SECTION V

MAINTENANCE

5.1. TROUBLE SHOOTING

In general, trouble encountered in radio apparatus may be isolated by means of various tests and measurements, and the section of the equipment determined in which the trouble is located. If this is done, the components in the associated circuit may be checked and the trouble located. Refer to the table of resistance and voltage measurements.

NOTE

NO ONE BUT AN AUTHORIZED AND COMPETENT SERVICE MAN EQUIPPED WITH PROPER TEST FACILITIES SHOULD BE PERMITTED TO SERVICE THIS EQUIPMENT.

5.2. FUSES

This equipment is supplied with a fuse of the correct rating. Fuse failures should be replaced with spares only after the circuit in question has been carefully examined to make certain that no permanent fault exists. Use only two ampere fuses.

5.3. ALIGNMENT (FOR NARROW BAND RECEIVER; FOR STANDARD RECEIVER FOLLOW PARAGRAPH 5-12)

5.3.1. EQUIPMENT AND TOOLS USED FOR ALIGNMENT

a. 455 kc to 30 mc signal generator.

b. Fiber or bakelite adjusting tool, approximately 1/8" diameter with screwdriver type bit.

c. Vacuum tube voltmeter such as the Voltohmyst Jr.

d. 100 kc frequency standard having harmonic output from 1.5 to 30.0 mc and accuracy better than .001%.

5.3.2. 455 kc I.F. ALIGNMENT

a. EQUIPMENT SET-UP

1. Connect the lead of the signal generator to pin No. 1 of V7. Tune signal generator to 455 kc.

2. Connect the vacuum tube voltmeter (VTVM) d-c lead to the diode lead, (Junction of R39 and R42).

3. Set the CRYSTAL SELECTIVITY control to the No. 0 position AUDIO GAIN control at minimum. RF GAIN control maximum. Place the CW-AM-FM

switch in the AM position.

b. ALIGNMENT PROCEDURE (slight misalignment). See figure 5-1.

1. Increase signal generator level until an increase above the static level is noted on the VTVM.

2. Adjust both primary and secondary tuning cores of T4, T5, T6 and T7 for a maximum indication on the VTVM.

3. With the signal generator lead on pin No. 7 of V4 and with CRYSTAL SELECTIVITY switch on position 4, carefully tune generator until maximum diode load voltage is obtained. Maintain the input below the AVC threshold point. (Approximately 8V).

4. With signal generator adjusted as in step 3 above, place the CRYSTAL SELECTIVITY switch to zero. Adjust all four i-f transformers for maximum diode load voltage.

5. Place CRYSTAL SELECTIVITY control on No. 1 position. Move the signal generator dial to 3 KC lower frequency. Adjust signal generator output to give 5 volts of diode load voltage.

6. Adjust crystal grid coil L-24 for a maximum output indication.

7. The knob on the phasing control should be set so that minimum hiss is present when positioned at the center of the scale.

c. ALIGNMENT PROCEDURE. (Large Misalignment)

1. If the misalignment is great, it may be impossible to force a signal through the i-f strip in step 1, paragraph b above. If this is the case, attach the signal generator output to the grid of V-7 and align T-7, then move the signal generator output to the grid of V-6 and align T-6. Repeat at the grid of V-5 and align T-4 and T-5. Then perform all the steps in paragraph b above for final alignment.

5.3.3. ALIGNMENT OF BFO

This should be performed after all other frequency controlling elements are aligned.

Connect the signal generator to the antenna terminals and tune both the receiver and generator to the 80M band. Place the crystal filter knob in #4 position. Leave the receiver in AVC position and tune in the signal from the generator to exact crystal filter frequency as indicated by a sharp rise in "S" meter reading. The BFO PITCH control should be set at center. Turn the MAN-AVC-CW Control to CW and adjust the BFO trimmer adjustment (In the top of the BFO coil) to zero beat. If the knobs have been removed, it is likely that the BFO PITCH knob will have been replaced incorrectly. The BFO PITCH knob should be centered when the associated

tuning capacitor is at the half capacity setting. To check the position of the capacitor, proceed as follows: Connect the signal generator to pin 7 V4 and turn the MAN-AVC-CW control to CW. Having aligned the BFO as outlined above, rotate the BFO PITCH Control to each side of zero 180 degrees. The tone should change an equal amount on each side of zero. If such is not the case, the knob pointer is not at the center point of the capacitor. To correct this, rotate the control until the highest pitch obtainable is found. (This indicates that the capacitor plates are all in or all out.) Loosen the BFO PITCH Control set screw and turn the knob 90° (right or left) from the center (BFO) marking on the panel. (This sets the knob at half capacity on the capacitor.) Now return the knob marker to zero again and adjust the BFO Coil trimmer to zero beat note. It is possible now that the BFO PITCH knob is rotated 180 degrees on the shaft. To check this loosely couple the signal generator to the antenna connections on the receiver, set the signal generator at some 100 kc point (such as 3700 kc) and tune in the signal to zero beat with the BFO PITCH control set at zero and the receiver set up for CW reception. Rotate the BFO knob to +1. Retune the signal to zero beat using the tuning dial of the receiver. If the dial indicates 1 kc less than the previous reading, the BFO knob is on the shaft correctly. If the tuning dial indicates 1 kc more, the BFO knob should be loosened and rotated exactly 180 degrees on the condenser shaft.

5.3.4. ADJUSTMENT OF CRYSTAL OSCILLATOR

a. Connect lead of VTVM through 1 meg. isolating resistor to pin No. 7 of V2.

b. Place band switch on 80 meters. Adjust L-12 for a maximum output indication.

c. Successively change band switch to 40, 20, 15, 11 and 10 meters and successively adjust L-13, L-14, L-15, L-16 and L-17 for a maximum indication.

d. The frequency of the crystal oscillator can be adjusted over a limited range by the controls named in steps b and c above. After the rest of the receiver is aligned this feature may be used to reduce the calibration error between bands. Couple the receiver to the output of an accurate frequency standard providing harmonically related output every 100 kc.

Start with the receiver tuned to zero beat with 2.000 mc. Do not turn tuning dial or BFO PITCH control during remainder of this adjustment. Turn BAND CHANGE control successively to the remaining bands and adjust receiver to zero beat by adjusting controls noted in steps b and c above.

Note that detuning of the crystal oscillator will reduce the crystal injection voltage at the first mixer. In most cases this effect is small and can be tolerated. In some cases the crystal oscillator may stop oscillating when its frequency is changed considerably. If this happens the ZERO SET control may be used instead to get exact calibration of the band in question.

5.3.5. VARIABLE I.F. ALIGNMENT

a. EQUIPMENT SET-UP

1. Connect signal generator to the first mixer V2, pin No. 1.

2. Connect voltohmyst at diode load resistor, (Junction of R39 and R42).

3. Adjust the front panel controls as follows: OFF-STANDBY-ON switch in ON position, CW-AM-FM switch on AM, CRYSTAL FILTER - SELECTIVITY switch on 0, CRYSTAL FILTER-PHASING on line, AUDIO GAIN maximum, BAND CHANGE switch on 80 meters.

5.3.6. 2.5 - 1.5 MC I.F. ALIGNMENT

a. Move signal generator lead to pin No. 1 of the first mixer V2.

b. Set dial at 4.1 mc. Adjust signal generator to 1.6 mc. Adjust tuning cores, L-18 and L-22 for a maximum output indication.

c. Set dial at 3.3 mc. Adjust signal generator to 2.4 mc. Adjust trimmers C-46 and C-53 for maximum output.

d. Repeat steps b and c until no further increase can be obtained.

5.3.7. 5.455 - 3.455 MC I.F. ALIGNMENT

a. Place BAND CHANGE switch on 10 meters.

b. Signal generator output lead should remain connected at pin No. 1 of V2.

c. Set dial at 30.0 mc. Adjust signal generator tuning to 3.455 mc. Adjust tuning cores L-19 and L-23 for a maximum output indication.

d. Set dial at 28.0 mc. Adjust signal generator tuning to 5.455 mc. Adjust trimmer C-43 and C-51 for a maximum output indication.

e. Repeat steps c and d until no further increase can be obtained.

5.3.8. TWEET TRAP ADJUSTMENT

a. A Third order tweet appears at 3533 kc in the 80 meter CW band and is caused by the signal of the 5.7 mc crystal beating with the second harmonic of the VFO at the mixer V4. A coil, L-21, is series resonant with C-52 and C-53 at 5.7 mc and effectively reduces this tweet.

b. To adjust L-21, turn on the BFO, tune in the tweet and adjust the core until the tweet is at a minimum.

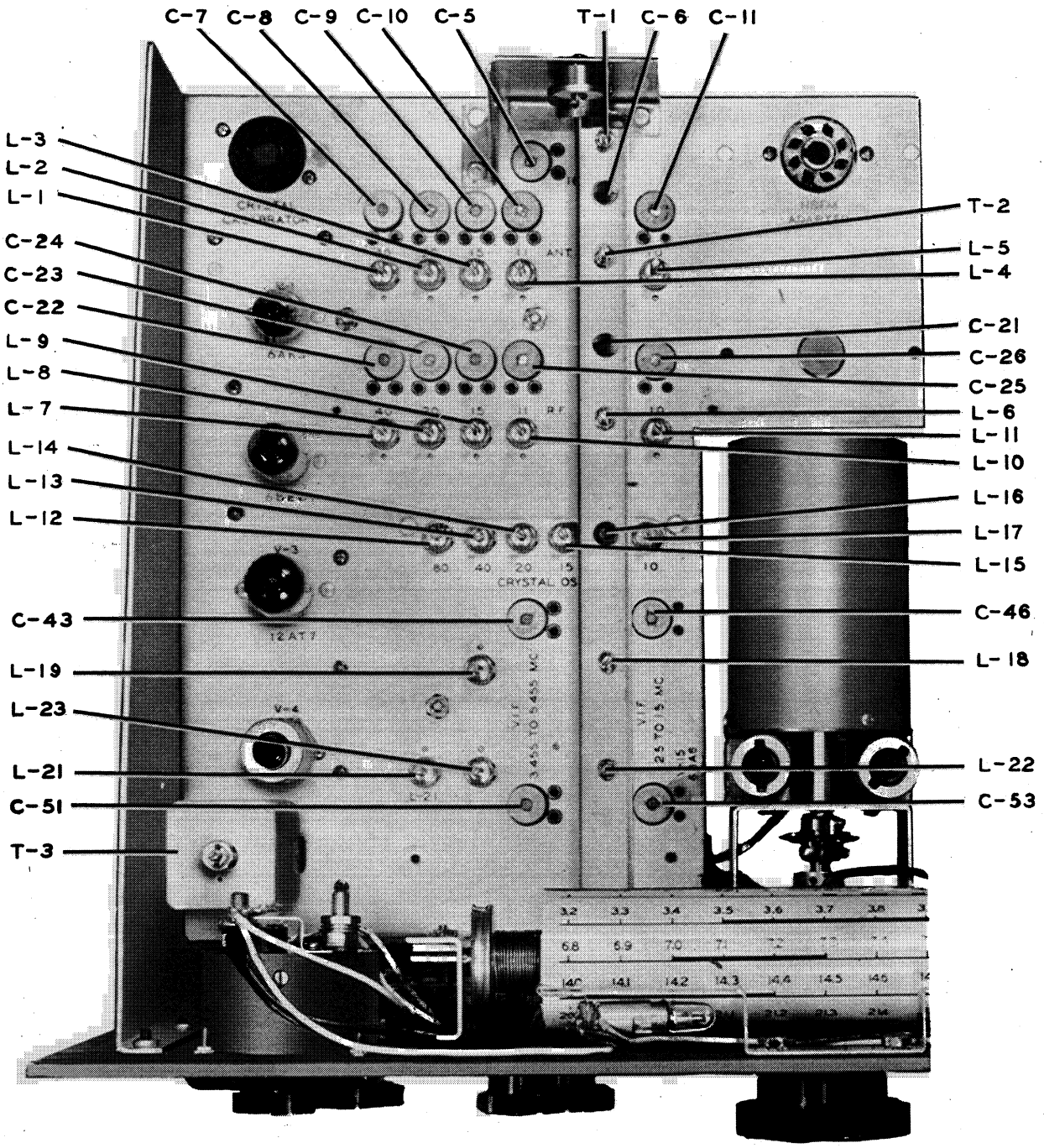


Figure 5-1 75A-2 Alignment Adjustments

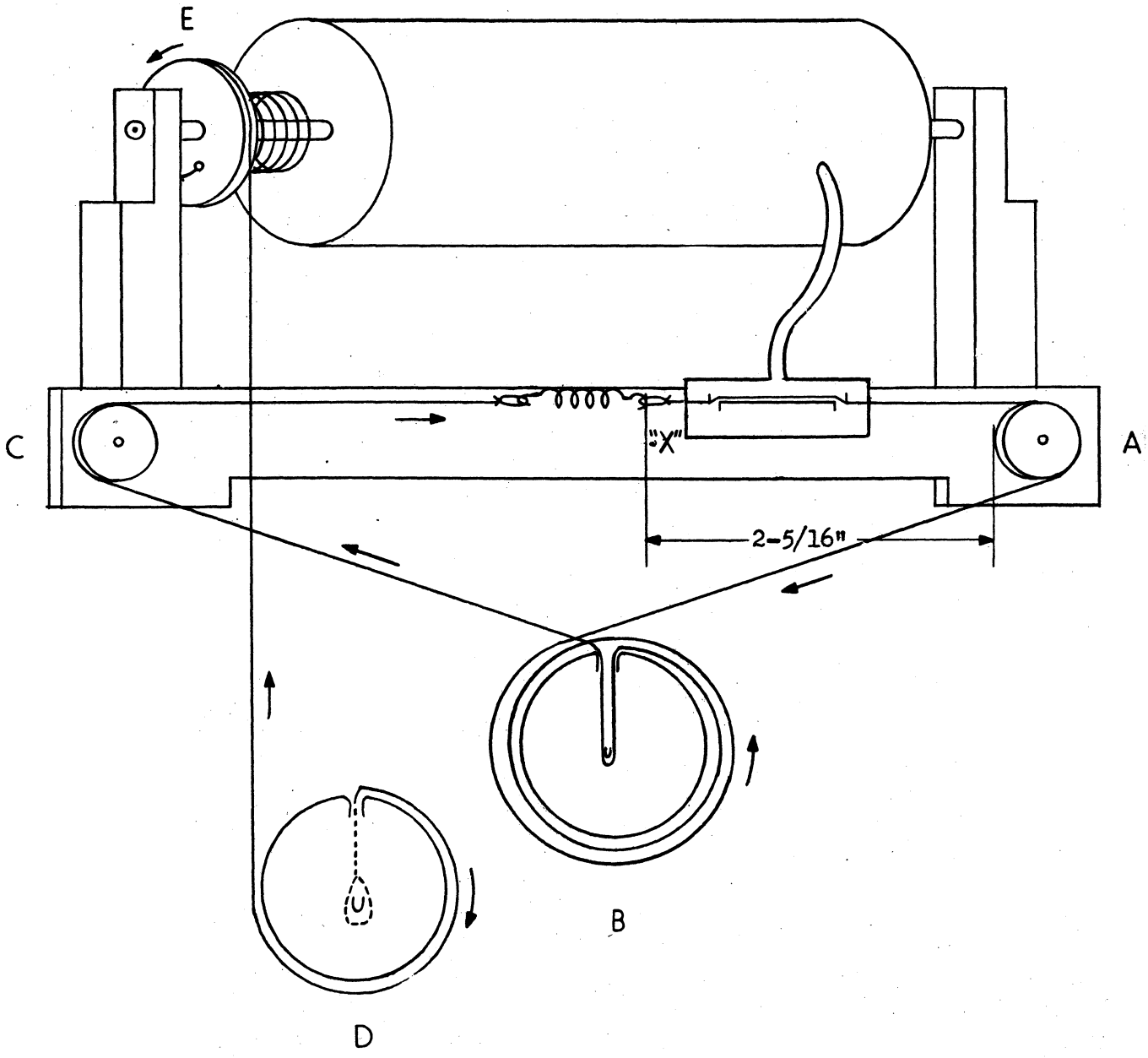


Figure 5-2 Dial Cord Drawing

5.3.9. R.F. ALIGNMENT

a. EQUIPMENT SET-UP

1. Connect signal generator lead to antenna connection of receiver.

2. Connect Voltohmyst at diode resistor, (Junction of R39 and R42).

b. PROCEDURE

1. Rotate band switch to 160 meters. Tune the receiver and signal generator to 1.6 mc. Adjust T1 tuning core for a maximum output indication.

2. Tune the receiver and signal generator to 2.4 mc and peak capacitor C5 for maximum output.

3. Continue back and forth until no improvement is noted.

4. Repeat for other bands using the following table as a guide.

	RECEIVER AND SIGNAL GEN. LOW END	RF INDUCTOR	ANT INDUCTOR	RECEIVER AND SIGNAL GEN. HIGH END	RF CAPACITOR	ANT CAPACITOR
160	1.6		T1	2.4		C1
80	3.3	L6	T2	4.1	C21	C6
40	6.9	L7	L1	7.7	C18	C2
20	14.1	L8	L2	14.9	C19	C3
15	20.9	L9	L3	21.7	C20	C4
11	26.2	L10	L4	27.8	C25	C10
10	28.2	L11	L5	29.8	C26	C11

5.3.10. VFO ADJUSTMENT - The VFO is carefully adjusted and sealed at the factory and should never require further adjustment in normal circumstances. Should the oscillator drift beyond the point at which the vernier dial connector (Zero Set Control) can compensate, tune the receiver to an accurate 2000 kc frequency standard, set the vernier dial corrector to mid-scale, loosen two set screws on one half of the coupler on the oscillator shaft, then carefully turn the oscillator shaft until zero beat is obtained.

Make final adjustment with the CW-AM-FM Switch in the AM position and SELECTIVITY control at position 4. Adjust the oscillator shaft for maximum indication on the "S" meter and maintain this while tightening screws in coupler on oscillator shaft.

The tuning rate of the VFO may be checked by setting the tuning dial to exact zero beat with a frequency standard at each end of one tuning range, (14.000 and 15.000 mc, for instance). The tuning dial travel between these two points should be 10 turns plus or minus 3 dial divisions. If the error is greater than 3 dial divisions the oscillator should be removed and returned to the factory for adjustment. Never attempt to adjust the oscillator at home

since breaking the seal would probably result in a much worse drift than was first experienced. After installing the repaired oscillator, it will be necessary to align the oscillator with the dial. To do this, carefully turn the oscillator shaft to the clockwise stop. WARNING; do not force the shaft, stop turning at the first sign of a drag. Set the vernier dial at 2.000 mc on the 160 meter band with BFO on. Turn the receiver on and couple a 2000 kc frequency standard to pin 7 of V4. Rotate the oscillator shaft approximately 5 turns CCW until a tweet is heard in the speaker. Adjust to zero beat.

Make final adjustment with the CW-AM-FM control on AM and the SELECTIVITY control at position 4. Adjust oscillator shaft for maximum indication on "S" meter. Tighten set screws in coupler.

5.4. DIAL CORDS

5.4.1. GENERAL - The front panel must be removed to replace either the dial pointer cord or the drum rotator cord. Figure 5-2 shows both cords in place and the direction in which the restringing should proceed.

5.4.2. FRONT PANEL REMOVAL

a. Remove the receiver from its cabinet.

b. Remove the six panel screws.

c. Remove the following knobs: CRYSTAL FILTER PHASING
SELECTIVITY
BFO PITCH (See CAUTION below).
ANT TRIM
BAND CHANGE
TUNING

CAUTION

Set the BFO PITCH control knob on the index mark (straight up) and do not move the control after the knob has been removed. If the control has been accidentally moved, see paragraph 5.3.3. for instructions for adjusting the knob position.

5.4.3. POINTER CORD - Obtain at least 33 inches of 432 1009 00 dial cord and tie loops in each end so that the loops are exactly 30 inches apart center to center. The spring part number is 503 1240 001, if a new one is necessary.

a. Turn the tuning knob to the clockwise stop.

b. Start at point X in the drawing with the cord hooked to one end of the spring.

c. Go around pulley A to pulley B.

d. Go around pulley B counterclockwise for 1-1/2 turns, through the slot in pulley B, around the tab and back through the slot to pulley C.

e. Go around pulley C with the cord and loop the end on the other end of the spring.

f. Fasten the pointer to the cord, tune in a station of known frequency and adjust the pointer to correct setting.

g. Replace the panel.

5.4.4. DRUM CORD - Obtain a 15 inch length of 432 1009 00 cord and tie loops in each end so that they are 12 inches apart.

a. Turn the BAND SWITCH to the 1.5 - 2.5 mc band (pulley D to the counterclockwise stop).

b. Turn pulley E approximately one turn and hold the tension of the tension spring.

c. Loop cord in pulley D. Make approximately 3/4 turn around pulley D.

d. Extend the cord around pulley E and hook to the tab. Release the tensions spring.

e. Replace the panel.

f. Loosen the set screw in the drum hub opposite the coil tension spring and align the dial calibration to the 1.5 - 2.5 mc band then tighten the set screw.

5.5. ALIGNMENT OF 148C-1 NBFM UNIT

The NBFM unit is aligned to the exact receiver intermediate frequency. With the receiver to be in satisfactory alignment, tune in a good, steady, unmodulated carrier using the "S" meter for indication of "on the nose" tuning. Place the CW-AM-FM control in the FM position. Connect a high impedance DC voltmeter between pin 2 of E2 and ground. Align as follows:

a. Detune the secondary of T-201 (top screw).

b. Tune the primary of T-201 (bottom screw reached through a hole in the 75A chassis) for maximum DC voltage indication.

c. Tune the secondary of T-201 (top screw) for zero d-c voltage indication. NOTE: There is a possibility of three minimum indications, the correct zero indication is the one at which, within a few turns of the screw, the voltmeter swings rapidly from a positive to a negative indication.

5.6. NARROW BAND CONVERSION

5.7. GENERAL - This receiver is designed with bandwidth of 4 kc at 6 db down and 13 kc at 60 db down. It is possible to convert the 75A-2 Receiver to a maximum bandwidth of approximately 2.4 kc at 6 db down if extreme selectivity is desired. (See the curve preceding Section 6 of this book).

5.8. PROCEDURE - To convert the set, remove the bottom plate and proceed as follows:

a. Remove the 100,000 ohm resistor R-68 from terminals A and C on T-3.

b. Remove the 5 uuf capacitor C-108 from terminals A and D on T-4.

c. Remove the 5 uuf capacitor C-109 from terminals A and D on T-5.

d. Remove the 10 uuf capacitor C-110 from terminals A and D on T-6.

e. Realign the set as outlined in paragraph 5-3 of this book. The bandwidth will be 2.4 kc at 6 db down and 9.5 at 60 db down.

5.9. BROAD BAND CONVERSION

5.10. GENERAL - To align the receiver after converting from narrow band to broad band, a slightly different procedure from that indicated in paragraph 5-3 is used. The bandwidth will be approximately 4 kc at 6 db down and 13 kc at 60 db down.

To convert to broad band, perform steps a. through d. in paragraph 5.8 above in reverse. That is, add these items rather then remove them. Then realign the i-f stages as follows:

5.11. TEST EQUIPMENT REQUIRED

a. Signal Generator

b. Vacuum Tube Voltmeter (Voltohmyst)

c. Swamping Tool - Comprised of a .01 mf capacitor in series with a 1000 ohm resistor and having an alligator clip on each end.

5.12. REALIGNMENT

a. SET CONTROLS -

1. CW-FM-AM control to AM.

2. SELECTIVITY control on position 2.

3. RF GAIN to full on (Position 10).

b. PROCEDURE -

1. Connect the VTVM to the diode load.

2. Couple the signal generator to terminal 1 on V-4.

3. Adjust unmodulated signal input to give 5 volts dc on the diode load, measured at terminal C on T-7 or junction of R-39 and R-42. As the alignment progresses, reduce the signal input to give approximately this figure in order to stay below the AVC threshold. Keep the signal generator tuned to the exact frequency of the crystal filter as indicated by maximum diode load voltage.

4. Tune T-3 trimmer core for maximum diode voltage.

5. Place swamping tool between terminal D (Primary) of T-4 and ground and adjust bottom (secondary)trimmer screw for maximum diode voltage.

6. Place swamping tool on terminal A (secondary) of T-4 and adjust top (primary) trimmer screw for maximum diode voltage.

7. Repeat steps 5 and 6 with T-5 and T-6.

D.C. SOCKET VOLTAGES 75A-2

Conditions:
1. AM
2. RF Gain Full On
3. AF Gain Off
4. Band -80 Meters No Signal
5. All voltages measured to ground with voltohmyst. (VTVM)

Tube No.	Tube Type	1	2	3	4	5	6	7	8	9
V_1	6AK5	-1.42	0	0	0	140	100	0		
V_2	6BE6	0	4.0	0	0	145	82	-1.72		
V_3	12AT7	133	0	1.3	0	0	133	-1.1	1.8	0
V_4	6BE6	-2.9	2.23	0	0	175	69	0		
V_5	6BA6	-1.55	0	0	0	168	72	0.6		
V_6	6BA6	-1.55	0	0	0	175	90	0		
V_7	6BA6	-1.55	1.25	0	0	168	93	1.25		
V_8	6AL5	-56	-0.6	0	0	0	-56	-46		
V_9	12AX7	-1.5	-53	-46	0	0	132	0	1.3	0
*V_{10}	6AL5	-0.3	0	0	0	0	0	0	0.4	
V_{11}	6AQ5	-12	0	0	0	190	175	-12		
**V_{12}	6BA6	-7.7	0	0	0	23	70	0		
V_{13}	5Y3GT	0	208	0	-55	0	-55	0	208	
V_{14}	6BA6	-2.2	0	0	0	50	50	0		
V_{15}	6BA6	-2.0	0	0	0	100	70	0		
V_{16}	6AL5	23	0.1	0	0	0	23	0		
V_{17}	0A2	0	0	0	0	150	0	0		

* Limiter On
** C.W. ON

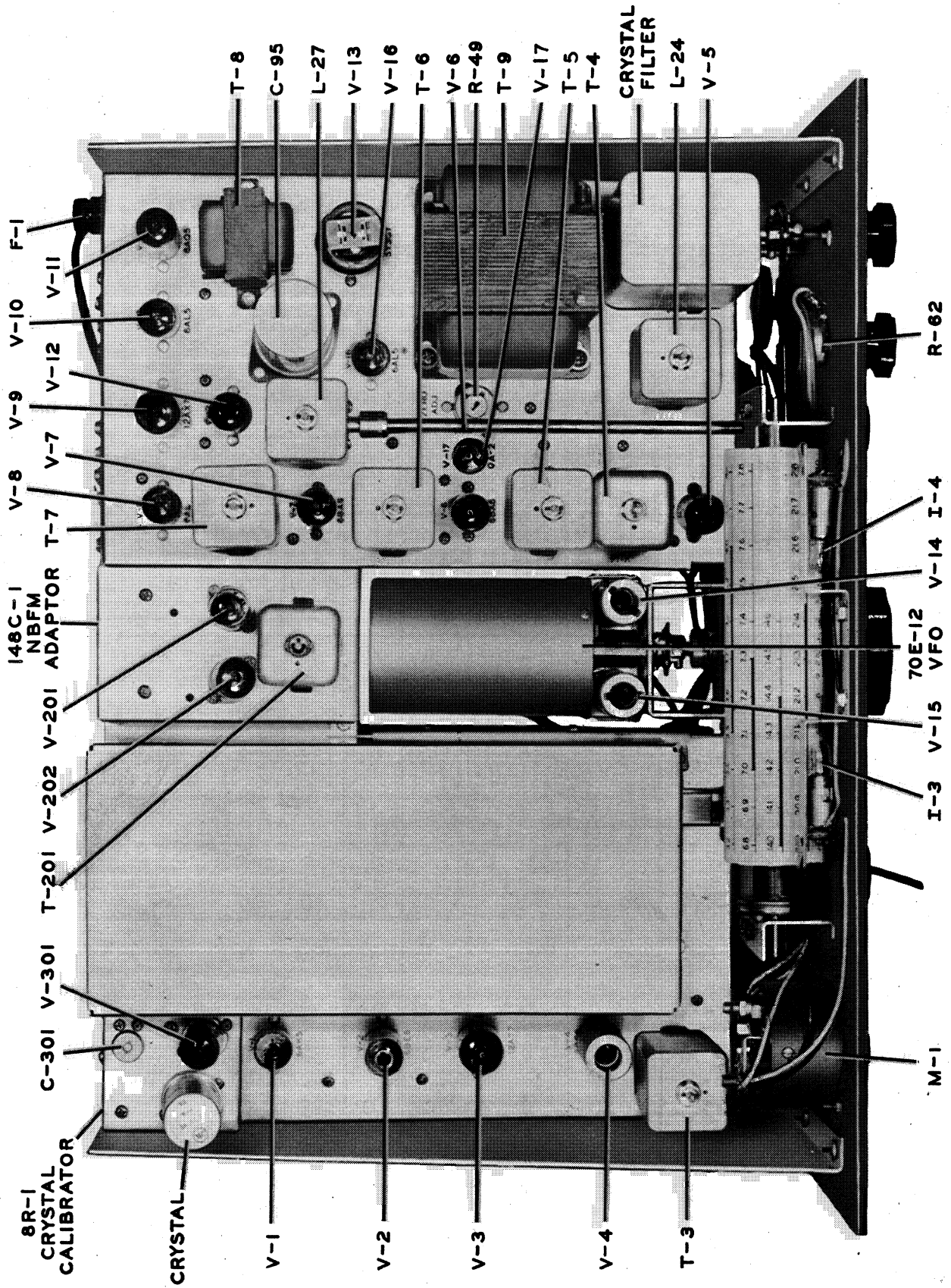


Figure 5-3 75A-2 Top View

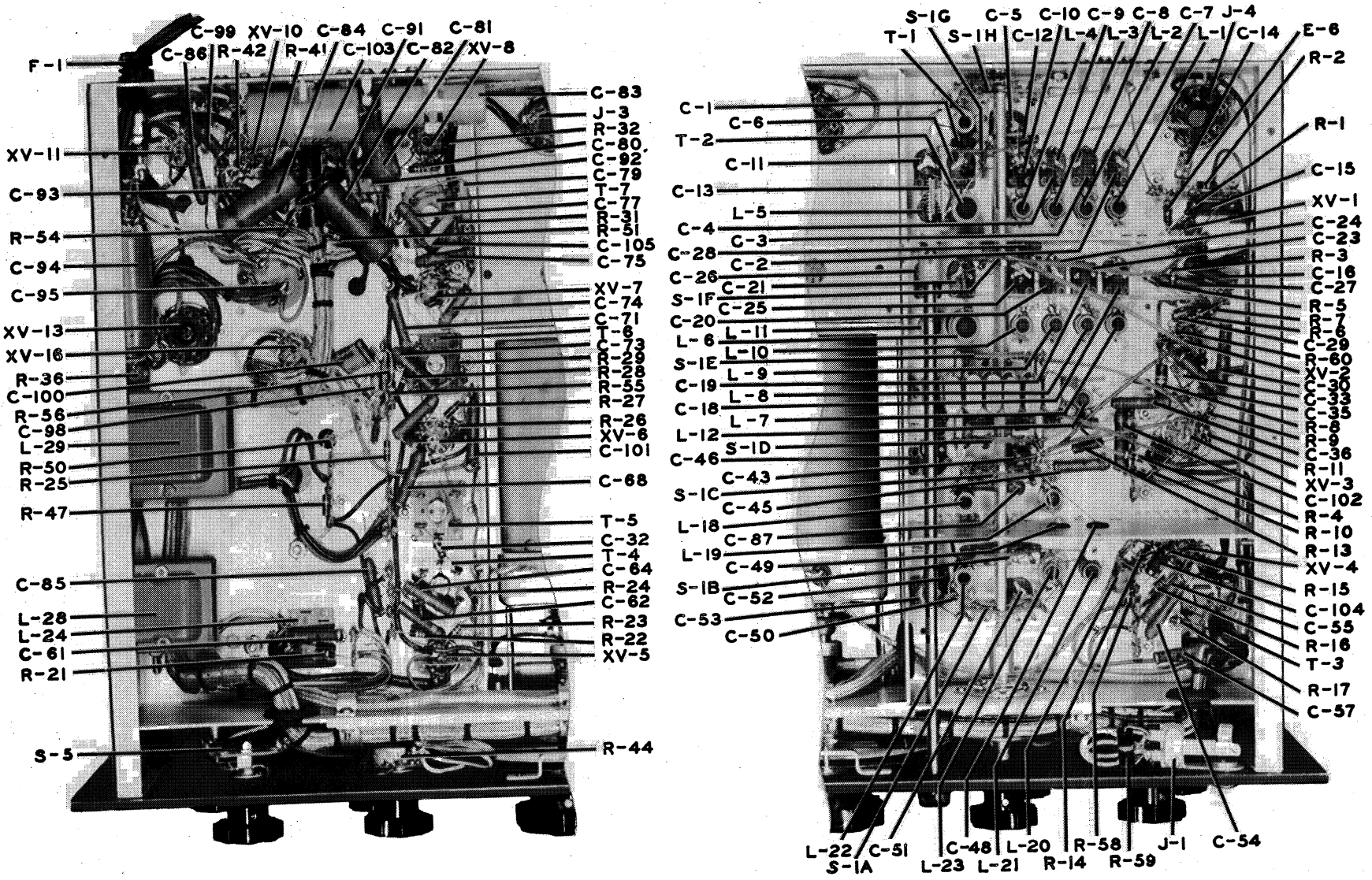
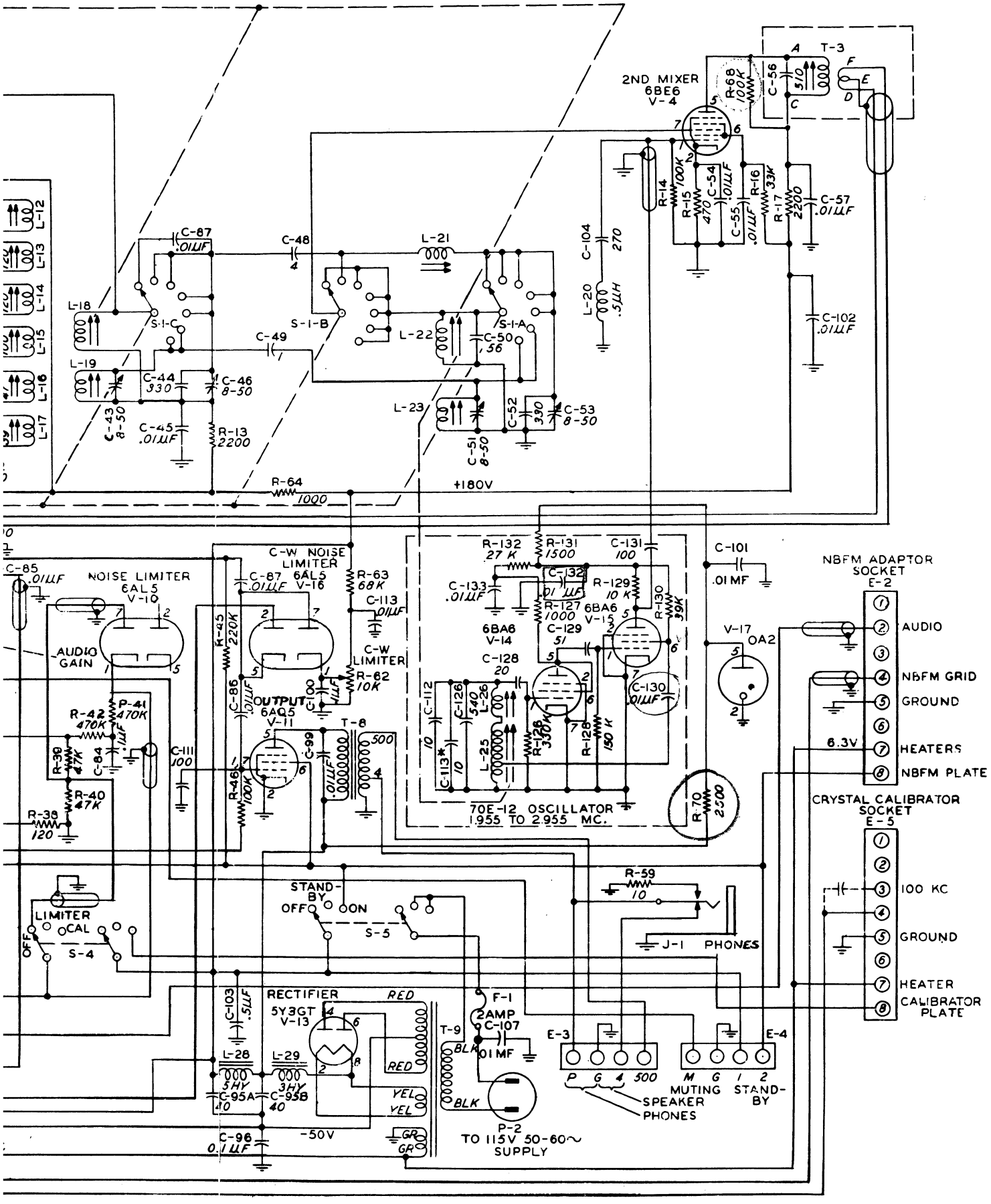


Figure 5-4 75A-2 Bottom View


2ND MIXER
6BE6
V-4
T-3
R-68 100K
C-56 510
R-14 100K
R-15 470
C-54 .01μF
C-55 .01μF
R-16 33K
R-17 2200
C-57 .01μF
C-102 .01μF
C-104 270
L-20 .5μH
L-18
L-19
L-21
L-22
L-23
S-1-A
S-1-B
S-1-C
C-87 .01μF
C-48
C-49
C-44 330
C-46 8-50
C-43 8-50
C-45 .01μF
R-13 2200
C-50 56
C-52 330
C-53 8-50
C-51 8-50
R-64 1000
+180V
C-W NOISE LIMITER
C-87 .01μF
6AL5
V-16
R-63 68K
C-113 .01μF
C-W LIMITER
R-62 10K
C-85 .01μF
NOISE LIMITER
6AL5
V-10
AUDIO GAIN
R-45 220K
C-86 .01μF
OUTPUT
6AQ5
V-11
C-100 .1μF
T-8
500
C-99 .01μF
R-46 100K
P-41 470K
R-42 470K
C-84 .1μF
R-39 47K
C-111 100
R-40 47K
R-38 120
R-132 27 K
R-131 1500
C-131 100
C-132 .01 μF
C-133 .01μF
R-129 10 K
R-127 1000
R-130 39K
6BA6
V-15
6BA6
V-14
C-129 51
C-128 20
C-112 10
C-126 540
L-26
C-113* 10
L-25
R-126 330K
R-128 150 K
C-130 .01μF
70E-12 OSCILLATOR
1.955 TO 2.955 MC.
R-70 2500
C-101 .01 MF
V-17
OA2
NBFM ADAPTOR SOCKET
E-2
AUDIO
NBFM GRID
GROUND
6.3V
HEATERS
NBFM PLATE
CRYSTAL CALIBRATOR SOCKET
E-5
100 KC
GROUND
HEATER
CALIBRATOR PLATE
LIMITER
CAL
OFF
S-4
STAND-BY
OFF
ON
S-5
R-59 10
J-1 PHONES
RECTIFIER
5Y3GT
V-13
C-103 .5μF
L-28 5HY
L-29 3HY
C-95A 40
C-95B 40
C-96 0.1μF
-50V
RED
RED
YEL
YEL
GR
GR
T-9
F-1
2AMP
C-107 .01 MF
BLK
BLK
P-2
TO 115V 50-60~ SUPPLY
E-3
P G 4 500
SPEAKER
PHONES
E-4
M G 1 2
MUTING
STAND-BY

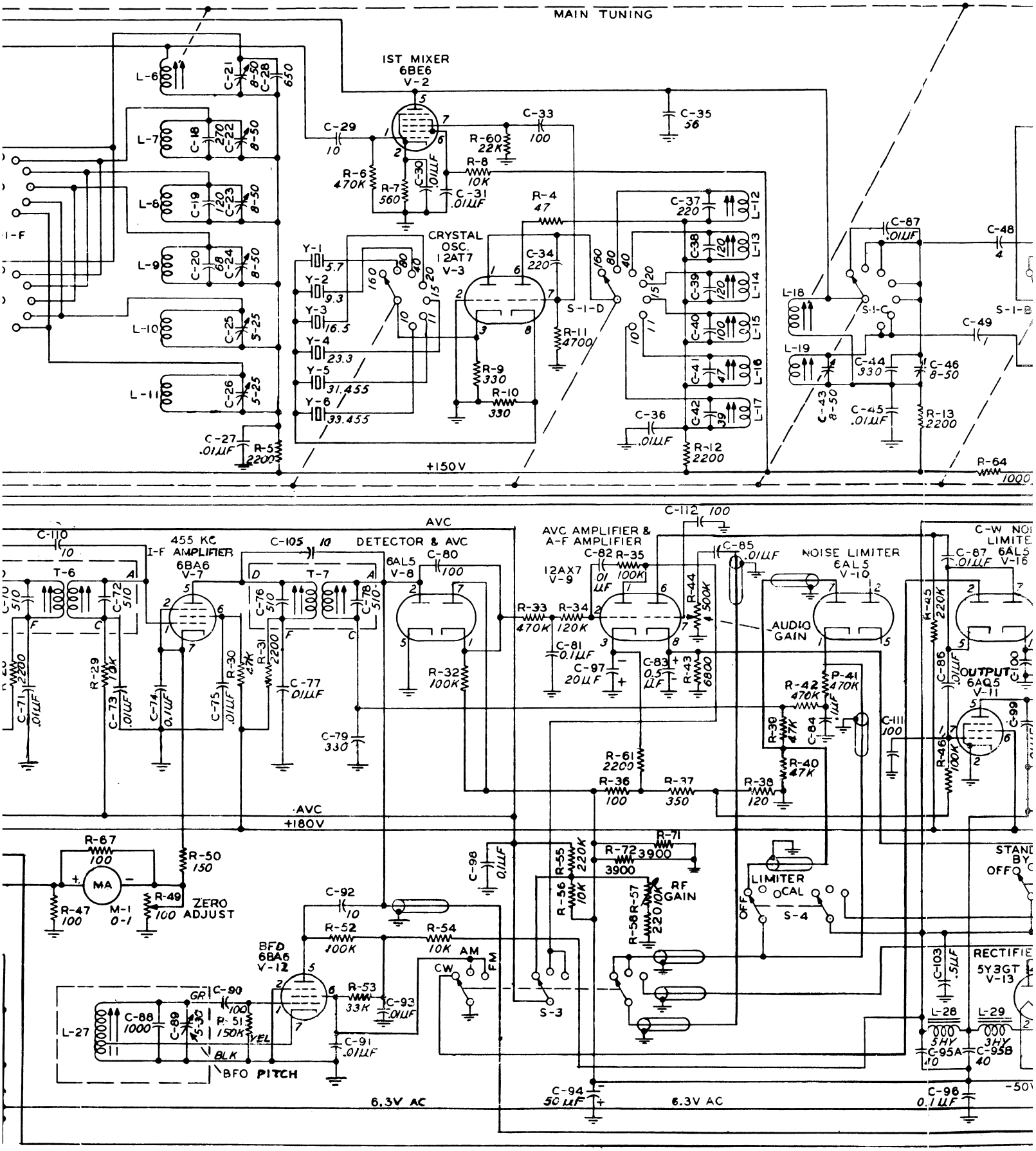
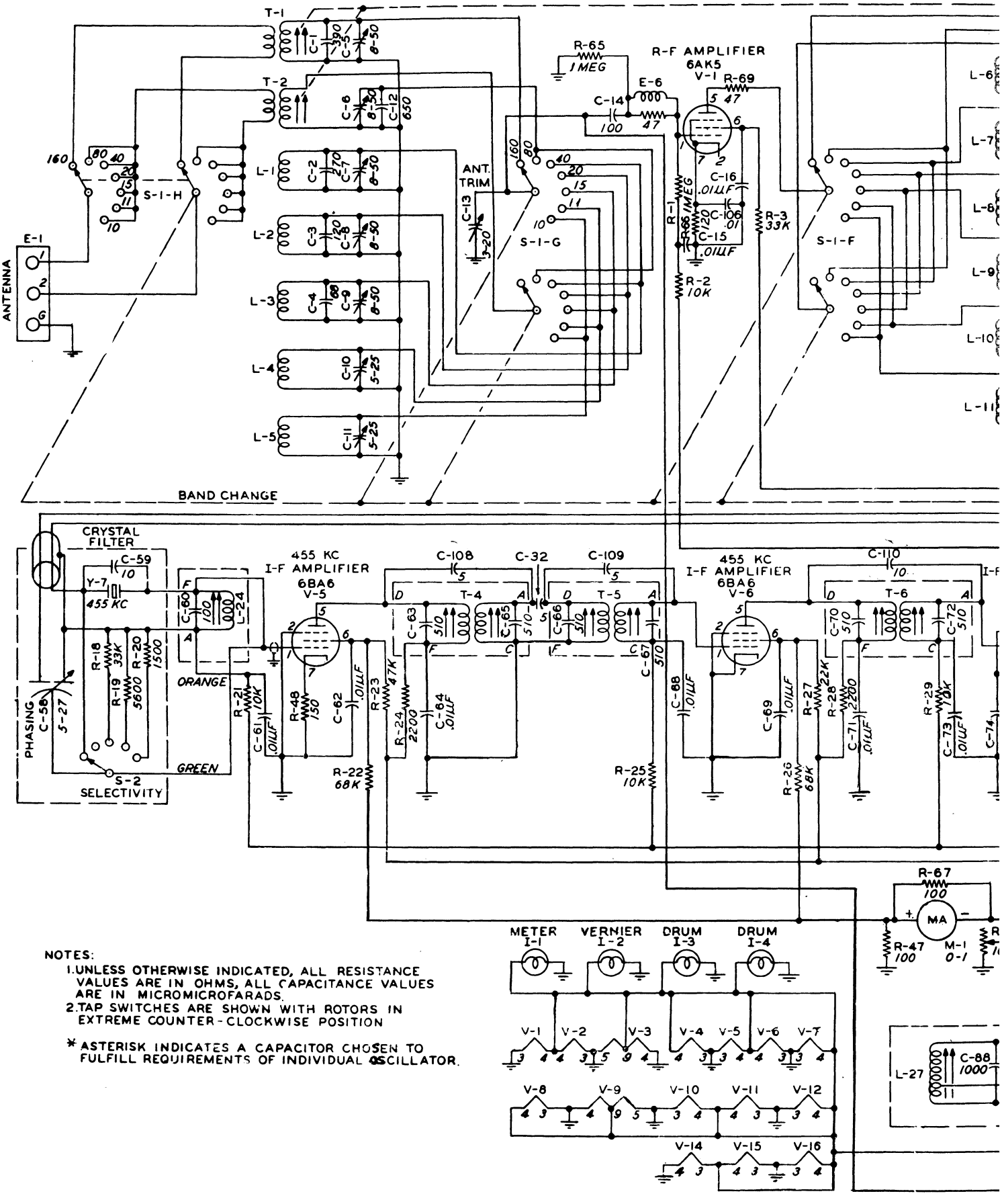


Figure 5-5. 75A-2 Amateur Receiver



NOTES:

1. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS.
2. TAP SWITCHES ARE SHOWN WITH ROTORS IN EXTREME COUNTER-CLOCKWISE POSITION

* ASTERISK INDICATES A CAPACITOR CHOSEN TO FULFILL REQUIREMENTS OF INDIVIDUAL OSCILLATOR.

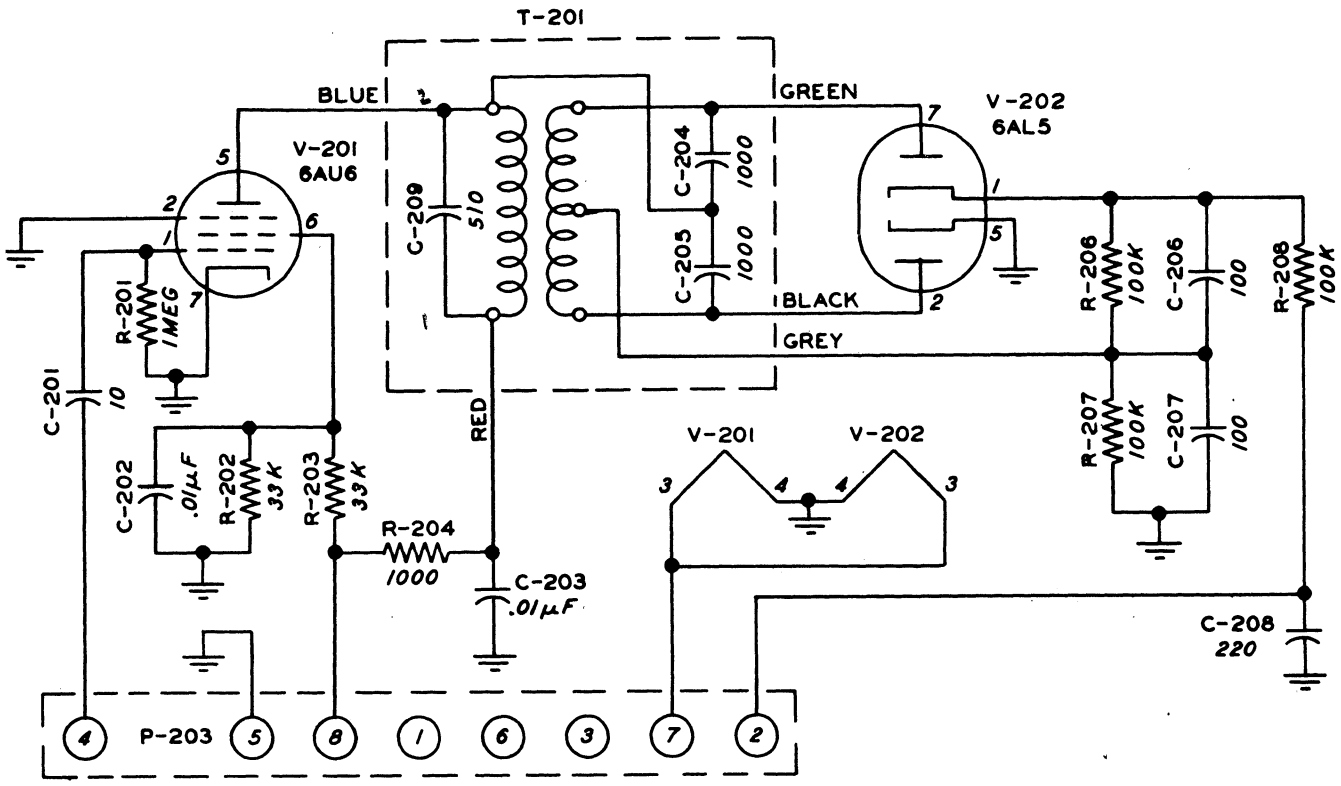


Figure 5-6 148C-1 NBFM Adaptor Schematic Diagram

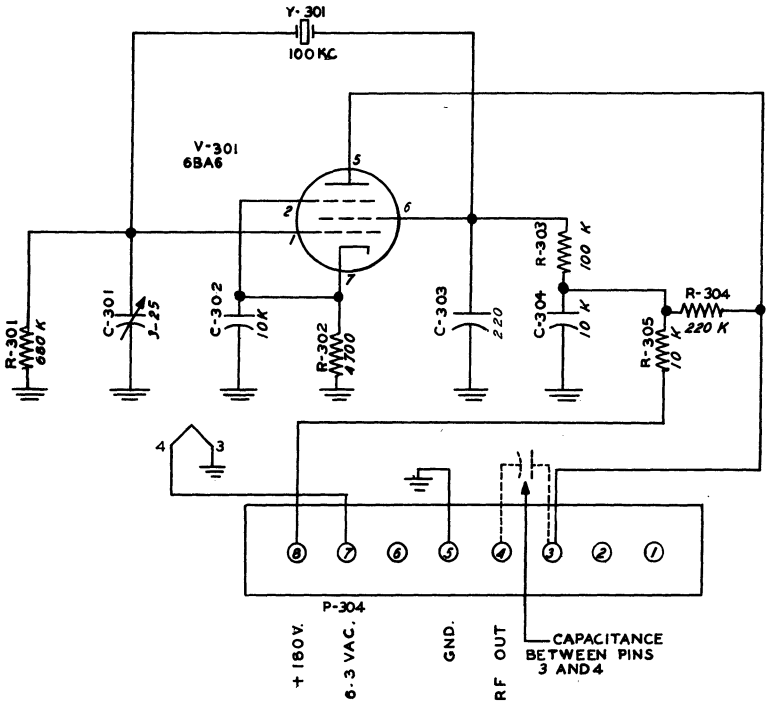
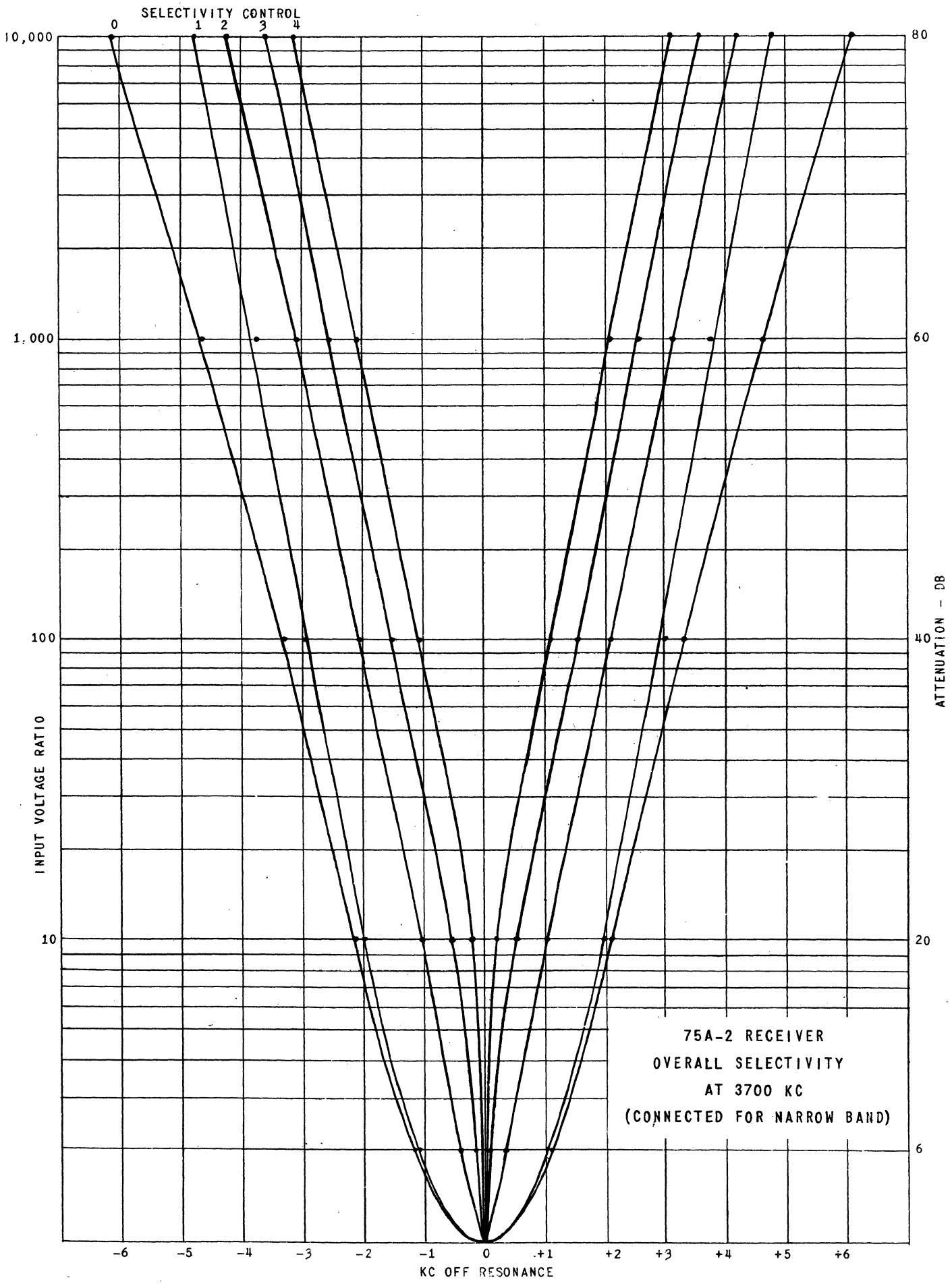
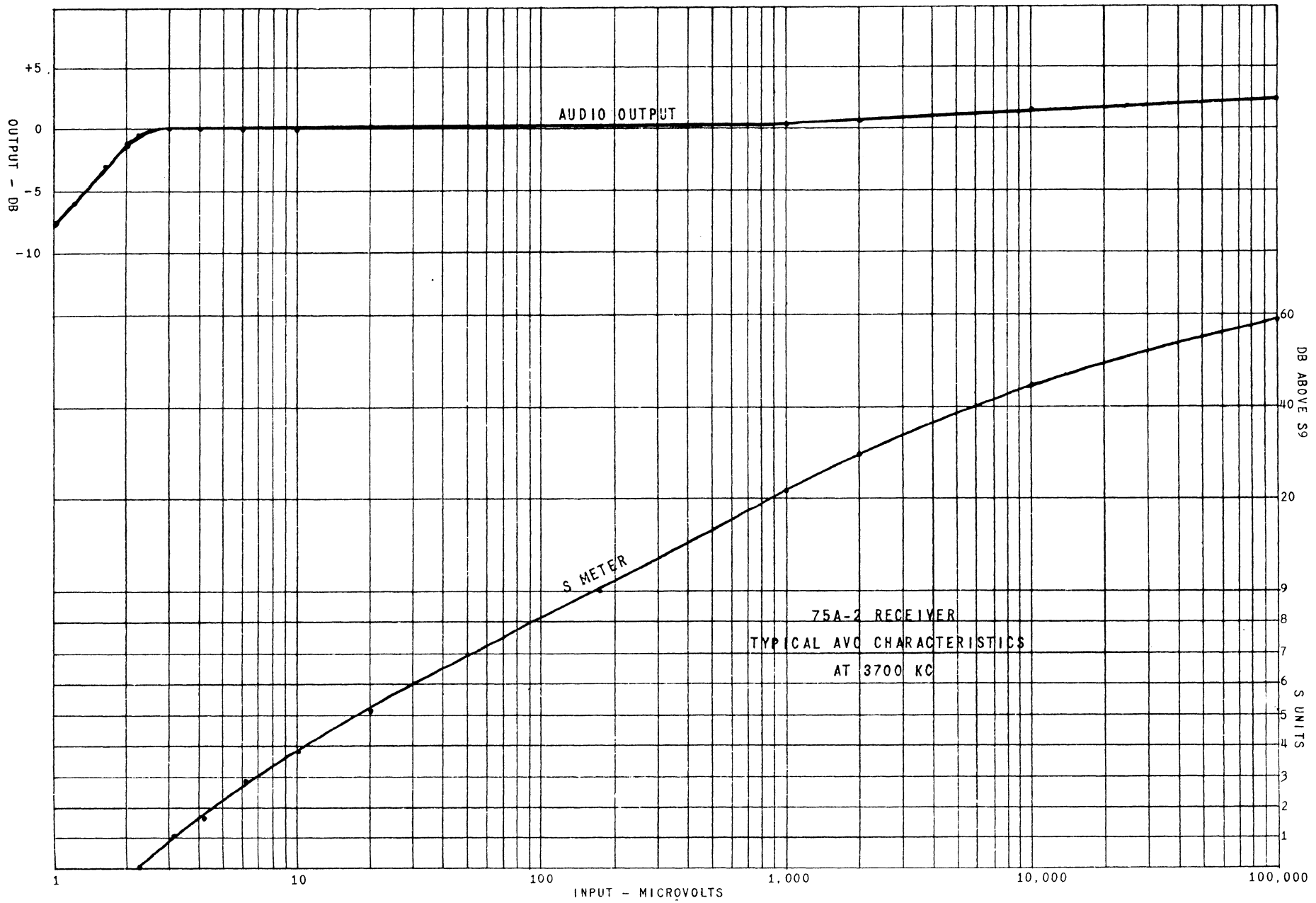


Figure 5-7 8R-1 Crystal Calibrator Schematic Diagram


SELECTIVITY CONTROL
0
1
2
3
4
10,000
1,000
100
10
80
60
40
20
6
INPUT VOLTAGE RATIO
ATTENUATION - DB
-6
-5
-4
-3
-2
-1
0
+1
+2
+3
+4
+5
+6
KC OFF RESONANCE
75A-2 RECEIVER
OVERALL SELECTIVITY
AT 3700 KC
(CONNECTED FOR NARROW BAND)


AUDIO OUTPUT
S METER
75A-2 RECEIVER
TYPICAL AVC CHARACTERISTICS
AT 3700 KC
OUTPUT - DB
+5
0
-5
-10
DB ABOVE S9
60
40
20
S UNITS
9
8
7
6
5
4
3
2
1
1
10
100
1,000
10,000
100,000
INPUT - MICROVOLTS