
SERVICE MANUAL



SOLID STATE FOUR BAND COMMUNICATIONS RECEIVER

MODEL DX-150

CAT. 20-150

A PRODUCT OF RADIO SHACK CORPORATION

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1.0 SPECIFICATIONS

1.1 CIRCUIT.....17 transistors, 13 diodes and 3 thermistors, super-heterodyne system, shown in Table 1 and Fig. 8 Schematic diagram.

1.2 FREQUENCY.....The R.F. tuning system covers the following four bands:

-1	Band A	0.535 – 1.6 MHz
-2	Band B	1.55 – 4.5 MHz
-3	Band C	4.5 – 13 MHz
-4	Band D	13 – 30 MHz

1.3 BAND SPREAD.....The band spread system covers the following frequencies:

-1	80 Meter Band	3.5 – 4 MHz
-2	40 Meter Band	7 – 7.3 MHz
-3	20 Meter Band	14 – 14.35 MHz
-4	15 Meter Band	21 – 24.5 MHz
-5	11 Meter Band	26.965 – 27.255 MHz
-6	10 Meter Band	28 – 29.7 MHz

1.4 INTERMEDIATE FREQUENCY.....455 KHz

1.5 RECEIVER SENSITIVITY.....uV

1.6 SIGNAL TO NOISE.....

1.7 IMAGE RATIO.....

1.8 AUDIO POWER.....1.5W max

TABLE 1. TRANSISTOR & DIODE COMPLEMENT

NUMBER	TYPE	FUNCTION
Q1, Q2	2SA234	Cascade R.F. stage
Q3	2SA234	Mixer
Q4	2SA353	1 st I.F. stage
Q5	2SA12	2 nd I.F. stage
Q6	2SC384	Local Oscillator
Q7	2SC371	Oscillator buffer
Q8	2SD77	1 st A.V.C. amplifier stage
Q9	2SB77	2 nd A.V.C. amplifier stage
Q10	2SA12	B.F.O. stage
Q11	2SA353	B.F.O. buffer
Q12	2SB75	Amplifier for C.W. / S.S.B.
Q13	2SB75	1 st A.F. amplifier stage
Q14	2SB77	2 nd A.F. amplifier stage
Q15, Q16	2SB370	A.F. power amplifier stage
Q17	2SD147	D.C. regulator
D1	1S73	Q1 protector for high level signal
D2	1S73	R.F. A.N.L.
D3	1N34A	A.M. detector
D4	1N34A	A.F. A.N.L.
D5, 6, 7, 8	1N34A	Product detector
D9	RD6A	Voltage regulator for Front end stage
D10	RD-9A	Overall voltage regulator
D11, 12	SW-05	Rectifier
D13	1N34A	Stabilizer
Th 1, 2	D-1E	Temperature compensator
Th 3	M-10K	Temperature compensator

1.9 LOUD SPEAKER.....3" x 5" P.M. type.

1.10 POWER INPUT & POWER CONSUMPTION:

-1 A.C. – 117V, 50 / 60 Hz, 6 V.A.

-2 D.C. 12V, 5 V.A., NEGATIVE GROUND ONLY - (No dial lights)

-
-
- 1.11 CONTROLS ON THE FEATURE:
- 1 TUNING DIAL
 - 2 SPREAD DIAL
 - 3 "S" METER
 - 4 A.N.L. SWITCH (ON / OFF)
 - 5 MODE SWITCH (A.M. / S.S.B., C.W.)
 - 6 A.V.C. SWITCH (FAST / SLOW)
 - 7 OPERATION SWITCH (REC. / STD. BY
 - 8 PHONES JACK
 - 9 BAND SPREAD CONTROL
 - 10 B.F.O. PITCH
 - 11 Power ON / OFF & A.F. GAIN CONTROL
 - 12 BAND SELECTOR
 - 13 ANTENNA TRIMMER
 - 14 R.F. GAIN CONTROL
 - 15 MAIN TUNING CONTROL
- 1.12 CONTROLS ON THE BACK:
- 1 ANTENNA TERMINAL
 - 2 FUSE HOLDER & FUSE
 - 3 D.C. / A.C. CHANGE SWITCH
 - 4 D.C. 12V POWER JACK
 - 5 STD. BY JACK

2.0 GENERAL ALIGNMENT INSTRUCTIONS

2.1 TEST EQUIPMENT:

- 1 STANDARD SIGNAL GENERATOR or TEST OSCILLATOR
- 2 VACUUM TUBE VOLTMETER (P TYPE) (a-c / d-c) or equivalent
- 3 DUMMY LOAD 8 OHMS
- 4 I.E.C. DUMMY ANTENNA

2.2 GENERAL ALIGNMENT CONDITIONS.

- 1 Before servicing this receiver, disconnect from the power source and remove all lead wires attached to terminal connections. Remove the six screws which fasten the chassis to the bonnet, speaker leads and remove the six screws which fasten the chassis to the bottom plate. See Item 3.1 CHASSIS DIS-ASSEMBLY, Fig. 2-1.
- 2 Knob function and its nominal position.
 - Tuning Dial.....0, on Logical Scale
 - Spread Dial.....V.C. Minimum
 - A.N.L. Switch.....OFF
 - Mode Switch.....A.M.
 - A.V.C. Switch.....FAST
 - OPR Switch.....REC.
 - B.F.O. PITCH.....--
 - A.F. GAIN.....Adjust to Test Requirements
 - Band Selector.....Adjust to Test Requirements
 - Antenna Trimmer.....Center
 - R.F. Gain.....Maximum
- 3 I.F. AMPLIFIER ALIGNMENT

NOTE: The non-metallic alignment tool is required for complete alignment. Unless otherwise specified, all front panel controls shall be positioned as Item 2.2-2 knob function & nominal position for complete alignment of the receiver. The receiver should be warmed up for a period of at least ½ hour before proceeding with the complete alignment.

A. S.G. – Coupling.

Connect the S.G. output through a capacitor (50 pF) between VC4 and chassis earth.

B. S.G. – Frequency.....455 KHz.

C. Adjust -

Adjust the cores of I.F. transformers T1, T2, T3 and T4 for a maximum deflection on the “S” meter in a front dial.

-4 R.F. AMPLIFIER ALIGNMENT

NOTE: Alignment tool, nominal position of knobs and receiver condition should be required as Item 2.2-2 and 2.2-3.

A. S.G. – Coupling.

Connect the cable of S.G. output through a dummy antenna between A1 and GND on the antenna terminal. See Fig. 9

B. S.G. – Frequency.

Three points characteristic alignment should be required on each A to D pass band. The plot frequency and modulation shall be positioned as follows:

BAND A	0.6 MHz, 1 MHz & 1.4 MHz
BAND B	1.7 MHz, 2.8 MHz & 4 MHz
BAND C	5 MHz, 8 MHz & 12 MHz
BAND D	14 MHz, 21 MHz & 28 MHz
MODULATION	1 KHz, 30%

C. Connect - V.T.V.M. or equivalent.

Connect an a-c vacuum tube voltmeter or equivalent to a phone jack with 8 ohms dummy load. Keep clear of low impedance speaker voice coil.

D. Adjust –

Adjust the cores and trimmers of antenna, R.F., and oscillator coils for maximum deflection. Part number of the core and trimmer is as following table:

STAGE	ANT. STAGE		R.F. STAGE		OSC. STAGE	
ADJ.	CORE	TRIM	CORE	TRIM	CORE	TRIM
BAND A	L1	VC1	L5	C101	L9	C105
BAND B	L2	VC1	L6	C102	L10	C106
BAND C	L3	VC1	L7	C103	L11	C107
BAND D	L4	VC1	L8	C104	L12	C108

NOTE: The oscillator adjustments is performed first. The R.F. is adjusted next to obtain maximum amplitude. The antenna cores are adjusted last. Adjust cores for low end of band and trimmers for high end of band.

-5 B.F.O. ALIGNMENT

NOTE: The non-metallic alignment tool is required for complete alignment. The mode switch on the front panel should be positioned S.S.B. / C.W. A knob of the B.F.O. pitch on the front panel should be positioned one o'clock.

A. Signal Coupling.

Receive one of a broad cast frequency with exactitude by an antenna through the antenna terminal.

B. Connect V.T.V.M. or equivalent.

Connect a P type vacuum tube voltmeter or equivalent probe between a side of T6 secondary coil and chassis earth. Set the vacuum tube voltmeter range on 1.5 volt.

C. Adjust -

Adjust the core of the B.F.O. coil T5 for a zero-beat note by loud speaker. Adjust the core of coil T6 for a maximum deflection on vacuum tube voltmeter or equivalent.

3.0 CHASSIS DIS-ASSEMBLY & DIAL CORD-ASSEMBLY

3.1 CHASSIS DIS-ASSEMBLY:

See Fig. 2-1 to Fig. 2-3 attached and Item 2.2-1.

NOTE: Before the chassis dis-assembly, pull out two of tips with speaker lead from loud speaker.

3.2 DIAL CORD ASSEMBLY:

NOTE: Before the dial cord assembly, seven of all control knobs, five nuts of phone jack, B.F.O. pitch control, A.F. gain control, ANT, trimmer, and R.F. gain control should be replacement with front panel. See FIG. 2-2.3.4.

-1 Main tuning dial cord assembly show the Fig. 3 attached

-2 Band spread dial cord assembly show the Fig. 4 attached

3.3 KNOB SETTING POSITION FOR B.F.O. PITCH & ANTENNA TRIMMER.

Set the knob slit on nine o'clock when a capacity of variable capacitor should be made maximum value.



FIG. 1-1 FRONT VIEW OF DX-150 CHASSIS

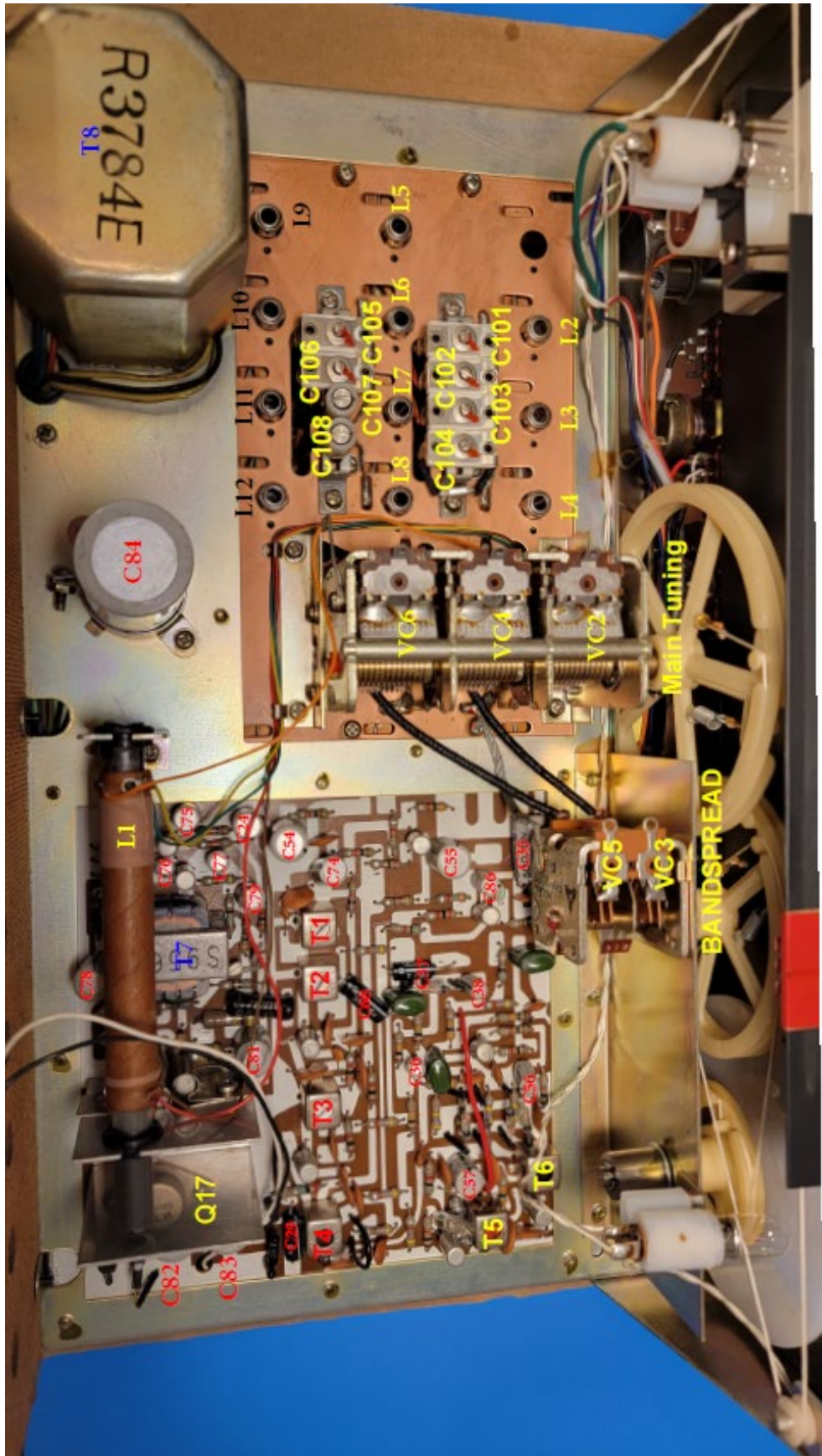


FIG. 1-2 TOP VIEW OF DX-150 CHASSIS

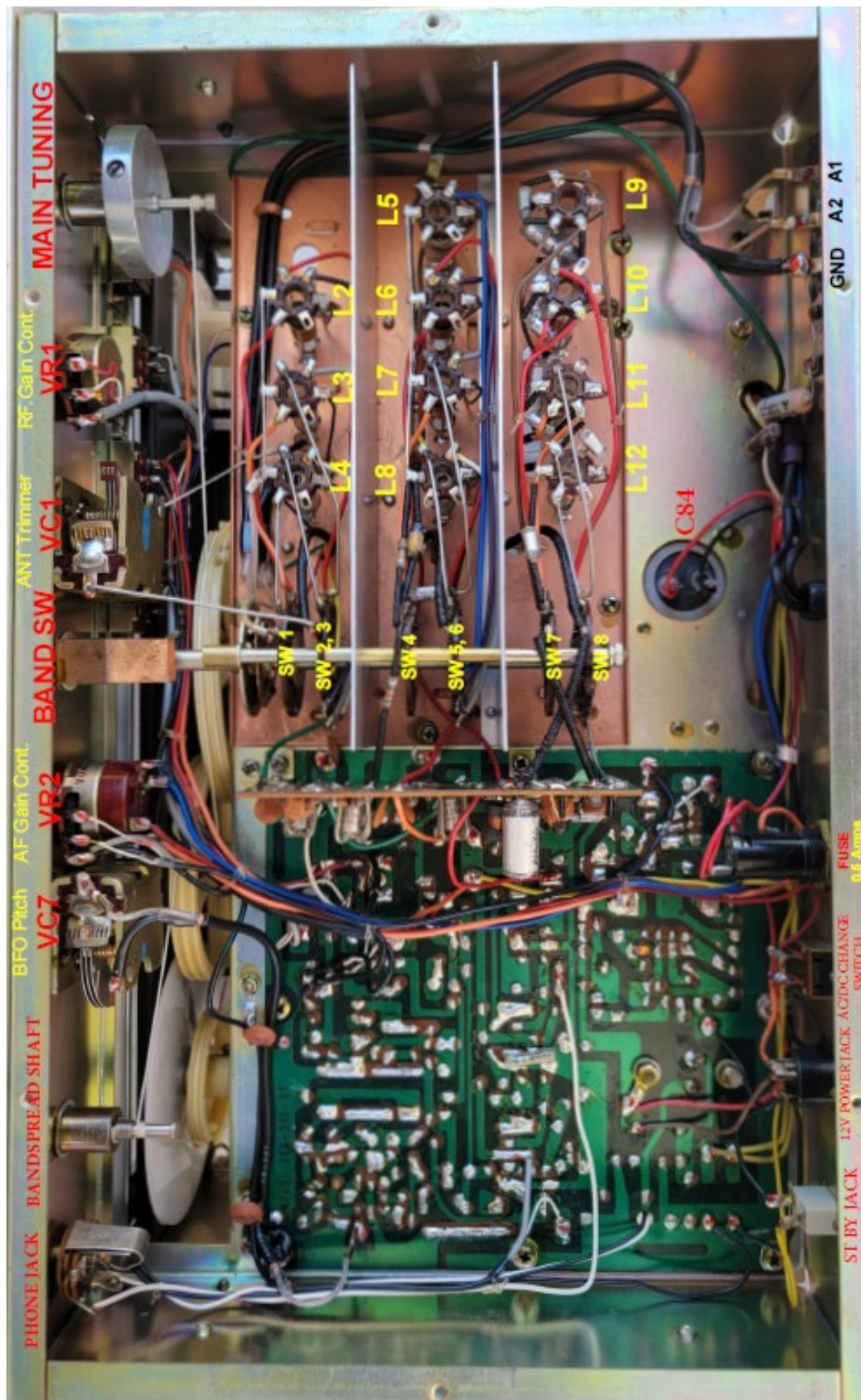
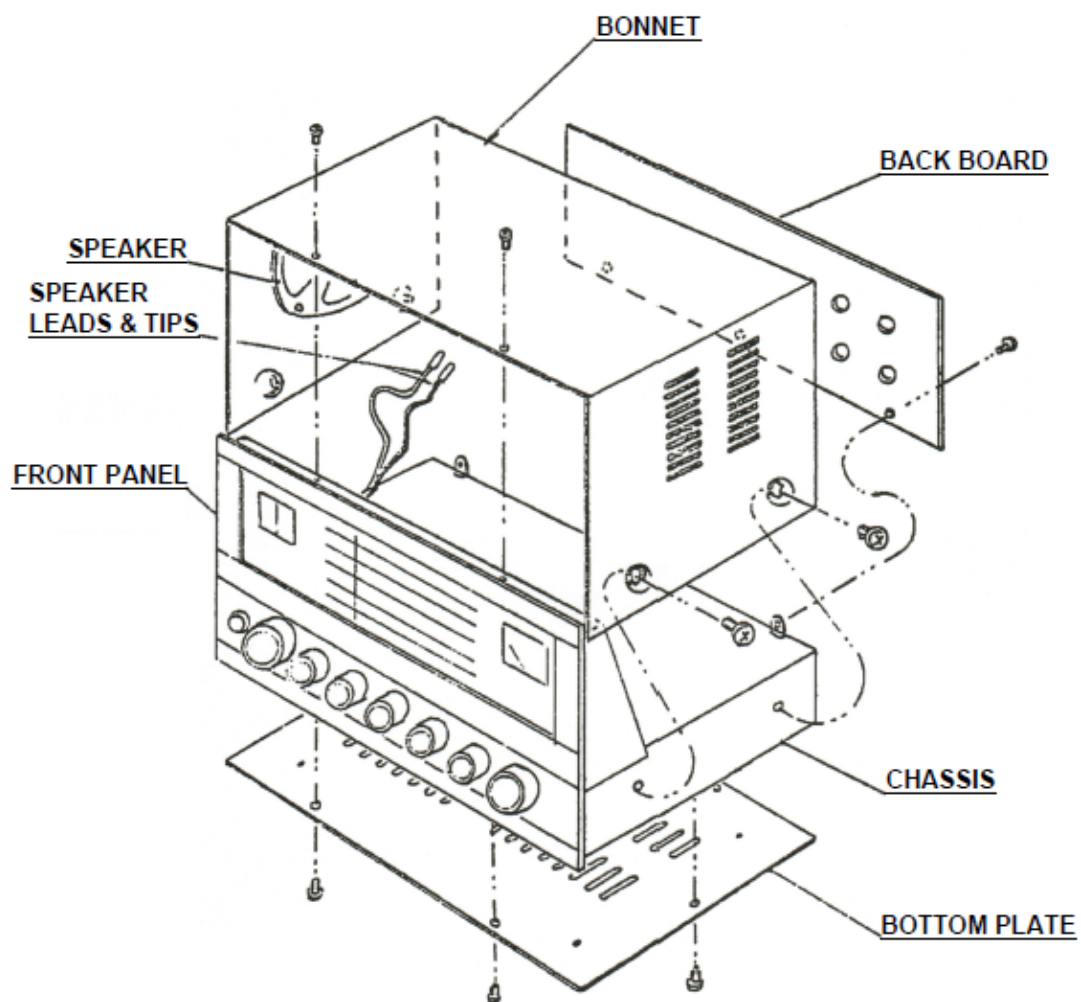


FIG. 1-3 BOTTOM VIEW OF DX-150 CHASSIS



NOTE: BEFORE THE CHASSIS DIS-ASSEMBLY,
PULL OUT SPEAKER LEAD WIRES.

FIG. 2-1 CHASSIS DIS-ASSEMBLY

FIG. 2-2

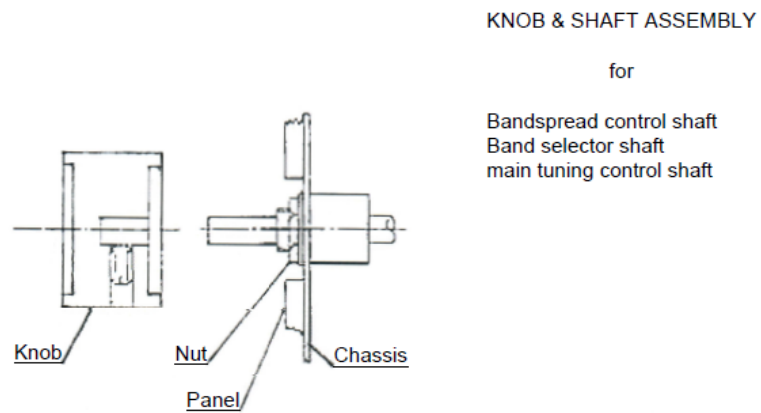


FIG. 2-3

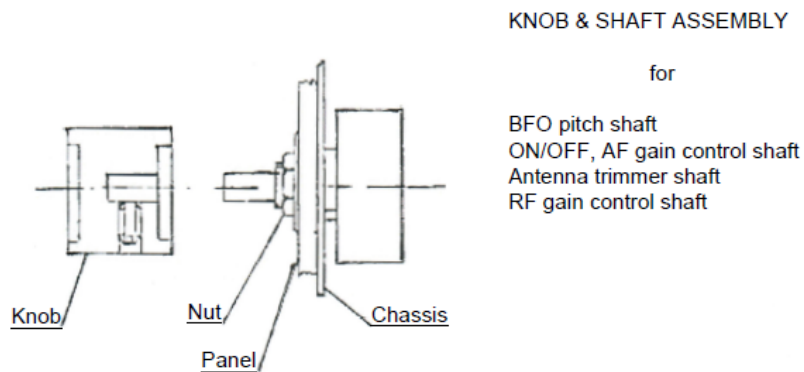
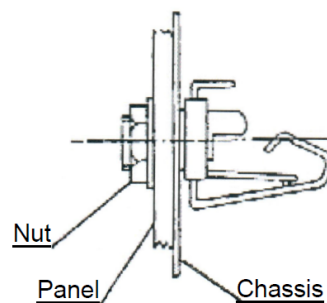


FIG. 2-4

PHONE JACK ASSEMBLY



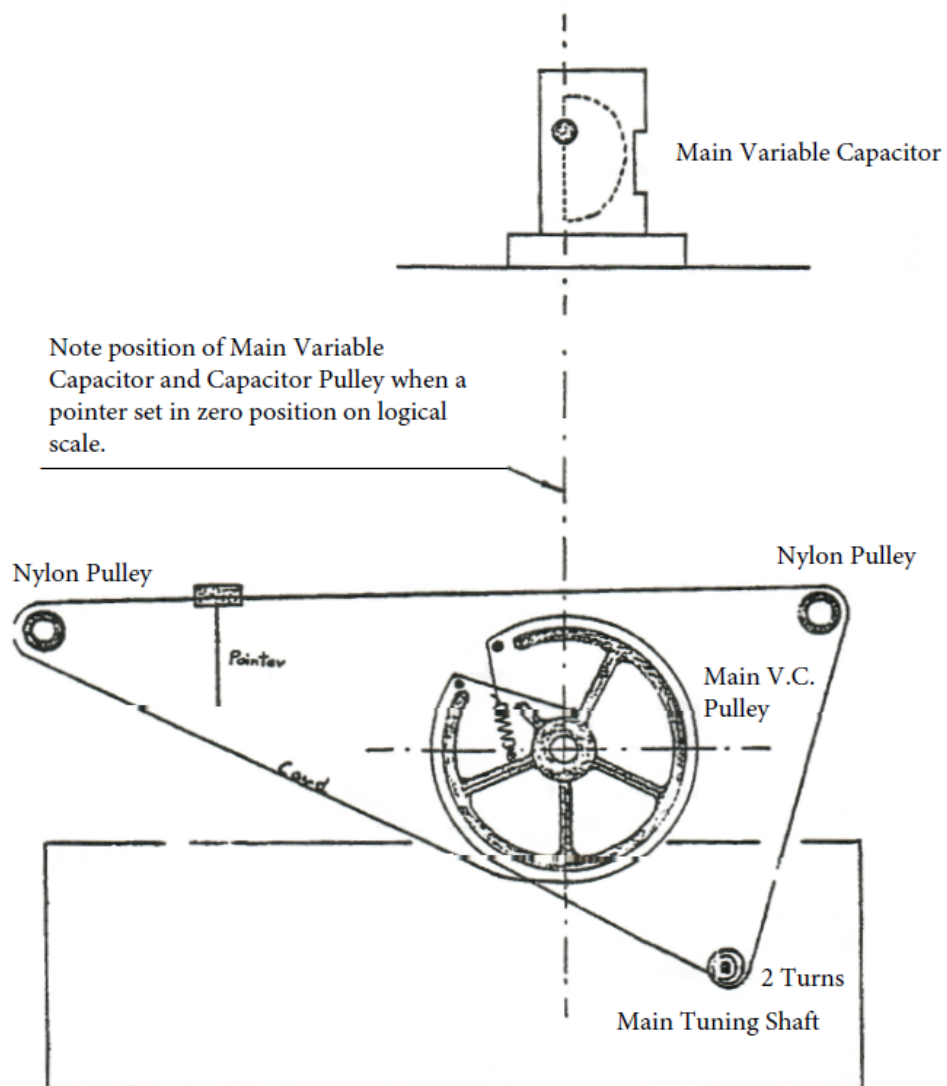
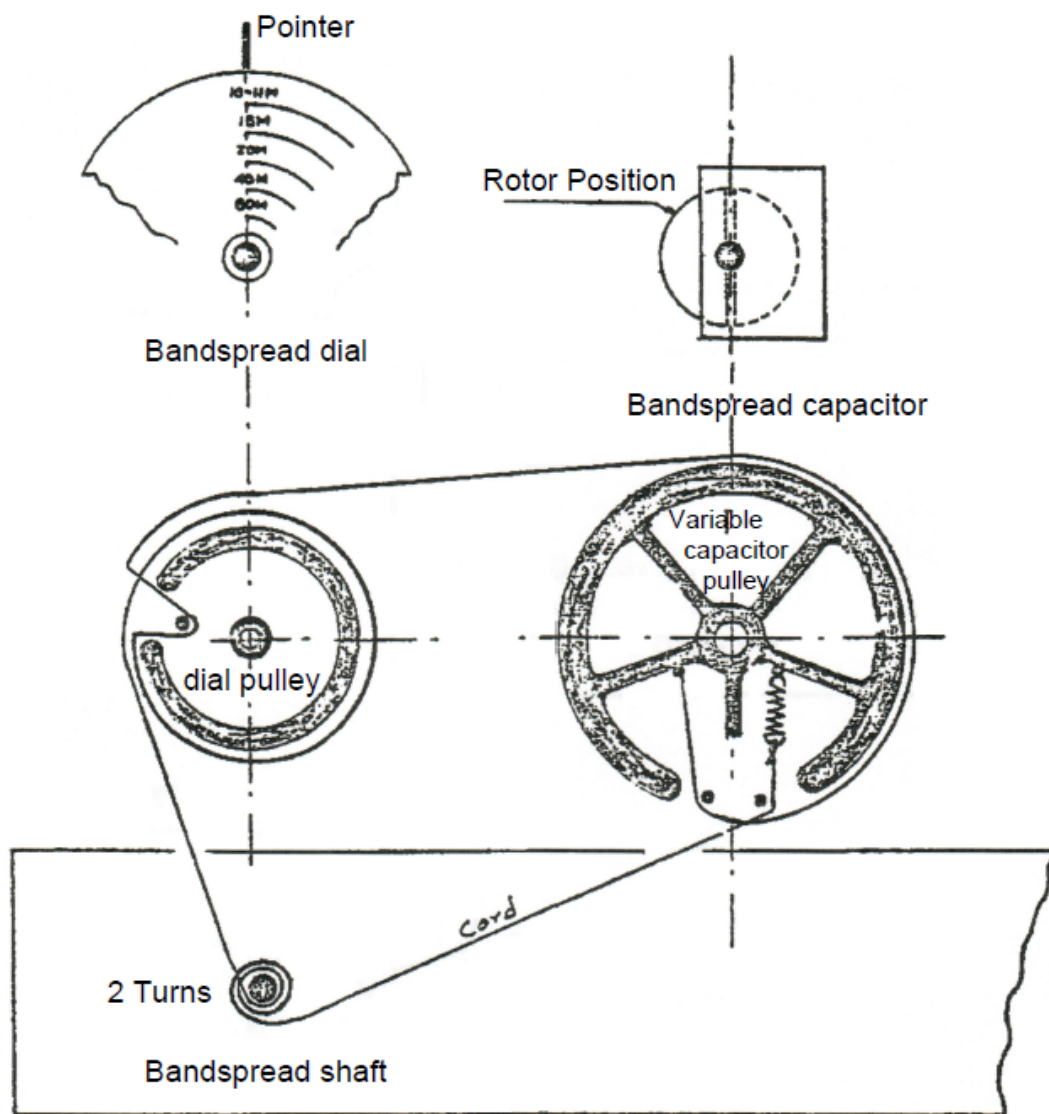


FIG. 3 MAIN TUNING DIAL CORD ASSEMBLY



Four of Note position for Bandspread Dial, Dial Pulley, Variable Capacitor and Capacitor Pulley.

FIG. 4 BANDSPREAD DIAL CORD ASSEMBLY

WIRING DIAGRAM



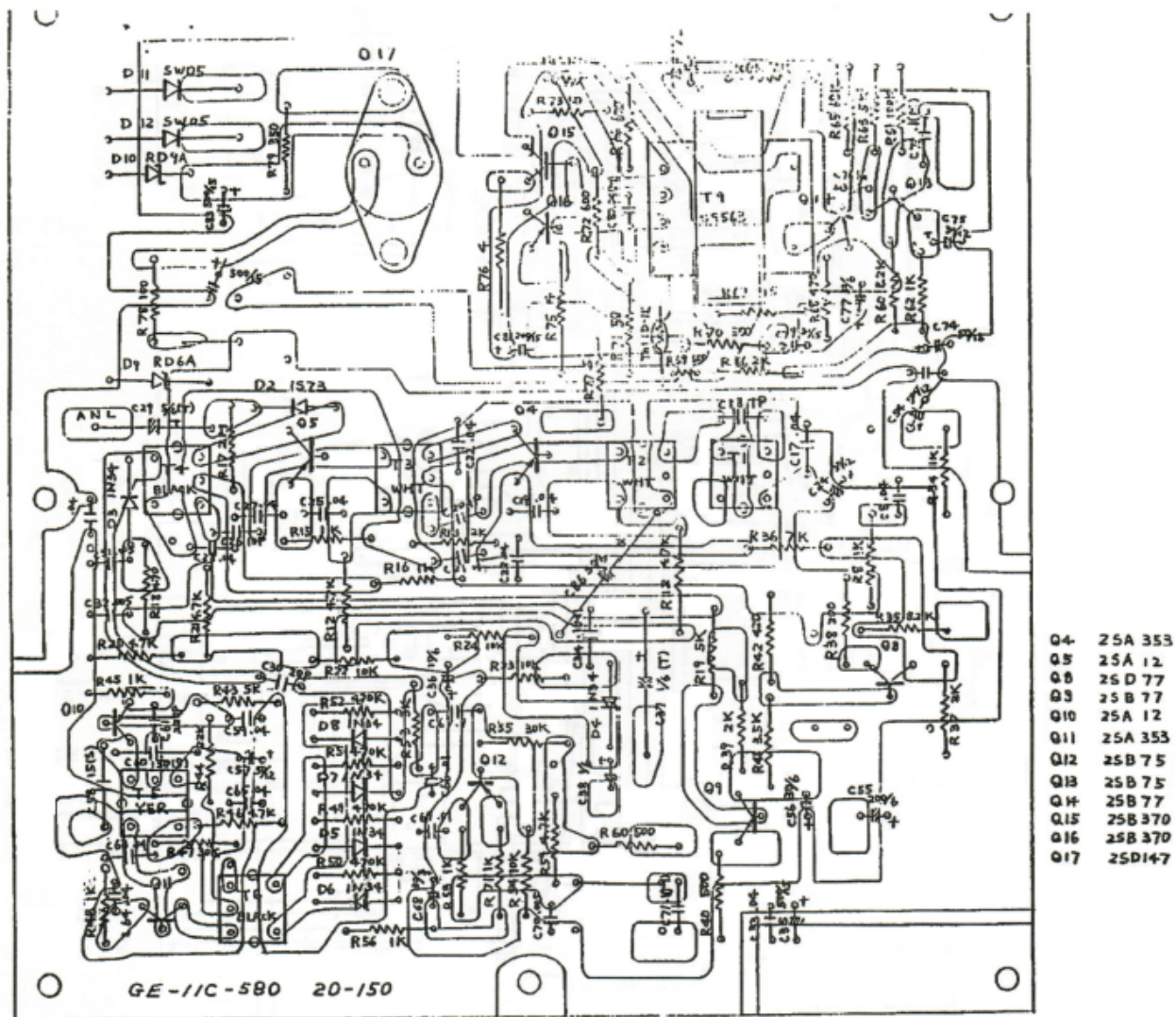
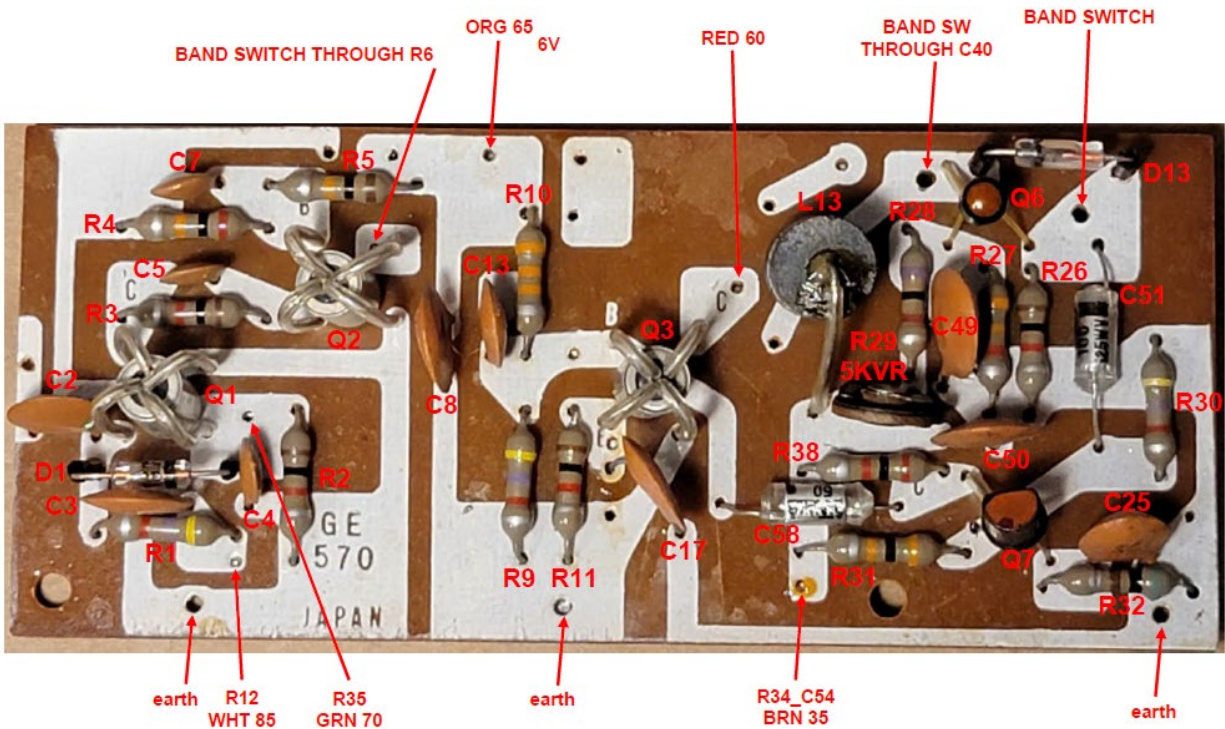
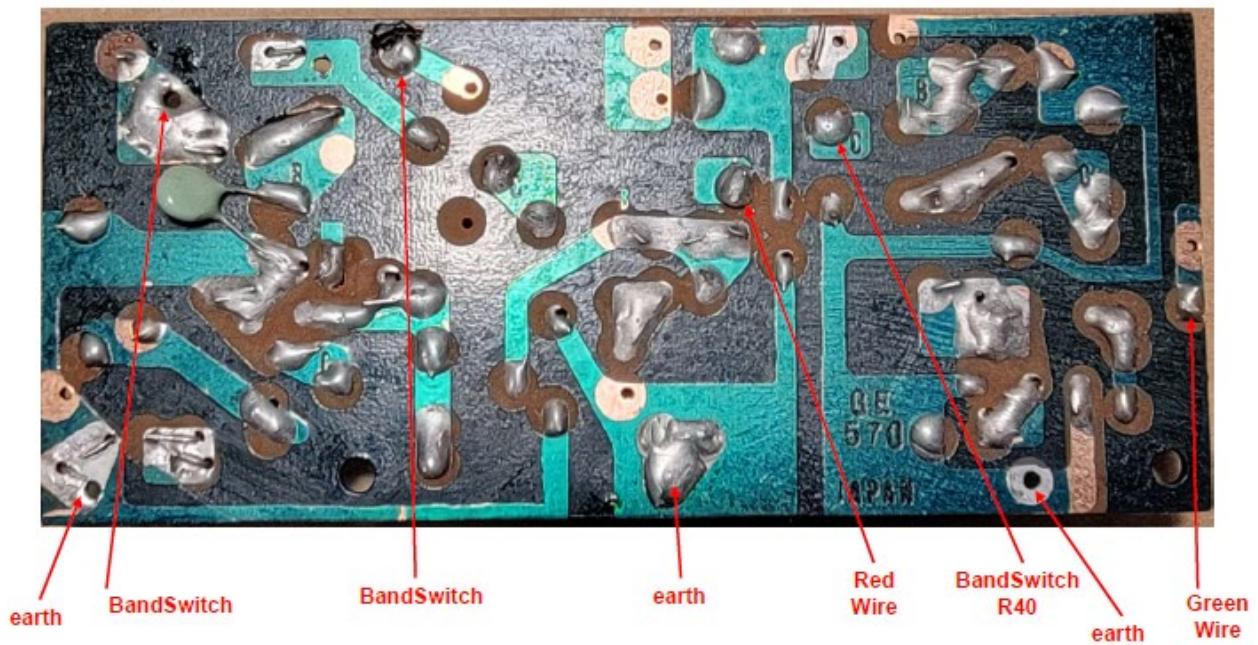


FIG. 6 DX-150 MAIN CIRCUIT BOARD DIAGRAM

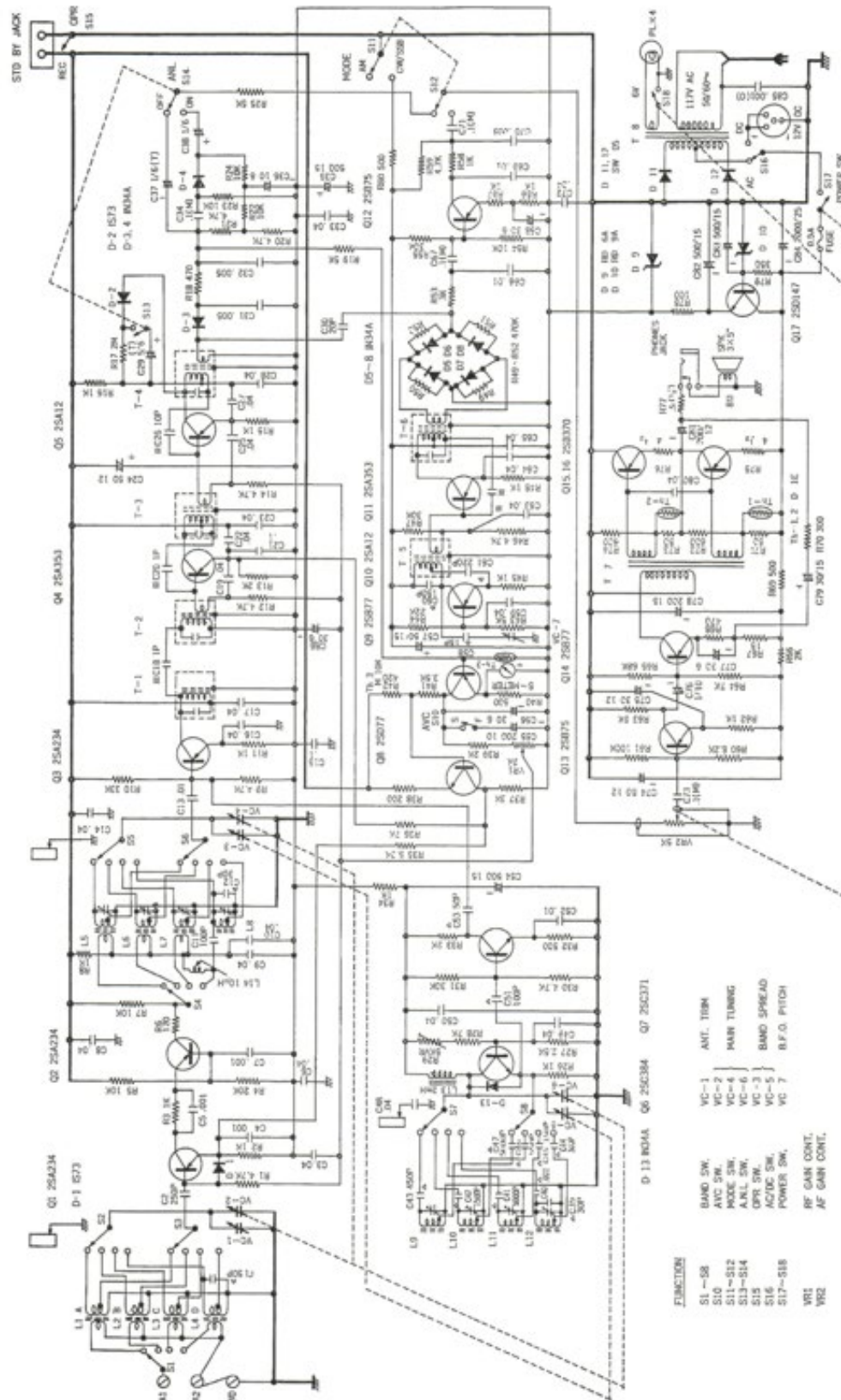


TOP



BOTTOM

FIG. 7 DX-150 RF SUB CIRCUIT BOARD & WIRING DIAGRAM
(TOP & BOTTOM VIEW)



SCHEMATIC DIAGRAM OF DX-150

FIG. 8 DX-150 SCHEMATIC DIAGRAM

7.0

PARTS LIST & DESCRIPTION

COMMUNICATIONS RECEIVER DX-150 (Cat. No. 20-150)

Symbol No. or Item No.	Description	Rating or Stock No.	Remarks
Q1, 2, 3	Transistor	2SA234	
Q4, Q11	Transistor	2SA353	
Q5, Q10	Transistor	2SA12	
Q6	Transistor	2SC384	
Q7	Transistor	2SC371	
Q8	Transistor	2SD77	
Q9, Q14	Transistor	2SB77	
Q11	Transistor	2SA353	
Q12, Q13	Transistor	2SB75	
Q15, Q16	Transistor	2SB370	
Q17	Transistor	2SD147	
D1, 2	Diode	1S73	
D3, 4, 5, 6, 7, 8, 13	Diode	1N34A	
D9	Diode	RD-6A	
D10	Diode	RD-9A	
D11, 12	Diode	SW-05	
Th1.2	Thermistor	D-1E	
Th3	Thermistor	M-10K	
T-1, 2, 3	I.F.T.	6021A (T66)	CA-6163
T-4, 6	I.F.T.	6089A (T68)	CA-6167
T-5	B.F.O. Coil	13258A	CA-6278
T-7	Input Transformer	S-9563-B	TA-0091
T-8	Power Transformer	R-3784-E	TA-0036
L1	BC. Antenna Coil	DX-120	CA-0028
L2, 6	SW 1 ANT, R.F. Coil		CA-2061
L3, 7	SW 2 ANT, R.F. Coil		CA-2062
L4, 8	SW 3 ANT, R.F. Coil		CA-2063
L5	BC. R.F. Coil		CA-2068
L9	BC. Oscillator Coil		CA-2067
L10	SW 1 Oscillator Coil		CA-2064
L11	SW 2 Oscillator Coil		CA-2065
L12	SW 3 Oscillator Coil		CA-2066
L13	R.F. Choke Coil	2 mH	CB-4023

Symbol No. or Item No.	Description	Rating or Stock No.	Remarks
L14	R.F. Choke Coil	10 uH	CB-4023
S1, 2, 3, 4, 5, 6, 7, 8	Band Switch	Y6124	
S9			Out of use
S10	Slide Switch	6P 14m / m	
S11, 12	Slide Switch	6P 14m / m	
S13, 14	Slide Switch	6P 14m / m	
S15	Slide Switch	6P 14m / m	
S16	Slide Switch	6P 9m / m	
S17, 18	Switch with V.R.		See VR2
PHONES JACK	Close Jack	AM-009	
STD. BY JACK	STD. BY CONCENT	No. 3822	
D.C. JACK	D.C. CONCENT 3P	No. 1476	
FUSE	Fuse	0.5A	
FUSE	Fuse Holder		
PL x 4	Pilot Lamp	8V, 0.15A	
PL x 4	Pilot Lamp (Lead type)	8V, 50mA	
PL x 4	Lamp Socket	No. 4108	
A1, 2, GND	3P Terminal	#3-210	
SPK	Speaker	3" x 5"	
S-METER			
C38	Electrolytic Capacitor	1uF, 6V	
C36	Electrolytic Capacitor	10uF, 6V	
C56, 68, 77	Electrolytic Capacitor	30uF, 6V	
C24, 57, 74	Electrolytic Capacitor	50uF, 12v	
C55	Electrolytic Capacitor	200uF, 10V	
C78, 81	Electrolytic Capacitor	200uF, 15V	
C35, 54	Electrolytic Capacitor	500uF, 10V	
C82, 83	Electrolytic Capacitor	500uF, 15V	
C75, 79	Electrolytic Capacitor	30uF, 15V	
C76	Electrolytic Capacitor	1uF, 10V	
C37	Electrolytic Capacitor	1uF, 6V (T)	
C29	Electrolytic Capacitor	5uF, 6V (T)	

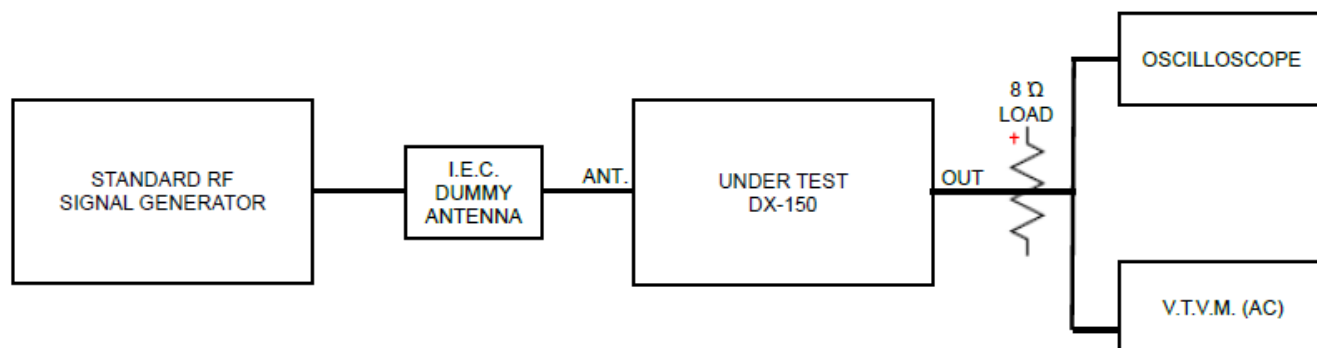
Symbol No. or Item No.	Description	Rating or Stock No.	Remarks
C86	Electrolytic Capacitor	30uF, 6V (T)	
C84	Electrolytic Capacitor	2000uF, 15V	Block
C34, 71, 73, 67	Mylar Capacitor	0.1uF, 25V	
C80	Mylar Capacitor	0.04uF, 25V	
C85	Oil Capacitor	0.001uF, 600V	
C18, 20	Ceramic Capacitor	1pF, +/-10%	
C26	Ceramic Capacitor	10pF, +/-10%	
C30	Ceramic Capacitor	20pF, +/-10%	
C2	Ceramic Capacitor	250pF, +/-10%	
C15, 21	Ceramic Capacitor	0.1uF	
C13, 52, 66, 69	Ceramic Capacitor	0.01uF	
C3, 6, 8, 9, 10, 14, 16, 17, 19, 22, 23, 25, 27, 28, 33, 49, 50, 59, 63, 64, 65, 72, 48	Ceramic Capacitor	0.04uF	
C4, 5, 7	Ceramic Capacitor	0.001uF	
C31, 32, 70	Ceramic Capacitor	0.005uF	
C58	Polyester Film Capacitor	15pF	
C39, 12	Polyester Film Capacitor	30pF	
C1, 53	Polyester Film Capacitor	50pF	
C11, 51	Polyester Film Capacitor	100pF	
C45, 60	Polyester Film Capacitor	150pF	
C61	Polyester Film Capacitor	220pF	
C44	Polyester Film Capacitor	300pF	
C43	Polyester Film Capacitor	450pF	
C46	Polyester Film Capacitor	550pF	
C42	Polyester Film Capacitor	1500pF	
C41, 47	Polyester Film Capacitor	5,000pF	
C40	Polyester Film Capacitor	10,000pF	
VC1, VC7	Variable Air Capacitor	GE-11C-561	
VC2, VC4, VC6	Variable Air Capacitor	ECU-3HA43A21	
VC3, VC5	Variable Air Capacitor	2JJ02A18	
C101, 102, 103, 104	Variable Mica Trimmer	B4-1M2	Block
C105, 106, 107, 108	Variable Mica Trimmer	B4-1M2	Block

Symbol No. or Item No.	Description	Rating or Stock No.	Remarks
R1, 9, 12, 14, 20, 21, 30, 46, 59	Resistor	4.7K ohms, $\frac{1}{4}$ W	
R2, R3, R8, R11, R15, R16, R26, R34, R45, R48, R56, R57, R58, R62	Resistor	1K ohms, $\frac{1}{4}$ W	
R4	Resistor	20K ohms, $\frac{1}{4}$ W	
R5, R7, R22, R23, R24, R54	Resistor	10K ohms, $\frac{1}{4}$ W	
R6	Resistor	120 ohms, $\frac{1}{4}$ W	
R9, R12, R14, R20, R21, R30, R46, R59	Resistor	4.7K ohms	
R10	Resistor	33K ohms, $\frac{1}{4}$ W	
R13, R33, R39, R66	Resistor	2K ohms, $\frac{1}{4}$ W	
R17	Resistor	2M ohms, $\frac{1}{4}$ W	
R18, 68	Resistor	470 ohms, $\frac{1}{4}$ W	
R19, R25, R43, R63	Resistor	5K ohms, $\frac{1}{4}$ W	
R27	Resistor	2.5K ohms, $\frac{1}{4}$ W	
R28, R36, R64	Resistor	7K ohms, $\frac{1}{4}$ W	
R31, R47, R55	Resistor	30K ohms, $\frac{1}{4}$ W	
R32, 40, 69	Resistor	500 ohms, $\frac{1}{4}$ W	
R35, R60	Resistor	8.2K ohms, $\frac{1}{4}$ W	
R37, 53	Resistor	3K ohms, $\frac{1}{4}$ W	
R38	Resistor	200 ohms, $\frac{1}{4}$ W	
R41	Resistor	3.5K ohms, $\frac{1}{4}$ W	
R42	Resistor	420 ohms, $\frac{1}{4}$ W	
R44	Resistor	22K ohms, $\frac{1}{4}$ W	
R49, R50, R51, R52	Resistor	470K ohms, $\frac{1}{4}$ W	
R61	Resistor	100K ohms, $\frac{1}{4}$ W	
R65	Resistor	68K ohms, $\frac{1}{4}$ W	
R67	Resistor	15 ohms, $\frac{1}{4}$ W	
R70	Resistor	300 ohms, $\frac{1}{4}$ W	
R71, R73	Resistor	50 ohms, $\frac{1}{4}$ W	
R72, R74	Resistor	600 ohms, $\frac{1}{4}$ W	
R78	Resistor	100 ohms, $\frac{1}{4}$ W	
R79	Resistor	350 ohms	
R75, 76	Resistor	4 ohms, $\frac{1}{2}$ W	
R77	Resistor	0.5 ohms, $\frac{1}{2}$ W	

Symbol No. or Item No.	Description	Rating or Stock No.	Remarks
VR1	Variable Resistor	V24N 2kB	
VR2	Variable Resistor	V245-SA21 5kA	with switch S17, 18
1	Bonnet	GE-11C-552	
2	Chassis	GE-11C-521-A	
3	Back Plate	GE-11C-535-A	Bottom Plate
4	Side Angle Plate	GE-11C-533-1A &2A	
5	Back Cover	GE-11C-522-A	Dial Back
6	Sub Panel	GE-11C-534	
7	Slide Rail	GE-11C-545	
8	Back Board	GE-11C-587-A	
9	SPK Board	GE-11C-595	
10	Front Panel	GE-11C-536	
11	Dial Plate	GE-11C-	
12	Spread Dial Plate	GE-11C-	
13	Dial String	180 cm	
14	Dial Pointer	GE-11C-549-1A	
15	Spread Dial Pointer	GE-11C-549-2A	
16	A.C. cord	6 feet (black)	U.L. Approved
17	Knob	30 Diameter	
18	Knob	22 Diameter	
19	Nylon Lug	No. 4850 #204	
20	Special Lug	18 h	for a-c input
21	Shaft (main)	GE-11C-541 (1)	
22	Shaft (spread)	GE-11C-541 (2)	
23	Shaft (spread plate)	GE-11C-541 (3)	
24	Dial Bearing	GE-11C-540 (1)	for dial
25	Bearing Nut	GE-11C-540 (2)	for dial
26	Dial Bearing	GE-11C-575 (1)	for band switch
27	Bearing Nut	GE-11C-575 (2)	for band switch
28	Nylon Pulley		
29	Pulley	90 Dia. (No. 302)	for tuning dial
30	Pulley	70 Dia. (No. 304)	for spread dial
31	Pulley	40 Dia. (No. 309)	for spread dial
32	Dial Stud		
33	Spread Sleeve		

Symbol No. or Item No.	Description	Rating or Stock No.	Remarks
34	Heat Sink		
35	Heat Sink Plate	GE-11C-534-A	
36	"L" Mount Bracket	GE-11C-602	for bar antenna
37	"L" Mount Bracket	GE-11C-593	for P/C board
38	"L" Mount Bracket	GE-11C-538-A	for VC
39	"L" Mount Bracket	GE-11C-537-A	for dial plate
40	Coil Mount Plate	GE-11C-577-A	
41	Net	No. 30 90 x 30	
42	Cord Stopper		
43	Printed Circuit Board	GE-11C-570	Front end circuit
44	Printed Circuit Board	GE-11C-580	Main circuit

ALIGNMENT SET-UP DIAGRAM



I.E.C. DUMMY ANTENNA DIAGRAM

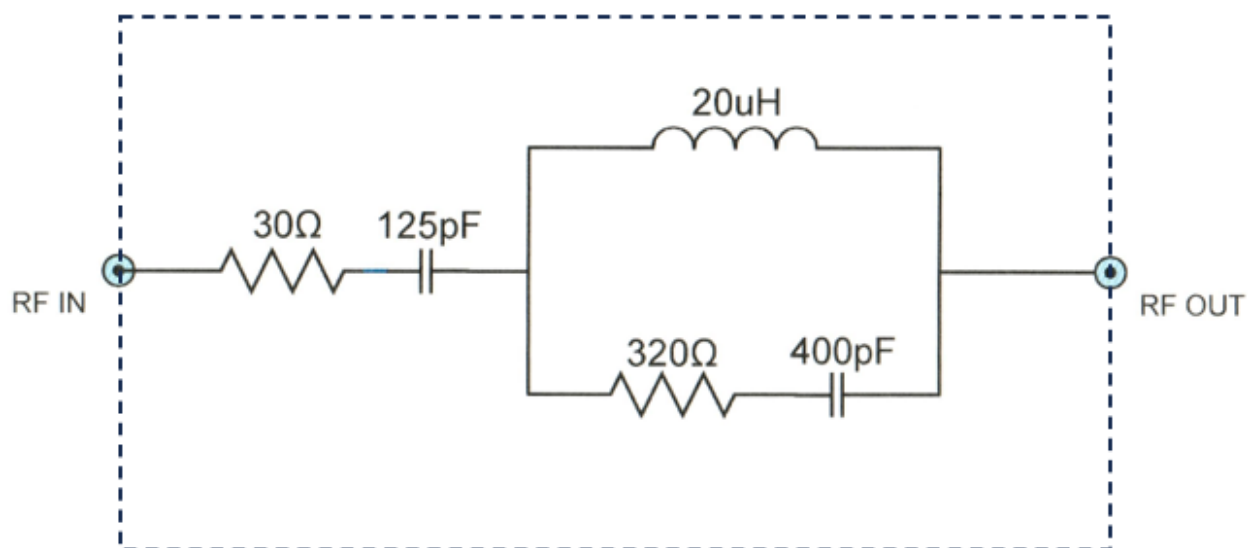
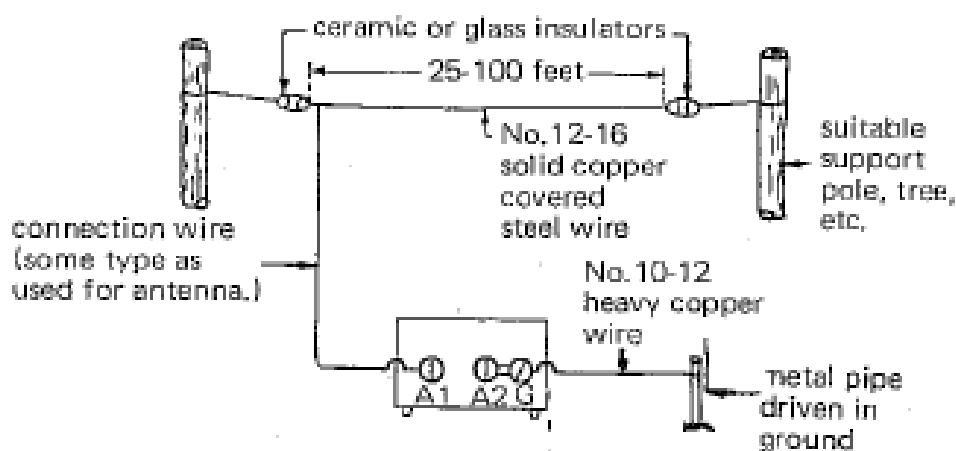


FIG. 9 TEST EQUIPMENT



ANTENNAS

An antenna is a necessary adjunct to ALL short-wave receivers. The better the antenna, the more signals you will be able to receive (even weak and remote ones).

Because most owners want good results on all short-wave frequencies covered by the DX-150, a suitable antenna for general coverage is sketched above.

For the best reception, mount it high and clear away from power lines, trees and surrounding objects.

If you are interested in putting up an antenna for a specific frequency, you can use the following formula to determine the $\frac{1}{2}$ wave length required.

$$\text{Length of } 1/2\text{-wave antenna in feet} = \frac{468}{\text{Freq. in MHz}}$$

For example, if you want to pick up International Short Wave signals specifically in the 19 Meter band (15.1 to 15.450 MHz). Pick a frequency in that range, such as 15.35 MHz. Using the formula:

$$1/2\text{-wave antenna} = \frac{468}{15.35} = 30.5 \text{ feet}$$

So, put up antenna 30-1/2 feet long; that will give you best reception for the 19 Meter International Short Wave Band.

FIG. 10 ANTENNA SUGGESTION