INSTRUCTION BOOK

FOR

"SUPER-PRO" RADIO RECEIVER

MANUFACTURED BY

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DESCRIPTION OF EQUIPMENT

1. GENERAL.—The Super-Pro receiving equipment consists of two units:

RECEIVER

POWER SUPPLY

- a. Packed separately are 18 tubes and 2 connector cables.
- 2. TYPE OF EQUIPMENT.—The Super-Pro receiving equipment employs a superheterodyne circuit designed for reception of amplitude modulated signals. It is generally intended to be operated from a standard commercial power line under fixed conditions. Although the Super-Pro is of rugged construction, it should receive the care and treatment usually given precision technical apparatus.
- 3. MECHANICAL DESCRIPTION.—The Super-Pro receiving equipment is available for two types of mounting, having the following physical characteristics:
 - a. Rack model receiver weighs 52 lbs.
 - (1) Over-all width 19 inches.
 - (2) Depth behind panel, 15\% inches.
 - (3) Height, $10\frac{1}{2}$ inches.
 - b. Rack model power unit weighs 42 pounds.
 - (1) Over-all width, 19 inches.
 - (2) Depth behind panel, 8\% inches.
 - (3) Height, 8¾ inches.

- c. Table model receiver weighs 70 pounds.
 - (1) Over-all width, 23 inches.
 - (2) Depth, 161/2 inches.
 - (3) Height, 121/4 inches.
- d. Table model power unit weighs 39 pounds.
 - (1) Over-all width, 13 inches.
 - (2) Depth, 83% inches.
 - (3) Height, 81/4 inches.
- e. Rack model panels are 19 inches wide and equipped with notches to fit standard relay racks.
 - (1) Rack model receiver is equipped with a dust cover which is fastened to the front panel with knurled thumb nuts. Similar thumb screws fasten the cover to the rear edge of the chassis.
 - (2) Rack model power unit has a dust cover fastened to the panel with knurled nuts, the same as the receiver. Similar thumb screws fasten the dust cover to the chassis.
 - (3) Rack model equipment, both receiver and power unit, as well as the table mounting power unit have bottom plates for protection against dust and damage.

- (4) Rack model panels have a special baked gray finish. Table models have a baked black wrinkle finish.
- f. All controls on the front panel are clearly identified by markings. These controls and their functions are explained under "OPERATION," page 7. On the rear skirt of the receiver chassis will be found terminal strips which serve to connect the power cable, output load, antenna and earphones (see page 28, fig. 9).
 - (1) Power supplies are also equipped with terminal strips for connecting the power cable (see page 28, fig. 9).
 - (2) The protective fuse is in a holder mounted on the rear skirt of the power supply chassis and can be replaced by unscrewing the fuse-holder cap.
- g. Terminal strips on both receivers and power supplies are protected by small rectangular covers. These covers must be in place before equipment is put in operation (see page 18, fig. 5).
- 4. ELECTRICAL DESCRIPTION.—The Super-Pro receiver normally receives its power from a separate unit which in turn connects to a 105/125 volt, 50/60 cycle, single phase power line. The average power consumed is 180 watts. The Super-Pro will also operate from a storage battery to supply the heater power, and "B" batteries for the plate and C-Bias voltages (see page 28, fig. 10).
 - a. The total heater current required is 6.25 amperes at 6 volts.
 - b. The total plate voltage required is 225 volts applied in the following manner:

225 volts at .117 amperes 90 volts at .0045 amperes

c. The "C" bias voltage required is 45 volts at .010 amperes.

- 5. POWER OUTPUT.—The Super-Pro, unless otherwise specified, has two output impedances. Appropriately marked terminals are located along the rear edge of the chassis. The total output power available is approximately 8 watts. Undistorted output is in the neighborhood of 3 watts with distortion increasing as the power output is increased.
 - a. The 600 ohm output (marked "SPKR") is provided for use under all conditions requiring an appreciable amount of power, such as loud-speaker, recorder, or a 600 ohm audio transmission line. All power output measurements and all audio frequency fidelity readings should be taken at this output terminal.
 - b. An 8000 ohm output (marked "PHONES") is provided for monitoring purposes only, and no attempt should be made to take power measurements at this terminal.
- 6. FREQUENCY RANGE.—The frequency range of the Super-Pro receiver is divided into five separate bands. The selection of any one of these bands is determined by the position of the band-switch control. This control is clearly marked to indicate the band in use.
 - a. The coverage of the five bands is as follows:

 $\begin{array}{ccc} 100\text{--}200 \text{ kilocycles} & 2.5\text{--}5.0 \text{ megacycles} \\ 200\text{--}400 \text{ kilocycles} & 5.0\text{--}10.0 \text{ megacycles} \\ & 10.0\text{--}20.0 \text{ megacycles} \end{array}$

- b. In addition to the markings on the band-switch control, a rotating mask, with appropriate windows, exposes a calibrated scale on the main tuning dial to correspond with the band selected by the band switch. This operation is automatic . . . the mask is controlled by the band switch through gears.
- c. Band spread: For simplified tuning over a narrow range of frequency, a separate band spreading control is provided. This control has an arbitrary scale reading from 0 to 100 through

approximately 170°. If set at 100, the frefrequency covered by moving the dial will extend from that indicated by the setting of the main dial, to some lower frequency, depending on how far the band spread dial is moved. The capacity of the band spread condenser increases as the scale approaches 0.

- (1) To cover a specific range with the band spread dial, the main dial should be set to the high frequency end of the band which it is desired to spread.
- 7. DIAL CALIBRATION.—The main tuning dial is calibrated directly in frequency as follows:

BAND	CALIBRATION
10 mc-20 mc	100 kc per division
5 mc-10 mc	100 kc per division
100 kc -200 kc	2 kc per division
200 kc -400 kc	5 kc per division
2.5 mc-5.0 mc	50 kc per division

- a. The above calibration holds true only with the band spread dial set at 100.
- 8. TUBE COMPLEMENT.—The following tubes are used in the receiver:

TYPE	FUNCTION	SYMBOL
6K7	1st FR Amplifier	V1A
6K7	2nd FR Amplifier	V2A
6L7	Mixer	V3A
6J7	HF Oscillator	V4A
6K7	1st IF Amplifier	V5A
6SK7	2nd IF Amplifier	V6A
6SK7	3rd IF Amplifier	V7A
6Н6	Second Detector	V8A
6N7	Noise Limiter	V9A
6SJ7	BF Oscillator	V10A
6SK7	AVC Amplifier	VIIA
6H6	AVC Diode	V12A
6C5	1st AF Amplifier	V13A
6F6	2nd AF Amplifier	V14A
2-6F6	3rd AF Amplifier	V15A-V16A

a. The following tubes are used in the power unit.

TYPE	FUNCTION	SYMBOL
5 Z 3	Plate Voltage Rectifier	V1B
80	C-Bias Rectifier	V2B

- 9. SENSITIVITY.—Normally, the Super-Pro has more sensitivity than can actually be used. The determining factor in practical operation is the background or external noise not generated in the receiver. Regardless of the capabilities of the receiver, when the background or external noise (generated by electrical apparatus or atmospheric conditions) reaches the level or intensity of the desired signal, it becomes very difficult to obtain satisfactory reception.
 - a. As a guide, fig. 13, page 31, illustrates sensitivity characteristics of each of the five frequency bands covered by the receiver.
 - b. Full benefit of the excellent sensitivity of the Super-Pro can be obtained only when properly installed, with respect to the antenna and choice of location.
- 10. SELECTIVITY.—A wide range of selectivity is available in this receiver. Starting with the most selective point of the crystal filter, the selectivity range is approximately from 100 cycles to 16 kilocycles. This wide range of selectivity permits the receiver to be used for a great many services. Usually a degree of selectivity can be found which will provide the best possible fidelity with the least amount of interference. Typical selectivity curves are shown in fig. 12, page 30.
 - a. Radio Frequency selectivity (pre-selection) is sufficient to reduce images or repeat spots (removed from the main frequency by twice the intermediate frequency) to a minimum.
 - b. Intermediate frequency (465 kc) selectivity is variable over wide limits. With the crystal filter out of the circuit, the range is from 3 to 16 kilocycles. Some deviation from this figure takes place on the two low frequency bands where the Radio Frequency stages have some effect. Variation of the intermediate frequency band width is accomplished by varying the degree of coupling between the primary and secondary coils of the IF transformers. The control on the panel marked BAND WIDTH performs this operation.

- c. The crystal filter employed in the Super-Pro has a distinct advantage over other types of filters. Besides the OFF position, there are five degrees of selectivity governed by different settings of the control knob on the panel.
 - (1) The first two settings of the crystal filter selectivity control are especially suited to radio telephone reception. In cases of extreme interference, the third position may be used, though a good portion of the intelligibility of the voice signal may be removed due to lack of the higher audio frequencies.
 - (2) The last two degrees of selectivity are for reception of radio telegraph signals where selectivity is more important than quality, though telegraph signals may be received on any degree of selectivity depending, of course, on the amount of interference from other signals or disturbances of the manmade variety.

- 11. AUDIO FIDELITY.—There are two factors controlling the quality of reproduction of the receiver.
 - a. During reception the overall selectivity of the receiver controls the quality of response. When adjusted to a high degree of selectivity, the quality will be deepened in tone due to the lack of high audio frequencies. As the selectivity is broadened, the higher frequencies become stronger.
 - b. The audio part of the receiver can pass only what has already gone through the IF amplifier. The Super-Pro audio amplifier is a relatively high quality system, capable of reproducing voice or music with a good degree of fidelity.
 - c. Fidelity curves taken with the entire receiver in operation are reproduced on page 31, fig. 14.

II

INSTRUCTIONS FOR INSTALLATION

- 1. CONNECTING EQUIPMENT.—In selecting the operating position for the Super-Pro receiving equipment, it should be borne in mind that evenness of temperature and humidity play an important part in obtaining uniform performance. Wide changes in temperature or humidity will have some effect on calibration. While the Super-Pro is of solid construction, vibration will have some effect on performance when the receiver is adjusted for a high degree of selectivity. In addition to the receiver power unit and tubes, there are two connector cables. One is for normal operation with the power unit, and the other cable is for use with batteries.
 - a. The vacuum tubes to be used with this equipment are packed separately. These tubes should be installed in the receiver with which they are supplied, for they were employed in the equipment during its final inspection and adjustment at the factory. The first operation after

- the equipment has been unpacked is to connect the two units together.
- (1) Remove the large terminal cover from the receiver and attach one end of the power supply cable. The cable having two terminal strips is the one referred to. After removing a similar terminal cover from the rear of the power unit, attach the other terminal strip of the cable to the terminal strip on the power unit. See page 28.
- (2) It will be noted that the terminal strips on the cable correspond exactly in dimensions with the terminal boards on the receiver and power unit. These terminals can be installed without difficulty. DO NOT USE FORCE! If they do not go together properly, remove and examine to determine whether or not they are being applied properly. Be certain the screws are fully

unscrewed. Terminal lugs should slip under the screws from the top. See page 28.

- b. If the equipment is to be operated with batteries, connections should be made in accordance with the drawing in fig. 10, page 28. The cable used for battery operation is the one having only one terminal strip, the other end consists of free wires. All other operations will be the same as for normal operation with the power unit.
- c. The antenna input has been designed to couple to either a balanced transmission line of approximately 115 ohms impedance, or to a conventional single wire antenna and ground. There is an electrostatic screen between primary and secondary of each antenna input transformer. This screening, together with a two-wire balanced lead-in, reduces noise pick-up to a minimum.
 - (1) In the case of the transmission line lead-in, the feeders should be connected to the terminals at the rear of the receiver marked "A". If a single wire type of antenna is used, its lead-in should be connected to

one of the "A" terminals, and the other "A" terminal should be connected to a good ground.

- (2) For reception over a relatively narrow band of high frequencies, a suitably designed doublet or similar tuned antenna connected to the receiver through a highgrade lead-in cable, will result in exceptional efficiency.
- (3) It is not essential to ground the receiver chassis but this may be readily accomplished by connecting a ground wire under one of the thumb screws securing the dust cover to the rear of the chassis.
- d. Earphones should be connected with an appropriate plug to the jack provided for them on the front panel (see fig. 2) for preliminary testing. Earphones may also be connected to a terminal strip on the rear skirt of the chassis.
- e. Next, connect the power cord (see fig. 5) to the AC power line. For further information, see "OPERATION."

Ш

ADJUSTMENT AND OPERATION

- 1. PLACING IN OPERATION.—After installation, the equipment should be checked thoroughly for possible mechanical defects caused by handling and shipping.
 - a. The tubes for this equipment are packed separately. The tubes should be installed in their respective sockets—each tube socket in the equipment is marked with the type number of the tube which is to be placed in that socket.
 - (1) It is necessary to remove the dust cover from the rack model of the Super-Pro, in

- order to install the tubes in their proper places. This is done by removing the knurled thumb nuts which fasten the dust cover to the front panel. Similar thumb screws on the rear edge of the chassis must also be removed. This dust cover may be left removed until the equipment is found to be operating satisfactorily. This will avoid an additional operation should further servicing be required.
- (2) The dust cover must also be removed from the power unit in order to install the two rectifier tubes.

- (3) Both dust covers should be replaced after the equipment has been found to be operating satisfactorily.
- 2. ADJUSTMENT.—This equipment has been completely adjusted at the factory and no further adjustment should be necessary prior to actual operation.
- 3. OPERATION.—Although the Super-Pro is a highly technical piece of apparatus with quite a large number of controls, it is relatively easy to operate. There are 14 controls on the panel. However, they are not all used at the same time. The number of controls necessary for operation will depend on the type of service for which the receiver is to be used. The major controls are:
 - a. BAND SWITCH AUDIO GAIN
 MAIN TUNING SENSITIVITY
 BAND SPREAD
 - (1) The remaining controls are brought into play as conditions demand their use.
 - b. Assuming that the earphones, power supply and antenna have been connected according to instructions, the various controls should be set in the following positions:

CRYSTAL SELECTIVITY	OFF
PHASING	On arrow
BAND WIDTH	3
LIMITER	OFF
AVC-MANUAL	AVC
SENSITIVITY	10
BAND SPREAD	100
MOD-CW'	MOD
AUDIO GAIN	5
SEND-REC	REC
BEAT OSCILLATOR)

- (1) Then throw the power switch in the center of the panel (marked OFF-ON to the ON position. This puts the receiver in operation.
- (2) The band switch should be adjusted to the band which the operator is likely to find most active. Receiving stations on this band will permit the operator to familiarize himself with the various adjustments. The band width control should be set at 3. If

interference is not serious, it can be adjusted to a wider degree of selectivity, depending upon the amount of fidelity desired. In general, this control should be adjusted to the band width providing best tone quality with a minimum of interference.

- (3) All tuning, with or without the meter, should be done with the band width control set at 3. Other settings provide a wider band making accurate tuning difficult. Band width adjustments should be made after the signal is tuned in properly.
- (4) The beat-oscillator is turned on when the SIGNAL switch is in the CW position. The beat-oscillator control varies the pitch of the heterodyne or beat between the oscillator and the incoming signal. This feature is used for code reception and for locating weak modulated signals.
- (5) The LIMITER control turns the noise limiter on and off. The noise limiter is most valuable on the higher frequencies where automobile ignition interference and other similar disturbances are serious.
- c. So far, we have considered adjustments necessary for radiophone reception. For code reception, the AVC-MANUAL control should be set in the MANUAL position and the SENSI-TIVITY control turned down to provide proper sensitivity.
 - (1) On strong signals, this control should not be turned all the way on because it will cause overloading. If the AUDIO GAIN control is set at approximately 7, volume can be regulated with the SENSITIVITY adjustment only.
 - (2) Because of the type of AVC system used in the Super-Pro, code signals can be very effectively controlled with this system. The AVC action is slow enough not to have an effect upon individual characterters of high speed code, but it is fast enough to control the overall level of the signal.

- d. The crystal filter is very effective and easy to operate because of its excellent stability. The first three positions are generally used for radiophone reception and will serve for code reception where interference is not serious. The last two positions are for code reception exclusively.
 - (1) After the CRYSTAL SELECTIVITY control is adjusted for the desired degree of selectivity, the PHASING control may be used to reject heterodyne interference or "whistle."
- e. The receiver can be silenced by turning the SEND-REC switch to the SEND position. This allows the receiver to remain ready for instant service during transmission periods when it is used for communication purposes.
- f. All tuning can be done with the MAIN TUN-ING control. In this case, the band spread dial is left at 100. The band spread dial operates so as to spread out a narrow band of frequencies below the frequency to which the main dial is set.
 - (1) The band spread dial operates continuously throughout the three high frequency bands covered by the receiver, but is automatically disconnected by the band switch on the two low frequency bands. In this manner, high frequency bands can be

- spread out over the band spread dial for easy tuning.
- g. For earphone operation, earphones are plugged into the jack provided for them on the front panel. A set of terminals are also available on the rear of the chassis for connecting earphones. These terminals are connected in parallel with the jack on the front panel.
- h. The S-meter operates only when the receiver is adjusted for AVC. This meter is used mainly as a tuning guide. Its reading will increase as the receiver approaches resonance with the incoming signal. Exact resonance is indicated by the greatest reading of the meter. The band width control must be set at 3 for accurate tuning by means of the meter.
 - (1) The meter calibration in "S" numbers is more or less arbitrary. A screw driver adjustment at the rear of the chassis near the second detector diode varies the resistance in shunt with the meter. By means of this adjustment, an S9 reading may be obtained on any input between approximately 10 and 10,000 micro-volts. The normal factory adjustment is made on an input of 50 micro-volts, and when so adjusted each "S" number represents a change in signal input of approximately 6 db.

IV

MAINTENANCE AND REPAIR

- 1. GENERAL.—The receiver has been carefully inspected and adjusted and servicing is not generally necessary over long periods of operation. Vacuum tubes should be tested at regular intervals and those indicating low sensitivity should be replaced. All adjustments were originally made with R.C.A. tubes and it is strongly recommended that the same type tubes be used for replacement purposes.
- a. If the receiver becomes completely inoperative, it may be due to a shorted filter or by-pass condenser or an open resistor. By measuring socket voltages and comparing them with the tabulations in the chart (page 13), the defective part can be quickly discovered. We do not believe that detailed continuity tests should be described since most operators are familiar with

the ordinary procedure for determining defective component parts. In both receiver and power supply units, (rack mounting) the bottom cover plates should be removed so that all parts are accessible. The table model receiver should be removed from its cabinet. Values of any resistor or capacitor may be obtained by locating the symbol number on the circuit diagram, and referring to the parts list.

- b. The receiver has been accurately aligned at the factory and under normal operating conditions should retain this adjustment indefinitely. When either sensitivity or selectivity (or both) appear to be below normal, and all tubes have been checked, it may be desirable to check the alignment. Removing the dust cover and bottom cover plate of the receiver will make all adjustments accessible. If the following instructions are carefully carried out, no difficulty should be experienced in restoring the original performance of the receiver. CAUTION:-Any changes from original settings will be relatively small and extreme care should be exercised when checking adjustments. This is especially true of the HF Oscillator circuits (fig. 11) which should NOT be disturbed unless the main tuning dial is definitely known to be off calibration. Do not manipulate the insulated screw driver indiscriminately.
- c. The Test Oscillator should be an accurately calibrated instrument producing modulated signals covering a range of 100 kc to 400 kc and 2.5 to 20 mc (also 465 kc). This test oscillator should have an output of the order of 100 micro-volts and an output impedance of approximately 100 ohms for best results when aligning the RF and HF Oscillator circuits. For IF alignment these values are not critical. The frequency calibration of the test oscillator is extremely important, if the receiver dial calibration is to be correct.
- d. The Output Meter should respond to the modulation frequency of the test oscillator, preferably 400 cps, and should provide at

- least half-scale deflection for 10 volts. Its resistance should be greater than 500 ohms.
- e. An insulated screw driver 9/64" wide and .025" thick at bit, is required for aligning the receiver.
- 2. PRELIMINARY PROCEDURE.—Throw the "OFF-ON" switch to the ON position and allow the receiver to warm up approximately one hour before beginning adjustments. Connect the output meter to the "SPKR" terminals located at the rear of the receiver chassis.
- 3. IF-AVC-BEAT OSC. ALIGNMENT.—Adjust the test oscillator to approximately 465 kc and connect the output to the control grid cap of the 1st detector tube (6L7) through a fixed condenser. Front panel controls should be set as follows:

SENSITIVITY	0
AVC-MANUAL	. MANUAL
MOD-CW	. MOD
SEND-REC	REC
BAND SWITCH	. 2.5-5.0 mc
AUDIO GAIN	10
CRYSTAL SELECTIVITY	OFF
CRYSTAL PHASING	.On arrow
BAND WIDTH	3
BAND SPREAD DIAL	.100

a. IF ALIGNMENT CHECK.—The main tuning dial should be set near 2.5 mc, but care should be taken to avoid tuning in a powerful local signal. Now tune the test oscillator to the proper alignment frequency in the following manner. Set the CRYSTAL SELECTIVITY switch on 3, the AVC-MANUAL switch on AVC, and advance the SENSITIVITY to 10. Turn off the modulation of the test oscillator and adjust its frequency slightly until maximum deflection of the "S" meter is obtained. The adjustment of the test oscillator frequency in this manner is necessary in order to insure exact agreement with the natural period of the particular quartz crystal in the receiver being checked. After reducing SENSITIVITY to 0 the modulation may be switched on, but the tuning of the test oscillator must not be altered until the alignment check is completed. The CRYSTAL SELECTIVITY and AVC-

MANUAL controls may now be returned to their original settings of OFF and MANUAL respectively and SENSITIVITY advanced until a suitable output meter reading is secured. A half-scale reading in the neighborhood of 5 or 10 volts will be satisfactory.

- b. Now check the alignment of both upper (grid) and lower (plate) air trimmer condensers in IF transformers T2A and T3A and the single trimmer in T4A for peak reading of the output meter. If one or more of these adjustments results in a material increase of output reduce SENSITIVITY sufficiently to bring meter reading back to half-scale. Alignment of the plate circuit of the crystal filter T1A can be tested in the same fashion by means of the lower adjusting screw on the side of the unit. This screw varies the position of the powdered iron core in coil L26A. Do not disturb the setting of the upper adjusting screw which tunes the grid coil L27A, as this circuit cannot be properly adjusted by the foregoing method. This circuit may, however, be correctly aligned by the "visual" method employing a frequencymodulated oscillator and cathode ray oscillograph.
- c. AVC ALIGNMENT CHECK.—Leaving /all other controls as above, and without disburbing the test oscillator frequency, reduce AUDIO GAIN to 0, switch to AVC, and increase SENSITIVITY to 10. Increase AUDIO GAIN to restore half-scale reading on output meter and adjust single trimmer condenser in T6A for minimum output meter reading. The "S" meter reading should "peak" at the same time the output meter reading "dips."
- d. BF OSCILLATOR ALIGNMENT CHECK.—
 Continuing with controls as above (AVC Alignment) switch off modulation of test oscillator leaving it tuned to same frequency. Disconnect output meter and plug in a pair of headphones, or replace meter with suitable loud speaker. Throw SIGNAL switch to CW and see that BEAT OSCILLATOR knob is exactly on zero. If tone in headphones (or

speaker) is not very low in pitch, readjust the trimmer condenser near the bottom of T5A until such is the case. In case the BFO is in perfect alignment when this test is made, no sound will be heard since the test oscillator and the BFO will be oscillating at the same frequency and consequently there will be no audible difference or "beat" note to be heard. This condition may be determined by turning the BEAT OSCILLATOR control knob slightly off 0 toward one side or the other. If such movement results in an audible tone rising in pitch as the pointer is turned away from 0 on either side. the BFO is perfectly aligned.

- e. HF OSCILLATOR CALIBRATION CHECK.

 —The accuracy of the main dial calibration depends solely on the HF oscillator frequency, which in the Super-Pro is 465 kc (the IF) higher than the signal frequency. For example, when the receiver is tuned to a 10.0 mc signal the frequency of the HF oscillator must be 10.465 mc. While the frequency of the HF oscillator can be measured directly if accurate frequency measuring equipment is available, it is far simpler to check it by tuning in signals of known frequency and noting the main dial readings. Be sure the band spread dial is set at 100 when making this test in the three high-frequency bands.
 - (1) When it has been determined that the dial calibration is sufficiently in error to require correction, this may be accomplished as follows: Reference to the alignment chart (fig. 11) will show the location of the HF oscillator adjustments as well as the signal frequencies at which the settings should be made. If the 2.5 to 5.0 mc band is to be corrected the test oscillator may be accurately set to 2.5 mc and its second harmonic (if strong enough) used for the 5.0 mc end of the band. The output of the test oscillator should be unmodulated and the SIGNAL switch on the receiver turned to CW. The BEAT OSCILLATOR control should be at 0, the AUDIO GAIN at 10, the AVC-MANUAL switch on MANUAL, and the BAND SWITCH at

- 16. The output meter should be disconnected and headphones or loud speaker used to make the necessary adjustments by the "zero beat" method. The test oscillator should be connected to the antenna terminals for this test.
- (2) Tune in the second harmonic at the 5.0 mc end of the dial to zero beat, noting the approximate dial error. Then turn the main dial slightly toward the 5.0 mc calibration line until the beat note rises to a high pitch. Do not turn the dial far enough to raise the beat note beyond audibility. With the alignment screw driver adjust the trimmer condenser designated HF OSC-5.0 mc until the beat note is again reduced to zero. Turn the main dial still further toward the 5.0 mc line and make a further adjustment of the trimmer condenser to return to zero beat. Repeat this process as many times as necessary to bring the dial to exactly 5.0 mc. While it is obvious that the main dial could be set at once on exactly 5.0 mc and the trimmer turned enough at one time to produce zero beat without further ado, the step-by-step method described above is recommended. Then tune in the 2.5 mc fundamental at the low frequency end of the dial and correct the calibration step-by-step as before using the inductance trimming adjustment designated HF OSC-2.5 mc in fig. 11. When the second harmonic is again tuned in at the other end of the dial, it will be found that the adjustment of the inductance at 2.5 mc has disturbed the correction previously made at 5.0 mc. This is perfectly normal, as an adjustment at one end of the dial also affects the other end of the band. It is therefore necessary to go back and forth several times from 2.5 to 5.0 mc in order to bring both ends of the dial scale into exact agreement with the signal frequency.
- (3) During the above process great care should be taken to properly adjust the SENSI-TIVITY control to avoid overloading or

"freak" reception due to excessive signal input.

- f. RF AND 1st DETECTOR ALIGNMENT.—Although the alignment of these three circuits (1st and 2nd RF and 1st Det) can be checked simultaneously with the HF oscillator, it is simpler to consider them as separate operations. Efficient weak signal reception with low receiver noise level and high image rejection ratios depends on the relative alignment of these three circuits with respect to the HF oscillator, without regard to calibration accuracy. As long as these circuits are adjusted to resonate at a frequency 465 kc lower than that of the HF oscillator, optimum results will be obtained.
 - (1) Accurate calibration of the test oscillator is not required to check these adjustments. Modulation of the oscillator, while convenient, is not strictly necessary. The input to the antenna terminals should be through 100 ohms (approximate) including the output resistance of the oscillator. If the test oscillator is modulated the receiver controls should be set as for IF alignment—if unmodulated, set BEAT OSCILLATOR knob to 2 (on either side) and throw SIGNAL switch to CW. SENSITIVITY should be adjusted to produce a half-scale reading on output meter when signals are exactly in tune.
 - (2) Starting with the 2.5 to 5.0 mc band, set the main dial at 5.0 mc (band spread dial at 100) and adjust the frequency of the test oscillator for peak deflection of the output meter. Then check the setting of the trimmer marked 1st DET and 5.0 mc in the center row of adjustments shown in fig. 11. Repeat this procedure on trimmers indicated as 2nd RF and 1st RF in the same row. If readjustment of one of these settings results in a material increase in output meter reading, the SENSITIVITY should be slightly altered to reduce the reading to half-scale. After each adjustment check the tuning of the receiver to make sure the test signal is still accurately

tuned. The band spread dial may be used as a vernier for this purpose in the three high frequency bands. This precaution is extremely important at the high end of the 10-20 mc band where there is some slight interaction between the 1st DET and HF OSC circuits. After checking the three trimmers at the high end of this band, turn the main dial to 2.5 mc and retune the test oscillator to suit. Then check the three inductance adjuster settings marked 2.5 mc in the same row. Since adjustments at one end of a band also affect the other end of the band, as described under HF OSC alignment, it will be necessary to repeat the above procedure until no further improvement can be secured. The number of repetitions necessary will depend on how much mistuning existed to start with. The remaining bands may be checked in the same manner.

- (3) For maximum possible efficiency with a particular antenna arrangement, the 1st RF circuits may be adjusted without disconnecting it. This can be accomplished by loosely coupling the output of the test oscillator to the antenna system instead of directly to the antenna terminals through a 100 ohm resistor. Make sure that the signal from the test oscillator actually reaches the receiver via the antenna rather than by some form of direct coupling.
- (4) In all the foregoing tests using output meter readings for circuit adjustment, it is recommended that headphones (or speaker) be used to monitor the signal. In this way false adjustments due to overloading, spurious responses, or other "freaks" may be avoided.



TUBE SOCKET VOLTAGES

Socket No.	(C) 1 N	Tube No. VOLTS AT SOCKET TERMINAL NUMBER*						
	1 ube 110.	3	4	5	6	7	8	
X1A	V1A	+250	+135		+135	6.3AC	0 0	
X2A	V2A	+250	+135		+135	6.3AC	0	
X3A	V3A	+250	+115		•	6.3AC) 0	
X4A	V4A	+150**	+150**	+150**	J	6.3AC	_	
X5A	V5A	+250	+135	0		6.3AC	0	
X6A	V6A	0	$-43 \\ -1.5$	0	+135	6.3AC	+250	
X7A	V7A	0		0	+100	6.3AC	+240	
X8A	V8A	2	+.4	2	, ,	6.3AC	$^{+.4}_{2}$	
X9A	V9A	+.4	0	0	+.4	4.0AC		
X10A X11A	V10A	0		0	+40	6.3AC	+155	
X11A X12A	VIIA	<u> </u>	$-1.5 \\ -3.2$	U ₂	+110	6.3AC	+240	
X12A X13A	V12A V13A	-3.2	-3.2	-3.2	2.0	6.3AC	-3.2	
X13A X14A	V 13A V 14A	+110	1.040		$\begin{array}{r} -3.2 \\ -20 \end{array}$	6.3AC	l 0	
X14A X15A	V14A V15A	+240	+240		-20	6.3AC	0	
X16A	VISA VI6A	+380 +380	$^{+380}_{+380}$	0		6.3AC 6.3AC	$^{+38}_{+38}$	

^{*} Terminals 1 and 2 of all sockets are at zero potential with respect to chassis.

The above voltage readings are based on an AC line voltage exactly equal to the primary tap on the power transformer—higher or lower line voltage should result in corresponding variations in these readings.

All DC readings are based on the use of a meter having a resistance of 1000 ohms per volt, and are taken between sockets terminals and chassis.

SENSITIVITY and AUDIO GAIN should be set at 0.

MOD-CW switch should be on CW.

AVC-MANUAL switch should be on MANUAL.

SEND-REC switch should be on REC.

LIMITER switch should be ON.

^{**} Varies widely with different tubes; also with dial setting.

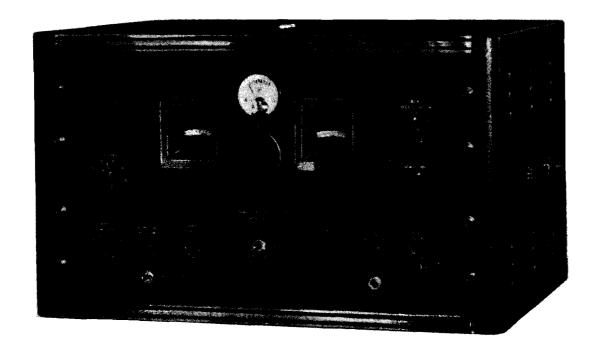


Fig. 1. Front view radio receiver table model

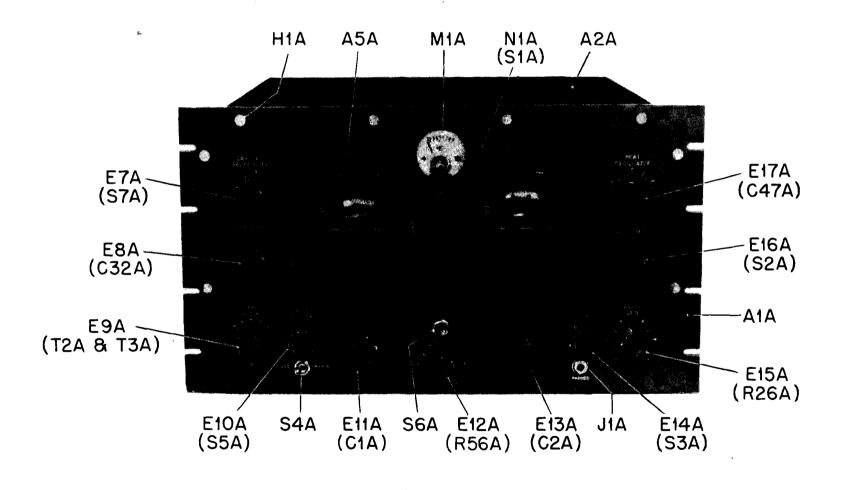


Fig. 2. Front view radio receiver rack model

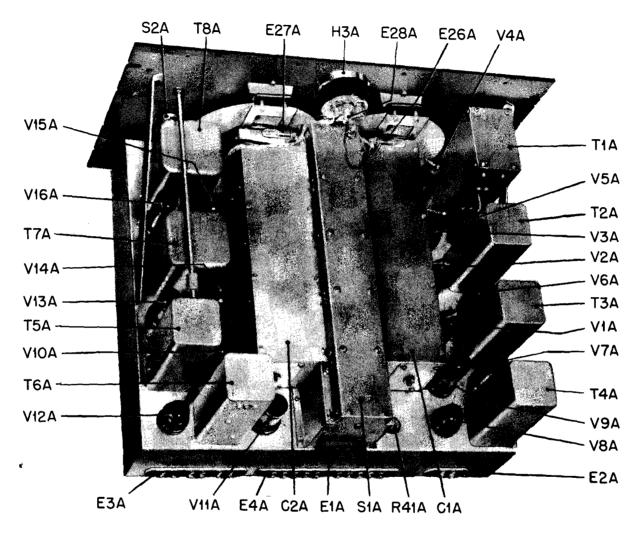


Fig. 3. Inside view radio receiver

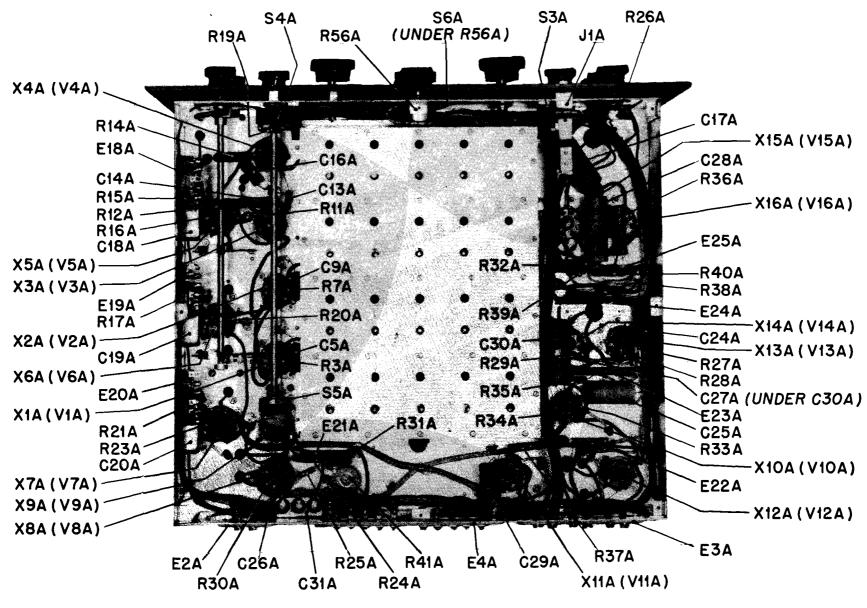


Fig. 4. Bottom view radio receiver

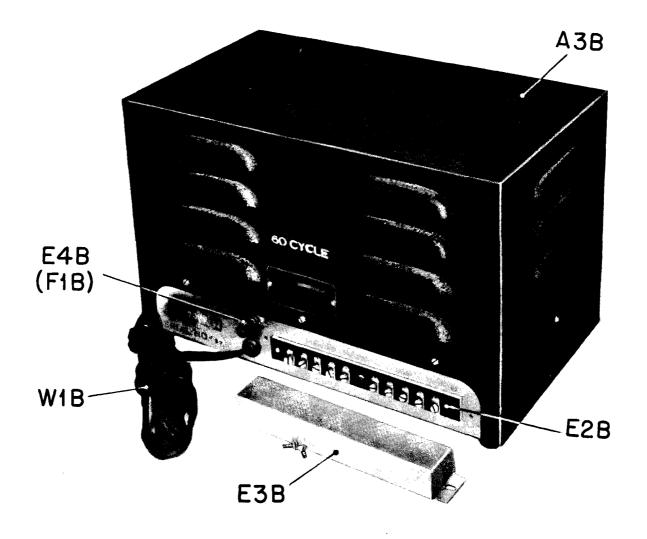


Fig. 5. Rear view power supply table model

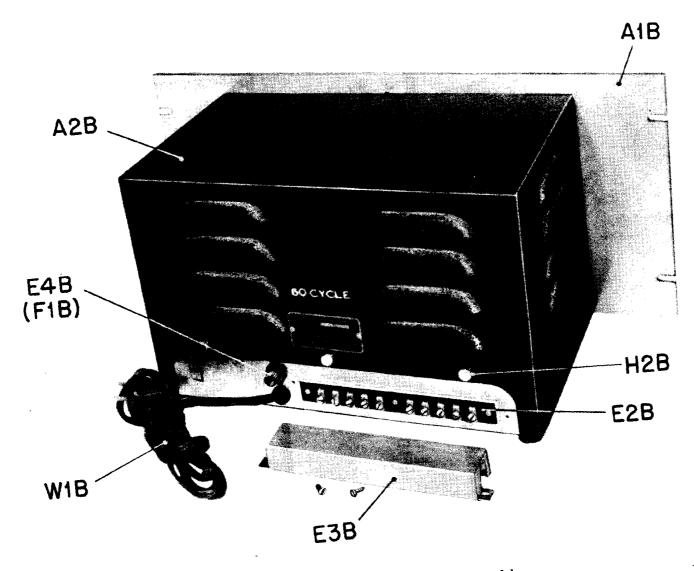


Fig. 6. Rear view power supply rack model

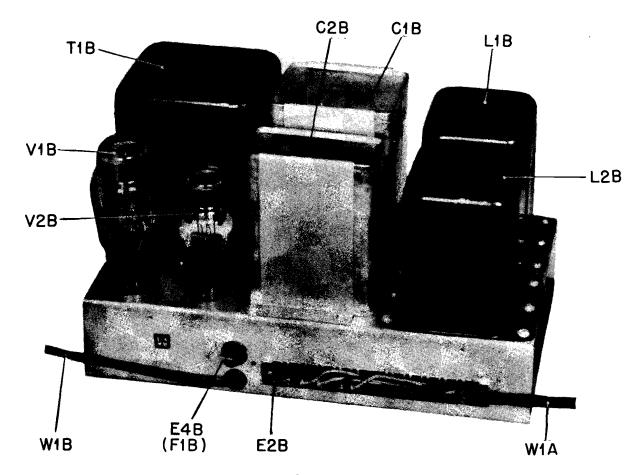


Fig. 7. Inside view power supply

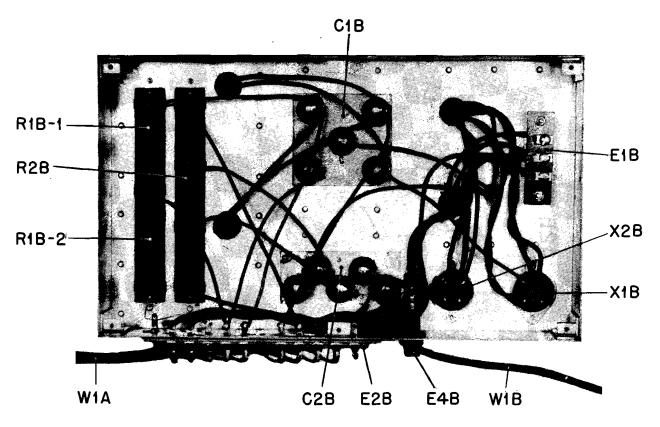


Fig. 8. Bottom view power supply

Symbol	ı	NAME OR FUNCTION	DESCRIPTION	Hammarlund Part No.	Mfgr.	Identification	NOTES
A1A A2A A3A A4A A5A		Front Panel, receiver Dust Cover, receiver (Rack Model only) Cabinet, receiver (Table Model only) Handle, cabinet (Table Model only) 2 required Dial escutcheon (Main and Band Spread) 2 required	19" wide, 10½" high, ¾6" thick Black wrinkle-finished steel Black wrinkle-finished steel, chromium trim Black enameled steel, chromium trim Black enameled brass	4901-A 2897 4902 6032 2957	9 9 25 19 26	4901-A 2897 X-2818-434"	
	1 2	* * * Capacitor, Main Tuning (in Tuning Unit) 1st R.F. grid tuning 2nd R.F. grid tuning	* * * 4 section (4 stators) variable condenser (Integral part of Tuning Unit)		9		
C2A	3 4 1 2 3	lst Det. grid tuning H.F. Osc. grid tuning Capacitor, Band Spread Tuning (in Tuning Unit) lst R.F. grid band spread 2nd R.F. grid band spread lst Det. grid band spread	4 section (12 stators) variable condenser (Integral part of Tuning Unit)		9		
C3A C4A C5A C6A C7A C8A	4	H.F. Osc. grid band spread Capacitor, 1st R.F. grid coupling (in Tuning Unit) Capacitor, 1st R.F. grid by-pass (in Tuning Unit) Capacitor, 1st R.F. screen by-pass Capacitor, 1st R.F. plate by-pass (in Tuning Unit) Capacitor, 2nd R.F. grid coupling (in Tuning Unit) Capacitor, 2nd R.F. grid by-pass (in Tuning Unit)	600 mmf. molded mica .01 mfd. molded mica Same as C4A Same as C4A Same as C3A Same as C4A	6073 4886	6 6	5W 3WLS	
C9A C10A C11A C12A C13A C14A		Capacitor, 2nd R.F. screen by-pass Capacitor, 2nd R.F. plate by-pass (in Tuning Unit) Capacitor, 1st Det. signal grid coupling (in Tuning Unit) Capacitor, 1st Det. grid by-pass (in Tuning Unit) Capacitor, 1st Det. oscillator grid coupling Capacitor, 1st Det. screen by-pass	Same as C4A Same as C4A Same as C3A Same as C4A 95 mmf. molded silvered mica Same as C4A	6195	6	5R	
C15A C16A		Capacitor, H.F. Osc. grid coupling (in Tuning Unit) Capacitor, H.F. Osc. plate by pass	50 mmf. molded silvered mica Same as C4A	6074	6	5R	
C17A C18A	1 2 2	Capacitor, extra A.V.C. timing for C.W. reception Capacitor, 1st Det. plate by-pass Common grid return by-pass 1st I.F. screen by-pass	3 x .05 mfd. paper in oil-filled metal can	4892 4891	15 15	Type 689 Type 630	
C19A	1 2 3	Capacitor, 1st I.F. plate by-pass 2nd I.F. grid by-pass 2nd I.F. screen by-pass	Same as C18A				
	1 2 3	Capacitor 2nd I.F. plate by-pass 3rd I.F. grid by-pass 3rd I.F. screen by-pass	Same as C18A				
C21A C22A C23A		Capacitor, Crystal filter plate coil tuning (in T1A) Capacitor, Crystal filter plate coil center tapping (in T1A) Capacitor, Crystal filter plate coil center tapping (in T1A)	120 mmf. molded silvered mica 100 mmf. molded mica Same as C22A	6179 6172	6 6	5R 5 W	
C24A C25A C26A		Capacitor, 1st A.F. grid coupling Capacitor, 2nd A.F. grid coupling Capacitor, 2nd Det. Cathode by pass	.02 mfd. paper in oil-filled metal can .05 mfd. paper in oil-filled metal can 50 mmf. molded mica	4894 4893 6199	15 15 6	Type 689 Type 689 5W	
C27A C28A		Capacitor, Beat oscillator plate by pass Capacitor, 3rd A.F. cathode by pass	Same as C25A 40 mfd. 150V dry electrolytic	6171	15	Type PRS	

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PARTS LIST SPR-210-LX (MODIFIED) RECEIVER (CONT.)

Symbol	NAME OR FUNCTION	DESCRIPTION	Hammarlund Part No.	Mfgr.	Identification	NOTES
C29A C30A C31A	Capacitor, AVC amplifier screen by-pass Capacitor, 3 Volt "C" bias by-pass Capacitor, "B" plus 250V by-pass	Same as C25A Same as C17A 2×.25 mfd. paper in oil-filled metal can	4890	6	DYR-6022	
C32A C33A	"B" plus 100V by-pass Capacitor, Crystal filter phasing (in T1A) Capacitor, Crystal Filter grid coil tuning (in T1A)	Variable, opposed stator type 85 mmf. molded silvered mica	SA-179 6180	9 6	SA-179 5R	
C34A C35A C36A C37A C38A C39A	Capacitor, 1st I.F. grid by-pass (in T1A) Capacitor, Crystal filter phasing trimmer (in T1A) Capacitor, 1st I.F. plate tuning (in T2A) Capacitor, 2nd I.F. grid tuning (in T2A) Capacitor, 2nd I.F. plate tuning (in T3A) Capacitor, 3rd, I.F. grid tuning (in T3A)	Same as C4A Adjustable mica trimmer 1.5 to 5 mmf. Air dielectric adjustable trimmer Same as C36A Same as C36A Same as C36A	6189 SA-1	9	6189 SA-1	
C40A C41A C42A C43A C44A	Capacitor, 3rd I.F. plate tuning (in T4A) Capacitor, Beat oscillator coupling (in T4A) Capacitor, Noise limiter timing (in T4A) Capacitor, 3rd I.F. plate by-pass (in T4A) Capacitor, 2nd Det. R.F. by-pass (in T4A)	Same as C36A 5½ mmf. molded silvered mica Same as C25A Same as C4A Same as C26A	6151	6	5R	
C45A C46A C47A C48A C49A C50A	Capacitor, 2nd Det. R.F. by pass (in T4A) Capacitor, Beat oscillator tuning (in T5A) Capacitor, Beat oscillator vernier tuning (in T5A) Capacitor, Beat oscillator parallel padding (in T5A) Capacitor, Beat oscillator plate blocking (in T5A)	Same as C26A Air dielectric adjustable trimmer Air dielectric variable Same as C13A Same as C3A Same as C22A	SA-197 SA-170	9	SA-197 SA-170	
C50A C51A C52A C53A C54A C55A	Capacitor, Beat oscillator grid coupling (in T5A) Capacitor, AVC amplifier plate tuning (in T6A) Capacitor, AVC diode load R.F. by-pass (in T6A) Capacitor, AVC amplifier plate by-pass (in T6A) Capacitor, AVC diode load filter (in T6A) Capacitor, AVC diode load filter (in T6A) Capacitor, AVC diode load filter (in T6A)	Same as C22A Same as C36A .005 mfd. molded mica Same as C4A Same as C4A Same as C4A Same as C4A	6194	6	1W	
00012	* * *	* * *				
E1A E2A E3A E4A E5A E6A E7A E8A E9A	Terminal Strip, Antenna Terminal Strip, "Send-Receive" relay Terminal Strip, "phono," "spkr," "phones" Terminal Strip, power supply connector Cover, E2A terminal strip Cover, E4A terminal strip Control knob, Crystal filter selectivity Control knob, Crystal filter phasing	Bakelite, two screw terminals Bakelite, two screw terminals Bakelite, six screw terminals Bakelite, ten screw terminals .031" sheet steel, cadmium plated .031" sheet steel, cadmium plated Black bakelite, with pointer, 11/8" dia. Same as E7A Same as E7A	3842 4904 4905 3838 2829 2813 SA-86	12 12 12 12 12 9 9	No. 6 (Special) No. 50 No. 50 No. 6 (special) 2829 2813 SA-86	·
E10A E11A E12A E13A E14A E15A	Control knob, Variable coupling I.F. transformers Control knob, Limiter switch Control knob, Main tuning Control knob, R.F. and I.F. sensitivity Control knob Band Spread tuning Control knob "Mod" "CW" switch Control knob A F gain	Same as E7A Same as E7A Black bakelite, 15%" dia. Same as E7A Same as E11A Same as E7A Same as E7A	3856	14	S-309-3	
E16A E17A E18A E19A E20A	Control knob, A.F. gain Control knob, "Send" "Receive" switch Control knob, Beat oscillator pitch Terminal Strip Terminal Strip Terminal Strip Terminal Strip	Same as E7A Same as E7A Bakelite, metal base, 6 lugs Same as E18A Same as E18A	6153	12	No. 2006	

Symbol	NAME OR FUNCTION	DESCRIPTION	Hammarlund Part No.	Mfgr.	Identification	NOTES
E21A E22A E23A E24A	Terminal Strip Terminal Strip Terminal Strip Terminal Strip	Same as E18A Bakelite, metal base, 4 lugs Bakelite, metal base, 9 lugs Same as E23A	6152 4885	12 12	No. 2004 No. 2009	
E25A E26A E27A E28A	Terminal Strip Dial lamp socket and bracket—Main tuning dial Dial lamp socket and bracket—Band spread dial Tuning meter lamp socket	Same as E23A Miniature socket on angle bracket Same as E26A Special bayonet type	2978	16 3	VB-13762-SUB 0	
HIA	* * * Knurled Cap Nut, dust cover (8 required for Rack Model only)	* * * Brass, nickel plated, tapped 8-32	2951	9	2951	
H2A H3A	Knurled Cap Nut, dust cover (3 required for Rack Model only) Clamp, tuning meter	Brass, nickel plated, threaded 6-32 Brass, nickel plated, ring type	2952 3926	9 17	2952 D-54108	
IIA	* * * Dial Lamp, Main tuning	* * * 6-8V, .15_amp. miniature screw base	3920	8	No. 40	
I2A I3A	Dial Lamp, Band spread Tuning Meter Lamp	Same as IIA 6-8V, .15 amp. bayonet base	6036	8	No. 47	
J1A	* * * Jack, headphone	* * * Open circuit, long frame	3892	16	No. 1	
L1A L2A L3A	Antenna Primary Coil Assembly, 10.0-20.0 mc Antenna Primary Coil Assembly, 5.0-10.0 mc	* * *	SA-46 SA-47	9 9	SA-46 SA-47 SA-48	
L4A L5A	Antenna Primary Coil Assembly, 2.5-5.0 mc Antenna Primary Coil Assembly, 200-400 kc Antenna Primary Coil Assembly, 100-200 kc		SA-48 SA-161 SA-162	9	SA-161 SA-162	· ·
L6A L7A L8A	lst R.F. Grid Coil Assembly, 10.0-20.0 mc lst R.F. Grid Coil Assembly, 5.0-10.0 mc lst R.F. Grid Coil Assembly, 2.5-5.0 mc		SA-110 SA-113 SA-116	9 9 9	SA-110 SA-113 SA-116	
L9A L10A L11A	lst R.F. Grid Coil Assembly, 200-400 kc lst R.F. Grid Coil Assembly, 100-200 kc lst R.F. Transformer Assembly, 10.0-20.0 mc		SA-160 SA-159 SA-111	9 9	SA-160 SA-159 SA-111	
L12A L13A L14A	lst R.F. Transformer Assembly, 5.0-10.0 me lst R.F. Transformer Assembly, 2.5-5.0 mc lst R.F. Transformer Assembly, 200-400 kc		SA-114 SA-117 SA-157	9 9 9	SA-114 SA-117 SA-157	
L15A L16A L17A	lst R.F. Transformer Assembly, 100–200 kc 2nd R.F. Transformer Assembly, 10.0–20.0 mc	Same as L11A	SA-158	ģ	SA-158	
L18A L19A	2nd R.F. Transformer Assembly, 5.0–10.0 mc 2nd R.F. Transformer Assembly, 2.5–5.0 mc 2nd R.F. Transformer Assembly, 200–400 kc	Same as L12A Same as L13A Same as L14A				
L20A L21A L22A	2nd R.F. Transformer Assembly, 100–200 kc H.F. Oscillator Coil Assembly, 10.0–20.0 mc H.F. Oscillator Coil Assembly, 5.0–10.0 mc	Same as L15A	SA-112 SA-115	9	SA-112 SA-115	
L23A L24A L25A	H.F. Oscillator Coil Assembly, 2.5-5.0 mc H.F. Oscillator Coil Assembly, 200-400 kc H.F. Oscillator Coil Assembly, 100-200 kc		SA-118 SA-155 SA-156	9 9 9	SA-118 SA-155 SA-156	
L26A L27A L28A	Coil, Crystal filter plate (in T1A) Coil, Crystal filter grid (in T1A)	Universal, 7/41 Litz., Iron dust core Universal, 7/41 Litz., Iron dust core	6146 6147 2903-A	23 23 9		
L28A L29A	Coil, 1st I.F. plate tuning (in T2A) Coil, 2nd I.F. grid tuning (in T2A)	3 pie universal on isolantite core, 7/41 Litz. 3 pie universal, 7/41 Litz., tapped 30 turns from finish	2903-A 3990	9	2903-A 3990	

Symbol	NAME OR FUNCTION	DESCRIPTION	Hammarlund Part No.	Mfgr.	Identification	NOTES
L30A	Coil, 2nd I.F. plate tuning (in T3A)	Same as L28A				
L31A L32A	Coil, 3rd I.F. grid tuning (in T3A) Coil, 2nd Det. input (in T4A)	Same as L29A Universal on isolantite core, 7/41 Litz.	4907	9	4907	
L33A	Coil, Beat oscillator tuning (in T5A)	3 pie universal, 7/41 Litz., tapped between	2021		2021	
L34A	Coil, AVC diode input (in T6A)	1st and 2nd pies Universal on isolantite core, 7/41 Litz.	2931 4906	9	2931 4906	
Lo III	don, it v a diode input (in 1011)	* * *	1500		1,00	
MIA	* * * Meter, tuning and "S"	* * * 2" flush mounting	4903	3		
MIA	Meter, tuning and S	2 hush mounting	4903	J		
313.4	* * *	* * *		', 		
NIA	Knob and dial, Band switch	Black bakelite knob with etched aluminum dial	SA-163	9	SA-163	
RlA	Resistor, 1st R.F. grid coupling (in Tuning Unit)	500,000 ohms, ½ watt, metallized	4959	10	F-½	
R2A	Resistor, 1st R.F. grid filter (in Tuning Unit)	10.000 ohms, 1/2 watt, metallized	6165	10	BT-½	
R3A R4A	Resistor, 1st R.F. screen filter Resistor, 1st R.F. plate filter (in Tuning Unit)	2,000 ohms, ½ watt, metallized Same as R3A	6160	10	BT-1/2	
R5A	Resistor, 2nd R.F. grid coupling (in Tuning Unit)	Same as RIA				
R6A	Resistor, 2nd R.F. grid filter (in Tuning Unit)	Same as R2A				
R7A	Resistor, 2nd R.F. screen filter	Same as R3A				
R8A R9A	Resistor, 2nd R.F. plate filter (in Tuning Unit) Resistor, 1st Det. grid coupling (in Tuning Unit)	Same as R3A Same as R1A				
R10A	Resistor, 1st Det. grid coupling (in Tuning Unit) Resistor, 1st Det. grid filter (in Tuning Unit)	Same as R1A Same as R2A				
RIIA	Resistor, 1st Det. oscillator grid	50,000 ohms, ½ watt, metallized	4960	10	F- ¹ / ₃ BT-2	
R12A	Resistor, 1st Det, screen filter	25,000 ohms, 2 watt, metallized	3999	10	BT-2	
R13A	Resistor, H.F. oscillator grid (in Tuning Unit)	Same as R11A	4040	10	D/T 0	
R14A R15A	Resistor, H.F. oscillator plate filter Resistor, 1st Det. plate filter	12,000 ohms, 2 watt, metallized Same as R3A	4840	10	BT-2	
R16A	Resistor, 1st Let. plate inter	Same as R3A				
R17A	Resistor, 1st I.F. plate filter	Same as R3A				
R18A	Resistor, 2nd I.F. grid filter	Same as R2A				
R19A	Resistor, "AVC-MAN" shunt	2,000,000 ohms, ½ watt, metallized	4920	10	BT-½	
R20A R21A	Resistor, 2nd I.F. screen filter Resistor, 2nd I.F. plate filter	Same as R3A Same as R3A				
R21A R22A	Resistor, 3rd I.F. grid filter	Same as R2A				
R23A	Resistor, 3rd I.F. screen filter	50,000 ohms, 1 watt, metallized	6166	10	BT-1	
R24A	Resistor, 2nd Det. diode load	75,000 ohms, ½ watt, metallized	4914	10	BT-1/2	
R25A	Resistor, 2nd Det. diode load	50,000 ohms, ½ watt, metallized	6075	10	$BT \cdot \frac{1}{2}$	
R26A	Resistor, A.F. gain control	250,000 ohms, variable potentiometer, taper "B"	4919	10	9801-6452 SUB 1	
R27A	Resistor, 1st A.F. grid coupling	500,000 ohms, ½ watt, metallized	6076	10	BT-1/2	
R28A	Resistor, 1st A.F. plate coupling	Same as R23A	,-		== /2	
R29A	Resistor, 2nd A.F. grid coupling	Same as R27A				
R30A	Resistor, 2nd Det. cathode bias	250,000 ohms, ½ watt, metallized	4912	10	BT-½	
R31A	Resistor, Noise limiter heater series dropping	4 ohms, 5 Watt, wire wound Same as R31A	4921	10	AA-3	
R32A R33A	Resistor, Dial and meter lamps series dropping Resistor, Beat Oscillator screen supply	Same as R31A Same as R27A				
R34A	Resistor, Beat Oscillator plate supply	Same as R25A				
R35A	Resistor, Beat Oscillator filter	5000 ohms, ½ watt, metallized	4814	10	$BT\frac{1}{2}$	
R36A	Resistor, 3rd A.F. cathode bias	750 ohms, 10 watts, wire wound	3836	18	10-V ₩ Q	
R37A	Resistor, AVC amplifier screen filter	Same as R23A				

Symbol	ı	NAME OR FUNCTION	DESCRIPTION	Hammarlund Part No.	Mfgr.	Identification	NOTES
R38A R39A R40A R41A		Resistor, "C" bias voltage divider (on E24A) Resistor, "C" bias voltage divider (on E25A) Resistor, "C" bias voltage divider (on E25A) Resistor, "S" meter shunt	300 ohms, ½ watt, metallized 1700 ohms, ½ Watt, metallized 3000 ohms, I Watt, metallized 1000 ohms, wire wound potentiometer	6169 4947 3809 4932	10 10 10 10	BT-½ BT-½ BT-1 BT-1 MH-1000	
R42A R43A R44A R45A R46A R47A		Resistor, Crystal filter selectivity controlling (in T1A) Resistor, 1st I.F. grid filter (in T1A) Resistor, 3rd I.F. plate filter (in T1A)	25 ohms, ½ Watt, metallized 50 ohms, ½ Watt, metallized Same as R38A Same as R3A Same as R2A Same as R3A	6155 6170	10 10	BW-½ BW½	
R48A R49A R50A R51A R52A		Resistor, 2nd Det. diode load (in T4A) Resistor, Noise limiter timing (in T4A) Resistor, Beat Oscillator grid (in T5A) Resistor, AVC amplifier plate filter (in T6A) Resistor, AVC timing (in T6A)	100,000 ohms, ½ Watt, metallized 1,000,000 ohms, ½ Watt, metallized Same as R48A Same as R3A Same as R49A	6135 6167	10 10	BT½ BT½	
R53A R54A R55A		Resistor, AVC diode load (in T6A) Resistor, AVC diode load (in T6A) Resistor, AVC diode load (in T6A)	25,000 ohms, ½ Watt, metallized Same as R35A Same as R35A	6198	10	BT1/2	
R56A		Resistor, Sensitivity control	50,000 ohm potentiometer, taper "E"	4918	10	9801-6453	
	1 2 3 4 5	Switch, Band change (in Tuning Unit) Antenna section 1st R.F. grid section 1st R.F. plate and 2nd R.F. grid section 2nd R.F. plate and 1st det. grid section H.F. oscillator grid and cathode section	10 pole, 5 position (5 sections) (Integral part of Tuning Unit)		9		
52A 53A 54A 55A 56A 57A		Switch, "Send-Receive" Switch, "CW-Modulation"	SPST rotary snap switch DPST rotary snap switch DPDT toggle SPST rotary snap switch DPST toggle - Wafer type, 6 positions	4917 4915 2990 4916 2983 4911	11 11 13 11 13 20		
		* * *	* * *				
Γ1A Γ2A Γ3A		Quartz Crystal filter assembly 1st I.F. transformer assembly (variable coupling) 2nd I.F. transformer assembly (variable coupling)	Same as T2A	SA-178-A SA-166	9 9	SA-178-A SA-166	
Г4А Г5А Г6А Г7А		2nd Detector diode input transformer assembly Beat oscillator assembly AVC diode input transformer assembly		SA-167-A SA-169 SA-168-A	9 9 9	SA-167-A SA-169 SA-168-A	
T8A		Push-pull input A.F. transformer Push-pull output A.F. transformer	Class AB ₂ driver trans, for triode-connected 6F6's Plates to 600 ohm load (8000 ohm monitor-	4887	5	4212-A	
		* * *	ing secondary)	4888	5	4962-B	
V1A V2A		lst R.F. amplifier 2nd R.F. amplifier	R.F. pentode, remote cut-off Same as V1A		21	6K7	
V3A V4A V5A		lst Detector (mixer) H.F. Oscillator lst I.F. amplifier	Pentagrid Mixer R.F. pentode, sharp cut-off Same as V1A		21 21	6L7 6J7	

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Symbol	NAME OR FUNCTION	DESCRIPTION	Hammarlund Part No.	Mfgr.	Identification	NOTES
V6A	2nd I.F. amplifier	R.F. pentode, remote cut-off, single ended	_	21	6SK7	
V7A	3rd I.F. amplifier	Same as V6A				•
V8A	2nd Detector	Twin diode		21	6Н6	
V9A	Noise limiter	Twin triode, class "B"	\	21	6N7	
V10A V11A	Beat oscillator AVC amplifier	R.F. pentode, sharp cut-off, single ended Same as V6A	Ì	21	6SJ7	
V12A	AVC amplifier AVC rectifier	Same as V8A				
V13A	1st A.F. amplifier	Triode amplifier, class "A"		21	6C5	
V14A	2nd A.F. amplifier (driver)	Power Pentode		21	6 F 6	
V15A	3rd A.F. amplifier (push-pull output)	Same as V14A			32 3	
V16A	3rd A.F. amplifier (push-pull output)	Same as V14A	ľ			
1 1	* * *	* * *	1			
WIA	Power Supply Connector Cable	9 wire, with two 10 terminal connector strips	SA-35	2	EH-1469	
W2A	Battery Connector Cable	8 wire, with one 10 terminal connector strip	SA-67	2	EH-1786	
	* * *	* * *	1			
XIA	Socket for VIA	Molded low-loss bakelite octal marked 6K7	5000	l ı	MIP-8-T	
X2A	Socket for V2A	Same as X1A		-	1.222 0 11	
X3A	Socket for V3A	Molded low-loss bakelite ocatal marked 6L7	5001	1	MIP-8-T	
X4A	Socket for V4A	Molded low-loss bakelite octal marked 6J7	5002	1	MIP-8-T	
X5A	Socket for V5A	Same as X1A			157D 0 T	
X6A X7A	Socket for V6A	Molded low-loss bakelite octal marked 6SK7 Same as X6A	5003	1	MIP-8-T	
X8A	Socket for V7A Socket for V8A	Molded low-loss bakelite octal marked 6H6	5005	1	MIP-8-T	
X9A	Socket for V9A	Molded low-loss bakelite octal marked 0N7	5006	1	MIP-8-1 MIP-8-T	
X10A	Socket for V10A	Molded low-loss bakelite octal marked 6SJ7	5004	l i l	MIP-8-T	
XIIA	Socket for V11A	Same as X6A		1 -		
X12A	Socket for V12A	Same as X8A				
X13A	Socket for V13A	Molded low-loss bakelite octal marked 6C5	5007	1	MIP-8-T	
X14A	Socket for V14A	Molded low-loss bakelite octal marked 6F6	5008	1	MIP-8-T	
X15A	Socket for V15A	Same as X14A	1	{		
X16A	Socket for V16A	Same as X14A]		
, j	* * *	* * *		,		
Y1A	Quartz Crystal (in T1A)	Resonator type, ground for 465 kc	4944	22	ļ	

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PARTS LIST SPR-210-LX (MODIFIED) POWER SUPPLY

Symbo	l	NAME OR FUNCTION	DESCRIPTION	Hammarlund Part No.	Mfgr.	Identification	NOTES
A1B A2B A3B		Power Supply Front Panel (Rack Model only) Power Supply Dust Cover (Rack Model only) Power Supply Cabinet (Table Model only)	19" wide, 8¾" high, ¾6" thick Black wrinkle-finished steel Black wrinkle-finished steel	2977 2976 2975	9 9 9	2977 2976 2975	
C1B C2B		* * * Capacitor, "B" supply filter Capacitor, "C" supply filter	* * * 4 x 8 mfd. Dykanol, 600 V DC 4 x 3 mfd. Dykanol, 600 V DC	4884 4883	6	PC-1936 PC-1937	
E1B E2B E3B E4B		Terminal Strip primary tap Terminal Strip, Power Supply Connector Cover for terminal strip E2B Fuse Holder	* * * Bakelite, 3 terminals marked 105-115-125 Bakelite, 10 terminals .031" sheet steel, cadmium plated Molded Bakelite, ser * * *	3858 3838 2813 4996	12 12 9 7	No. 6 No. 6 2813 1075-A	
F1B H1B H2B		Power line fuse * * * Knurled Cap Nut (Rack Model only) 5 required	2 amp., glass enclosed * * * Same as H1A	3921	4	3AG	
LIB		Knurled Cap Screw (Rack Model only) 3 required * * * First Filter Choke	Same as H2A * * * Potted, 350 ohms DC resistance, 20h at	4004		SDEC 7410	
L2B		Second Filter Choke	.160 amp. Potted, 1300 ohms DC resistance, 50h at .100 amp.	4994 4999	5 5	SPEC. 7410 SPEC. 7393	
	1 2	Resistor, "B" supply voltage divider Screen voltage dropping resistor—8500 ohms Screen voltage bleeder resistor—9500 ohms Resistor "C" Supply filter	* * * 18,000 ohm "steelbak" tapped at 9,500 ohms	4946	24		
R2B	-	Resistor "C" Supply filter	24,000 ohm "steelbak" tapped at 8,000 and 16,000 ohms	4882	24		
ТІВ		Power Transformer	Potted in drawn steel case, 105-115-125V, 50-60 cycles	4998	5	SPEC. 7397	
V1B V2B		"B" supply rectifier "C" supply rectifier	* * * Full wave rectifier Full wave rectifier		21 21	5 Z 3 80	-
W1B		Power line cord and plug	* * * 2 conductor with plug	6143	2	POS-J	
X1B X2B		Socket, "B" supply rectifier Socket, "C" supply rectifier	* * * Molded bakelite, four prong, marked 5Z3 Molded bakelite, four prong, marked 80	5009 5010	1 1	MIP-4 MIP-4	

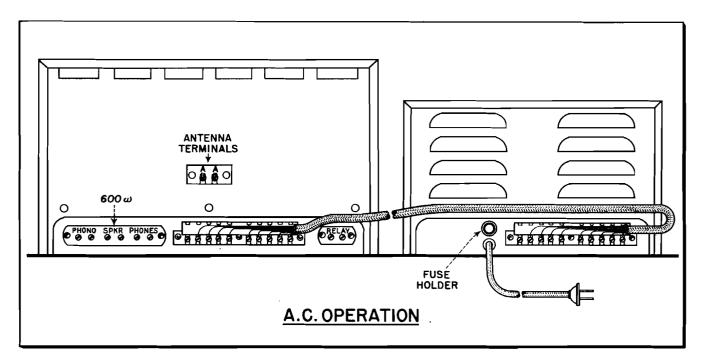


Fig. 9. Power connection for AC operation

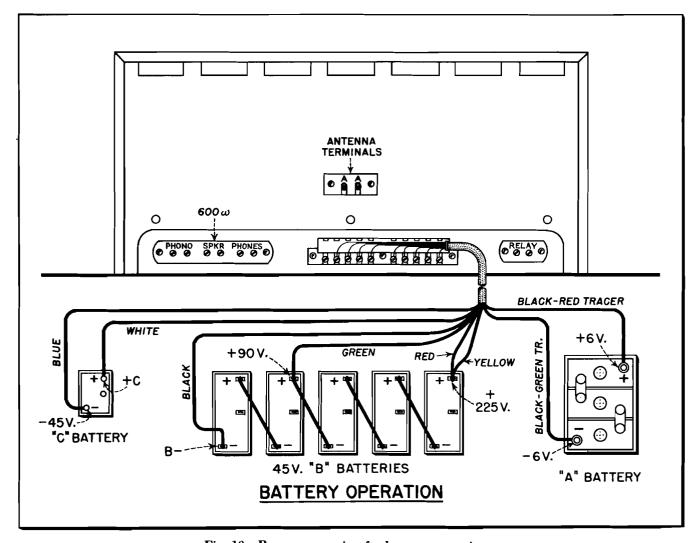


Fig. 10. Power connection for battery operation

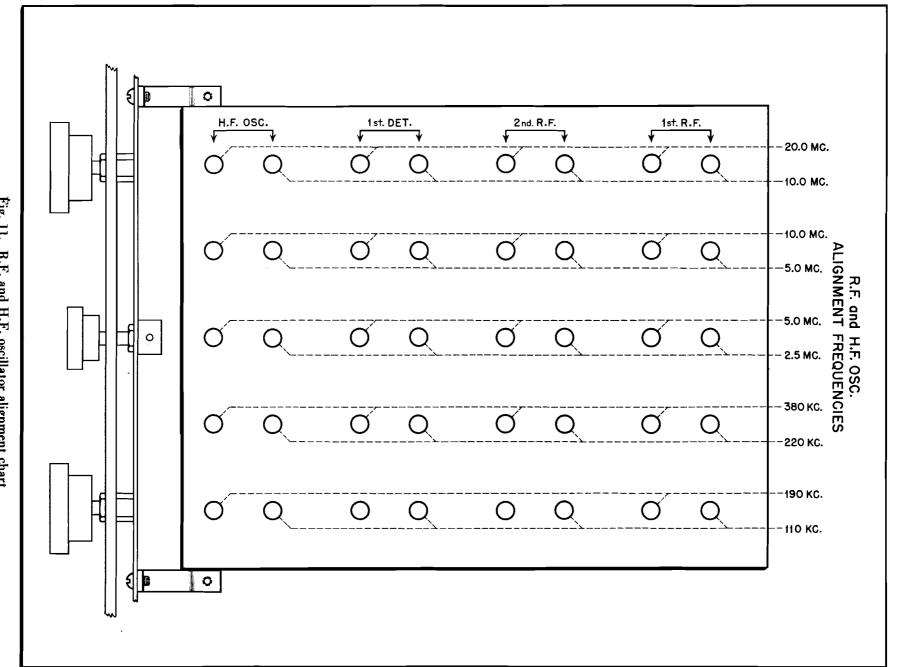


Fig. 11. R.F. and H.F. oscillator alignment chart

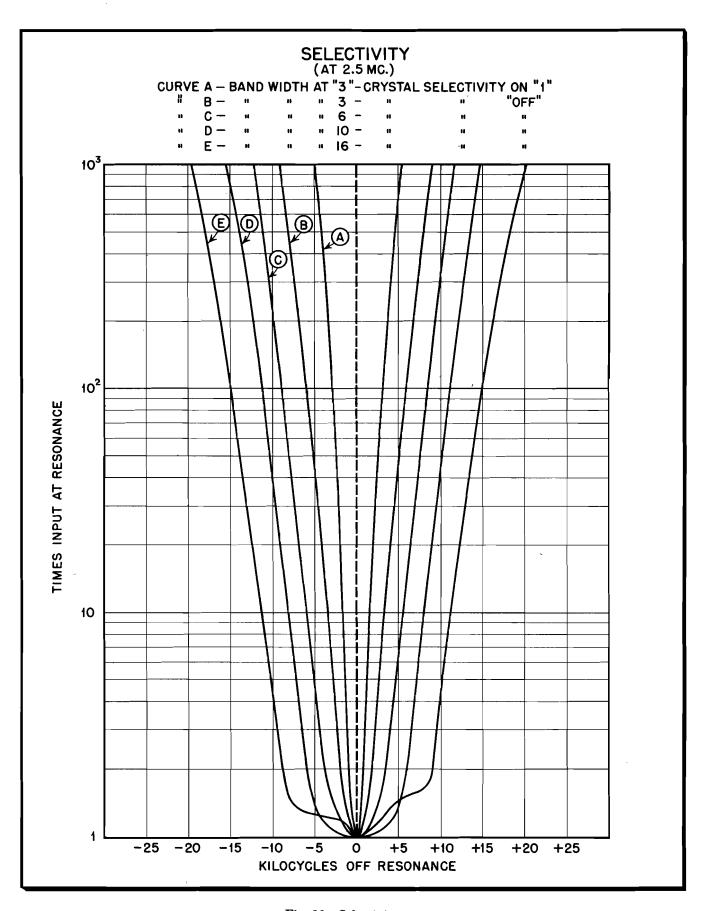


Fig. 12. Selectivity curves

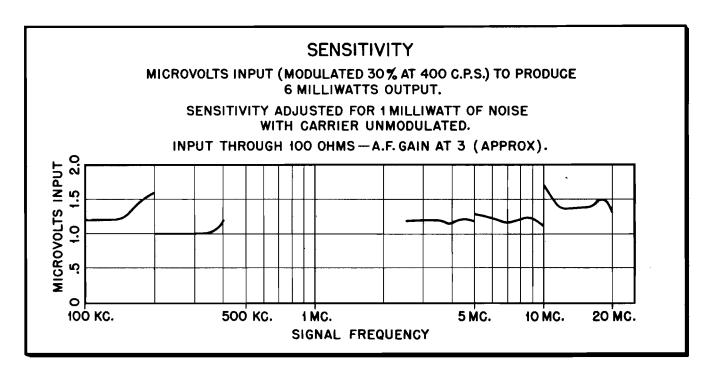


Fig. 13. Sensitivity curves

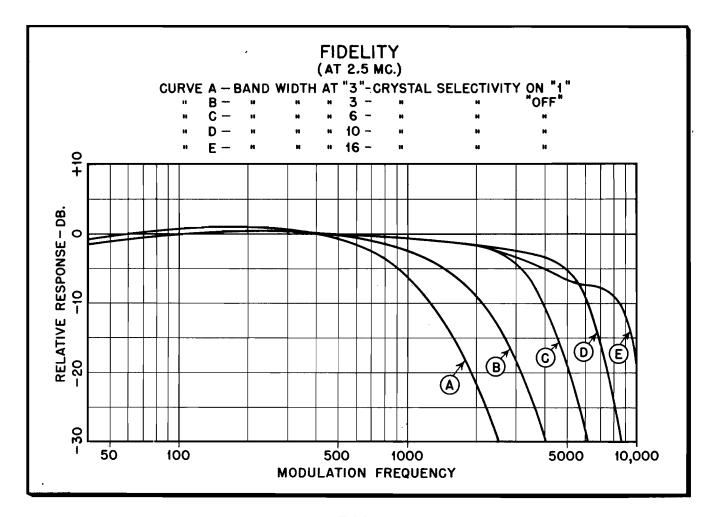


Fig. 14. Fidelity curves

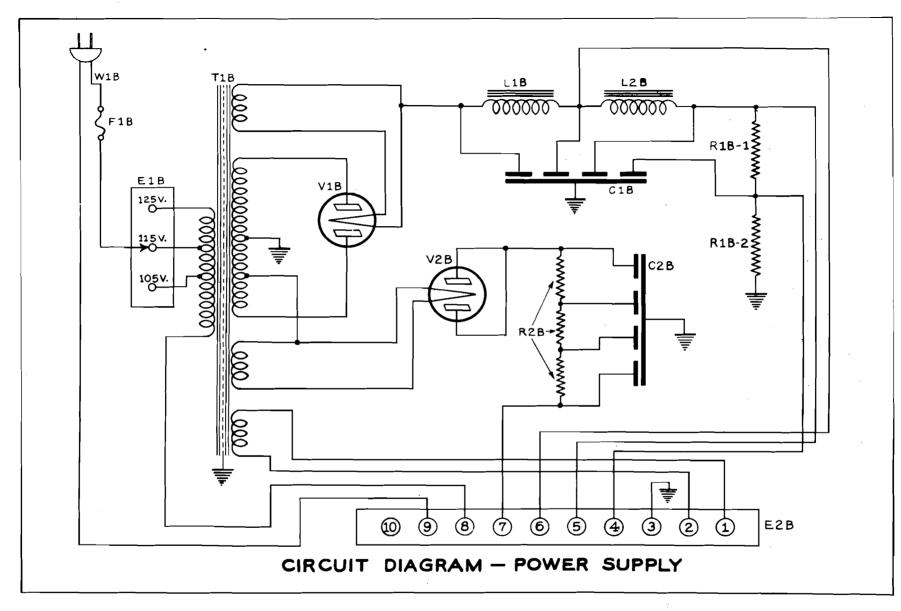
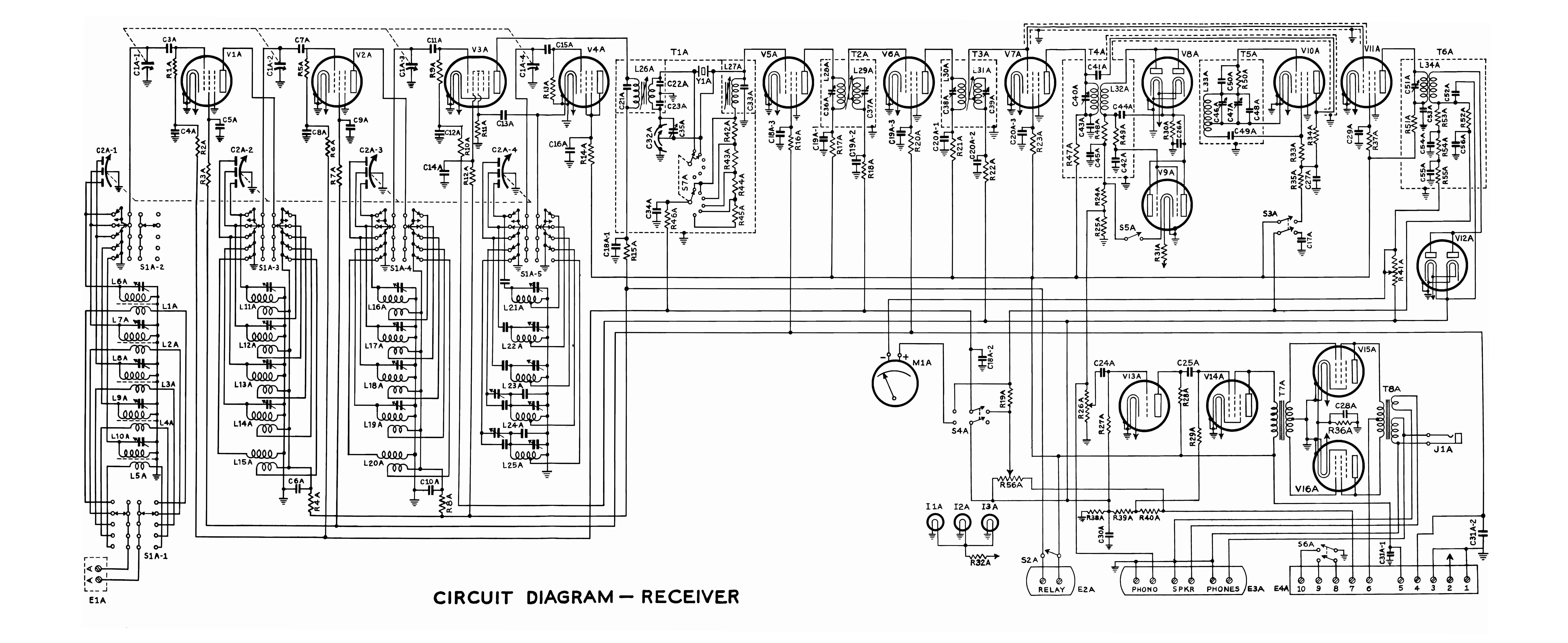


Fig. 15. Power supply wiring diagram



LIST OF MANUFACTURERS

No.	Name	Address
1	American Phenolic Corp	. Chicago, Ill.
2	Belden Mfg. Co	
3	Beede Electrical Instrument Co	
4	Bussmann Mfg. Co	. New York, N. Y.
5	Chicago Transformer Corp	
6	Cornell-Dubilier Electric Corp	. South Plainfield, N. J.
7	Littlefuse Inc	. Chicago, Ill.
8	General Electric Co	. Cleveland, Ohio
9	Hammarlund Mfg. Co., Inc	. New York, N. Y.
10	International Resistance Co	. Philadelphia, Pa.
11	Clarostat Mfg. Co	. Brooklyn, N. Y.
12	Howard B. Jones Co	. Chicago, Ill.
13	Cutler-Hammer, Inc	. Milwaukee, Wisc.
14	Kurz-Kasch Co	. Dayton, Ohio
15	Aerovox Corp	. New Bedford, Mass.
16	P. R. Mallory & Co., Inc	. Indianapolis, Ind.
17	Weston Electrical Instrument Co	. Newark, N. J.
18	Utah Radio Products Co	. Chicago, Ill.
19	National Lock Co	. Rockford, Ill.
20	Oak Mfg. Co	. Chicago, Illinois
21	R.C.A. Mfg. Co	. Harrison, N. J.
22	R.C.A. Mfg. Co	. Camden, N. J.
23	F. W. Sickles Co	. Springfield, Mass.
24	Wirt Company	. Philadelphia, Penna.
25	Par-Metal Products Corp	. Long Island City, N. Y.
26	American Emblem Company	. Utica, N. Y.