INSTRUCTION

MANUAL

F L 5 0 B

SOMMERKAMP ELECTRONICS GMBH

GERMANY

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FL-50B SSB TRANSMITTER
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The model FL-50B SSB Transmitter is a compact, high performance
desk top amateur transmitter with CW, AM and SSB modes. On all
modes, except AM, this transmitter works at an input of 50 watts
PEP on all bands from 80 to 10 meters. AM consists of transmitted
carrier and one sideband. The SSB signal is generated by a crystal
filter.

SPECIFICATIONS

Emission type	SSB (A3J) (A3A) PHONE (A3H) CW (A1)
Input power	50W PEP
Frequency range	3.5-4.0, 7-7.5, 14-14.5, 21-21.5, 28-30 MHz
Antenna impedance	50 - 75 ohms
Carrier suppression	-40 dB
Sideband suppression	-40 dB (1500 CPS)
Spurious radiation	-40 dB
Audio bandwidth	300 - 2700 CPS ± 3 dB
Operation	Manual, P.T.T., Break-in keying
Microphone	High impedance (50K ohms)
Power requirement	220V AC 50/60 CPS 130VA
Dimension	334 m/m Wide, 153 m/m High, 262 m/m Deep
Weight	7 kg

BLOCK DIAGRAM
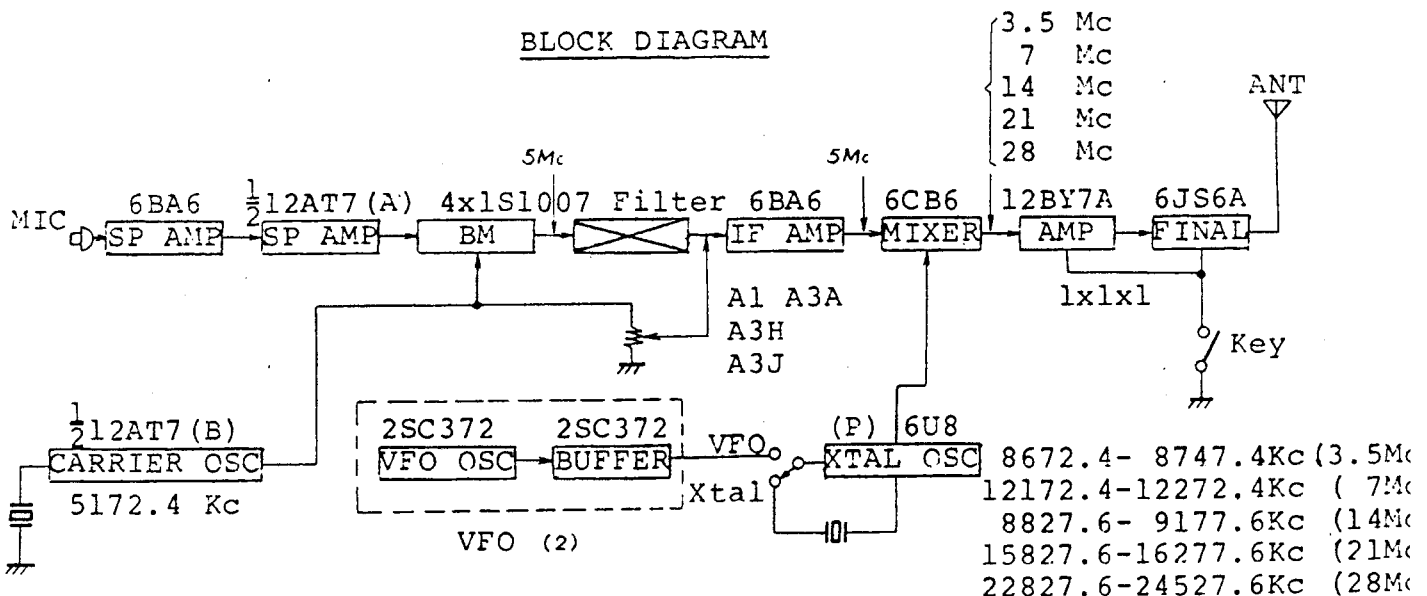
CIRCUIT DESCRIPTION

Output of carrier oscillator V2, 12AT7 is injected to the balanced modulator, and audio signal from microphone amplifier V1, 6BA6 is applied to the balanced modulator through cathode follower V2, 12AT7. This signal then passes through crystal filter which eliminates lower sideband thus resulting in a USB signal at a carrier frequency of 5172.4 kc.

The 5 Mc signal after passing through the filter is amplified by IF amplifier tube V3, 6BA6, thence to grid of mixer tube V4, 6CB6 together with local oscillator signal. The resultant mixed frequencies appear at plate tuned circuit of the mixer and is the transmitting output signal frequency.   .

Local signal from V7, $\frac{1}{2}$6U8 is subtractively mixed with the USB signal from IF amaplifier stage to result in LSB operation on 40 and 80 meters, and the frequencies are additively mixed resulting in output on the opposite sideband on 20, 15 and 10 meters.

Determination of local crystal frequencies:-

  For 40 and 80 meters

    Transmitting frequency + 5172.4 = Crystal frequency in Kc

  For 20, 15 and 10 meters

    Transmitting frequency − 5172.4 = Crystal frequency in Kc

 Use fundamental crystal for 80 and 20 meters, $\frac{1}{2}$ for 40 and $\frac{1}{3}$ for 15 and 10 meters.

For AM and CW operation, the carrier signal is injected to the grid circuit of the mixer tube through carrier control potentiometer.

This signal is amplified by V5, 12BY7 tuned driver and finally to power amplifier tube V6, 6JS6A, and antenna. Power amplifier tube operates in class AB2 for maximum power output.

The AC audio component of PA grid current, when overdriven by signal peaks, is rectified by diodes D5/D6 to provide an ALC (automatic level control) voltage into the IF amplifier stage thus reducing its gain and maintaining low distortion.

The PA PI network plate circuit provides attenuation to the higher order harmonics and enables easy, flexible adjustment of impedance matching to antenna feedline.

On CW, manual or break-in keying methods are available. On phone, Push-To-Talk control is available. VOX control can be installed as illustrated in this manual.
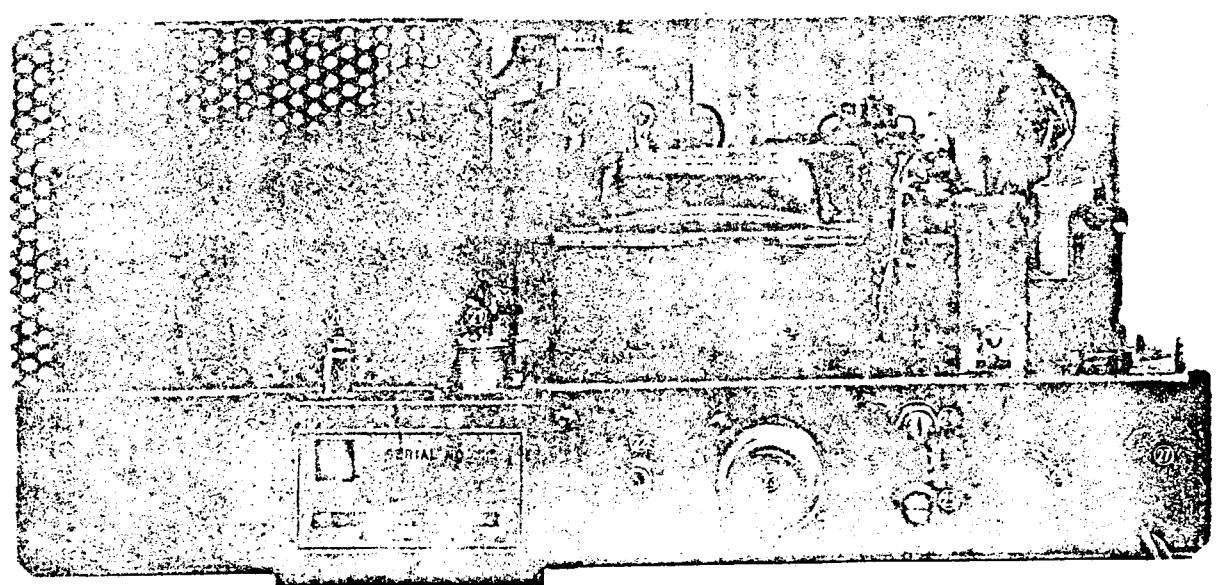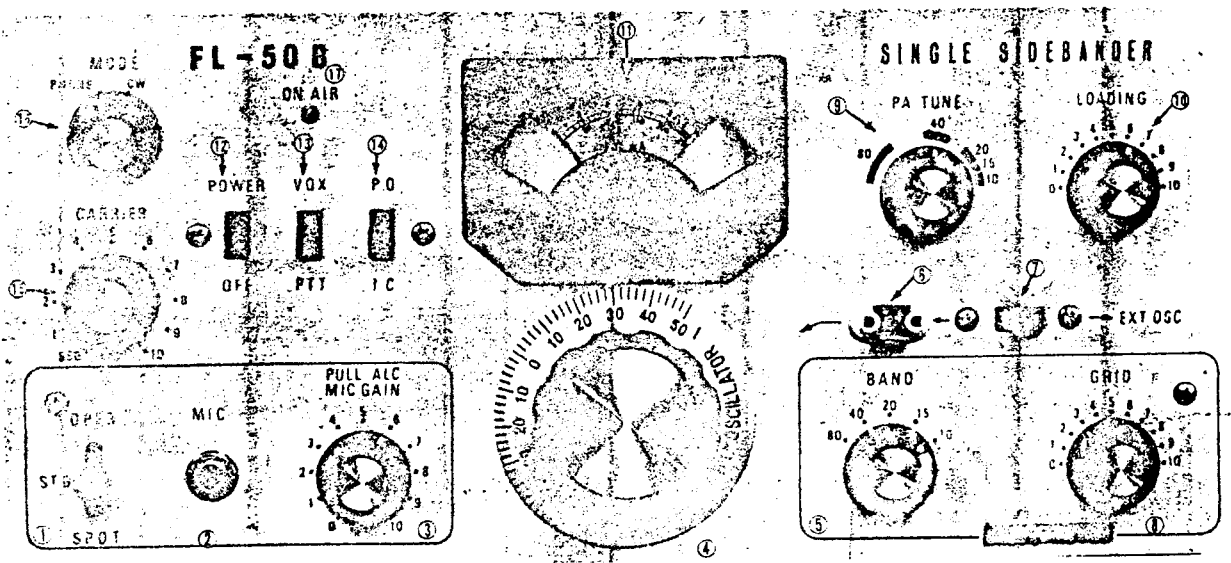
OPERATION

Function of Operating Controls

1. OPER .... Selects functions of calibration,
   receiving and transmitting operation.

2. MIC .... Microphone jack. 3 contact T.R.S. type.

3. PULL ALC MIC GAIN Potentiometer controls microphone gain
   and switch selects meter to ALC indication.

4. VXO .... Knob shifts crystal frequency few kilocycle.

5. BAND .... Band switch.

6. CRYSTAL SOCKET ... For crystal control, use HC-6U type crystal
   and frequency calculation is given on page 2.

7. EXT. OSC .... Selects crystal or external VFO control.

8. GRID .... Tunes driver, mixer and local oscillator
   plate circuit.

9. PA TUNE .... P.A. plate tuning.

10. LOADING .... P.A. plate loading.

11. METER

12. POWER .... AC power switch

13. VOX-PTT .... Selects push-to-talk or break-in CW keying.
    VOX is optional.

14. PO-IC .... Switches meter function.

15. CARRIER .... Carrier level control for CW and AM.

16. MODE .... Selects operation modes.

17. ON AIR .... Indicates transmission.

18. GND .... Earth terminal.

19. RF OUT .... 3V RF output.

20. REC .... Connector for receiver.

21. ANT .... Antenna terminal.

22. EXT. OSC .... Terminal for external VFO.

23. REMOTE .... Accessory socket.

24. BIAS .... Adjusts Bias on PA tube.

25. ALC .... Adjusts ALC meter zero setting.

26. KEY .... Key jack for CW operation.

27. FUSE .... 2A.

Initial Adjustment

Set controls as shown below:-

POWER	:	OFF
OPER	:	STBY
MIC GAIN	:	Fully counter-clockwise and push down
BAND	:	Desired band
GRID	:	12 o'clock position
PA TUNE	:	Desired band
LOADING	:	Minimum loading
METER SWITCH	:	IC
PTT-VOX	:	PTT
CARRIER	:	SSB
MODE	:	PHONE

Insert crystal given from the formula into the crystal socket
and place crystal switch toward the crystal socket. When external
VFO or receiver VFO is used instead of crystal, the crystal switch
should be placed toward EXT.OSC.

Accessory plug must be in its socket to supply heater voltage to
final tube.

Connect dummy load to antenna terminal on the rear apron of the
chassis.

1) Turn on power switch and wait for warm-up.

2) Set OPER switch OPER position. Meter shows approximately
   60mA. If not, adjust BIAS control at rear.

3) Advance CARRIER control to obtain small increase in meter
   reading.

4) Tune GRID for maximum IC reading.

5) Adjust PLATE for minimum dip in IC. Switch meter to P.O. and adjust PLATE and LOAD controls in turn for maximum RF output. IC should dip to about 70 - 80% of the off-tune current for best loading condition. At maximum input the IC is about 160 mA, but refrain from using this high current for longer than few seconds, therefore make all adjustments quickly. During tune-up, switch OPER-STBY switch off periodically to reduce the time transmitter is on with high IC. Meter can be left in IC position for constant monitoring of PA current. Any abnormal rise in IC can then be noted and quickly corrected.

SSB (A3J)

After initial adjustment, insert microphone plug of PTT microphone. If microphone does not have a PTT switch, then short out PTT terminals on plug as illustrated and control transmitter with OPER panel switch. Set CARRIER control to SSB position. Advance MIC GAIN for correct IC meter "kick-up" for normal speaking. Indicated IC will be about half the tuning IC, i.e. about 80 mA. Pull ALC switch on MIC GAIN control. Meter will indicate full scale for no modulation. If not, adjust ALC control on rear. Check that needle does not kick down below limit of green section of scale on speach peaks.

AM (A3H)

At first adjust the transmitter in SSB mode. Then increase CARRIER control until IC shows 80 mA. Adjust MIC GAIN control until meter kicks up about 5 mA, i.e. 85 mA on speach peaks.

CW (A1)

After initial adjustment, set MODE switch to CW position. Insert key plug. Set OPER switch to OPER position and key down. Advance CARRIER control until IC saturates. Do not increase CARRIER control from this point.

For break-in keying, wire the key plug as illustrated and place PTT-VOX switch VOX position.
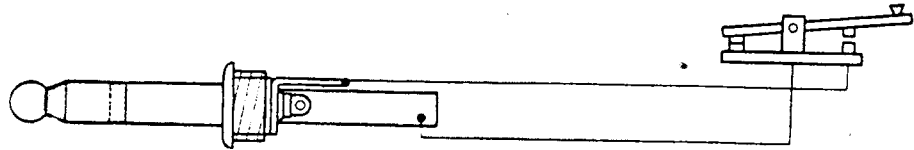
To calibrate transmitter to the receiving signal, switch OPER switch down SPOT position, and increase until zero beat is heard. At SPOT position, weak signal is transmitted for calibration.
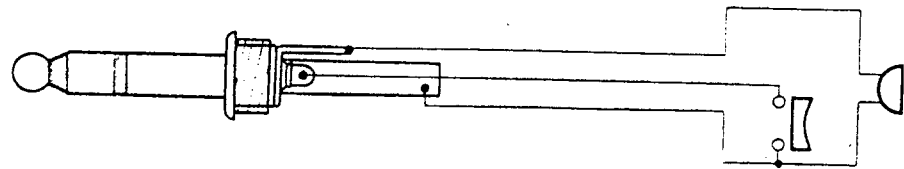
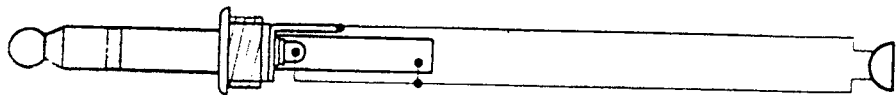## Plug Connection

    1.   **Break-in keying**
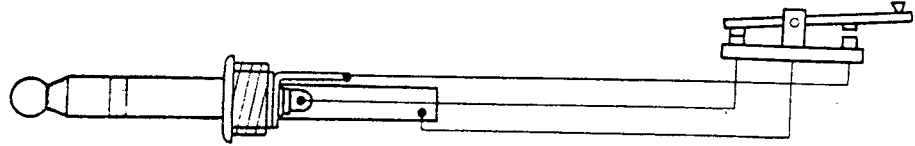
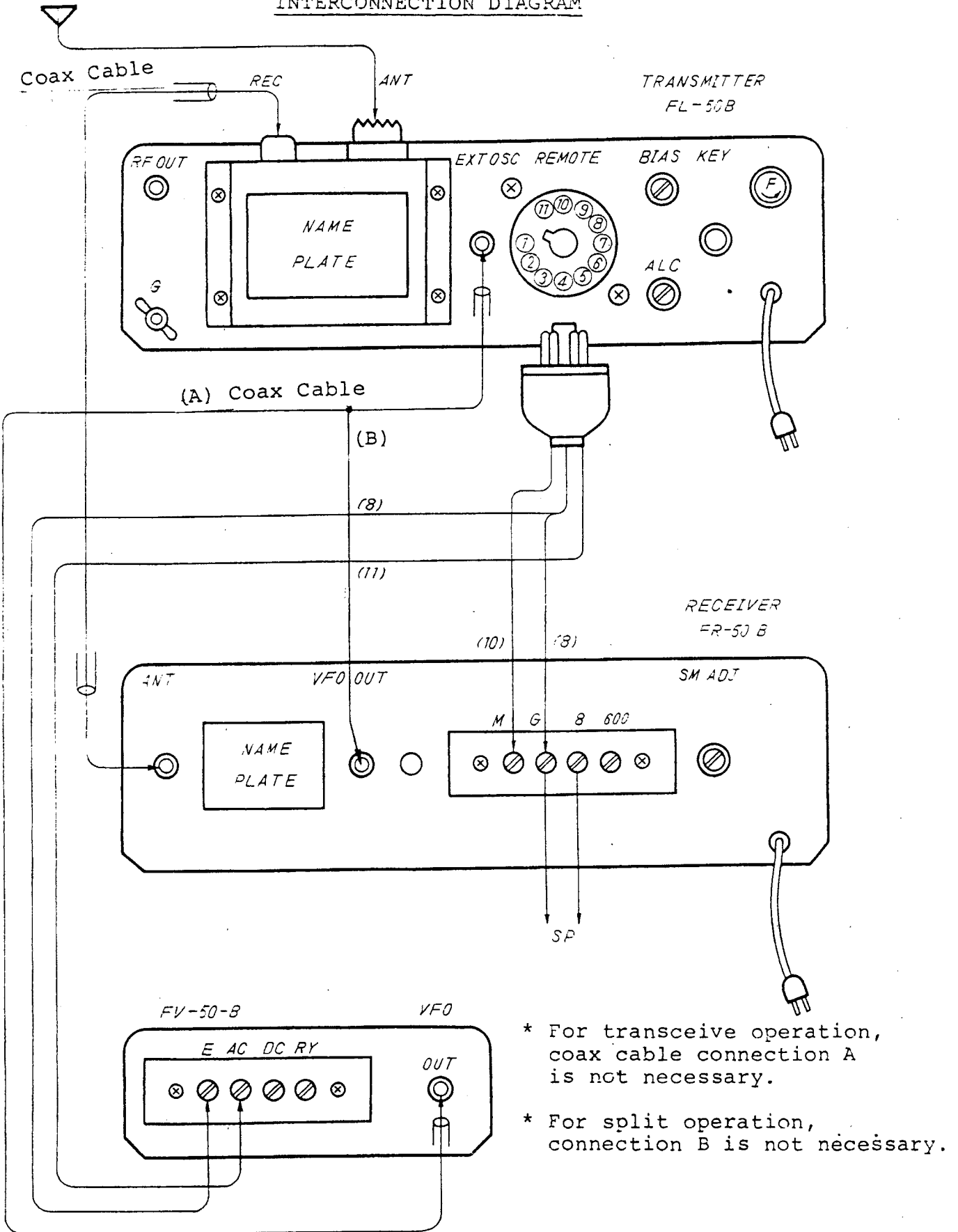   2.   **Operation switch control**
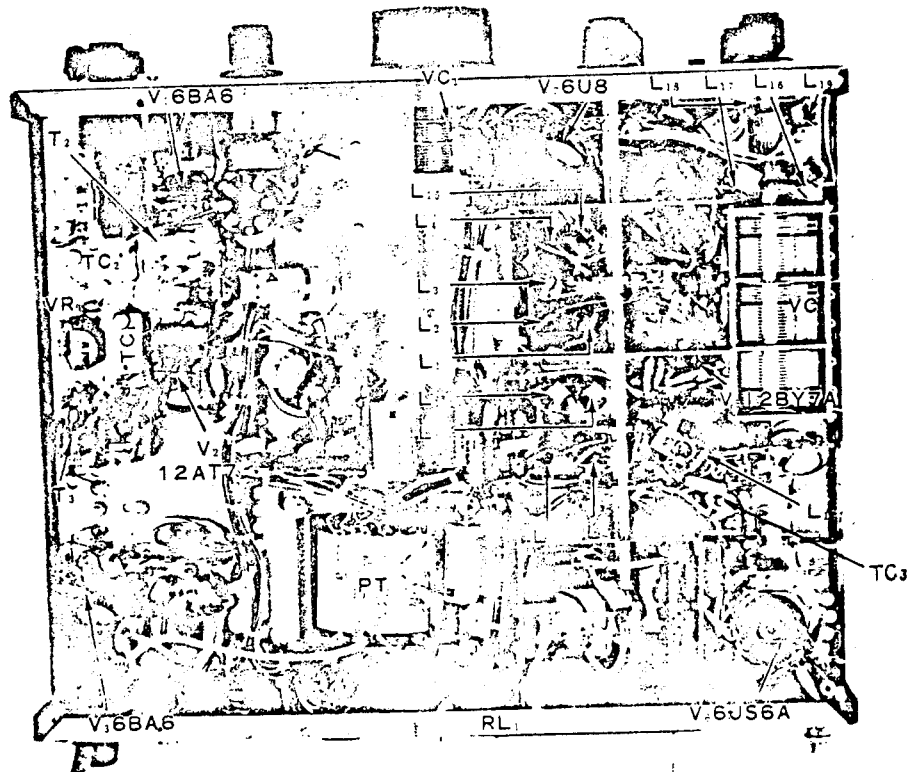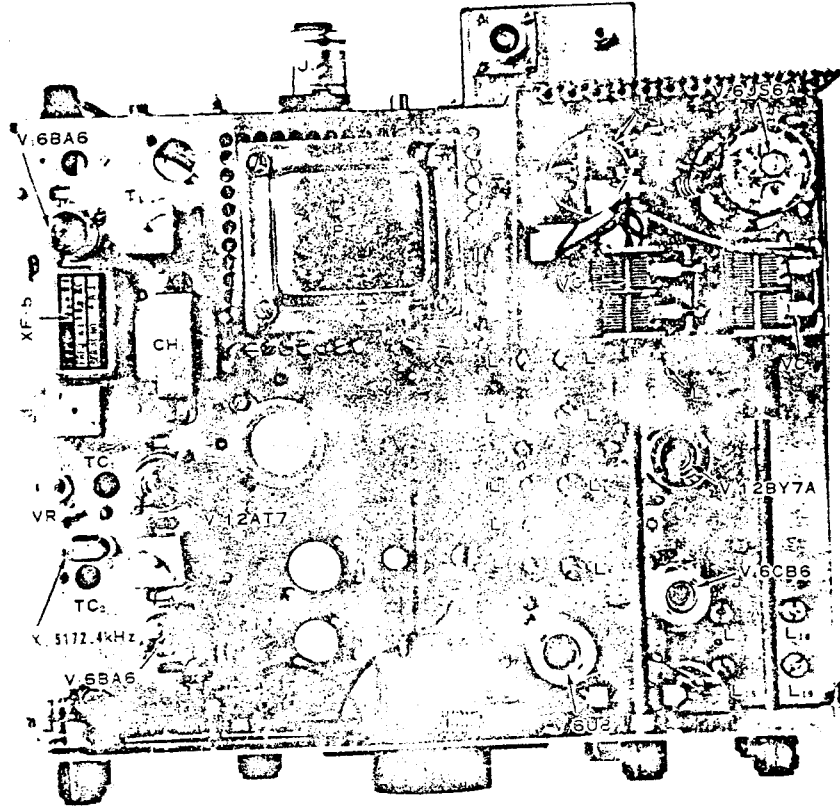

    3.   **Push-to-talk**

    4.   **Operation switch control**
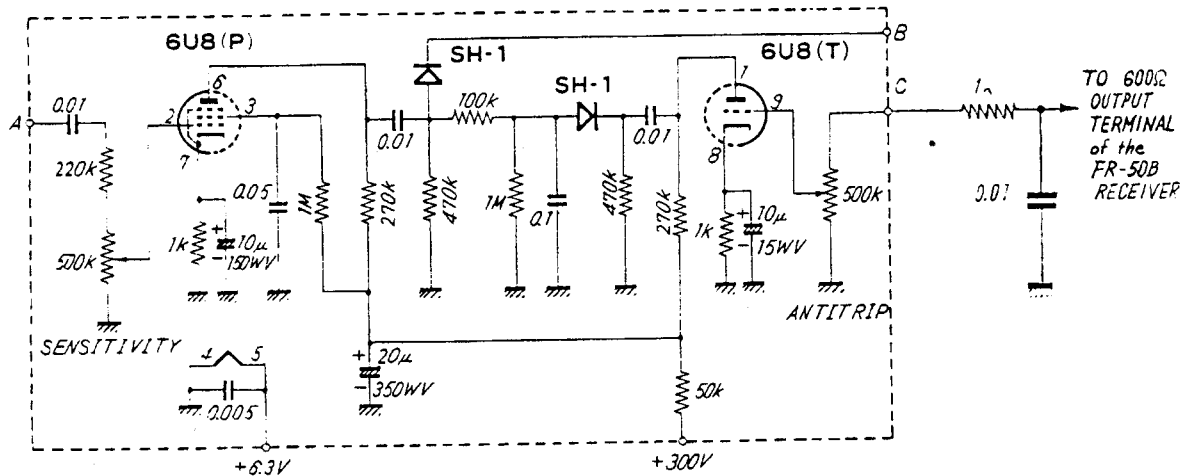
INTERCONNECTION DIAGRAM

* For transceive operation,
coax cable connection A
is not necessary.

* For split operation,
connection B is not necessary.

VOX CIRCUIT

In this transmitter, VOX circuit is not built-in, but can be easily built on the chassis. Recommended circuit diagram is shown below. A, B and C shall be wired to the point marked A, B, C on main circuit diagram.

TROUBLE SHOOTING

Most cases of trouble can be traced to defective tubes. Substitution of new tubes will sometimes clear the obscure case. Intermittent fault in tubes can be discovered by lightly tapping the tube. Occasionally, tube socket terminals will become dirty or corroded causing an intermittent condition.

Table shows typical voltage readings at each tube socket terminal. The value listed are nominal and vary slightly due to the line voltage fluctuation and to normal tolerances in components.

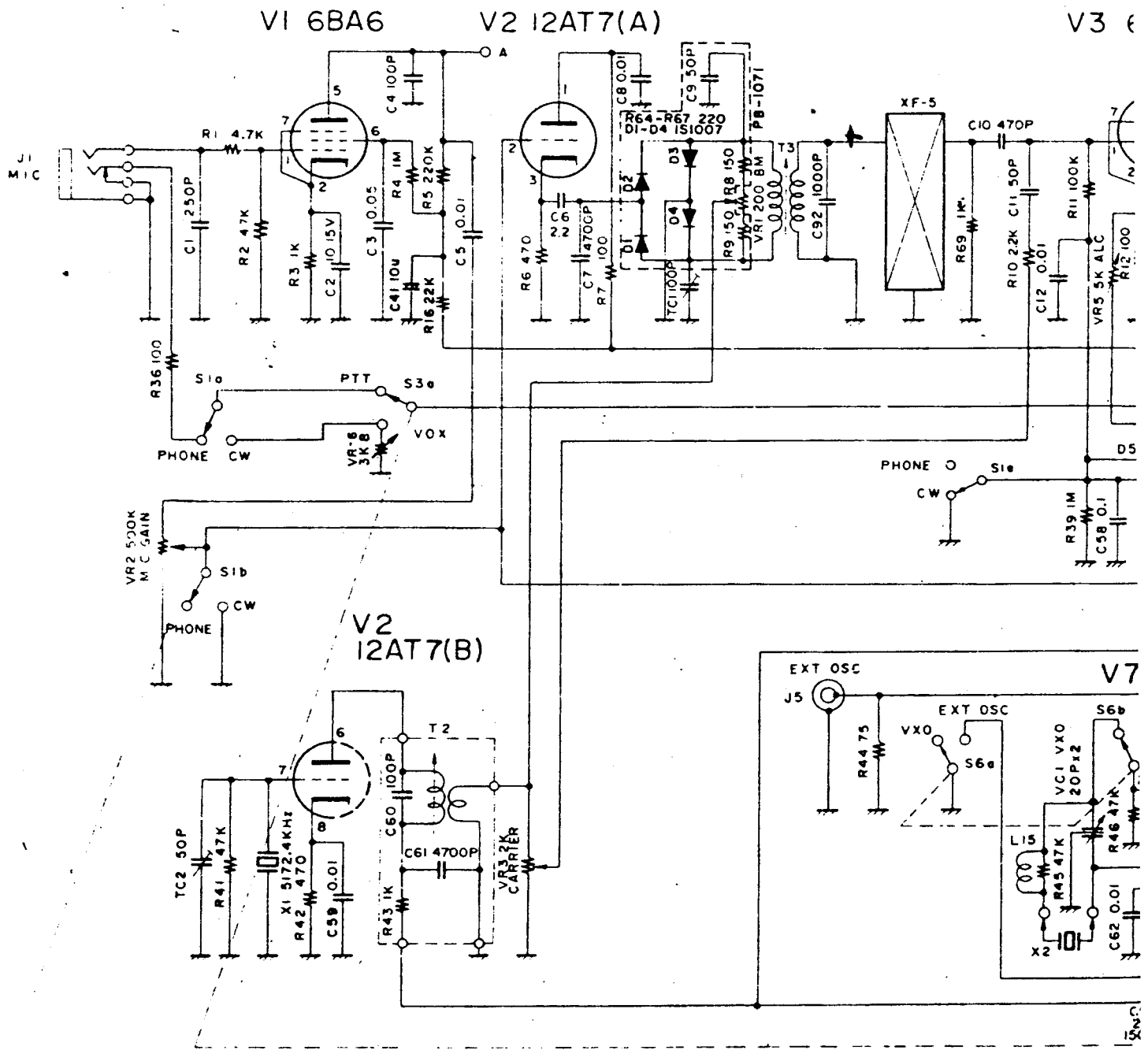Followings are typical cases of the trouble and trouble shooting guides.

DEFECT	POSSIBLE CAUSE
Fuse blow	Defective transformer, silicon diode or electrolitic capacitor
Relay does not work	Defective relay or V7, 6U8
Insufficient output	Defective tube V5, V7, V3, V4, V2, V6. PA grid improperly tuned. Antenna not resonant at frequency. Defective transmission line. Carrier crystal or local crystal defective.
Insufficient carrier suppression	Carrier balance control improperly adjusted. Carrier frequency improperly set. Defective balanced modulator diodes.
Insufficient sideband suppression	Excessive mic gain, Carrier frequency incorrect. Crystal filter mistuned.

VOLTAGE CHART

* AC voltage

TUBE	SSB MODE	PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V 1 6 B A 6	OPER	0	0.5	※ 6.3	0	60	2	0.5		
	STBY	0	0.5	※ 6.3	0	60	2	0.5		
V 2 1 2 A T 7	OPER	150	0	2.3	0	0	105	0	1	※ 6.3
	STBY	160	0	2.5	0	0	115	0	1.2	※ 6.3
V 3 6 B A 6	OPER	0	1.3	※ 6.3	0	140	80	1.3		
	STBY	0	1.4	※ 6.3	0	150	95	1.4		
V 4 6 C B 6	OPER	0	1.8	※ 6.3	0	140	110	0		
	STBY	-27	0	※ 6.3	0	160	140	0		
V 5 1 2 B Y 7 A	OPER	3.4	0	0	※ 6.3	※ 6.3	0	150	150	0
	STBY	0	-27	0	※ 6.3	※ 6.3	0	160	160	0
V 6 6 J S 6 A	OPER	0	0.05	150	※ 0	- 35	0	(10) 0.1	(12) ※ 6.3	(P) 300
	STBY	0	0	160	0	- 65	0	(10) 0	(12) ※ 6.3	(P) 330
V 7 6 U 8	OPER	105	0	70	※ 6.3	0	145	0.5	1.5	0
	STBY	330	0	75	※ 6.3	0	160	0.5	17	0

(10) Pin 10, (12) Pin 12, (P) Top cap

V1 6BA6   V2 12AT7(A)   V3 6

V2
12AT7(B)

EXT OSC   V7

V6 6JS6A

J2 RF OUT

C56 10P

TC3 10P

C50 1000P 1KV

L14

S2P

J3 ANT

100P

R31 56 1W

L13

P

L20

L21

RL1

C85 80P C86 80P

C87 80P C88 80P

J4 REC

L12

RFC3

C52 4700P

VC3 PLATE

R33 22K

LOAD VC4

R29 56

C49 0.01

C97 300P

C55

R34 1K

D12 1S1007

C95 10P

RFC2 250UH

R27 1K

R30

C48 4700P

C91 4700P

R32 100

P.C

S5

C57 0.01

C96 0.01

DC 0.0V

R28 10K

C47 4700P

C46 0.047

R56 470K

R35 15K 2W

C45 0.01

R72 15K 3W

C98 150V 10u

R71 5.1K 2W

IC P.O

C53 0.01

S9 ALC

A

NE1 NE68

R70 470K

6JS6A

1   12

C83 0.01

6CB6

C77~80 0.0047 D7~10 1S1943

R58 3.3K

J8

C74 0.01

20V

D7

C79

C51 0.01

C44 0.01

CH1 1H 50mA

12V

C77

D8

47u350V

47u350V

47u350V

6.3V

R59 10K

VR4 20K BIAS

117V
110V
100V

D9

C78

C80

D10

C81

117V
110V
100V

120V
100V

D11 1S1943
20mA

R57 4.7K

:75
00P

:76
00P

2A

C84 20u50V

C82 20u150V

POWER PT
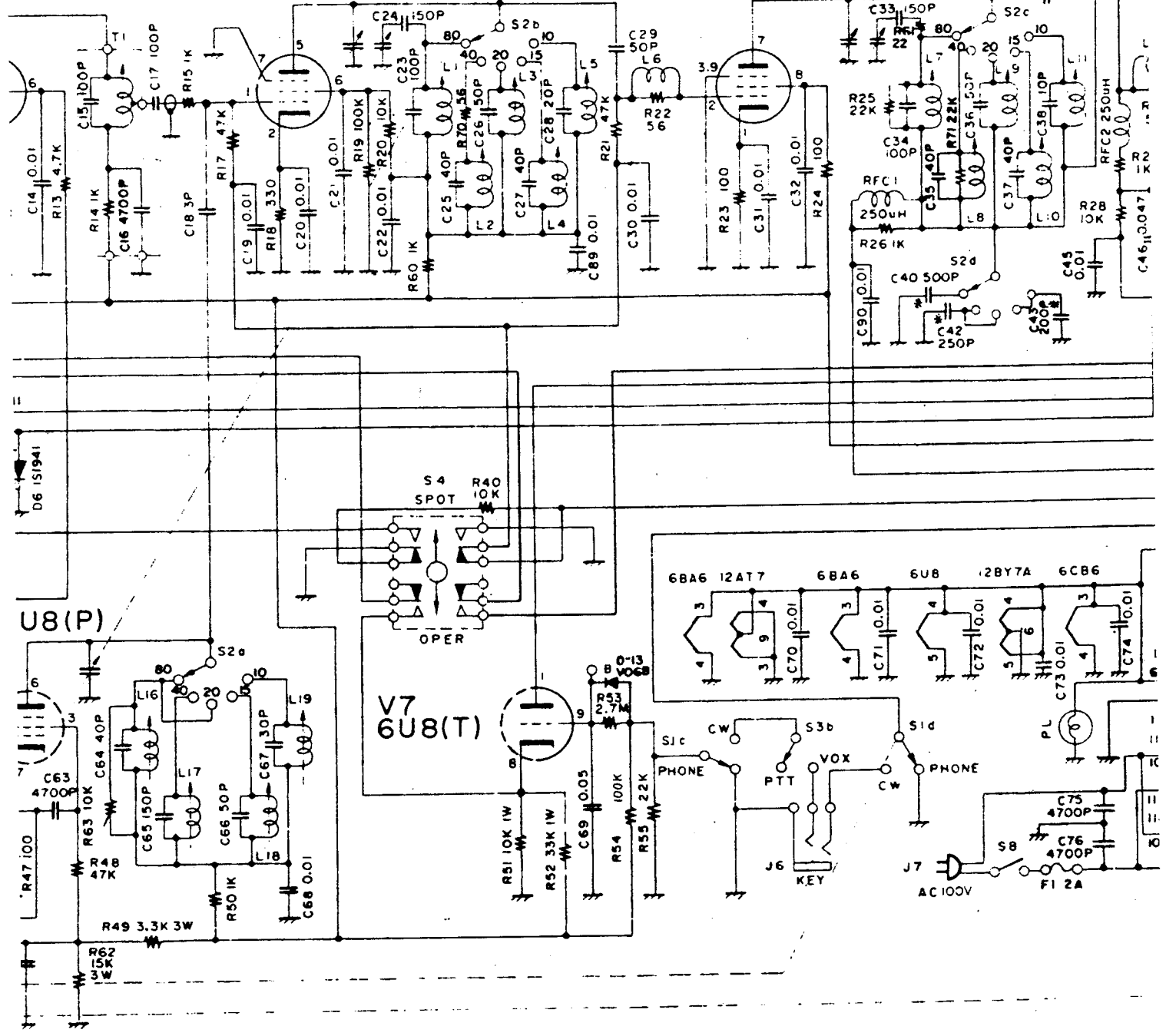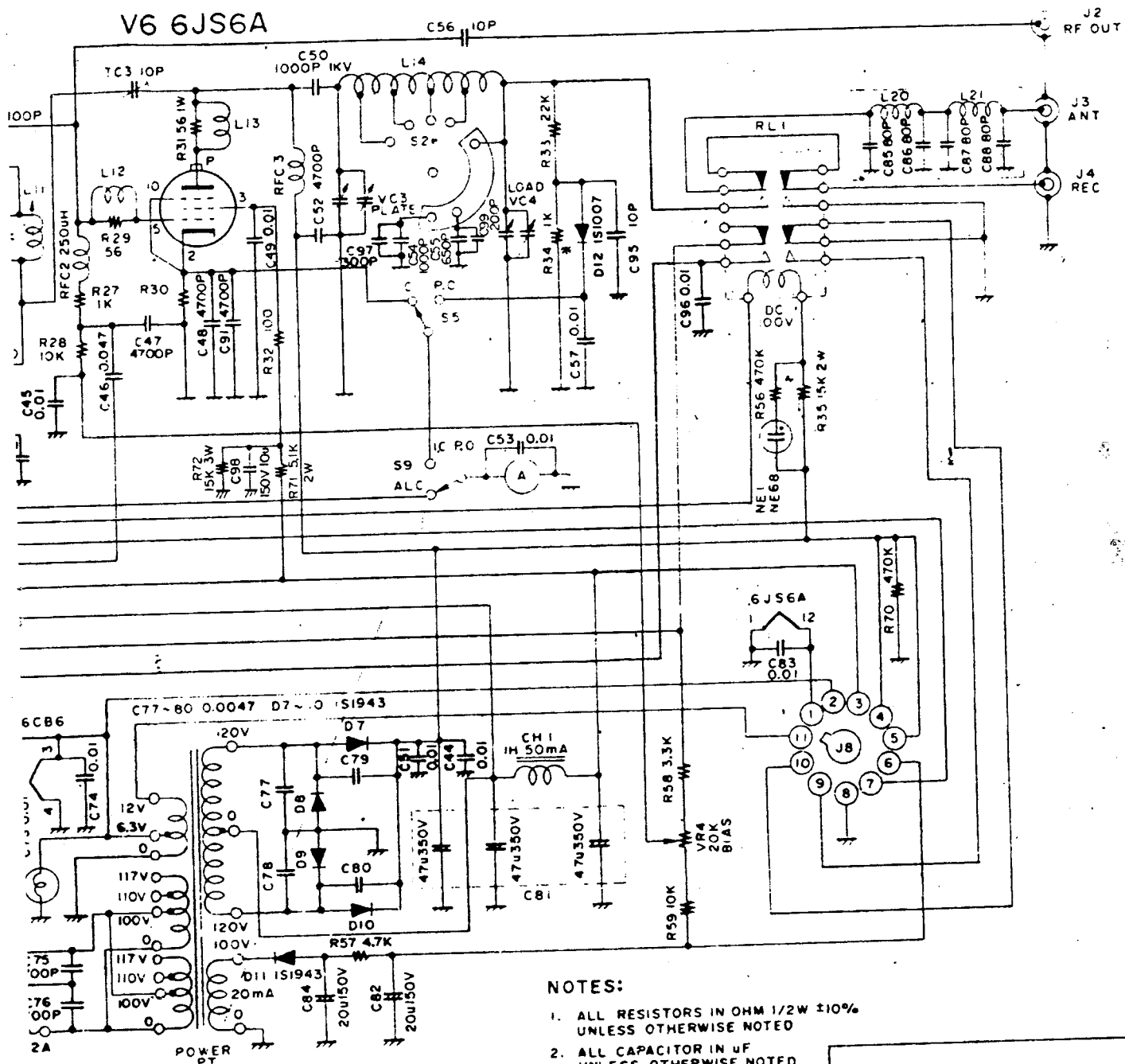
NOTES:
1. ALL RESISTORS IN OHM 1/2W ±10%
   UNLESS OTHERWISE NOTED
2. ALL CAPACITOR IN uF
   UNLESS OTHERWISE NOTED
3. ※ VALUE IS NOMINAL

FL-50B
CIRCUIT DIAGRAM