GENERAL PURPOSE COMMUNICATIONS RECEIVER

MODEL CR-88

INSTRUCTIONS

Manufactured by

RADIO CORPORATION OF AMERICA

ENGINEERING PRODUCTS DEPARTMENT

Camden, New Jersey, U. S. A.

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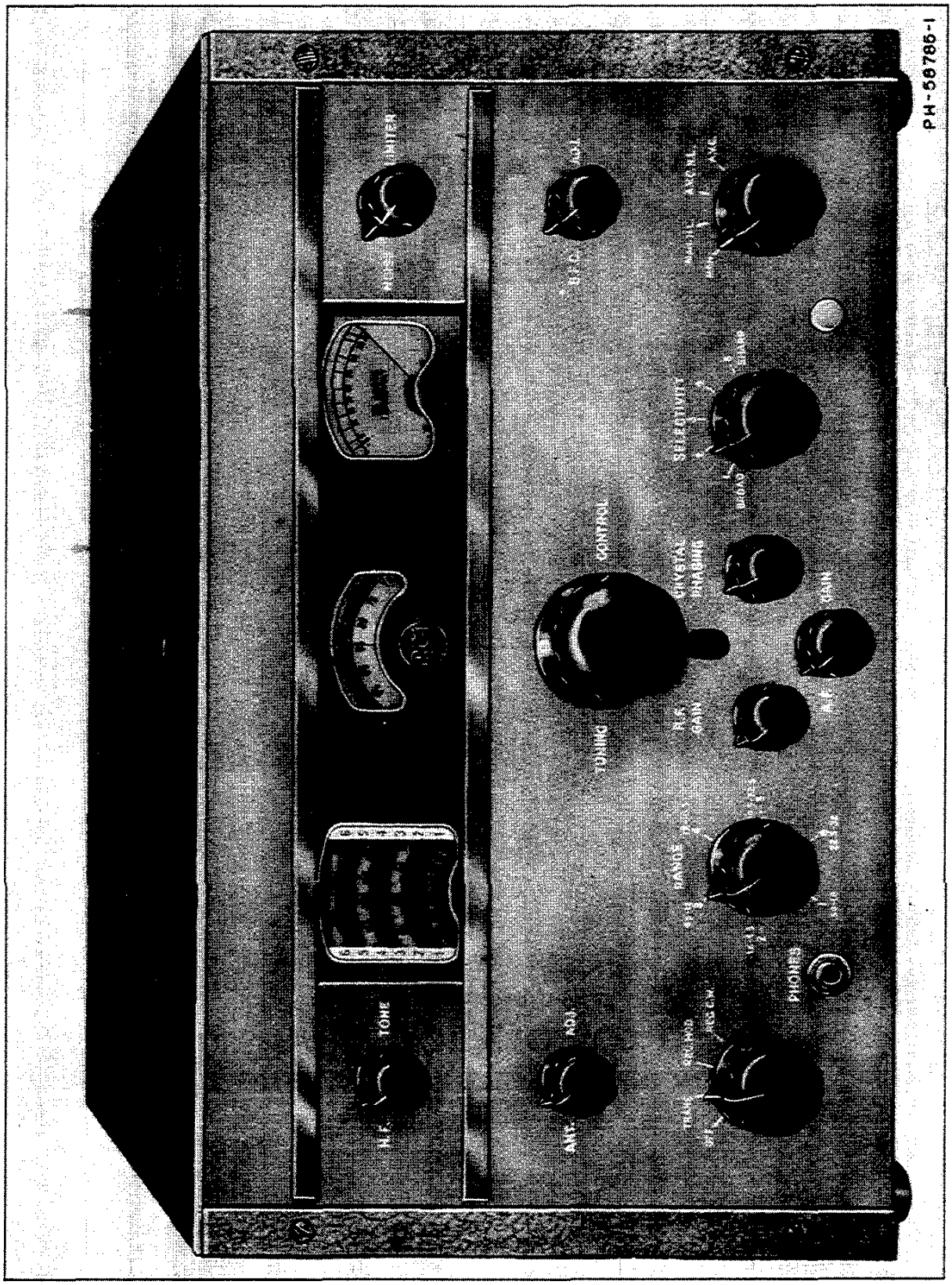

Figure 1—Front View of CR-88 Receiver

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MODEL CR-88
TECHNICAL SUMMARY

Electrical Characteristics

Frequency Range—total 6 bands ..... **535 to 32,000 kc**
Band 1 ..... 535 to 1,600 kc
Band 2 ..... 1,570 to 4,550 kc
Band 3 ..... 4,450 to 12,150 kc
Band 4 ..... 11,900 to 16,600 kc
Band 5 ..... 16,100 to 22,700 kc
Band 6 ..... 22,000 to 32,000 kc

Maximum Undistorted Output—approximate—2.5 watts.

Output Impedance—2.5 ohms and 600 ohms.

Power Supply Requirements

Line Rating ..... 100-117, 117-135, 135-165, 190-230, 200-260 volts, 50/60 cycles.
or Batteries ..... 6 volt "A" battery and 250 to 300 volt "B" battery.
or Vibrator Power Supply Unit ..... MI-8319-A.
Power Consumption—100 watts.

Tube Complement

R-F and I-F Amplifiers 5 RCA-6SG7
1st Detector (mixer) 1 RCA-6SA7
Oscillator 1 RCA-6J5
2nd Detector 1 RCA-6H6
Noise Limiter 1 RCA-6H6
A-F Amplifier 1 RCA-6SJ7
Power Amplifier 1 RCA-6K6GT
Beat Frequency Oscillator 1 RCA-6J5
Rectifier 1 RCA-5Y3GT
Voltage Regulator 1 RCA-VR-150

Mechanical Specifications

Overall Dimensions ..... 19¼ inches wide x 11 inches high x 19¼ inches deep

PERFORMANCE DATA—TABLE 1

(Approximate Values — Taken on Sample Receiver)

Band No.	Megacycles	Sensitivity in Microvolts for 4 volts across diode load	Antenna Input in Microvolts for 6DB Signal-Noise Ratio	Image Ratio
1	0.6	0.5	3	Greater than 1,000,000
	1.0	0.5	4	
	1.5	0.5	6	1,000,000
2	1.7	0.5	4	240,000
	3.0	0.5	3	
	4.3	0.5	3	14,500
3	4.6	0.5	4	60,000
	8.0	0.5	4	
	11.5	0.5	4	2,000
4	12.1	0.5	4	4,000
	16.4	0.5	4	1,500
5	16.4	0.5	4	1,000
	22.5	0.5	4	400
6	22.5	0.5	4	400
	28.0	0.5	4	200

I-F rejection at 600 kc is 100,000.

AVC Action—Increasing the signal input from 1 to 300,000 microvolts (109.5 db) will not cause an increase in the developed diode voltage of more than 10 db (3-2 x) with the "R-F GAIN" control at maximum and a 600 kc CW input signal.

GENERAL PURPOSE
COMMUNICATIONS RECEIVER

I
INTRODUCTION

In the design of a high frequency radio receiver, there are four important qualities for consideration:

1. Usable sensitivity.
2. Selectivity.
3. Frequency stability.
4. Reliability.

The **sensitivity** of the CR-88 receiver is limited only by the tube noise originating in the first tube and its associated circuits. A large part of this noise is due to "shot" effect and thermal agitation in the first tuned circuit. A signal, to be readable, must produce a voltage on the grid, of the same or greater order of magnitude than this inherent noise voltage. Therefore, an efficient coupling system between the antenna and the first R-F tube of the receiver is of great importance. This has been the subject of considerable development, and the system used on this receiver gives optimum coupling with antenna or transmission line impedances of 200 ohms, over the entire frequency range of the receiver, except on the broadcast band. On the broadcast band, a low frequency primary is used, resonating well below the band with a 200 mmf antenna.

The second quality of a receiver, **selectivity,** is necessarily a compromise with fidelity of the reproduced signal. The CR-88 receiver is designed to have five degrees of selectivity, three of which include a crystal filter.

To secure good **frequency stability,** rugged construction of parts and wiring in the high frequency heterodyne oscillator circuit has been included in the design. This, together with voltage stabilization of the oscillator plate supply, temperature compensation, and proper oscillator excitation, provides a high degree of stability.

Reliability depends to a large extent on the quality of material and workmanship. Throughout the CR-88 receiver the best material obtainable is used for each particular purpose and all workmanship is of the best.

The following instructions should be studied before the installation or operation of the equipment described in this book is attempted, in order that optimum performance may be obtained.

II
EQUIPMENT

The equipment described in this book is intended for table mounting and includes the cabinet, control panel, and tubes necessary for operation.

Additional equipment required includes headphones or loudspeakers, an antenna system, and an AC source of power, batteries, or Vibrator Power Supply Unit MI-8319-A. The Loudspeaker, shown in Figure 11, is not supplied with the equipment, unless specially ordered. It may be obtained separately as MI-8303-F. Headphones MI-5803-6 are recommended.

III
DESCRIPTION

The CR-88 receiver covers short wave, standard broadcast, and CW service; its principal use is for short wave communications. It is designed to withstand severe climatic and line voltage variations without appreciable impairment of performance.

Its features include:

- Mechanical Band Spread with Single Control for ease of tuning a previously logged station.
- Automatic Noise Limiter which automatically limits interference to a percentage of modulation determined by the Noise Limiter Control.
- Noise Limiter Control for setting Noise Limiter to operate at any desired percent modulation.
- Noise Limiter Switch for switching Noise Limiter on or off.
- Continuously variable High Frequency Tone Control.
- Antenna trimmer for circuit alignment.
- Crystal filter for ultra-sharp selectivity when required.
- Crystal Phasing Control on front panel.
- Tuning Meter for indicating relative strength of incoming signals.
- Exceptionally good oscillator stability through normal variations in line voltage.
- Four-gang Condenser giving high image ratio on all bands.
- Twelve Tuned I-F Circuits giving a very high degree of selectivity.
- Temperature compensated oscillator circuits on all bands.
- Ceramic Insulation throughout on gang condenser, sockets, range switch, and selectivity switch.
- Tuning Lock for service under extreme conditions of vibration.

IV
CIRCUIT ARRANGEMENTS

The circuit is shown schematically in Figure 17. It consists of two stages of R-F amplification, first detector, first heterodyne oscillator, three stages of I-F amplification, second detector, noise limiter, second heterodyne oscillator, A-F amplifier stage, output power stage and power supply system.

Input Coupling — The antenna coupling system is designed to provide optimum coupling from a 200 ohm transmission line, except in the broadcast band. The first tuned circuit is provided with a trimmer condenser adjustable from the front panel. This insures the proper tuning of this circuit with any antenna system.

For the standard broadcast band, conventional antenna and ground connections should be used.

The antenna terminal board is provided with three terminals (see Figures 2 and 12), two of which may be joined together with a link. When a single wire antenna is used, the link should be closed and the antenna connected to "A." If a ground is used, it should be connected to "G." If a transmission line or balanced input is used, the link should be opened and the line connected to terminal "A" and the center terminal.

IMPORTANT—Receivers are shipped from the factory with a permanent bus-wire connection on the rear of the antenna terminal board, between the center and ground terminals. If balanced input operation with open link is required, this connection on the rear of the antenna terminal board must be removed.

R-F Amplifier — The R-F Amplifier is designed to provide ample selectivity ahead of the first detector for minimizing cross modulation and blocking effects from strong interfering signals and for obtaining a high degree of image signal suppression. The amplification is adjusted to provide optimum signal-to-noise ratio by making noise contributions of circuits following the first tube negligible in comparison with the noise contributed by the first R-F grid circuit; that is, each tuned circuit in the receiver contributes some noise voltage, but by making the gain of the first tube as high as practicable, the noise contributed by succeeding circuits is unimportant.

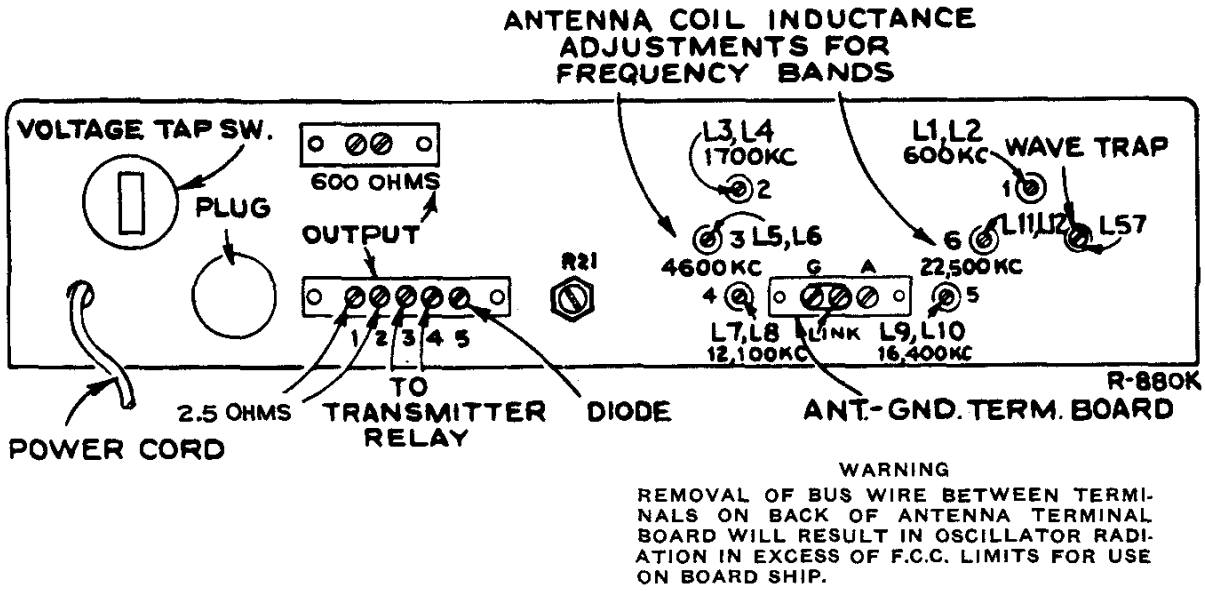


Figure 2—Diagram of Rear of Chassis

Band Spread — The mechanical band spread with single control knob enables the operator to quickly tune a previously logged station. The log scale on the main dial and the separate vernier dial provide for exact logging and tuning.

First Heterodyne Oscillator — The first heterodyne oscillator is aligned to track with the R-F Amplifier at 455 kc higher than the signal frequency, thus producing a 455 kc intermediate frequency in the first detector plate circuit which is amplified further in the I-F stages. The oscillator voltage is regulated by the RCA VR-150 regulator tube to provide maximum frequency stability under conditions of variations in power supply voltage.

Intermediate Frequency Crystal Filter — The first detector plate circuit is tuned to the intermediate frequency and a balanced link circuit is used to couple the first detector plate and first I-F grid circuits. A 455 kc crystal is connected in one arm of the link circuit and a phasing capacitor is connected in the other. The impedances of the coils in the link circuit are designed so that the crystal selectivity characteristic is not impractically sharp. The band width at two times resonant input may be adjusted to 400 cycles, 1,500 cycles, or 3,000 cycles. For this adjustment see "Operation."

Intermediate Frequency Amplifier — Three stages of I-F amplification are used; RCA-6SG7 tubes are used in all stages and an RCA-6H6 tube is used for AVC and second detector. The first I-F Transformer has its primary and secondary tuned, and is coupled through the crystal filter link. The second and third I-F Transformers are composed of four tuned circuits each. These circuits are varied in coupling by the selectivity switch. The fourth I-F Transformer has two tuned circuits.

The third I-F stage is not connected to the AVC nor to the manual volume control. Therefore, a good AVC characteristic with little overload distortion is obtained. This also permits the CW oscillator to be coupled to the grid circuit of this stage, giving a comparatively high detector excitation voltage with small electrical coupling to the oscillator circuit.

Second Heterodyne Oscillator — The second heterodyne (CW) oscillator is a triode RCA-6J5 tube which is electrostatically coupled to the final I-F stage. A panel control is provided by means of which the frequency of the heterodyne oscillator and resultant audio beat note may be varied.

Particular care has been taken in the design of the circuit constants to minimize oscillator harmonics.

Automatic Volume Control — The AVC voltage is obtained from the second detector, an RCA-6H6 tube. A variable delay is obtained depending on the setting of the R-F gain control.

The second heterodyne (CW) oscillator excitation voltage is just lower than the AVC diode bias voltage so that it does not decrease the sensitivity of the receiver.

Manual Volume Control — Two manual volume controls are provided; an audio gain control which is employed when the AVC is in use, to obtain the desired output level, and an R-F gain control.

Noise Limiter — The noise limiter circuit utilizes an RCA-6H6 tube and limits the noise interference to 100% modulation and to continuously lower percentages down to any modulation whatsoever, determined by the setting of the noise limiter control.

A noise limiter switch in conjunction with AVC provides for use of the noise limiter on CW or on modulated reception when interference is present.

Output Tube — The RCA 6K6GT output tube is resistance coupled from the A-F amplifier, an RCA 6SJ7 tube, and operates into an output transformer which has taps for matching into a 2.5 or 600 ohm load, or into headphones. The headphone winding is designed so that a maximum of approximately 10 milliwatts of power may be delivered to 20,000 ohm phones. Terminals are provided on the rear apron for the 2.5 and 600 ohm impedances. The output from the 600 ohm winding is fed directly to the 600 ohm terminals, neither of which is grounded. This winding may be used to feed a balanced 600 ohm line. The output from the 2.5 ohm tap is fed to the 2.5 ohm terminals through a two-position jack mounted on the panel. The headphone winding also connects to the jack. With the phone plug inserted into the jack in the first position, the phones are in parallel with the 2.5 ohm output and both are on. When the plug is pushed into the second position, the phones are connected to the phone winding and the 2.5 ohm output is cut off from the rear terminals. If no load is connected to the 2.5 or 600 ohm output terminals, the phones should always be used in the second position, as under this condition a load resistor is shunted across the 2.5 ohm tap to maintain impedance matching of the system.

Power Pack — The power pack mounted on the receiver chassis consists of a power transformer, rectifier tube RCA-5Y3GT, and filter. A tap switch is provided on the rear apron for changing the power transformer voltage tap. (See Figures 2 and 12.) The voltage for which the switch is set may be read directly on the switch. The instrument may also be operated from 6V. "A" and 250 to 300 V. "B" batteries, or Vibrator Power Supply Unit MI-8319-A.

Shielding — Interstage shielding is provided to insure stability under all operating conditions and to minimize oscillator radiation. Complete external shielding prevents coupling to any portion of the circuit except through the antenna circuit.

Tuning Meter — The tuning meter on the front panel, calibrated in db's above one microvolt, indicates the accuracy of tuning and the comparative strength of signals received.

V
PERFORMANCE

The performance data under technical summary and the data for the various curves, are approximate values taken on a sample receiver. Variations in these values are to be expected because of practical manufacturing tolerances. The data were taken with an artificial antenna of 200 mmf. capacity for band 1 and 200 ohms resistance for bands 2 to 6 inclusive. The output was measured across a resistance of 2.5 ohms connected in place of the speaker voice coil. The selectivity switch was placed in position 2.

VI
INSTALLATION

Power Supply — The power supply circuit is integral with the receiver. Determine line voltage and frequency and check with the rating of the receiver. The power transformer primary may be connected for any one of five voltage ranges by means of a tap switch. This switch is located in the rear apron of the receiver, and the voltage for which it is set may be read directly on the switch.

For Battery or other Supply Operation — For connections see Schematic Diagram Figure 17. It is only necessary to remove the plug from the socket on the rear of the receiver, and connect the batteries to the proper terminals as indicated by the schematic diagram. A battery cable terminating in an octal male plug is necessary for this purpose. A vibrator power supply MI-8319-A is available which will operate the receiver directly from a 6 volt storage battery. For information on this power unit see Section XI.

Tubes — Inspect the chassis before applying power to see that all tubes are firmly seated in their respective sockets.

Antenna — The input impedance at the antenna terminals is designed to match a 200 ohm transmission line except on the broadcast band where a low frequency primary is used.

For general use it is recommended that a straight wire antenna between 25 and 50 feet long be used.

Speaker — Terminals for connection of a loudspeaker are indicated in Figures 2 and 12. The output transformer is designed to match a speaker having 2.5 ohms impedance.

Headphones — A jack is provided on the left of the front panel for plugging in a pair of headphones. There are two positions of the plug.

1. Half way in—for reception on both speaker and phones.
2. Fully in—for phone reception only.

See "CIRCUIT ARRANGEMENTS" "Output Tube."

Mounting — The instrument may be placed on a table or mounted on a rack. For rack mounting loosen the panel mounting screws and remove the panel and chassis complete from the cabinet. The panel is equipped with standard slots for rack mounting.

VII
OPERATION

Figure 3 illustrates the dials and control knobs.

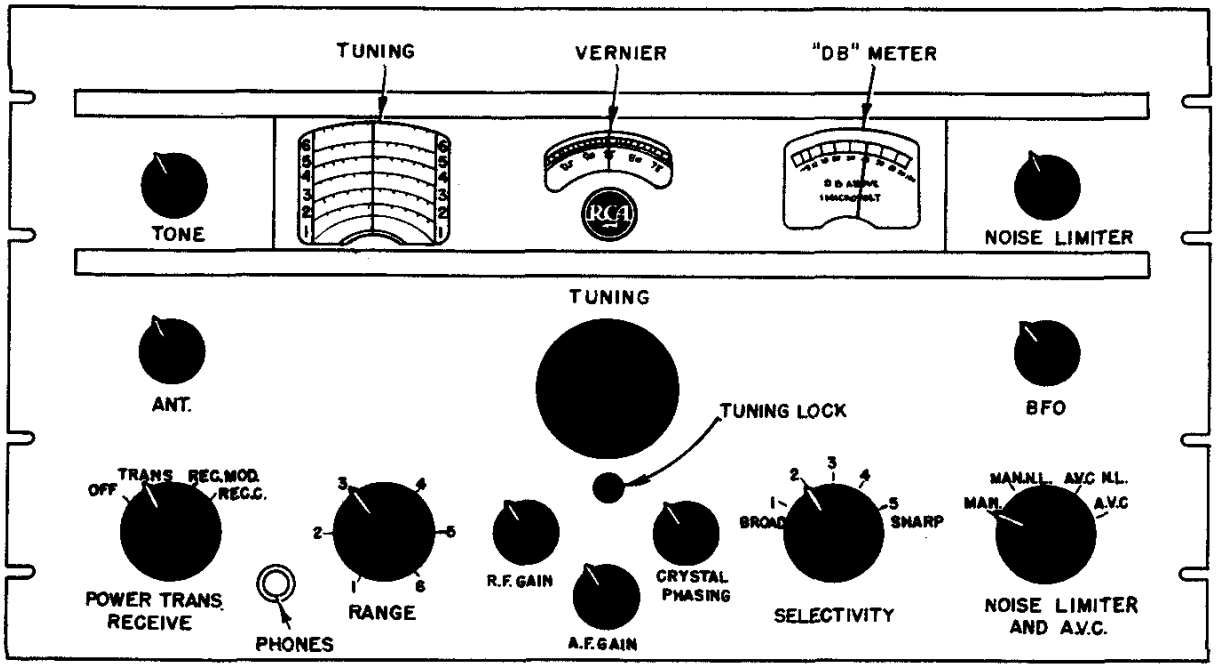


Figure 3—Diagram of Front Panel

DIALS

The Main Tuning Dial is on the left and consists of a disc with seven scales, one for each of the six bands and a log scale. The Standard Broadcast Band is calibrated in kilocycles and the other five bands in megacycles.

The Vernier Tuning Dial is in the center and has a scale with arbitrary calibrations for exact tuning and log records of particular communication stations. It is used in conjunction with the log scale on the main tuning dial to give additional figures for logging.

The Tuning Meter is on the right and is calibrated in db's above one microvolt. It is used to indicate accuracy of tuning and also gives an indication of the strength of the signal being received.

CONTROLS

Power-Transmit-Receive Switch — This is a four-position switch. Starting from fully counterclockwise these positions are:

1. Power off.
2. Transmit position which gives energized tube filaments, open plate circuits, and shorted terminals for transmitter relay on the speaker terminal board on the back of the chassis. Connect relay to these two terminals for transmitter operation. See Figure 2.
3. Normal reception.
4. CW reception — Beat frequency oscillator switched on.

Selectivity Switch — This is a five-position switch and the band widths and control of selectivity are illustrated in the curves of Figure 18. The five positions are:

1. I-F band width for High Fidelity, modulated reception.
2. I-F band width for normal modulated reception.
3. Crystal Filter in—for CW telegraph or sharp modulated signal reception.
4. Crystal Filter in — for sharper CW telegraph reception.
5. Crystal Filter in — for sharpest CW telegraph reception.

Crystal Phasing Control — This control may be set to reject adjacent interfering signals under relatively unfavorable conditions.

Noise Limiter–AVC Switch — This is a four-position switch. Starting from fully counterclockwise these positions are:

1. AVC and NL out—Manual gain only—for CW—no interference.
2. NL on, AVC out—Manual gain—for CW with interference.
3. NL and AVC on—for Modulated Reception with interference.
4. AVC on, NL out—for Modulated Reception —no interference.

R-F Gain Control — This continuously variable sensitivity control is for use in conjunction with the audio gain (Volume) control for all manual gain operation. With AVC on, it should as a rule be set to its fully clockwise position or may be turned to eliminate interference.

Noise Limiter Control — This control sets the instrument for operation at the required percentage value of Noise Limitation. The fully clockwise position limits the noise interference to 100% modulation. As the knob is turned counterclockwise, the noise interference is limited to continuously lower percentages of modulation so that in the fully counterclockwise position the Noise Limiter is operative on any modulation whatsoever. Normally, the fully clockwise position will be used, but under extreme conditions of interference a balance point should be found for maximum intelligibility of signal with best modulation and least noise.

Tone Control — This is a continuously variable control for reducing HF audio response. In the fully clockwise position the full tone is obtained and as turned counterclockwise, high tones are lessened. Set it to suit the particular tonal conditions for the signal being received.

Beat Frequency Oscillator Control — This control is normally used for CW code signals. It should be adjusted to give the desired audio pitch after the signal has been accurately tuned.

TUNING

For functions of controls see the foregoing paragraphs.

1. Turn receiver on and set the Power-Transmit-Receive Switch for the required type of operation.
2. Set Range Switch for band required.
3. Set Antenna Trimmer for maximum background noise.
4. Set Selectivity Switch for the required operating conditions — See Selectivity Curves — Figure 18.
5. Adjust Crystal Phasing Control for CW operation when required.
6. Set Noise Limiter–AVC Switch for the required operating conditions.
7. Set R-F Gain Control fully clockwise.
8. Set Audio Gain Control about halfway.
9. Tune in the station.
10. Reset Audio Gain Control to give desired volume.
11. Reset Selectivity and Sensitivity (R-F Gain) Controls and Noise Limiter Control in accordance with requirements due to interference, station transmission, and other conditions.
12. Set Tone Control for preferred tone.
13. On CW operation set Power-Transmit-Receive Switch to "Rec. CW" (position 4) and set BFO Control to give desired pitch.
14. If the receiver is subject to vibration, the tuning may be locked by turning clockwise the knurled screw directly beneath the tuning knob. Turning the screw moderately tight will lock the tuning.

Diversity Reception — When properly spaced, individual antennas are available, two or more receivers may be used for diversity reception. The 2nd detector diode output at TB2-5 should be connected with a low capacity shielded cable to the second receiver's 2nd detector diode output. The audio gain control, R51, on one receiver should be set for maximum gain and on all other receivers to minimum gain. The r-f gain control on all receivers should be adjusted to the same level.

VIII
MAINTENANCE

The CR-88 receiver should maintain its correct factory adjustments over a reasonably long period of time. Causes of trouble and the probable sequence of their development are outlined in the following paragraphs:

1. **Vacuum Tubes** — A noticeable decrease in the sensitivity of the receiver usually indicates worn out vacuum tubes. If the sensitivity is low, remove and check the tubes in a reliable tube tester or substitute new tubes one at a time. See Technical Summary, and Schematic Diagram Figure 17. Tube socket voltages are given in Table 2 on page 17.
2. **Range Switch** — A switch may operate defectively on certain positions after long periods of inoperation. Usually rotating the switch back and forth several times will clean the contacts and operation will become normal.

   A bad range-switch contact is likely to cause a change in the sensitivity of the receiver, or the frequency of a received signal, as the switch is moved back and forth slightly in a certain frequency band position. A further check is to turn the switch off and on at one particular frequency band several times and note the apparent sensitivity of the receiver each time the switch comes into position. The sensitivity should be the same each time and may be adequately judged for this test by listening to the receiver background noise.
3. **Automatic Volume Control and Tuning Meter** —The AVC voltage is obtained from the second detector. It controls the first and second R-F and first and second I-F tubes. The tuning meter is connected in the cathode circuit of the 1st I-F tube and thus records changes in cathode current caused by changes of AVC voltage applied to the grid. The tuning meter should normally give a low scale reading when no signal is being received. To adjust this meter, tune the receiver to a point free of signals; turn the R-F Gain control to maximum; rotate the Noise Limiter-AVC switch to AVC and the Selectivity switch to position 2. Then turn the antenna trimmer off resonance and adjust the potentiometer (R21 at the back of the receiver) to the position at which the meter pointer just coincides with the mark at the low end of the scale. The meter pointer will usually deflect upward when the antenna trimmer is tuned to resonance.
4. **Circuit Alignment**

   Alignment Tools — Special tools for alignment of R-F and I-F circuits are provided. They are mounted in fuse clips on the inside of the large R-F unit cover. The shorter one of the two is for adjustment of all R-F and I-F coils, and the longer one is for adjustment of the plunger type trimmers. One end of this tool is for turning the lock nut on the trimmers and the other end has a hook for engaging in the hole in the end of the plungers. After adjustment, the lock nut should be securely tightened.

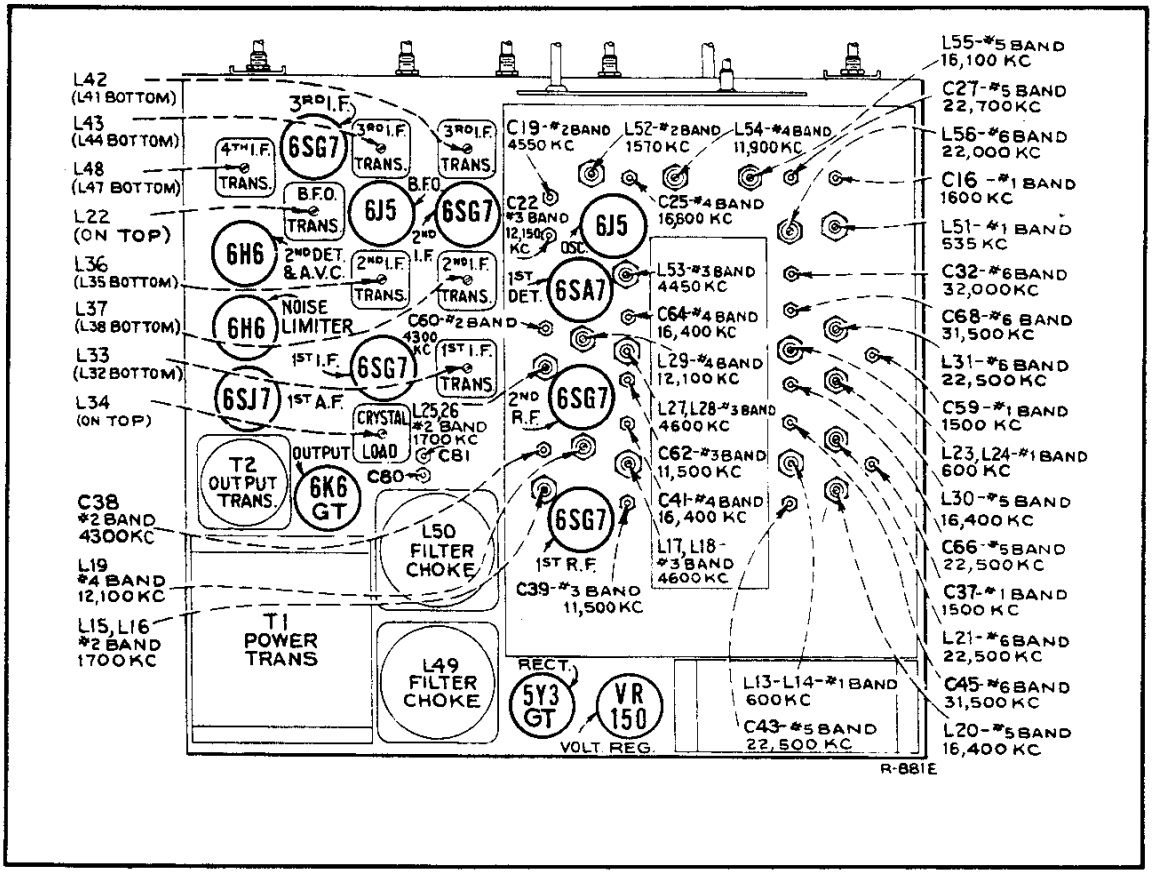


Figure 4—Diagram of Top of Chassis

I-F Alignment — The intermediate frequency is 455 kc. The most satisfactory method of I-F alignment is by means of a sweep oscillator and cathode ray oscillograph. Follow the sequence as given below.

Oscillograph Connections..... Vertical "HI" to Terminal C on last I-F Transformer (L47, L48), Vertical "LO" to chassis
Dummy Antenna..... Insert in series with generator output, 0.01 mfd.
Connection of Generator Output Lead..... See chart below
Connection of Generator Ground Lead..... To chassis
Position of Power-Transmit-Receive Switch..... Position 3 (Rec. Mod.)
Position of R-F Gain Control..... Fully clockwise
Position of Selectivity Switch..... Position 2
Position of Noise Limiter and AVC Switch..... Position 4 (AVC)

LOCATION OF PARTS AND ALIGNMENT ADJUSTMENTS ON CHASSIS

Steps	Generator Connections	Trimmer Adjustments (See Fig. 4)	Trimmer Function
1	6SG7 — 3rd I-F Grid	L47, L48	4th I-F Transformer
2	6SG7 — 2nd I-F Grid	L41, L42, L43, L44	3rd I-F Transformer
3	6SG7 — 1st I-F Grid	L35, L36, L37, L38	2nd I-F Transformer
4	6SA7 — 1st Det. Grid	L32, L33	1st I-F Transformer

When making the alignment adjustments, the following selectivity data for each step gives detailed procedure:

STEP 1.

With the oscillograph connected to the diode output as indicated, and the signal generator connected to the third I.F. grid, the stage under test is the third I.F. stage (fourth I-F. transformer, T9) and the trimmer adjustments are L47 and L48 (primary and secondary). This stage is not affected by the selectivity switch. It is a single peaked sharply tuned stage having a band width of approximately 10 KC at two times down. The voltage gain is approximately 100. Curve shape Figure 5:

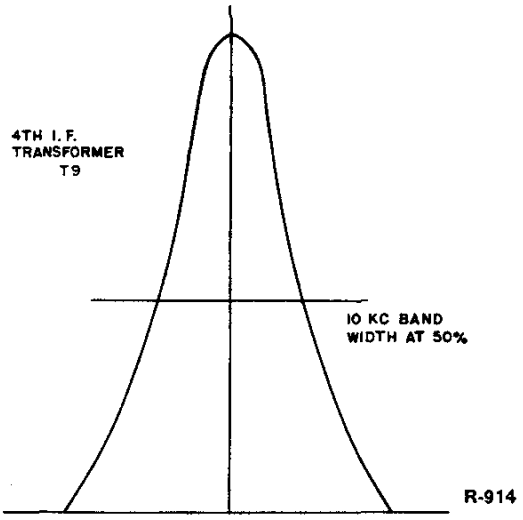


Figure 5—Third I-F Stage, Selectivity Curve

STEP 2.

With the oscillograph connections remaining as before, the signal generator is connected to the second I.F. grid. The stages under test now are the second and third (third and fourth I.F. transformers, T7, T8 and T9) but since the fourth transformer has already been adjusted, only the third transformer, T7, T8 (L41, L42, L43 and L44) is to be adjusted. The selectivity switch now affects the curve, because the switch changes the coupling of the third I.F. transformer. The adjustments should be made first in position two, and checked for symmetrical expansion in position one. Since in position one the third transformer itself is double peaked, the combination of the third and fourth will be flat topped and broad. In position two the combination will be round topped and somewhat sharper. The band width at two times down is about 8.5 KC in position two and 15 KC in position one. Since the gain of the second stage alone is about 3.5 and 6 in positions one and two respectively, the gain of the combination under test will be about 350 and 600. Curve shape Figure 6:

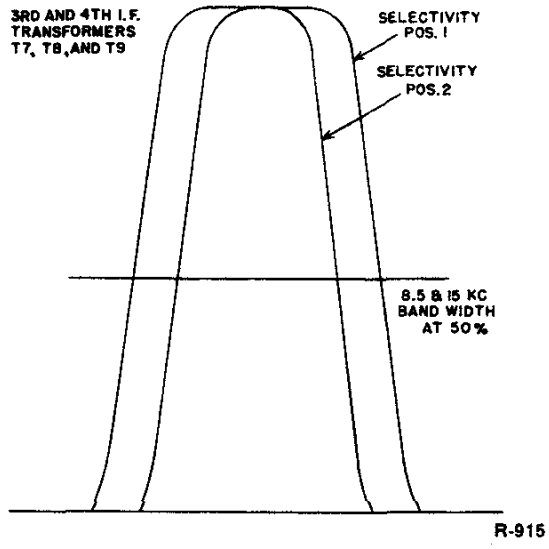


Figure 6—Second and Third I-F Stages, Selectivity Curves

STEP 3.

With the oscillograph connections remaining as before, the signal generator is now connected to the first I.F. grid. The second, third, and fourth I.F. transformers are now under test, and the second T5, T6 (L35, L36, L37 and L38) is to be adjusted. The second I.F. transformer is switched like the third, and has a similar curve shape. Therefore, the combination of the second, third and fourth will be double-peaked in position one and flat-topped in position two. The adjustments should be made in position two and checked for symmetrical expansion in position one. The band width will be somewhat sharper than for the third and fourth transformers alone. The gain of the first stage alone is about 5 and 8 in positions 1 and 2 respectively, so the gain of the combination under test is about 1,750 and 4,800. Curve shape Figure 7:

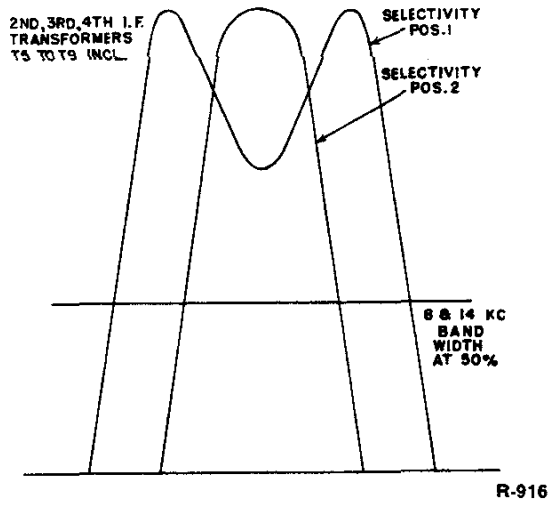


Figure 7—First, Second and Third I-F Stages, Selectivity Curves

Before performing STEP 4, set crystal phasing control C75, Figures 3 and 15, at approximately one half of its maximum capacity. This is approximately its final setting and changing it appreciably will slightly detune the first I-F transformers T3, T4.

Adjustment of Crystal Phasing Control — This adjustment is best made by means of a signal generator and a high resistance sensitive DC voltmeter such as the RCA Junior Voltohmyst. Place Selectivity Switch in Position 3. Connect the generator to the grid of the 6SA7 first detector and the voltmeter to Terminal C on the last I-F Transformer T9 (L47, L48). Tune the generator to about 7 kc off I-F resonance and adjust the crystal phasing control C75 for minimum response. Loosen control knob on front panel if necessary and reset with pointer in vertical position.

Adjustment of Crystal Load Circuit — Make connections as for the preceding adjustment.

(a) Place Selectivity Switch in Position 3. Rock the signal generator frequency back and forth across the I-F resonant frequency and adjust the crystal load circuit trimmer L34 for symmetrical round-top curve.

(b) Place the Selectivity Switch in Position 4. Rock the signal generator frequency and adjust trimmer C81 for symmetrical curve. (Fig. 4.)

(c) Place the Selectivity Switch in Position 5. Adjust Trimmer C80, rocking the signal generator as in (a) and (b). (Fig. 4.)

These three adjustments are very critical and must be made carefully to obtain symmetrical curves.

STEP 4.

All I-F transformers are now under test and the first, T3 (L32 and L33) is to be adjusted. This first transformer is sharply peaked like the fourth, and is not switched by the selectivity switch. Therefore, it will transform the double peaked curve of STEP 3 back to a flat top. The gain of the converter stage alone is about 2, so the overall gain of the I.F. is about 3,500 and 9,600 in positions one and two respectively. The band width at two times down is about 7.5 KC in position two and 13 KC in position one. Curve shape Figure 8:

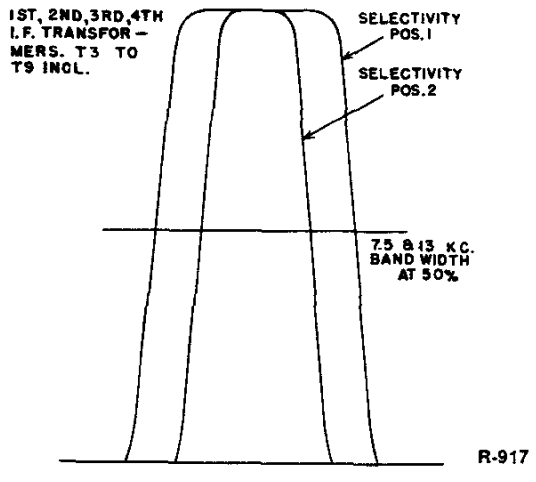


Figure 8—Overall Selectivity Curves for I-F Stages

Suggested Methods of Taking Individual Stage Measurements — Since only the 4th I.F. transformer works into a diode and, therefore, only the 4th transformer has a rectified D.C. output, individual I.F. curves of the other transformers cannot be taken with the sweep generator and oscilloscope unless the oscilloscope itself is equipped with a diode rectifier. If such an instrument is available, individual curves can be taken on each I.F. transformer separately. Another way to take individual curves on each transformer is with a manually operated signal generator and a vacuum tube voltmeter. The signal generator is connected to the grid of the tube which is ahead of the transformer. If this is done, however, the transformer will be mis-aligned when the tube voltmeter is removed, by an amount representing the capacity of the tube voltmeter. One way to avoid this is to connect the tube voltmeter across a resistor which is connected in the plate circuit of the following tube in place of the usual I.F. transformer, as shown in the following simplified schematic diagram Figure 9:

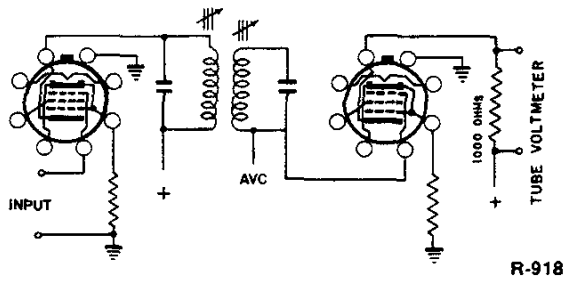


Figure 9—Diagram for Tube Voltmeter Connections

With the method suggested, the transformer under test may be completely aligned and tested, and the connections then shifted to another stage. For aligning the 4th transformer, the tube voltmeter could be loosely coupled to the diode with a capacity of approximately one micromicrofarad. An alternate method for aligning the 4th transformer is to connect a high impedance d.c. voltmeter, similar to the RCA Voltohmyst, from R48 to ground. Align for maximum voltage.

Using one of the above methods, the curve shapes of the individual stages are as shown in Figure 10:

The first and fourth are not affected by the selectivity switch except that the crystal filter is switched in positions 3, 4 and 5. The coupling of the 2nd and 3rd transformers is changed between positions 1 and 2.

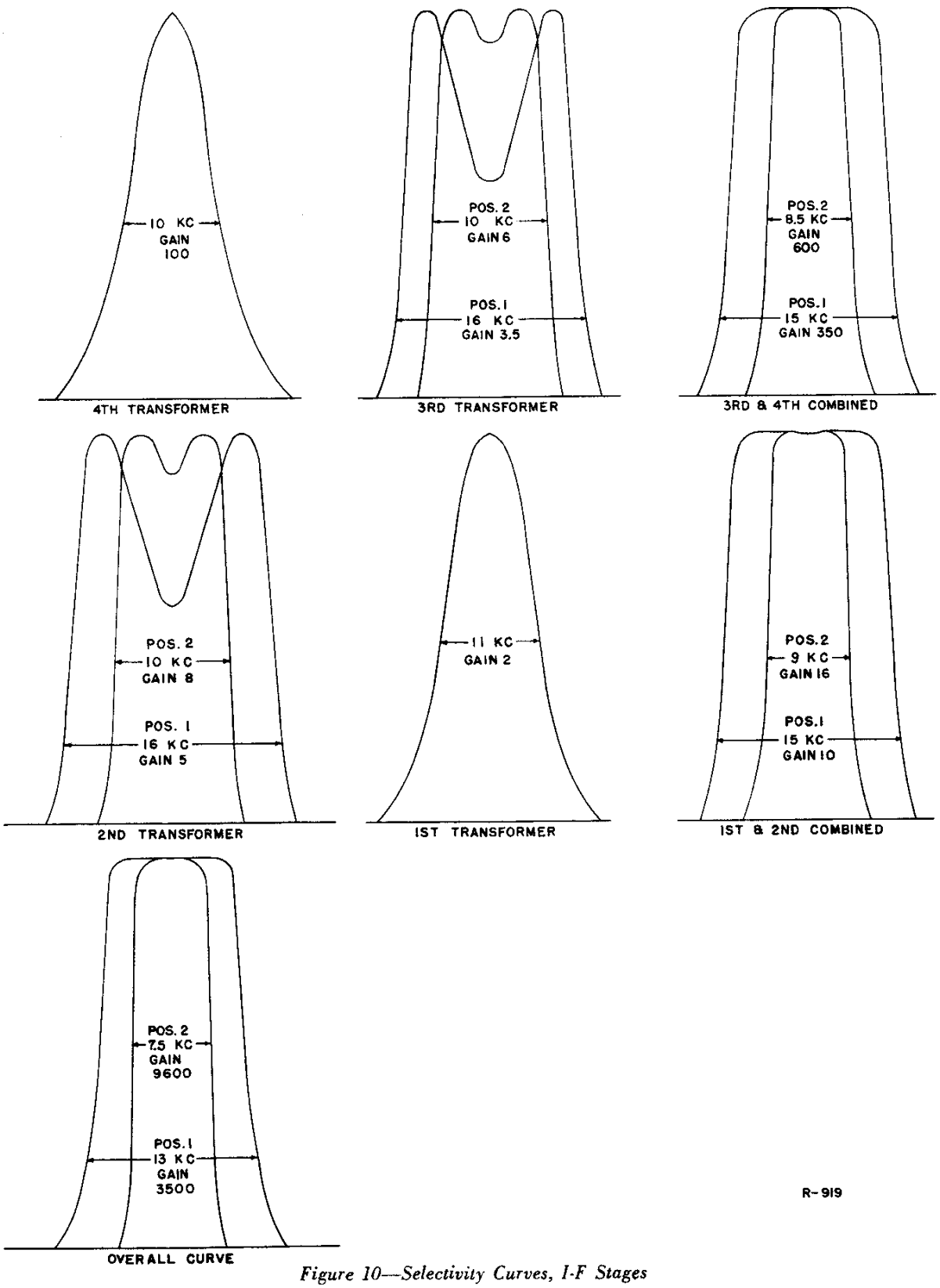


Figure 10—Selectivity Curves, I-F Stages

When aligning these transformers with the vacuum tube voltmeter method, it will be found that the 1st and 4th are easily aligned since they are sharply peaked and have only two tuned circuits each. The 2nd and 3rd, however, are more difficult, since they are double peaked and consist of four tuned circuits each. When aligning the 2nd and 3rd as individual transformers, the best method is to proceed as follows:

1. With the signal generator input at 455 KC and the selectivity switch in position two, align all four adjustments for maximum output on the tube voltmeter. (This gives an approximate alignment only.)
2. Change selectivity switch to position one. It will now be noted by changing the signal generator frequency that the curve response is double peaked but not necessarily symmetrical. Since the peak separation when properly aligned is about 12 KC, the generator frequency should be adjusted to 6 KC either above or below resonance (that is 461 or 449 KC) and the four circuits again adjusted for maximum response.
3. Check the amplitude of the other peak and it should be the same. If not make slight readjustment of the circuits.
4. This method, *if carefully performed, will result* in very symmetrical alignment. Since the peaks of a double peaked curve are points of maximum gain, adjusting for maximum output at the peak frequency gives proper alignment. If, after alignment, it is found that the peak separation is not exactly 12 KC, step 2 should be repeated with the signal generator shifted by an amount which is half the peak separation instead of the 6 KC as stated.

Adjustment of Wave Trap — A wave trap is connected across the broadcast band antenna primary to increase the rejection of I-F signal frequencies. With the range switch on Position 1, apply a modulated I-F signal to the antenna and ground terminals. Adjust the wave trap trimmer L57 (See Fig. 2) for minimum output. The wave trap should be adjusted before the final R-F alignment on No. 1 band, or the antenna coil alignment may be affected.

R-F Alignment — A signal generator covering a range from 535 kc to 32 megacycles, and an output voltmeter, are required. It is desirable to connect a speaker across the output terminals. The output voltmeter should then be connected across the speaker voice coil. The output impedance is 2.5 ohms. Remove the cover from over the R-F unit by loosening the four knurled screws and lifting off.

Output Meter Connections ..... Across speaker voice coil
Dummy Antenna ..... See following chart
Generator Modulation ..... 30% at 400 cycles
Position of Tone Control ..... Fully clockwise
Position of Antenna Trimmer ..... See following chart
Position of Power-Transmit-Receive Switch ..... Position 3 (Rec. Mod.)
Position of Range Switch ..... See following chart
Position of R-F Gain Control ..... Fully clockwise
Position of Audio Gain Control ..... Fully clockwise
Position of Noise Limiter and AVC Switch ..... *Position 4 (AVC)*
Position of Selectivity Switch ..... Position 2

LOCATION OF PARTS AND ALIGNMENT ADJUSTMENTS ON CHASSIS

Operation No.	Range Switch Position	Position of Dial	Generator Frequency	Dummy Antenna	Position of Antenna Trimmer	Trimmer Adjustments for Max. Peak Output (See Figures 2 and 4)	Trimmer Function
1	1	Extreme low end	535	200 mmf	—	L51	Low end osc.
2	1	Extreme high end	1,600	200 mmf	—	C16	High end osc.
3	Repeat 1 and 2 until extreme end frequencies are as indicated.						
4	1	1,500 k.c.	1,500	200 mmf	Max. output	C37, C59	1st & 2nd R-F
5	1	600 k.c.	600	200 mmf	Untouched	L2, L14, L24	Ant. & 1st and 2nd R-F
6	*Repeat 4 and 5 until circuits remain in alignment over the band.*						
7	2	Extreme low end	1,570	200 ohms	—	L52	Low end osc.
8	2	Extreme high end	4,550	200 ohms	—	C19	High end osc.
9	Repeat 7 and 8 until extreme end frequencies are as indicated.						
10	2	4,300 k.c.	4,300	200 ohms	Max. output	C38, C60	1st & 2nd R-F
11	2	1,700 k.c.	1,700	200 ohms	Untouched	L4, L16, L26	Ant. & 1st and 2nd R-F
12	Repeat 10 and 11 until circuits remain in alignment over the band.						

Operation No.	Range Switch Position	Position of Dial	Generator Frequency	Dummy Antenna	Position of Antenna Trimmer	Trimmer Adjustments for Max. Peak Output (See Figures 2 and 4)	Trimmer Function
13	3	Extreme low end	4,450	200 ohms	—	L53	Low end osc.
14	3	Extreme high end	12,150	200 ohms	—	C22	High end osc.
15	Repeat 13 and 14 until extreme end frequencies are as indicated.						
16	3	11,500 k.c.	11,500	200 ohms	Max. output	C39, C62	1st & 2nd R-F
17	3	4,600 k.c.	4,600	200 ohms	Untouched	L6, L18, L28	Ant. & 1st and 2nd R-F
18	Repeat 16 and 17 until circuits remain in alignment over the band.						
*19	4	Extreme low end	11,900	200 ohms	—	L54	Low end osc.
20	4	Extreme high end	16,600	200 ohms	—	C25	High end osc.
21	Repeat 19 and 20 until extreme end frequencies are as indicated.						
22	4	16,400 k.c.	16,400	200 ohms	Max. output	C41, C64	1st & 2nd R-F
23	4	12,100 k.c.	12,100	200 ohms	Untouched	L8, L19, L29	Ant. & 1st and 2nd R-F
24	Repeat 22 and 23 until circuits remain in alignment over the band.						
*25	5	Extreme low end	16,100	200 ohms	—	L55	Low end osc.
26	5	Extreme high end	22,700	200 ohms	—	C27	High end osc.
27	Repeat 25 and 26 until extreme end frequencies are as indicated.						
28	5	22,500 k.c.	22,500	200 ohms	Max. output	C43, C66	1st & 2nd R-F
29	5	16,400 k.c.	16,400	200 ohms	Untouched	L10, L20, L30	Ant. & 1st and 2nd R-F
30	Repeat 28 and 29 until circuits remain in alignment over the band.						
*31	6	Extreme low end	22,000	200 ohms	—	L56	Low end osc.
32	6	Extreme high end	32,000	200 ohms	—	C32	High end osc.
33	Repeat 31 and 32 until extreme end frequencies are as indicated.						
34	6	31,500 k.c.	31,500	200 ohms	Max. output	C45, C68	1st & 2nd R-F
35	6	22,500 k.c.	22,500	200 ohms	Untouched	L12, L21, L31	Ant. & 1st and 2nd R-F
36	Repeat 34 and 35 until circuits remain in alignment over the band.						

On all bands the oscillator tracks above the signal frequency.
If more than one peak is obtainable on oscillator, use the higher frequency peak.

* NOTE: On all coils, except Nos. 4, 5, and 6 band oscillator coils (L54, L55, and L56) turning the core clockwise increases the inductance. On the above three mentioned coils, turning the core clockwise decreases the inductance.

Adjustment of Beat Frequency Oscillator — Tune in a signal either R-F or I-F to exact resonance with Power-Transmit-Receive Switch at "Rec. Mod." (Fig. 3). Turn on beat frequency oscillator by turning switch to "Rec. CW." If zero beat does not fall within the range of the BFO control, adjust BFO Trimmer L22 (see Fig. 4) until zero beat occurs at the mid-point setting of the BFO control.

IX
MECHANICAL CONSTRUCTION

The receiver has been designed to be very rugged so that it will stand up under severe conditions of use, and yet have all parts available for easy replacement. All component parts such as transformers, chokes, filter and by-pass capacitors, etc., are mounted with screws and nuts rather than with rivets. All wiring other than that involving high frequency circuits is made up in the form of a laced cable so that no loose leads are left floating which might cause damage or change capacity to various portions of the circuit. The tuning condenser is mounted so as to be rigid with respect to the tuning unit, and yet is flexible with respect to the chassis. This prevents distortion of the chassis from having any appreciable effect on the stability of the oscillator.

The R-F unit which consists of the tuning condenser, tuning unit, range switch, and all of the R-F and oscillator coils and trimmers, is mounted on a separate base which bolts to the main base. The various coils and trimmers on this base may be easily replaced by means of a single nut which screws on the individual mounting bushings. However if a major repair is to be made such as replacement of the range switch, it is necessary first to remove the complete R-F unit from the receiver. To do this the following procedure should be observed:

1. Remove the chassis and panel from the cabinet by removing the four panel mounting screws and sliding the chassis forward out of the cabinet.
2. Remove the knobs by means of the small wrench held in the spring clip on the right hand side of the chassis. This wrench fits the

set screws in all knobs except the main tuning knob. For this knob use an ordinary small screw driver.

3. Remove the panel by removing the eight nuts with which it is held to the support brackets.
4. Remove the large cover from the top of the R-F unit, by removing the four knurled nuts with which it is supported.
5. Remove the small cover from the tuning condenser, by removing the eight knurled nuts with which it is supported.
6. Remove the dial light sockets where they are clipped on to the tuning unit.
7. Remove the antenna trimmer shaft extension by loosening set screw in coupling with same wrench as used above for knobs.
8. Remove support bracket from flywheel tuning shaft.
9. Remove main dial, vernier dial, and flywheel by loosening set screws with same wrench as used for knobs.
10. Disconnect the eight leads which connect the R-F unit to the main base. These leads are as follows:
    (a) Two on the antenna terminal board (blue and black).
    (b) One on number 7 pin of the 6K6GT output tube (brown).
    (c) One on terminal E of the crystal load circuit (yellow).
    (d) One on terminal E of the first I-F Transformer (red).
    (e) One on terminal F of the first I-F Transformer (blue).
    (f) One on pin 6 of the second I-F tube (green).
    (g) One on pin 7 of the second I-F tube (brown).

    In addition, the by-pass condenser which grounds to the R-F unit near the second I-F tube must be disconnected.
11. Remove eleven screws which hold R-F unit to main base. Three of these are on under side of chassis along the front edge. The other eight are removed from the top.
12. The R-F unit may now be removed from the bottom by lifting up first the rear of the R-F unit and sliding it back out of the opening. After the unit has been repaired it may be reassembled by following the above procedure in reverse order.

TUBE SOCKET VOLTAGES—TABLE 2

Tube	Type	Function	Voltages — Pin Numbers 1	2	3	4	5	6	7	8	R-F Gain Control Position
V1	6SG7	1st R-F Amp.	0	0	0	−18.0	0	250	6.0 AC	269	Minimum
			0	0	0	− 2.0	0	146	6.0	235	Maximum
V2	6SG7	2nd R-F Amp.	0	0	0	−18.6	0	260	6.0	268	Minimum
			0	0	0	− 2.15	0	136	6.0	235	Maximum
V3	6J5	R-F Oscillator	0	0	115	155*	24.0	152*	6.0	0	Min. or Max.
V4	6SA7	1st Detector	0	0	268	57	−0.3	2.3	6.0	0	Minimum
			0	0	242	56	−0.3	2.75	6.0	0	Maximum
V5	6SG7	1st I-F Amp.	0	0	0	−20.2	0	153	6.0	265	Minimum
			0	0	0.86	− 2.27	0.86	151	6.0	232	Maximum
V6	6SG7	2nd I-F Amp.	0	0	0	−20.2	0	155	6.0	267	Minimum
			0	0	0.3	− 2.25	0.3	152	6.0	234	Maximum
V7	6SG7	3rd I-F Amp.	0	0	3.5	0	3.5	153	6.0	260	Minimum
			0	0	3.45	0	3.45	151	6.0	235	Maximum
V8	6H6	2nd Det. & AVC	0	0	−21.2	−21.3	−0.82	−1.9	6.0	0	Minimum
			0	0	−2.4	− 2.4	−0.67	−1.53	6.0	0	Maximum
V9	6H6	Noise Limiter	0	0	−0.73	0	−0.91	0	5.0	0	Minimum
			0	0	−0.56	0.12	−0.62	0	5.0	0.1	Maximum
V10	6SJ7	1st A-F Amp.	0	0	0	1.1	0	33	6.0	50	Min. or Max.
V11	6K6GT	Power Output	0	0	276	265	−15.7	0	6.0	0	Minimum
V12	6J5	Beat Freq. Osc.	0	0	41	0	− 1.9	0	6.0	0	Min. or Max.
V13	VR-150	Voltage Regulator	0	0	0	0	149	0	0	0	Min. or Max.
V14	5Y3GT	Rectifier	0	** 4.9	–	–	0	–	0	** 4.9	——
				330 volts DC—Output							

All voltages read to ground with Junior Voltohmyst.
Band No. 1 gang condenser closed.
* Used as tie down lug.
** AC voltage between pins 2 and 8.

X
PARTS LIST

Symbol Designations	DESCRIPTION	RCA Drawing and Part No.
	CAPACITORS	
C1, 11, 33, 47, 51, 52, 54, 63, 83, 117, 118, 121, 122	Capacitor, 4,700 mmfd...	M-86079-531
C2	Capacitor, antenna trimmer	M-253132-2
C3, 6, 35, 40, 49, 50, 70, 77	Capacitor, variable, assembly, 8 sections....	P-92444-501
C4, 5, 14, 34, 57	Capacitor, 220 mmfd....	K-90581-341
C7	Capacitor, 18 mmfd.....	K-90581-315
C8	Capacitor, 33 mmfd.....	K-90581-321
C9, 10	Capacitor, 22 mmfd.....	K-90581-317
C12	Capacitor, 56 mmfd.....	K-90581-227
C13, 26, 29, 42, 65, 67, 69	Capacitor, 82 mmfd.....	K-90578-231
C16, 19, 22, 37, 59	Capacitor, air trimmer..	M-95534-503
C17	Capacitor, 525 mmfd.....	M-86079-503
C15, 18, 21	Capacitor, 13 mmfd.....	K-90580-212
C20	Capacitor, 1,550 mmfd...	M-86079-533
C23, 28	Capacitor, 3,000 mmfd...	P-721133-9
C24	Capacitor, 2,700 mmfd...	P-721133-8
C25, 27, 32, 41, 43, 45, 64, 66, 68	Capacitor, air trimmer...	M-95534-501
C30	Capacitor, 3,900 mmfd...	P-720538-46
C31	Capacitor, 75 mmfd.....	K-90577-230
C36, 58	Capacitor, 180 mmfd....	K-90581-239
C38, 39, 60, 62, 80, 81	Capacitor, air trimmer...	M-95534-502
C44	Capacitor, 91 mmfd.....	K-90575-232
C46	Capacitor, 85 mmfd.....	K-98054-9
C48, 109, 110, 103, 106, 107	Capacitor, by-pass, assembly, 3 sections, 0.05 mfd. each	K-98034-1
C53	Capacitor, 6.8 mmfd.....	K-90581-305
C56, 76, 93	Capacitor, by-pass, assembly, 3 sections, 0.01 mfd. each	K-98034-4
C61, 120	Capacitor, 15 mmfd.....	K-90581-313
C71, 95, 102, 79, 84, 92	Capacitor, by-pass, assembly, 3 sections, 0.1 mfd. each	K-98034-2
C74	Capacitor, 4,700 mmfd...	M-86079-531
C75	Capacitor, crystal phasing trimmer.....	M-253132-6
C86	Capacitor, BFO Trimmer.	M-253132-1
C96, 97, 98	Capacitor, filter pack, assembly, 3 sections, 4 mfd. each	P-72026-515
C99, 112, 113	Capacitor, by-pass, assembly, 3 sections, 0.25 mfd. each	K-98034-3
C105	Capacitor, 560 mmfd.....	M-86034-502
C111, 116	Capacitor, 2,700 mmfd...	M-86034-534
C119	Capacitor, 3,000 mmfd...	K-251248-3
C123	Capacitor, 10 mmfd.....	K-90581-309
	CONNECTORS	
J1	Socket	M-421395-509
J2	Phone Jack	K-98965-2
	INDUCTORS	
L1, 2	Antenna Coil, No. 1 band	M-95520-502
L3, 4	Antenna Coil, No. 2 band	M-95521-501
L5, 6	Antenna Coil, No. 3 band	M-95521-502
L7, 8	Antenna Coil, No. 4 band	M-95521-503
L9, 10	Antenna Coil, No. 5 band	M-95521-504
L11, 12	Antenna Coil, No. 6 band	M-95519-507
L13, 14, 23 24	R.F. Coil, No. 1 band...	M-95520-508
L15, 16, 25, 26	R.F. Coil, No. 2 band...	M-95520-503
L17, 18, 27, 28	R.F. Coil, No. 3 band...	M-95520-504
L19, 29	R.F. Coil, No. 4 band...	M-95519-501
L20, 30	R.F. Coil, No. 5 band...	M-95519-502
L21, 31	R.F. Coil, No. 6 band...	M-95519-503
L49, 50	Coil, Filter Choke.....	K-901433-501
L51	Oscillator Coil, No. 1 band	M-95520-505
L52	Oscillator Coil, No. 2 band	M-95520-506
L53	Oscillator Coil, No. 3 band	M-95520-507
L54	Oscillator Coil, No. 4 band	M-95519-504
L55	Oscillator Coil, No. 5 band	M-95519-505
L56	Oscillator Coil, No. 6 band	M-95519-506
L57	Wave trap, 455 k.c.....	M-76299-505
	RESISTORS	
R1, 6	Resistor, 47,000 ohms, ½ watt	K-850981-82
R2, 33, 36, 47	Resistor, 2.2 meg, ½ watt	K-850981-33
R3, 10, 12, 16, 22, 26, 31, 34	Resistor, 1,000 ohms, ½ watt	K-82283-62
R4	Resistor, 56,000 ohms, ½ watt	K-82283-83
R5, 60	Resistor, 1 meg, ½ watt	K-82283-31
R7, 17, 61, 62	Resistor, 10 ohms, ½ watt	K-867970-338
R8, 18	Resistor, 5,600 ohms, ½ watt	K-82283-71
R9, 14	Resistor, 100,000 ohms, ½ watt	K-82283-86
R11	Resistor, 10,000 ohms, ½ watt	K-82283-74
R13	Resistor, 560 ohms, ½ watt	K-850981-59
R19, 49	Resistor, 33,000 ohms, ½ watt	K-850981-80
R20, 39	Resistor, 100 ohms, ½ watt	K-82283-50
R21	Resistor, Meter Adjustment	K-251402-4
R23, 27, 50, 57, 58	Resistor, 560,000 ohms, ½ watt	K-82283-95
R25	Resistor, 180 ohms, ½ watt	K-82283-53
R30	Resistor, 2,700 ohms, 4 watts	K-90497-3
R32	Resistor, 390 ohms, ½ watt	K-850981-57
R35	Resistor, 680,000 ohms, ½ watt	K-850981-96
R37	Resistor, 1 meg, ½ watt	K-850981-31
R38	Resistor, 1.5 meg, ½ watt	K-850981-100
R40	Resistor, 270,000 ohms, ½ watt	K-850981-91
R41	Resistor, 100,000 ohms, ½ watt	K-850981-86
R42	Resistor, 390,000 ohms, ½ watt	K-82283-93
R43	Resistor, 100 ohms, 4 watts	K-90497-1
R44	Resistor, 160 ohms, 4 watts	K-90497-2
R45, 59	Resistor, 15 ohms, ½ watt	K-867970-340

PARTS LIST (Continued)

Symbol Designations	DESCRIPTION	RCA Drawing and Part No.
R46	Resistor, R.F. Gain Control	K-251402-2
R48	Resistor, Noise Limiter Control	K-251402-2
R51	Resistor, Audio Gain Control	K-980027-4
R52	Resistor, Tone Control	K-251402-1
R53	Resistor, 330,000 ohms, ½ watt	K-82283-92
R54	Resistor, 2,700 ohms, ½ watt	K-850981-67
R55	Resistor, 5,600 ohms, ½ watt	K-850981-71
R56	Resistor, 5 ohms, 4 watts	K-90497-4
	SWITCHES	
S1 to 16	Range Switch	M-253097-1
S17 to 20	Selectivity Switch	M-253134-2
S21, 22	A.V.C.—N.L. Switch	M-253099-2
S23, 24	Off-Trans.-Rec. Switch	M-253098-2
S25	Voltage Tap Switch	K-99585-1
	TRANSFORMERS	
T1	Transformer, Power, Universal	K-901432-501
T2	Transformer, Output	K-901666-501
T3	Transformer, 1st I.F.	P-92430-501
T4	Transformer, Crystal Load I.F.	P-92430-506
T5, 6	Transformer, 2nd I.F.	P-92430-503
T7, 8	Transformer, 3rd I.F.	P-92430-503
T9	Transformer, 4th I.F.	P-92430-502
T10	Transformer, BFO	P-92430-504
	TERMINAL BOARDS	
TB1	Terminal Board, Antenna and Ground	M-254373-6
TB2	Terminal Board, Output	M-254373-5
TB4	Terminal Board, Output	M-254373-7

Symbol Designations	DESCRIPTION	RCA Drawing and Part No.
	TUBE SOCKETS	
X1, 2, 7, 8, 11	Tube Socket	M-421395-507
X3, 4, 9	Tube Socket	M-421395-508
X5, 6, 10, 13, 14	Tube Socket	M-421395-509
X12	Tube Socket	M-421395-510
	CRYSTAL	
A1	Crystal (455 KC)	MI-19454-1
	METER	
M1	Tuning Meter	K-98949-1
	MISCELLANEOUS	
	Resistor Board	K-98958-2
	Tuning Unit	P-92417-1
	Dial Window	29932-3
	Tuning Dial Assembly	K-98947-501
	Vernier Dial Assembly	K-98947-502
	Flywheel Bracket Assembly	K-99819-501
	Flexible Coupling	K-98950-1
	Battery Plug Assembly	K-99895-501
	Pilot Lamp Socket Assembly	K-98983-502
	Pilot Lamp Socket Assembly	K-98982-1
	Pilot Lamp	K-61114-15
	Lock Screw	K-99821-1
	Wrench (Knob & Coupling Set Screw)	K-828505-12
	Knob (Large)	M-254283-501
	Knob (Medium)	M-254283-502
	Knob (Small)	M-254283-503
	Power Cord	K-99883-1
	I.F. Transformer Adj. Tool	M-86183-501
	Air Trimmer Adj. Tool	M-81059-501
	Coupling (Ant. Trimmer Shaft)	K-99630-2
	Ant. Trimmer Shaft	K-99631-1

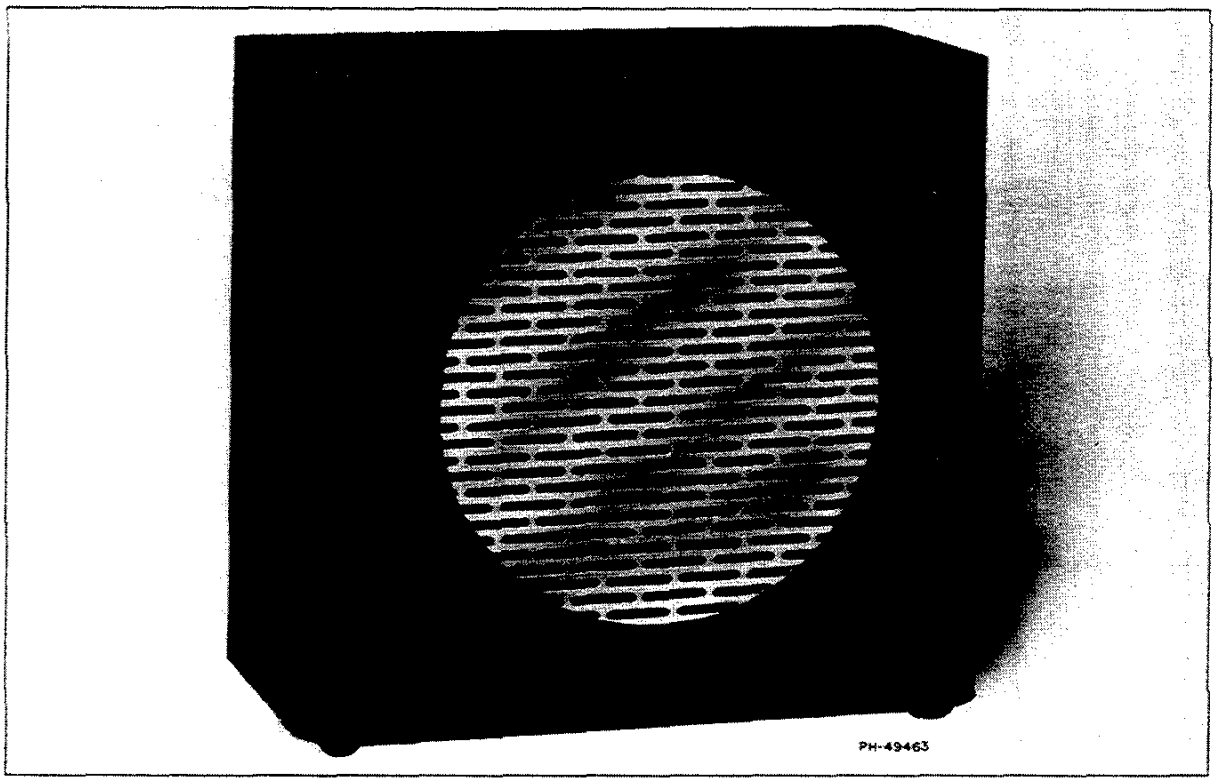


Figure 11—Loudspeaker

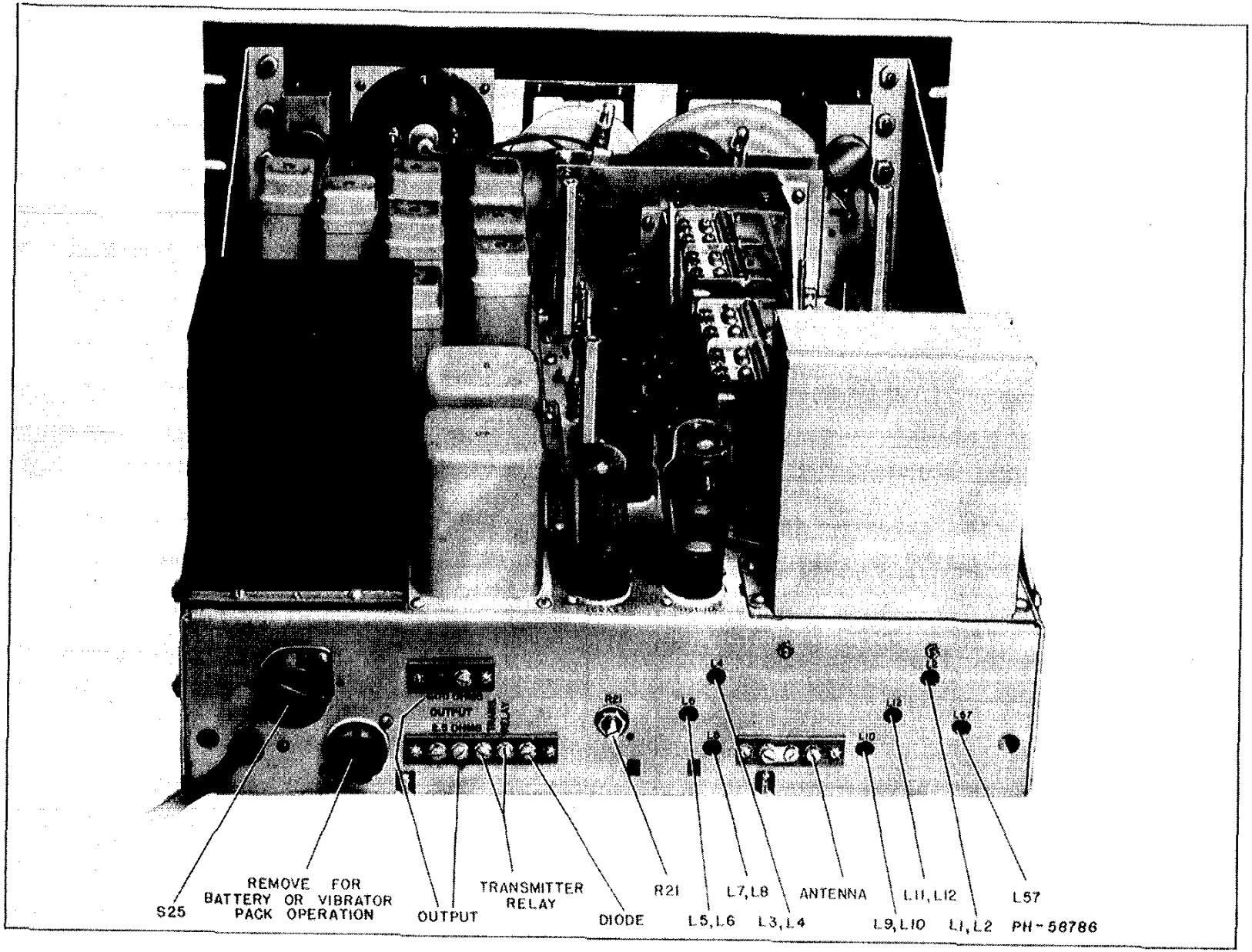


Figure 12.—CR-88 Chassis (Covers Removed)

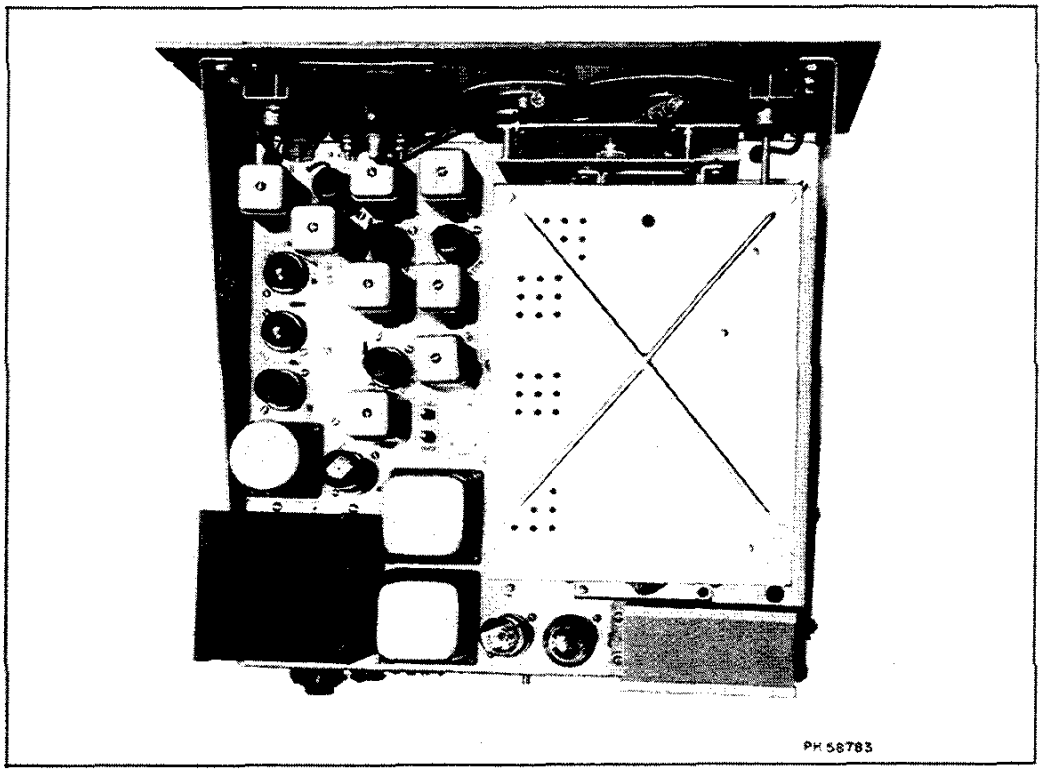


Figure 13—Top View of Chassis

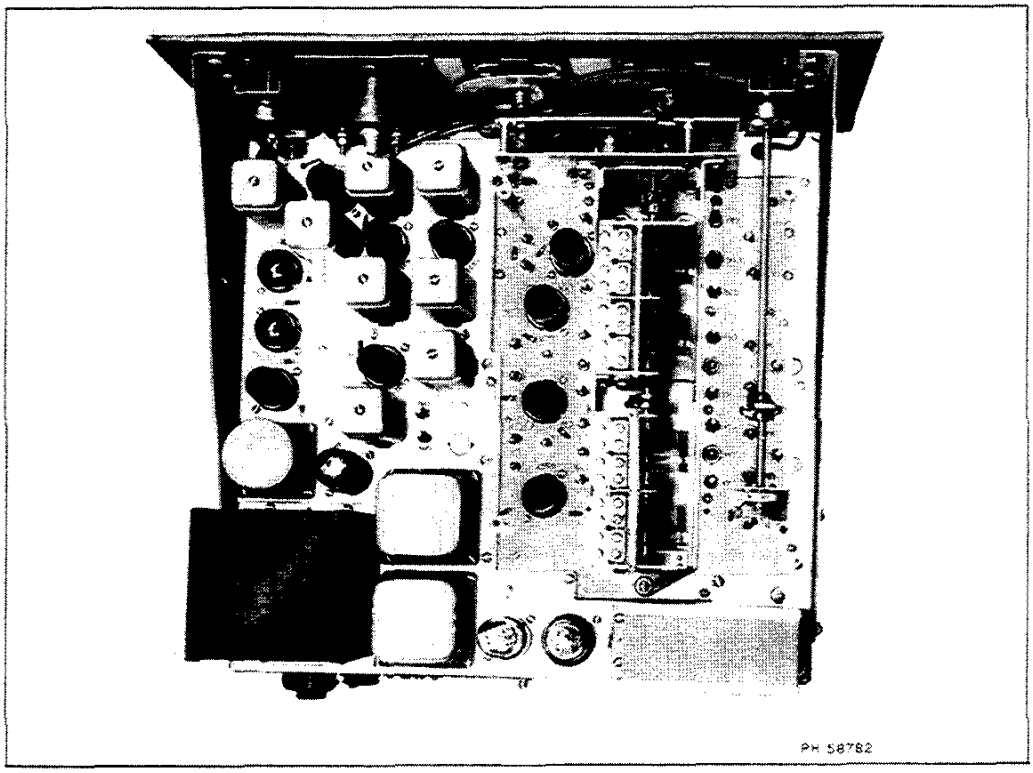


Figure 14—Top View of Chassis—Covers Removed

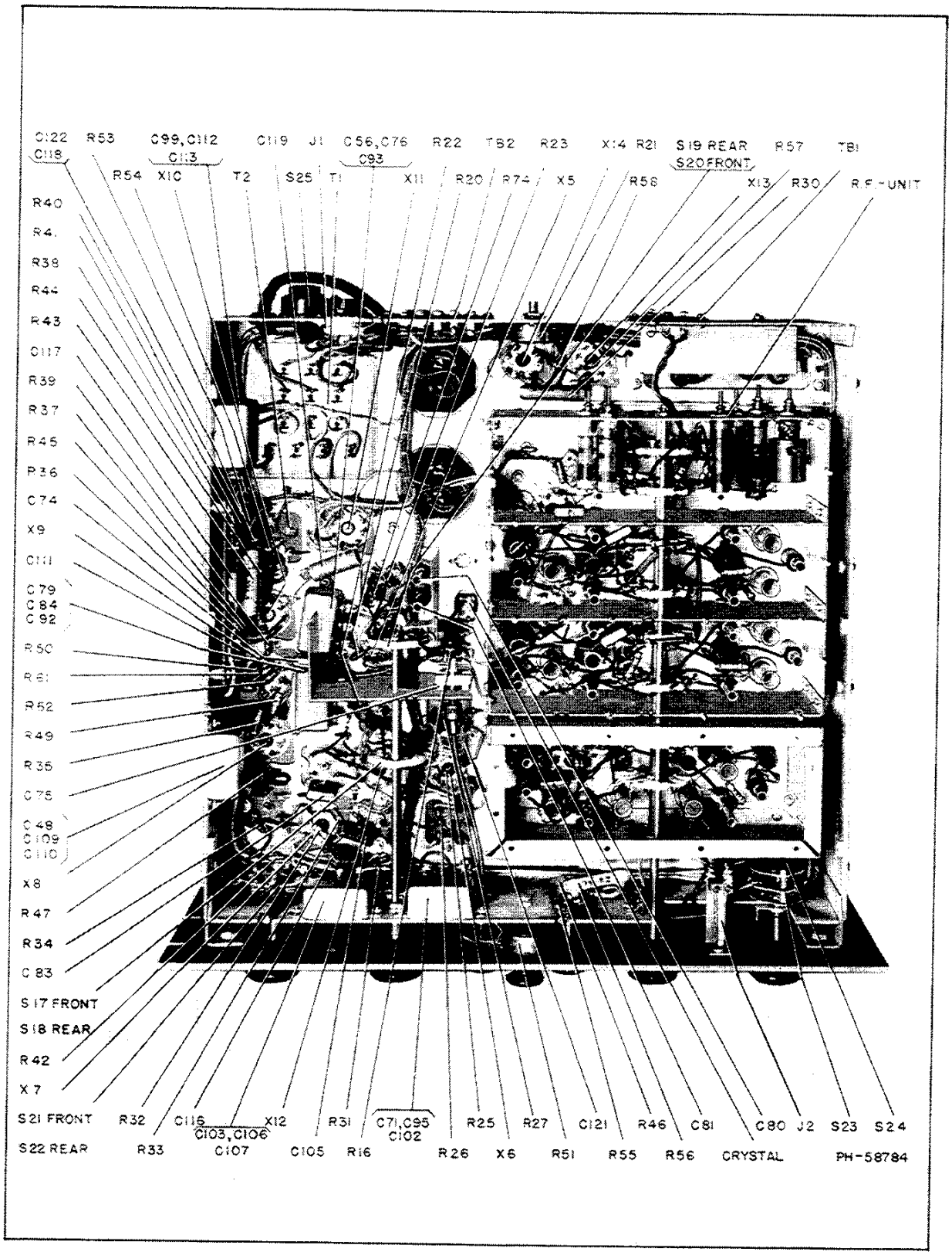


Figure 15—Bottom View of Chassis

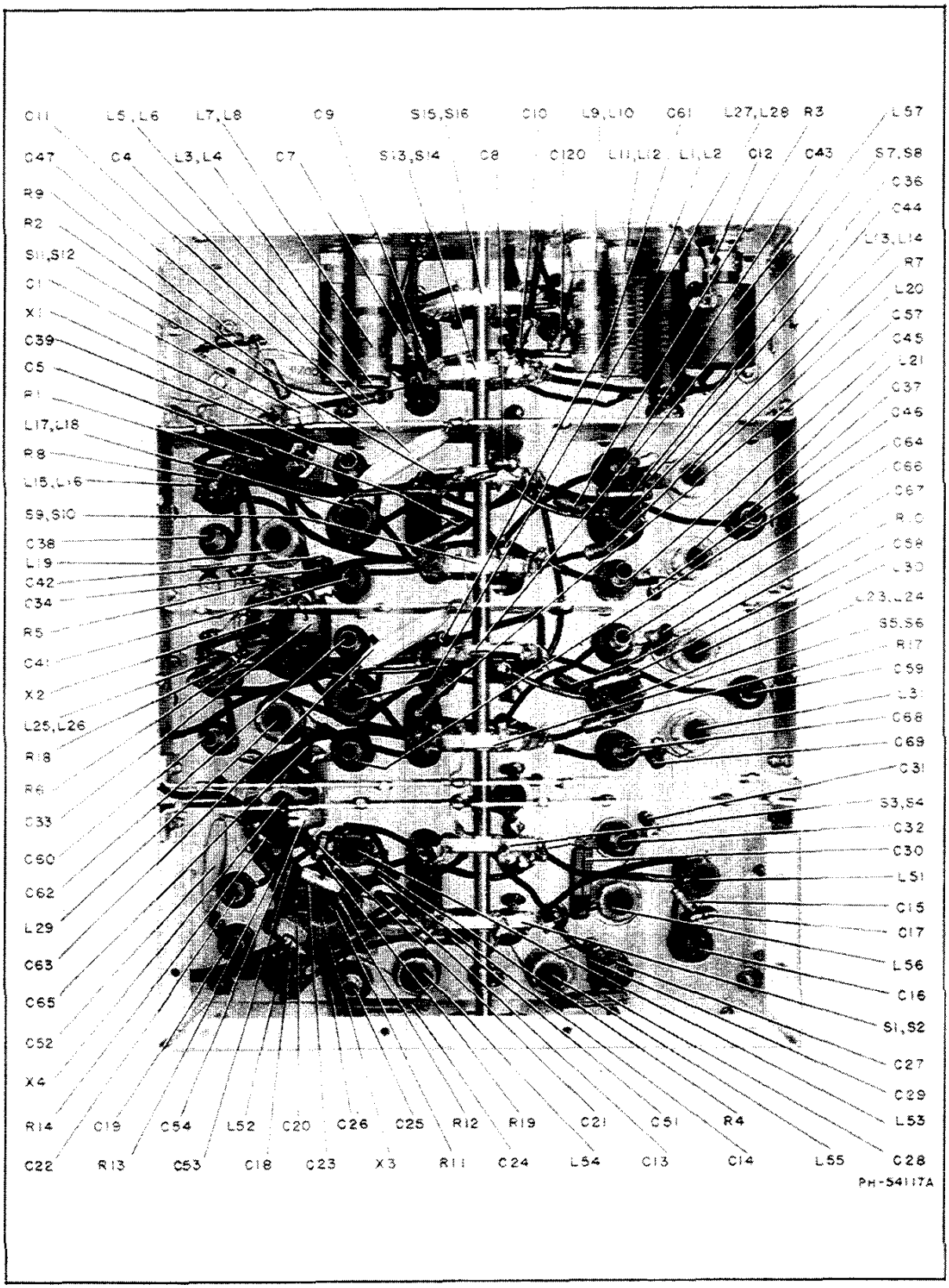


Figure 16— R-F Unit

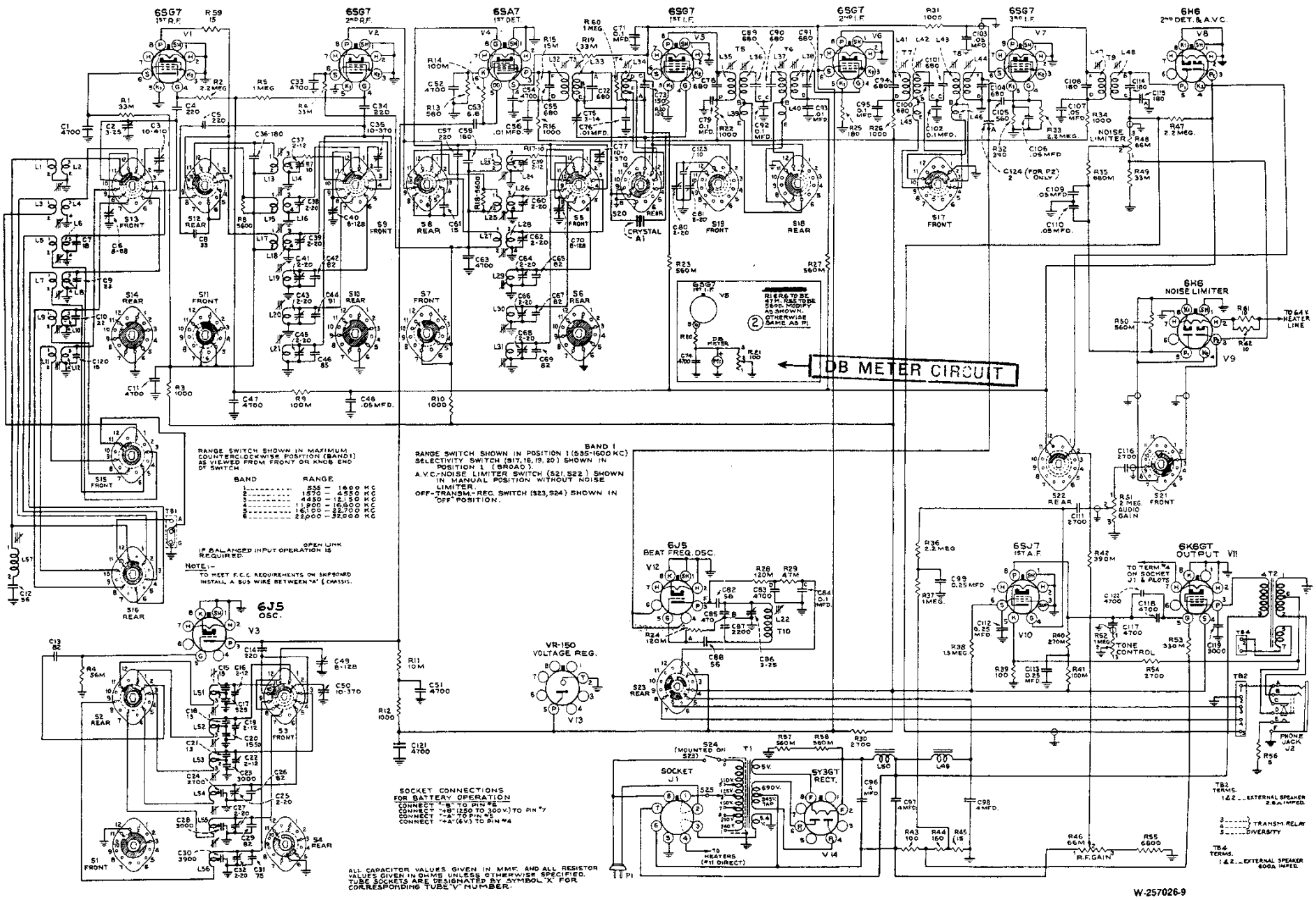


Figure 17—Schematic Diagram

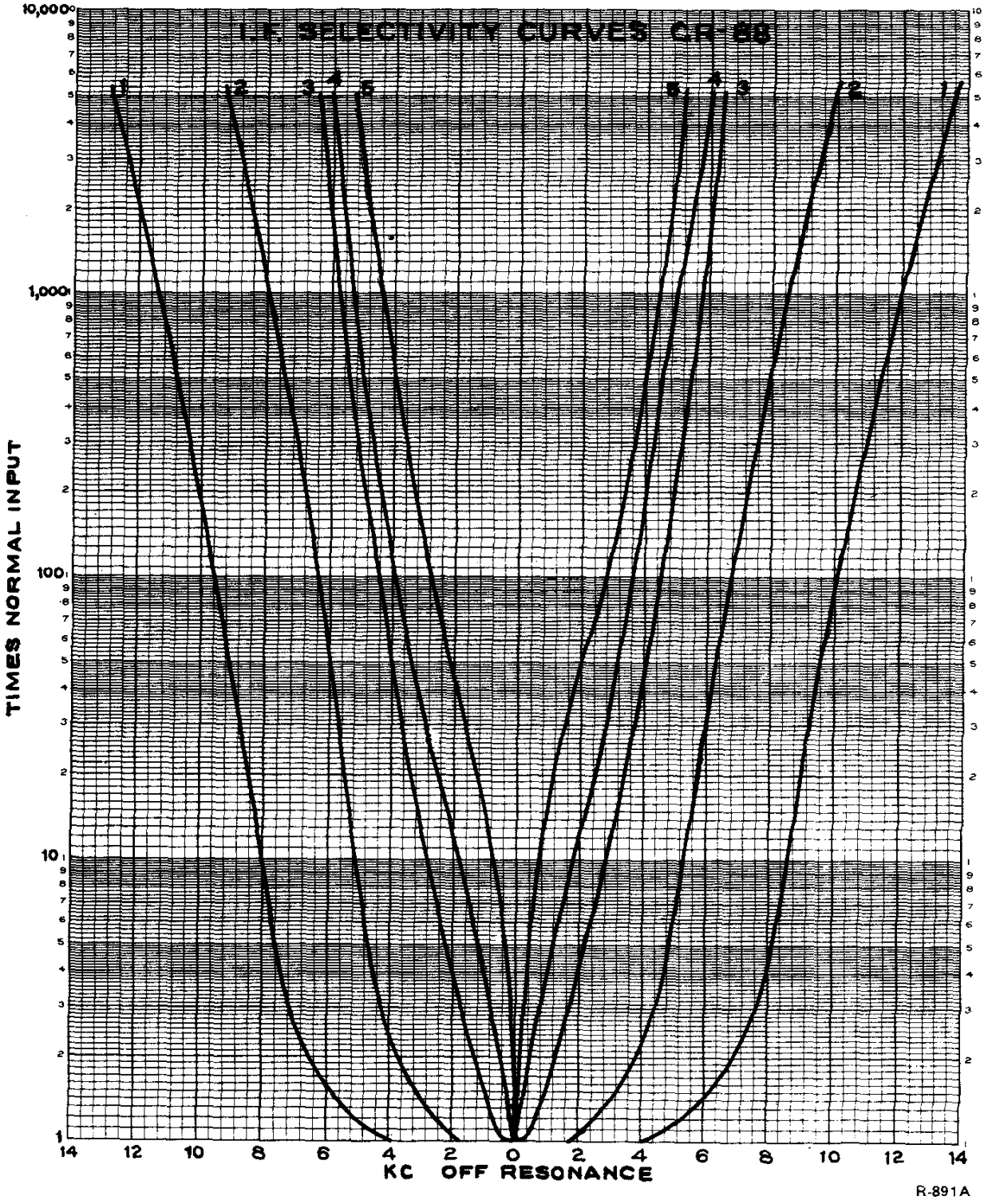
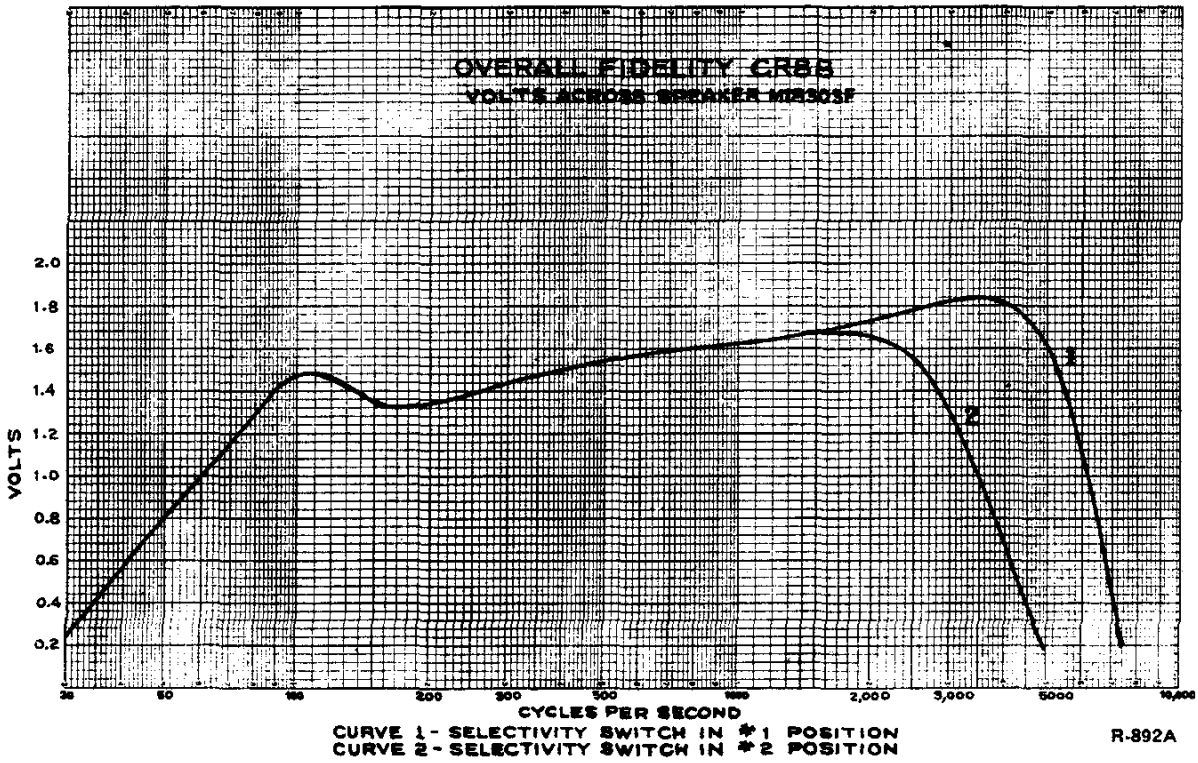


Figure 18- Selectivity Curves



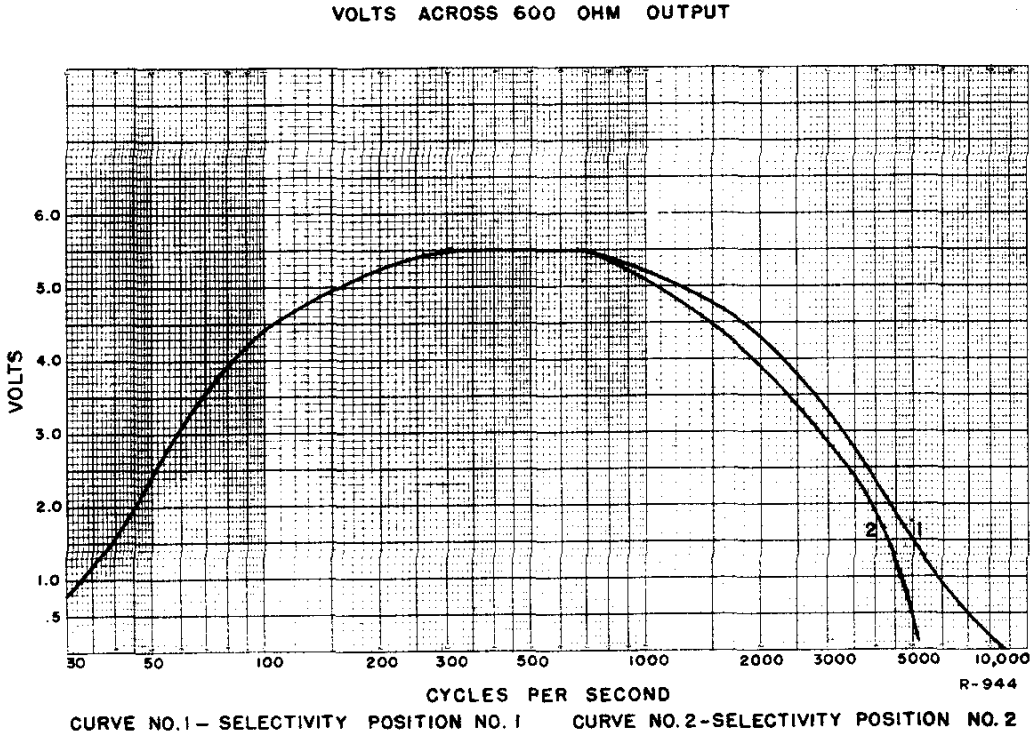
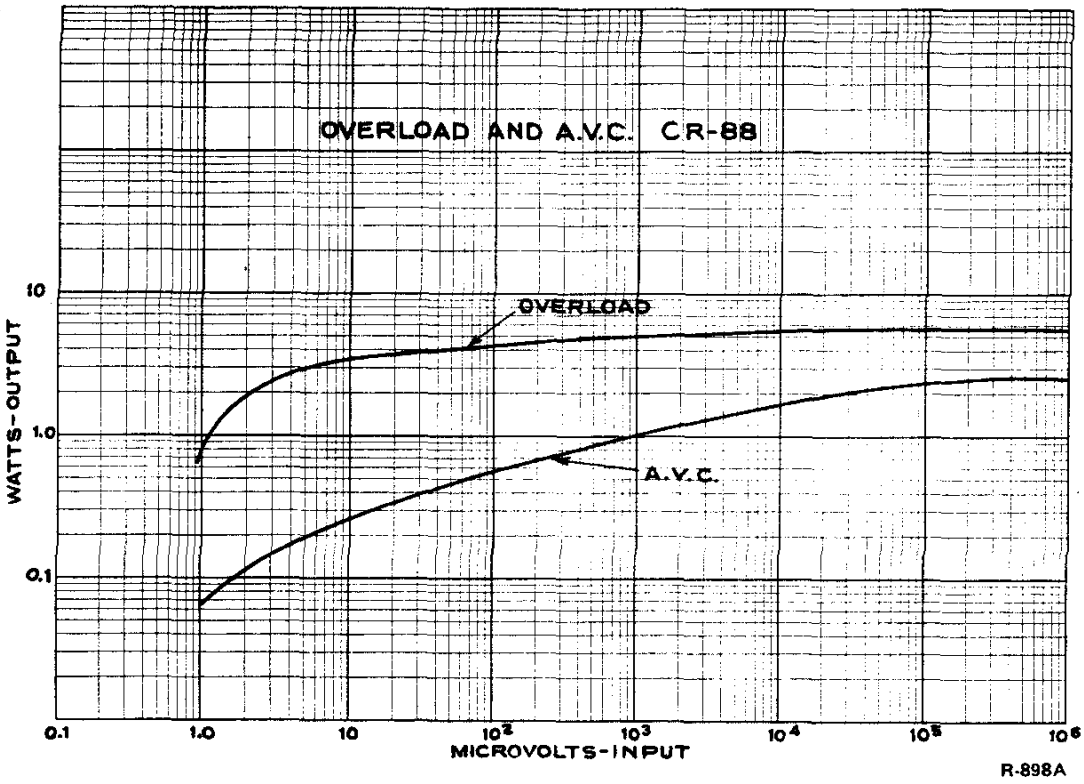


Figure 19—Fidelity Curves



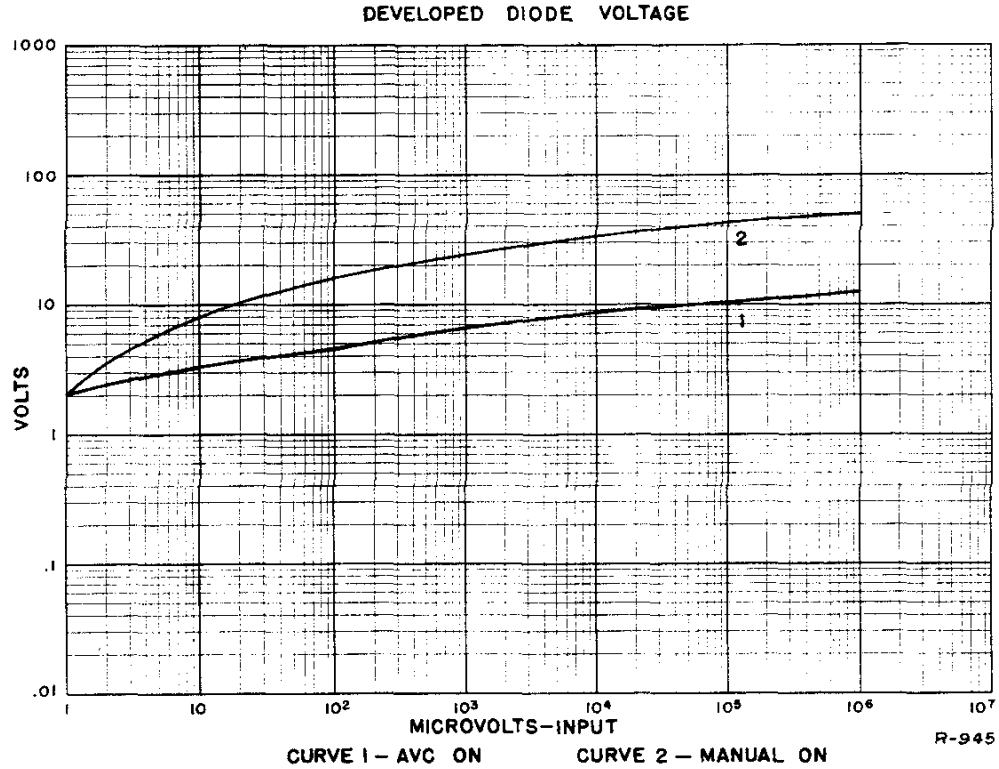


Figure 20—AVC Curves

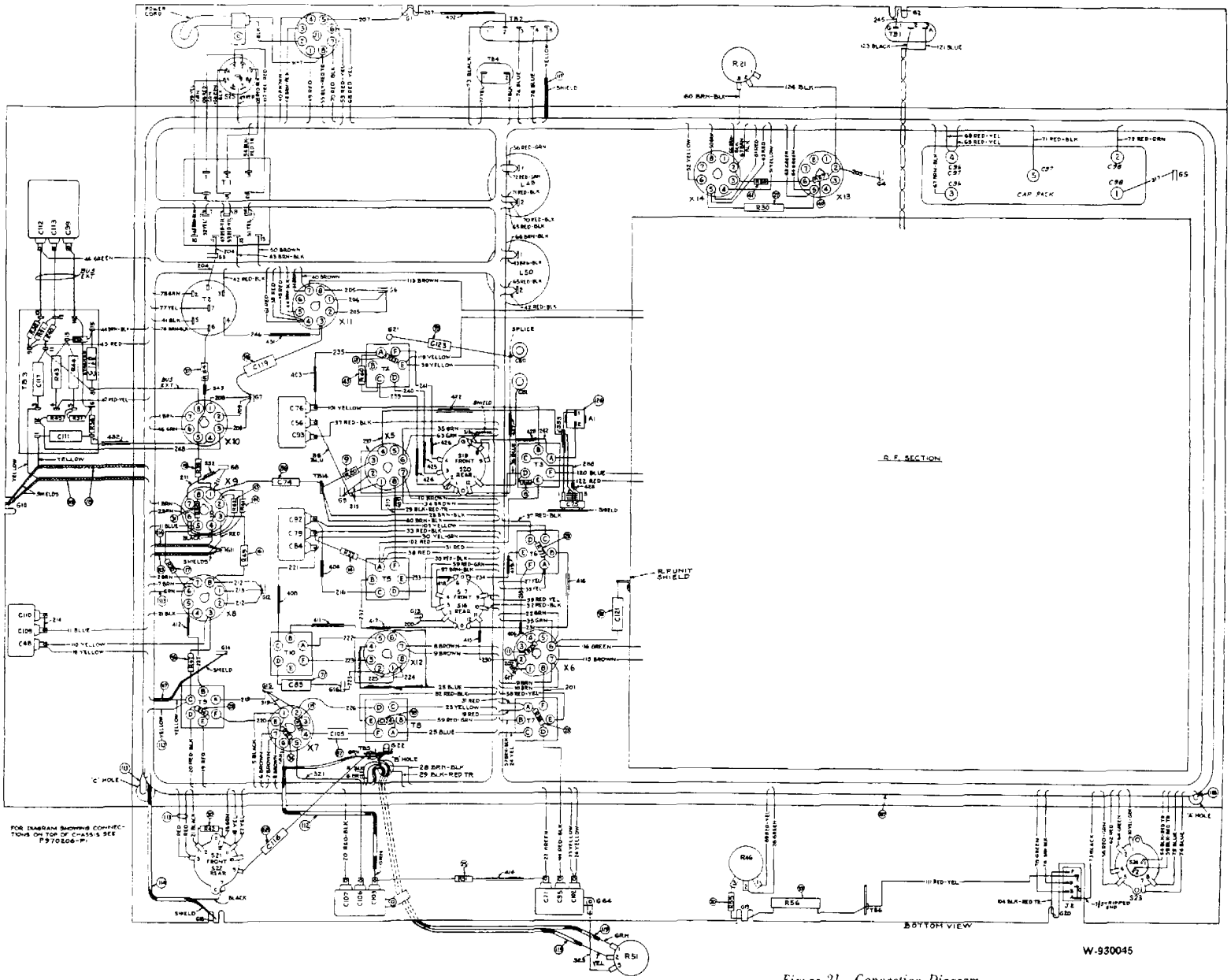


Figure 21—Connection Diagram (CR-88, less R-F Unit)

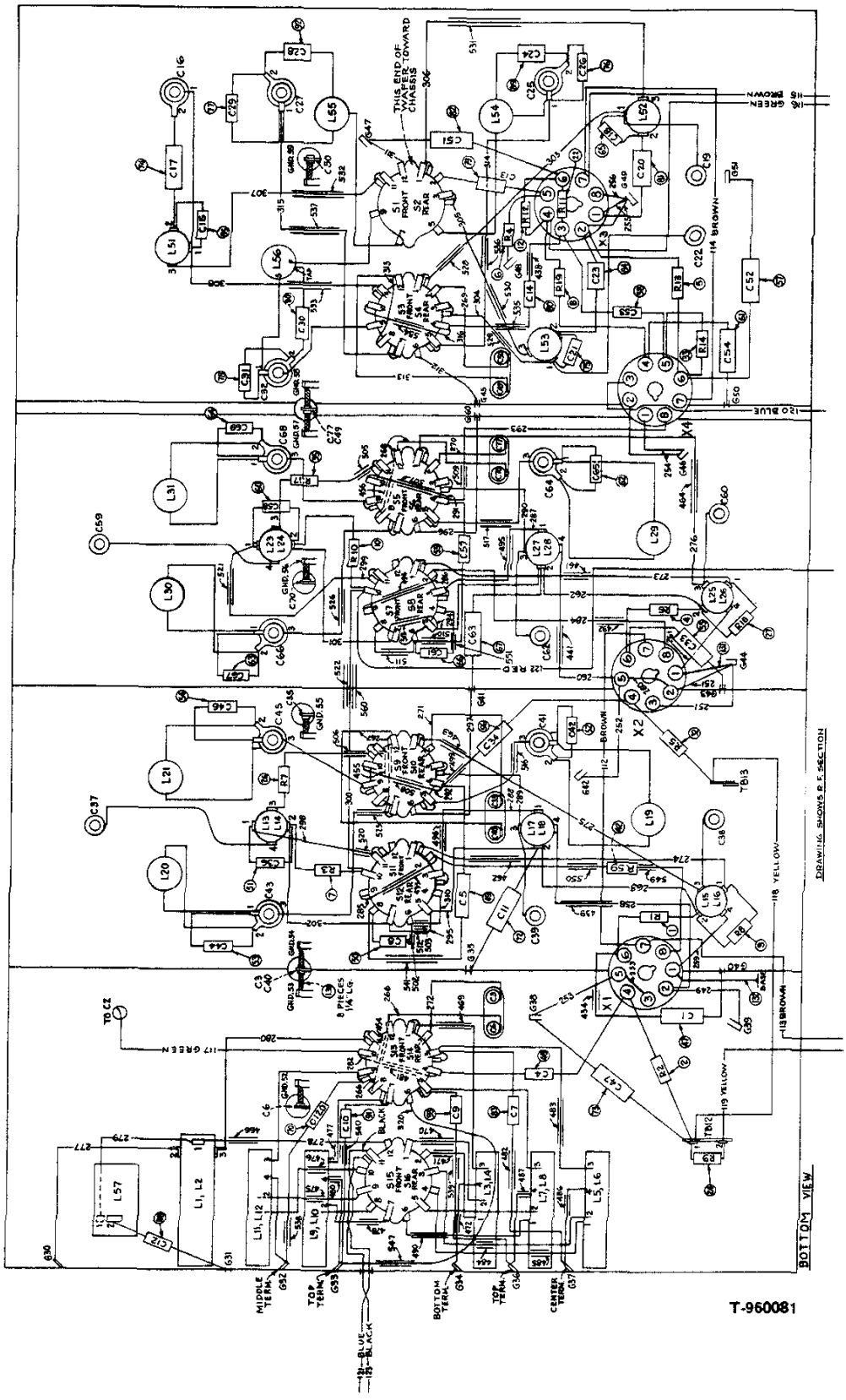


Figure 22—Connection Diagram
(R-F Unit, Bottom View)

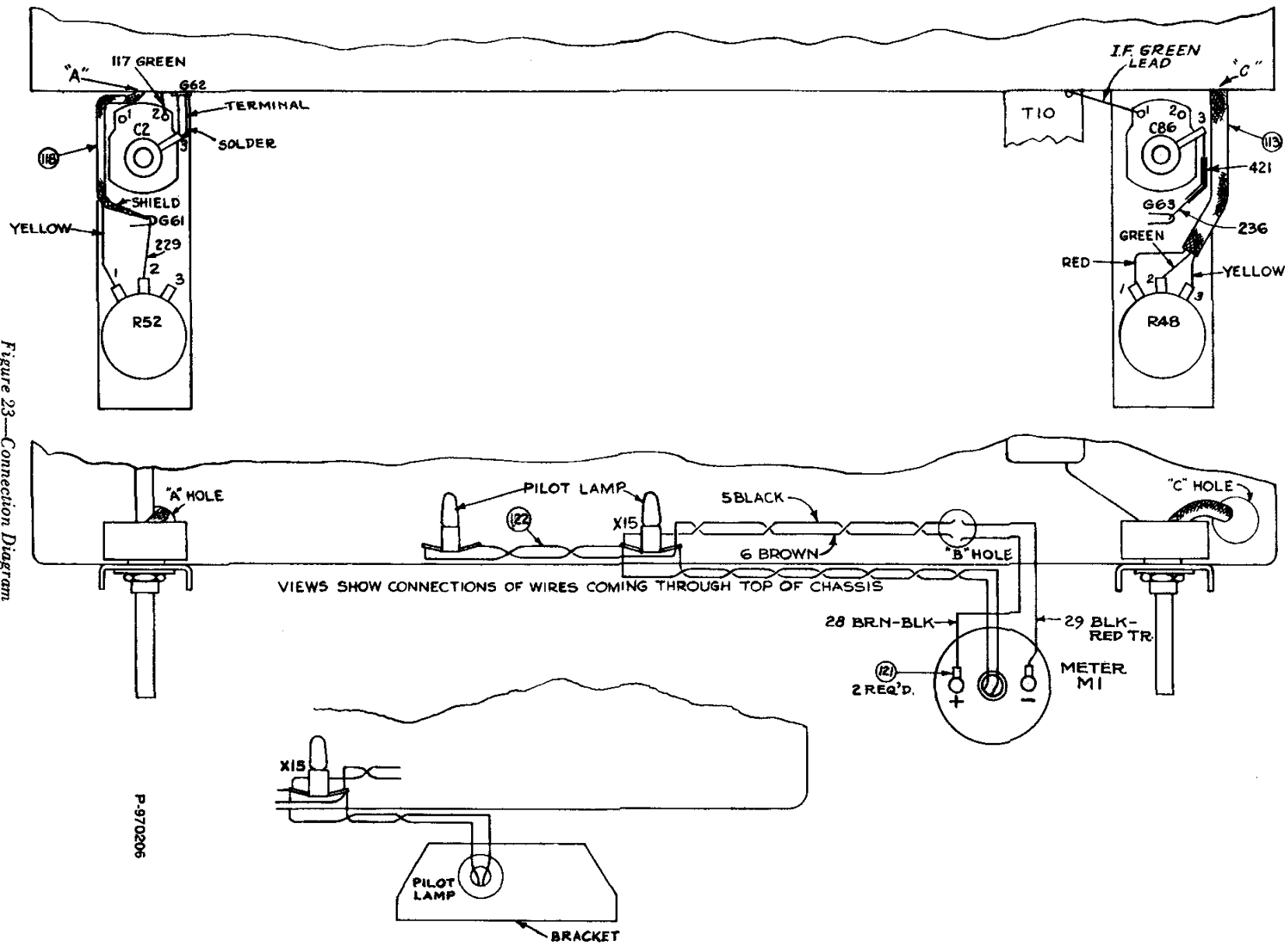


Figure 23—Connection Diagram (R-F Unit, Top View)

RCA Equipment for

EVERY COMMUNICATION NEED

The CR-88 Communications Receiver is designed for general use in the frequency range of 535 to 32,000 kilocycles. Its features are high selectivity, great frequency stability, sensitivity, and reliability. The use of this receiver may suggest other fields in which radio communications equipment may serve you. RCA has a complete line of transmitters and accessory equipment as well as other types of receivers, to fit any communications need. Some of these will be illustrated and described on the following pages.

RCA is the world leader in electronic equipment for every communications purpose. Its products include:

Electronic Tubes	Receivers
Microphones	Transmitters
Loudspeakers	Amplifiers
Crystals	Test Equipment

As your communication problems change, modify your equipment to keep pace. Let RCA engineers help to solve your communication problems and to suggest the proper radio equipment to keep you up-to-date.

Success today must be radio equipped.

Do not handicap yourself by inadequate equipment. For friendly and expert help write or radio to:

RADIO CORPORATION OF AMERICA

RCA International Division **745 Fifth Avenue, N. Y., U. S. A.**

Diversity Communication Receiver DR-89

Uses

The DR-89 is intended for use wherever high quality telephone or telegraph reception, with a minimum of the effect of fading, is required. It is particularly well suited for reception of high speed telegraph in regions where noise and fading often cause loss of characters.

Description

The DR-89 Diversity Receiver is designed to operate within the frequency range of 535 to 32,000 kilocycles. Three complete radio receivers, type RCA AR-88, together with a combining unit and tone keyer, monitoring unit, monitor power supply, and a loudspeaker are mounted on a single rack. The combining unit electronically selects the strongest output signal from the three individual receivers and suppresses the other two, each of the three receivers being connected to its own antenna which is located at a point about 1000 feet from each of the other two.

Output may be taken from the complete Diversity Receiver through the combining unit, or from any of the individual receivers. Suitable impedances are provided to match either a telephone line, a loudspeaker, or headphones.

Features

- Highly selective for CW keying reception—selective noise filter and adjustable threshold control insure maximum discrimination between signal and noise or interference.
- High sensitivity and five degrees of selectivity—each individual receiver in the DR-89 has 12 tuned i-f circuits.
- High frequency stability with respect to temperature change.
- Excellent voltage stability—electronically regulated power supply compensates for normal line voltage variations.
- Selective noise limiter for phone reception.
- Exact tuning indicated by the crystal controlled monitoring unit without interfering with diversity operation.
- Eight standard tone frequencies available from the tone keyer for line transmission of CW reception—terminals provided for connection of external tone if desired.
- Up to 2½ watts of audio output power available for local monitoring.
- Compact, enclosed 84 inch rack. Total weight only 650 lbs.
- Built-in loud speaker for on-the-spot monitoring.
- Extra panel space provided for mounting auxiliary equipment.
- Single dial tuning for each receiver.
- Band spread tuning for accurate logging.
- Adaptable—suitable for use anywhere from the arctic to the tropics.
- Flexible—each of the three receivers may be operated individually, or any pair or all three may be operated in diversity.
- Reliable—a dependable substitute and replacement for long distance wired telephone or telegraph.
- Completely self-contained—no additional external components required for operation.
- Economical—modern in design, simple to operate, easy to maintain.

Specifications

ELECTRICAL CHARACTERISTICS

Frequency Range—Total 6 Bands	535 to 32,000 kc
Band 1	535 to 1,600 kc
Band 2	1,570 to 4,550 kc
Band 3	4,450 to 12,150 kc
Band 4	11,900 to 16,600 kc
Band 5	16,100 to 22,700 kc
Band 6	22,000 to 32,000 kc
Maximum Undistorted Output (Tone Keyer and Combining Unit)	12 milliwatts
Maximum Undistorted Output (Receiver Amplifier)	approximately 2.5 watts
Output Impedance Tone Keyer	600 ohms
Output Impedance Receiver	2.5 ohms and 600 ohms
Power Supply Voltage	110-117, 117-135, 135-165, 190-230, 200-260 volts, a-c
Power Supply Frequency	50 to 60 cycles
Power Requirements	450 watts

MECHANICAL SPECIFICATIONS

Overall Dimensions	
Approximate inches	22 wide x 84 high x 21 deep
Approximate cm	56 wide x 214 high x 54 deep
Total weight (unpacked)	Approximate (pounds) 650 Approximate (kilos) 295

RADIO CORPORATION OF AMERICA

Diversity Communication Receiver DR-89

Specifications

Shipping Weights and Dimensions

Box and Contents	Dimensions (inches)	Volume (cu. ft.)	Weight (lbs.)
1 Box Cabinet	89x28x26	37.5	467
3 Boxes AR-88 Receiver	27x29x18½	8.4	121
1 Box *Tone Keyer*	24x25x21	7.3	150
1 Box Tubes	27x19x14	4.2	40

TUBE LIST

Type	Number Used	Type	Number Used
RCA 6H6	8	RCA 6SL7-GT/G	3
RCA 6J5	6	RCA 6SN7-GT/G	2
RCA 6K6-GT/G	3	RCA 5Y3-GT/G	5
RCA 6SA7	3	RCA VR75-30	1
RCA 6SG7	17	RCA VR150-30	5
RCA 6SJ7	4		

PERFORMANCE

Sensitivity—Satisfactory tone keying with CW signal input of .5 microvolt with noise peaks .4 microvolt or less. Only 4.0 microvolt phone signal input required for output signal-to-noise ratio of 6 db.

Selectivity—Figures below show approximate band width for which output is 1/10 that at resonance.

Selectivity Switch Position	Band Width (KC)
1	16.0
2	10.0
3	5.5
4	3.5
5	1.5

Diversity Action—A difference of 4 db in signal strength between channels at an average input of 1.0 microvolts causes diversity action to occur.

Fidelity—±4.5 db from 65 to 4000 cycles (receiver selectivity position #1)

Frequency Range—535 kc to 32 mc.

Undistorted Audio Power Output—2.5 watts

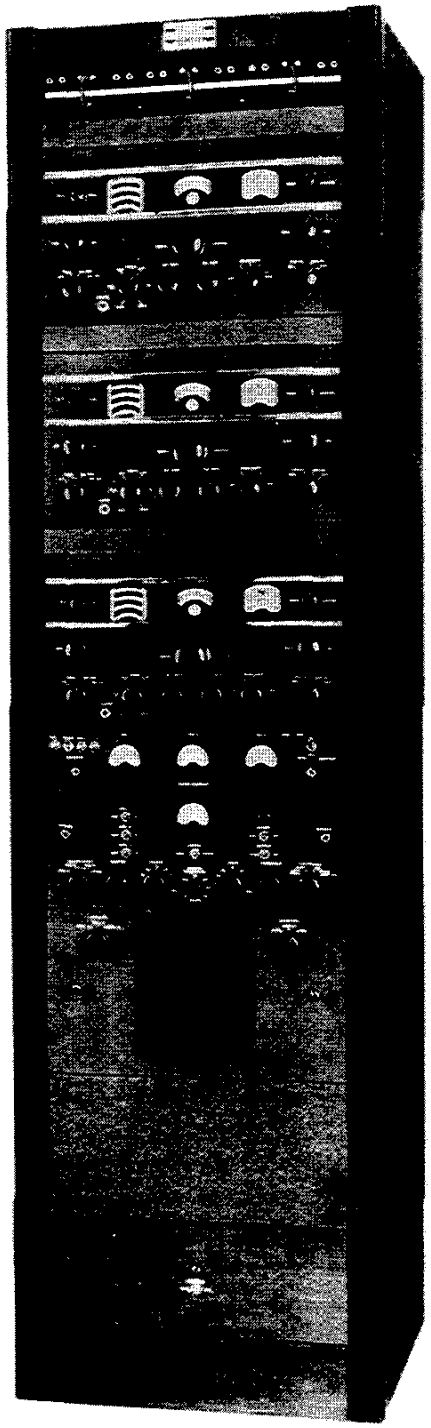
Image Ratio—From 1,000,000 to 1 at 535 kc to 100 to 1 at 28 mc.

Adjacent Channel Attenuation—at 10 kc from resonance
(selectivity position #1) 100
(selectivity position #2) 5000

Frequency Stability—0.003% per degree C.

Antenna Input Balance—15 db at 18 mc.

Automatic Gain Control—110 db input change required for 10 db change in output



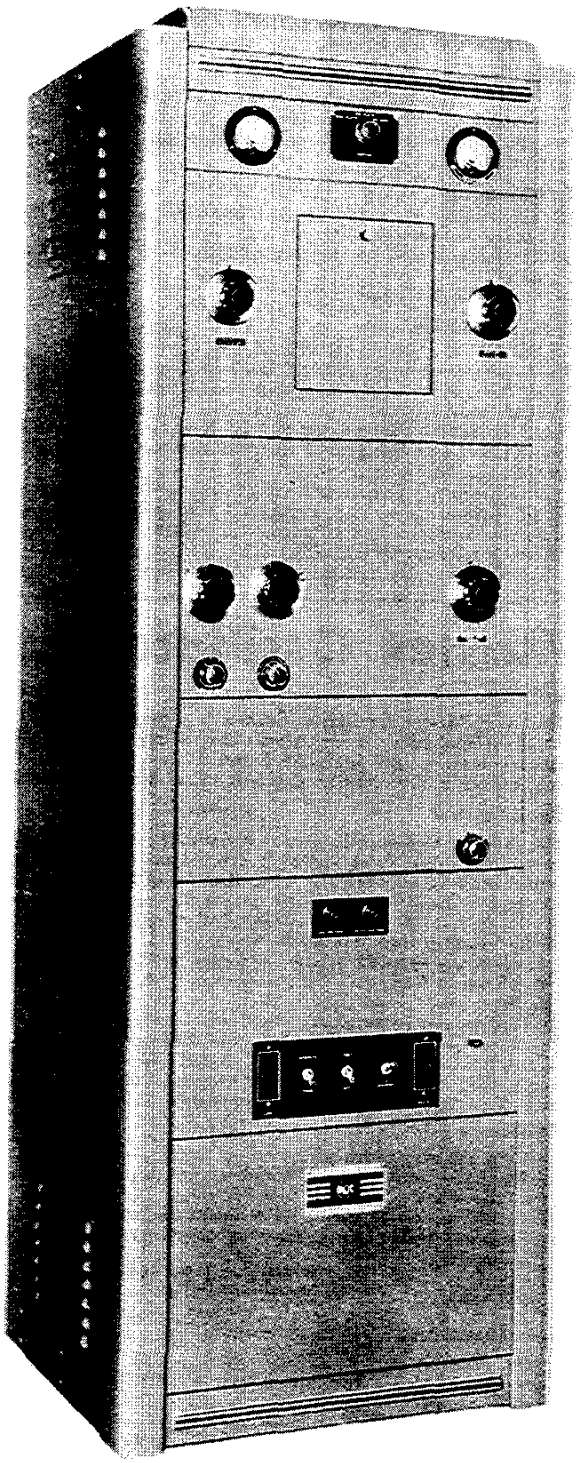
Front View DR-89 Diversity Receiver

RADIO CORPORATION OF AMERICA

ET-4339 Communications Transmitter

Uses

The RCA ET-4339 Transmitter is built for low power, one or two channel, point-to-point phone and CW communication service.



Description

It has unit chassis type of construction which permits various combinations of units to be assembled for different types of service. Each channel is equipped to take two crystals so that transmission on two adjacent frequencies may be effected by merely turning one switch.

The ET-4339 may be used for telegraph or telephone telegraph communication. It has a minimum number of operating controls, all located on the front panel and clearly identified. The cabinet, panels, and chassis frames are built of heavy guage steel and are finished to withstand adverse climates. Component parts are selected to give reliable service under difficult operating conditions.

Features

- Versatility—The units of the transmitter may be assembled to provide the following five types of service.
  1. Two Channel (not simultaneous) Telephone and telegraph
  2. Two Channel—Telegraph only
  3. Single Channel—Telephone and telegraph
  4. Single Channel—Telegraph only
  5. Simultaneous Two-channel—Telegraph only
- Protection—The transmitter power supply is completely protected by overload circuit breakers, and the operator is protected against accidental injury from high voltages by a rear door interlock switch. Accessible terminal boards and special cables permit changing units without necessity of extensive wiring changes.

Specifications

Frequency Range—1.7 to 20.0 megacycles
Power Output CCS Telegraph—200 watts
ICAS Telephone—200 watts
Power Supply—105/125 volts, 50/60 cycles single phase a-c
Power Supply with Auto Transformer
190 200/210/230/240/250 volts, 50 60 cycles
Antenna-Matching Characteristics—direct from r-f unit to 70-800 ohm non-reactive, balanced antenna
Antenna-Matching Characteristics with Antenna Coupler Unit, non-reactive or reactive balanced or unbalanced antenna—70-800 ohms
Audio Response—300 to 3000 cycles, ±2 db
Audio Input—125 or 500 ohm line, or single button carbon microphone. Microphone voltage supply built in
Keying—In cathodes of oscillator and IPA
Keying Speed—Up to 50 words per min.
Audio Input Level for 100% Modulation—0.2v across 500 ohms
Modulation—High level, Class B
Distortion—Less than 10% at 90% mod. (300 to 3000 cycles)

Dimensions

Height—6′
Depth—18″
Width—21″

RADIO CORPORATION OF AMERICA

Line Amplifier-Rectifier MI-7590

Uses

The Line Amplifier-Rectifier, MI-7590, is used to convert tone telegraph signals into direct current pulses for operating a tape recorder or relay. It may be operated from a communications receiver (such as the DR-89, or AR-88) or from a high-speed tone telegraph circuit.

Description

The Line Amplifier-Rectifier consists of two stages of resistance-coupled voltage amplification, a power stage, and an output rectifier stage. It is designed for standard cabinet rack mounting.

Features

- Zero center d-c milliammeter provided on front panel for measuring rectified output.
- Monitoring jack for high impedance head set provided on panel.
- Output noise filter.

Specifications

ELECTRICAL CHARACTERISTICS

Frequency Response	Flat within 1 db from 200 to 5,000 cycles
Input Impedance	Matching 600 ohms; Bridging 20,000 ohms
Output Impedance	1,600 ohms
Input Level (Matching)	−50 db* for Rectified Output of 16 ma
Input Level (Bridging)	−35 db* for Rectified Output of 16 ma
Output Circuit	
D-C Output	Linear up to 16 ma into a 3,000-ohm load
A-C Output	600 ohms for monitoring
Power Supply	105-125 volts, 50-60 cycles
Power Consumption	65 watts
Fuses	3 amperes (2 required)

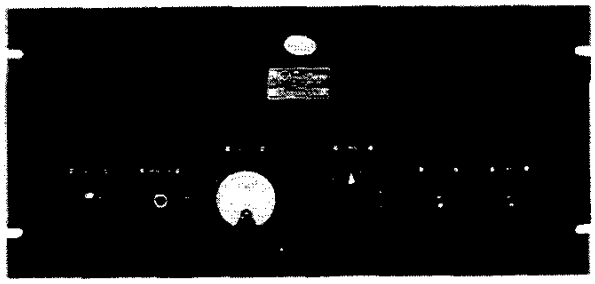
TUBE COMPLEMENT

1st Stage	1 RCA-6C6
2nd Stage	1 RCA-76
3rd Stage	1 RCA-42
Signal Rectifier	1 RCA-84/6Z4
Power Supply Rectifier	1 RCA-80

MECHANICAL SPECIFICATIONS

Width	19"
Height	8¾"
Depth (overall)	8½"
Weight	(18 kilos) 39½ lbs.

* Zero db = 6 milliwatts.



Front View of Line Amplifier-Rectifier

Master Oscillator Exciter MI-19427-B

Uses

The RCA Master Oscillator Exciter is a highly stable source of radio-frequency power. It will supply excitation at any frequency between the limits of 2 and 20 megacycles, to a radio transmitter, radio frequency generator or other equipment.

Description

The Master Oscillator Exciter is a compact, rack-mounted unit, using very little floor space. It can be mounted next to the transmitter, or remotely, up to a distance of 50 feet. It can be finished to harmonize with the particular piece of equipment of which it is a part. It has the following sub-unit arrangement (reading from top to bottom):

1. Electron coupled master oscillator unit.
2. Constant frequency tone generator unit.
3. Regulated power supply unit.

A coupling can be supplied—making a fourth unit—and should be mounted, if possible, in the associated transmitter.

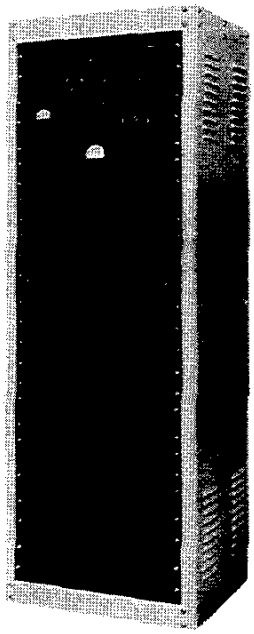
Transmission Line: 50 feet of Coaxial Line is furnished for connecting the master oscillator to the transmitter coupling unit. This line has a nominal impedance of 70 to 75 ohms.

Features

- Used all over the world.
- Ruggedly built and will stand up for shipment to any part of the world.
- Unaffected by humidity or temperature changes.
- Simple working parts. Easy to operate even by unskilled technicians.
- Operates from 115/230 volts and 50/60 cycles. Consumes 200 watts.

Specifications

Output Frequency	2 to 20 megacycles
Output Level	Sufficient power to drive an RCA 807 tube
Modulation Frequency	500 ± 500 cycles
Power Consumption	200 watts
Power Supply	115/230 volts a-c, 50/60 cycles
Frequency drift from cold start to end of 1 hr., negative drift	of 100-400 cycles measured at 7mc.
Dimensions	height 66⅞"; width 22"; depth 17⅛"
Weight, unpacked	275 lbs. (125 kilos)
Weight, packed	630 lbs. (286 kilos)
Weight, with coupling unit, unpacked	282 lbs. (128 kilos)
Weight, with coupling unit, packed	640 lbs. (290 kilos)
Coaxial Cable, packed	39 lbs. (17.7 kilos)



MI-19427-B Master Oscillator Exciter

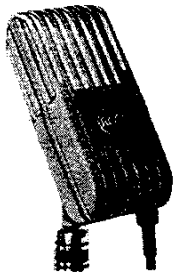
Microphones MI-6203, MI-6206, MI-6226-H

Varacoustic MI-6203

Uses

The Varacoustic Microphone is ideally suited for public address use under high reverberatory conditions and for stage pickups where auditorium noises are to be kept to a minimum. As an economy microphone it may also be used for similar broadcast applications when shock mounting is not required and when it may be kept away from fluorescent lighting fixtures or other hum producing sources.

Description



This microphone is of entirely new design. A slide adjustment which changes the physical characteristics of the labyrinth permits a choice of non-directional, bi-directional or uni-directional operation. In addition, three variations between the uni-directional and bi-directional pattern may be obtained.

Features

- Low cost.
- Good frequency response.
- Reduced reverberation pickup.
- Adjustable directional characteristics to provide non-directional, bi-directional or directional pickup patterns.
- Attractive appearance.

Specifications

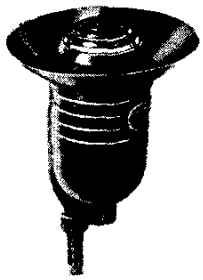
Directional Characteristics	Adjustable for non-directional, bi-directional or uni-directional
Output Impedance	250 ohms
Effective Output Level	—58 db*
Frequency Response	80-8,000 cycles
Finish	Grey wrinkle
Mounting	⅛" pipe thread (Supplied with adapter ⅛" to ⅜"—27 fixture thread, MI-12501 Adaptor required for ½" pipe thread.)
Dimensions, overall	
Length	6⅞"
Width	2½"
Depth	6⅞"
Weight (unpacked)	3½ lbs.
Cable (two conductor shielded)	30' less plug
Stock Identification	MI-6203

Aeropressure MI-6206

Uses

The MI-6206 offers outstanding performance as a public address microphone. Its relatively wide frequency response, high sensitivity and attractive appearance also readily adapt it for use as a "talk back" microphone in broadcast studios. It is well suited to the requirements of a program director's microphone or it may be used for emergency announce purposes.

Description



Like other pressure operated microphones, the MI-6206 is relatively non-directional at the lower frequencies and directional at the higher frequencies. The reversible paracoustic baffle supplied with this microphone will change the high frequency directional characteristics. This baffle either sharpens or broadens the directional characteristic, depending upon whether its concave surface faces toward or away from the microphone grille. This microphone is supplied with a clevis mounting bracket.

Features

- Low cost.
- Good frequency response.
- Baffle for directional or non-directional application.
- Attractive appearance.

Specifications

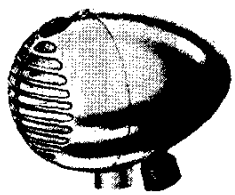
Directional Characteristics	Non-directional (Baffle makes instrument more directional at higher frequencies.)
Output Impedance	250 ohms
Effective Output Level	—56 db*
Frequency Response	80-8,000 cycles
Finish	Black and chromium
Mounting	⅛" pipe thread (MI-12051 Adaptor required for ½" pipe thread.)
Dimensions, overall	
Length	5"
Diameter	2 1/16"
Weight (unpacked)	2¼ lbs.
Cable (two conductor shielded)	30' less plug
Stock Identification	MI-6206

Aerodynamic Pressure MI-6226-H

Uses

The Aerodynamic Microphone is an inexpensive unit which is especially well suited for broadcast "talk-back" purposes. It meets all the requirements for a close talking microphone.

Description



The Type MI-6226-H Aerodynamic Microphone is relatively insensitive to mechanical shock and is ruggedly constructed to give years of satisfactory service. The unit can be supplied with a special stand (MI-6227) to match the streamlined chromium plated microphone case.

Features

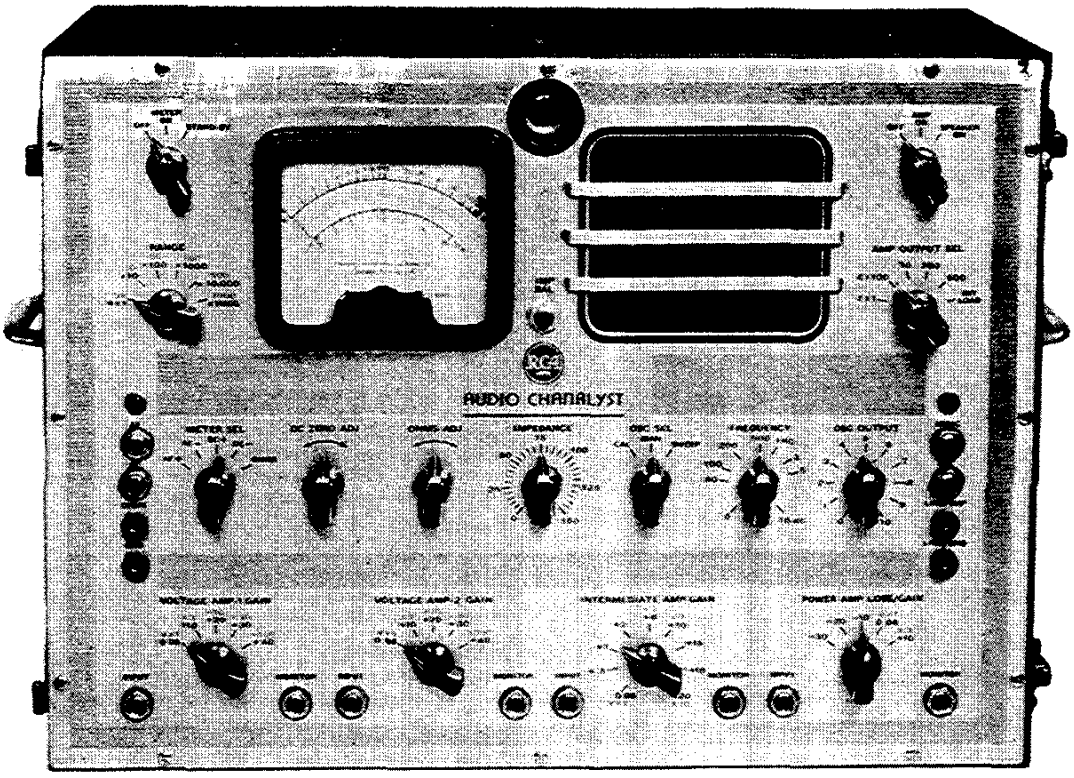
- Low cost.
- Frequency response sufficient for pleasing voice transmission.
- Especially suited for close talking.
- Rugged construction.
- Attractive appearance. Streamlined styling.

Specifications

Directional Characteristics	Non-directional
Output Impedance	250 ohms
Effective Output Level	—63 db*
Frequency Response	100-8,000 cycles
Finish	Polished chromium
Mounting	⅛" pipe thread (Supplied with adaptor ⅛" to ⅜"—27 fixture thread. MI-12051 Adaptor required for ½" pipe thread.)
Dimensions, overall	
Length	3"
Width	2⅝"
Depth	3⅜"
Weight (unpacked)	2¼ lbs.
Cable (two conductor shielded)	30' less plug
Stock Identification	MI-6226-H

* Referred to one milliwatt and a sound pressure of 10 dynes/cm².

Audio Chanalyst Type 170-A



Uses

The RCA Audio Chanalyst, type 170-A, is in itself a complete sound system testing laboratory. It can be set up in any convenient location to do a conclusive job of diagnosing trouble in audio amplifier, loud speaker systems, and pick-up devices.

Description

The instrument is portable, weighing approximately 45 pounds and it is furnished complete with a cover which contains all of the necessary cables and test leads, packed in neat carrying order.

The Audio Chanalyst itself consists of three principal sections or channels; namely, a complete volt-ohmmeter, a complete signal source, and a calibrated audio amplifier. Beside its basic use as a testing unit, the audio amplifier section can be used as an emergency replacement unit or as an auxiliary amplifier for communications and entertainment.

There are several other units included which operate in collaboration with the above mentioned principal channels to extend the facilities of this instrument. They are: An impedance measuring device, a distortion indicating device, a loud speaker for audible testing, and a monitoring electronic indicator which also serves as a trouble-shooting device.

Features

- Portable test bench with facilities for checking all makes of sound equipment.
- Self-contained audio signal source.
- Electronic vacuum tube voltmeter for a-c (a-f), d-c, ohms,
- Calibrated signal tracing amplifier.
- High speed electronic indicator and impedance tester.
- Channel monitoring facilities.

Specifications

Height 14"; width 21"; depth 10⅜"; weight 47 lbs.

Voltmeter Channel

A-c Diode and d-c Vacuum Tube V.M.—0-1000 v. in 6 ranges

Ohmmeter—0-1000 megohms in 6 ranges

Oscillator Channel

20 to 10,000 cycle beat frequency oscillator with direct low *level output or high level when used with amplifier channel.*

Automatic 10 second audio sweep for multiple speaker testing.

Amplifier Channel

4 stage high gain with power output of 1 watt at 10, 250, 500 or high output impedance. Calibrated in db and voltage ratios. Each stage can be used separately or in cascade.

General

Also has speaker channel, electronic indicator, impedance tester and polarizing voltage supply.

RADIO CORPORATION OF AMERICA

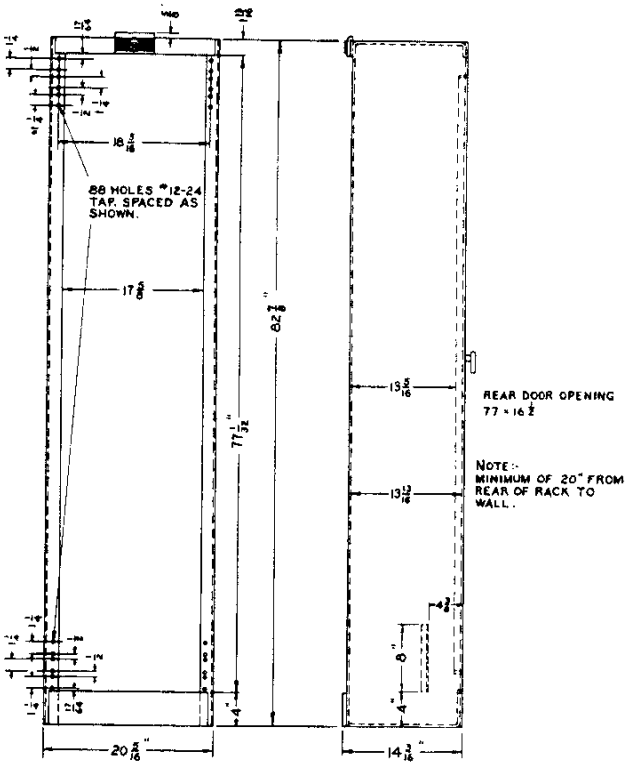
Cabinet Rack Type 9-AX

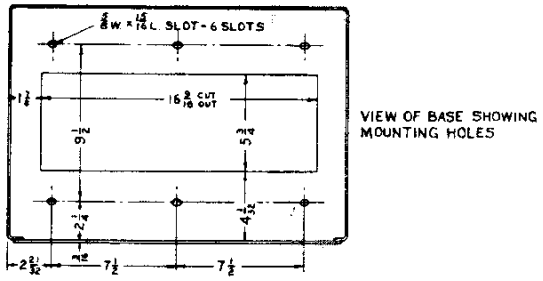
Uses

The Type 9-AX is a heavy-duty Speech Input Cabinet Rack which is widely used in control room and transmitter installations. It provides 77" of panel space for mounting amplifiers, jack panels, switch panels, oscillators, measuring equipment or other panel-mounted equipment of standard 19" width. The 9-AX completely shields and protects all the equipment on the rack, while at the same time, largely dispensing with individual shield covers.

Description

This rack is of sheet metal construction with an open front and a hinged ventilated door on the rear. A metal plate placed approximately one inch below a rectangular opening in the cabinet top provides complete ventilation, but protects equipment from falling articles and dust. The plate may be removed completely, if desired. The rack is drilled and tapped, as shown on the Dimension Drawing, for standard 19" panels and has an overall height of 6' 10⅞". It is shipped with supporting rods to insure accurate alignment.





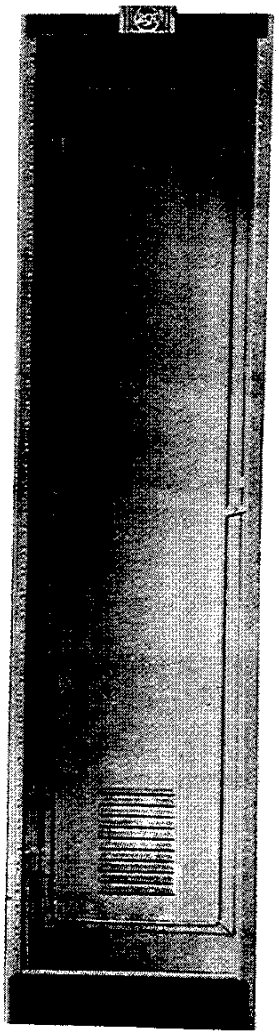
OUTLINE DIMENSIONS OF 9AX CABINET RACK

Outline Dimensions of 9-AX Cabinet Rack

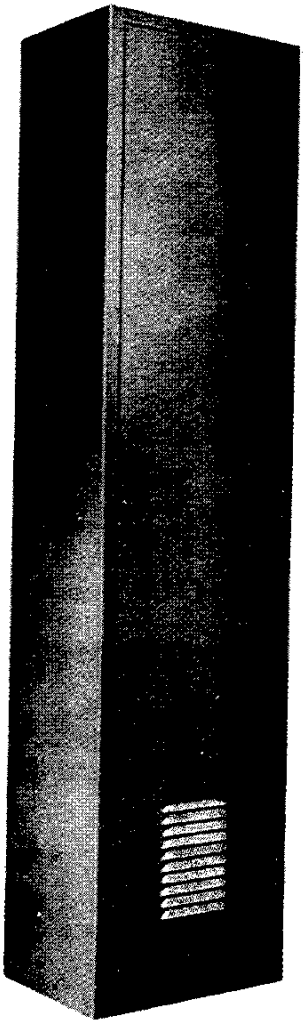
Accessories for the Type 9-AX Rack include "J" Strips, "U" Strips, Terminal Block Mounting Brackets, A-C Terminal Blocks, Audio Terminal Blocks and Cable Supports. "J" Strips are used with the 9-AX Cabinet Racks to give them a finished appearance when the equipment is assembled on the racks. These strips, which mount along the side of the cabinet and cover the panel slots and mounting screws, are easily installed by means of clips and screws which are supplied with the strips. "U" Strips are used to dress up an assembly of cabinet racks when they are mounted side by side. Angle strips 8" long are mounted inside cabinet (see dimension drawing) as a support for the terminal block mounting bracket.

The bracket will accommodate as many as three W.E. 100-B (RCA Stock Identification, MI-4569) Audio Terminal Blocks and two General Electric 16EB1B3 (RCA Stock Identification, MI-4568) A-C Terminal Strips. The cable supports provide a convenient means for holding the cabling in place. They are mounted by means of the same screws which hold the front panels.

Included with each 9-AX Cabinet Rack is a quantity of 90 12--24 x ½" round head machine screws for mounting the panels.



Front View Type 9-AX Cabinet Rack



Rear View Type 9-AX Cabinet Rack

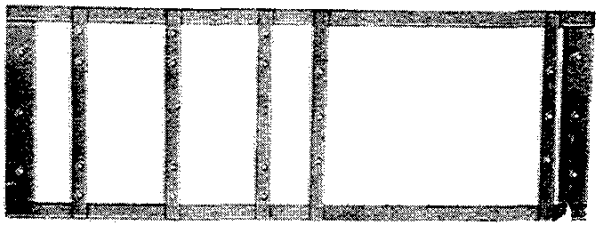
Cabinet Rack Type 9-AX

Specifications

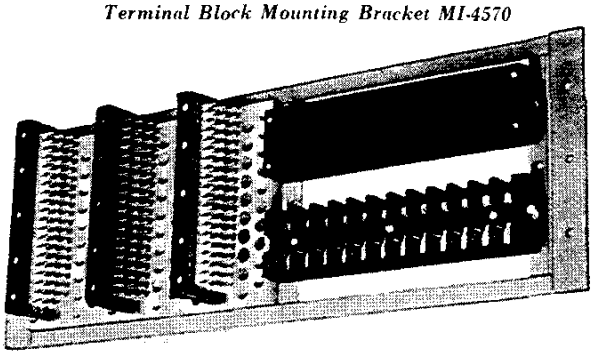
Dimensions, overall	
Height	82 7/8"
Width	20 1/16"
Depth	14 3/16"
Panel Size	19"
Mounting Space	77"
Weight (unpacked)	190 lbs.
Stock Identification	
Black	MI-4519-C
Light Umber Grey	MI-4519-E

Accessories

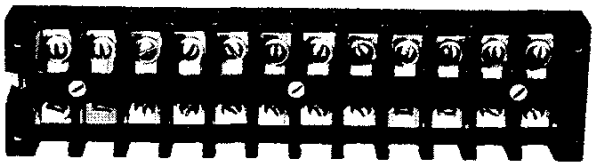
"J" Strip	
Black	MI-4537-A
Dark Umber Grey	MI-4537-D
"U" Strip	
Black	MI-4524-A
Dark Umber Grey	MI-4524-D
Terminal Block Mounting Bracket	MI-4570
W.E. 100-B, 80 Terminal (4 rows of 20 each) Block	MI-4569
G.E. A-C Terminal Strip (12 terminals)	MI-4568
Cable Support	MI-4571



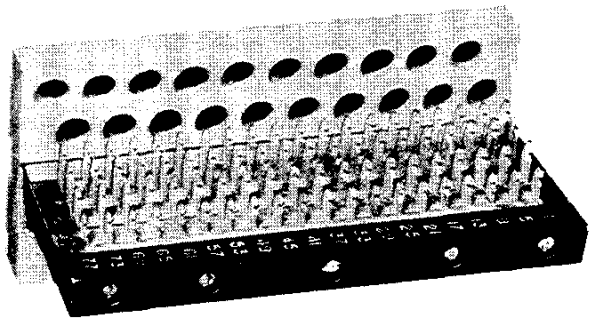
Terminal Block Mounting Bracket MI-4570



Terminal Block Mounting Bracket with Terminal Blocks in Position



Power Terminal Block MI-4568



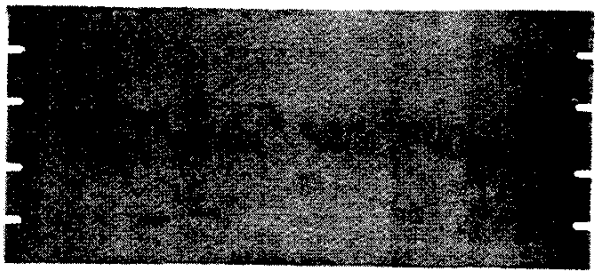
Audio Terminal Block MI-4569

Cable Support MI-4571

Blank Panels

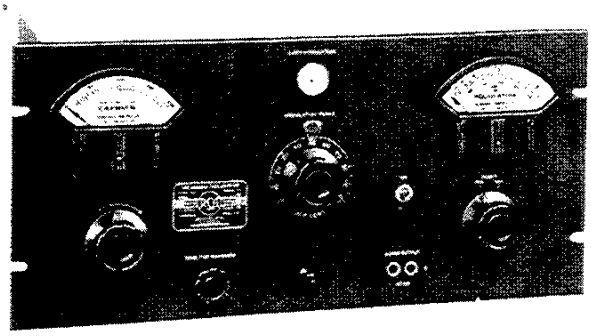
A complete line of 19" blank panels are carried in stock for filling spaces on racks not occupied by equipment panels. These blanks are also suitable for applications where equalizers, transformers, switches or other items must be panel mounted by the user. The stock of panels includes all standard widths from 1¾" to 13 31/32". They are 7/64" sheet steel and are finished and drilled to match the standard equipment panels.

The 33-A and 33-B Jack Panel heights are not standard multiples of 1¾". Therefore when these jack panels are mounted in a Type 9-AX Rack it is often necessary to use either a 2¼" or 2⅜" blank panel so that the summation of all panel heights will equal 77".



Panel Width				
1 23/32"	Blank	Panel,	Black	MI-4590
	"	"	Umber Grey	MI-4590-A
2 1/8"	"	"	Black	MI-4598
	"	"	Umber Grey	MI-4598-A
2 3/8"	"	"	Black	MI-4599
	"	"	Umber Grey	MI-4599-A
3 3/32"	"	"	Black	MI-4589
	"	"	Umber Grey	MI-4589-A
3 15/32"	"	"	Black	MI-4591
	"	"	Umber Grey	MI-4591-B
5 7/32"	"	"	Black	MI-4592
	"	"	Umber Grey	MI-4592-B
6 31/32"	"	"	Black	MI-4593
	"	"	Umber Grey	MI-4593-A
8 23/32"	"	"	Black	MI-4594
	"	"	Umber Grey	MI-4594-B
10 15/32"	"	"	Black	MI-4595
	"	"	Umber Grey	MI-4595-B
12 7/32"	"	"	Black	MI-4596
	"	"	Umber Grey	MI-4596-A
13 31/32"	"	"	Black	MI-4597
	"	"	Umber Grey	MI-4597-A

AM Modulation Monitor Type WM-43A



Uses

The RCA Type WM-43A Modulation Monitor is designed to give continuous direct reading indications of percentage modulation in the carriers of broadcast or other transmitters operating in the range of 0.5 to 60 mc. This modulation monitor performs the following specific functions:

1. Measurement of percentage of modulation on either positive or negative peaks.
2. Overmodulation indication.
3. Program level monitoring.
4. Measurement of carrier shift when modulation is applied.
5. Measurement of transmitter audio-frequency response.

Description

The RCA WM-43A Modulation Monitor consists of three essential elements: (1) A linear diode rectifier which gives an instantaneous output voltage proportional to the carrier envelope, (2) a peak voltmeter which gives a continuous indication of the peak modulation, and (3) a trigger circuit which flashes a light whenever the modulation momentarily exceeds any previously set value.

The linear rectifier is designed for operation at a low power level, which greatly simplifies the coupling to the transmitter. In the output of the linear rectifier is a d-c meter, which indicates the carrier level at which the instrument is operating and also shows any carrier shift during modulation.

In addition, two auxiliary audio output circuits operating from a separate diode rectifier are provided. One of these at 600 ohms, is intended for audible monitoring; the other, a high-impedance circuit, gives a faithful reproduction of the carrier envelope with less than 0.1% distortion. The high impedance output circuit can be connected directly to the RCA WM-71A Distortion and Noise Meter, enabling overall fidelity and noise measurements to be made on the transmitter.

Features

- Wide frequency range (0.5 to 60 mc).
- Operates at low r-f input power (0.5 watt in 75 ohms).
- Indicates either positive or negative peaks in percentage modulation and in decibels.
- Meets all FCC specifications for modulation monitors.
- Carrier amplitude shift with modulation can be measured.
- High impedance, low distortion output circuit permits use of RCA WM-71A Distortion and Noise Meter.
- Low impedance, low distortion output circuit for aural monitoring.
- Terminals for connecting remote percentage-modulation indicator.

Specifications

Carrier Frequency Range ——— 0.5 to 60 mc*

MODULATION PERCENTAGE RANGE
Negative Peaks ——— 0 to 100%
Positive Peaks ——— 0 to 110%

ACCURACY, of full scale at 0 and 100% ——— ±2%
of full scale at any other percentage ——— ±4%

AUDIO FREQUENCY RESPONSE
Meter Indication, 30 to 15,000 cps ——— ±0.25 db
Meter Circuit, 50 to 15,000 cps ——— ±0.1 db
Audio Monitoring Output, 30 to 45,000 cps ——— ±1.0 db
Measuring Output, when used with RCA Type WM-71A Distortion—Noise Meter and Coupling Cable, 30 to 15,000 cps ±1.0 db
R-f Input Power (over entire frequency range) approximately ——— 0.5 watts
R-f Input Impedance, broadcast band, approximately ——— 75 ohms
NOTE: Input impedance increases at higher frequencies. Actual impedance varies with coil position and input tuning.

WARNING LAMP CIRCUIT

The overmodulation lamp will flash whenever the negative modulation peaks exceed the setting of the MODULATION PEAKS dial by approximately 2% modulation, for audio frequencies between 30 and 7500 cps. For higher audio frequencies, the percentage overmodulation required to flash the lamp increases slightly.

AUXILIARY OUTPUT

A multipoint connector at the rear of the instrument provides a means of connecting:
1. A remote percentage modulation meter.
2. Line for 600 ohm monitoring.
3. The RCA WM-71A Distortion and Noise Meter.

TUBE COMPLEMENT (shipped with instrument)

2 Type 6SN7-GT	1 Type 2050
2 Type 6SJ7	2 VR-150-30
1 Type 6H6	1 Type 6X5

Dimensions ——— width 19", height 8¾", depth 10"
Weight (unpacked) ——— 31 lbs.
Finish ——— Umber gray
Stock Identification ——— MI-30043A

* A single set of coils (either 0.5 to 8 megacycles or 3 to 60 megacycles) is supplied with each instrument, unless both sets are specifically ordered.

ADDENDA TO INSTRUCTION BOOK

FOR

CR-88 COMMUNICATIONS RECEIVER

To Be Inserted in IB-31014

Indicate the following wiring change on the CR-88 Schematic Diagram, figure 17, and the Connection Diagram, figure 21:

Remove the lead shown connected to pin number 4 of the B.F.O. tube socket X12, and indicate it as being connected to pin number 6 of the same socket. On the connection diagram, show the foregoing change on the blue (number 25) wire.

Manufactured by
RADIO CORPORATION OF AMERICA
ENGINEERING PRODUCTS DEPARTMENT
Camden, New Jersey, U.S.A.

Printed in U.S.A.