

## SERVICE DATA

### MODEL CB-24

*the hallicrafters co.*

A Subsidiary of Northrop Corporation



156-010728

Figure 1. Hallicrafters' Model CB-24 Citizens Band Transceiver.

## SPECIFICATIONS

### GENERAL

Compliment:	20 transistors, 11 diodes and 2 thermistors
Frequency Range:	26.965-27.255MHz
Channels:	23-all channels operational
Microphone:	600 ohm dynamic
Power Source:	13.8 volts DC-NEGATIVE GROUND, Receive 0.25 amps; transmit 0.75 amps.
Size:	2-3/16"H x 6"W x 8"D
Weight:	6 lb. approx.

### RECEIVER

Circuit:	Dual conversion superheterodyne
Sensitivity:	1 $\mu$ volt for 10db S/N + N
Selectivity:	5.0 $\pm$ 1KHz at 6 db
Adjacent Channel Rejection:	Greater than 30db

Spurious Image Rejection:	Greater than 40 db; 60 db typical.
Audio Output:	3.0 watts
Intermediate Frequencies:	10.595 - 10.635MHz and 455KHz
AGC Figure of Merit:	60 db minimum.
Noise Limiting:	Series type and 12 volt line filtering.

### TRANSMITTER

Emission:	Type 8A3
RF Input:	5.0 watts
RF Output:	3 watts minimum; 3.5 watts typical.
RF Spurious Radiation and Harmonic Attenuation:	Exceeds FCC and DOT requirements.
RF Output Impedance:	50 ohms
Modulation:	High level AM with class B push pull circuitry.

### TRANSCEIVER ALIGNMENT

This equipment has been carefully aligned and adjusted at the factory by specially trained personnel using precision equipment. Alignment should not be attempted until all other possible causes of faulty operation have been investigated. Alignment should not be required unless the unit has been tampered with or component parts have been replaced in the RF or IF stages. Alignment should be performed only by persons familiar with transistorized communications equipment and experienced in its alignment.

All adjustments on the frequency synthesizer board, i.e., L52, L54, L101, L102, T55 and T104 have been set at the factory for optimum per-

formance. These adjustments determine both the transmitter and receiver frequencies. They will not require adjustment unless a major component on the synthesizer board has been replaced. Alignment of the synthesizer should be attempted only by qualified service personnel with suitable test equipment. The FCC requires that persons making transmitter frequency adjustments be licensed commercial radio telephone operators, second class or higher.

The transmitter output circuit has been optimized at the factory to properly match an antenna load impedance of 50 ohms, and no further adjustment

is recommended. After the unit has been completely installed as either a base or mobile unit and with the antenna to be employed connected to the unit, a VSWR measurement should be made. If this measurement indicates a VSWR in excess of 1.5:1, the antenna should be adjusted to provide the best possible match.

NOTE

All alignment and performance specifications stipulated in the manual were performed at the EIA STANDARD DC input of 13.8 volts.

EQUIPMENT REQUIRED

RECEIVER

1. Standard, AM-type signal generator covering the frequency range of at least 262.5KHz to 27.255MHz, modulated 30 percent with either 400 or 1000Hz. Generator should be capable of being accurately adjusted to 455KHz.
2. Output meter (or AC vacuum tube voltmeter) connected across speaker terminals (or 8.0 ohm termination).
3. 0.1 UF, 200V capacitor.

4. 0-500MA DC meter.
5. Oscilloscope capable of displaying the modulation envelope of a 27-MHz signal.

SYNTHESIZER

1. VTVM with RF probe.
2. Frequency counter capable of measuring frequencies between 11.0 and 34.0MHz to an accuracy of .001 percent.

TRANSMITTER

1. 50-ohm non-reactive dummy load (two 100-ohm 2-watt resistors in parallel).
2. RF power output indicator or SUNIT-RFO meter connected across above load.
3. Audio oscillator capable of supplying a 1000-Hz signal of 8.0MV into 600 ohms.

GENERAL

1. Plastic screwdriver, 1/8-inch tip.
2. Hexagonal alignment tool (GC NO. 8606 or equivalent).
3. Hexagonal alignment tool (GC NO. 9296 or equivalent).

RECEIVER ALIGNMENT

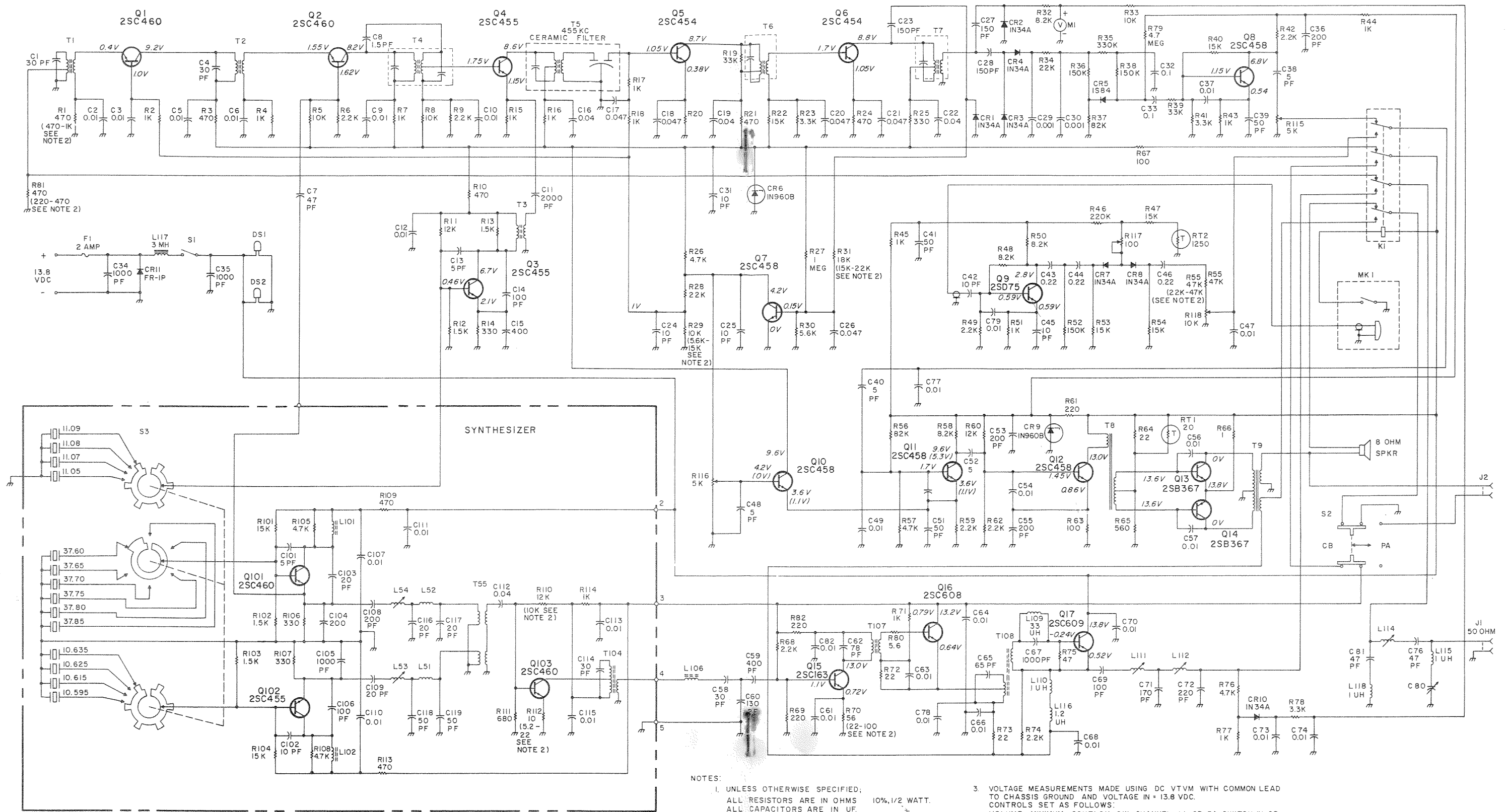
STEP	ALIGNMENT	CONNECTIONS	GEN. FREQ.	CHAN. /FREQ.	ADJUSTMENT
1	455KHz I. F. Transformer	Signal generator to the 2nd mixer (Q4) base through a 0.1μ capacitor.	455 KHz ±0.2%	None	Adjust the top of T5, T6 and T7. Keep reducing the generator output to maintain the audio output level below 0.5 watt (Volume control set at maximum).
2	Local Osc. * Transformer	Frequency counter to 2nd mixer (Q4) emitter.		1 - 11.09MHz 2 - 11.08MHz 3 - 11.07MHz 4 - 11.05MHz	Adjust T3 for best compromise between oscillator starting and frequency.
3	1st I. F. Transformer	Signal generator to first mixer (Q2) emitter.	Tune for peak near 10.615MHz	11 (10.615MHz)	Using a low level signal generator input, tune the slug at the top of T4 for maximum output.
4	R. F. and Antenna coil	Signal generator to antenna input connector.	Tune for peak at 27.085MHz	11 (27.085MHz)	Using a low level signal generator input, tune the slugs at the top of T1 and T2 for maximum output.
*This stage should be adjusted only if repairs have been made to Q3 or its associated circuitry.					

TRANSMITTER ALIGNMENT

NOTE				
The following transmitter adjustments are made with the PUSH-TO-TALK switch on the microphone in the transmit position.				
STEP	ALIGNMENT	CONNECTION	CHAN. POS.	ADJUSTMENT
1	Driver	Dummy load with RF power indicator, connected to antenna connector (J1).	17	Top of T107 and T108 for maximum output.
2	Final Amplifier	1. Same as above. 2. 0-500 MA DC meter inserted in the collector lead of Q17.	11	Adjust L111 for maximum inductance. Tune L112 and L114 for maximum output while keeping the collector current under 362MA (5W input).
3	Modulator and Clipper	1. Same as step 1. 2. Audio oscillator connected across the 600-ohm mic. connections. 3. Oscilloscope connected across dummy load for monitoring modulation envelope of output signal.	11	With the audio oscillator output set for 7.0 MV and 1000Hz, adjust R117 and R118 for maximum upward modulation and 85 percent downward modulation.
NOTE				
Coil L115 and capacitor C80 function as a trap circuit to suppress second harmonic radiation. Unless a frequency-selective output indicator is available, the setting of C80 should not be changed. To adjust this circuit, a frequency-selective output meter, tuned to the second harmonic of the CB-24 channel frequency, should be connected to sample the signal at the dummy load. C80 should then be adjusted for minimum reading on the output meter.				

SYNTHESIZER ALIGNMENT

STEP	ALIGNMENT	CONNECTION	CHAN./FREQ.	ADJUSTMENT
1	37 MHz Osc. Coil	1. H. F. Voltmeter to Q101 emitter. 2. Frequency counter to Q101 emitter.	1-37.60 MHz 5-37.65 MHz 9-37.70 MHz 13-37.75 MHz 17-37.80 MHz 21.37.85 MHz	Turn the core of coil L101 fully counter-clockwise, then turn the core slowly clockwise until the oscillator starts. Continue turning the core for exactly 3 more turns beyond this point.
2	10 MHz Osc. Coil	1. H. F. Voltmeter to Q102 emitter. 2. Frequency Counter to Q102 emitter.	1-10.635 MHz 2-10.625 MHz 3-10.615 MHz 4-10.595 MHz	Adjust coil L102 using the above procedure.
3	37 MHz Filter Matching coil	H. F. Voltmeter to Q103 base		Adjust the slug at the top of L54 for maximum voltage on the H. F. voltmeter.
4	10 MHz Filter Matching coil	1. Remove the B+ voltage from Q101. 2. H. F. Voltmeter to Q103 base.		Adjust the slug at the top of L53 for maximum voltage on the H. F. voltmeter.
NOTE				
After making any adjustment to the synthesizer circuitry, check the frequency of the transmitter carrier. At room temperature all 23 channels should be within $\pm .004$ percent of the nominal channel frequency. Any greater deviation should be corrected by making slight adjustments to L101 and L102 until all channels are within this limit.				



NOTES:

- UNLESS OTHERWISE SPECIFIED; ALL RESISTORS ARE IN OHMS 10%, 1/2 WATT. ALL CAPACITORS ARE IN UF.
- VALUE USED MAY VARY BETWEEN THESE LIMITS. FROM SET TO SET; VALUE SHOWN ON TOP IS VALUE LISTED IN PARTS LIST.
- VOLTAGE MEASUREMENTS MADE USING DC VTVM WITH COMMON LEAD TO CHASSIS GROUND AND VOLTAGE IN = 13.8 VDC. CONTROLS SET AS FOLLOWS: VOLUME-MINIMUM, SQUELCH-CW, CHANNEL-11, CB-PA SWITCH IN CB. THE VOLTAGES ON Q10 AND Q11 WILL DEPEND ON POSITION OF SQUELCH CONTROL. THOSE VOLTAGES SHOWN IN BRACKETS ARE WITH SQUELCH CONTROL IN THE CCW POSITION. VOLTAGES ON Q16, Q17 AND Q18 ARE MEASURED IN TRANSMIT POSITION. A 50 OHM 4 WATT LOAD MUST BE CONNECTED TO THE ANTENNA CONNECTOR (J1) BEFORE MEASURING TRANSMITTER VOLTAGES.

Figure 2. Model CB-24 Schematic Diagram.

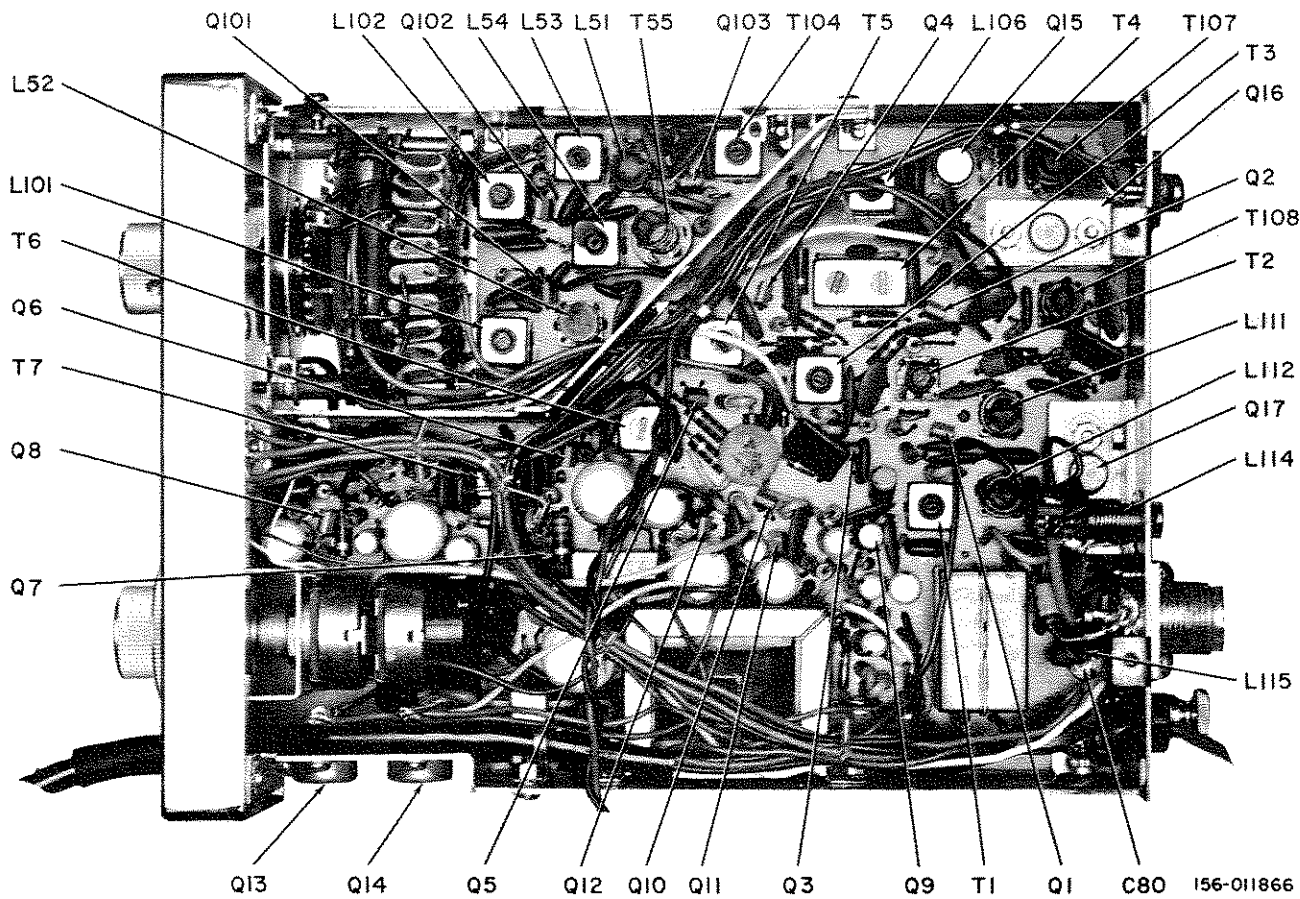
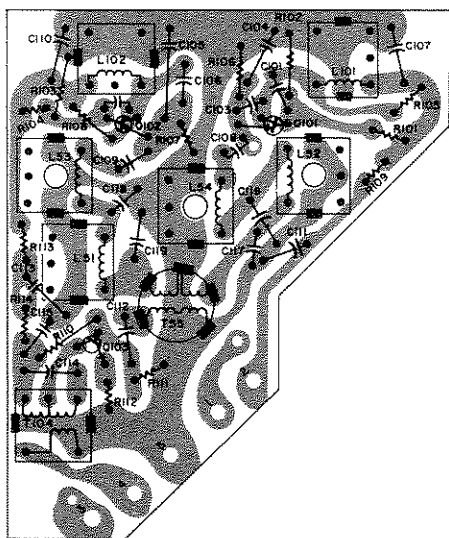


Figure 3. Alignment Points and Transistor Location.



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Figure 4. Synthesizer Printed Circuit Board.

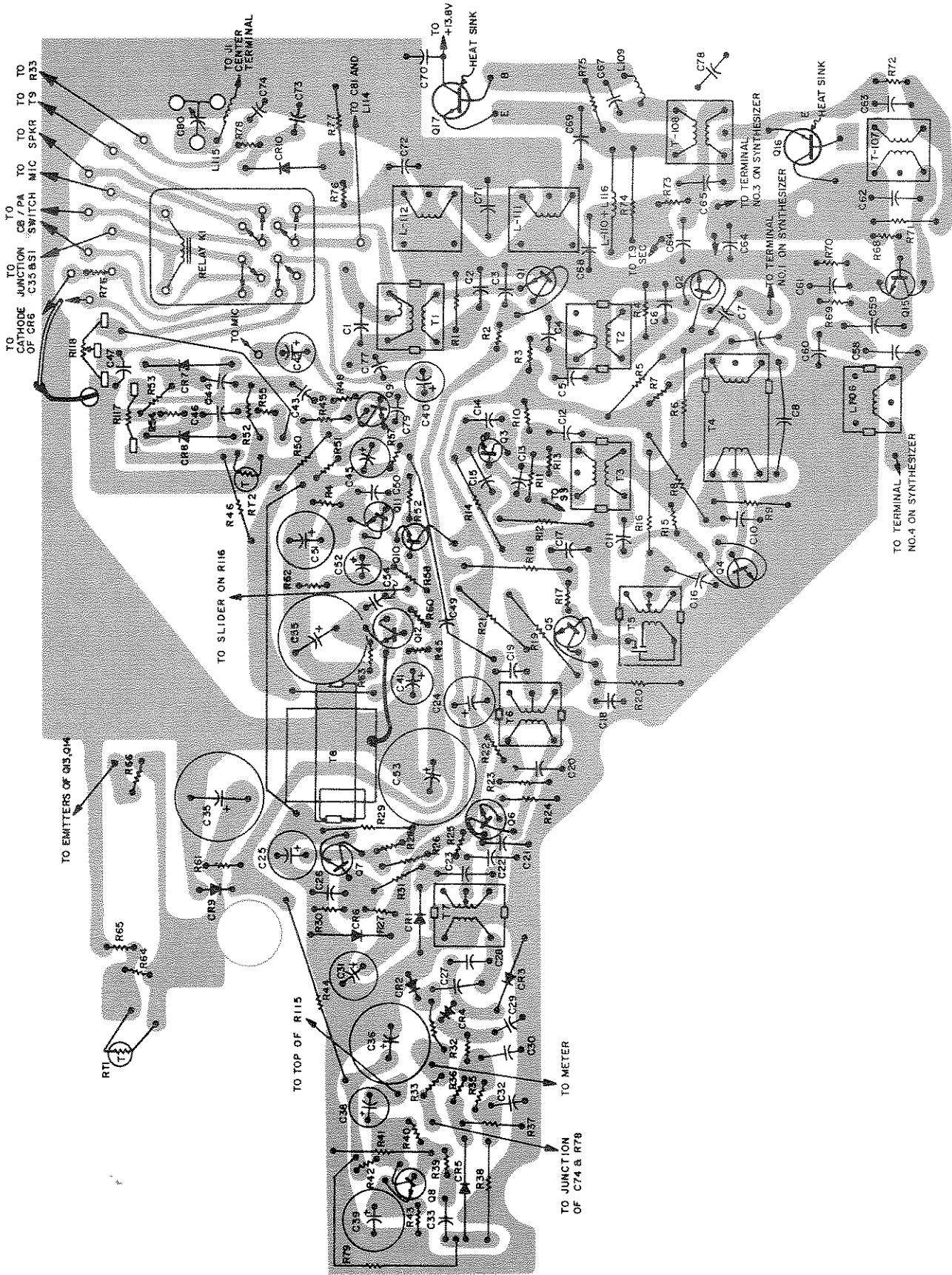


Figure 5. Transceiver Printed Circuit Board.

Schematic Symbol	Description	Hallcrafters Part Number	Schematic Symbol	Description	Hallcrafters Part Number	Schematic Symbol	Description	Hallcrafters Part Number	
*RESISTORS									
R1,3,10, 21,24,81, 109,113	470 ohm	120-004810	C16,19, 22,112	0.04μF +100% -0% 50V Ceramic Disc.	120-004784	Q9	2SD75 Germanium Trans.	120-004888	
R2,4,7, 15,16,17, 18,43,44, 45,51,71, 77,114	1K ohm	120-004811	C17,18, 20,21,26	0.047μF ±20% 6V Ceramic Disc.	120-004785	Q13,14	2SB367 Germanium Trans.	120-004887	
R5,8,29, 33	10K ohm	120-004813	C23,27, 28	150PF ±10% 50V Mica	120-004948	Q15	2SC163 Silicon Transistor	120-004884	
R6,9,42, 49,59,62, 68,74	2.2K ohm	120-004812	C24,25, 31,42,45	10μF +100% -10% 15V Electrolytic	120-004806	Q16	2SC608T Silicon Transistor	120-004885	
R11,60, 110	12K ohm	120-004833	C29,30	0.001μF ±20% 50V Ceramic Disc.	120-004786	Q17	2SC509T Silicon Transistor	120-004886	
R12,13, 102,103	1.5K ohm	120-004835	C32,33	0.1μF ±20% 50V Mylar	120-004787	CRYSTAL			
R14,25, 106,107	330 ohm	120-004836	C34	1000PF +200% -0% 500V Cutton Capacitor	120-004789	X1	Crystal 11.09MHz HC/18/U	120-004889	
R19,39	33K ohm	120-004815	C35	1000μF +100% -10% 15V Electrolytic	120-004809	X2	Crystal 11.08MHz HC/18/U	120-004890	
R20,61, 69	220 ohm	120-004814	C36,53	200μF +100% -10% 15V Electrolytic	120-004808	X3	Crystal 11.07MHz HC/18/U	120-004891	
R22,40, 47,53,54, 101,104	15K ohm	120-004816	55	5μF +100% -10% 15V Electrolytic	120-004805	X4	Crystal 11.05MHz HC/18/U	120-004892	
R23,41, 78	3.3K ohm	120-004817	C38,40, 48,52	50μF +100% -10% 15V Electrolytic	120-004807	X5	Crystal 37.60MHz HC/18/U	120-004893	
R26,57, 76,105, 108	4.7K ohm	120-004823	C39,41	51 Electrolytic	120-004804	X6	Crystal 37.65MHz HC/18/U	120-004894	
R27	1M ohm	120-004827	C43,44, 46	0.22μF ±20% 15V Electrolytic	120-004804	X7	Crystal 37.70MHz HC/18/U	120-004895	
R28,34, 56,64	22K ohm	120-004819	C60	130PF ±10% 50V Mica	120-004792	X8	Crystal 37.75MHz HC/18/U	120-004896	
R30	5.6K ohm	120-004826	C62	78PF ±10% 50V Mica	120-004795	X9	Crystal 37.80MHz HC/18/U	120-004897	
R31	18K ohm	120-004843	C65	65PF ±10% 50V Mica	120-004952	X10	Crystal 37.85MHz HC/18/U	120-004898	
R32,48, 50,58	8.2K ohm	120-004818	C67,105	1000PF ±10% 50V Mica	120-004790	X11	Crystal 10.635MHz HC/18/U	120-004899	
R35	330K ohm	120-004822	C71	170PF ±10% 50V Mica	120-004791	X12	Crystal 10.625MHz HC/18/U	120-004900	
R36,38, 52	150K ohm	120-004820	C72	220PF ±10% 50V Mica	120-004953	X13	Crystal 10.615MHz HC/18/U	120-004901	
R37	82K ohm	120-004821	C80	2-10PF Ceramic Trimmer	120-004801	X14	Crystal 10.595MHz HC/18/U	120-004902	
R46	220K ohm	120-004824	COILS AND TRANSFORMERS					MISCELLANEOUS	
R55	47K ohm	120-004825	L51	Filter Coil 10MHz	120-004862	Assembly, Mic cable			
R63,67	100 ohm	120-004828	L52	Filter Coil 37MHz	120-004861	Bracket, Speaker			
R65	560 ohm ±10% 1/2W	120-004829	L53	Coil, matching for Filter 10MHz	120-004860	Bracket, Volume Cont.			
R66	1 ohm ±10% 1W Wire Type	120-004830	L54	Coil, matching for Filter 37MHz	120-004859	Cabinet			
R70	56 ohm	120-004837	L101	Coil, 37MHz Osc.	120-004857	Channel Indicator			
R73	2.2 ohm	120-004832	L102	Coil, 10MHz	120-004858	Chassis			
R75	47 ohm	120-004834	L106	Coil RF 27MHz	120-004885	Chassis for Synthesizer			
R79	4.7M ohm	120-004841	L109	33μH ±10% RF Choke	120-004870	Fuse 1.5-2.0 Amp.			
R80	5.6 ohm	120-004838	L110,115	1μH ±10% RF Choke	120-004869	Fuseholder in Line			
R111	680 ohm	120-004840	L111,112	Coil, final Amp.	120-004872	Handle Mounting			
R112	10 ohm	120-004839	L114	Coil, Ant. Peaking	120-004871	Hanger, Mic			
R115	5K ohm united with R116 and S1	120-004844	L116	1.2μH ±10% RF Choke	120-004868	Hardware for Mounting Bracket			
R116	5K ohm	120-004845	L117	Choke, line filter	120-004873	Hardware (screws, nut, washers)			
R117	100K ohm Semi fixed	120-004846	T1	Transformer, RF	120-004850	Heat Sink (Q16)			
R118	10K ohm Semi fixed	120-004847	T2	Transformer, RF	120-004851	Holder, pilot lamp for channel selector switch			
RT1	20 ohm Thermistor	120-004848	T3	Transformer, 2nd local osc.	120-004852	Isolated Board, Crystal			
RT2	1250 Thermistor	120-004849	T4	Transformer, 1st IF 10.595MHz	120-004853	Jack, Antenna Connector			
*Unless otherwise stated all RESISTORS are carbon type, 1/4 watt.									
CAPACITORS									
C1,4,58, 114	30PF ±10% 50V Mica	120-004796	T5	Transformer, 2nd IF 455KHz united with ceramic filter	120-004854	Jack, PA, Speaker			
C2,3,5,6, 9,10,12, 37,47,49, 50,54,56, 57,61,63, 64,66,68, 70,73,74, 77,78,79, 107,110, 111,113, 115	0.01μF +100% -0% 50V Ceramic Disc.	120-004783	T6	Transformer 455KHz	120-004855	Knob, channel			
C7,76	47PF ±10% 50V Mica	120-004797	T7	Transformer 455KHz	120-004856	Knob, squelch			
C8	1.5PF ±10% 50V Mica	120-004803	T8	Transformer AF Input	120-004874	Knob, volume			
C11	2000PF ±10% 50V Mica	120-004788	T9	Transformer, AF Output	120-004875	Lamp 16volt, 140 MA			
C13,101	5PF ±10% 50V Mica	120-004802	T55	Transformer, RF Mixing osc.	120-004863	Lock, Line Cable			
C14,69, 106	100PF ±10% 50V Mica	120-004947	T104	Transformer, RF	120-004864	Lock, meter			
C15.59	400PF ±10% 50V Mica	120-004793	T107	Transformer, RF 1st Amp.	120-004866	Lock, Mic cable			
DIODES, TRANSISTORS AND CRYSTALS									
			T108	Transformer, RF Driver	120-004867	Lock, Speaker			
			CR1,2, 3,4,7,8, 10	1N34A Germanium Diode	019-001918	Meter 200μA, TYPZV-14			
			CR5	1S84 Silicon Diode	120-004977	Microphone, Dynamic 600 ohm			
			CR6,9	1N90B Zener Diode	120-004879	Panel, back (for synthesizer)			
			CR11	FR-1P Silicon Rectifier	120-004878	Panel, front			
			Q1,2, 101,103	2SC460 Silicon Transistor	120-004880	Plate, front			
			Q4,3,102	2SC455 Silicon Transistor	120-004881	Printed Circuit Board			
			Q5,6	2SC454 Silicon Transistor	120-004882	Printed Circuit Board, Synthesizer			
			Q7,8,10, 11,12	2SC458 Silicon Transistor	120-004883	Printed Circuit Board, Crystal			
						Relay, 4P-2T			
						Shipping carton box			
						Spacer, rotary switch			
						Speaker, 70mm 8			
						Styrofoam, plastic			
						Switch, power (united with R115, R116)			
						Switch, rocker 2P-2T			
						Switch, rotary 3P-24 pos			