a low level.
[Troubleshooting Chart 31]

( ) Perform this step **only** if you had to adjust IF transformer T201 earlier during this "HI VHF Alignment" to decrease the sensitivity of the IF circuits. Turn the slug in IF transformer T201 clockwise to its original position.

NOTE: If you preset or adjusted coil L201 (on the IF circuit board) during UHF alignment, disregard the next step.

( ) Adjust coil L201 for minimum noise from the speaker regardless of the test lamp indication. This may be a rather broad adjustment.
[Troubleshooting Chart 30]

( ) Turn the VOLUME control off.

LO VHF ALIGNMENT

( ) Plug the alignment generator into LO VHF socket S5.

( ) Make sure the wires coming from the alignment generator are connected as follows:

Yellow wire to test point TP1.
Red wire to test point TP2.
Green wire to test point TP9.
Shielded cable:
Inner lead to test point TP6.
Shield lead to test point TP7.

( ) Turn the slugs in coils L402, L403, and L404 until they are even with the tops of the coil forms.

( ) Push the CHANNEL 7 pushbutton in.

( ) Release all other CHANNEL pushbuttons.

( ) Turn the VOLUME control on.

( ) Turn the RF LEVEL control clockwise to 3/4 of its maximum clockwise rotation or, until the test lamp just lights. If the test lamp will not light, move the red wire to TP3. Then repeat this step. If the test lamp still does not light, you will have to decrease the sensitivity of the IF circuits as follows: Count the turns as you turn the slug in IF transformer T201 counterclockwise until the test lamp lights. IMPORTANT: Remember the exact number of turns so you can return the slug to its original position later. Then repeat this step.

NOTE: Since the following adjustments (coils L402, L403, and L404) tune rather broadly, a null (minimum lamp brightness) is harder to determine. It will help, however, if you readjust the RF LEVEL control as often as necessary to keep the test lamp brightness at a very low level.

( ) Adjust the coil L403 for minimum brightness.
[Troubleshooting Chart 31]

( ) Adjust coil L402 for minimum brightness.
[Troubleshooting Chart 31]

( ) Adjust coil L404 for minimum brightness.
[Troubleshooting Chart 31]

( ) Connect the red wire coming from the alignment generator to test point TP3 (5 V) if it is not already connected there. Then repeat the three previous steps until no further improvement can be made.
[Troubleshooting Chart 31]

( ) Perform this step **only** if you had to adjust IF transformer T201 earlier during this "LO VHF Alignment" to decrease the sensitivity of the IF circuits. Turn the slug in IF transformer T201 clockwise to its original position.

( ) Disconnect the alignment generator and its wires from the Scanner.

FINAL ALIGNMENT

( ) Install the 2-section UHF antenna on the UHF circuit board. Pull the top section of the antenna up half way.

( ) Select and monitor an active UHF station. If the signal is noisy and the audio distorted, adjust control R228 (on the IF circuit board) until the signal is clear and sharp.
[Troubleshooting Chart 30]

( ) Install the 6-section HI VHF antenna on the HI VHF circuit board. Extend the antenna as far as it will go.

( ) Install the 10-section LO VHF antenna on the LO VHF circuit board. Extend the antenna as far as it will go.

( ) Push the CHANNEL 4 pushbutton in.

( ) Release all other pushbuttons.

( ) Turn the SQUELCH control fully clockwise.

( ) Adjust the VOLUME control to a comfortable listening level (you may hear only noise from the speaker).

NOTE: You will listen to the noise coming from the speaker when you make the following adjustment. Do not try to make the adjustment when a station is being received.

( ) Listen to the noise as you carefully adjust coil L205 (or the IF circuit board) for minimum noise. You should not have to turn the slug in this coil more than 1/4-turn to obtain minimum noise.

( ) Refer to the "Operation and Installation" section on Page 89 and install any remaining crystals you may have. Also, read the Operation section to become familiar with your Scanner before you proceed.

( ) Monitor all channels. If there is interference from an FM broadcast station, adjust trimmer capacitor C5 (on the back panel) for minimum interference.

( ) Turn the VOLUME control off.

( ) Unplug the line cord plug from the AC outlet.

( ) Remove all three antennas.

This completes the "UHF/HI VHF/LO VHF Alignment." Proceed to "Final Assembly" on Page 87.

FINAL ASSEMBLY

PARTS LIST

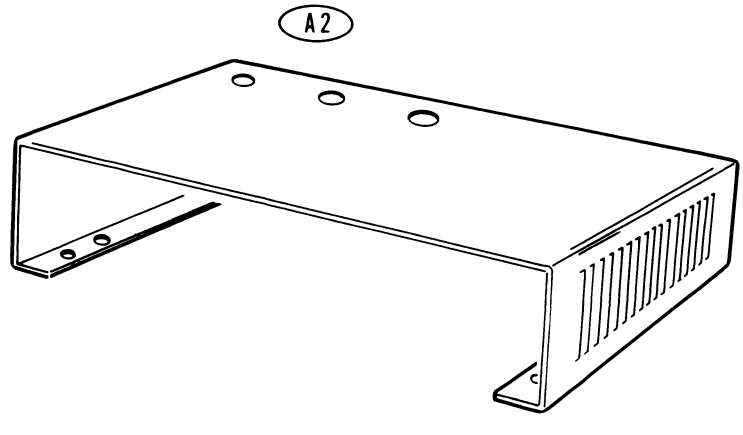
( ) Unpack the remaining parts.

( ) Check these parts against the following list. The key numbers correspond to the numbers in the "Final Assembly Parts Pictorial."

To order a replacement part, always include the PART NUMBER. Use the Parts Order Form furnished with this kit. If one is not available, see "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
A1	455-641	1	Large snap-in bushing
A1	455-70	2	Small snap-in bushing
A2	90-1166	1	Cabinet shell

Final Assembly Parts Pictorial



STEP-BY-STEP ASSEMBLY

Refer to Pictorial 9-1 (Illustration Booklet, Page 14) for the following steps.

( ) Install three clips on the indicated edge of the bezel. Push each clip onto the bezel as far as possible.

Refer to Pictorial 9-2 (Illustration Booklet, Page 14) for the following steps.

( ) Refer to Detail 9-2A and push two small snap-in bushings into the smaller holes in the cabinet shell.

( ) Push a large snap-in bushing into the large hole in the cabinet shell.

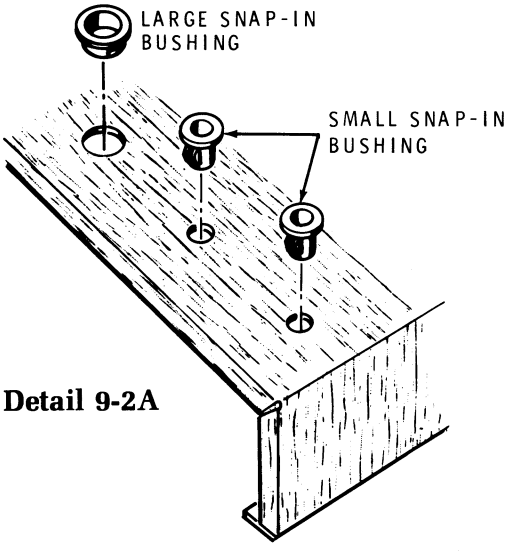
( ) Refer to Detail 9-2B and slide the cabinet shell part way onto the chassis. Then place a ruler (or other similar straightedge) at the ends of the clips and push them down as you slide the cabinet shell the rest of the way onto the chassis.

( ) Secure the cabinet shell to the chassis with four 6-32 × 5/16" screws.

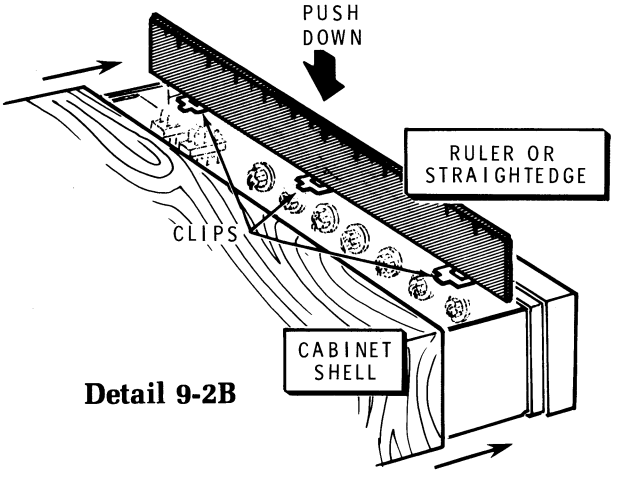
NOTE: The two large holes in the bottom of the Scanner are used only when you use the Mobile Mount Accessory.

( ) Install the three antennas through the indicated bushings and into their respective circuit boards.

This completes the "Final Assembly." Proceed to the "Operation and Installation" section.



Detail 9-2A



Detail 9-2B

OPERATION AND INSTALLATION

OPERATION

PROGRAMMING THE SCANNER

The following steps will show you how to install crystals and how to program the Scanner so each crystal operates on the proper band.

( ) Disconnect the line cord from the Scanner.

( ) Unscrew the three whip antennas and set them aside.

( ) Remove the four screws from the cabinet shell; then remove the cabinet shell and set it aside.

Refer to Figure 1-1 as you perform the following steps.

The Scanner circuits momentarily monitor channel 1 every 3-5 seconds. If a signal is present on channel 1, the Scanner immediately switches to channel 1. This occurs even though another channel is being received. This means that channel 1 is given "priority" over all other channels. Crystals for fire frequencies are a good choice for channel 1 (priority), especially for volunteer firemen. However, you can install any crystal you choose in channel 1.

NOTE: When you perform the following steps, we recommend you use a non-busy channel in the priority position (channel 1); then install your other crystals in the other positions in the order of descending priority. However, the crystals do not have to be in any specific order.

( ) Plug the crystal that corresponds to the frequency you wish to use as a priority channel into the crystal socket pins at Y201.

NOTE: Perform only one of the next three steps.

1. ( ) If your priority crystal is in the LO VHF band, push the free end of the brown wire coming from hole 1 in the IF circuit board into the test point pin at LO VHF 1 as shown in the Figure.

2. ( ) If your priority crystal is in the HI VHF band, push the free end of the brown wire coming from hole 1 in the IF circuit board into the test point pin at HI VHF 1 as shown in inset drawing #1 of the Figure.

3. ( ) If your priority crystal is in the UHF band, push the free end of the brown wire coming from hole 1 in the IF circuit board into the test point pin at UHF 1 as shown in inset drawing #2 of the Figure.

( ) Write the operation frequency of the crystal and the name of the service on this frequency in the channel 1 blanks on the label on the bottom cover.

NOTE: Perform the following steps if you have more than one crystal. If you have only one crystal at this time, proceed to "Automatic Scan."

( ) Plug a crystal into the crystal socket pins at Y202.

( ) Push the free end of the red wire coming from hole 2 in the IF circuit board into the test point pin at HF 2, VHF 2, or UHF 2, depending on which band the crystal is made for.

( ) Write the operating frequency of this crystal and the name of the service on this frequency in the channel 2 blanks on the label on the bottom cover.

( ) Continue in this manner until you have all of your crystals installed and have each corresponding jumper wire connected to the proper test point pin.

( ) Reinstall the cabinet shell on the Scanner.

( ) Reinstall the three whip antennas with the shortest on the left and the longest on the right.

( ) Connect the power cable to the corresponding socket on the rear panel.

AUTOMATIC SCANNING

Refer to Figure 1-2 for a brief description of all front and rear panel controls, switches, and sockets.

Perform the following steps to learn the automatic operation of your Scanner. After you become familiar with the Scanner, you will be able to change the sequence of these steps to suit your individual needs.

NOTE: Perform the following steps while no stations are being received.

1. Place the SCAN-MAN pushbutton in the SCAN position (released or "out" position).

2. Be sure all of the CHANNEL pushbuttons, for those channels where you have crystals installed, are pushed in (on). The position of the other Channel pushbuttons is not important.

3. Set the SQUELCH control fully clockwise.

4. Set the VOLUME control for a comfortable listening level.

5. Adjust the SQUELCH control counterclockwise until the audible sound (noise) just disappears. The front panel controls are now adjusted and the Scanner is ready for normal operation. The channel indicator lights will indicate each channel as the Scanner scans each of those where the Channel Select pushbutton is pushed in.

The Scanner will continue to scan all channels that have the CHANNEL pushbuttons pushed in. It will automatically stop if a crystal is installed and a signal is received. The Scanner will remain locked on that signal as long as it is present. (Except if a crystal is in the channel 1 position and a signal appears on that channel, the Scanner will instantly switch to channel 1.) Within a short time after the channel 1 signal ceases, the Scanner will again begin to scan all the selected channels.

If the Scanner receives a signal on channel 1 (the priority channel) at any time, it will immediately lock onto that signal until the transmission stops. The scan circuit will then return to a normal search operation. If the priority signal overrides a regular channel, the scan circuit will resume scanning from channel 1.

If, while you are listening to a signal, you wish to hold that channel for a period of time, push the SCAN-MAN pushbutton to the in (MAN) position. The Scanner is then locked onto that channel until you return the switch to the SCAN position. The Scanner will only change stations when a priority signal is detected or when you manually sequence the Scanner to some other channel. The Scanner must be squelched when you manually sequence the channels.

If you wish to pass over any specific channel at any time, you can "lock it out" by releasing the appropriate pushbutton. The scan circuit will then pass over the "locked out" frequency until you press that pushbutton.

MANUAL MODE

To operate your Scanner in the MANUAL mode, push the SCAN-MAN pushbutton to the in (MAN) position. Then set the remaining controls as described in steps 2 through 5 under "Automatic Scanning."

To select a specific channel, hold the spring-return CHANNEL SELECT pushbutton in until the Scanner sequences to the channel you desire.

If a priority signal (channel 1) overrides the manually-selected channel, the circuit will remain locked on channel 1 until you again manually sequence the Scanner to another channel. You can "lock out" any channel (including the priority channel) by releasing the pushbutton for that channel.

To return the Scanner to automatic scanning, place the SCAN-MAN pushbutton in the SCAN position.

ANTENNAS

Depending on the transmitter power and antenna height, the whip antennas on the Scanner should provide a reception range of 15 to 20 miles. The terrain of the surrounding areas can increase or decrease this range depending on the location of the Scanner in relation to the transmitter, nearby hills, mountains, flatlands, etc.

Typical lengths for the whip antennas on the Scanner are as follows:

UHF Antenna	Adjust so antenna tip is 5-3/4" above the top of the cabinet.
HI VHF Antenna	Adjust so antenna tip is 18" above the top of the cabinet.
LO VHF Antenna	Adjust so antenna is fully extended.

To increase the receiving range to 20 to 30 miles, you should use an outside antenna, or an outside antenna for each band. If you use a single outside antenna, use one of the communications type antennas for the 150 to 160 MHz range. Connect the antenna lead into the HI VHF antenna socket for optimum performance on all three bands (be sure you completely collapse the whip antennas). Even though this type of antenna is short for the LO VHF band, the height advantage will usually increase the receiving range over the built-in antenna.

If you use a separate outside antenna for each band, the receiving range can be extended even further. Directional-gain antennas are recommended for fringe-area reception.

Most of the antennas mentioned above are available from many electronics distributors. A 3-band monitor antenna is available from Heath Company. Refer to a current Heathkit Catalog for the Model Number and price. If you prefer, you can make a ground-plane antenna as shown in Figure 1-3. Cut each of the elements to correspond to the desired frequency (see the "Antenna Charts"). NOTE: Parts are not supplied in the kit for this assembly. If you have more than one crystal on a band, locate a frequency that is halfway between your two frequency extremes and cut the radials to that length.

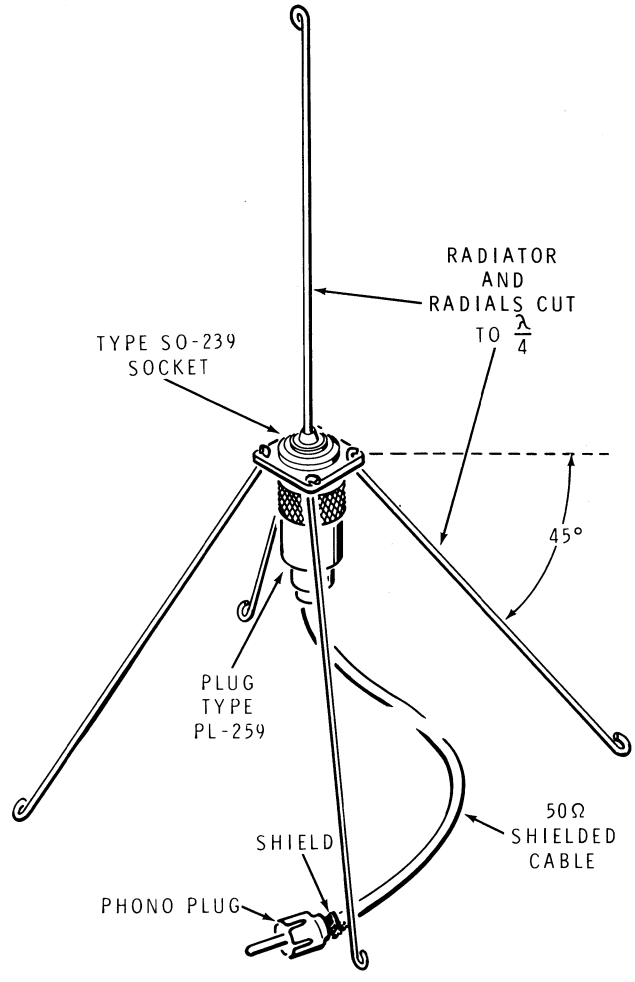


Figure 1-3

HI VHF ANTENNA CHART

FREQUENCY IN MHz	LENGTH λ/4
146	19″
147	18-7/8″
148	18-3/4″
149	18-5/8″
150	18-1/2″
151	18-3/8″
152	18-1/4″
153	18-1/8″
154	18″
155	18-7/8″
156	17-7/8″
157	17-3/4″
158	17-5/8″
159	17-1/2″
160	17-3/8″

FREQUENCY IN MHz	LENGTH λ/4
161	17-1/4″
162	17-1/8″
163	17″
164	17″
165	16-7/8″
166	16-3/4″
167	16-5/8″
168	16-1/2″
169	16-1/2″
170	16-3/8″
171	16-1/4″
172	16-1/8″
173	16″
174	16″

UHF
ANTENNA CHART

FREQUENCY IN MHz	LENGTH λ/4
450	6-1/8″
451	6-1/8″
452	6-1/8″
453	6-1/8″
454	6-1/8″
455	6-1/8″
456	6-1/8″
457	6-1/8″
458	6-1/8″
459	6″
460	6″
461	6″
462	6″
463	6″
464	6″
465	6″
466	6″
467	6″
468	6″
469	5-7/8″
470	5-7/8″
471	5-7/8″
472	5-7/8″
473	5-7/8″
474	5-7/8″
475	5-7/8″

FREQUENCY IN MHz	LENGTH λ/4
476	5-7/8″
477	5-7/8″
478	5-7/8″
479	5-3/4″
480	5-3/4″
481	5-3/4″
482	5-3/4″
483	5-3/4″
484	5-3/4″
485	5-3/4″
486	5-3/4″
487	5-3/4″
488	5-3/4″
489	5-5/8″
490	5-5/8″
491	5-5/8″
492	5-5/8″
493	5-5/8″
494	5-5/8″
495	5-5/8″
496	5-5/8″
497	5-5/8″
498	5-5/8″
499	5-5/8″
500	5-1/2″

LO VHF
ANTENNA CHART

FREQUENCY IN MHz	LENGTH λ/4
30	92-5/8″
31	89-5/8″
32	86-7/8″
33	84-1/4″
34	81-3/4″
35	79-3/8″
36	77-1/4″
37	75-1/8″
38	73-1/8″
39	71-1/4″
40	69-1/2″

FREQUENCY IN MHz	LENGTH λ/4
41	67-3/4″
42	66-1/4″
43	64-5/8″
44	63-1/8″
45	61-3/4″
46	60-3/8″
47	59-1/8″
48	57-7/8″
49	56-3/4″
50	55-5/8″

FM BROADCAST INTERFERENCE

If you notice interference from a nearby FM broadcast station adjust the slug in the FM trap (C5) on the rear panel of the Scanner to null out the interference.

If strong nearby signals cause adjacent channel interference, purchase and install the optional crystal filter Model GRA-1100-2.

DETERMINING CHANNEL FREQUENCY FROM CRYSTAL FREQUENCY

In most cases, your crystals will be marked with the operating frequency. If, however, you have a crystal that is marked with the crystal frequency instead of the operating frequency, you can use one of the following formulas to determine the operating frequency:

LO VHF Operating Frequency = crystal frequency −10.7

Example:

Crystal Frequency	=	53.28 MHz
Operating Frequency	=	53.28 −10.7
Operating Frequency	=	42.58 MHz

HI VHF Operating Frequency = (crystal frequency × 3) + (10.7)

Example:

Crystal frequency	=	48.323333 MHz
Operating Frequency	=	(48.323333 × 3) + (10.7)
Operating Frequency	=	155.67 MHz.

UHF (450-470 MHz) Operating Frequency = (crystal frequency × 9) + (10.7)

Example:

Crystal Frequency	=	49.933333 MHz
Crystal Frequency	=	(49.93333 × 9) + (10.7)
Operating Frequency	=	460.1 MHz

UHF (470-512 MHz) Operating Frequency = (crystal frequency × 10) + (10.7)

Example:

Crystal Frequency	=	47.435 MHz
Operating Frequency	=	(47.435 × 10) + (10.7)
Operating Frequency	=	485.05 MHz

INSTALLATION

HOME INSTALLATION

( ) Plug the line cord into the mating socket on the rear panel of the Scanner.

( ) If you have an external antenna or antennas, connect them to the proper sockets on the rear panel. If you do not have external antennas, adjust the whip antennas on the top of the Scanner as mentioned under "Antennas."

MOBILE INSTALLATION

NOTE: The DC power source for this Scanner must be a **negative-ground** 13.8-volt system.

IMPORTANT: Before you install the Scanner in your vehicle, check your state and local government regulations concerning the use of this Scanner to listen to official frequencies.

( ) Connect the red lead of the DC cable assembly to the 13.8-volt source.

( ) Connect the ground (black) lead of the DC cable assembly to a suitable ground location on the chassis of the vehicle.

( ) Plug the DC cable assembly into the mating socket on the rear panel of the Scanner.

( ) If you have an external antenna or antennas, connect them to the proper sockets on the rear panel. If you do not have external antennas, adjust the whip antennas on the top of the Scanner as mentioned under "Antennas."

NOTE: A Gimbal Bracket Accessory, Model GRA-1131-1, is available from the Heath Company if you wish to mount the Scanner in your vehicle.

IN CASE OF DIFFICULTY

This section of the Manual is divided into two parts. The first part, titled "General Troubleshooting Information," describes what to do about the difficulties that may occur right after your Scanner is assembled.

The second part, titled "Troubleshooting Charts," is keyed to the testing that you did during the assembly of the Scanner. Since the Troubleshooting Chart numbers in the "Problem" column can be found throughout the testing sections of the Manual, you should carefully examine the indicated test section when you encounter a problem.

The third part, titled "Operational Problems," is a chart that lists problems that may occur after the Scanner has been in operation for some time. The problems listed in this chart are described as front panel or operational problems. The "Area of Problem" column directs (or cross-references) you to specific parts of the "Troubleshooting Charts."

Try to analyze the symtoms of any problem you might have before starting any troubleshooting procedure. This can usually be accomplished by trying the various functions of your Scanner to determine abnormal operations. A review of the "Operation and Installation" section may help.

Refer to the X-Ray Views for the physical location of parts on the circuit boards.

GENERAL TROUBLESHOOTING INFORMATION

NOTE: The following checks will be most effective if you apply them to one part of the kit at a time.

1. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something you have consistently overlooked.

2. About 90% of the kits that are returned for repair do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by a careful inspection of connections to make sure they are soldered as described in the "Soldering" information on Page 7 and Page 11. Reheat any doubtful connections. Be sure all wires are soldered at places where several wires are connected.

3. Check each circuit board foil to be sure there are no solder bridges between adjacent connections. Remove any solder bridges by holding a clean soldering iron tip between the two points that are bridged until the excess solder flows **down** onto the tip of the soldering iron.

4. Check each resistor value carefully. A resistor that is discolored, or cracked, or shows any sign of bulging would indicate that it is faulty and should be replaced.

5. Be sure each diode is installed with the banded end positioned correctly.

6. Check all component leads connected to the circuit boards. Make sure the leads do not extend through the circuit board and come in contact with other connections or parts.

7. The components listed in the "Possible Cause" column of the "Troubleshooting Chart" are the most likely causes (but not necessarily the only causes) of a problem. When you check these components, look first for the following items:

- Parts installed incorrectly or backwards. This pertains especially to diodes, electrolytic and tantalum capacitors, and transistors.
- Unsoldered or inadequately soldered parts. Reheat the connections in the area of a problem.
- Incorrect or interchanged parts. Check the part numbers on the diodes and transistors.

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

TROUBLESHOOTING CHART

PROBLEM	POSSIBLE CAUSE
1. Test lamp does not light.	A. D106, D107, or D108. B. Test lamp not making contact in socket. C. Q601. D. Transformer leads or power switch SW1 incorrectly wired. E. Test lamp.
2. Test lamp does not light.	A. ZD103 or ZD104. B. IC101 pin 16 shorted to ground. C. IC102 pin 5, 6, or 7 shorted to ground. D. C107 or C108. E. Test lamp.
3. Channel indicator lamps do not scan.	A. Lamp lead not making contact in socket. B. Lamp socket leads incorrectly wired to switches. C. Q102, Q105, Q106, Q108, Q109, or Q110. D. IC101 or IC102. E. ZD103. F. Scan-Man switch (SW2) pushed in or incorrectly wired. G. C105 or C106. H. D101 or D102.
4. Priority oscillator does not operate.	A. Q101, Q102, Q103, or Q104. B. C102. C. Channel 1 pushbutton (SW101).
5. Manual scan does not operate.	A. Check items F and G of steps 3 above.
6. Scanning does not skip unused channels.	A. Q109 or Q110. B. C105 or C106. C. D101 or D102. D. R114, R115, R117, or R119.
7. No audio.	A. Shielded cable coming from circuit board holes J and K to Volume control R3 is shorted or incorrectly wired. B. C112, C113, C114, or C117. C. Q111, Q112, or Q113. D. Q114 and Q115 interchanged (#417-818 at Q114; #417-819 at Q115).

	PROBLEM	POSSIBLE CAUSE
8.	Test lamp does not light.	A. A short circuit exists in the 9 V line on the IF circuit board. Check the foils and jumper wires associated with the foil at hole M. B. Test lamp.
9.	Test lamp does not light.	A. IC201.
10.	No audio.	A. IC201. B. Q209 or Q210. C. C248, C253, or C254. D. L205 or T201. E. Shielded cable coming from holes U AND W to Volume control R3 is shorted or incorrectly wired.
11.	Scanner will not scan.	A. Q211 or Q212. B. IC201.
12.	IF circuit will not tune (adjust).	A. Check the alignment generator circuits. B. Check the items listed under step 10 above.
13.	Squelch circuits inoperative.	A. Too much signal from the alignment generator. Insert the red wire into test point TP3 (5 V). B. Q211 or Q212. C. D210. D. Squelch control R2. E. Check the wiring of the brown wire hole T on the IF circuit board. F. Check for solder bridges at IC201.
14.	Incorrect test indication.	A. D201.
15.	Incorrect test indication.	A. Appropriate diode D202 through D208.
16.	Incorrect test indication.	A. RFC209 or RFC210. B. Q201. C. R209 or R211.
17.	UHF circuits will not turn on.	A. Brown programmer wire (from IF circuit board hole 11) not inserted into its respective UHF pin. B. D211. C. Q205.

PROBLEM	POSSIBLE CAUSE
18. HI VHF circuits will not turn on.	A. Yellow programmer wire (from IF circuit board hole 14) not inserted into its respective HI VHF pin. B. D214. C. Q204.
19. LO VHF circuit will not turn on.	A. Violet programmer wire (from IF circuit board hole 17) not inserted into its respective LO VHF pin. B. D217. C. Q203.
20. AFC circuit inoperative.	A. Check all items listed in step 17 above. B. Q206, Q207, or Q208. C. C221.
21. AFC circuit inoperative.	A. Check all items listed in step 20 above. B. D209. C. R225 through R231.
22. Power is not applied to UHF circuits.	A. RFC501. B. Q501. C. Check all items listed in step 17 above. D. Check for solder bridges on the UHF circuit board.
23. Power is not applied to the HI VHF circuits.	A. RFC301. B. Q301. C. Check all items listed in step 18 above. D. Check for solder bridges on the HI VHF circuit board.
24. Bias is not applied to Q302.	A. Check the shielded cable from IF circuit board holes K and L to HI VHF circuit board holes D and E. B. Check the shielded cable from LO VHF circuit board holes D and E to HI VHF circuit board holes H and J. C. Check the shielded cable from UHF circuit board holes D and E to HI VHF circuit board holes K and L. D. Q302.

PROBLEM	POSSIBLE CAUSE
25. Power is not applied to the LO VHF circuits.	A. Q401. B. Check all items listed in step 20 above. C. Check for solder bridges on the LO VHF circuit board.
26. Unable to adjust L305.	A. Check the shielded cable from HI VHF circuit board holes F and G to IF circuit board holes D and E. B. Check all items listed in step 24 above. C. Solder bridge across FL201 or FL202.
27. Unable to adjust capacitors C501 or C502.	A. Check all items listed in step 16 above. B. D219. C. Crystal installed in wrong socket for the channel selected. D. Crystal. E. Check the shielded cable from socket S5 to UHF circuit board holes A and B. F. Check the shielded cable from IF circuit board holes H and J to UHF circuit board holes F and G. G. Q502.
28. Unable to adjust C501, C502, or C201 (unstable).	A. Make sure all of the mounting hardware is tight. B. Components were not mounted close to the UHF circuit board as directed in the "Step-By-Step Assembly." C. Trimmer Capacitors C501, C502, and C201 were not properly preset. D. Check all items listed in step 27 above.
29. Unable to adjust L201 for minimum lamp brightness.	A. Check all items listed in step 27 above.

PROBLEM	POSSIBLE CAUSE
30. UHF signal distorted, does not clear up when control R228 is adjusted.	A. Check all items listed in step 28 above. B. Crystal is the wrong type or too far off frequency.
31. Unable to adjust coils L301, L302, L303, or L304.	A. Check all items listed in step 27 above. B. Check the shielded cable from socket S3 to HI VHF circuit board holes A and B. C. Check the shielded cable from IF circuit board holes D and E to HI VHF circuit board holes F and G. D. Q302.
32. Unable to adjust coils L402, L403, or L404.	A. Check all items listed in step 28 above. B. Check the shielded cable from socket S4 to LO VHF circuit board holes A and B. C. Check the shielded cable from IF circuit board holes F and G to LO VHF circuit board holes F and G. D. Q402.

OPERATIONAL PROBLEMS

PROBLEM	AREA OF PROBLEM (Troubleshooting Chart Number)
Unit dead.	1, 2.
Scanner won't scan.	5.
Scanning skips selected channels.	3, 6.
Priority channel circuit inoperative.	4.
No audio.	7, 10.
Squelch circuits inoperative.	13.
Weak reception.	A. Defective or incorrect type crystals. B. Improperly aligned.

SPECIFICATIONS

FREQUENCY RANGE

LO VHF Band	30 to 50 MHz.
HI VHF Band	146 to 174 MHz.
UHF Band	450 to 500 MHz.

SCANNING RANGE (6 dB bandwidth)

LO VHF Band	Any 10 MHz segment of frequency range.
HI VHF Band	Any 8 MHz segment of frequency range.
UHF Band	Any 8 MHz segment of frequency range.

SENSITIVITY (of aligned channel)

LO VHF Band	0.5 μF or less for 12 dB SINAD.
HI VHF band	0.5 μV or less for 12 dB SINAD.
UHF Band	0.7 μV or less for 12 dB SINAD.

GENERAL

Modulation Acceptance	±6.5 kHz minimum.
Antenna Input Impedance	50 ohms.
Channels	8, crystal controlled.
Adjacent Channel Rejection	−40 dB typical (±30 kHz channel spacing) (−55 dB typical with optional 8-pole filter).

Scan Rate	Approximately 16 channels per second.
Scan Delay	Approximately 1/2 second.
Priority Channel Scan Rate	Approximately every 4 seconds.
Intermediate Frequency (IF)	10.7 MHz.
Audio Output:	
AC Operation	1 watt with 10% or less distortion.
DC Operation	2 watts with 10% or less distortion.
Power Requirements:	
AC Operation	120 volts, 60 Hz; 12 watts.
DC Operation	13.8 volts; 300 mA squelched, 500 mA (at full audio) unsquelched.
Overall Dimensions	3-3/16″ high × 8-1/2″ deep × 11-1/16″ wide. (8.1 × 21.6 × 28.1 cm).
Net Weight	5 lbs (2.3 kg).

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

CIRCUIT DESCRIPTION

Refer to the Schematic Diagram and the Block Diagram as you read this Circuit Description. The part numbers on the Schematic are arranged in the following groups to help you locate specific parts on the Schematic, chassis, and circuit boards:

0-99	Parts mounted on the chassis.
100-199	Parts mounted on the scan circuit board.
200-299	Parts mounted on the IF circuit board.
300-399	Parts mounted on the HI VHF circuit board.
400-499	Parts mounted on the LO VHF circuit board.
500-599	Parts mounted on the UHF circuit board.
600-699	Parts mounted on the alignment generator circuit board.

HI VHF CIRCUIT

RF signals from the antenna are coupled through impedance matching network C301 and C302 to the bandpass transformer, L301, L302, and C303. This circuit is tuned to the incoming signals.

From a second impedance matching network, C304 and C305, the RF signals are applied to the base of RF amplifier Q301. An amplified RF signal is coupled from the collector of Q301 to a second bandpass transformer, L303 and L304, and then to the base of mixer transistor Q302. The base of Q302 also receives a signal from the crystal oscillator circuit that is 10.7 MHz lower in frequency than the incoming signal. The 10.7 MHz IF output from transistor Q302 is tuned by impedance matching coil L305 before it is applied to the input of the IF circuit on the IF circuit board.

LO VHF CIRCUIT

The LO VHF RF circuit is almost identical to the HI VHF circuit with a few exceptions. Coil L401 and capacitor C401 form a network that electrically lengthens the built-in antenna. This is necessary to tune the lower frequencies. Resistor R405 broadens tuned circuit L404 and C412 in order to get the necessary bandpass at these frequencies. Capacitor C414 couples the crystal oscillator signal to the base of mixer transistor Q402. The crystal oscillator signal is 10.7 MHz higher in frequency than the incoming signal. The 10.7 MHz IF output signal from transistor Q402 is tuned by the same impedance matching coil (L305) on the HI VHF circuit board.

UHF CIRCUIT

Inductors L501 and L502 are micro-strip lines etched on the glass-epoxy circuit board. These lines are tuned by trimmer capacitors C501 and C502. The incoming UHF signals are coupled from the antenna, through capacitor C503, to a low impedance point on the micro-strip line, L501. From an even lower impedance point, the signals are coupled to the emitter of grounded-base RF amplifier Q501. The amplified signals are coupled through C506 to the second micro-strip line, L502, and then through C507 to the base of mixer transistor Q502. The multiplied crystal oscillator signal (from the IF circuit board), which is 10.7 MHz lower in frequency than the incoming signal, is injected at the base of Q502. The 10.7 MHz IF output from transistor Q502 is tuned by the same impedance matching coil (L305) on the HI VHF circuit board.

IF CIRCUIT

The 10.7 MHz IF signal at coil L305 (on the HI VHF circuit board) is coupled through capacitor C222 to the monolithic crystal filters, FL201 and FL202 (a 4-pole network). An accessory package consisting of crystal filters FL203 and FL204, and capacitors C226 and C227 can be added to achieve an 8-pole network. This will increase the overall selectivity of the filter network. These filters and their matching coils, L203 and L204, help to shape the filter bandpass and eliminate frequencies other than the 10.7 MHz IF signal.

Transistor Q209 amplifies and matches the IF signal coming from the crystal filters to integrated circuit IC201 through IF transformer T201. IC201 is a limiting amplifier and quadrature detector. It also has the squelch circuitry and an AFC output. Coil L205 and its associated circuit form a phase-shift network for the quadrature detector.

The detected audio output from pin 6 of IC201 is coupled through a de-emphasis network, which consists of C245, C246, C247, R243, and R244. Capacitor C248 couples the audio signal to the base of audio preamplifier transistor Q210. Amplified audio signals are coupled from the collector of Q210 through capacitor C253 to Volume control R3.

The squelch output voltage at pin 12 of IC201 is filtered by R242, C243, and C244, before it is coupled to the Squelch control, R2. When no signal is present at the input of IC201, a positive voltage is present on the squelch output line (pin 12). As you adjust the Squelch control above threshold, gating transistor Q211 turns on. As this happens, its collector voltage goes low (near ground potential). This turns off transistor Q107 (on the scan circuit board), which starts the Scanner scanning. At the same time, transistor Q212 turns off, raising its collector voltage high. This high voltage, which is coupled back to pin 5 of IC201, mutes the audio signal at the output (pin 6).

When a signal is present in the IF circuit, the voltage at pin 12 of IC201 goes low (towards ground). If the voltage goes below the threshold setting of the Squelch control, Q211 turns off. The high level at the collector of Q211 turns on Q107 (on the scan circuit board), which stops the scanning. Transistor Q212 also turns on and a low level appears at its collector. This low, which is coupled to pin 5 of IC201, unmutes the audio signal at the output (pin 6). Diode D210 latches the circuit so that signals that are varying in amplitude, such as flutter, do not open and close the squelch circuits. Capacitor C244, because of its value, aids the latching circuit and also provides approximately 1/2-second time delay before the scanning circuits can operate again.

AFC CIRCUIT

The high multiplication factor of the crystal frequency for the UHF band can cause slight frequency errors of the crystal to become large errors at the injection frequency. To overcome this, AFC (automatic frequency control) circuits are used for the UHF band only.

A small error voltage is detected within IC201 and it is present at pin 7. This voltage is amplified by the DC amplifier, transistors Q206 and Q208, before it is applied to variable capacitance diode D219. This error voltage on D219 varies the capacitance of the crystal oscillator circuit, which pulls the frequency of the crystal to match the incoming signal frequency.

Switching transistor Q207 turns the AFC circuit on whenever a UHF channel is scanned. Control R228 presets the bias on D219. When the AFC circuit is turned off, resistors R225, R226, and R227 form a voltage divider, which places a constant fixed bias on D219. Diode D209 shorts out R227 when the AFC circuit is turned on, allowing the proper voltage swing from Q208.

CRYSTAL OSCILLATOR

The crystal oscillator, Q201, is a Pierce oscillator circuit. The collector of Q201 appears as RF ground potential at the crystal frequency. The crystals are connected between the base of Q201 and the collector supply line through their associated diode, D201 through D208. Each diode, which is normally biased off, forms an RF path between the crystal and the collector of the transistor. When IC101 (on the scanner circuit board) grounds a series RF choke (RFC201 through RFC208), the associated diode conducts and places the crystal in the circuit. Resistors R201 through R208 limit the current through the diodes.

The collector tank circuit (L201, C206, and C207) of transistor Q201 is tuned to the third harmonic of the crystal frequency. This provides a low impedance to the crystal frequency, but offers a high impedance to the third harmonic. The third harmonic signal is coupled from the collector of Q201 through capacitor C208 to the base of transistor Q302 (the mixer on the HI VHF circuit board).

Third harmonic energy is also coupled from the junction of C206 and C207 to the base of tripler stage Q202. Here again, coil L202 is etched on the circuit board and it is tuned by trimmer capacitor C201 to the ninth harmonic of the crystal frequency. (For incoming signals above 470 MHz, this stage is tuned to the tenth harmonic.) This harmonic signal is coupled from the collector of Q202 through capacitor C202 to the base of mixer transistor Q502 on the UHF circuit board.

Fundamental energy of the crystal oscillator is coupled from the emitter of Q201 through capacitor C209 to the base of mixer transistor Q402 on the LO VHF circuit board.

PROGRAMMER

Switching transistors Q203, Q204, and Q205, and jumper wires brown through gray, wire pin sockets 1 through 8, and diodes D211 through D218 make up the programmer circuit.

You can program each channel for any of the three bands (UHF, HI VHF, or LO VHF) by merely inserting the appropriate jumper wire into the wire pin socket that corresponds to the band you desire. When IC101 grounds the cathode of a diode, the diode will conduct, placing the base of the selected switching transistor (Q203, Q204, Q205) at ground potential. This causes the transistor to conduct, which supplies 9 volts to the appropriate front-end (UHF, HI VHF, LO VHF) board. When transistor Q205 (UHF) is turned on, it also supplies voltage to tripler stage Q202 and bias voltage to gate Q207.

SCANNER CIRCUITS

The scan oscillator consists of transistors Q105, Q106, and a timing network made up of R112, C104, C105, and C106. At normal scan rates, C105 is the controlling timing capacitor. Sharp rectangular pulses are coupled from the junction of R109 and R111 to the input (pin 14) of a 4-bit binary counter IC102. The output of the binary counter is directly coupled to decoder driver IC101. The outputs of IC101 go to zero (ground potential), which turns on the channel indicator lamps, when the channel select switch is closed. These outputs are also coupled to the gating diodes in the programmer and crystal oscillator circuits.

Transistor Q109 is a current-sensing circuit that determines if a channel switch is open. When a channel indicator lamp is on and drawing current, it produces a voltage drop across R115. This turns Q109 on, causing it to draw current through collector load resistors R117 and R119. The positive bias produced across R119 turns switching transistor Q108 on, which places timing capacitors C105 and C106, and the emitter of switching transistor Q107 at ground potential. If a channel select switch is open, that indicator lamp draws no current, and produces no voltage drop across R115 to cause Q109 to stop conducting. With no voltage drop across R119, switching transistor Q108 opens, which removes timing capacitors C105 and C106 from the circuit. Capacitor C104, the remaining timing capacitor, is such a small value that the scan oscillator speeds up to a scan rate that does not allow the associated crystal to start oscillating, thus skipping that channel.

When a signal is being received or when squelch control R2 is adjusted below threshold, the squelch voltage at the collector of Q211 (on the IF circuit board) goes high. This voltage is coupled to the base of switching transistor Q107, turning it on. As Q107 turns on, it shorts across the timing capacitors (C104 and C105), which stops the scan oscillator.

When the Man/Scan switch SW2 is in the Manual position (in), a positive voltage is coupled from the collector of Q109, through resistor R118, to the base of Q107. Since a positive voltage is also present at the base of Q108, both Q107 and Q108 conduct. This places a short across the timing capacitors, which stops the scan oscillator. When you push the Channel Select switch, SW3, the base of Q107 is grounded, turning the transistor off. This removes the short from across the timing capacitors and allows the scan oscillator to operate. However, since the Man/Scan switch also places C106 in parallel with timing capacitors C104 and C105, the resulting higher value capacitance lowers the scan oscillator frequency. This allows the scan oscillator to operate, but at a much slower rate.

Diode D102 isolates timing capacitor C106 so that it is out of the circuit when the Man/Scan switch is in the Scan position. However, this diode still allows current flow through Q107 and Q108, regardless of which position the Man/Scan switch is in. Diode D101 allows the timing capacitors to discharge when Q107 turns off.

PRIORITY OSCILLATOR

The priority oscillator, which consists of transistors Q103 and Q104, is similar to the scan oscillator except for the values of R107 and C102 in the timing network. This network produces a pulse output approximately every four seconds.

The action of IC102 repetitively sequences the outputs of IC101 to produce the normal scanning action. During this normal scanning, the priority channel (channel 1) is sampled approximately every four seconds. This sampling occurs quite rapidly (within about 40 milliseconds), even when a signal is being received on another channel. If no signal exists on the priority channel, the scanning will not be affected. However, if a signal is present on channel 1, IC102 is reset to hold the channel 1 output line (pin 1) of IC101 low. This holds the channel 1 circuit on. Scanning will resume when a signal is no longer present at channel 1.

Resistors R105 and R106 form a voltage divider that normally biases transistor Q102 on. However, when the priority oscillator circuit produces a negative pulse at the collector of Q103, transistor Q102 turns off. Since this causes the collector of Q102 to go high, both the D input (pin 12) of decoder-driver IC101 and the base of Q101 go high. The high at the base of Q101 causes it to turn on, which pulls the collector toward ground. This also grounds the channel 1 (priority) crystal. At the same time, the high at the D input of IC101 forces all outputs of decoder-driver IC101 high. This momentarily turns off all other crystals during the priority channel sample time. Also, when Q101 turns on, a negative pulse is coupled through capacitor C101 to pin 3 of IC102. This negative pulse stops and holds the counting process of IC102 during the priority channel sample time, which allows the Scanner to momentarily sample channel 1 and then return to the same channel.

If a signal is present when channel 1 is being sampled, a high level is coupled from transistor Q211 to pin 2 (reset 1) of IC102. Therefore, since pin 3 (reset 2) of IC102 is also low during the priority channel sample time, IC102 is reset. That is, the output of IC102 causes the decoder-driver IC101 pin 1 output to go low. This action places the Scanner in the channel 1 mode.

AUDIO AMPLIFIER

The audio signal from the Volume control is coupled to the base of transistor Q111, part of differential amplifer Q111 and Q112. The signal at the collector of Q111 is coupled to the base of constant-current, voltage-amplifier transistor Q113. From the collector of Q113, the signal is coupled to the base of output transistor Q114 and through diode D109 to the base of Q115. The constant voltage drop across D109 provides the bias voltage for the output stages.

Output transistors Q114 and Q115 form a quasi-complementary output circuit. In this circuit, a positive-going signal applied to the base of Q114 causes the transistor to conduct, increasing the signal current flow through the speaker voice coil. Negative-going signals applied to the base of Q115 cause this transistor to conduct, decreasing the signal current through the speaker voice coil. This alternate increase and decrease of signal current through the speaker voice coil, converts the electrical energy to audible signals.

POWER SUPPLY

The power supply consists of a dual-input power source. The unit can be powered from either a 13.8-volt DC or a 120-volt AC power source.

When a 13.8-volt DC source is used, the power is routed through an in-line fuse, a hash filter network (C109, C111, RFC101) and to the On-Off switch, SW1. Diode D106 protects the unit against wrong polarity connections by blowing the in-line fuse.

When a 120-volt AC power source is used, power is connected to the primary of transformer T1. This transformer can be left connected to the AC source continuously. It is protected by a built-in thermal fuse. If a short circuit occurs, the thermal fuse will open when the transformer temperature exceeds a predetermined safe level.

Transformer T1 steps the voltage down to approximately 14 volts AC in the secondary winding. Full-wave rectifier diodes D107 and D108 convert this AC voltage to DC. It is then filtered by capacitor C108, and routed to the audio power amplifier, regulator circuits, and scanner circuits.

The 9-volt supply, for the IF and RF circuit boards, is regulated by ZD104 and R123. C107 adds additional filtering to this supply.

The 5-volt supply for the scan circuits is regulated by ZD103 and R122.

Transistor Q110, ZD105 and R116 comprise an 11-volt regulator. The purpose of this regulator is to keep a constant voltage for back biasing the numerous gating diodes in this circuit. Because most diodes have varicap effects, any unregulated voltage on these diodes would cause problems in the crystal oscillator circuits, such as frequency shift, crystals not starting, etc.

ALIGNMENT GENERATOR

Transistor Q602 and crystal Y601 form a 10.7 MHz crystal oscillator circuit. The 10.7 MHz output signal from the collector of Q602 is coupled through capacitor C605 to RF LEVEL control R608. The RF LEVEL control sets the amount of signal that is coupled through C608 to plug P601. The 10.7 MHz signal is used to align the 10.7 MHz IF circuits.

When resistor R601 (at the end of the shielded cable) is inserted between test points TP6 and TP7 (on the IF circuit board), the heterodyne oscillator signal, plus its harmonics, are coupled from transistor Q201 to mixer diode D601. Here, the oscillator signal or one of its harmonics, is mixed with the 10.7 MHz signal from Q602. This provides an on-channel signal frequency that is used to align the RF stages.

Transistor Q601 and test lamp PL601 form a signal level indicator. Power (usually 13.8 V) is applied through the yellow lead. The green lead serves as the signal input to transistor Q601. When the voltage on the green lead becomes sufficiently positive, the test lamp starts to turn on. The brightness of the lamp is directly related to the voltage present on the green lead.

CIRCUIT BOARD X-RAY VIEWS

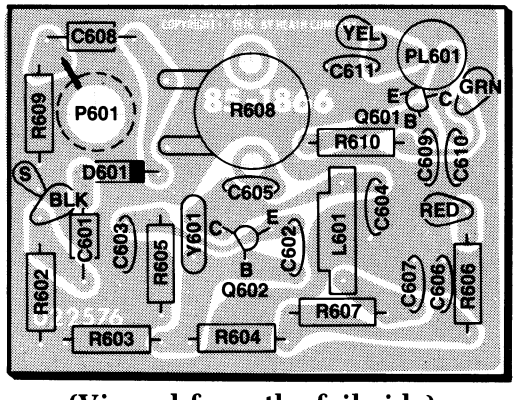
NOTE: To find the PART NUMBER of a component for the purpose of ordering a replacement part:

A. Find the circuit component number (R105, C103, etc.) on the X-Ray View.

B. Locate this same number in the "Circuit Component Number" column of the "Parts List" in your Manual.

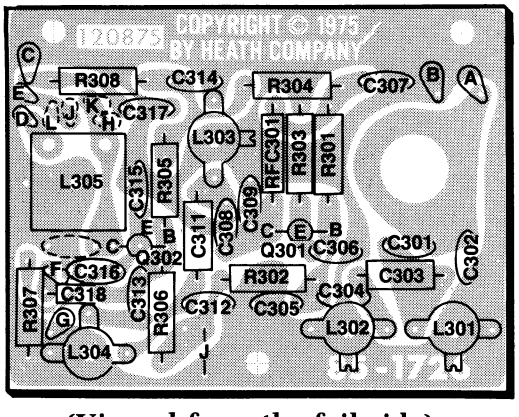
C. Adjacent to the circuit component number, you will find the PART NUMBER and DESCRIPTION which must be supplied when you order a replacement part.

ALIGNMENT GENERATOR CIRCUIT BOARD



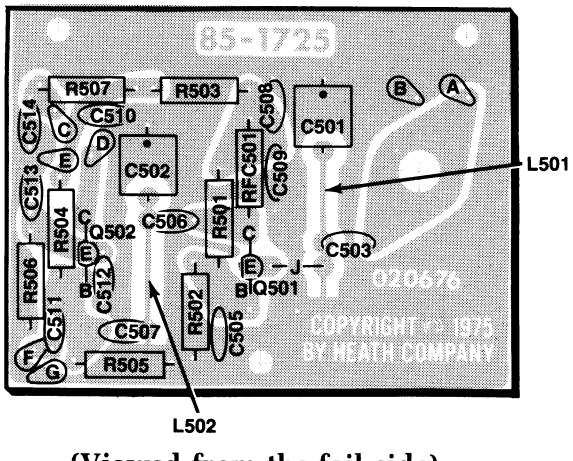
(Viewed from the foil side)

HI VHF CIRCUIT BOARD



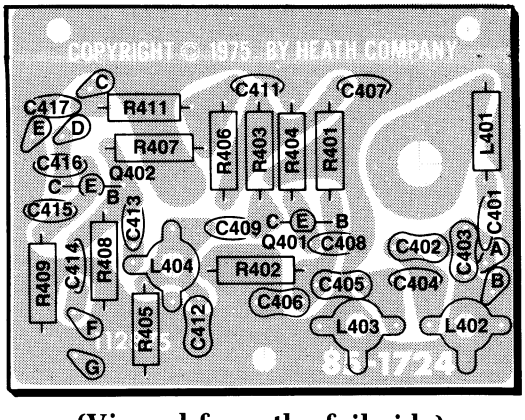
(Viewed from the foil side)

UHF CIRCUIT BOARD



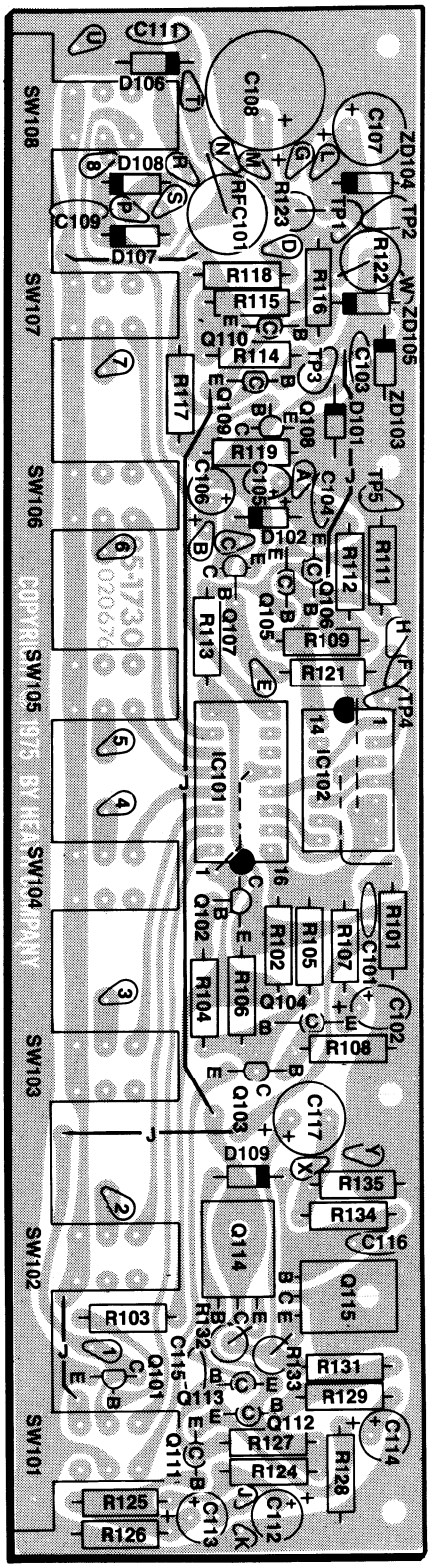
(Viewed from the foil side)

LO VHF CIRCUIT BOARD



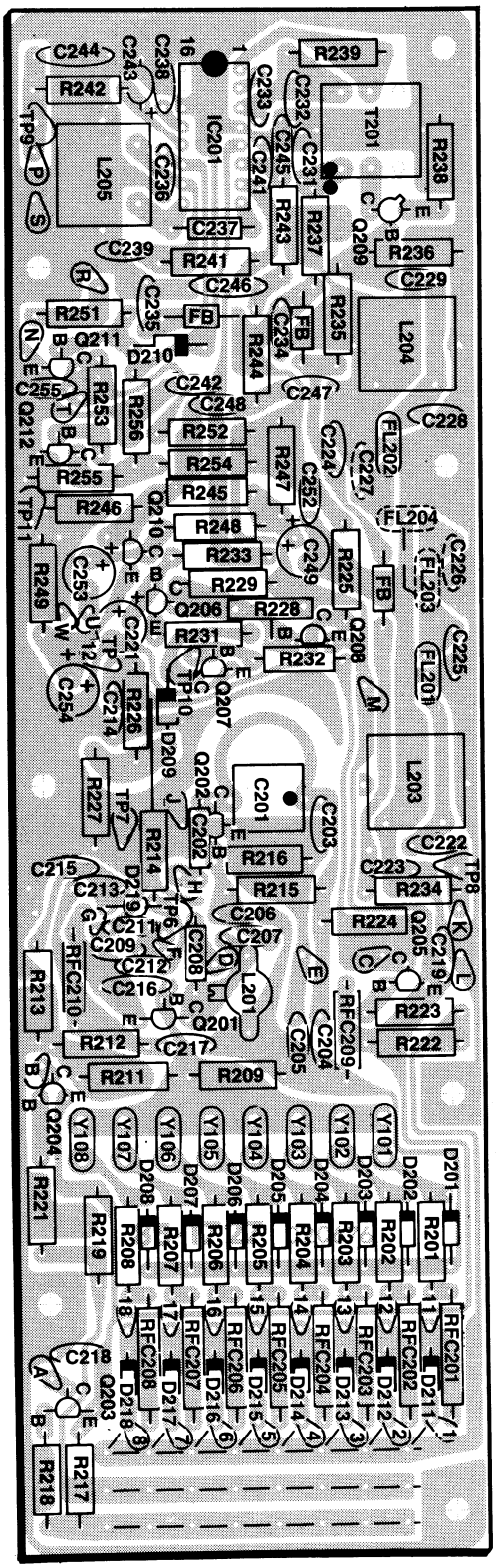
(Viewed from the foil side)

SCANNER CIRCUIT BOARD



(Viewed from the foil side)

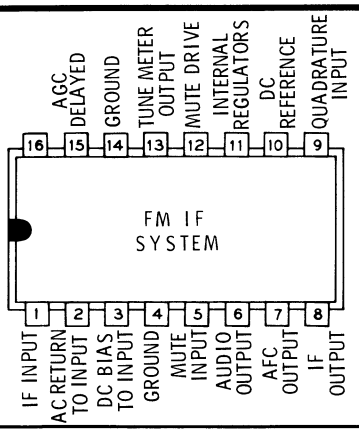
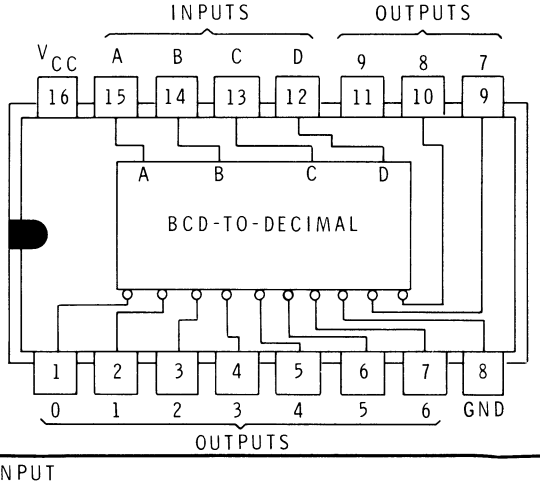
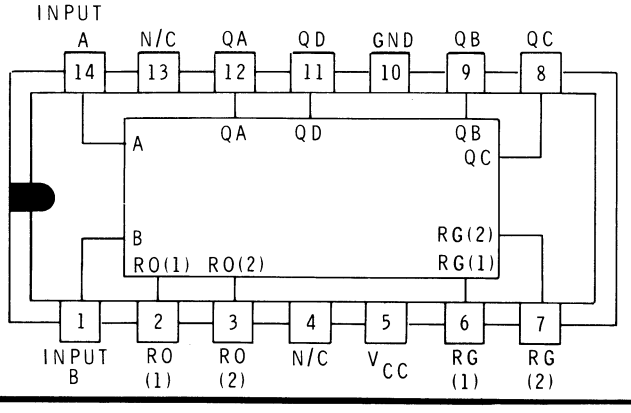
IF CIRCUIT BOARD



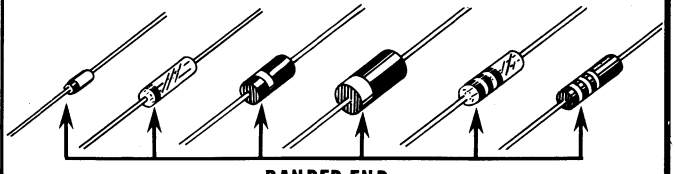
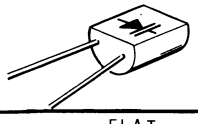
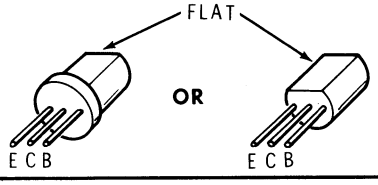
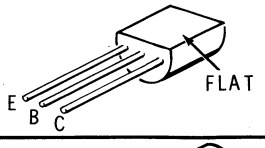
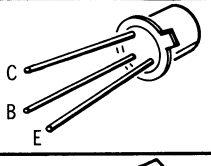
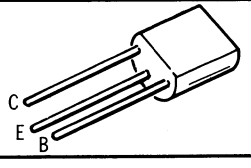
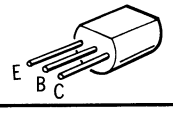
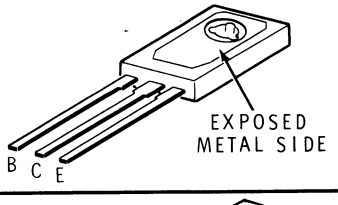
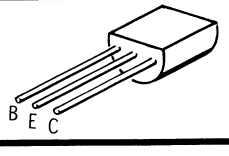
(Viewed from the foil side)

SEMICONDUCTOR IDENTIFICATION CHARTS

INTEGRATED CIRCUITS

COMPONENT	HEATH PART NUMBER	TYPE NUMBER	IDENTIFICATION
IC201	442-92	CA3089	
IC101	443-87	SN74145	
IC102	443-640	SN7493A	

DIODES AND TRANSISTORS

COMPONENT	HEATH PART NUMBER	TYPE NUMBER	IDENTIFICATION
ZD103	56-16	1N751 ZENER	HEATH PART NUMBERS ARE STAMPED ON MOST DIODES NOTE: DIODES MAY BE SUPPLIED IN ANY OF THE FIVE SHAPES SHOWN IN THE FOLLOWING ILLUSTRATION. ALWAYS POSITION THE BANDED END AS SHOWN IN THE PICTORIAL WHERE IT IS INSTALLED.  BANDED END
ZD104	56-19	VR-9.1 ZENER	
D601	56-26	1N191	
D101, D102, D109, D201, D202, D203, D204, D205, D206, D207, D208, D209, D210, D211, D212, D213, D214, D215, D216, D217, D218	56-56	1N4149	
ZD105	56-57	1N716A	
D106, D107, D108	57-65	1N4002	
D219	56-640	MV2110	
Q103, Q105, Q111, Q112, Q206, Q210, Q601	417-91	2N5232A	
Q104, Q106, Q109, Q113, Q203, Q204, Q205, Q208	417-201	X29A829	
Q110	417-94	2N3416	
Q201	417-293	2N5770	
Q209	417-154	2N2369	
Q202	417-258	TIS87	
Q101	417-864	MPSA05	
Q102, Q107, Q108, Q207, Q211, Q212	417-801	MPSA20	
Q114	417-818	MJE181	
Q115	417-819	MJE171	
Q301, Q501	417-887	MPSH10	
Q302, Q401, Q402, Q502, Q602	417-888	2N5222	

FOR PARTS REQUESTS ONLY

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

DO NOT WRITE IN THIS SPACE

INSTRUCTIONS

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

  Total enclosed $_____
- If you prefer COD shipment, check the COD box and mail this card. COD ☐

NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

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

Model # _____ Invoice # _____

Date Purchased _____ Location Purchased _____

LIST **HEATH** PART NUMBER	QTY.	PRICE EACH	TOTAL PRICE
TOTAL FOR PARTS			
HANDLING AND SHIPPING			
MICHIGAN RESIDENTS ADD 4% TAX			
TOTAL AMOUNT OF ORDER			

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

Phone (Replacement parts only): 616 982-3571

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OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR

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Date Purchased _____ Location Purchased _____

LIST **HEATH** PART NUMBER	QTY.	PRICE EACH	TOTAL PRICE
TOTAL FOR PARTS			
HANDLING AND SHIPPING			
MICHIGAN RESIDENTS ADD 4% TAX			
TOTAL AMOUNT OF ORDER			

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

Phone (Replacement parts only): 616 982-3571

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NOTES:

1. REFER TO THE X-RAY VIEWS FOR THE PHYSICAL LOCATION OF PARTS.
2. ALL RESISTORS ARE 1/2-WATT, 10% UNLESS THEY ARE MARKED OTHERWISE.
3. ALL CAPACITOR VALUES LARGER THAN 1.0 ARE IN pF UNLESS OTHERWISE SPECIFIED. CAPACITOR VALUES LESS THAN 1.0 ARE IN µF.
4. ⬭ INDICATES A DC VOLTAGE MEASURED FROM THE POINT INDICATED TO GROUND UNDER THE FOLLOWING CONDITIONS:
   a. AC POWER.
   b. VOLUME AND SQUELCH CONTROLS TURNED FULLY CLOCKWISE.
   c. LOCKED ON CHANNEL 1.
   d. NO SIGNAL INPUT.
5. ⬭ INDICATES A DC VOLTAGE TAKEN WHEN THE UHF CIRCUITS ARE ON.
6. ⬭ INDICATES A DC VOLTAGE TAKEN WHEN THE UHF CIRCUITS ARE OFF.
7. ⬭ INDICATES A DC VOLTAGE TAKEN WHEN THE HI VHF CIRCUITS ARE ON.
8. ⬭ INDICATES A DC VOLTAGE TAKEN WHEN THE LO VHF CIRCUITS ARE ON.
9. △ INDICATES A DC VOLTAGE TAKEN WHEN THE SCANNER IS DC POWERED.
10. ⬡ INDICATES A DC VOLTAGE TAKEN WHEN THE SQUELCH CONTROL IS FULLY COUNTERCLOCKWISE.
11. ◓ INDICATES A PART MOUNTED ON THE CHASSIS, ALTHOUGH ITS LOCATION IN THE SCHEMATIC SUGGESTS ANOTHER LOCATION.
12. □ INDICATES A LETTERED WIRE CONNECTION TO A CIRCUIT BOARD.

LO VHF CIRCUIT BOARD

HI VHF CIRCUIT BOARD

UHF CIRCUIT BOARD

IF CIRCUIT BOARD

SCANNER CIRCUIT BOARD

GRA-1100-2 FILTER ACCESSORY

IC201 PIN VOLTAGES

ALIGNMENT GENERATOR

SCHEMATIC OF THE HEATHKIT® LO-HI VHF/UHF SCANNER MODEL GR-1132

Part of 595-1832