OPERATING AND SERVICE INSTRUCTIONS

COMMUNICATION RECEIVER MODEL CRX-3

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d by the owner to our authorized radio dealer, which
om purchased, or, authorized service center, intact for
with all transportation charges prepaid within ninety
date of sale to original purchaser and provided that
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does not extend to any of our radio products which
jected to misuse, neglect, accident, incorrect wiring not
roper installation, or to use in violation of instructions
ns, nor extended to units which have been repaired or
of our factory or authorized service center, nor to cases
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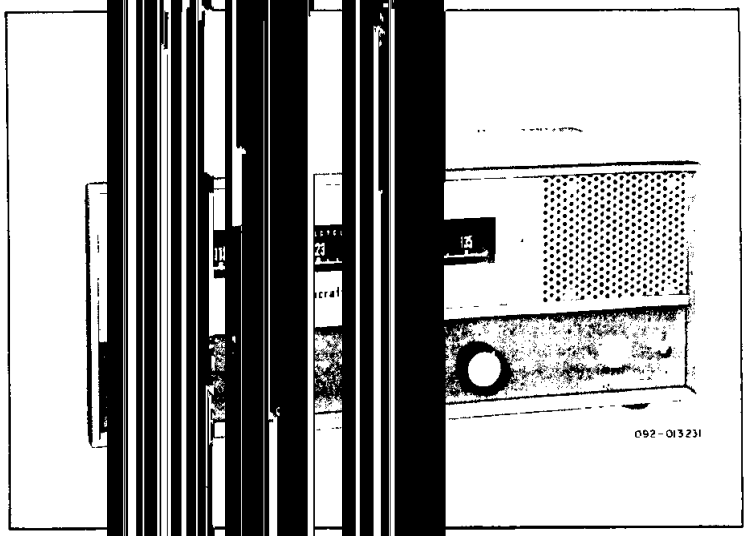
ours used therewith not of our own manufacture

unit approved for remedy or exchange hereunder will
or exchanged by the authorized radio dealer or whole-
charge to the owner.

is in lieu of all other warranties expressed or implied
sentative or person is authorized to assume for us any
in connection with the sale of our radio products."

The **hallicrafters** *Co.*

092-013231



092-013231

of *-3 Receiver.*

SEC L TION

1-1. INTR

Your r el precision built, sensitive, reliable AM comm e vid e coverage in the frequency range from 108 r o ycl es, plus two silicon rectifiers are employed e ect try to give maximum performance in the rece V on s ese services include the receiving of emerger c din entral control, and VHF communications.

Tuni o ion -MC to 135-MC frequency band is controlled di st c ls. These controls are mounted on coaxial sh r to e pointer. The pointer traverses a dial calibr y cle onic squelch control permits easy and accur f ch f addition to the manual tuning function, two o a ed c available.

Othe a l fe he Model CRX-3 Receiver include . . . narrov ssi operation ... an external-internal speaker co s and y socket.

Care dire installation and operating instructions that f e hs v ize you with the routine necessary to insure s n shi crafters precision-built product.

CTION II

TECHNICA CHARACTERISTICS

RECEPTION	AM.
INTERMEDIATE FREQUENC	10.7 MC and 455 KC.
FREQUENCY COVERAGE	108 MC to 135 MC.
POWER SOURCE	105 volts to 125 volts AC, 50/60 cycles.
POWER CONSUMPTION	35 watts.
NUMBER OF TUBES	Seven tubes, plus two silicon rectifiers.
SPEAKER OUTPUT	Internal speaker provided. Toggle switch and two-contact, screw-type terminal strip provided on the chassis rear for alternate use of external 3-ohm to 4-ohm speaker.
ANTENNA INPUT	50-ohm to 75-ohm coaxial; pin-type receptacle provided on rear of chassis to accept a pin-type connector.
DIMENSIONS	13-1/2 inches wide, 5-3/4 inches high, and 8 inches deep.
SHIPPING WEIGHT	15.50 pounds.
NET WEIGHT	12.75 pounds.

CTION III

I TALLATION

3-1. UNPACKING.

After unpacking the recei , examine it closely for damage that may have occurred in transit. Should any s f damage be apparent, immediately file a claim with the carrier stating the ext of the damage. Carefully check the instructions on all shipping labels and tags h e removing or destroying them.

3-2. LOCATION.

The receiver is equippe th rubber mountting feet for table-top or shelf mounting. In selecting a locatio void excessively warm locations near radiators and heating vents; also, avoid c y places. This latter precaution is particularly desirable if manual-controlled ration is intended. For proper ventilation, allow at least one inch of clearance be en the back of the receiver and the wall.

3-3. POWER SOURCE.

The Model CRX-3 Receive designed to operate from a 105-volt to 125-volt 50/60 cycle AC power source. P r consumption is 35 watts.

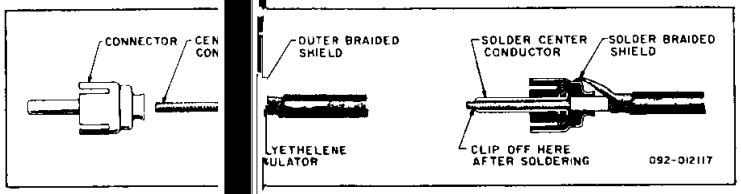


Figure *abricating the Antenna Input Cable.*

IMPORTANT

Your power outle st furnish AC (alternating current). If in doubt about your power rce, contact your local power company prior to inserting the pow rd in a power outlet. Plugging the cord into the wrong power sour ay cause extensive damage to the unit, requiring costly repairs.

3-4. ANTENNAS.

The radio frequen put to the receiver is designed for operation from a 50-ohm to 75-ohm coax ansmission line, or lead-in, from a suitable outside antenna. The coaxial line ws long lead-ins to be used without impairing the performance of the antenna. ground-plane vertical antenna is the most widely used type of outdoor antenna le for this application. Coaxial cable and ground-plane vertical antennas are a le from a number of manufacturers and, in almost all cases, can be obtained f e dealer from whom this receiver was purchased.

Regardless of the na type used, it will be found that any given antenna will work best in one ra frequencies but, at the same time, will give satisfactory performance over ntire range of this receiver. Follow the instructions furnished by the anten nufacturer and cut the antenna to your own requirements. Where you are ir ted in a specific frequency, cut the antenna to this frequency. Otherwise, the a a may be cut to approximately 120 megacycles.

For local ground- reception, performance will depend generally on the height of the antenna. Pl e antenna in the clear, and if possible, above the tree tops. The higher the a , the better the reception. Use any available natural supports, but use a chim r smoke stack only as a last resort. The fumes from a chimney can be corros the metal elements of the antenna and connections.

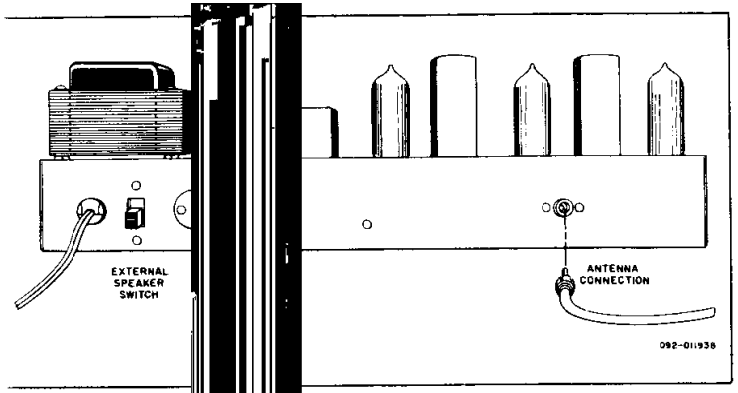
Use the antenna cc or furnished to connect the coaxial line to the receiver. Strip and connect the lin hown in figure 2. These connections must be soldered to assure a good electri nnection.

3-5. EXTERNAL SPE

Screw terminals f external speaker connection are located on the back of the chassis (see figure 3 se terminals can also be used for other external audio connections, such as h nes or a recorder. The switch on the back apron of the receiver selects eit e internal speaker or the external connection.

Any size of exter eaker may be used. Electrically, a permanent-magnet type speaker with a 3-o 4-ohm voice coil is preferred. The 12-ohm resistor, connected across the te ls, may be removed when using the equipment with an external speaker.

When connecting ecorder or to headphones, the 12-ohm resistor connected across the ter in parallel with the external device should remain connected.



Fi ar View of Receiver Chassis.

-6. ACCESSORY

An accessory s
ehind the speaker.
nis socket. The acc
)C power at 0.01 amp

ated on the top deck of the receiver, immediately
er, and signal voltages have been brought out to
t will furnish 12-volt AC at 150 MA and 180-volt
sible future accessory devices.

SECTION IV

OPERATION

-1. GENERAL.

There are only
few minutes of alr-
id the effect each co

s on the front panel of the Model CRX-3 Receiver.
familiarize you with the operation of each control
the performance of the receiver.

-2. TUNING CO

The TUNING co
d on coaxial shafts a
eiver. The rear kn
om one section of t
nob, is used as a fi
crowded portion of

of a vernier-drive and a fast-drive control mount-
on the extreme left of the front panel of your re-
e, will move the slide-rule pointer relatively fast
ther to tune-in a station. The vernier drive, front
ustment to accurately tune-in a desired station in

-3. VOLUME CO

The VOLUME
ceiver off. To turn
ately one-half from
ntrol to the desire

he extreme counterclockwise position, turns the
n, rotate the VOLUME control clockwise approxi-
sition. Tune to a station and readjust the VOLUME
vel.

-4. SQUELCH CO

The SQUELCH
e receiver when n
mes on the channe
the radio carrier
e VOLUME contro
ception, and to sile

automatic electronic switch. This switch silences
als are present on a channel. When a radio station
will automatically open and will stay open as long
on the air. The purpose of this switch is to allow
e set at a comfortable listening level for message
between radio transmissions.

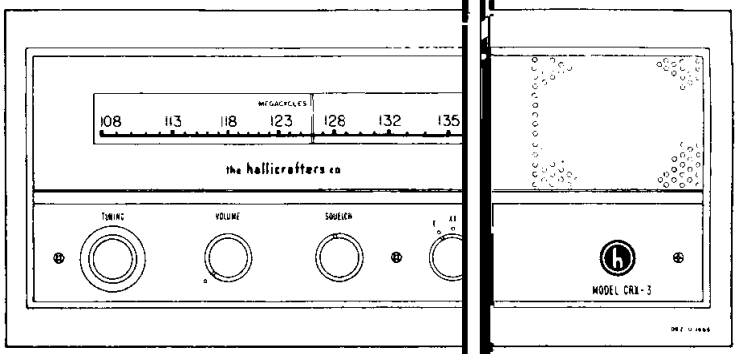


Figure 4. Front Panel View o ceiver.

As the SQUELCH control is rotated in a cloc se direction, a point will be
reached in the rotation where the electronic switch s, allowing off-signal noise
to come through. Rotate this control back in a cour clockwise direction until all
noise is silenced. This adjustment is to be made n no stations are on the air.
A further adjustment can be made, depending upon the akest signal to be received.

4-5. T-X1-X2 (SELECTOR) CONTROL.

For manual tuning operation, the selector s h should be placed in the T
position. In this position, you may tune in statio nywhere on the band and set
the VOLUME and SQUELCH controls as desired.

Two crystal positions have been provided fo ners who will only be using
the receiver on one or two frequencies and who wi o devote a minimum of time
to tuning and adjusting the receiver.

Quartz frequency control crystals may be chased and installed with a
minimum of effort.

Assume a crystal is on hand for a specific de d channel for this receiver.
Insert the crystal into the socket marked X1 on the t eck of the receiver chassis
near the front panel. Turn the receiver on and allow minutes for warmup. Rotate
the selector knob to the X1 position. Connect a p e on a DC VTVM to the test
point on the crystal oscillator coil nearest the t panel of the receiver (see
figure 7). Set the range on the VTVM to the minus v ge, 0 to 100 scale. Tune the
coil slug nearest the front panel until a maximum re g is obtained on the meter.
With an antenna connected, stations on the desired nel should be heard. Set the
main-tuning pointer to approximately the same uency being received in the
crystal-controlled position. Note the pointer posit which gives best reception.
You can then switch from crystal control to ma tuning and back, merely by
resetting the pointer at the noted position.

Where a good quality crystal has been used, th ceiver is now locked on the
desired channel. Reset VOLUME and SQUELCH con s as required. The receiver
should require only occasional resetting of the VOL and SQUELCH controls.

Occasionally it is possible for permissable t ances on your quartz crystal
and on the quartz crystal at the radio transmitt ou are monitoring to add up
enough to cause mistuning or off-channel errors. T crystal in your receiver can
be shifted slightly in frequency to compensate for sonable errors by inserting
a tuning tool through the hole in the bottom of the ca t to trim the proper crystal
oscillator coil.

When the proper crystals are obtained, you should experience no difficulty in setting the receiver on the correct frequency. Crystals may be ordered from the dealer from whom you purchased the receiver or directly from The Hallicrafters Company Service Department.

4-6. CRYSTAL ORDERING INFORMATION.

When ordering crystals for your receiver, follow the information given below:

A. Specify receiver model (CRX-3) and the serial number.

B. Specify crystal type as follows:

One each type CR-23/U or commercial equivalent crystal, Hallicrafters part number 019-002842.

C. Compute the required crystal frequency from the transmitter frequency. The following formula is to be used in computing the crystal frequency. An example is given using a transmitting frequency of 121.5 megacycles.

$$\text{Crystal Frequency} = \frac{121.5 + 10.7}{4} \text{ MC}$$

$$= \frac{132.2}{4} \text{ MC}$$

$$= 33.0500 \text{ MC}$$

D. Specify the crystal frequency (not the signal or dial frequency) in six digit numbers.

Example: 32.9250 megacycles, 34.4000 megacycles, 38.0125 megacycles.

Do not estimate the frequency from the dial reading on the receiver. Obtain this information from a reliable source. Information on VHF radio frequencies can be obtained at a very small cost from the "Sectional Aeronautical Charts," printed by the "Coast and Geodetic Survey." A catalog of these charts can be obtained from dealers in aviation supplies at the larger airports. The charts are also obtainable from the same suppliers.

The non-professional user of this equipment will find that excellent stability and reliability can be obtained from the Model CRX-3 without the crystal-control feature. On the other hand, when the user requires this unit to receive signals directed specifically to him, the use of the crystal-control feature is strongly recommended. The increased reliability justifies the comparatively small additional cost.

SECTION V

SERVICE DATA

5-1. CHASSIS REMOVAL.

The chassis and front panel assembly are removable as a unit. Remove the four rubber mounting feet. Slide the chassis out through the rear of the cabinet. Care should be taken to make certain that the tuning dial is at the low end of the band (tuning capacitor fully closed) before removing the chassis.

5-2. TUBE AND LAMP REPLACEMENT.

To gain access to the tubes and dial lamps, see paragraph 5-1, CHASSIS REMOVAL.

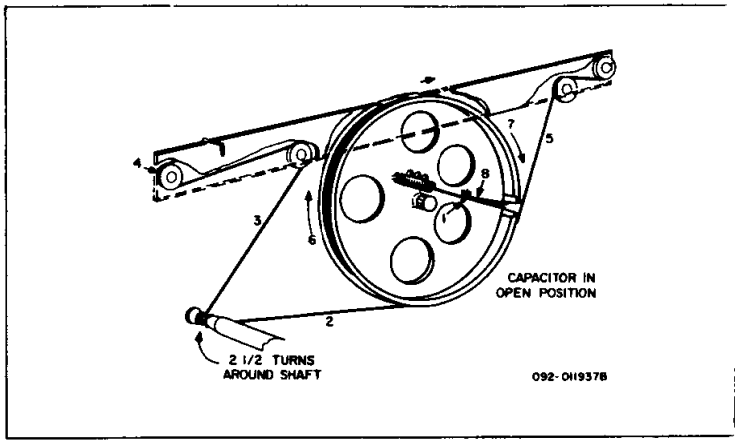


Figure 5. Dial Stringing Diagram.

5-3. DIAL CORD RESTRINGING.

Remove the chassis assembly from the cabinet as described in paragraph 5-1. String the dial cord by following the numerical sequence shown in figure 5.

5-4. SERVICE OR OPERATION QUESTIONS.

For further information regarding operation or servicing of your Model CRX-3 Receiver, contact your Hallicrafters dealer. The Hallicrafters Company maintains an extensive system of Authorized Service Centers where any required service will be performed promptly and efficiently at a nominal charge. All Hallicrafters Authorized Service Centers display the sign shown at the right.

Authorized hallicrafters Service Center communications equipment

For the location of the one nearest you, consult your local dealer or telephone directory. Make no service shipments to the factory, as The Hallicrafters Company will not accept the responsibility for unauthorized shipments.

The Hallicrafters Company reserves the privilege of making revisions in current production of equipment and assumes no obligation to incorporate these revisions in earlier models.

SECTION VI

ALIGNMENT

6-1. GENERAL.

The Model CRX-3 Receiver has been carefully aligned at the factory by specially trained personnel using precision equipment. Alignment of the receiver should not be attempted until all other possible causes of faulty operation have been investigated. Alignment should not be required unless the receiver has been tampered with or component parts in the RF or IF stages have been replaced. Alignment should only be attempted by persons experienced in this work, using the proper test equipment.

IMPORTANT

Where it is planned to use the crystal-controlled reception feature of this receiver, it is absolutely essential that the 455-KC IF transformer he exactly centered on frequency. The crystal correlation will only hold when this circuit is properly on frequency.

The oscillator, RF, and tunable IF must track together, according to the following formula:

OSCILLATOR FREQUENCY = RF + 10.7 MC

With the receiver turned off, this tracking can be checked using a grid-dip meter.

6-2. TEST EQUIPMENT REQUIRED.

The following test equipment, or its approved equivalent, is to be used in performing necessary alignment on the Model CRX-3 Receiver.

1. Signal Generator, Measurements Corporation Model 80; to he used for RF alignment.

2. A good quality sweep generator, in conjunction with an oscilloscope; to be used for IF alignment. Use procedure given in paragraph 6-4.

3. A good quality signal generator, such as the Measurements Corporation Model 65B; to be used as an alternate for the IF alignment if a sweep generator and/or oscilloscope is not available. Use alternate procedure given in paragraph 6-5.

NOTE

Only quality signal generators which operate on fundamentals across their entire range are to be used in this alignment. Generators operating on harmonics should not he used.

4. DC Vacuum Tube Voltmeter (VTVM), RCA Senior Voltohmyst; to he used for RF alignment.

5. Hexagonal alignment tool, preferably plastic.

6. Nylon screwdriver blade (with metal hlade on opposite end, if one is available).

6-3. INITIAL CONTROL SETTINGS.

Before the alignment is hegun, the front panel controls should he set as follows:

VOLUME	Approximately centered (one-half clockwise)
T-X1-X2 (Selector). . .	T (Manual tuning)
SQUELCH	Open
TUNING	As required

6-4. IF ALIGNMENT PROCEDURE.

1. 455-KC IF Alignment. - Connect sweep generator horizontal output to horizontal connection on oscilloscope. Connect RF output from the sweep generator to pin 1 of V4. Set sweep generator frequency to 455 KC. Connect probe from vertical connection on oscilloscope to pin 9 of V6. Adjust alignment points A (T3 secondary) and B (T3 primary) until the signal on the oscilloscope is the same as that shown in figure 6.

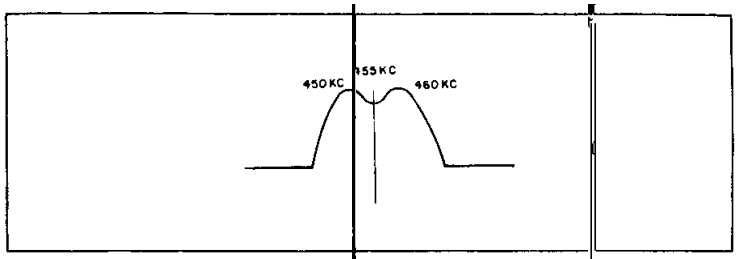


Figure 6. Alignment Waveform.

Move the sweep generator to pin 2 of V3. Adjust alignment points C (T2 secondary) and D (T2 primary) for a symmetrical signal the same as shown in figure 6.

NOTE

The oscilloscope trace should he positioned so that it is symmetrical about 455 KC. The IF must he centered on 455 KC, or 10.7 MC will he inaccurate; and, most important, the crystal-control correlation will he wrong.

2. 10.7 MC IF Alignment. - Reset the sweep generator to exactly 10.7 MC and connect the RF output from the sweep generator to pin 2 of V2. The signal presentation on the oscilloscope will resemble that shown in figure 6, except it will he centered around 10.7 MC. Adjust alignment points E (T1 secondary) and F (T1 primary) until the scope presentation is symmetrical and the 10.7-MC marker is exactly centered.

6-5. ALTERNATE IF ALIGNMENT PROCEDURE.

This procedure is to he followed if a sweep generator and/or oscilloscope is not available.

1. 455-KC IF Alignment. - Set the signal generator to exactly 455 KC and connect it to pin 1 of V4 through a 0.01 mfd capacitor. Connect the DC VTVM to pin 5 of the accessory socket. Set the signal generator to maintain an output level at approximately mid-scale. Adjust alignment points A and B for maximum indication on the VTVM.

Move the signal generator to pin 7 of V3. Adjust alignment points C and D for maximum indication on the VTVM.

Detune the signal generator 10 KC above and below 455 KC. The output should be reasonably flat on top and symmetrical about the 455-KC center frequency. Retouching one or two of the alignment points should give a symmetrical output.

2. 10.7-MC Alignment. - Set the signal generator to 10.7 MC. Move the generator connection to pin 2 of V2. Adjust alignment pins E and F for maximum indication on the VTVM.

This completes the IF alignment. All of the RF alignment procedure which follows can he completed using the Model 80 Signal Generator connected as specified and the DC VTVM connected to pin 5 of the accessory socket.

6-6. RF ALIGNMENT PROCEDURE.

Connect the signal generator to the antenna jack (J1). Set the receiver dial to 135 MC. Set the generator output to approximately 10 or 20 microvolts. Rock the generator slowly above and below 135 MC until the generator signal is heard in the receiver. Adjust C25 (oscillator trimmer) until the dial calibration is correct. Adjust C2 and C8 for maximum indication on the VTVM. When these circuits are peaked, an immediate performance check can be made before proceeding with the next step in the alignment.

Reduce the generator output to zero. Close the SQUELCH control to the point where the noise is just silenced. Increase the generator output to 1.0 microvolt. As the receiver is slowly tuned through the signal, the squelch should open and close.

Set the receiver dial to 115 MC. Reset the generator output to 10 or 20 microvolts. Rock the generator slowly above and below 115 MC until the generator signal is heard in the receiver. Adjust L3 until dial calibration is correct. Adjust L1 and L2 for maximum indication on the VTVM. Repeat this procedure a few times until a negligible increase in output is obtained by further alignment. Coils L1, L2, and L3 are adjustable by varying the spacing between the windings with an insulated tool.

RVICE REPAIR PARTS LIST

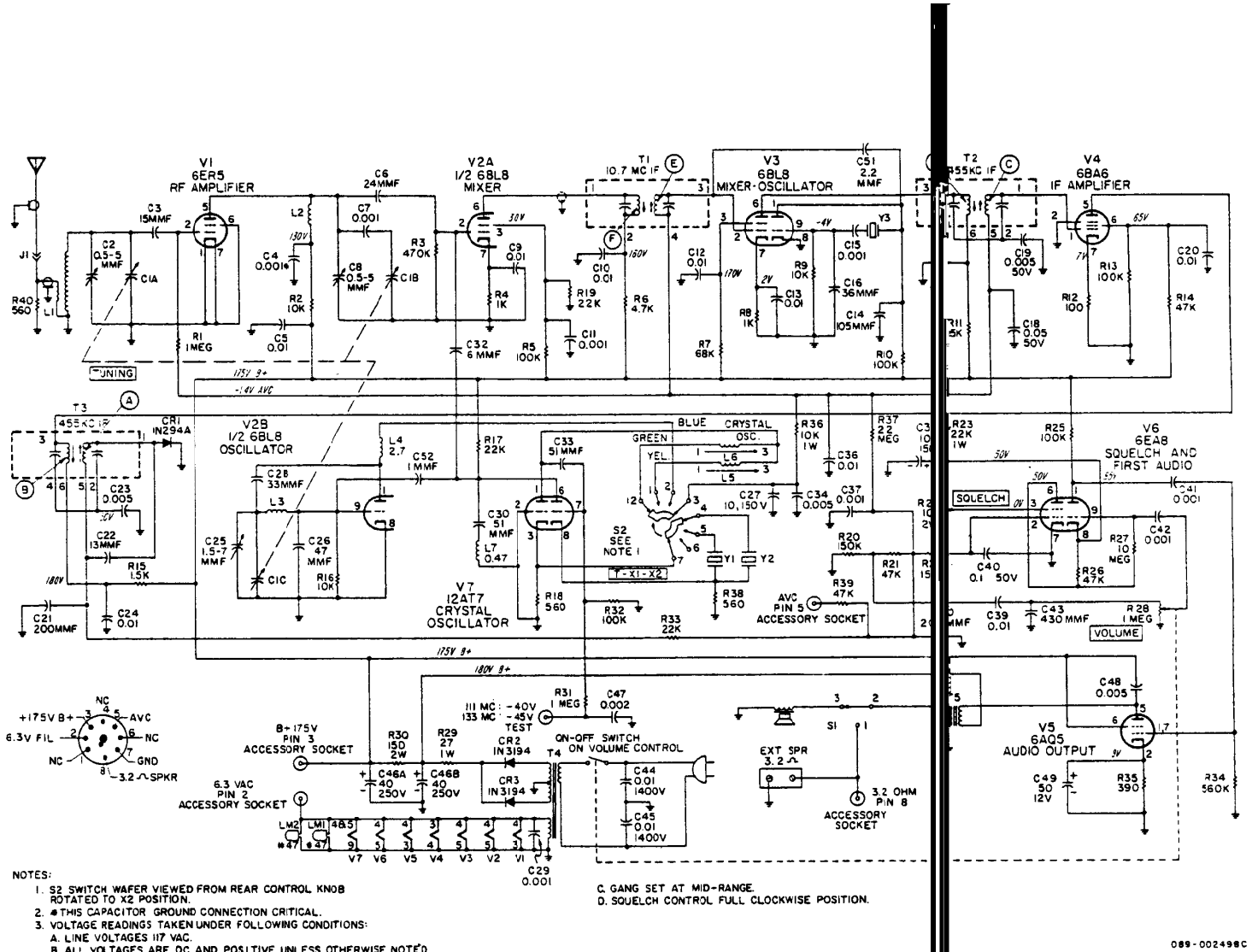
Schematic Symbol	Description	Hallicrafters Part Number
	CAPACITORS	
C1A,B,C	Variable, TUNING	048-000528
C2,8	Variable, 0.5 mmf to 5 mmf, Tubular Trimmer	044-000543
C3	15 mmf, 10%, N750, Ceramic Tubular	491-108150-95
C4,7 11, 15,29,37, 41,42	0.001 mfd, 500V, GMV, Ceramic Disc	047-200230
C5,9,10, 12,13,17, 20,24,36, 39	0.01 mfd, -80%, -20%, 500V, Ceramic Disc	047-100217
C6	24 mmf, 10%, N750, Ceramic Tubular	491-108240-95
C14	105 mmf, 2%, 300V, Plastic Mica	493-121050-324
C16	36 mmf, 2%, 300V, Plastic Mica	481-151380
C18	0.05 mfd, -80%, -20%, 50V, Ceramic Disc	047-001144
C19,23	0.005 mfd, -80%, -20%, 50V, Ceramic Disc	047-001139
C21,50	200 mmf, 10%, N750, Ceramic Tubular	491-156201-95
C22	13 mmf, 2%, 300V, Plastic Mica	493-910130-321
C25	Variable, 1.5 mmf to 7 mmf, Ceramic Trimmer	044-000544
C26	47 mmf, 5%, N220, Ceramic Tubular	491-105470-63
C27,38	10 mfd, 150V, Electrolytic	045-200307
C28	33 mmf, 2%, 300V, Plastic Mica	481-151330
C30	51 mmf, 2%, 300V, Plastic Mica	481-151510
C32	6 mmf, ±0.5 mmf, N750, Ceramic Tubular	491-002060-93
C33	51 mmf, 10%, N750, Ceramic Tubular	491-108510-95
C34,48	0.005 mfd, 20%, 500V, Ceramic Disc	047-100442
C40	0.1 mfd, 50V, Ceramic Disc	047-001148
C43	430 mmf, 2%, 300V, Plastic Mica	481-161431
C44,45	0.01 mfd, 1400V, Ceramic Disc	047-001309
C46A,B	2 x 40 mfd, 250V, Electrolytic	045-000742
C47	0.002 mfd, 20%, 500V, Ceramic Disc	047-100395
C49	50 mfd, 12V, Electrolytic	045-200278
C51	2.2 mmf, 10%, 500V	047-200403
C52	1 mmf, 10%, Gimmick	047-200403-2

Schematic ymbol	Description	Hallicrafters Part Number
	RESISTORS	
1,31	1 megohm	451-252105
2,9,16	10K ohm	451-252103
3	470K ohm	451-252474
4,8	1000 ohm	451-252102
5,10,13	100K ohm	451-252104
5,32		
6	4700 ohm	451-252472
7	68K ohm	451-252683
11,15	1500 ohm	451-252152
12	100 ohm	451-252101
14,21, 6,39	47K ohm	451-252473
17,19,33	22K ohm	451-252223
18,38,40	560 ohm	451-252561
20,22	150K ohm	451-252154
23	22K ohm, 1 watt	451-352223
24	Variable, 10K ohm, 2 watt, SQUELCH	025-001974
27	10 megohm	451-252106
28	Variable, 1 megohm, VOLUME	025-001973
29	27 ohm, 1 watt	451-352270
30	150 ohm, 2 watt	451-852151
34	500K ohm	451-252564
35	390 ohm	451-252391
36	10K ohm, 1 watt	451-352103
37	2.2 megohm	451-252225

All RESISTORS are carbon type, 10%, 1/2 watt unless otherwise stated.

	COILS AND TRANSFORMERS	
1	Coil, Antenna	051-003518
2	Coil, Mixer	051-003316
3	Coil, Oscillator	051-003519
4	Coil, RF Choke, 2.7 μH	053-100470
5,6	Coil, Crystal Oscillator	051-003318
7	Coil, RF Choke, 0.47 μH	053-000664
1	Transformer, IF (10.7 MC)	050-000774
2,3	Transformer, IF (455 KC)	050-000764
4	Transformer, Power	052-000934
5	Transformer, Output	055-000457
	TUBES AND DIODES	
1	Electron Tube, Type 6ER5, RF Amplifier	090-901461
2	Electron Tube, Type 6BL8, First Mixer-Oscillator	090-901431
3	Electron Tube, Type 6BL8, Second Mixer-Oscillator	090-901431

Schematic Symbol	Description	Hallicrafters Part Number
	TUBES AND DIODES	
V4	Electron Tube, Type 6E IF Amplifier	.2
V5	Electron Tube, Type 6A Audio Output	1
V6	Electron Tube, Type 6E Squelch and First Aud	0
V7	Electron Tube, Type 12 Crystal Oscillator	4
CR1	Diode, Type 1N294A, D	6
CR2,3	Diode, Silicon, Type 1N Rectifier	9
	MISCELLANEOU	
	Cabinet Assembly	5
	Clip, IF Transformer Mounting	5
J1	Connector, Antenna, Co	1
Y3	Crystal (10.245 MC)	5
	Dial Cord	9
	Dial Pointer	8
	Dial Scale, Calibrated	4
	Foot, Rubber	9
	Front Panel	5
	Knob, Selector and VOL	2
	Knob, SQUELCH	1
	Knob, TUNING (Coarse	0
	Knob, TUNING (Fine)	9
LM1,2	Lamp, Indicator, Type	4
	Line Cord	8
	Lock, Line Cord	7
XV1,4,5	Socket, 7-Pin Miniatur	0
XV2	Socket, 9-Pin Miniatur (Mica)	3
XV3,6,7	Socket, 9-Pin Miniatur (Wafer)	7
	Socket, Crystal (Y1 and	4
	Socket, Crystal (Y3)	0
	Socket, Octal (Accesso	0
	Socket, Pilot Lamp As (L. H.)	5
	Socket, Pilot Lamp As (R. H.)	6
	Speaker	1
	Spring, Crystal Retain	7
	Spring, Dial Cord	2
	Switch, Slide (SPDT)	7
	Switch, Rotary, Selecto (T-X1-X2)	8
	Terminal Board (3.2 Ohm, GND)	0
	Trim Strip, Cabinet	3



NOTES:
1. S2 SWITCH WAFER VIEWED FROM REAR CONTROL KNOB ROTATED TO X2 POSITION.
2. # THIS CAPACITOR GROUND CONNECTION CRITICAL.
3. VOLTAGE READINGS TAKEN UNDER FOLLOWING CONDITIONS:
   A. LINE VOLTAGES 117 VAC.
   B. ALL VOLTAGES ARE DC AND POSITIVE UNLESS OTHERWISE NOTED.
   C. GANG SET AT MID-RANGE.
   D. SQUELCH CONTROL FULL CLOCKWISE POSITION.

089-002498C

Figure 9. Schematic Diagram of the Model CRX-3 Receiver.