

Bearcat-6

FM MONITOR RECEIVER

MADE IN U.S.A.

OPERATING INSTRUCTIONS




Electra COMPANY

DIVISION OF MASCO CORPORATION

CUMBERLAND, INDIANA 46229

© Copyright 1976 by Electra Company

GENERAL DESCRIPTION

The Bearcat 6 is a table model, two-band FM monitor receiver providing automatic scanning of 6 channels in the Public Safety/Business/Police Bands at 30-50MHz and 146-174MHz. Its features include: full band coverage in both bands; accepts 6 plug-in crystals; simple bandswitching arrangement; high speed automatic scanning; channel switches to omit scanning of undesired channels; solid state Light Emitting Diode channel indicators; quieting squelch control; front-mounted 3" x 5" speaker and operation from a single telescoping or outside antenna.

To assure the best performance from your Bearcat 6 please follow this check-list:

1. Unpack your radio and telescoping antenna and determine that they are in good order.
2. Install the proper crystal for each desired channel as described on page 3.
3. Attach the band-switch probe as described on page 5.
4. Install telescoping antenna.
5. Apply power and turn on.
6. Set volume, squelch, and lock-out switches as instructed.

Please follow detailed instructions in this manual for each step.

SPECIFICATIONS

Size: 9" W x 3½" H x 7½" D

Weight: 5 lbs.

Cabinet: Vinyl-clad wooden cabinet

Power Requirement: 117 Vac, 10W

Audio Output: 1.5 W rms

Antenna: Telescoping antenna electronically tuned for both bands (supplied). Connector provided for outside antenna.

Input Impedance: 50-70 ohms.

Sensitivity: H and L bands: readable at .3 microvolt for ±5KHz deviation, .6 microvolt for 20db signal-to-noise ratio.

Channels: Up to 6 crystal-controlled channels may be scanned automatically or locked out.

Frequency Range:

Low band: 30-50MHz (Aligned 30-48MHz)

High band: 146-174MHz, total spread 28MHz (includes 146-147MHz amateur band)

Scan Rate: Approximately 20 channels per second

Crystals: Miniature plug-in type A-135 for easy user installation.

Front Panel Features: Squelch control / Volume On-Off Control / 6 Channel switches / 6 Light Emitting Diode Channel indicators / Forward-facing 3" x 5" speaker.

CAUTION: To prevent fire or shock hazard, do not expose this appliance to rain or moisture.

CRYSTAL INSTALLATION

DO NOT REMOVE RADIO FROM CABINET. There are no customer servicable components. Crystal access is through the "trap door" at the bottom of the radio.

LEAVE RADIO UNPLUGGED AND POWER OFF WHILE INSTALLING CRYSTALS.

To prevent damage to the antenna or internal circuits, the antenna must not be installed while changing or adding crystals. To install crystals, place the radio on its top, loosen the locking screw and slide the "trap door" open which will reveal the crystal sockets and the bandswitching probe.

Up to six crystals may be installed in a simple band-switching arrangement. Each crystal is installed in the socket corresponding to its channel as shown in Figure 1. (Channel #1 is nearest the side of the radio in the same order and direction as the channel switches.)

The Bandswitching probe consists of a white wire and a female connector.

SINGLE BAND OPERATION

1. Low Band (30-50MHz): Slide the bandswitch probe over the post at point "Y", then install crystals in any order desired.
2. High Band (146-174MHz): Slide the bandswitch probe over the post at point "X", then install crystals in any order desired.

DUAL BAND OPERATION

Install low band crystals first starting with Channel #1, then Channel #2 etc. until all low band crystals have been installed.

Install high band crystals in the remaining channels, slide the bandswitch probe over the post adjacent to the first high band channel. All successive channels will automatically be high band channels.

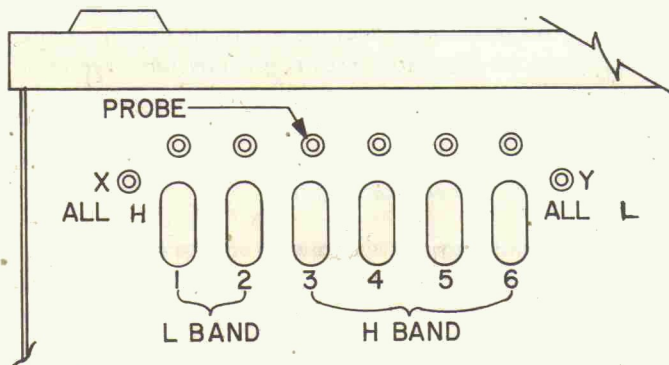


Figure 1

Example #1:

(Figure 1) Two crystals in the low band
Four crystals in the high band

Insert the low-band crystals in channels one and two. Insert the high-band crystals in channels three, four, five and six. Place the band-switching probe over the post adjacent to Channel 3 (where the first high-band crystal is located).

Example #2:

With three low-band crystals followed by three high band, the bandswitching probe will be placed on the post adjacent to the first high-band crystal or Channel 4.

Remove crystals by a gentle pull upward. Insert crystals by aligning the pins with the sockets and pushing straight down. DO NOT BEND THE SOCKETS. THESE MINIATURE SOCKETS ARE MADE OF SPRING BRONZE AND WILL BREAK IF BENT EXCESSIVELY.

NOTE: Do not install two crystals of the same frequency. To insure proper operation, a minimum of two crystals should be installed in the radio.

Rigid quality standards are applied to crystals furnished by Electra Company to assure full performance, therefore, our warranty does not include correcting poor operation caused by crystals from other sources.

The "H" alignment spread is 146MHz to 174MHz and the "L" 30MHz to 48MHz. New frequencies may be added with in these spreads.

CRYSTAL FORMULAS

"L" Received frequency + 10.80MHz = crystal frequency
Example: 35.80MHz + 10.80MHz = 46.60000MHz

"H" $\frac{\text{Received frequency} - 10.80\text{MHz}}{3} = \text{crystal frequency}$

Example: $\frac{155.01\text{MHz} - 10.80\text{MHz}}{3} = 48.07000$

ANTENNA

This receiver is shipped with the telescoping antenna for use in areas of fair-to-good signal strength on both bands. It fits through the top of the cabinet into a threaded mount; just push it through and turn clockwise until secure.

If an outside antenna is necessary for fringe reception, you may use a 155MHz antenna, a 40MHz antenna or a two-band antenna. External antennas should be coupled to the antenna jack on the back of the receiver by 50 ohm coaxial cable, such as RF-58 A/U, using the supplied automotive type connector. Suitable antennas are available at most radio dealers.

OPERATION

1. With the power cord plugged in and the antenna properly installed, turn the receiver on by rotating the "VOLUME" control clockwise.
2. Place the 6 channel switches in the up (ON) position.
3. Adjust the "SQUELCH" control clockwise until a rushing noise is heard. Then adjust the "SQUELCH" control counterclockwise until the rushing noise disappears.
4. The receiver is now automatically scanning the six channels. Any channel may be omitted as desired by moving the individual channel switch downward. (OFF)
5. Single channel operation is obtained by locking out the other five. This assures that the radio will remain on this desired channel even after turning power off and on.

LIMITED WARRANTY

This receiver is warranted to be free from defects in material and workmanship. We agree to remedy such defect or to furnish a new part in exchange for any part which, under normal installation, use and service, discloses such defect, provided the receiver is delivered to us, intact, for our examination, with all transportation charges prepaid to our factory, within one year from the date of sale to the original purchaser, and provided such examination discloses, in our judgement, that it is this defective.

This warranty does not apply if the receiver has been subject to misuse, neglect, accidents, incorrect wiring not our own; improper installation, destruction of serial number, or to use in violation of instructions furnished by us, nor to receivers that have been repaired or altered outside our factory.

This warranty excludes all oral or other implied warranties, and the manufacturer shall in no event be liable for damages for a breach of warranty in any amount exceeding the purchase price of the alleged defective equipment.

TO PLACE WARRANTY IN FORCE FILL OUT AND RETURN WARRANTY CARD WITHIN TEN (10) DAYS OF PURCHASE.

USER HINTS

Radio equipment usually operates in an environment of man-made electro-magnetic noise which radiates from power lines, fluorescent lights, motors, appliances, ignition systems, etc. Modern radios are designed to minimize interference from such sources but operation may be affected under conditions of unusually strong noise.

Distant weak, "skip" or noise signals may be received by this receiver because of its high sensitivity. Whenever such conditions interrupt scanning or whenever a very busy channel prevents reception of other desired signals, the affected channel may be by-passed by means of its individual panel switch.

The BC-6 has high noise immunity because of the quieting squelch system. However, in cases of strong interfering noise or signals, it may be desirable to reduce the length of the antenna to reduce noise pickup below a critical level. This may be very effective in medium and strong signal areas.

Single-channel operation may be obtained by locking out all but the desired channel. Continuous-carrier signals such as the NOAA weather broadcasts on 162.55MHz and 162.400 MHz, which are available in many areas, may be received when desired by use of the individual channel switches.

When moving or shipping the radio, remove the telescoping antenna to avoid damage to it or to the internal circuit assemblies.

RADIO SERVICES

Local Government	Special Emergency	Police
Highway Maintenance	Hospitals	Fire
Forestry-Conservation	Ambulances	Press
Motion Pictures	Physicians	Business
Special Industrial	Disaster Relief	Railroad
Telephone Maintenance	School Buses	Taxicab
Automobile Emergency	Power	Marine
Public Mobile Radio	Petroleum	Manufacturers
Mobile Telephones	Forest Products	Motor Carrier
	Rural Radio	

SERVICING

It is recommended that servicing of this receiver be done by the factory service center. Special equipment and skills are maintained at the factory to give fast and efficient service on all of our products.

When returning radio receivers to the factory for service, include crystals and telescoping antenna. Remove antenna, pack carefully and include a brief, detailed description of the difficulty you are having.

The most advanced developments in solid state circuitry are incorporated in this receiver; dual gate MOS Field Effect R-F and mixer transistors provide low-noise and low cross-modulation. Since conversion into monolithic quartz crystal I-F filters reduces spurious responses and radiation and improves selectivity; linear integrated circuits provide I-F gain, detection, audio amplification and output; TTL I.C. multi-vibrators and gates provide scanning logic. An exclusive track-tuning system using voltage-variable capacitors provides high performance, full-band coverage.

Servicing should not be attempted by anyone who is not familiar with the manufacturer's recommendations and cautions relating to each of these devices. The use of ohmmeters is particularly hazardous since they can deliver voltages and currents large enough to damage semiconductors. Unusual circuitry in this receiver includes the automatic tuning system. I.C. No. 1 and the associated circuits generate tuning voltages to track the antenna, R-F and oscillator circuits as channels are scanned. Also, when the receiver is operating in the "L" band, loading coil L-1 is switched into the telescoping antenna circuit to increase its electrical length.

The L.E.D. indicators have a forward voltage drop of about 1.6v at 20ma. The current should not exceed 50ma. They are polarized and may be damaged by a high reverse voltage. When a channel lamp does not light, the failure may be either the lamp or the switching I.C. When groups of lamps are out, refer to the logic chart.

TRACKED TUNING SYSTEM

All tuned circuits in the R-F sections are tuned by voltage-variable capacitors which optimize the radio for each crystal individually regardless of where it falls in any band. This tuning is done automatically and allows the Bearcat 6 to tune all parts of either band without compromise.

Tracked tuning is accomplished by means of a DC voltage applied to VVC1, 2, 3. This voltage varies with crystal frequency and is higher for higher frequency crystals. It is adjusted by T1, T2, R15 and R37.

Factory alignment of the R-F and tracked-tuning system involves highly specialized equipment and training not available to normal service activities. Because this unique feature is outside the experience of even the most highly trained technicians, these adjustments should only be made by Electra.

BANDSWITCHING

The bandswitching probe is used to select the proper band for single-band operation or to switch the radio to the High-Band for dual operation.

Half of IC5 and the channel scanning logic (IC5, 6, 7, 8) generate the High (H) Band switching signal. This signal switches inductors and shifts tuning voltages to select L or H-Band. If the H-Band switching circuit is not activated, then the radio is automatically in the Low (L) Band.

The bandswitching signal is taken from Pin 6 of IC5 which is wired as a Bi-stable "flip-flop." A "Low or 0" at Pin 5 (band-switching probe) of IC5 "flips" Pin 6 to a "High or 1" state. A high output at Pin 6 activates the H-Band section.

The location of the bandswitching probe determines the state of Pin 6. When placed over the post adjacent to a crystal socket, that channel and all following channels up to and including channel 6 will be switched to the H-Band. Placing the probe at point "X" (fig. 1) will switch all channels to H-Band. Placing the probe at point "Y" (Fig. 1) will switch all channels to the L-Band. As the radio is scanning, channel 1 is automatically reset to the L-Band unless overruled by the bandswitching probe.

BANDSWITCHING FUNCTIONS

Pin 6 – IC5 – High for High-Band only.

1. Switches D7 ON (grounds tripler tank).
2. Switches Q3 ON (shifts tuning voltage upward).
3. Switches D1 ON (electrically bypasses loading coil).
4. Switches D4 and D5 ON (bypasses Low-Band coils L4 and L6).

ALIGNMENT

I-F SECTION

Alignment of the I-F system consists of optimizing the input and output networks and balancing the detector output. The bandpass and center frequency are established by quartz crystal filters and "peaking" the coils can result in bandpass ripple or poor sensitivity. Field alignment should not be necessary but the procedure is given for general information.

EQUIPMENT NEEDED

Oscilloscope
Sweep generator with 10.79, 10.80
and 10.81MHz markers

1. Connect sweep generator to TP-1 through a 1pF capacitor.
2. Connect oscilloscope to TP-3.
3. Maintain output of 10.80MHz sweep generator at a low level to prevent distortion from overloading.
4. Detune T5 for maximum IF output display. See Fig 2.
5. Adjust T3 for maximum output, and T4 for minimum ripple.
6. Adjust T5 so that 10.80MHz is in center of discriminator curve and for best linearity. See Figure 3.

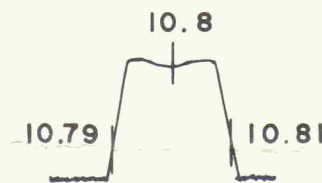


Figure 2

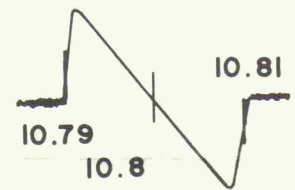


Figure 3

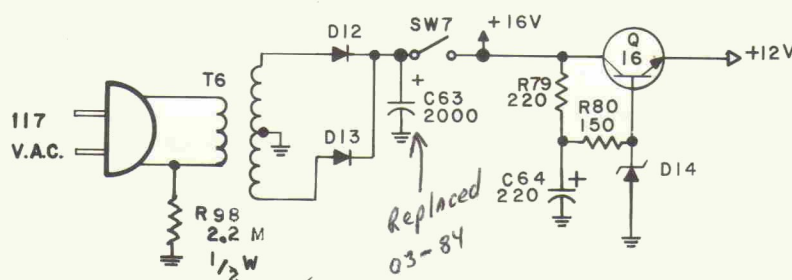
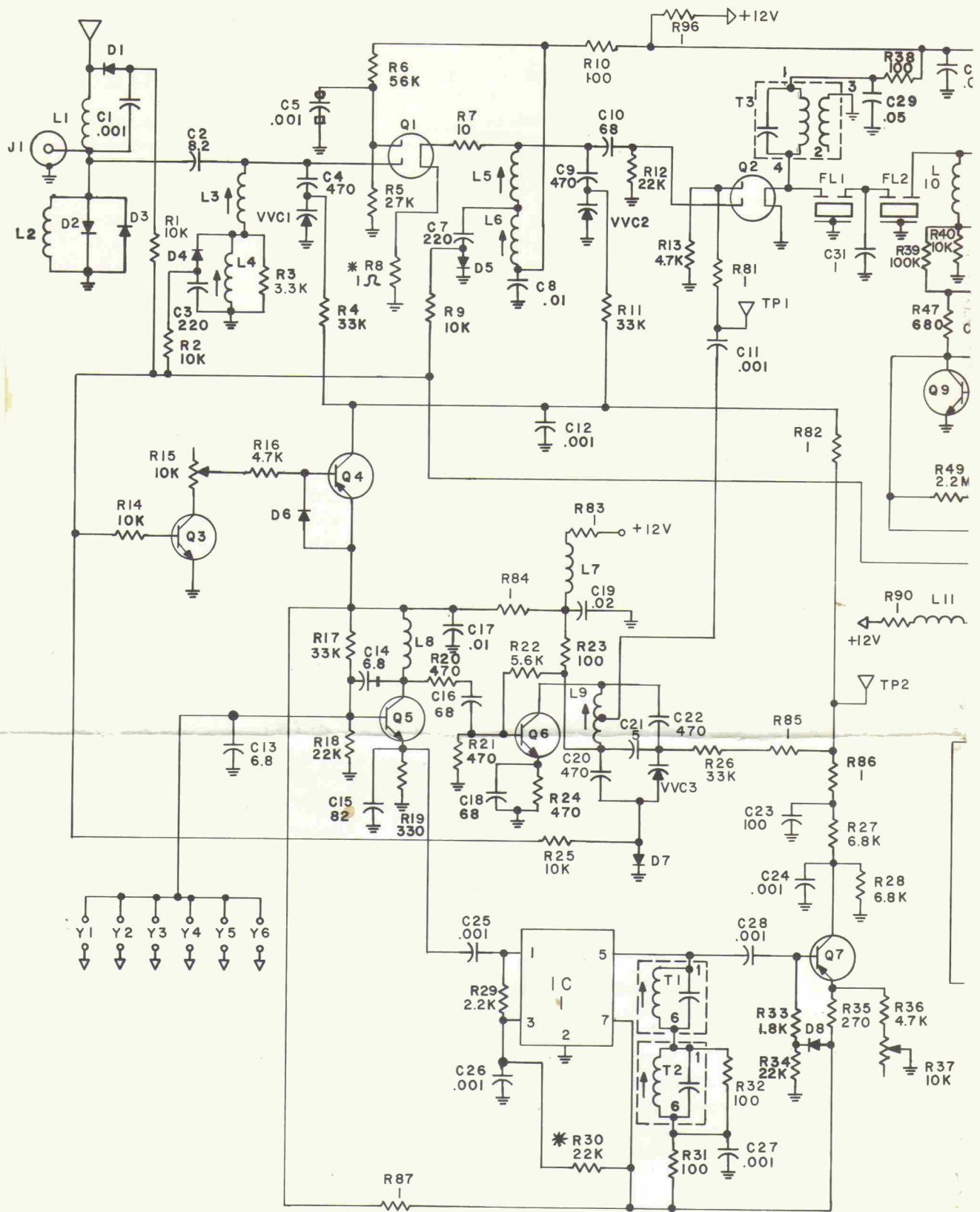
ALTERNATE METHOD: I-F alignment may be checked using a Measurements Model 800 Generator or equivalent tuned to an operating frequency and swept ± 25 kc. Markers are not essential since center frequency is determined by the filter.

R-F SECTION

**DO NOT ATTEMPT ALIGNMENT
OR "PEAKING" OF R-F SECTION**

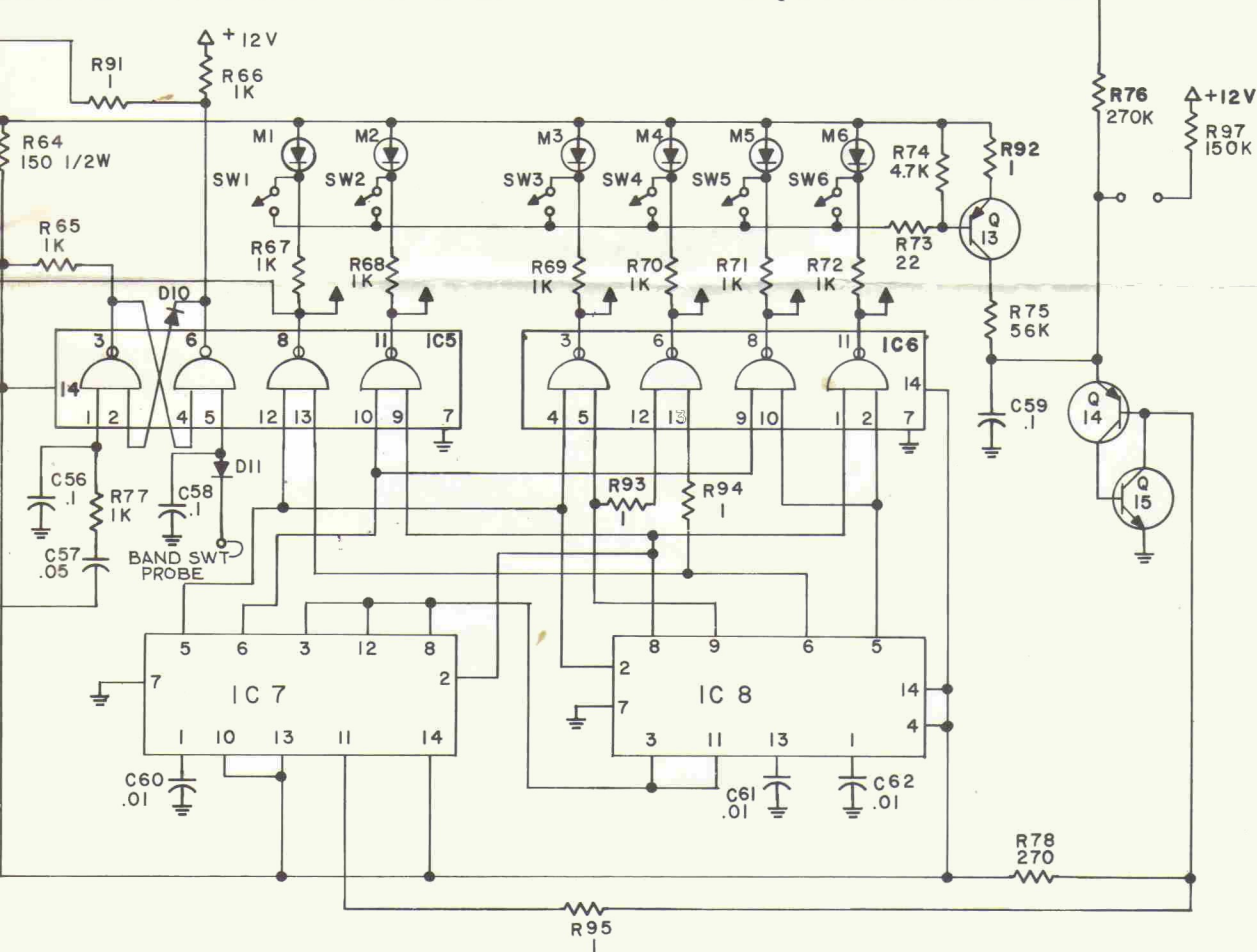
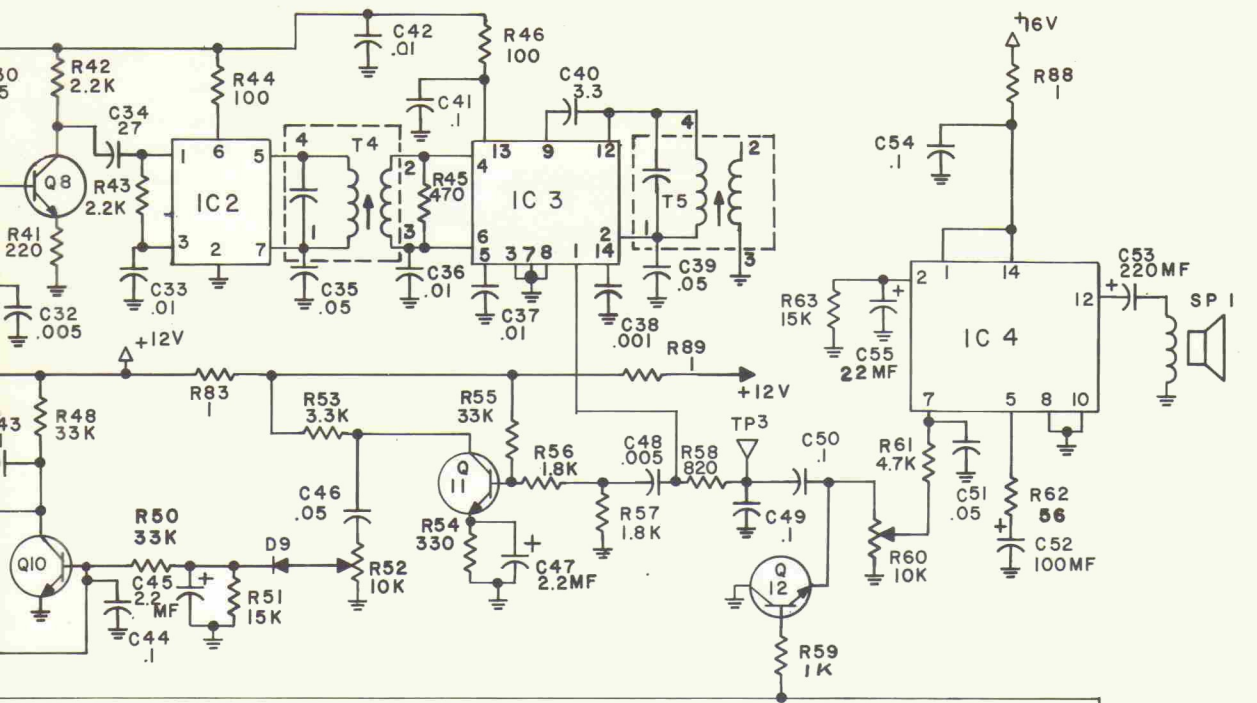
The R-F alignment points are adjusted and sealed at the factory and should not be disturbed. Factory alignment involves multi-frequency signal generation systems, add-on test modules, output indicators and training beyond the scope of normal service activities.

The unique R-F system includes electronic tracking of R-F and oscillator circuits for maximum performance over a wide range of frequencies. THIS PERFORMANCE CAN BE DESTROYED BY AN ATTEMPT TO "PEAK UP" OR "TWEAK" OR "OPTIMIZE," ETC.



* VALUE MAY
RESISTOR Ω
CAPACITOR μ
UNLESS OTI

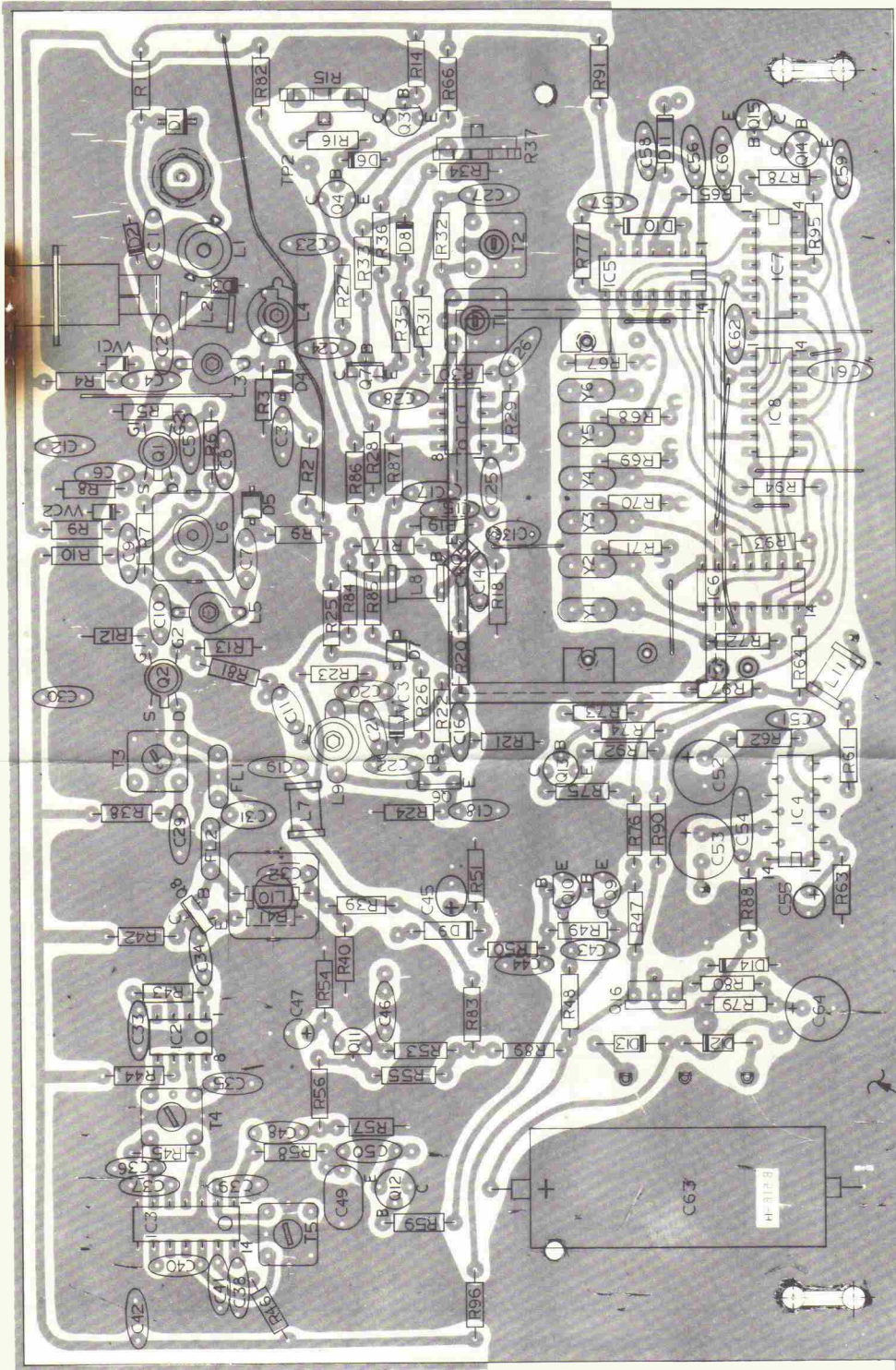
SCHEMATA



CHANGE
 VALUES IN OHMS
 BELOW 1 IN MFD
 VALUES ABOVE 1 IN pf
 OTHERWISE SPECIFIED

IC BC 6

*IC1 is track tuning IC.
 went out (no receive at all)*



← COPPER SHOWN ON OPPOSITE SIDE

I.C. VOLTAGE CHART

The Voltage Chart may be used as an approximate guide in following circuit operation or locating a defective stage. You should be familiar with the entire manual before attempting measurements.

INTEGRATED CIRCUIT VOLTAGES

IC NO.	1	2	3	4	5	6	7	8
Pin 1	1.4	1.4	4.2	16	.5	4	1	1
2	GND	GND	3.7	8.5	.6/6	.2	4	.1
3	1.5	1.5	GND	x	5/.2	12.6	4	4
4	x	x	1.5	x	5.4/.2	.1	2	on
5	12	11	1.5	.6	.2/.3	.1	.1	inn2
6	12.5	12	1.5	x	.3/9	12.6	4	4
7	12.5	11	GND	0	GND	GND	GND	G1.D
8	x	x	GND	GND	.3	12.6	4	4
9	x	x	.2	x	4	.3	.1	.1
10	x	x	1.5	GND	4	4	5	5.4
11	x	x	3.1	x	12.6	12.6	5	4
12	x	x	3.7	6.8	.1	.1	4	.2
13	x	x	10.9	x	14	4	5	1
14	x	x	4.8	16	5	5	5	5

Channel No. 1 Selected

LOGIC CHART

The logic sequence for counting is shown by "0" under .5V and "1" over 4V.

IC NO.	PIN	COUNT					
		1	2	3	4	5	6
7	5	0	1	1	1	0	0
	6	1	0	0	0	1	1
	8	1	1	1	1	1	1
	9	0	0	0	0	0	0
8	5	0	0	1	1	1	0
	6	1	1	0	0	0	1
	8	1	1	1	0	0	0
	9	0	0	0	1	1	1
5	8	0	1	1	1	1	1
	11	1	0	1	1	1	1
6	3	1	1	0	1	1	1
	6	1	1	1	0	1	1
	8	1	1	1	1	0	1
	11	1	1	1	1	1	0

TRANSISTOR VOLTAGE CHART

TEST CONDITION	Q No.	D	S	G ₁	G ₂
	1	11.6	.2	0	4
	2	12	GND	0	0
No Xtal/Xtal No Xtal/Xtal	3		E GND	B .3/.8	C 12/0
	4		12.6	12.4/12	*
	5		3.4	4	13
	6		.3/1	1	12
	7		12.2/11.9	12	*
	8		.3	1	10
	9		0	.8/.1	.1/8
	10		0	0/.7	.8/.1
Squelch CW/CCW Squelch CW/CCW Squelch CW/CCW Squelch CW/CCW Squelch CW/CCW	11		.6	1.3	6.6
	12		0	0/.8	0
	13		12.6	12.6/12.4	.1/5.5
	14		.1/4	5.4/5.3	0
	15		GND	0	5.4/5.3
	16		12.6	13.2	16

*Tuning voltage — varies with crystal frequency.

SERVICE PARTS LIST

Ref. No.	Resistors, ¼W 10%	List Price	Ref. No.	Resistors, ¼W 10%	List Price
R1	10k	\$.25	R51	15k	\$.25
R2	10k	.25	R52	10k, Sq. Cont.	1.50
R3	3.3k	.25	R53	3.3k	.25
R4	33k	.25	R54	330	.25
R5	27k	.25	R55	33k	.25
R6	56k	.25	R56	1.8k	.25
R7	10	.25	R57	1.8k	.25
R8	1	.25	R58	820	.25
R9	10k	.25	R59	1k	.25
R10	100	.25	R60	10k, Vol. Cont./Sw.	2.00
R11	33k	.25	R61	4.7k	.25
R12	22k	.25	R62	56	.25
R13	4.7k	.25	R63	15k	.25
R14	10k	.25	R64	150, ½W 10%	.25
R15	10k, pot.	.75	R65-R72	1k	.25
R16	47k	.25	R73	22	.25
R17	33k	.25	R74	4.7k	.25
R18	22k	.25	R75	56k	.25
R19	330	.25	R76	270k	.25
R20	470	.25	R77	1k	.25
R21	470	.25	R78	270	.25
R22	5.6k	.25	R79	220	.25
R23	100	.25	R80	150	.25
R24	470	.25	R81-R96	1	.25
R25	10k	.25	R97	150k	.25
R26	33k	.25	R98	2.2 Meg., ½W	.25
R27	6.8k	.25			
R28	6.8k	.25			
R29	2.2k	.25			
R30	22k	.25			
R31	100	.25			
R32	100	.25			
R33	1.8k	.25			
R34	22k	.25			
R35	270	.25			
R36	4.7k	.25			
R37	10k, pot.	.75			
R38	100	.25			
R39	100k	.25			
R40	10k	.25			
R41	220	.25			
R42	2.2k	.25			
R43	2.2k	.25			
R44	100	.25			
R45	470	.25			
R46	100	.25			
R47	680	.25			
R48	33k	.25			
R49	2.2 Meg.	.25			
R50	33k	.25			

Ref. No.	Capacitors	List Price
C1	.001mf	\$.50
C2	8.2pf 10%	.50
C3	220pf	.50
C4	470pf	.50
C5	.001mf	.50
C6		
C7	220pf	.50
C8	.01mf	.50
C9	470pf	.50
C10	68pf 10%	.50
C11	.001mf	.50
C12	.001mf	.50
C13	6.8pf 10%	.50
C14	6.8pf 10%	.50
C15	82pf 10%	.50
C16	68pf 10%	.50
C17	.01mf	.50
C18	68pf 10%	.50
C19	.02mf	.50
C20	470pf	.50
C21	5pf 10%	.50

