INSTRUCTION BOOK

for

75A-1 AMATEUR RECEIVER

Manufactured By

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

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SECTION I - GENERAL DESCRIPTION

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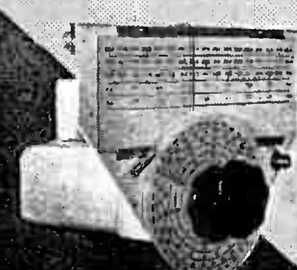
COLLINS EQUIPMENT OF HIGHER QUALITY FOR DISCRIMINATING AMATEURS

The 75A Double Conversion Amateur Band Receiver

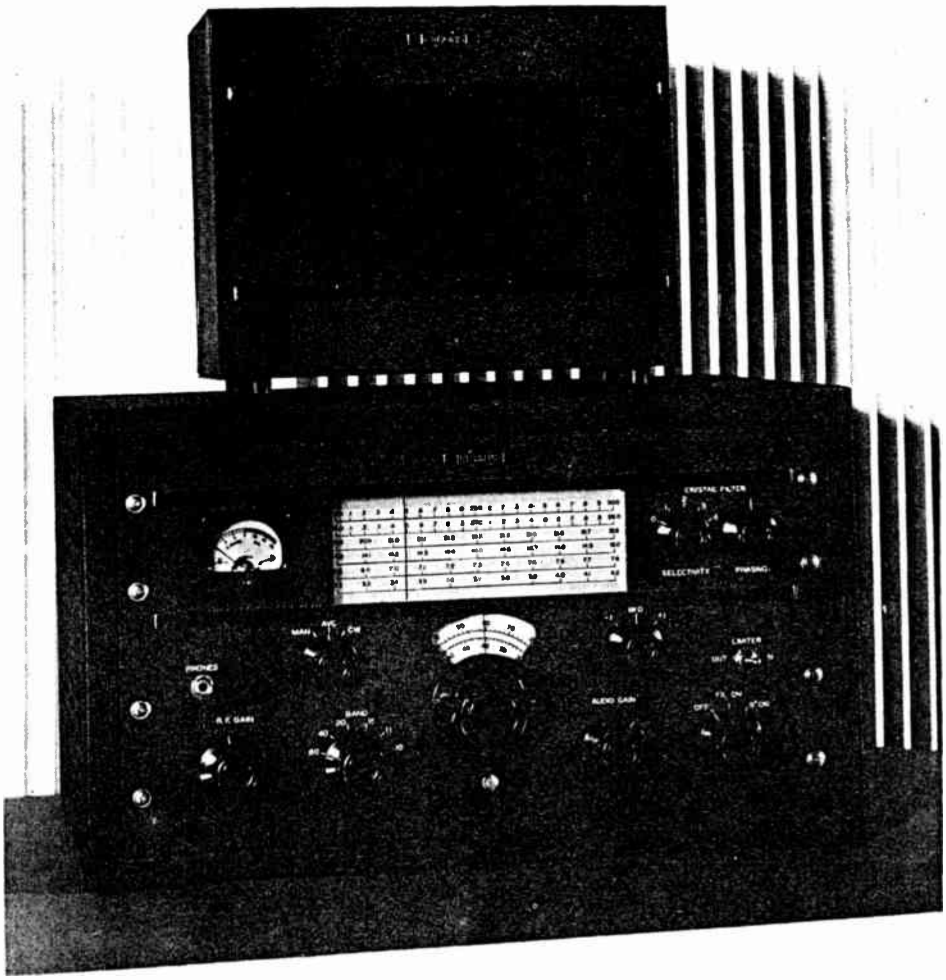
The 32V 150 Watt Bandswitching Transmitter. Permeability Tuned Oscillator Control.

The 30K 500 Watt Bandswitching Transmitter

The 310A Exciter Unit (for the 30K). Single Dial Tuning. Permeability Tuned Oscillator Control. Bandswitching.



The 70E-8 Permeability Tuned Oscillator 1600-2000 kc.



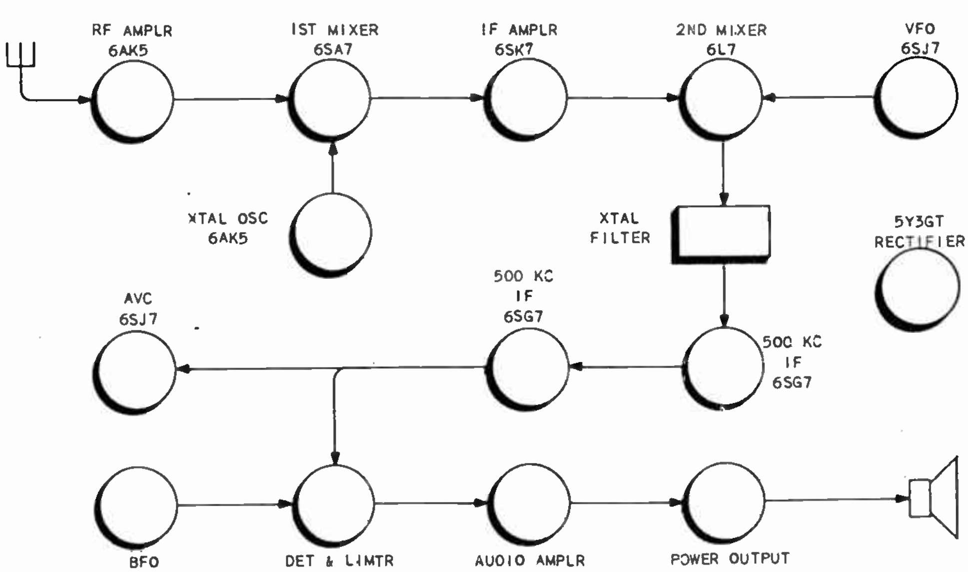


FIGURE 1-1 MODEL 75A RECEIVER

SECTION I

GENERAL DESCRIPTION

1-1. GENERAL.

This handbook has been prepared to aid in the installation, adjustment, operation, and maintenance of the Collins Model 75A Amateur Receiver.

1-2. PURPOSE OF EQUIPMENT.

In recent years, the number of licensed amateurs has been increasing at an accelerated rate. The recent war has introduced a great many people to our great hobby. With the advent of undreamed numbers of amateur stations on the most popular amateur bands, it is apparent that a receiver capable of extreme selectivity and with a high degree of accuracy and stability will be necessary to maintain a high percentage of 100% QSO's. With this in mind, the Collins engineers designed a receiver especially for the amateur which solves the reception problems of the modern amateur better than any other receiver. In addition to superb selectivity and stability, the 75A receiver has a sensitivity which satisfies the most critical of DX hounds. The AVC, image rejection, and cross modulation characteristics are in line with modern commercial practices. Embodying many new electrical and mechanical features never before used in an amateur receiver, it has been described as "The first really new amateur receiver since the advent of the superheterodyne circuit." This is the receiver you amateurs have been waiting for.

1-3. DESCRIPTION.

1-4. FREQUENCY COVERAGE. - The Amateur Bands are covered as follows:

80 meters - 3.2--4.2 mc	15 meters - 20.8--21.8 mc
40 meters - 6.8--7.8 mc	11 meters - 26.0--28.0 mc
20 meters - 14.0--15.0 mc	10 meters - 28.0--30.0 mc

1-5. BANDSPREAD. - An entirely new system of permeability tuning provides linear calibration on all bands. Ten turns of the vernier tuning dial cover the ranges shown above. Each division of the vernier dial(which has 100 divisions) represents 1 KC on 80, 40, 20 and 15 meters, and 2 KC on the 11 and 10 meter bands.

1-6 ACCURACY AND STABILITY. - Extreme stability and precise calibration assure visual tuning accurate to with 1 KC (one dial division) at 21 mc or 2 KC (one dial division) at 27 and 30 mc. This accuracy and stability is accomplished by the use of: (1) quartz crystals in the first conversion circuit, (2) the inherent accuracy and stability of the VFO in the second conversion circuit, and (3) linearity and absence of backlash in the tuning mechanism. The stability is such that on CW reception extreme variation in

The supply voltage causes a change of only a few cycles in the note. Furthermore, the CW note is absolutely independent of all except the tuning controls. Physical shock will not disturb the frequency unless the shock is severe enough to change the dial settings. This outstanding stability is available as soon as the receiver is turned on.

1-7. IMAGE AND IF REJECTION. - The modern circuit design of the 75A has inherently high rejection to spurious frequencies. Image rejection is a minimum of 50 db, even on 10 meters. IF rejection is 70 db minimum.

1-8. SENSITIVITY AND SIGNAL TO NOISE RATIO. - A one microvolt r-f input signal provides 1 watt audio output with approximately 6 db of signal to noise ratio at 300 ohms antenna impedance with a bandwidth of 4kc.

1-9. SELECTIVITY. - The crystal filter controls provide a bandwidth that is variable in 5 steps from 4 kc to 200 cycles at 2 times down (6 db down from the peak of the resonant frequency). There is no loss in gain caused by use of the crystal filter with the exception of the extremely sharp position which gives about 6 db loss.

1-10. AUTOMATIC NOISE LIMITER. - The 75A receiver contains a new series type noise limiter developed during the war. It automatically adjusts itself to all signal levels.

1-11. AUTOMATIC VOLUME CONTROL. - Constant output within 5 db is obtained for a change in r-f input from 5 microvolts to 0.5 volt. AVC is applied to the r-f stage and three i-f stages. The proper amount of AVC delay is employed for maximum sensitivity on weak signals.

1-12. SIGNAL STRENGTH METER. - The S-meter is calibrated from 1 to 9 in steps of approximately 6 db each, and for 20, 40 and 60 db above S9. Two external adjustments are provided, one for zero adjustment, and one for adjusting the sensitivity to compensate for variations in antenna installations.

1-13. AUDIO OUTPUT. - 2.5 watts of power are available.

1-14. TERMINAL IMPEDANCES.

a. INPUT. - The antenna input circuit is designed for a nominal 300 ohms impedance but will accommodate a wide variety of antennas both balanced and unbalanced without serious loss.

b. OUTPUT. - 500 ohm and 4 ohm terminals are provided as well as a low impedance output for headphones.

1-15. CONTROLS. - The following controls are on the front panel to provide complete operation of the receiver:

- Tuning Control
- Band Switch
- RF Gain Control
- Audio Gain Control
- CW Pitch Control
- ON-OFF Standby switch
- Crystal Selectivity Switch
- Crystal Phasing Control
- AVC-Manual-CW Switch
- Noise Limiter Switch

1-16. CIRCUIT. - Refer to figure 1-1. The double conversion circuit of the 75A employs fourteen tubes, including rectifier. The use of double conversion avoids the compromise always made in conventional receivers, i.e., a high IF is desirable for image rejection and a low IF is best for selectivity. The 75A uses two intermediate frequencies and has both features. Because of the high frequency of the first IF, only one stage of r-f amplification is needed to give extremely high image rejection. Additional stages are unnecessary and unwarranted. Following the r-f stage the incoming signal is mixed with the output of a crystal oscillator to produce the first IF. The first IF is amplified and mixed with the output of the variable frequency oscillator to produce the 500 KC second IF. The crystal filter is incorporated in the 500 KC second IF circuit. The audio is then removed from the carrier, passed through the automatic noise limiter, amplified, and fed to loudspeaker or headphones. BFO output is applied to the second detector. AVC voltage is obtained from the same point and fed to the controlled stages.

Permeability tuning is employed in the radio frequency, first and second mixer, and first IF stages. Gang tuning is accomplished by the use of a variable platform to which the powdered iron cores of the coils in the above stages are attached. The variable frequency oscillator is also permeability tuned and ganged to the above assembly, however, a precision lead screw acts upon the tuning core of the oscillator core to vary the frequency of the oscillator. Permeability tuned transformers are also employed in the second IF stages. A separate tube is used to rectify the carrier voltage for AVC bias. Two audio stages provide ample amplification and power output for normal amateur requirements.

1-17. TUBE COMPLEMENT.

SYMBOL	TUBE TYPE	FUNCTION
V1	6AK5 - 2.47	RF Amplifier
V2	6SA7 2.18	First Mixer
V3	6SK7 2.00	IF Amplifier
V4	6L7 2.82	Second Mixer

GENERAL DESCRIPTION

SYMBOL	TUBE TYPE	FUNCTION
V5	6AK5 2.47	Crystal Oscillator
V6	6SG7 2.38	500 KC IF Amplifier
V7	6SG7	500 KC IF Amplifier
V8	6H6 1.49	Detector andNoise Limiter
V9	6SJ7 2.09	AVC Tube
V10	6SJ7	Beat Frequency Oscillator
V11	6SJ7	First Audio Amplifier
V12	6V6 2.82	Audio Power Amplifier
V13	6SJ7	Variable Frequency Osc.
V14	5Y3GT	Rectifier

1-18. POWER SOURCE. - The power supply is self contained and well filtered. It requires a 115 volt 50/60 cps source. Power consumption is 80 watts.

1-19. DIMENSIONS AND CABINET DESIGN. - 21-1/8" wide, 12-1/4" high, 13-7/8" deep overall. The shassis is mounted on a standard 19" panel and can be removed from the cabinet and mounted in a standard relay rack.

1-20. WEIGHT. - 57 lbs.

1-21. FINISH. - St. James Grey wrinkle.

1-22. ACCESSORIES.

1-23. MODEL 270G-1 SPEAKER. - An external speaker is available, mounted in a matching cabinet. The speaker cabinet measures 13" wide, 10-19/32" high, 6-5/8" deep and the speaker and cabinet weigh 9 lbs.

1-24. HEADPHONES. - Any good headphone may be used.

1-25. ANTENNA. - Any good antenna may be used; however, a balanced antenna, well in the clear, connected to the receiver terminals through a 300 ohm transmission line is recommended.

SECTION II

THEORY OF OPERATION

2-1. MECHANICAL

2-2. GENERAL. - The 75A receiver is constructed in two major units, the receiver unit and the speaker unit. The receiver is constructed on an aluminum chassis. The receiver and speaker cabinets both are constructed of heavy gauge steel. The receiver cabinet has a hinged cover utilizing inside hinges. Ventilation openings are punched in the sides and rear of the cabinet. The front panel is recessed and trimmed for neat appearance. Both the receiver and the speaker cabinets are finished in a hard St. James Grey wrinkle finish.

2-3. TUNING. - The first completely permeability tuned amateur receiver to reach the market, the 75A, contains many new tuning principles and ideas. The vernier tuning dial is directly coupled to the lead screw of the variable frequency oscillator thus eliminating any possibility of back-lash. The iron cores which tune the r-f, first mixer, first i-f and second mixer stages are all mounted on a moveable platform. This platform is geared and belted to the vfo shaft by means of split gears and metal belts thus giving ganged tuning. The slide rule dial pointer is cord driven. The BFO coil is placed for most efficient operation and a long shaft is used to connect the tuning control with the panel knob. All other stages are fixed tuned with iron cores and variable ceramic capacitors.

2-4. BAND SWITCH. - Band switching of r-f stages is accomplished by means of a multiple section switch gang. Each switch section with its accompanying components is completely shielded from the others. In addition to r-f circuits, the band switch selects crystals and dial illumination lamps for the various bands.

2-5. ELECTRICAL THEORY.

2-6. GENERAL. - Refer to block diagrams of the receiver, figures 1-1 and 2-1. The general plan of the 75A receiver is a result of efforts to give to the amateur a receiver which has a stability and calibration accuracy never before obtainable in any amateur receiver. In addition, the receiver features an image rejection ratio, selectivity and sensitivity not found in many receivers of modern design. Improved AVC and noise limiter circuits are incorporated to complete the long list of desirable features of the equipment. How these features are obtained is explained in subsequent paragraphs.

2-7. CIRCUIT. - As shown in the block diagram, figure 1-1, the receiver has one stage of pre-selection. A high gain 6AK5 tube is used here because of its excellent electrical characteristics and desirable physical features. Following the r-f stage is the first mixer of the double detection system.

The signal grid of this tube, a 6SA7, is tuned to the received frequency, the injection grid receives voltage from the high frequency oscillator circuits at a frequency within a band 2.5 to 1.5 mc or 5.5 to 3.5 mc removed from the received frequency. This oscillator voltage is supplied by a 6AK5 crystal oscillator tube. Since the high frequency oscillator frequency is fixed (by the quartz crystals) the output frequency of the first mixer tube varies. This necessitates a variable i-f channel for the first intermediate frequency. A type 6SK7 tube is used in the variable frequency i-f stage. The second mixer is a type 6L7 tube, the signal grid of which is tuned to the frequency of the variable i-f. To produce the second i-f frequency of 500 kc (fixed), the output of a precision variable frequency oscillator is fed into the injection grid of the second mixer tube. This oscillator employs a 6SJ7 tube in a highly stabilized, temperature compensated circuit. The output of the second mixer tube is amplified by a 500 kc i-f channel composed of two 6SG7 tubes. A 6H6 as a detector and noise limiter follows the i-f channel. The audio thus produced is amplified by a 6SJ7 voltage amplifier and a 6V6 power amplifier. AVC bias is produced by a 6SJ7 in a controlled rectifier circuit. A type 6SJ7 tube is used in a BFO circuit coupled to the detector input for cw reception.

2-8. TUNING. - Tuning of the r-f stage, the first mixer, the variable i-f stage, the second mixer, and the VFO is accomplished by changing the inductance of the tuned circuits by means of a powdered iron core varied within the magnetic field of the coils involved. The tuning cores of all of the above stages are ganged together and are vafied as one unit. The inductance of each coil is trimmed with a similar iron core whereas the capacitance trimming of each coil is done with a ceramic capacitor.

A unique method of band change is employed in the 75A receiver. In the r-f and first mixer stages, the inductance of only one set of coils, the 80 meter, is varied by the tuning slugs. To change bands, the 80 meter coils are paralleled with a tuned circuit having characteristics which will combine with the 80 meter coils to produce a tuned circuit suitable for the new frequency range. Five sets of tuned circuits are used, one set for each band. In each case, however, the 80 meter coil is the only coil in which the inductance is varied by the tuning apparatus. Refer to the complete schematic, figure 5-4. The two frequency ranges of the variable i-f channel are produced in like manner.

The tuning ranges of the coils in both the r-f portion and the variable i-f portion are 1000 kc in the 80, 40, 20 and 15 meter bands and 2000 kc in the 11 and 10 meter bands.

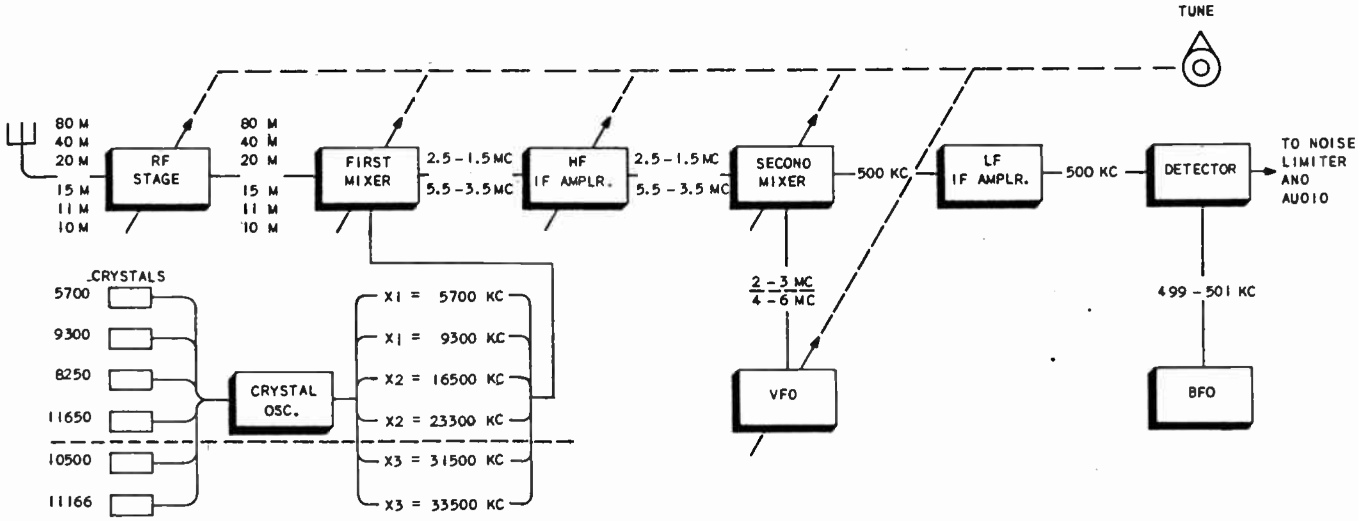


FIGURE 2-1 BLOCK DIAGRAM OF TUNING CIRCUITS

BANDS	80	40	20	15	11	10
XTAL	5.7	9.3	8.25	11.65	10.5	11.166
XTAL OUTPUT	5.7	9.3	16.5	23.3	31.5	33.5
DIAL READINGS	3.2	6.8	14.0	20.8	*26*	*28*
	3.3	6.9	14.1	20.9	*26.2*	*28.2*
	3.4	7.0	14.2	21	*26.4*	*28.4*
	3.5	7.1	14.3	21.1	*26.6*	*28.6*
	3.6	7.2	14.4	21.2	*26.8*	*28.8*
	3.7	7.3	14.5	21.3	*27*	*29*
	3.8	7.4	14.6	21.4	*27.2*	
	3.9	7.5	14.7	21.5	*27.4*	
	4.0	7.6	14.8	21.6	*27.6*	*29.6*
	4.1	7.7	14.9	21.7	*27.8*	*29.8*
	4.2	7.8	15.0	21.8	*28*	*30*

NOTE:

→ = FREQUENCY INCREASE

ALL FREQUENCIES IN MEGACYCLES

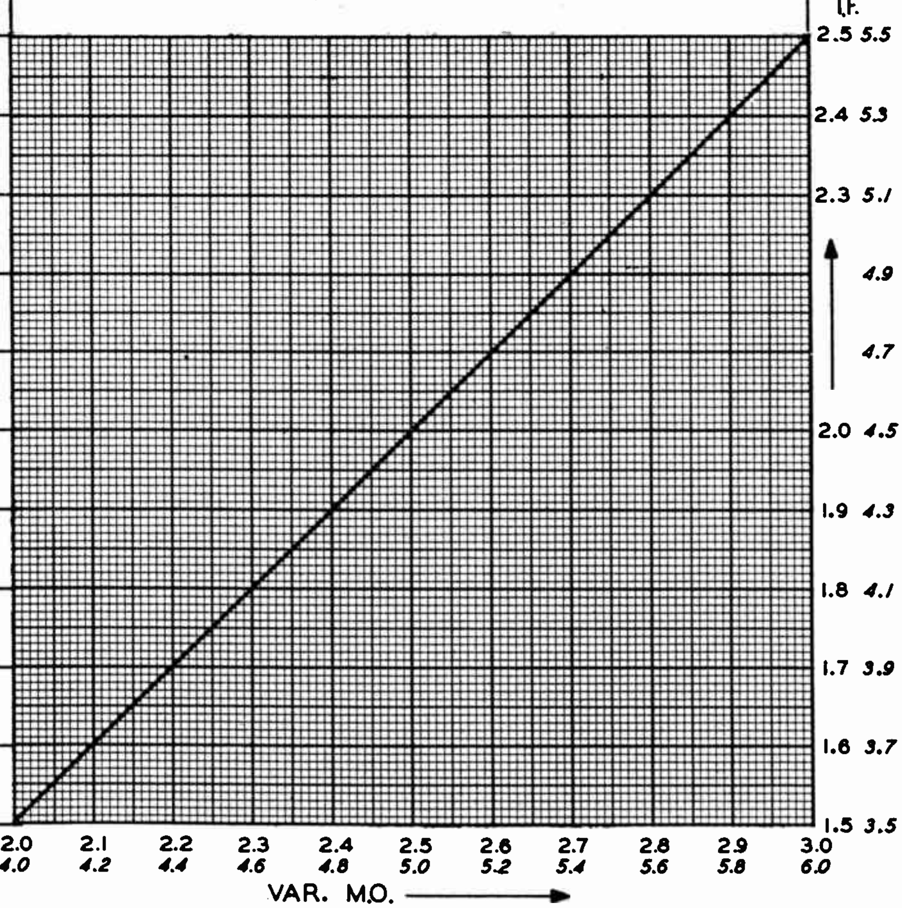


CHART OF CIRCUIT FREQUENCIES VS DIAL READINGS

THEORY OF OPERATION

The frequency coverages of the r-f stages are:

80 meters = 3.2 to 4.2 mc	15 meters = 20.8 to 21.8 mc
40 meters = 6.8 to 7.8 mc	11 meters = 26.0 to 28.0 mc
20 meters = 14.0 to 15.0 mc	10 meters = 28.0 to 30.0 mc

The frequency coverages of the variable i-f are:

80, 40, 20, 15 meter bands = 2.5 to 1.5 mc
11 and 10 meter bands = 5.5 to 3.5 mc

In order to produce heterodynes suitable for amplification by the variable frequency i-f stage i.e. 2.5 to 1.5 mc or 5.5 to 3.5 mc, fixed frequency high frequency oscillator outputs are necessary. These are obtained by the use of a crystal oscillator and six crystals (one for each band). Since it is impractical to get crystals with fundamental frequencies as high as is necessary for the higher frequency bands, low frequency crystals and harmonic operation is employed.

Crystal frequencies vs harmonic output frequencies are shown below:

BAND	CRYSTAL FREQ (kc)	MULTIPLIER	OUTPUT FREQ (kc)
80	5700	1	5700
40	9300	1	9300
20	8250	2	16500
15	11650	2	23300
11	10500	3	31500
10	11166	3	33500

In each case, the high frequency oscillator harmonic output is higher in frequency than the received signal by 2.5 to 1.5 mc or 5.5 to 3.5 mc depending upon which band is being used.

Refer to figure 2-1. In order to get a 500 kc heterodyne for the second, or fixed, i-f amplifier stages, it is necessary to introduce another signal to beat against the variable i-f. Since the output of the variable i-f does change from 2.5 to 1.5 mc or 5.5 to 3.5 mc, the output frequency of this new signal must also be variable in the ranges 2.0 to 3.0 mc and 4.0 to 6.0 mc. These requirements are met by the use of a Collins 70E-7 precision oscillator. The fundamental output frequency range of this oscillator is 2.0 to 3.0 mc. The second harmonic therefore, would be 4.0 to 6.0 mc, the 4.0 to 6.0 mc output being used when the variable i-f is 5.5 to 3.5 mc (when tuning in the 11 and 10 meter bands).

This 500 kc difference frequency is amplified by two stages of fixed i-f amplification, the output of which is detected and sent through the noise limiter and audio amplifiers.

The beat frequency oscillator employed in this receiver is highly stabilized and the dial used in varying the frequency is calibrated +1 and -1 kc. This feature is useful in cw work, for reading frequency. If the dial is set at +1 kc, add 1 kc to the vernier dial reading for the exact frequency of the received station or if the dial is set at -1 kc, subtract 1 kc.

Summarizing the above description of the tuning scheme of the 75A receiver, it can be seen that the received signal beating against the output of a crystal oscillator produces an intermediate frequency which varies across the band. Therefore, a variable i-f amplifier is used, following the first mixer tube, which covers the frequency range of the beat note of this intermediate frequency. Now in order to get a 500 kc beat note, the output of a variable oscillator is beat against the output of the variable i-f stage. The 500 kc heterodyne thus produced is amplified by a fixed tuned amplifier.

The unequalled stability of the receiver is obtained because of the inherent stability of the quartz crystals in the first oscillator and the highly stabilized output of the 70E-7 variable frequency oscillator which operates in a frequency range more readily controlled.

Linear tuning is accomplished by the use of a cam wound oscillator coil which has the coil turns spaced non-linear in such a manner that linear movement of the tuning slug within the coil produces a linear frequency output of the oscillator. In addition, a mechanical frequency correcting mechanism is attached to the tuning slug. All coils which are tuned by movement of the tuning dial are wound in similar fashion.

The high degree of selectivity obtainable with this receiver is due to an efficient crystal filter circuit in addition to the many tuned circuits.

2-9. CRYSTAL FILTER. - Refer to figure 5-4. The crystal filter in the 75A receiver functions as follows. The 500 kc i-f channel input transformer T1 has a tuned primary which is tuned to the intermediate frequency. The secondary on this transformer is a low impedance coil, the center tap of which is grounded. One stator of phasing capacitor C71 is attached to one end of this secondary winding while one side of the filter crystal is attached to the other end. A bridge circuit is formed by attaching the rotor of the phasing control to the opposite side of the crystal. This point of attachment must return to ground (or center tap of the secondary coil) to complete the bridge circuit. This is done by means of the selectivity control

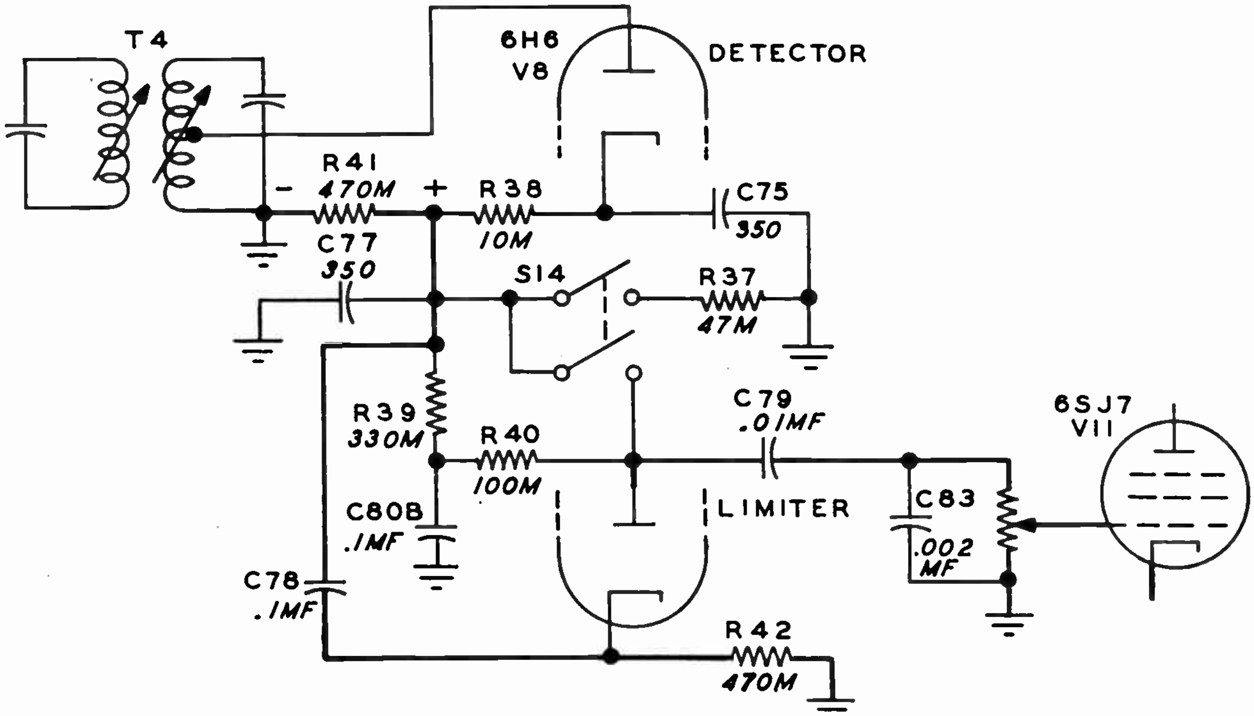


Figure 2-2 Noise Limiter Circuit

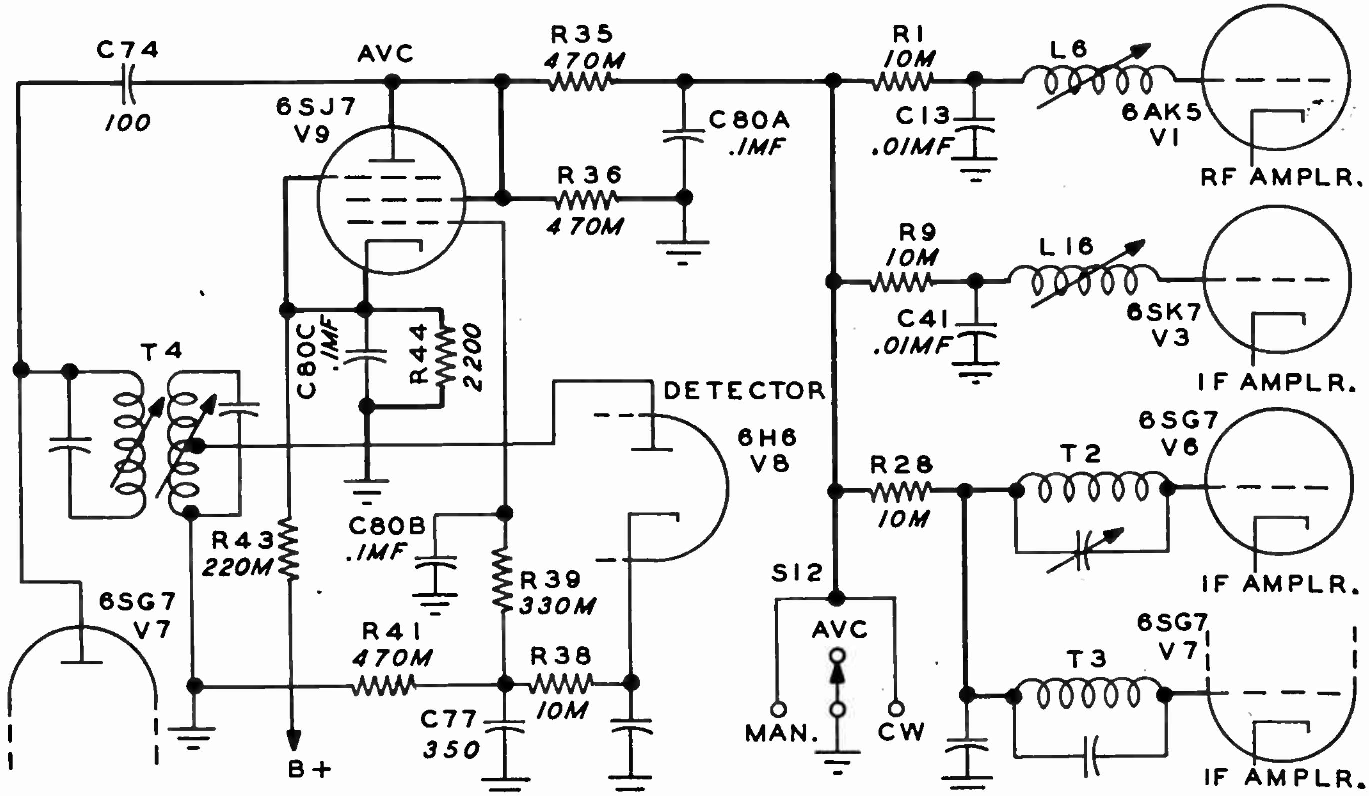


Figure 2-3 Automatic Volume Control Circuit

resistors R21, R22, and R23 or through i-f coil T2. The bridge circuit is necessary to balance out the capacity of the filter crystal holder plates to prevent the signal from by-passing the crystal. If the point of attachment of the rotor of C71 and the output plate of the crystal was returned directly to ground, the Q of the crystal would be at its highest point and the selectivity would be so great as to be almost unusable, therefore, resistors R21, R22, and R23 are placed in series with the crystal circuit to vary the Q. When the SELECTIVITY switch S11 is in the "0" position, the crystal is short circuited and the selectivity is determined by the receiver circuits only. When the SELECTIVITY control is in position "1", the crystal Q is at its lowest point because of the return circuit through T2 (a parallel tuned circuit having high impedance). When the SELECTIVITY control is at "2", the Q of the crystal circuit is improved because of the lower value of series resistance and so on through position 3 and 4 until at position 4 the series resistance is at the lowest usable value and the crystal Q is highest with a resultant high degree of selectivity.

Because the phasing capacity is across T2, detuning of T2 would normally occur when changing the setting of the phasing condenser. To neutralize this effect an additional set of stator plates has been placed on the phasing capacitor which compensates for this detuning effect.

2-10. NOISE LIMITER. - Refer to figure 2-2. One half of V-8, a type 6H6 tube, is used as a noise limiter. The circuit employed here is a new circuit developed for military use. In this circuit the negative half of the audio wave is automatically clipped at approximately 35% modulation by virtue of the heavy value of AC load impedance in the detector circuit. This eliminates the noise peaks from the negative half of the audio wave. However the noise peaks still appear on the positive halfof the audio wave so the automatic noise limiter is inserted in the circuit to remove these. This limiter is a series type limiter in that it is placed between the detector and the first audio stage. In operation, the plate of the noise limiter tube has a voltage, taken from the detector load resistor, placed upon it. Since this voltage is positive with respect to the limiter tube cathode, current flows throug this portion of the tube. This current is modulated at the cathode by audio from the detector through capacitor C78, thus the audio appears at the plate of the limiter tube from where it is fed to the grid of the audio amplifier tubes. Since the positive audio peaks appear as positive impulses across the detector diode load, the audio impulses through C78 are positive or in opposition to the negative potential on the cathode of the noise limiter tube. Whenever these positive audio impulses get high enough in amplitude to cancel this negative cathode potential, the tube ceases drawing plate current and the audio is interrupted. The value of plate voltage applied to the limiter plate can be set by varying the sizes of the circuit components therefore the cut-off point can be set at any degree of modulation desired. In the

75A receiver this is set at approx. 35% modulation. As a result, any degree of modulation above approx. 35% is clipped on both the positive and negative halves of the audio; therefore, any noise impulses which are greater than 35% modulation are also clipped off. Since the operating voltage for the limiter is taken from the detector load resistor, the clipping level is always at approx. 35% regardless of how weak or how strong the signal becomes. In-as-much as regular speech frequencies do not suffer in intelligibility to any great extent under such circumstances, this system makes an efficient noise limiter.

A filter composed of R39, C80B, and R40 is inserted in the noise limiter plate return to prevent any of the audio from the diode load resistor reaching the noise limiter output directly rather than through the noise limiter tube. A switch, S14, has been placed in the circuit to by-pass the noise limiter where operating conditions do not require its use.

2-11. AUTOMATIC VOLUME CONTROL. - In order that the receiver may operate at peak efficiency on weak signals, a system of delayed AVC is employed. Refer to figure 2-3. Notice that the cathode of V9 is connected to ground through a voltage divider consisting of R43 and R44. B+ voltage is introduced to the cathode of V9 through R43. This places the delay voltage on the cathode of V9. The plate of V9 is coupled to the i-f amplifier through C74 and therefore, as soon as the received signal becomes strong enough to overcome the positive bias on the cathode of V9, rectification of the signal takes place and AVC control voltage appears across the load resistor R36. At the same time, rectification of the i-f signal is taking place in the detector circuit, and since the grid of the AVC tube, V9, is connected to the positive side of the detector load resistor, the delay voltage is being cancelled by the positive detector voltage. Therefore, the delay voltage is cancelled out allowing the full AVC voltage to be realized, and at the same time an accelerating effect is produced allowing the S-meter to begin functioning sooner than in other delay circuits.

AVC voltage developed across load resistor R36 is fed to the controlled stages through filter resistor R35. Filter resistor R35 and filter capacitor C80A remove AC components from the AVC line. The r-f amplifier, variable i-f, and the first and second fixed i-f stages have AVC voltage applied to them.

SECTION III

INSTALLATION AND INITIAL ADJUSTMENTS

3-1. INSTALLATION.

3-2. UNPACKING. - Refer to figure 1-1. The model 75A Receiving Equipment is packed in a number of heavy cartons. Refer to the packing slip for a list of all equipment supplied. Open packing cartons carefully to avoid damage to the units within. Remove the packing material and carefully lift the units out of the cartons. Search all of the packing material for small packages. Two extra pilot lamp bulbs and one extra fuse are included with each equipment. Inspect each unit for loose screws and bolts. Be certain all controls such as switches, dials, etc., work properly. All claims for damage should be filed promptly with the transportation company. If a claim is to be filed, the original packing case and material must be preserved.

3-3. INSTALLATION PROCEDURE.

3-4. GENERAL. - The reciver is intended primarily for table mounting. Before attempting to relay rack mount the receiver, make certain the rack has a large enough opening. The receiver and speaker cabinets are both equipped with rubber feet and may be mounted on any table.

When choosing a location for the receiver, consideration should be given to convenience of power, antenna and ground connections, placement of cables and to maintenance.

3-5. CONNECTIONS.

3-6. ANTENNA AND GROUND. - Viewing the receiver from the rear, the antenna and ground connections are at the extreme right hand side of the chassis. Terminals number 1 and 2 should be used for antenna connections if a balanced antenna is employed. If an unbalanced antenna is used for general coverage, connect the antenna to terminal #1 and jumper terminal #2 to ground (G). Connect a good external ground to the G terminal regardless of what kind of an antenna is used. It is recommended that a balanced antenna of good construction and well in the clear be employed. An antenna cut to the operating frequency employing 300 ohm feeders will have optimum sign signal to noise ration but will have directional characteristics and be most efficient on the one band.

3-7. SPEAKER. - Viewing the receiver from the rear, the speaker connections are at the left hand side of the chassis. Two output impedances are available, 500 ohms and 4 ohms, Terminal C is the common terminal while the second terminal from the left is the 4 ohm connection and the third terminal from the left is the 500 ohm connection. The model 270G-1 speaker should be connected to the 4 ohm terminals.

3-8. AUXILIARY.

a. STANDBY. - A pair of terminals located at the rear of the chassis marked "STD BY RELAY" is provided for connecting a relay or other similar device for automatically disabling the receiver for break-in operation. These terminals break the cathode circuits of certain tubes and are in parallel with contacts on the OFF-FIL ON-B+ switch. If these connections are used, they will be operable when the OFF-FIL ON-B+ switch is in the FIL ON position and shorted when this switch is in the B+ position.

b. CW BREAK-IN. - Terminals at the rear of the chassis marked "G" and "B" are provided for CW break-in. The receiver can be muted during CW operation by applying a +20 volt potential to the terminal marked "B". This potential can be obtained from the cathode of a keyed stage (providing it is biased to cut-off) or from a "B" battery connected through the keying relay to the receiver muting terminal. Also, if the transmitter is cathode keyed, a resistor can be inserted in series with the key and ground and the muting voltage taken from across this resistor. Terminal "G" must be connected to the transmitter ground if receiver muting is employed.

Note that this muting system does not provide protection to the input of the receiver. Protection of the input circuits of the receiver is a separate problem. It is recommended that a small neon bulb be connected between antenna and ground terminals of the receiver for this purpose. In the event a high powered transmitter is used, it is recommended that an antanna-ground shorting relay be used in addition to the neon bulb.

3-9. POWER. - Power connections to the receiver are made by means of a 5-1/2 foot permanently attached power cord. The end of the cord is equipped with a standard AC plug. The equipment consumes 80 watts of 115 volts 50/60 cps power.

3-10. HEADPHONES.- Headphone connections are made by means of a panel jack and a standard 1/4" dia. plug. 500 ohm headphones should be employed, however, any higher impedance phones will be quite satisfactory.

3-11. TUBES. - Before turning the equipment on for the first time, inspect the tubes and see that they are in the correct positions and firmly seated in their respective sockets. Be sure the tube shields are on the type 6AK5 tubes.

3-12. FUSE. - The fuse is located on top of the chassis near the rear right hand corner. Contained within an extractor type fuse post, the fuse can be removed for inspection by turning the cap of the post to the left and pulling straight back until the cap and fuse comes free.

3-13. INITIAL ADJUSTMENTS.

3-14. GENERAL. - As shipped from the factory, there are no adjustments which will be necessary to place the receiver in immediate operation, however, the S-meter can be adjusted for various antennas if desired. The S-meter has been set to read S-9 with a 100 microvolt signal presented to the antenna terminals from a 300 ohm load. If desired, the S-meter can be allowed to remain as adjusted at the factory, in which case, the receiver is ready to operate. Refer to SECTION IV for FUNCTIONS OF CONTROLS and operating notes.

3-15. S-METER ADJUSTMENT. - In event a beam antenna is used on the receiver, the S-meter can be set back to correspond to the gain of the antenna thus allowing a more accurate reading. To do this it will be necessary to know the approximate gain of the beam. If this is known, a signal can be tuned in and the SENSITIVITY adjustment (see figure 5-2) can be rotated until the S-meter reading is a comparable amount lower. (One S unit equals 6 db on the meter). After adjusting the sensitivity of the meter, short circuit or remove the antenna and adjust the meter for zero reading with the ZERO adjustor.

MUTING COLLINS 75A-1 RECEIVER FOR CW BREAK-IN OPERATION

A method has been worked out wherein the 75A-1 Receiver may be silenced when CW break-in operation is desired. This muting is accomplished by applying a 20 volt positive potential to the cathode (pin #8) of the 6H6 detector limiter tube (V7) when the transmitting key is closed. This 20 volts should drop to zero when the key is up. A one half megohm isolating resistor should be connected to the socket pin #8 of V7 in series with the lead running out to the plus 20 volts.

One place this muting voltage may be obtained is from the voltage drop across a cathode resistor in the transmitter. The tube in the transmitter whose cathode resistor is used for this purpose should be a tube which is biased to cut off when the transmitter key is open.

It is necessary that a common ground connection be used between receiver chassis and transmitter chassis.

This voltage may also be obtained from a B battery or a low voltage power supply, and its application to pin #8 of V7 in the receiver may be controlled by a relay which in turn is operated by the transmitter keying circuit.

In the event cathode keying is used in the transmitter, a resistor may be placed between key and ground, and the voltage drop across this resistor may be used to supply the muting voltage.

CAUTION

You will note that this muting system does not provide protection to the input of the receiver. Protection of the input circuits of the receiver is a separate problem. It is recommended that a small neon bulb be connected between antenna and ground terminals of the receiver for this purpose. In the event a high powered transmitter is used, it is reccommended that an antenna-ground shorting relay be used in addition to the neon bulb.

13650

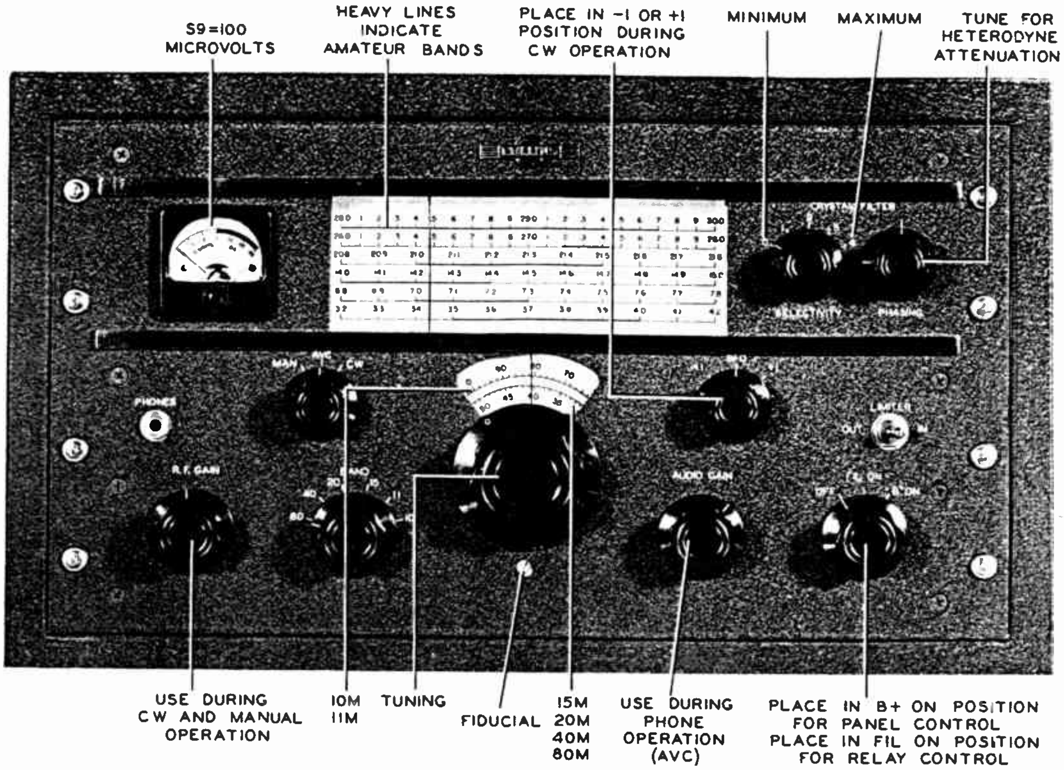


FIGURE 4-1 OPERATING CONTROLS

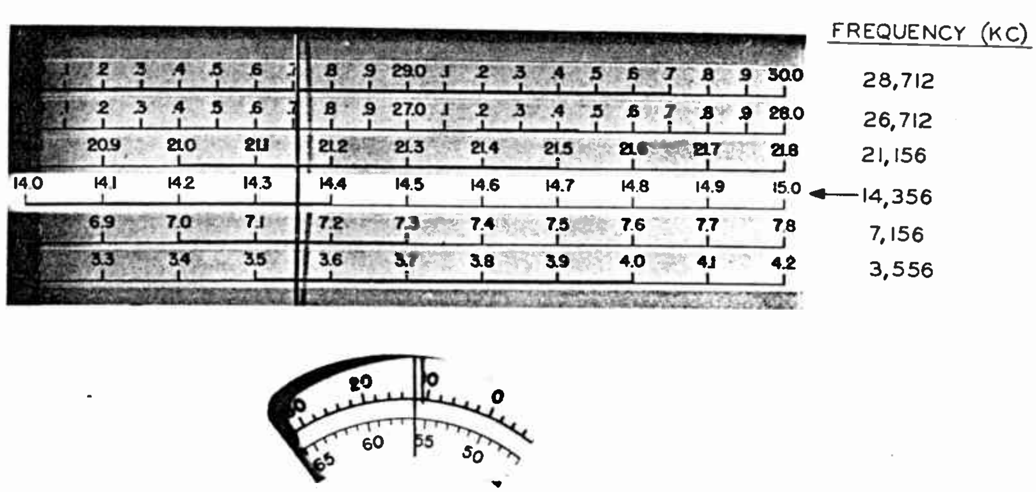


FIGURE 4-2 TYPICAL DIAL READINGS

SECTION IV

OPERATION

4-1. GENERAL.

This section contains only the information necessary for adjusting the 75A receiver during normal operation.

4-2. FUNCTION OF CONTROLS.

4-3. OFF - FIL ON - B+ ON. - See figure 4-1. This knob controls the plate and filament power in the receiver. In the OFF position this control turns the receiver completely OFF. In normal operation the control is turned to the B+ ON position. During stand-by, the control can be turned to the FIL ON position thus disabling the receiver but allowing the tube filaments to remain heated.

4-4. BAND SWITCH. - The BAND switch, located at the left of the TUNING dial, selects the amateur band upon which reception is desired and at the same time illuminates both the correct dial scale in the slide-rule dial, and the correct portion of the vernier dial.

4-5. MAN-AVC-CW. - This control is provided to select either automatic or manual volume control and to turn the beat frequency oscillator on for CW reception.

4-6. TUNING.- The TUNING Control is equipped with a large knob for ease and comfort in operation. Two scales make up the tuning dial. The slide rule dial is calibrated in divisions of 100 kc each while the vernier dial is calibrated in 1 kc divisions on the 80,40, 20, and 15 meter bands and 2 kc divisions on the 11 and 10 meter bands. The upper scale on the vernier dial is 2 kc per division, the lower scale is 1 kc per division. The proper scales on both dials are illuminated by operation of the BAND switch.

In reading the TUNING dial, it is merely necessary to combine the vernier dial reading with the slide-rule dial reading. Thus the 10 meter dial reading in figure 4-2, would be 28712 kc. The vernier dial supplies the last two figures of the frequency in kilocycles on all bands whereas the slide-rule dial supplies the first two figures of the frequency in kilocycles in the 80 and 40 meter bands and the first three figures in the 20, 15, 11 and 10 meter bands.

4-7. CRYSTAL FILTER.

a. SELECTIVITY. - The selectivity of the receiver is varied with the SELECTIVITY control. The band width is adjustable in 5 steps from 4 kc to 200 cycles at 2 times down (6 db down from the peak of the resonant frequency). Position 0 is broad tuning while position 4 is sharp tuning.

b. PHASING. - The phasing control is used primarily to assist in rejecting interfering heterodynes. The control when positioned on the panel mark (straight up), is properly set for crystal phasing. In the event a high frequency heterodyne is interfering with reception, the control should be moved back and forth in the vicinity of the panel mark until the heterodyne is attenuated. If the heterodyme is low frequency (low pitched whistle) the control should be moved farther out from the panel mark on either side.

4-8. BFO. - The beat frequency oscillator control is located to the right of the vernier tuning dial. This control is used only during CW reception. Because of the high degree of selectivity obtainable with this receiver, it is important that the BFO control be used properly during CW reception. The control should be operated to +1 or -1 on the panel to obtain the beat note, do not allow the BFO control to remain at "0" setting and detune the tuning dial to obtain the beat note, since this would result in a loss of signal strength. If an accurate frequency check of the received signal is wanted tune the signal to zero beat with the TUNING dial then add 1 kc to the dial reading if the BFO control is set at +1 or subtract 1 kc if the control is set at -1.

4-9. RF GAIN. - The RF GAIN control is connected in the cathode circuits of the r-f amplifier, the second mixer, and the second 500 kc i-f stages. It is used when manual volume control is desired. Operating the MAN-AVC-CW switch to MAN or CW connects the control into the circuit and disables the AVC circuit.

4-10. AUDIO GAIN. - The AUDIO GAIN control is used to control the audio amplification of the receiver. This control is used primarily during radio telephone reception when the automatic volume control is functioning.

4-11. PHONES. - The phones jack is located on the front panel of the receiver. Any headphone may be employed, 500 ohm impedance preferred. The speaker is automatically disconnected when the headphones are plugged in.

4-12. LIMITER. - The LIMITER switch controls the use of the automatic noise limiter.

4-13. MOVEABLE FIDUCIAL. - The line on the vernier dial can be set to exact frequency by tuning in a signal from a frequency standard and moving the fiducial to correspond. (WWV can be found at 15 MC on the 20 meter band).

4-14. OPERATION. - While the 75A receiver contains many new and improved principles and circuits, a simplicity of operation found in few other receivers has been obtained. Familiarity with the FUNCTIONS OF CONTROLS, paragraphs 4-2 through 4-11 and reference to figure 4-1 will enable any amateur to operate the receiver. For those not familiar with the amateur bands, the following paragraphs are written.

OPERATION

The postwar amateur bands, upon which standard equipment can be expected to operate, are converted to frequency as follows:

80 meter band = 3500 to 4000 kc
40 meter band = 7000 to 73000 kc
20 meter band = 14000 to 14400 kc
11 meter band = 27195 to 27455 kc
10 meter band = 28000 to 29700 kc

An additional band, the 15 meter band (21000 to 21500 kc) is pending; therefofe, it also is included in the 75A receiver.

The BAND switch calibration is in meters.

Each amateur band is indicated with a heavy line on the slide-rule dial; therefore, the band is quickly found during band change.

While the United States amateur is allowed to operate only within the frequency limits of 28000 to 29700 kc on the 10 meter band, some foreign amateurs are allowed to operate to 30,000 kc. This has been taken care of by extending the 10 meter scale to 30,000 kc in the 75A receiver, however, the heavy line only covers the band to 29700 kc.

MAINTENANCE

5-1. INSPECTION

5-2. GENERAL. - This radio equipment has been constructed of materials considered to be the best obtainable for the purpose and has been carefully inspected and adjusted at the factory to reduce maintenance to a minimum. However, a certain amount of checking and servicing will be necessary to maintain efficient and dependable operation. The following section has been written to aid in checking the equipment.

5-3. ROUTINE INSPECTION. - Routine inspection schedules should be set up for periodic checks of this equipment. This inspection should include examination of the mechanical system for excessive wear or binding and of the electrical system for electrical defects and deterioration of components.

If the routine inspection of the equipment is carried out faithfully, the chances of improper operation of the equipment are greatly minimized. It is, therefore, important that this inspection be made as frequently as possible and it should be sufficiently thorough to include all major electrical circuits of the equipment as well as the mechanical portion.

5-4. CLEANING. - The greatest enemy to uninterrupted service in equipment of this type is corrosion and dirt. Corrosion itself is accelerated by the presence of dust and moisture on the component parts of the assembly. It is impossible to keep moisture out of the equipment in certain localities, but foreign particles and dust can be periodically removed by means of a soft brush and a dry, oil-free jet of air. Remove the dust as often as a perceptible quantity accumulates in any part of the equipment. It is very important that rotating equipment such as variable condensers and tap switches be kept free from dust to prevent undue wear.

One of the greatest sources of trouble in equipment located in a salt atmosphere is corrosion. Corrosion resulting from salt spray or salt laden atmosphere may cause failure of the equipment for no apparent reason. In general it will be found that contacts such as tap switches, tube prongs, cable plug connectors and relay contacts are most affected by corrosion. When it is necessary to operate the equipment in localities subject to such corrosive atmosphere, inspection of wiping contacts, cable plugs, relays etc., should be made more frequently in order to keep the equipment in good condition.

5-5. VACUUM TUBES. - Make a check of emission characteristics of all tubes. After the emission check, examine the prongs on all tubes to make sure that they are free from corrosion. See that all tubes are replaced correctly and firmly seated in their sockets, and a good electrical contact is made between the prong of the tube and the socket. Before a tube is discarded, make certain that the tube is at fault and the trouble is not a loose or broken connection within the equipment.

A complete set of tested tubes of the same type specified should be kept on hand at all times. If faulty operation of the equipment is observed and tube failure suspected, each tube may be checked by replacing it with a tube known to be in good condition. Defective tubes causing an overload in power circuits may usually be located by inspection. It will be found that excessive heating or sputtering within the vacuum tubes is a good indication of a fault in the tube circuit.

If tubes have been in use for a period of time equal to or exceeding the manufacturers tube life rating, it is suggested that they be replaced. A marked improvement in the performance of the equipment is usually noticeable after the weak tubes have been replaced.

5-6. TUBE REPLACEMENT PRECAUTIONS.

a. All tubes are removed by pulling straight up on them.

b. Before a tube is inserted, make certain that the type of tube is correct for the socket into which it is being placed.

5-7. TUBE TABLE.

RECEIVER:

Symbol	Type	Function
V1	6AK5	RF amplifier
V2	6SA7	First mixer
V3	6SK7	First i-f amplifier
V4	6L7	Second mixer
V5	6AK5	Crystal h-f oscillator
V6	6SG7	500 kc i-f amplifier
V7	6SG7	500 kc i-f amplifier
V8	6H6	Noise limiter
V9	6SJ7	AVC
V10	6SJ7	BFO
V11	6SJ7	Audio amplifier
V12	6V6	Output tube
V13	6SJ7	Variable frequency oscillator
V14	5Y3 GT	Rectifier

5-8. TROUBLE SHOOTING

5-9. GENERAL. - The most general cause of improper operation of radio equipment is tube failure. Refer to paragraph 5-5 in this section for comments concerning vacuum tube replacement. Defective tubes causing an overload in power circuits may usually be located by inspection. Corrosion resulting from operating the equipment in a salt laden atmosphere may cause failure of the equipment for no apparent reason.

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.

5-10. NO ONE BUT AN AUTHORIZED AND COMPETENT SERVICE MAN EQUIPPED WITH PROPER TEST FACILITIES SHOULD BE PERMITTED TO SERVICE THIS EQUIPMENT.

5-11. FUSES.

5-12. GENERAL. - 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. Always replace the fuse with a fuse of 2 amp rating.

5-13. ALIGNMENT.

5-14. GENERAL. - Should the receiver get out of alignment, it is recommended that it be aligned at once since misalignment would cause unsatisfactory performance.

5-15. EQUIPMENT AND TOOLS USED FOR ALIGNMENT.

a. 500 kc to 30 mc signal generator.

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

c. Fiber or bakelite adjusting tool, 5/16" diameter with screwdriver type bit.

d. Small screwdriver.

5-16. 500 KC IF. - The i-f frequency for this receiver is the exact frequency of the filter crystal and will be within one or two kc of 500 kc. Thus the first step in 500 kc i-f alignment is to determine the exact frequency of the crystal. This is done by turning the receiver ON and attaching the 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. T2 (and T1) can be adjusted from either the top or the bottom of the receiver.

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.

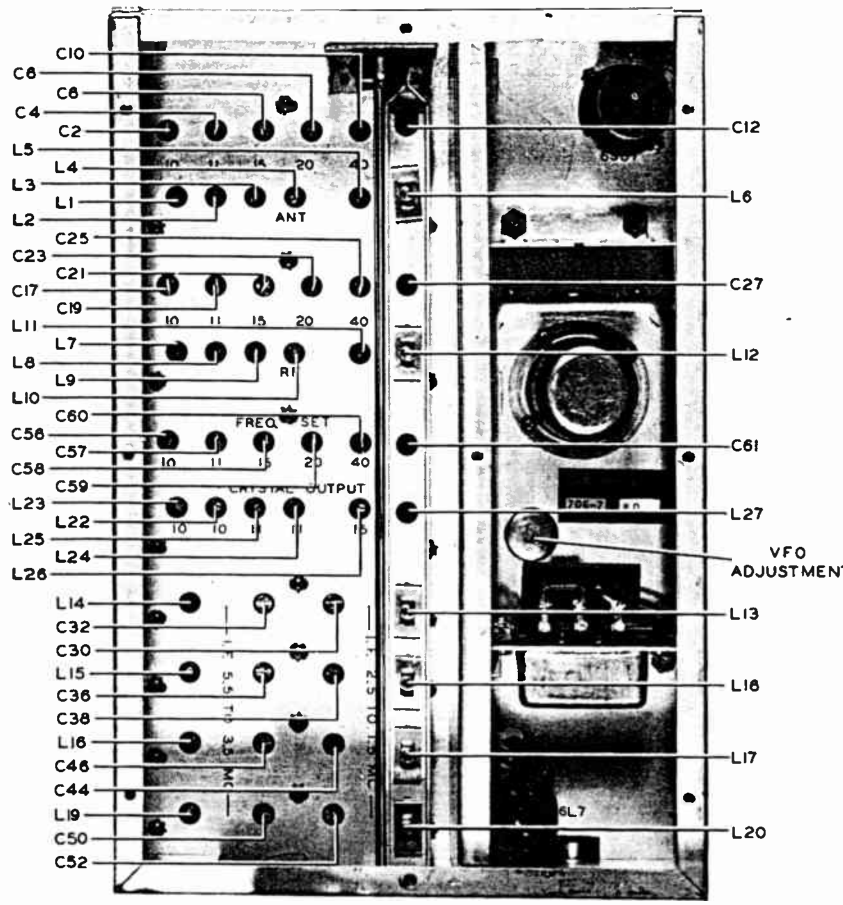


FIGURE 5-1 RF, VARIABLE IF, AND OSCILLATOR ADJUSTMENT

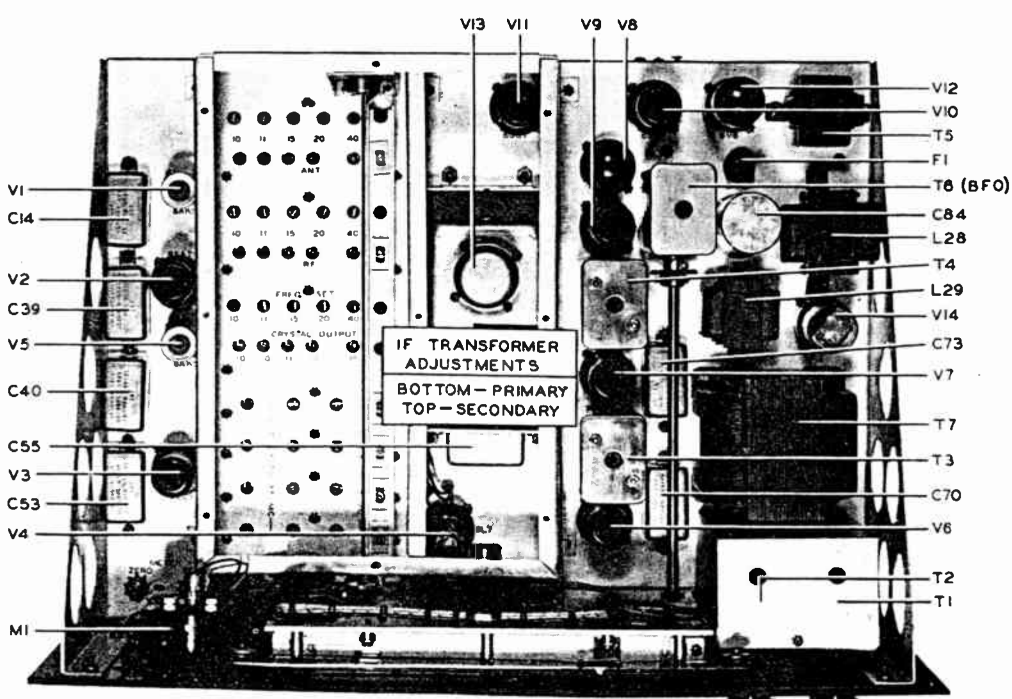


FIGURE 5-2 75A RECEIVER-TOP OPEN

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 per cent 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 2 mc 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 again.

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.117ac

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

TUBE: V2 6SA7 First mixer

Pin No.	Function	Resistance	Voltage
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

TUBE: V4 6L7 Second Mixer

Pin No.	Function	Resistance	Voltage
1	Shell	0	0
2	Heater	0.2	6.3 ac
3	Plate	30,000	220
4	Grids #2 and #4	55,000	125
5	Grid #3	0.9	0
6	*TP	220	2.1
7	Heater	0	0
8	Cathode & Grid #5	1,000**	8
Cap	Grid #1	100,000	0

TUBE: V5 6AK5 Crystal Oscillator

Pin No.	Function	Resistance	Voltage
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.

Pin No.	Function	Resistance	Voltage
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

Pin No.	Function	Resistance	Voltage
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

Pin No.	Function	Resistance	Voltage
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	10M
Volts	-2.6	-2.6	-6.2	-6.4	-8.3	-4.7

5-39. VFO ACTIVITY TEST

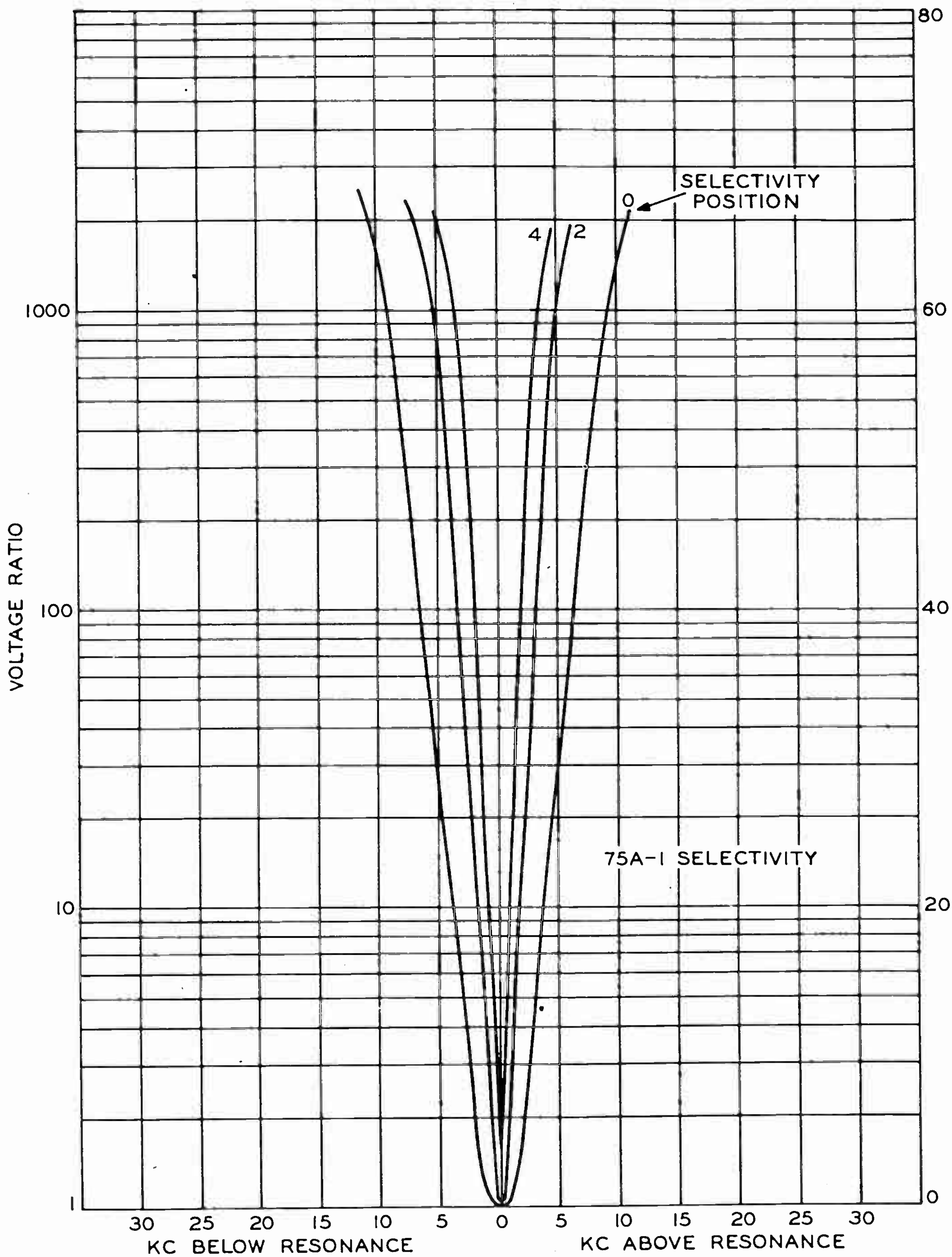
Conditions: No signal, Manual Operation, RF gain full ON, B + ON, pin #8 on V4 grounded,

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.



SELECTIVITY POSITION
0
4
2
75A-1 SELECTIVITY
VOLTAGE RATIO
1000
100
10
1
DB ATTENUATION
80
60
40
20
0
30 25 20 15 10 5 0 5 10 15 20 25 30
KC BELOW RESONANCE
KC ABOVE RESONANCE

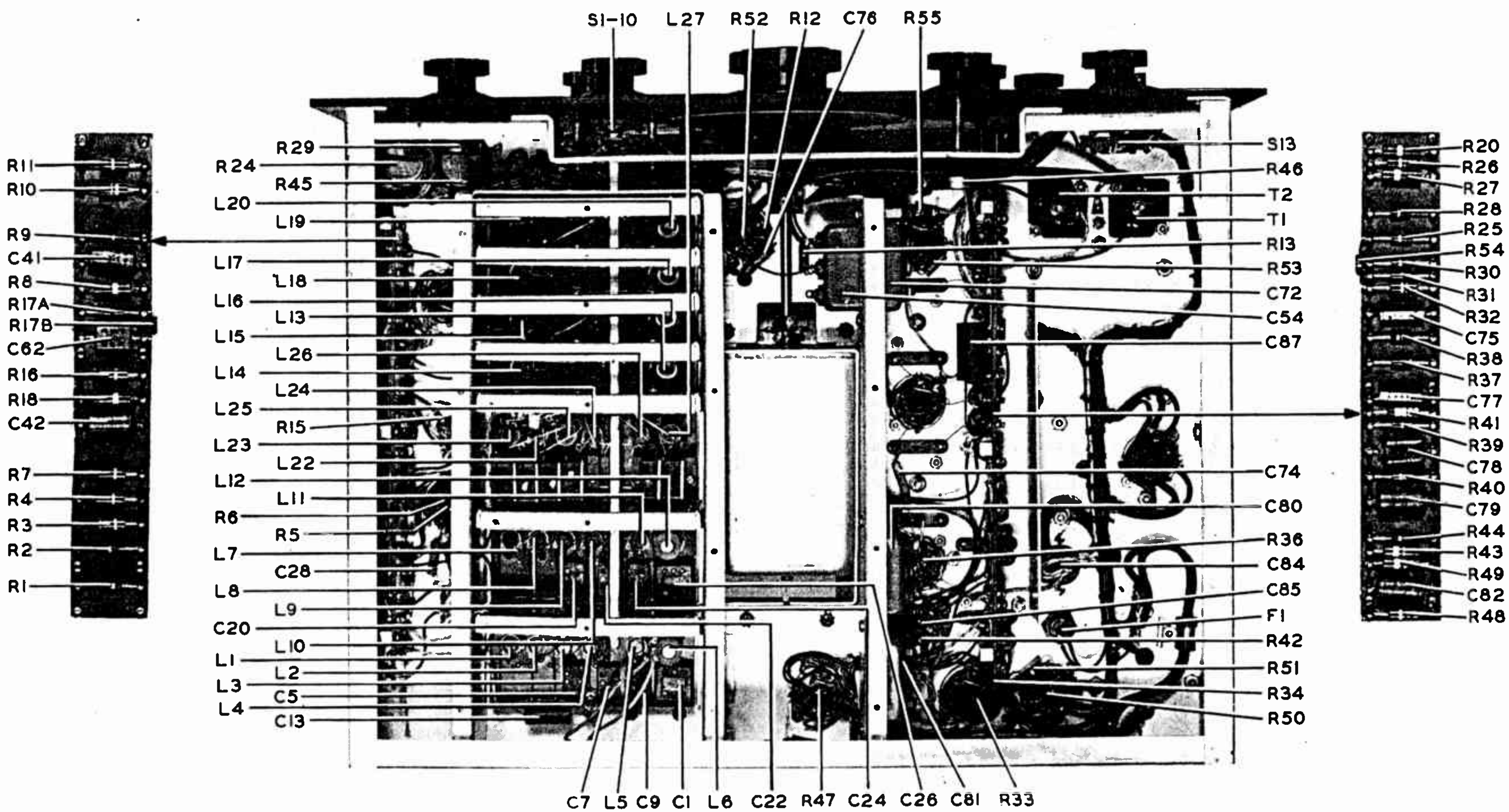


FIGURE 5-3 75A RECEIVER — BOTTOM OPEN

PARTS LIST

75A-1 RECEIVER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C1	R-F amplifier grid padder	CAPACITOR: 10 mmf ±5%; 500 WV	912 4103 10
C2	10 meter trimmer	CAPACITOR: 4.5 mmf to 25.0 mmf; 1000 TV; 500 WV	917 1006 00
C3		CAPACITOR: Not used	
C4	11 meter trimmer	CAPACITOR: 4.5 mmf to 25.0 mmf; 500 WV	917 1006 00
C5	15 meter padder	CAPACITOR: 68. mmf ±10% 500 WV	935 0099 00
C6	15 meter trimmer	CAPACITOR: 4.5 mmf to 25.0 mmf; 500 WV	917 1006 00
C7	20 meter padder	CAPACITOR: 100 mmf ±5%; 500 WV	912 3103 10
C8	20 meter trimmer	CAPACITOR: 5 mmf to 50 mmf; 500 WV	917 1007 00
C9	40 meter padder	CAPACITOR: 250 mmf ±5%; 500 WV	912 3253 10
C10	40 meter trimmer	CAPACITOR: 5 mmf to 50 mmf; 500 WV	917 1007 00
C11	80 meter padder	CAPACITOR: 620 mmf ±2%; 500 WV	935 4203 00
C12	80 meter trimmer	CAPACITOR: 5 mmf to 50 mmf; 500 WV	917 1007 00
C13	V-1 grid de-coupling	CAPACITOR: 0.01 mf +40 -20%; 600 WV	931 0195 00
C14	C14A, C14B, C14C	CAPACITOR: Triple section; 0.1 mf per section ±20%; 400 WV	961 6045 00
C14A	V1 screen bypass		
C14B	V1 plate decoupling		
C14C	V2 cathode by-pass		
C15	V1 cathode bypass	CAPACITOR: 0.01 mf +40 -20%; 600 WV	931 0195 00
C16	V2 grid padder	CAPACITOR: 10 mmf ±5%; 500 WV	912 4103 10
C17	10 meter trimmer	CAPACITOR: 4.5 mmf to 25.0 mmf; 500 WV	917 1006 00
C18		CAPACITOR: Not used	
C19	11 meter trimmer	CAPACITOR: 4.5 mmf to 25.0 mmf; 500 WV	917 1006 00
C20	15 meter padder	CAPACITOR: 68 mmf ±10% 500 WV	935 0099 00
C21	15 meter trimmer	CAPACITOR: 4.5 mmf to 25.0 mmf; 500 WV	917 1006 00
C22	20 meter padder	CAPACITOR: 100 mmf ±5%; 500 WV	912 3103 10

PARTS LIST

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C23	20 meter trimmer	CAPACITOR: 5 mmf to 50 mmf; 500 WV	917 1007 00
C24	40 meter padder	CAPACITOR: 250 mmf ±5%; 500 WV	912 3253 10
C25	40 meter trimmer	CAPACITOR: 5 mmf to 50 mmf; 500 WV	917 1007 00
C26	80 meter padder	CAPACITOR: 620 mmf ±2%; 500 WV	935 4203 00
C27	80 meter trimmer	CAPACITOR: 5 mmf to 50 mmf; 500 WV	917 1007 00
C28	V1 plate blocking	CAPACITOR: 100 mmf ±20%; 500 WV	935 0107 00
C29	H.F. i-f primary padder 1.5 to 2.5mc	CAPACITOR: 330 mmf ±5%; 500 WV	935 0126 00
C30	H.F. i-f primary trimmer 1.5 to 2.5 mc	CAPACITOR: 5 mmf to 50 mmf; 500 WV	917 1007 00
C31	H.F. i-f primary padder	CAPACITOR: 51 mmf ±5%; 500 WV	912 0297 00
C32	H.F. i-f trimmer 3.5 to 5.5 mc	CAPACITOR: 4.5 mmf to 25.0 mmf; 500 WV	917 1006 00
C33	H.F. i-f coupling 1.5 to 2.5 mc	CAPACITOR: 5 mmf ±20%; 400 WV	913 0100 00
C34	H.F. i-f coupling 3.5 to 5.5 mc	CAPACITOR: 1 mmf ±20%; 400 WV	913 0109 00
C35	H.F. i-f secondary padder	CAPACITOR: 51 mmf ±5%; 500 WV	912 0297 00
C36	H. F. i-f secondary trimmer 3.5-5.5mc	CAPACITOR: 45 mmf to 25.0 mmf; 500 WV	917 1006 00
C37	H.F. i-f secondary padder 1.5 - 2.5 mc	CAPACITOR: 330 mmf ±5%; 500 WV	935 0126 00
C38	H.F. i-f secondary trimmer 1.5 - 2.5 mc	CAPACITOR: 5 mmf to 50 mmf; 500 WV	917 1007 00
C39	C39A, C39B, C39C	CAPACITOR: Triple section; 0.1 mf per section; ±20%; 400 WV	961 6045 00
C39A	V2 screen by-pass		
C39B	V5 plate decoupling		
C39C	V5 screen by-pass		

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C40	C40A, C40B, C40C	CAPACITOR: Triple section; 0.1 mf per section ±20%; 400 WV	961 6045 00
C40A	Filament by-pass		
C40B	V2 plate decoupling		
C40C	V3 cathode by-pass		
C41	V3 grid decoupling	CAPACITOR: 0.01 mf + 40 - 20%; 600 WV	931 0195 00
C42	B+ by-pass	CAPACITOR: 0.01 mf +40 -20%; 600 WV	931 0195 00
C43	H.F. i-f primary padder 1.5 - 2.5 mc	CAPACITOR: 330 mmf ±5%; 500 WV	935 0126 00
C44	H.F. i-f primary trimmer 1.5 - 2.5 mc	CAPACITOR: 5 mmf to 50 mmf; 500 WV	917 1007 00
C45	H.F. i-f primary padder	CAPACITOR: 51 mmf ±5%; 500 WV	912 0297 00
C46	H.F. i-f primary trimmer 3.5 - 5.5 mc	CAPACITOR: 4.5 mmf to 25.0 mmf; 500 WV	917 1006 00
C47	H.F. i-f coupler 3.5 - 5.5 mc	CAPACITOR: 1 mmf ±20%; 400 WV	913 0109 00
C48	H.F. i-f coupler 1.5 - 2.5 mc	CAPACITOR: 5 mmf ±20%; 400 WV	913 0100 00
C49	H.F. i-f secondary padder	CAPACITOR: 51 mmf ±5%; 500 WV	912 0297 00
C50	H.F. i-f secondary trimmer 3.5 - 5.5 mc	CAPACITOR: 4.5 mmf to 25.0 mmf; 500 WV	917 1006 00
C51	H.F. i-f secondary padder 1.5 - 2.5 mc	CAPACITOR: 330 mmf ±5%; 500 WV	935 0126 00
C52	H.F. i-f secondary trimmer 1.5 - 2.5 mc	CAPACITOR: 5 mmf to 50 mmf; 500 WV	917 1007 00
C53	C53A, C53B,C53C	CAPACITOR: Triple section; 0.1 mf per section; ±20%; 400 WV	961 6045 00
C53A	Gain control by-pass		
C53B	V3 screen by-pass		
C53C	V3 plate decoupling		

PARTS LIST

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C54	C54A, C54B, C54C	CAPACITOR: Triple section; 0.1 mf per section; ±20%	956 3016 40
C54A	V4 cathode by-pass		
C54B	V4 screen by-pass		
C54C	B+ by-pass		
C55	C55A, C55B, C55C	CAPACITOR: Triple section; 0.1 mf per section; ±20%; 400 WV	961 6045 00
C55A	B+ by-pass		
C55B	B+ by-pass		
C55C	V13 filament by-pass		
C56	10 meter band crystal compensator	CAPACITOR: 5 mmf to 50 mmf; 500 WV	917 1007 00
C57	11 meter band crystal compensator	CAPACITOR: 5 mmf to 50 mmf; 500 WV	917 1007 00
C58	15 meter band crystal compensator	CAPACITOR: 5 mmf to 50 mmf; 500 WV	917 1007 00
C59	20 meter band crystal compensator	CAPACITOR: 5 mmf to 50 mmf; 500 WV	917 1007 00
C60	40 meter band crystal compensator	CAPACITOR: 5 mmf to 50 mmf; 500 WV	917 1007 00
C61	80 meter band crystal compensator	CAPACITOR: 5 mmf to 50 mmf; 500 WV	917 1007 00
C62	Feedback voltage divider	CAPACITOR: 68 mmf ±10%; 500 WV	935 0099 00
C63	10 meter crystal output padder	CAPACITOR: 51 mmf ±10%; 500 WV	916 0011 00
C64	10 meter crystal output padder	CAPACITOR: 51 mmf ±10%; 500 WV	916 0011 00
C65	11 meter crystal output padder	CAPACITOR: 51 mmf ±10%; 500 WV	916 0011 00
C66	11 meter crystal output padder	CAPACITOR: 51 mmf ±10%; 500 WV	916 0011 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C67	15 meter crystal output padder	CAPACITOR: 150 mmf ±2%; 300 WV	913 0017 00
C68	20 meter crystal output tuning	CAPACITOR: 350 mmf ±10%; 500 WV	913 0081 00
C69	Injection voltage coupling	CAPACITOR: 100 mmf ±20%; 500 WV	935 0107 00
C70	C70A, C70B, C70C	CAPACITOR: Triple section; 0.1 mf per section ±20%; 400 WV	961 6045 00
C70A	V4 plate decoupling		
C70B	V6 screen by-pass		
C70C	V6 plate decoupling		
C71	Crystal filter phasing	CAPACITOR: Dual section; 3 mmf ±1 mmf min, 10 mmf ±1 mmf max per section	922 0023 00
C72	C72A, C72B,C72C	CAPACITOR: Triple section; 0.1 mf per section; ±20%	956 3016 40
C72A	V7 grid decoupling		
C72B	Filament by-pass		
C72C	V6 cathode by-pass		
C73	C73A, C73B, C73C	CAPACITOR: Triple section; 0.1 mf per section; ±20%; 400 WV	961 6045 00
C73A	V7 cathode by-pass		
C73B	V4 screen by-pass		
C73C	V7 plate decoupling		
C74	AVC r-f coupling	CAPACITOR: 100 mmf ±20%; 500 WV	935 0107 00
C75	Detector r-f filter	CAPACITOR: 350 mmf ±20%; 500 WV	913 0082 00
C76	V4 cathode by-pass	CAPACITOR: 0.1 mf ±20%; 150 WV	931 0001 00
C77	Detector r-f filter	CAPACITOR: 350 mmf ±20%; 500 WV	913 0082 00
C78	Audio coupling	CAPACITOR: 0.1 mf ±20%; 150 WV	931 0001 00
C79	Audio coupling	CAPACITOR: 0.01 mf +40 -20%; 600 WV	931 0195 00
C80	C80A, C80B, C80C	CAPACITOR: Triple section; 0.1 mf per section ±20%	956 3016 40
C80A	AVC time constant		
C80B	Audio filter		
C80C	Det. cathode by-pass		
C81	C81A, C81B, C81C	CAPACITOR: Triple section; 0.1 mf per section;	956 3016 40
C81A	Transient filter		
C81B	V10 screen by-pass		
C81C	V11 screen by-pass		

PARTS LIST

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C82	V11-V112 Audio coupling	CAPACITOR: 0.01 mf +40 -20%; 600 WV	931 0195 00
C83	Equalizer capacitor	CAPACITOR: .002 mf ±20%; 300 WV	909 0005 00
C84 C84A C84B	C84A, C84B, Filter	CAPACITOR: Dual section; 40 mf per section; -15% +100%; 450 WV	183 1009 00
C85	BFO coupling	CAPACITOR: 1mmf ±1/4 mmf; 500 WV	916 4194 00
C86	Crystal shunt	CAPACITOR: 3 mmf ±1/2 mmf; 500 WV	916 4203 00
C87 C88	Gain control bypass	CAPACITOR: 10 mf +100% -10%; 50 WV	183 1008 00
C89	RF Bypass	CAPACITOR: 470 mmf ±20%; 500 WV	935 0135 00
C90	RF Bypass	CAPACITOR: 100 mmf ±20%; 500 WV	935 0107 00
F1	Primary fuse	FUSE: 2 amp; 250 v	264 4070 00
I1, I2, I3 I4 I5 I6 I7 I8 I9 I10 I11 I12	Dial lamp	LAMP: Midget flange base; T-1-3/4 bulb; 6 v; 0.200 amp	262 0023 00
I13	S meter lamp	LAMP: Pilot light bulb; frosted; miniature bayonet base; 6.8 v; .150 amp; 7/16" diam 1-1/8" lg	262 3230 00
I14, I15	Dial lamp	LAMP: Midget flange base; T-1-3/4 bulb; 6 v; 0.200 amp	262 0023 00
J1	Headphone jack	RECEPTACLE: Phone jack; 2 circuit; for use with 1/4" plug	360 0004 00
L1	10 meter r-f coil	COIL: 10 turns #28 DL enameled wire	503 1296 001
L2	11 meter r-f coil	COIL: 9 turns #28 DL enameled wire	503 1300 001
L3	15 meter r-f coil	COIL: 7 turns #28 DL enameled wire	503 1295 001
L4	20 meter r-f coil	COIL: 9 turns #28 DL enameled wire	503 1300 001
L5	40 meter r-f coil	COIL: 18 turns #28 DL enameled wire	503 1297 001
L6	80 meter r-f coil	COIL: Variable pitch wound; first coil; 17 turns, second coil; 3 turns #32 DL enameled wire	503 1318 002

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
L7	10 meter mixer coil	COIL: 10 turns #28 DL enameled wire	503 1296 001
L8	11 meter mixer coil	COIL: 9 turns #28 DL enameled wire	503 1300 001
L9	15 meter mixer coil	COIL: 7 turns #28 DL enameled wire	503 1295 001
L10	20 meter mixer coil	COIL: 9 turns #28 DL enameled wire	503 1300 001
L11	40 meter mixer coil	COIL: 18 turns #28 DL enameled wire	503 1297 001
L12	80 meter mixer coil	COIL: Variable pitch wound; 17 turns #32 DL enameled wire	503 1319 002
L13	Variable i-f coil 1.5 - 2.5 mc	COIL: Variable pitch wound; 56 turns #32 DL enameled wire	503 1317 002
L14	Variable i-f coil 3.5 - 5.5 mc	COIL: 88 turns 1/4" wide pie wound; 9-41 Litz wire	503 1294 001
L15	Variable i-f coil (secondary) 3.5 - 5.5 mc	COIL: 88 turns 1/4" wide pie wound; 9-41 Litz wire	503 1294 001
L16	Variable i-f coil (secondary) 1.5 - 2.5 mc	COIL: Variable pitch wound; 56 turns #32 DL enameled wire	503 1317 002
L17	Second mixer coil 1.5 - 2.5 mc	COIL: Variable pitch wound; 56 turns #32 DL enameled wire	503 1317 002
L18	Second mixer coil (secondary) 3.5 - 5.5 mc	COIL: 88 turns 1/4" wide pie wound; 9-41 Litz wire	503 1294 001
L19	Second mixer coil (secondary) 3.5 - 5.5 mc	COIL: 88 turns 1/4" wide pie wound; 9-41 Litz wire	503 1294 001
L20	Second mixer coil (secondary) 1.5 - 2.5 mc	COIL: Variable pitch wound; 56 turns #32 DL enameled wire	503 1317 002
L22	10 meter crystal coil	COIL: 5 turns #28 DL enameled wire	503 1298 001
L23	10 meter crystal coil	COIL: 5 turns #28 DL enameled wire	503 1298 001
L24	11 meter crystal coil	COIL: 5 turns #28 DL enameled wire	503 1298 001

PARTS LIST

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
L25	11 meter crystal	COIL: 5 turns #28 DL enameled wire	503 1298 001
L26	15 meter crystal	COIL: 6 turns #28 DL enameled wire	503 1299 001
L27	20 meter crystal	COIL: 6 turns #28 DL enameled wire	503 1299 001
L28	Power supply filter reactor	REACTOR: Filter; 3 henries; 100 ohms; 120 cps; 2500 TV rms	688 0020 00
L29	Power supply filter reactor	REACTOR: Filter; 5 henries; 300 ohms; 120 cps; 2500 TV rms	668 0019 00
M1	S meter	METER: Signal level; 1 ma dc at full scale; 45 ohms; 2% accuracy; illuminated dial	458 0044 00
P1	Power cord and plug	CONNECTOR: Two conductor flexible AC cord; standard AC plug	426 1003 00
R1	V1 grid decoupling	RESISTOR: 10,000 ohm ±10%; 1/2 watt	745 1128 00
R2	V1 cathode	RESISTOR: 220 ohm ±10%; 1/2 watt	745 1058 00
R3	V1 screen dropping	RESISTOR: 68,000 ohm ±10%; 1 watt	745 3163 00
R4	V1 plate decoupling	RESISTOR: 10,000 ohm ±10%; 1 watt	745 3128 00
R5	V2 grid decoupling	RESISTOR: .33 megohm ±10%; 1/2 watt	745 1191 00
R6	V2 cathode	RESISTOR: 220 ohm ±10%; 1/2 watt	745 1058 00
R7	V2 screen dropping	RESISTOR: 15,000 ohm ±10%; 1 watt	745 3135 00
R8	V2 plate decoupling	RESISTOR: 2200 ohm ±10%; 1 watt	745 3100 00
R9	V3 grid decoupling	RESISTOR: 10,000 ohm ±10%; 1/2 watt	745 1128 00
R10	V3 screen dropping	RESISTOR: 0.10 megohm ±10%; 1 watt	745 3170 00
R11	V3 plate decoupling	RESISTOR: 2200 ohm ±10%; 1 watt	745 3100 00
R12	V4 cathode	RESISTOR: 820 ohms ±10%; 1/2 watt	745 1083 00
R13	V4 screen dropping	RESISTOR: 22,000 ohm ±10%; 1 watt	745 3142 00
R14	V13 B+ filter	RESISTOR: 3300 ohm ±20%; 1/2 watt	745 1108 00
R15	V5 grid leak	RESISTOR: 0.10 megohm ±10%; 1/2 watt	745 1170 00
R16	V5 screen dropping	RESISTOR: 22,000 ohm ±10%; 1 watt	745 3142 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R17	40, 80 meter crystal load	RESISTOR: 470 ohm ±20%; 1/2 watt	745 1073 00
R17A R17B	V5 cathode	RESISTOR: 470 ohm ±20%; 1/2 watt	745 1073 00
R18	V5 plate decoupling	RESISTOR: 2200 ohm ±10%; 1 watt	745 3100 00
R19	V2 injector grid return	RESISTOR: 0.33 megohm ±10%; 1/2 watt	745 1191 00
R20	V4 plate decoupling	RESISTOR: 2200 ohm ±10%; 1 watt	745 3100 00
R21	Selectivity control resistor	RESISTOR: 0.10 megohm ±10%; 1/2 watt	745 1170 00
R22	Selectivity control resistor	RESISTOR: 22,000 ohm ±10%; 1/2 watt	745 1142 00
R23	Selectivity control resistor	RESISTOR: 4,700 ohm ±10%; 1/2 watt	745 1114 00
R24	S meter zero adjust	RESISTOR: 500 ohm ±20%; 1/2 watt	376 3753 00
R25	V6 cathode	RESISTOR: 330 ohm ±10%; 1/2 watt	745 1065 00
R26	V6 screen dropping	RESISTOR: 22,000 ohm ±10%; 1 watt	745 3142 00
R27	V6 plate decoupling	RESISTOR: 2200 ohm ±10%; 1 watt	745 3100 00
R28	V7 grid decoupling	RESISTOR: 10,000 ohm ±10%; 1/2 watt	745 1128 00
R29	RF gain control	RESISTOR: 10,000 ohm ±20%; 1/2 watt	376 4037 00
R30	V7 cathode	RESISTOR: 560 ohm ±10%; 1/2 watt	745 1076 00
R31	V7 screen dropping	RESISTOR: 0.33 megohm ±20%; 1 watt	745 1192 00
R32	V7 plate decoupling	RESISTOR: 0.12 megohm ±10%; 1 watt	745 3174 00
R33	V10 plate load	RESISTOR: 0.10 megohm ±10%; 1 watt	745 3170 00
R34	V10 screen dropping	RESISTOR: 0.33 megohm ±10%; 1 watt	745 3191 00
R35	AVC series resistor	RESISTOR: 0.47 megohm ±10%; 1/2 watt	745 1198 00

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R36	V9 plate load	RESISTOR: 0.47 megohm ±10%; 1/2 watt	745 1198 00
R38	Detector load	RESISTOR: 10,000 ohm ±10%; 1/2 watt	745 1128 00
R39	Limiter filter	RESISTOR: 0.33 megohm ±20%; 1/2 watt	745 1192 00
R40	Limiter filter	RESISTOR: 0.10 megohm ±10%; 1/2 watt	745 1170 00
R41	Detector load	RESISTOR: 0.47 megohm ±20%; 1/2 watt	745 1199 00
R42	Limiter cathode	RESISTOR: 0.47 megohm ±10%; 1/2 watt	745 1198 00
R43	AVC delay voltage divider	RESISTOR: 0.22 megohm ±10%; 1 watt	745 3184 00
R44	V9 cathode and AVC voltage divider	RESISTOR: 2200 ohm ±10%; 1/2 watt	745 1100 00
R45	S meter sensitivity control	RESISTOR: 1000 ohm ±20%	376 3754 00
R46	Audio gain	RESISTOR: 0.50 megohm; ±20%; 1/2 watt	376 3132 00
R47	V11 cathode	RESISTOR: 1500 ohm ±20%; 1/2 watt	745 1094 00
R48	V11 screen dropping	RESISTOR: 1.2 megohm ±10%; 1 watt	745 3216 00
R49	V11 plate load	RESISTOR: 0.22 megohm ±10%; 1 watt	745 3184 00
R50	V12 grid load	RESISTOR: 0.47 megohm ±10%; 1/2 watt	745 1198 00
R51	V12 cathode	RESISTOR: 330 ohm ±10%; 1 watt	745 3065 00
R52	V4 cathode	RESISTOR: 330 ohm ±10%; 1/2 watt	745 1065 00
R53	V6 screen bleeder	RESISTOR: 18,000 ohm ±10%; 1 watt	745 3139 00
R54	RF bias bleeder	RESISTOR: 0.22 megohm ±10%; 1/2 watt	745 1184 00
R55	Pilot light dropping	RESISTOR: 2.2 ohm ±10%; 25 watt	710 0401 00
R56	T2 primary loading	RESISTOR: 0.33 megohm ±10%; 1/2 watt	745 1191 00
R57	Audio output loading	RESISTOR: 2200 ohm ±10%; 2 watt	745 5100 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
S1	RF band-switch	SWITCH: 6 position; 1 pole tap switch section	269 1020 00
S2	Mixer band switch	SWITCH: 6 position; 1 pole tap switch section	269 1020 00
S3	Variable i-f band switch	SWITCH: 6 position; 1 pole tap switch section	269 1020 00
S4	Variable i-f band switch	SWITCH: 6 position; 1 pole tap switch section	269 1020 00
S5	Second mixer band switch	SWITCH: 6 position; 1 pole tap switch section	269 1020 00
S6	Second mixer band switch	SWITCH: 6 position; 1 pole tap switch section	269 1020 00
S7	Pilot light band switch	SWITCH: 6 position; 2 pole tap switch section	269 1021 00
S8	Crystal band switch	SWITCH: 6 position; 1 pole tap switch section	269 1020 00
S9	Harmonic selector band switch	SWITCH: 6 position, 2 pole tap switch section	269 1021 00
S10	Harmonic selector band switch	SWITCH: 6 position; 2 pole tap switch section	269 1021 00
S11	Selectivity control switch	SWITCH: Band change; 1 circuit, shorting; 5 position; 1 deck	259 0033 00
S12	MAN-AVC-CW selector	SWITCH: Band change; two circuit, shorting 3 position; 1 deck	259 0054 00
S13	OFF-FIL-ON-B+-ON selector switch	SWITCH: Band change; two circuit, shorting; 3 position, 1 deck	259 0034 00
S14	Limiter	SWITCH: DPDT toggle	266 0002 00
T1	Crystal filter transformer	TRANSFORMER: Crystal filter plate; 490 to 510 kc; adjustable powdered iron core	278 0058 00
T2	First i-f transformer	TRANSFORMER: Crystal filter grid coil assem; 490 to 510 kc; adjustable powdered iron core	278 0059 00
T3	Interstage i-f transformer	TRANSFORMER: I.F. interstage; 490 to 510 kc; adjustable powdered iron core	278 0028 00

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
T4	Output i-f transformer	TRANSFORMER: I.F. diode 490 to 510 kc; adjustable powdered iron core	278 0029 00
T5	Audio output transformer	TRANSFORMER: Audio output Pur: 5000 ohm; Sec: 500 ohm: tapped at 4 ohm; 300 to 3500 cps	667 0018 00
T6	BFO transformer	TRANSFORMER: BFO coil assembly; adjustable powdered iron core; 480 to 520 kc	278 0027 00
T7	Power transformer	TRANSFORMER: Power; Pri: 117 v, Sec #1: 700 v CT; 0.090 amp, Sec #2: 5 v, 2 amp, Sec #3: 6.3 v, 5 amp, 50/60 cps	662 0017 00
V1	RF tube	TUBE: Type 6AK5; r-f amplifier pentode	257 0040 00
V2	First mixer	TUBE: Type 6SA7; pentagrid converter	255 0121 00
V3	Variable i-f tube	TUBE: Type 6SK7; triple grid super-control amplifier	255 0064 00
V4	Second mixer	TUBE: Type 6L7; pentagrid mixer amplifier	255 0127 00
V5	Crystal oscillator	TUBE: Type 6AK5; r-f amplifier pentode	257 0040 00
V6	First i-f tube	TUBE: Type 6SG7: h-f amplifier pentode	255 0177 00
V7	Second i-f tube	TUBE: Type 6SG7; h-f amplifier pentode	255 0177 00
V8	Detector and limiter	TUBE: Type 6H6; twin diode	255 0117 00
V9	AVC tube	TUBE: Type 6SJ7: triple grid detector amplifier	255 0030 00
V10	BFO tube	TUBE: Type 6SJ7; triple grid detector amplifier	255 0030 00
V11	Audio amplifier	TUBE: Type 6SJ7, triple grid detector amplifier	255 0030 00
V12	Power amplifier	TUBE: Type 6V6; beam power amplifier	255 0090 00
V14	Rectifier	TUBE: Type 5Y3GT; full-wave high-vacuum rectifier	255 0157 00
X1	Socket for V1	SOCKET: Miniature; tube; ceramic	220 1003 00
X2, X3, X4	Socket for V2, V3, V4	SOCKET: Octal tube; black bakelite	220 1015 00
X5	Socket for V5	SOCKET: Miniature tube; ceramic	220 1003 00

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
X6, X7, X8, X9, X10, X11, X12	Socket for V6, V7, V8, V9, V10, V11, V12	SOCKET: Octal tube; black bakelite	220 1015 00
X13	Fuse holder	HOLDER: Fuse; for 3 AG fuses	265 1002 00
X14	Socket for V14	SOCKET: Octal tube; black bakelite	220 1015 00
X15, X16, X17, X18	Socket for Y1, Y2, Y3, Y4	SOCKET: 8 eyelets with ends flattened on mounting plate	503 1290 001
X19, X20	Socket for Y5, Y6	SOCKET: 4 eyelets with ends flattened on mounting plate	503 1291 001
Y1	Crystal for 10 meter operation	CRYSTAL: 11,166 kc	291 2927 00
Y2	Crystal for 11 meter operation	CRYSTAL: 10,500 kc	291 2926 00
Y3	Crystal for 15 meter operation	CRYSTAL: 11,650 kc	291 2928 00
Y4	Crystal for 20 meter operation	CRYSTAL: 8,250 kc	291 2924 00
Y5	Crystal for 40 meter operation	CRYSTAL: 9,300 kc	291 2925 00
Y6	Crystal for 80 meter operation	CRYSTAL: 5700 kc	291 2923 00
Y7	Filter crystal	CRYSTAL: 500 kc	291 5175 00
70E-7A	OSCILLATOR	This unit has been dehydrated and hermetically sealed, and should be returned to the Collins Radio Company, if servicing is required.	

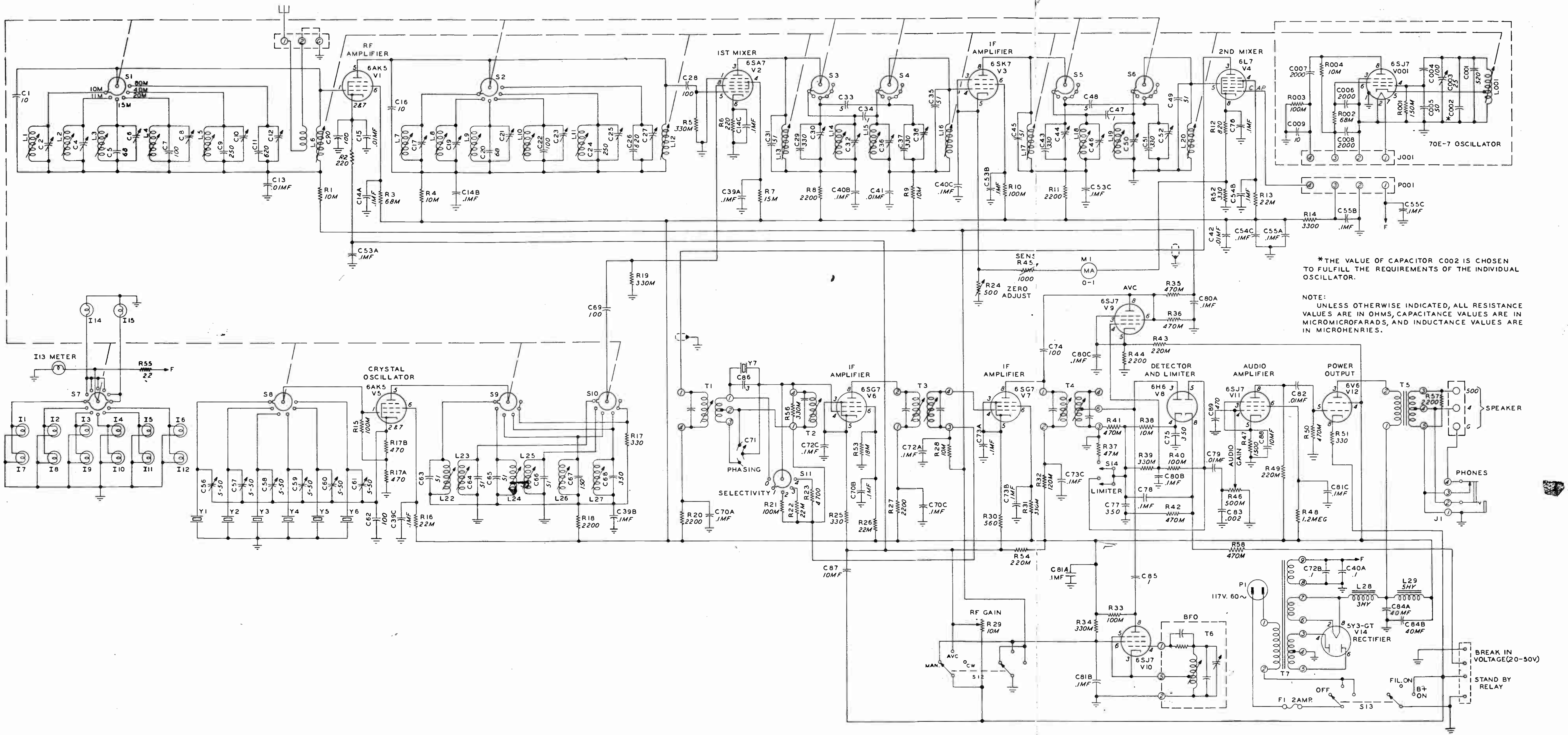

Figure 5-4 Receiver Schematic Diagram

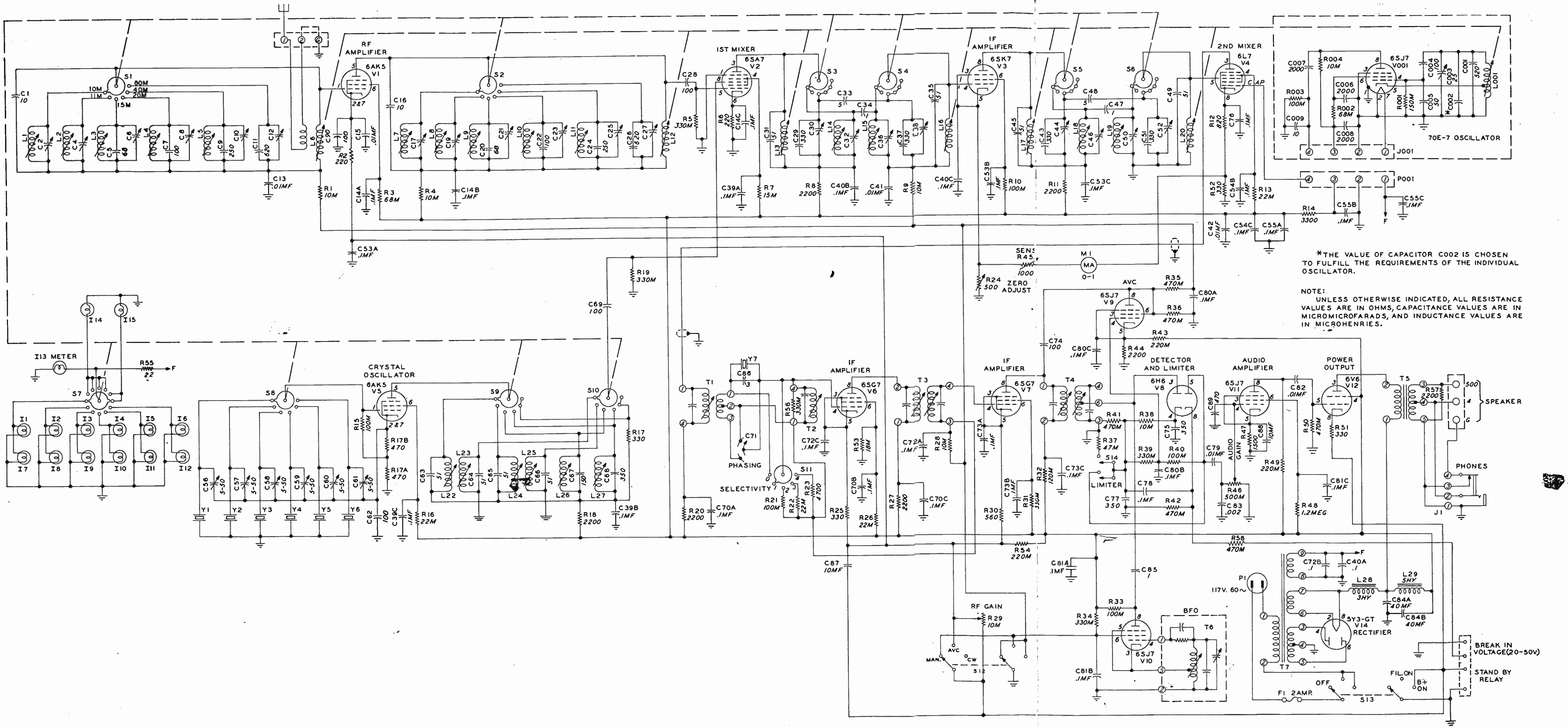

Figure 5-4 Receiver Schematic Diagram