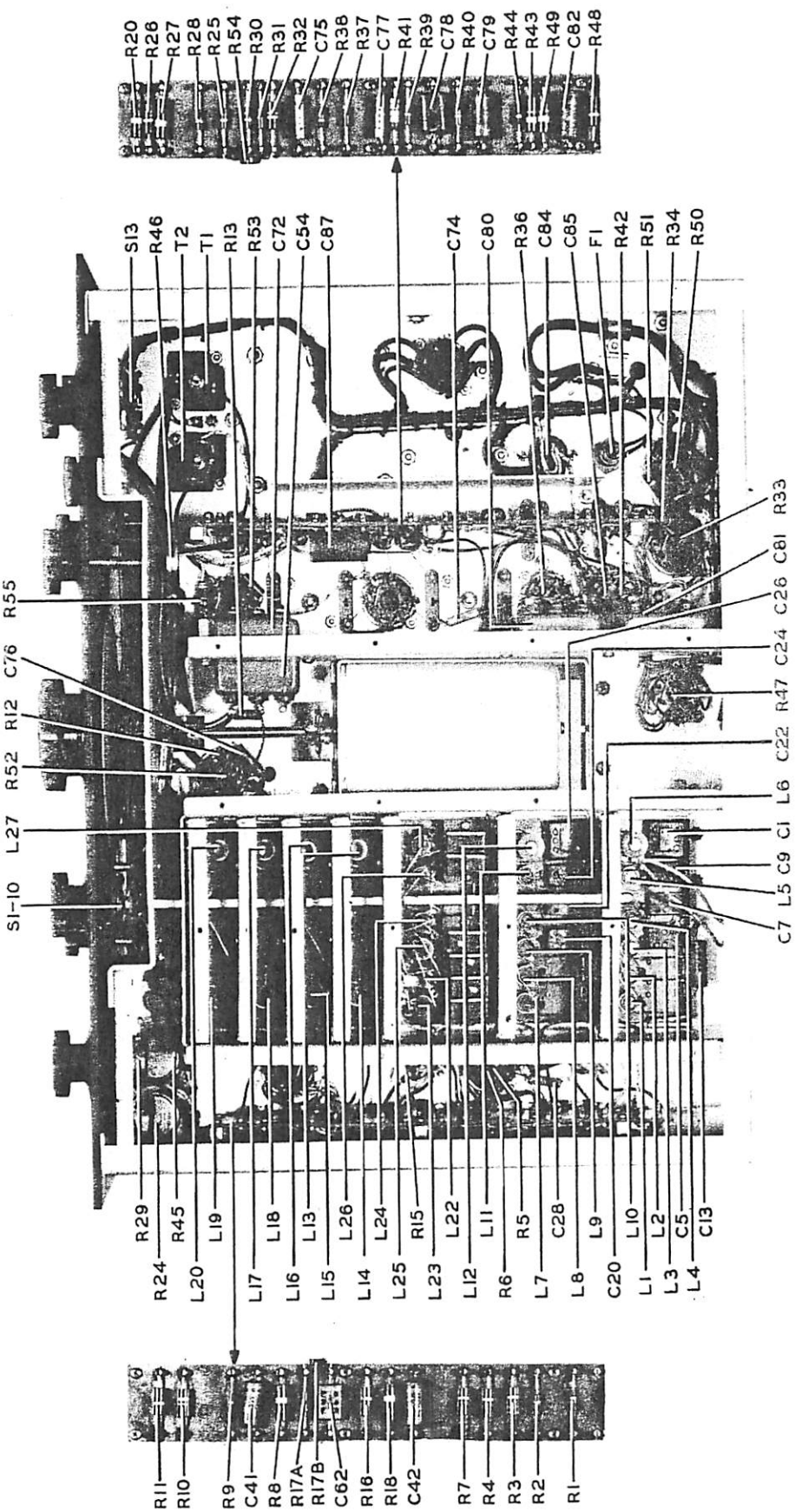


FIGURE 5-3 75A RECEIVER — BOTTOM OPEN

output of the signal generator to the control grid of V4. Adjust the receiver on AVC operation and turn the SELECTIVITY control to position 4, after which turn the signal generator tuning control through the 500 kc range until maximum signal is indicated on the S meter. This is the exact frequency of the crystal and therefore the frequency to which the i-f transformers should be tuned.

5-17. PROCEDURE.

a. Turn the SELECTIVITY control back to the 0 position.

b. Allow the signal generator to remain connected to the control grid of V4.

c. Refer to figure 5-2. Tune first the secondary and then the primary of the i-f transformers T4 and T3 and then the primary of T1 (See paragraph 5-18 for alignment of T2) tuning for maximum output on the S meter but attenuating the signal generator output to stay below a meter reading of S9.

d. Align T2.

5-18. ALIGNMENT OF T2. - T2 is the crystal filter output transformer and must be aligned in the following fashion in order that the selectivity control will operate properly.

5-19. PROCEDURE.

a. Rotate the SELECTIVITY Control to position #1.

b. Connect the signal generator to the control grid on V4.

c. Detune the signal generator to the low frequency side of the i-f frequency until the output drops off about 6 db. (One S Unit on the S meter.)

d. Set the PHASING CONTROL at 0.

e. Peak T2 for maximum output on the S meter (always attenuate the signal generator output to hold the S meter reading below S9.)

f. The above alignment can be checked by switching the crystal in and out and observing the S meter reading. The S meter reading should not change appreciably if the alignment is correct. Also, the gain at any position of the PHASING Control should be approximately the same on any position of the SELECTIVITY Control at exact crystal frequency.

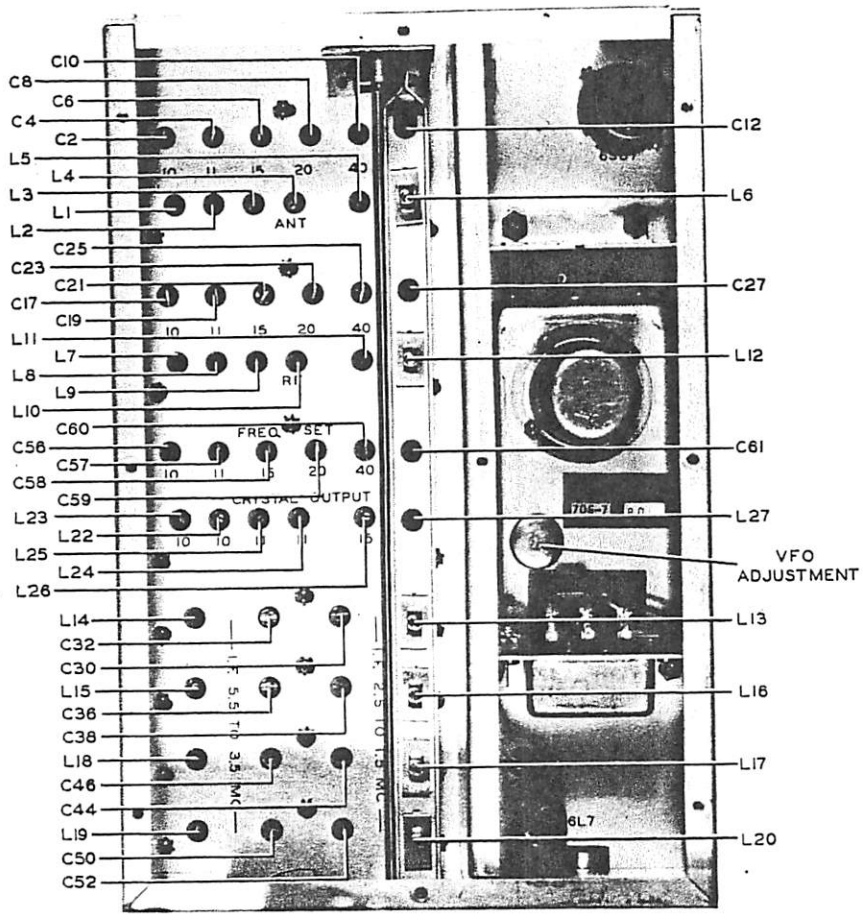


FIGURE 5-1 RF, VARIABLE IF, AND OSCILLATOR ADJUSTMENT

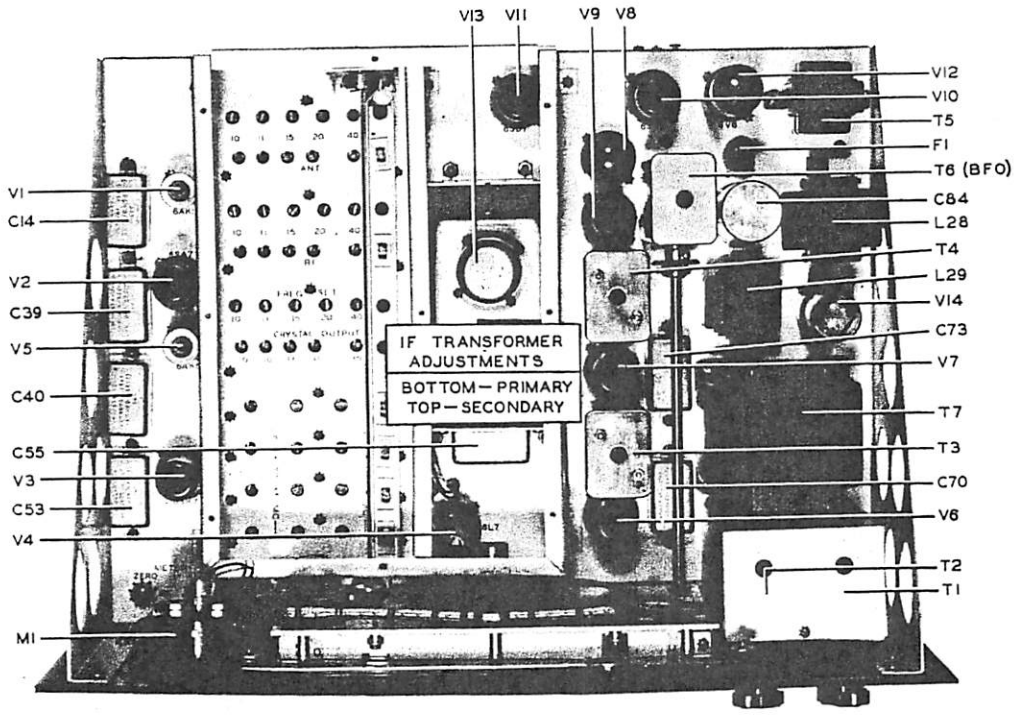


FIGURE 5-2 75A RECEIVER-TOP OPEN

5-20. ALIGNMENT OF BFO. - 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 Control should be set at zero. 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 receiver has been removed from the cabinet and the knobs removed, it is likely that the BFO knob will have been replaced incorrectly. The BFO knob should read zero when the associated tuning condenser is at the half capacity setting. To check the position of the condenser, proceed as follows: Connect the signal generator to the control grid of V4 and turn the MAN-AVC-CW control to CW. Having aligned the BFO as outlined above, rotate the BFO 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 condenser. To correct this, rotate the control until the highest pitch obtainable is found. (This indicates that the condenser plates are all in or all out.) Loosen the BFO Control set screw and turn the knob 90° (right or left) from the zero (BFO) marking on the panel. (This sets the knob at half capacity on the condenser.) 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 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 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.

5-21. VARIABLE IF ALIGNMENT.

5-22. GENERAL. - The variable i-f channel should be aligned after the 500 kc fixed channel has been aligned. There are two channels in the variable i-f (2.5 to 1.5 mc and 5.5 to 3.5 mc), therefore, two sets of coils must be aligned. The low frequency channel (2.5 to 1.5 mc) must be aligned first. The alignment follows standard procedure where permeability tuned coils are concerned, i.e., tune the capacitor trimmer for the high frequency end of the tuning range and the iron core for the low frequency end of the tuning range. In the high frequency channel (5.5 to 3.5 mc) the iron cores tune very broadly. Refer to figure 5-1 for alignment adjustments.

5-23. PROCEDURE.

a. Adjust the receiver for AVC operation in the 80 meter band.

b. Connect the signal generator to the control grid of V2 and inject a 2,5 mc signal.

c. Tune the receiver to approximately 3.2 mc.

d. Tune capacitors C52, C44 and then C38 and C30 for maximum S meter reading. (Always adjust the signal generator output to stay below S9 on the S meter.)

e. Tune the receiver to 4.2 mc and inject a 1.5 mc signal into the grid of V2.

f. Tune the iron core of L20, L17, L16 and L13 for maximum S meter reading.

g. Repeat the above procedure several times and then switch to the 10 meter band.

h. Inject a 5.5 mc signal into the grid of V2.

i. Tune the receiver to 28.0 mc.

j. Tune capacitors C50, C46, C36 and C32 for maximum S meter reading.

k. Tune the receiver to 30.0 mc and inject a 3.5 mc signal.

l. Adjust the cores of inductors L19, L18, L15 and L14 for maximum S meter reading.

m. Repeat steps h thru l several times.

NOTE

Be sure, during the above adjustments, to attenuate the signal generator output to hold the S meter readings below S9. This permits a more accurate degree of alignment while using the S meter for an output indicator.

5-24. RF ALIGNMENT.

5-25. GENERAL. - The r-f amplifier and first mixer stages should be aligned only after the 500 kc and variable i-f stages have been aligned.

As in the case of the variable i-f coils, the r-f and mixer coils should be aligned at the high frequency end with the trimmer capacitor and at the low frequency end with the iron cores (Inductance adjustment). The lowest frequency band (80 meters) should be aligned first. This is important. The various bands should be aligned at a point 100 kc inside each band edge.

5-26.

PROCEDURE.

a. Adjust the receiver for AVC operation in the 80 meter band.

b. Connect the signal generator to the antenna connections of the receiver.

c. Set the receiver tuning dial at 4.1 mc. and turn the signal generator dial until maximum signal is indicated on the S meter.

d. Adjust C27 and C12 for maximum S meter reading.

e. Operate the receiver tuning dial to 3.3 mc and turn the signal generator dial until maximum signal is indicated on the S meter.

f. Adjust the iron cores of L12 and L6 until maximum reading is obtained on the S meter.

g. Repeat steps c to f several times and then rotate the band switch to 40 meters.

h. Repeat the above procedure using capacitors C25 and C10 and inductors L11 and L5 for 40 meters.

i. Rotate the band switch to 20 meters and repeat steps c to f using capacitors C23 and C8 and inductors L10 and L4.

j. Rotate the band switch to 15 meters and repeat steps c to f using capacitors C21 and C6 and inductors L9 and L3.

k. Rotate the band switch to 11 meters and repeat steps c to f using capacitors C19 and C4 and inductors L8 and L2. Set the tuning dial however, to 27.9 mc and 26.1 mc.

l. Rotate the band switch to 10 meters and repeat steps c to f using capacitors C17 and C2 and inductors L7 and L1. Set the tuning dial to 29.9 mc and 28.1 mc.

5-27. OSCILLATOR ALIGNMENT.

5-28. GENERAL. - Due to both the inherent stability of the quartz crystals and the careful design of the VFO employed in this receiver, it is quite unlikely that the dial calibration will become inaccurate through normal use or treatment. However, should the dial calibration become inaccurate, the following paragraphs will enable a service technician with adequate facilities to correct the dial calibration.

a. If the slide rule calibration (only) is off in the same direction on all bands, follow instructions in paragraph 5-29.

b. If the Vernier dial calibration is correct for the majority of the bands but incorrect for one or two of the others, follow instructions in paragraph 5-30.

c. If the Vernier dial calibration is incorrect by the same amount for all bands follow instructions in paragraphs 5-31 thru 5-33.

5-29. DIAL POINTER. - The dial pointer on the slide rule dial can be corrected by grasping the dial cord on the same side of the pointer in which the discrepiency exists and sliding the pointer along the dial cord until the correct position for the pointer is found.

5-30. CRYSTAL FREQUENCY ADJUSTMENT. - This adjustment should only be made after the 500 kc i-f channel and beat frequency oscillator have been accurately adjusted according to paragraphs 5-16 thru 5-20. To set the crystals to frequency, the crystal padders must be adjusted. This is done as follows.

a. If a secondary frequency standard is available, set it for 100 kc operation and calibrate it against WWV.

b. Connect the output of the signal generator to the antenna posts and tune in a harmonic of the 100 kc signal in the band which is off calibration. 3.7 mc for 80 meters, 7.3 mc for 40 meters, 14.5 mc for 20 meters, 21.3 mc for 15 meters, 27 mc for 11 meters and 29 mc for 10 meters are good signals to work with.

c. Turn the BFO on and set the BFO Control at 0.

d. Tune the crystal padders and attempt to pull the frequency of the crystal to the correct dial setting on the vernier dial.

e. If all bands are off an equal amount, and it is impossible to pull the crystals to the dial setting, align all the crystals on a frequency that can be reached, i.e., 1/2 kc or so higher or lower on each band, then loosen the set screws in the flexible coupler to the VFO and set the dial on the correct figure after which, turn the VFO shaft until the signal is zero beat. The set screws should then be tightened.

If no secondary frequency standard is available, an ordinary signal generator can be used. In this application the signal generator should be tuned to 500 kc and the 30th harmonic beat against WWV at 15,000 kc. The tuning procedure outlined above can be followed using the 500 kc harmonics of the test signal. Useful harmonics are at 4.0 mc for 80 meters, 7 mc for 40 meters, 15 mc for 20 meters, 21 mc for 15 meters, 27 mc for 11 meters and 29 mc for 10 meters.

5-31. VFO ADJUSTMENT.

5-32. GENERAL. - Should trouble develop in the variable frequency oscillator the unit should be returned to the factory for servicing, however, the unit can be realigned by persons understanding such techniques providing accurate test equipment is at hand. A crystal controlled frequency standard with outputs at 2 mc and 3 mc and with an accuracy of .015 percent may be used. If such is not available, a signal generator tuned to 500 kc may be employed, using the fourth harmonic (2000 kc) and the sixth harmonic (3000 kc). If this is done the thirtieth harmonic of the generator should be set to exact zero beat with WWV at 15 mc.

If the vernier dial reading is off only 2 or 3 kc in the same direction at both ends of the dial, the moveable fiducial line can be moved to correct this error. If the reading is more than 3 kc in the same direction, the correction can be made by loosening the set screw in the VFO coupler. However, if the error is greater or is not in the same direction or by the same amount at both ends of the dial, proceed as follows.

There is only one adjustment on the VFO. This is a variable condenser which may be observed through the top of the oscillator container by removing a clip plug. (See figure 5-1.) The main object in aligning the VFO is to make the 2mc and 3 mc points fall exactly ten turns of the vernier dial apart, after which the dial may be loosened, if necessary, and the dial calibration corrected. Be sure the 500 kc i-f channel is aligned as indicated in paragraphs 5-16 thru 5-20 before attempting to align the VFO.

5-33. PROCEDURE.

a. Turn the receiver ON and adjust for CW reception, with the BFO in the zero position, in the 80 meter band. (Be sure the BFO is aligned as indicated in paragraph 5-20 or proper results will be difficult to obtain.)

b. Couple the signal generator to grid number 1 (cap) of V4.

c. Turn the vernier dial to the vicinity of 4.2 mc and find the beat note.

d. Write the dial calibration down and turn the dial 10 turns in the opposite direction. There should be another beat note at exactly 10

turns from the first. If this beat note is to either side of the 10 turn figure, take the difference frequency (between the actual beat note reading and the reading where it should have appeared) and multiply it by three. Add this figure to the actual beat note dial setting if the beat note was less than 10 turns or subtract it if the beat note occurred more than 10 turns. Now set the dial to this new frequency, remove the plug from the top of the oscillator, and turn the adjustment until zero beat is again reached. It will be found that the high and low end beat notes are now exactly 10 turns apart. If such is not the case, repeat the above procedure, remembering that a new reference point at the high end of the dial will likely be necessary each time.

Examples of above operations:

#1

Beat note at high end of dial	= 4199 kc
Reading at which dial should appear after approx. 10 turns	= 3199 kc
Actual dial reading	= 3198 kc
Difference frequency (3199 - 3198 kc)	= 1 kc
Multiplied by three	= 3 kc
Added to 3198 kc (Since beat note occurred at less than 10 turns)	= 3201 kc

Turning the dial back to the high frequency end, the high frequency beat note should appear at 4201 kc (exactly 10 turns).

#2

Beat note on high end of dial	= 4201 kc
Reading at which dial should appear after approx. 10 turns	= 3201 kc
Actual dial reading	= 3203 kc
Difference frequency (3203 - 3201)	= 2 kc
Multiplied by three	= 6 kc
Subtracted from 3203 kc (Since beat note occurred at more than 10 turns)	= 3197 kc

Turning the dial back to the high frequency end of the band, the high frequency beat note should appear at 4197 kc (exactly 10 turns of the dial).

e. If the dial does not indicate exactly 3.2 and 4.2 mc at the beat notes after the above procedure, loosen the set screw in the flexible coupler connecting the dial to the VFO and turn the dial for correct indication (be sure the oscillator is zero beat with the check signal at the end of the dial on which this adjustment is being made) after which tighten the set screws aga

NOTES

Check the frequency of the signal generator against WWV several times during the VFO alignment to be sure it does not creep.

It will not be necessary to readjust the r-f and i-f amplifiers for small changes in the VFO adjustment.

5-34. CRYSTAL HARMONIC ADJUSTMENT. - It is unlikely that there will ever be a need for adjusting the crystal harmonic selector circuits since this adjustment is not critical, however, in event some component has been replaced, the harmonic selector circuits can be adjusted in the following manner.

a. Place a short circuiting wire between pin #6 on V2 and ground.

b. Connect a d-c vacuum tube voltmeter between pin #5 on V2 and ground.

c. Turn the receiver ON and rotate the BAND switch to 10 meters.

d. Rotate the inductor trimmers in L22 and L23 for maximum reading on the voltmeter. (See figure 5-1.)

e. Rotate the BAND switch to 11 meters.

f. Rotate the inductor trimmers in L24 and L25 for maximum voltmeter reading.

g. Rotate the BAND switch to 15 meters.

h. Rotate the inductance trimmer in L26 for maximum reading on the voltmeter.

i. Rotate the BAND switch to 20 meters.

j. Rotate the inductance trimmer in L27 for maximum reading on the voltmeter.

k. There is no adjustment necessary for 40 and 80 meters.

CAUTION

Under no circumstances, while making the above adjustments, should any of the crystal padding condenser (C56 thru C61) settings be changed as this will change the crystal frequency.

NOTE

Refer to paragraphs 5-38 for CRYSTAL ACTIVITY TEST readings.

5-35. VFO REMOVAL. - In event the VFO has to be removed for servicing, the following procedure is recommended.

a. Remove the entire top section of the coil shield. This is done by first removing the cover then unscrewing the 6 screws which fasten the shield assembly to the chassis.

b. Loosen screws in the flexible coupler.

c. Remove the four screws holding the oscillator mounting bracket to the chassis.

d. Slide the VFO unit back and tip the rear up towards the top of the receiver.

e. Remove the connector plug.

f. While the rear of the VFO is tipped up, remove the three screws from the front which attach the VFO to the VFO mounting bracket. (Reach in through the bottom of the receiver with a screwdriver to do this.)

g. Slide the VFO out of the receiver through the top.

5-36. DIAL BULB REPLACEMENT. - The slide rule dial bulbs are easily replaced by taking the rear contactor boards out of the two clip fasteners with which each board is provided. After this, the defective bulb may be extracted by pulling straight out on the rear of the bulb.

The vernier dial bulbs are replaced by first removing the top section of the coil shield. This is done by first removing the top cover of the shield, then unscrewing the 6 screws which fasten the shield assembly to the chassis. Once this is done, the rear contactor board is removed by unscrewing the two mounting screws. The defective bulb can now be removed by pulling straight back on the rear of the bulb.

5-37. TUBE SOCKET RESISTANCE AND VOLTAGE MEASUREMENTS

CONDITIONS-VOLTAGE: No signal, Manual Operation, RF gain full ON, 80 meter band, B + ON, measurement to ground, NL OUT, Line Volt. 11

CONDITIONS-RESISTANCE: Same as above, AC switch OFF, measurement to ground.

METER USED: Volt-Ohmyst Jr.

TUBE: V1 6AK5 r-f amplifier

Pin No.	Function	Resistance	Voltage
1	Grid #1	10,000	0
2	Cathode, Grid #3	220	1.5
3	Heater	0	0
4	Heater	0.2	6.3 ac
5	Plate	40,000	164
6	Grid #2	100,000	110
7	Grid #3, Cathode	220	1.5

6SB7Y

TUBE: V2 6SA7 First mixer

1	Grid #5	0	0
2	Heater	0.2	6.3 ac
3	Plate	35,000	220
4	Grids #2 and #4	50,000	100
5	Grid #1	330,000	-.05
6	Cathode	230	2.7
7	Heater	0	0
8	Grid #3	100,000	0

TUBE: V3 6SK7 First i-f amplifier

Pin No.	Function	Resistance	Voltage
1	Shell	0	0
2	Heater	0	0
3	Suppressor	210	2.1
4	Grid	10,000	0
5	Cathode	**210	2.1
6	Screen	140,000	75
7	Heater	0.2	6.3 ac
8	Plate	30,000	214

~~6SD7~~ 6SK7

TUBE: V4 ~~6L7~~ 6L7 Second Mixer

1	Shell	0	0
2	Heater	0.2	6.3 ac
3	Plate	30,000	220
4	Grids #2 and #4	55,000	125
~~8~~ 5	Grid #3	0.9	0
~~1~~ 6	*TP	220	2.1
7	Heater	0	0
6 4	Cathode & Grid #5	1,000**	8
~~Cap~~ 5	Grid #1	100,000	0

TUBE: V5 6AK5 Crystal Oscillator

1	Grid #1	110,000	-4.9
2	Cathode, Grid #3	900	9.5
3	Heater	0	0
4	Heater	0.2	6.3 ac
5	Plate	35,000	207
6	Grid #2	55,000	168
7	Grid #3, Cathode	900	9.5

TUBE: V6 6SG7 First 500K i-f amp.

1	Shell	0	0
2	Heater	0.2	6.3 ac
3	Suppressor	330	1.7
4	Grid	11,000	0
5	Cathode	220	1.7
6	Screen	17,000	88
7	Heater	0	0
8	Plate	35,000	209

TUBE: V7 6SG7 Second 500 KC i-f amp.

Pin No.	Function	Resistance	Voltage
1	Shell	0	0
2	Heater	0.2	6.3 ac
3	Suppressor	560	1.1
4	Grid	11,000	0
5	Cathode	560	1.1
6	Screen	360,000	55
7	Heater	0	0
8	Plate	150,000	60

TUBE: V8 6H6 Detector and Limiter

1	Shell	0	0
2	Heater	0.2	6.3 ac
3	Plate #2	1.3	0
4	Cathode #2	57,000	0.5
5	Plate #1	47,000	0.5
6			
7	Heater	0	0
8	Cathode #1	470,000	1.2

TUBE: V9 6SJ7 AVC tube

1	Shell	0	0
2	Heater	0	0
3	Suppressor	2,000	2.1
4	Grid	147,000	0.5
5	Cathode	2,000	2.1
6	Screen	260,000	0
7	Heater	0.2	6.3 ac
8	Plate	470,000	0

TUBE: V10 6SJ7 BFO (MAN-AVC-CW Control in CW position)

1	Shell	0	0
2	Heater	0	0
3	Suppressor	0.3	0
4	Grid	100,000	-6.0
5	Cathode	0.3	0
6	Screen	350,000	60
7	Heater	0.2	6.3 ac
8	Plate	140,000	75

TUBE: V11 6SJ7 Audio Amplifier

Pin No.	Function	Resistance	Voltage
1	Shell	0	0
2	Heater	0.2	6.3 ac
3	Suppressor	1,000	0.9
4	Grid	0 - Audio gain off pos.	
5	Cathode	1,000	0.9
6	Screen	1.2 meg	27
7	Heater	0	0
8	Plate	220,000	75

TUBE: V12 6V6 Power Output

1	Shell	0	0
2	Heater	0.2	6.3 ac
3	Plate	250,000	240
4	Screen	250,000	225
5	Grid	500,000	0
6	*TP	30,000	210
7	Heater	0	0
8	Cathode	330	11.4

TUBE: V14 5Y3GT Rectifier

1	NC		0
2	Filament	250,000	263
3			
4	Plate #2	130	345 ac
5			
6	Plate #1	130	345 ac
7			
8	Filament	250,000	263

Capacitor C84 to ground:

	C84A	C84B
Voltage -	250	224
Resistance -	28,000	28,000

5-38. CRYSTAL ACTIVITY TEST

Conditions: No signal, Manual Operation, RF gain full ON, B + ON, pin #6 on V2 grounded.
Measurement taken from pin #5 on V2 to ground with a Volt-Ohmyst Jr.

Line volts: 117 AC

Band	80 M	40 M	20 M	15 M	11 M	10 M
Volts	-2.6	-2.6	-6.2	-6.4	-8.3	-4.7

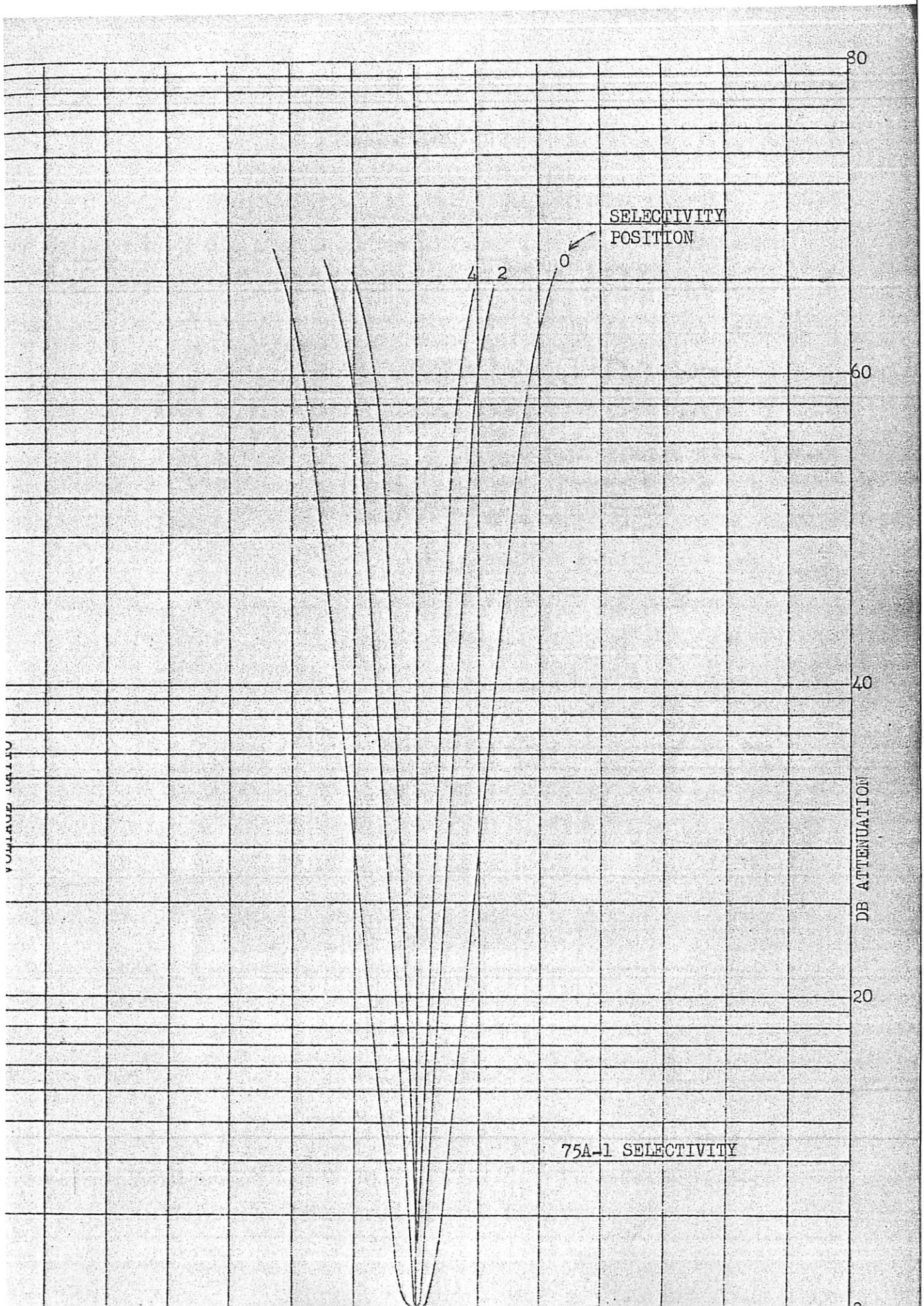
5-39. VFO ACTIVITY TEST

Conditions: No signal, Manual Operation, RF gain full ON, B + ON, pin #8 on V4 grounded.
Measurements taken from Cap of V4 to ground with a Volt-Ohmyst Jr. All measurements taken on 80 meter band.

Frequency	3.2 MC	3.7 MC	4.2 MC
Volts	-4.6	-5.3	-6.5

* TP = Tie point.

** Varies with "S" meter calibration.


80
60
40
20
SELECTIVITY
POSITION
0
2
4
DB ATTENUATION
75A-1 SELECTIVITY