

CAUTION

USE EXTREME CARE DURING INITIAL TESTING AND ALL SUBSEQUENT OPERATION OF THIS CW TRANSCEIVER. WHILE THE HW-16 IS DESIGNED FOR MAXIMUM SAFETY, NEVER LOSE RESPECT FOR THE HIGH VOLTAGE PRESENT IN THIS UNIT. ALWAYS PROTECT YOURSELF AGAINST LETHAL OR SEVERE ELECTRIC SHOCK.

Assembly
and
Operation
of the



CW TRANSCEIVER

MODEL HW-16

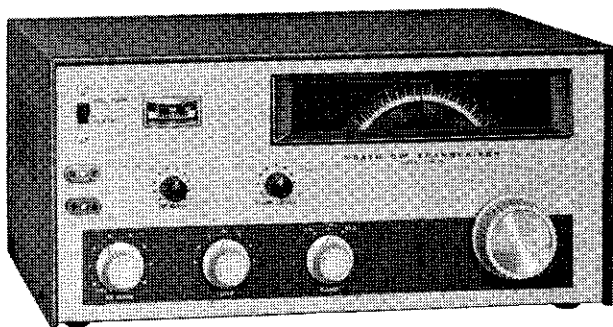


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INTRODUCTION

The Heathkit Model HW-16 CW Transceiver is a high performance and economical amateur radio receiver and transmitter. Although it is designed with the Novice Class operator in mind, this Transceiver is also an excellent piece of equipment for the General Class operator. The Transceiver provides full break-in CW communications in the lower 250 kHz segments of the 80-, 40-, and 15-meter bands.

The transmitter is crystal-controlled, using 80-meter crystals on 80- or 40-meter bands, and 40-meter crystals on 40- or 15-meter bands. The Transceiver also has provisions for an external VFO.

Input power to the final stage is adjustable for 50 to 90 watts input. A 75 watt marker on the meter, which indicates plate current, represents maximum power for Novice Class operation. All three stages of the transmitter are grid-block keyed. The only tuning required when changing bands or frequency is adjusting the final Tune capacitor.

The receiver uses dual conversion for excellent image rejection and the receiver's front end is

crystal controlled for excellent stability. For high selectivity, the receiver uses a 500 Hz crystal filter. The receiver is automatically muted each time the key is depressed, providing full break-in operation. No external antenna relay is required, as antenna switching is accomplished within the Transceiver.

The following equipment will be necessary for the initial test and alignment of the Transceiver.

1. An 11 megohm input VTVM (a 20 K Ω /V VOM may also be used).
2. A 50 Ω nonreactive dummy load that is capable of 100 watts dissipation, such as the Heathkit Cantenna, Model HN-31.
3. Crystals:
 - 7.030 MHz or slightly higher frequency.
 - 3500 kHz or slightly higher frequency.
 - 3750 kHz or slightly lower frequency.

NOTE: Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

PARTS LIST

NOTE: The numbers in parentheses in the Parts List are keyed to the numbers on the Parts Pictorial (fold-out from Page 5) to aid in parts identification.

To order replacement parts, refer to the Replacement Parts Price List and use the Parts Order Form furnished with this kit.

PART No.	PARTS Per Kit	DESCRIPTION
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PART No.	PARTS Per Kit	DESCRIPTION
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RESISTORS

1/2 Watt		
(1) 1-41	3	10 Ω (brown-black-black)
1-54	1	15 Ω (brown-green-black)
1-66	2	150 Ω (brown-green-brown)
1-42	1	270 Ω (red-violet-brown)
1-6	1	470 Ω (yellow-violet-brown)
1-9	4	1000 Ω (brown-black-red)
1-13	1	2700 Ω (red-violet-red)
1-14	4	3300 Ω (orange-orange-red)
1-18	2	5600 Ω (green-blue-red)
1-20	4	10 K Ω (brown-black-orange)
1-21	1	15 K Ω (brown-green-orange)
1-22	3	22 K Ω (red-red-orange)
1-25	5	47 K Ω (yellow-violet-orange)
1-60	1	68 K Ω (blue-gray-orange)
1-26	5	100 K Ω (brown-black-yellow)

Resistors (1/2 Watt) (cont'd.)

1-121	1	120 K Ω (brown-red-yellow)
1-29	2	220 K Ω (red-red-yellow)
1-99	2	240 K Ω (red-yellow-yellow)
1-31	1	330 K Ω (orange-orange-yellow)
1-33	1	470 K Ω (yellow-violet-yellow)
1-35	2	1 megohm (brown-black-green)
1-36	3	1.5 megohm (brown-green-green)
1 Watt		
(2) 1-2-1	1	1000 Ω (brown-black-red)
1-5-1	1	22 K Ω (red-red-orange)
1-7-1	3	47 K Ω (yellow-violet-orange)
1-8-1	1	68 K Ω (blue-gray-orange)

PART No.	PARTS Per Kit	DESCRIPTION	PART No.	PARTS Per Kit	DESCRIPTION
2 Watt			Other Capacitors		
(3) 1-13-2	1	220 Ω (red-red-brown)	(11) 21-29	1	4.7 pf tubular
1-17-2	1	6800 Ω (blue-gray-red)	(12) 31-31	1	3-12 pf trimmer
1-11-2	2	22 K Ω (red-red-orange)	(13) 26-113	2	54 pf variable
1-18-2	2	33 K Ω (orange-orange-orange)	COILS		
1-10-2	1	47 K Ω (yellow-violet-orange)	NOTE: Do not remove coils from their envelopes until they are called for in the assembly steps.		
1-24-2	2	100 K Ω (brown-black-yellow)	(14) 40-79	1	40-meter oscillator coil
Other Resistors			(15) 40-360	1	15-meter heterodyne oscillator coil
(4) 3-19-5	1	330 Ω 5 watt	40-363	1	15-meter RF coil
3-9-7	1	100 Ω 7 watt	40-795	1	80-meter RF coil
CAPACITORS			40-796	1	40-meter RF coil
Resin			40-797	2	40/80-meter heterodyne oscillator coil
(5) 20-130	2	12 pf	(16) 40-798	1	80/40/15-meter final coil
20-99	1	22 pf	(17) 40-799	1	VFO shielded coil
20-96	2	36 pf	40-801	1	80-meter driver coil (shielded)
20-101	1	47 pf	40-802	1	40-meter driver coil (shielded)
20-110	2	75 pf	40-803	1	15-meter driver coil (shielded)
20-102	5	100 pf	(18) 40-800	1	Crystal filter coil (shielded)
20-104	1	130 pf	CHOKES		
20-108	2	200 pf	(19) 45-30	3	.5 mH RF choke
20-106	2	390 pf	(20) 45-3	1	1 mH RF choke
20-107	2	680 pf	(21) 45-19	1	Parasitic RF choke (wound on 47 Ω yellow-violet-black)
20-122	3	1000 pf	TRANSFORMERS		
(6) 27-47	1	.1 μ fd	51-55	1	AF output transformer
Disc			(22) 52-71	1	IF transformer
(7) 21-3	4	10 pf	(23) 52-102	1	Bandpass coupler transformer
21-7	1	33 pf	54-179	1	Power transformer
21-49	1	68 pf 4KV	DIODES-TRANSISTOR		
21-139	1	150 pf 2KV or 4KV	56-26	1	1N191 crystal diode (brown-white-brown)
21-56	2	470 pf	(25) 57-27	6	Silicon diode
21-14	6	.001 μ fd	(26) 417-150	1	2N1274 transistor
21-71	2	.001 μ fd 1.4 KV			
21-36	1	.002 μ fd			
21-57	33	.005 μ fd			
21-35	1	.005 μ fd 1.6 KV			
21-31	8	.02 μ fd			
Electrolytic					
(8) 25-54	1	10 μ fd			
(9) 25-206	1	20-20 μ fd			
(10) 25-179	1	50-40-80-80 μ fd			
25-17	2	50 μ fd			

PART No.	PARTS Per Kit	DESCRIPTION	PART No.	PARTS Per Kit	DESCRIPTION
TUBES			Sockets-Jacks-Plugs (cont'd.)		
411-26	1	12AX7	(41)434-112	2	7-pin circuit board type tube socket
411-63	2	6CL6	(42)434-121	1	12-pin compactron tube socket
411-124	2	6EA8	(43)436-4	2	Phone jack
411-170	2	6EW6	(44)438-3	1	Phone plug
411-171	1	6HF8	(45)438-4	3	Phono plug
411-185	1	6GE5	(46)431-10	2	3-lug terminal strip
CRYSTALS			431-11	1	5-lug terminal strip
(27)404-206	1	3396.4 kHz product detector	431-12	3	4-lug terminal strip
404-301	1	9.045 MHz	431-16	2	2-lug terminal strip
404-302	1	12.545 MHz	431-55	1	6-lug terminal strip
404-303	1	26.545 MHz	(47)481-1	1	4-prong metal capacitor mounting wafer
404-305		Matched set of crystals consisting of the following:	(48)481-4	2	3-prong fiber capacitor mounting wafer
404-241	1	3395.150 kHz	(49)206-54	2	Tube shield
404-242	1	3395.450 kHz			
LAMPS			COAXIAL CABLE-WIRE-SLEEVING		
412-1	2	6 volt incandescent	343-7	1	Coaxial cable
(28)412-34	1	Neon	344-50	1	Black hookup wire
CONTROLS-SWITCHES			344-51	1	Brown hookup wire
(29)10-33	1	200 Ω control (RF Gain)	344-52	1	Red hookup wire
11-78	1	15 K Ω control (Power-Level)	344-54	1	Yellow hookup wire
(30)19-72	1	500 K Ω control with switch (AF Gain and Off-On)	344-55	1	Green hookup wire
(31)60-4	1	SPDT slide switch (Rel-Pwr-Plate)	344-56	1	Blue hookup wire
(32)63-436	1	4-section band switch	344-59	1	White hookup wire
(33)65-10	1	3 ampere circuit breaker	340-3	1	Large bare wire
SOCKETS-JACKS-PLUGS			340-8	1	Small bare wire
(34)434-2	1	Octal tube socket	346-4	1	Sleeving
(35)434-38	1	Large crystal socket	HARDWARE		
(36)434-42	3	Phono socket	#3 Hardware		
(37)434-43	2	9-pin, shielded tube socket	(50)250-49	26	3-48 x 1/4" screw
(38)434-74	1	Small crystal socket	(51)254-7	29	#3 lockwasher
(39)434-79	4	9-pin circuit board type tube socket	(52)252-1	26	3-48 x 3/16" nut
(40)434-90	2	Miniature pilot lamp socket with bracket	#4 Hardware		
			(53)250-34	2	4-40 x 1/2" screw (retain in envelope)
			(54)252-15	2	4-40 x 3/16" nut (retain in envelope)

PART No.	PARTS Per Kit	DESCRIPTION
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PART No.	PARTS Per Kit	DESCRIPTION
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#6 Hardware

(55) 250-138	8	6-32 x 3/16" screw
(56) 250-56	36	6-32 x 1/4" screw
(57) 250-116	4	6-32 x 1/4" black screw
(58) 250-8	10	#6 sheet metal screw
(59) 250-162	4	6-32 x 1/2" screw
(60) 254-1	59	#6 lockwasher
(61) 252-3	44	6-32 x 1/4" nut
(62) 252-22	4	6-32 speednut
(63) 259-1	3	#6 solder lug
(64) 259-6	3	#6 small solder lug

METAL PARTS

90-358	1	Top cover
(81) 100-43	1	Dial hub assembly
200-485-1	1	Chassis
203-479-1	1	Front panel
(82) 204-102	1	Shield bracket
205-260	1	Plate, chassis bottom
(83) 206-334	1	Small shield plate
(84) 206-335	1	Large shield plate
(85) 206-336	1	RF shield

MISCELLANEOUS

73-1	1	3/8" rubber grommet
73-4	1	5/16" rubber grommet
75-24	1	Line cord strain relief
89-1	1	Line cord
85-173-1	1	Circuit board
(86) 100-624	1	Dial drive assembly
(87) 407-121	1	Meter
464-29-5	1	Dial
453-39	1	Shaft, 5-13/16" long
462-122	3	Gray knob with skirt and pointer
462-258	2	Dark green knob
462-189	1	2" gray knob
446-59	1	Escutcheon
(88) 346-25	1	Black tubing
(89) 260-7	4	IF transformer clip
261-9	4	Rubber foot
489-1	1	Sandpaper
490-5	1	Nut starter
490-1	1	Alignment tool
391-34	1	Identification label
597-260	1	Parts Order Form
597-308	1	Kit Builders Guide
	1	Manual (See front cover for part number.)
		Solder

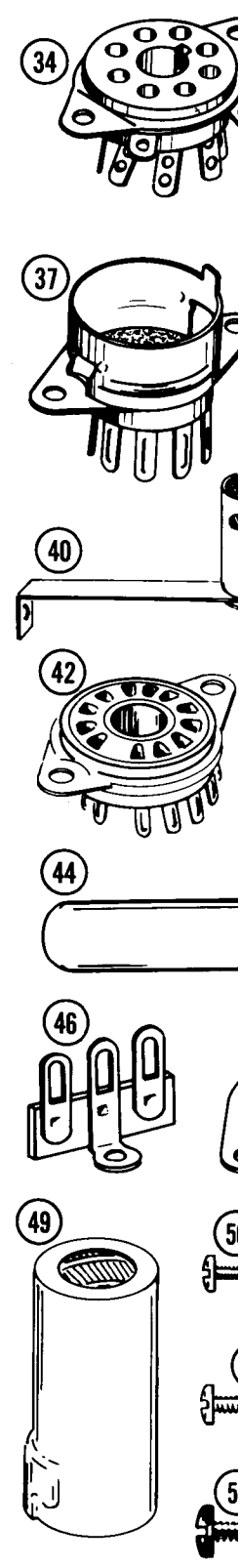
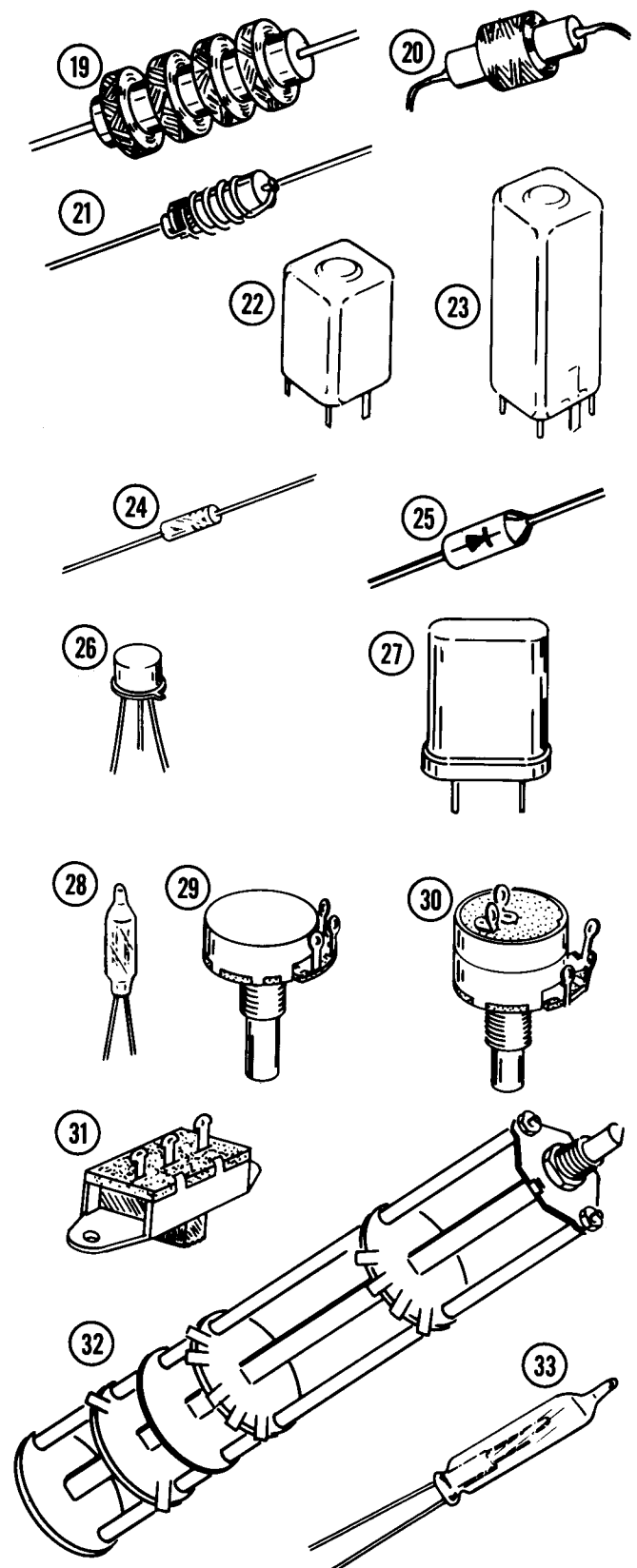
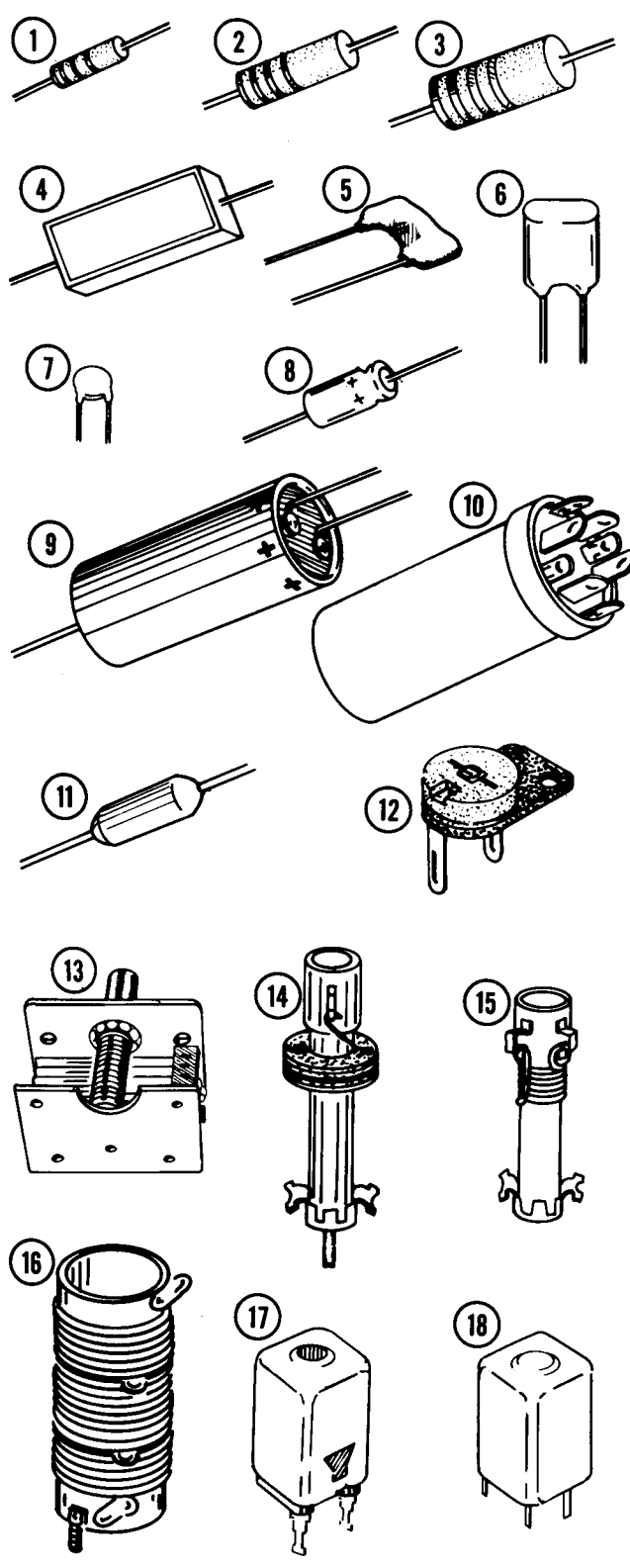
#8 Hardware

(65) 250-16	1	8-32 x 3/16" setscrew
(66) 250-92	1	8-32 x 5/8" screw
(67) 253-9	4	#8 small flat washer
(68) 253-45	2	#8 large flat washer
(69) 254-2	5	#8 lockwasher
(70) 252-4	5	8-32 nut
(71) 252-28	1	8-32 knurled nut
(72) 259-24	4	#8 wire lug

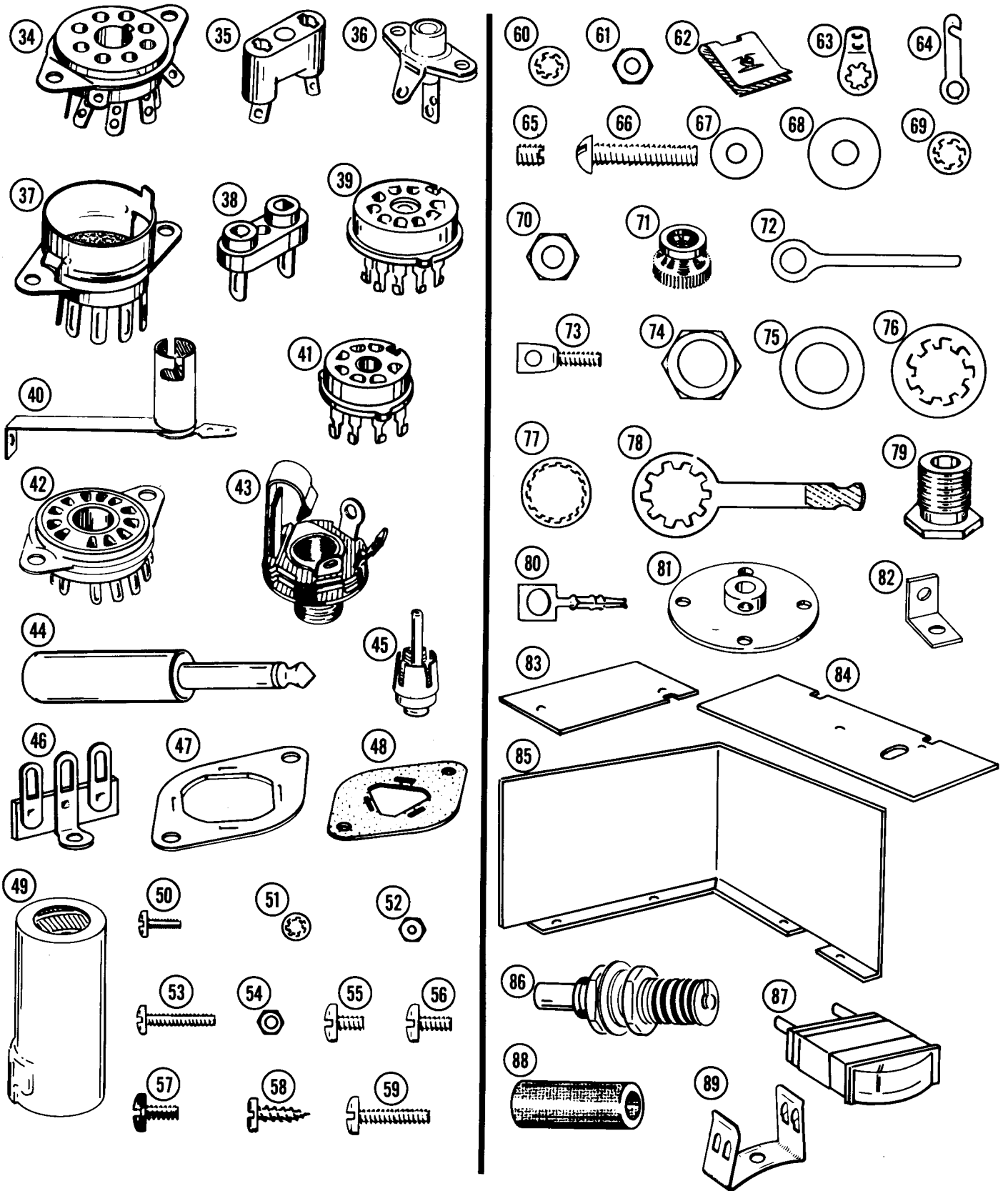
Other Hardware

(73) 251-1	3	6-32 spade bolt
(74) 252-7	7	Control nut
(75) 253-10	8	Control flat washer
(76) 254-4	6	Control lockwasher
(77) 254-5	1	Thin control lockwasher
(78) 259-10	1	Control solder lug
(79) 455-9	1	Bushing
(80) 259-20	1	Terminal pin

PARTS PICTORIAL



PARTS PICTORIAL



STEP-BY-STEP ASSEMBLY

CIRCUIT BOARD ASSEMBLY

Before you start the circuit board assembly be sure to read the Circuit Board Parts Mounting and the Soldering sections (Pages 11, 12, and 13) of the Kit Builders Guide.

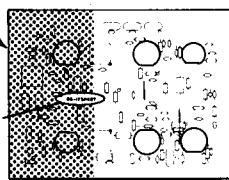
Use 1/2 watt resistors unless the step directs otherwise. All resistors will be called out by only the resistance value (in Ω , $K\Omega$, or megohms) and the color code. Capacitors will be called by only the capacitance and type. Use hookup wire of

the color specified when wire is called for in a step. Cut the wires to the proper length and remove insulation from each end as directed. Position each wire as shown.

Refer to Pictorial 1. Position the circuit board on your work surface as shown in Pictorial 1. Due to its large size, only a small portion of the circuit board is shown in each of the next three Pictorials; the complete board is shown in Pictorial 4.

Complete each step on Pictorials 1, 2, 3, and 4.

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

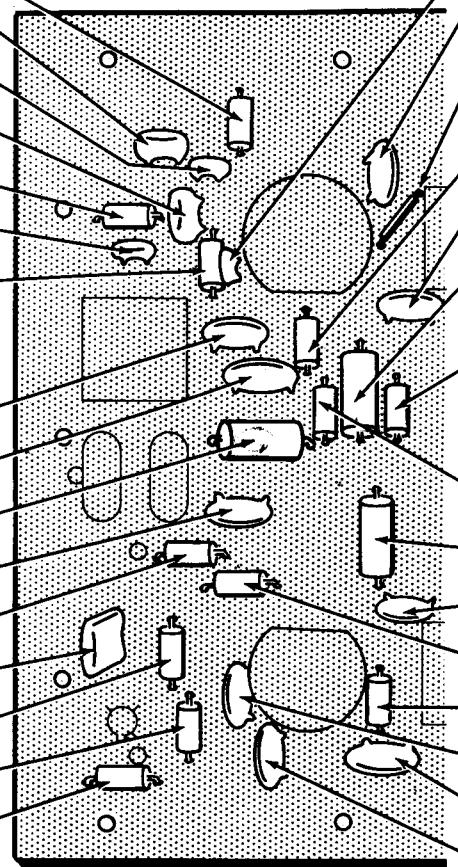


START



PART NUMBER

- () 1000 Ω (brown-black-red).
- () 1000 pf resin.
- () 680 pf resin.
- () 1000 pf resin.
- () 1000 Ω (brown-black-red).
- () 100 pf resin.
- () 100 K Ω (brown-black-yellow).
- () Solder all leads to the foil and cut off the excess lead lengths.
- () .005 μ fd disc.
- () .02 μ fd disc.
- () 47 K Ω 1 watt (yellow-violet-orange).
- () .005 μ fd disc.
- () 22 K Ω (red-red-orange).
- () .1 μ fd Mylar.
- () 220 K Ω (red-red-yellow).
- () 120 K Ω (brown-red-yellow).
- () 10 K Ω (brown-black-orange).
- () Solder all leads to the foil and cut off the excess lead lengths.



PICTORIAL 1

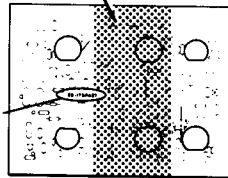
CONTINUE



- () 100 pf resin.
- () .005 μ fd disc.
- () 1-1/2" wire. Use yellow hookup wire with 1/2" of insulation removed from each end.
- () 3300 Ω (orange-orange-red).
- () .005 μ fd disc.
- () 47 K Ω 1 watt (yellow-violet-orange).
- () 1.5 megohm (brown-green-green).
- () Solder all leads to the foil and cut off the excess lead lengths.
- () 47 K Ω (yellow-violet-orange).
- () 68 K Ω 1 watt (blue-gray orange).
- () .005 μ fd disc.
- () 3300 Ω (orange-orange-red).
- () 5600 Ω (green-blue-red).
- () .005 μ fd disc.
- () .02 μ fd disc.
- () .005 μ fd disc.
- () Solder all leads to the foil and cut off the excess lead lengths.

PROCEED TO PICTORIAL 2.

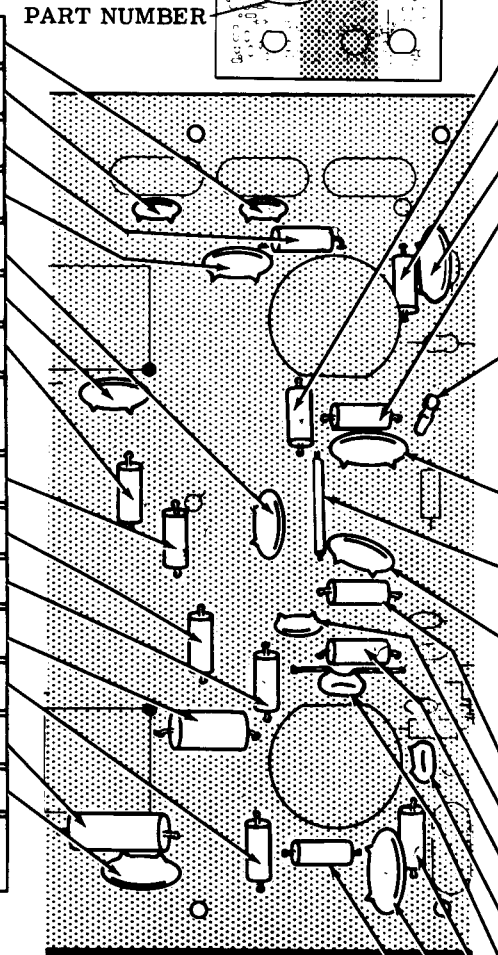
The steps performed in this Pictorial are in this area of the circuit board.



START ↓

CONTINUE ↓

- () 10 pf disc.
- () 10 pf disc.
- () 1000 Ω (brown-black-red).
- (✓) .005 μfd disc.
- (✓) .005 μfd disc.
- (L) .005 μfd disc.
- () 100 KΩ (brown-black-yellow).
- () Solder all leads to the foil and cut off the excess lead lengths.
- () 10 Ω (brown-black-black).
- () 150 Ω (brown-green-brown).
- () 3300 Ω (orange-orange-red).
- () 4.7 pf tubular.
- () 3300 Ω (orange-orange-red).
- (✓) 22 KΩ 1 watt (red-red-orange).
- () .02 μfd disc.
- (✓) Solder all leads to the foil and cut off the excess lead lengths.




- (✓) 1 megohm (brown-black-green).
 - () 10 KΩ (brown-black-orange).
 - (L) .005 μfd disc.
 - (L) 240 KΩ (red-yellow-yellow).
 - (L) Install terminal pin (#259-20) at "test point" location on circuit board.
-
- () .02 μfd disc.
 - (L) 1-3/4" wire. Use yellow hook-up wire with 1/2" of insulation removed from each end.
 - (L) .005 μfd disc.
 - () Solder all leads to the foil and cut off the excess lead lengths.
 - (✓) 240 KΩ (red-yellow-yellow).
 - () 470 pf disc.
 - () 47 KΩ (yellow-violet-orange).
 - () 36 pf resin.
 - () 200 pf resin.
 - (✓) 47 KΩ (yellow-violet-orange).
 - () .02 μfd disc.
 - (✓) 68 KΩ (blue-gray-orange).
 - (✓) Solder all leads to the foil and cut off the excess lead lengths.

PICTORIAL 2

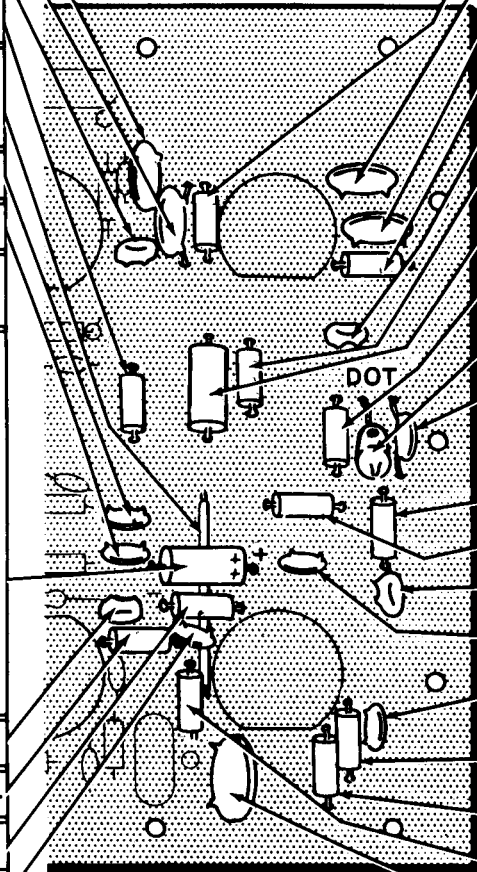
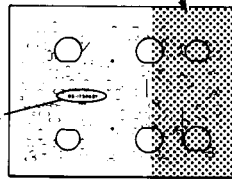
PROCEED TO PICTORIAL 3.

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

START ↓

- (.) .005 μ fd disc.
 - () .005 μ fd disc.
 - (.) 22 pf resin.
 - () 1 megohm (brown-black-green).
 - (.) 2-1/4" wire. Use yellow hookup wire with 1/2" of insulation removed from each end.
 - (.) .001 μ fd disc.
 - (.) 470 pf disc.
 - (.) Solder all leads to the foil and cut off the excess lead lengths.
 - (.) 10 μ fd electrolytic. NOTE: When mounting electrolytic capacitors, always match the positive (+) mark on the capacitor with the positive (+) mark on the circuit board.
- 
- () 100 pf resin.
 - (.) 2700 Ω (red-violet red).
 - (.) 270 Ω (red-violet-brown).
 - (.) .001 μ fd disc.
 - (.) Solder all leads to the foil and cut off the excess lead lengths.

PART NUMBER



CONTINUE ↓

- (v) 47 K Ω (yellow-violet orange).
- () .005 μ fd disc.
- () .005 μ fd disc.
- () 100 K Ω (brown-black yellow).
- (.) 100 pf resin.
- () 10 Ω (brown-black-black).
- (v) 47 K Ω 1 watt (yellow-violet-orange).
- () 1.5 megohm (brown-green-green).
- (.) Neon lamp. Align red dot of neon lamp to red dot on circuit board.
- () .002 μ fd disc.
- (.) Solder all leads to the foil and cut off the excess lead lengths.
- (.) 470 K Ω (yellow-violet-yellow).
- (.) 100 K Ω (brown-black-yellow).
- (.) 390 pf resin.
- () .001 μ fd disc.
- () .001 μ fd disc.
- (.) 1.5 megohm (brown-green-green).
- (.) 470 Ω (yellow-violet-brown).
- (.) 330 K Ω (orange-orange yellow).
- () .005 μ fd 1.6 KV disc.
- (.) Solder all leads to the foil and cut off the excess lead lengths.

PROCEED TO PICTORIAL 4.

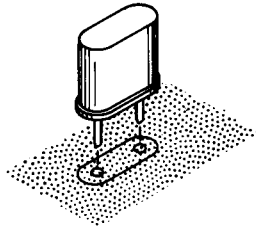
PICTORIAL 3

START

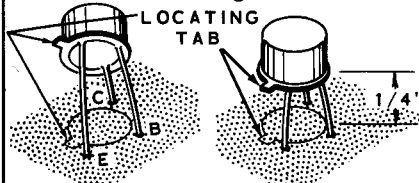


NOTE: Solder the pins of each part as it is installed. Do not bend or cut off the crystal pins after soldering.

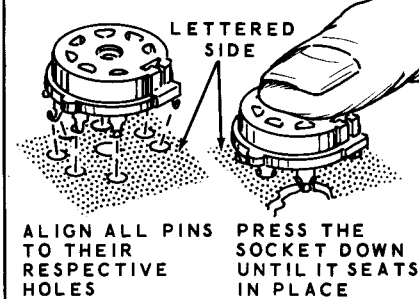
(.) 3395,150 kHz crystal (#404-241).



(.) Install the transistor in the following manner, as shown: First, line up the locating tab of the transistor with the outline of the tab on the circuit board. Then insert the transistor ends into their correct holes, which are indicated by C, B, and E. Position the transistor 1/4" away from the circuit board. Solder each lead to foil and cut off the excess lead lengths.



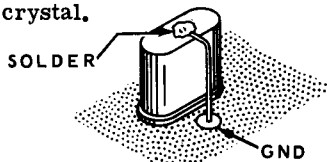
(.) Mount 7-pin circuit board tube sockets at V1 and V4.



ALIGN ALL PINS TO THEIR RESPECTIVE HOLES PRESS THE SOCKET DOWN UNTIL IT SEATS IN PLACE

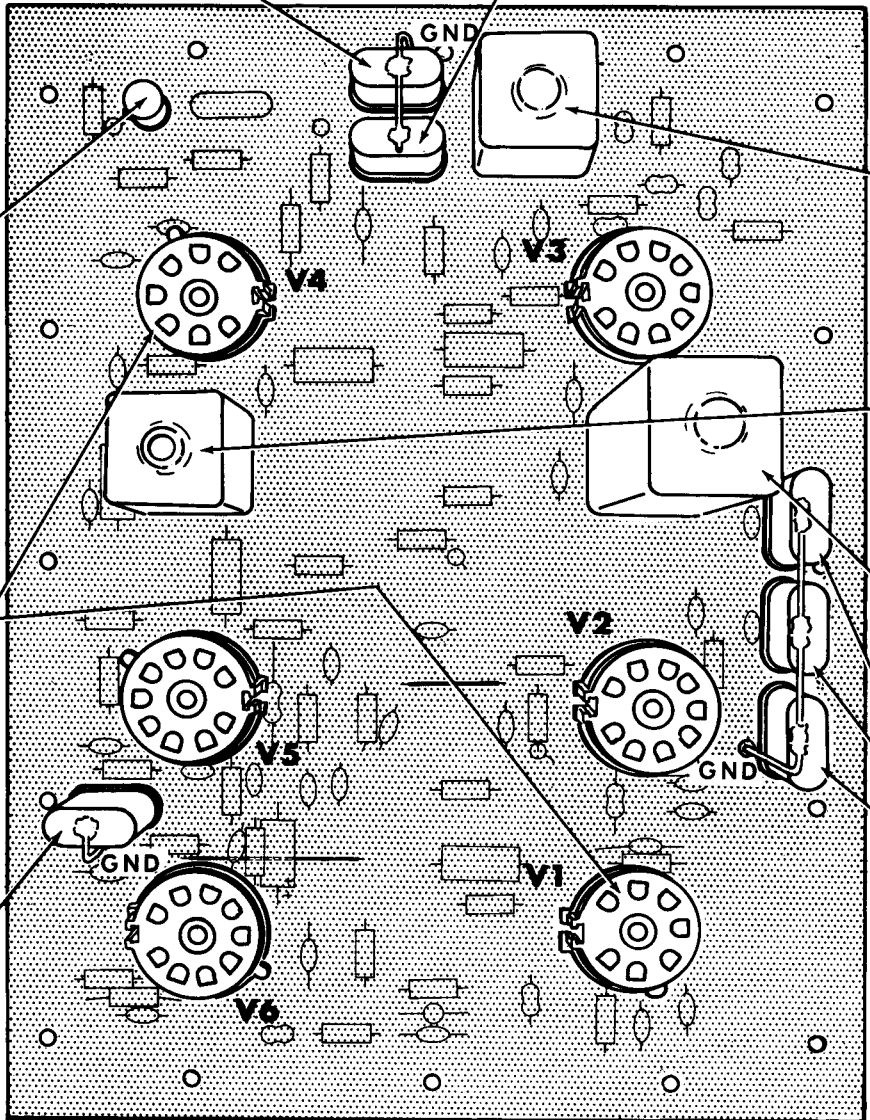
(.) 3396,4 kHz crystal (#404-206).

(v) 1-3/4" small bare wire. Bend wire 90 degrees 1/4" from end. Insert 1-1/2" portion into GND hole in circuit board. Solder wire to crystal. Be careful, excessive heat can damage the crystal.

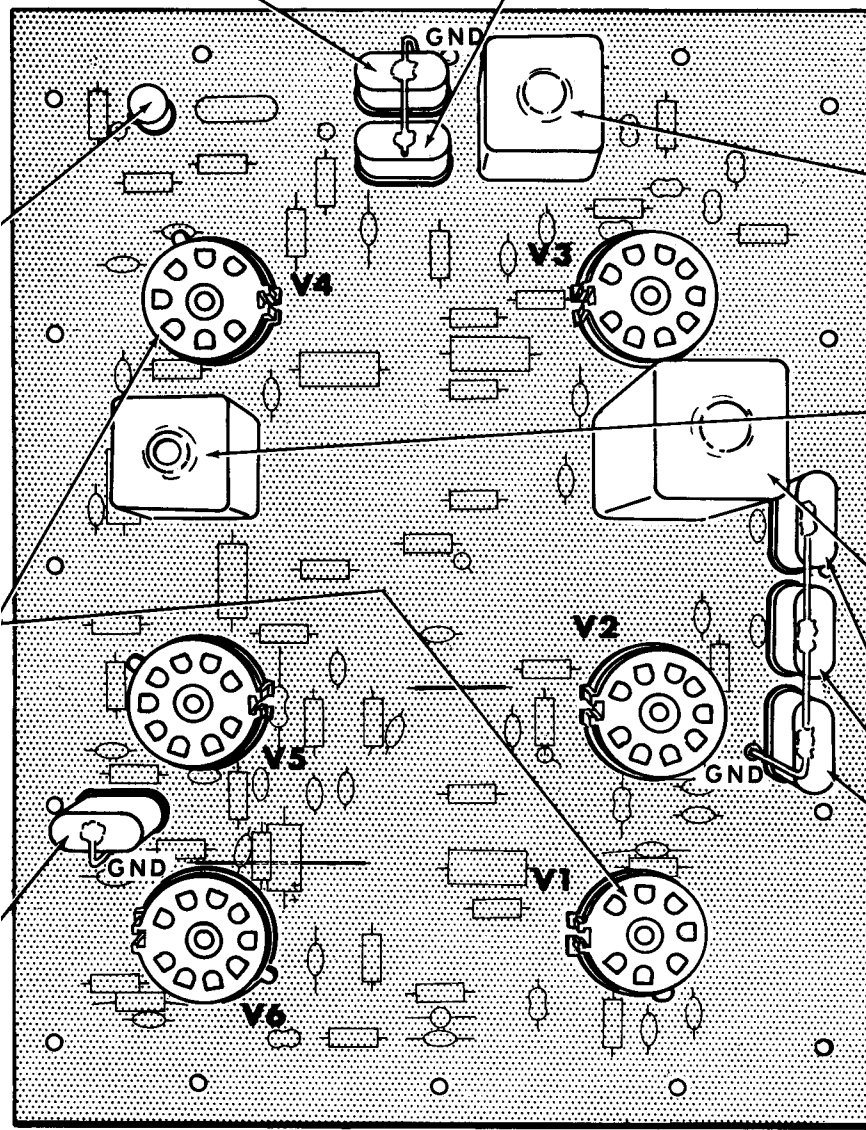


(v) Turn circuit board over, solder wire to foil, and cut off excess lead.

(.) Install 9-pin circuit board tube sockets at V2, V3, V5, and V6.

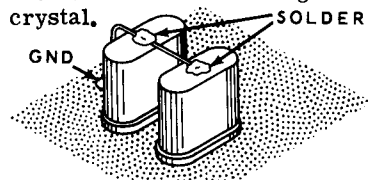


PICTORIAL 4



() 3395,450 kHz crystal (#404-242).

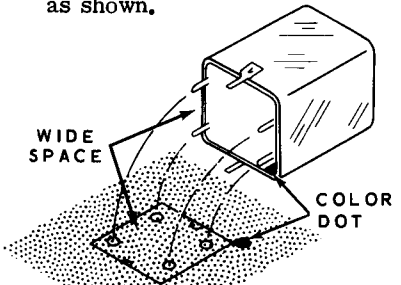
() 2-1/2" small bare wire. Bend wire 90 degrees 1" from end. Insert 1-1/2" portion into GND hole in circuit board. Solder wire to each crystal. Be careful, excessive heat can damage the crystal.



() Turn circuit board over, solder wire to foil, and cut off excess lead.

() Crystal filter coil (#40-800).

() 3,395 MHz IF transformer (#52-71). Position the color dots as shown.



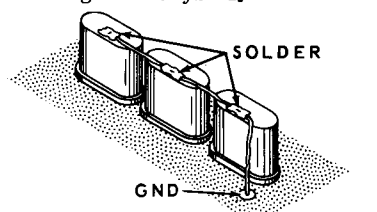
() Bandpass transformer (#52-102). Position the transformer color dot over the circuit board color dot.

() 9,045 MHz crystal (#404-301).

() 12,545 MHz crystal (#404-302).

() 26,545 MHz crystal (#404-303).

() 3-1/2" small bare wire. Bend wire 90 degrees 1-1/2" from end. Insert 1-1/2" portion into GND hole in circuit board. Solder the wire to each crystal. Be careful, excessive heat can damage the crystal.

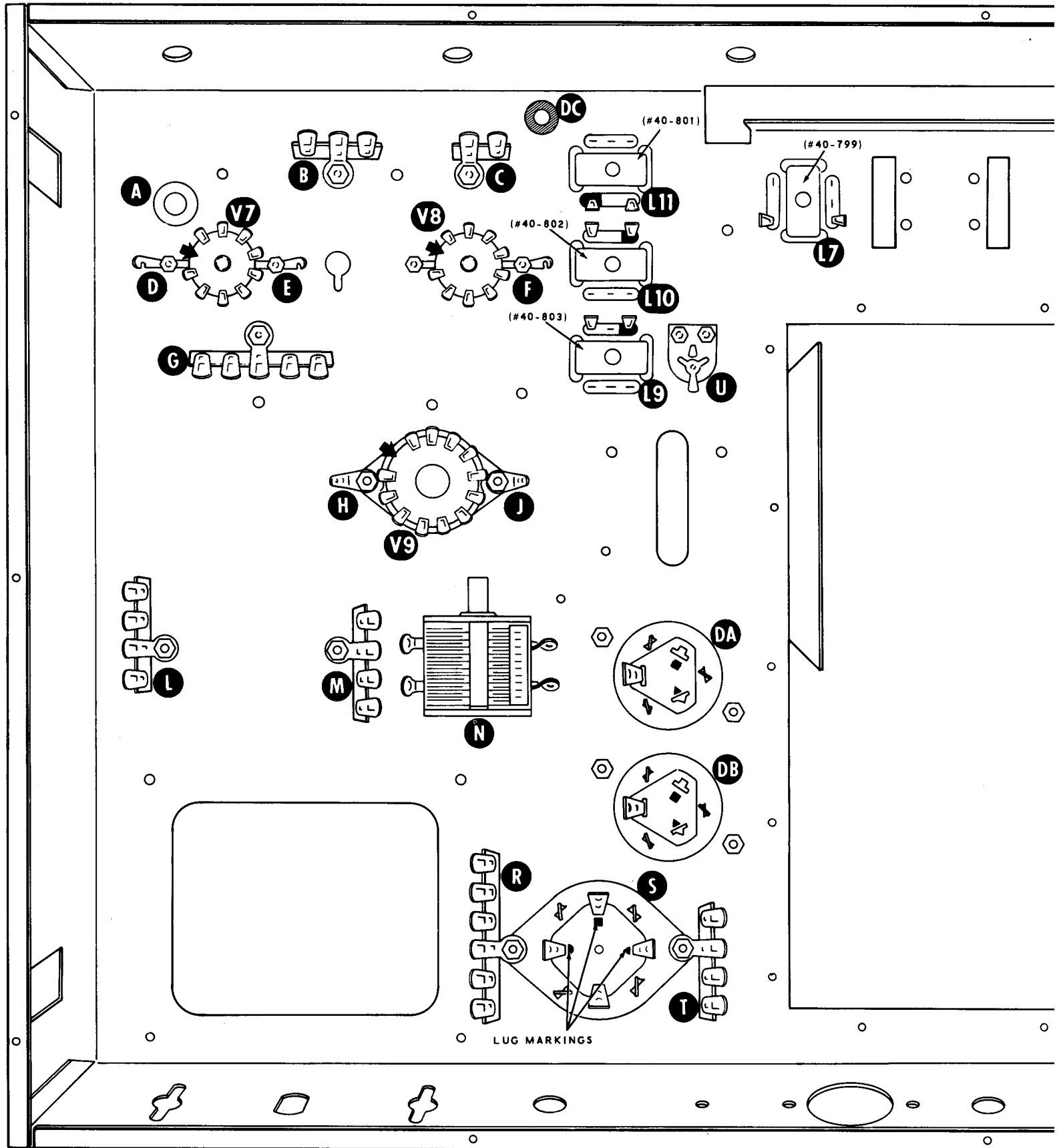


() Turn circuit board over, solder wire to foil, and cut off excess lead.

() Carefully inspect the foil side of the circuit board and solder any connections that might have been missed. Then set the circuit board aside temporarily.

PICTORIAL 4

FINISH



PICTORIAL 5