New KP-81 RECEIVER

A COMMUNICATION RECEIVER ENGINEERED
TO FILL THE COMPOSITE REQUIREMENTS
OF THE DISCERNING AMATEUR AND
THE ASTUTE PROFESSIONAL OPERATOR.

PIERSON ELECTRONIC CORPORATION

LOS ANGELES, CALIFORNIA

ONLY THE KP-81 HAS ALL THESE FEATURES

THE KP-81 is offered today as the Receiver of tomorrow, having been designed and developed by Karl E. Pierson who formerly designed the famous PR series of Receivers. Engineered to meet present day conditions and to anticipate future requirements.

RF OR PRE-SELECTOR STAGES—Two tuned RF or Pre-Selector stages are in continuous operation at all times on all bands, with highest efficiency of design. This combination gives an unusually high image ratio on all bands. Image ratio table for each band appears below:

AVERAGE IMAGE RATIO

BAND—1	ABOVE 7000 to 1
BAND—2	ABOVE 4000 to 1
BAND—3	ABOVE 3000 to 1
BAND—4	ABOVE 1500 to 1
BAND—5	ABOVE 1000 to 1

BAND SPREAD—Electrical band spread utilizes a separate tuning condenser, employed with its separate dial and is so arranged as to eliminate paralax. A shutter system is employed with this dial which makes visible a 0 to 100 band spread scale as well as an accurately calibrated frequency scale for the particular ham band in use at the particular time. Other provisions in the Receiver make possible accurate frequency setting for this dial. (See Calibrated Switch Par.) Circuit and dials are so arranged as to spread each ham band over literally the entire band-spread dial.

MAIN TUNING DIAL—The main tuning dial is clearly and accurately calibrated in kilocycles on the broadcast or No. 1 band and in megacycles on the other four bands. Band number and coverage both in kilocycles or megacycles and meters is plainly indicated for each individual band by information appearing on a dial shutter which leaves visible only the band in use.

DIAL DRIVE—The dial drives for both band spread and main dial are ball bearing of the high inertia type, extremely simple and fool proof, thus affording smooth operation.

TUNING CONDENSER—The main tuning condenser is a 4 gang type, rigidly constructed and mounted, non-microphonic. The same design is also used in the band spread condenser.

BAND CHANGE—Band changing is accomplished by the use of a slide coil drawer, an adaptation of the well known turret system. Contacts are heavy silvered knife switch type. This drawer operates on ball bearing typewriter carriage principle and is of heavy mechanical construction assuring smooth performance and permanent alignment.

FIVE BANDS—7 ½ to 550 meters (550 KC to 40 MC).

BAND INDICATOR—Band and frequency indicators consist of printed information on the dial shutters themselves indicating all information pertinent to the particular band in use. Coverages for each band shown in table below:

BAND—1	550.0 KC	to	1700.0 KC
BAND—2	1.7 MC	to	5.5 MC
BAND—3	5.5 MC	to	12.0 MC
BAND—4	12.0 MC	to	20.0 MC
BAND—5	20.0 MC	to	40.0 MC

CRYSTAL FILTER—BAND PASS AND SERIES—PARALLEL TYPE COMBINED—The crystal filter and component parts are separately shielded, utilizing precision-one-peak-crystal, and air tuning, isolantite insulated, phasing condenser with insulated shaft, assuring maximum efficiency of operation.

C. W. TUNING—Single Signal with or without crystal.

INTERMEDIATE TRANSFORMERS—Are of new and unusual design which together with their circuits give a type of selectivity and interference elimination heretofore unknown in communication receivers.

HIGH FREQUENCY OR HETERODYNE OSCILLATOR—The oscillator circuit is of the electron coupled type of unusually high stability. Changes of oscillator plate voltage as high as 50% have a negligible effect on the oscillator frequency, even when operating on the highest frequency band. The setting or changing positions of any of the controls has absolutey no effect whatsoever on the oscillator frequency.

BEAT OSCILLATOR—is an extremely stable electron oscillator, carefully shielded with calibrated pitch control on front panel. The method of coupling and detector circuit makes possible, for the first time, CW reception in a super-heterodyne circuit which is far superior to the old type "TRF" Receivers, performance being uniform on either strong or weak signals.

SIGNAL TO NOISE RATIO—Due to a large number of features too lengthy for discussion here having to do with the RF circuit design and silencer circuits, the signal to noise ratio is of such high order as to be negligible on all signals above one micro-volt strength.

INTER-CHANNEL NOISE SUPPRESSION—(Squelch, or silent-between-stations) may be switched in or out of any band at will, it may be adjusted to open on a signal of any R strength down to and even below the noise level of any given location. It will be found of extraordinary benefit in stand-by aviation, or police work, where the carrier of the station being received, is turned off between transmissions. It does not affect the sensitivity or performance of the receiver.

MANUAL CONTROL—Operates the "AVC-off" switch. This control is normally intended for CW operations and as such controls both RF and IF gain permitting an ideal condition for cutting through heavy local interference on both phone and CW reception.

CONDENSERS AND RESISTORS—of close tolerance requirements, are encased in heavily moulded bakelite, thus assuring permanence under any climatic condition. The main voltage divider is heavy, wire-wound and of ample capacity and protected by a heavy vitreous coating.

SENSITIVITY CONTROL—is a fixed setting control mounted on back of chassis and may be used to set the sensitivity for any given location. However, this control is set at the factory for maximum signal to noise ratio, in the average location consistent with accurate R meter calibration and in the majoriy of cases need never be changed. Fractional microvolt sensitivity is attainable on all bands.

METER CIRCUIT—The meter circuit is an integral part of the second intermediate amplifier circuit. It is of the balanced bridge type of high stability. Further, the meter may be removed from the circuit, shorted out or grounded without damage to the meter or affecting the performance of the receiver. The meter terminals are only three volts above ground, eliminating all possibility of shock from high voltage meter terminals as is the usual case. Large changes in line voltage have absolutely no effect whatsoever on the zero setting of the meter circuit due to its balanced bridge design.

DESIGN! ENGINEERING! CONTINUED ADVANCEMENT!

AUDIO TRANSFORMERS—are hermetically sealed and baked export type.

POWER OUTPUT STAGE—is of the push-pull AB-1 type capable of an undistorted output of better than 12 watts.

TONE CONTROLS—are in actuality variable sharp cut-off Hi-pass and Low-pass filters making possible the adjustment of the audio curve to fit the particular noise or such conditions of any situation normally encountered in communication work. Great benefits are derived both on CW and phone by proper use of these controls. In full "on" position the audio curve becomes a sharp peak at 1,000 cycles, an ideal situation for code reception particularly through heavy noise.

INDUCTANCES—All coils and inductances are of a most efficient design and are doubly impregnated and double-baked by a special process. This process increases efficiency or Q of the coils over any other known method. The coils, after treating, are actually more efficient than a perfectly dry coil. Further, when finished, they are covered with a heavy coating, which is of the texture of glass, and so hard as to make damage to windings practically impossible.

UNIFORM GAIN—over entire range.

SOCKETS—All sockets used in high frequency stages and oscillator are of heavy construction HI-Q material.

HEAD PHONE JACK—on front panel completely kills speaker leakage when in use.

COMMUNICATION CALIBRATE SWITCH—is of the usual type with filaments "on", supply "off" in the send position. External connections are brought out from this switch for the purpose of transmitter relay operation if desired.

CALIBRATE SWITCH—is an integral part of the band spread mechanism. Switch being actuated automatically when the band spread dial is returned to zero. Calibration is accomplished by the shorting of the antenna circuit and turning on an accurate crystal controlled 500 KC oscillator, thus placing a marker signal at every 500 KC multiple throughout the spectrum. Locks are provided on both main and band spread dials to assure permanence of calibration over long periods of time. Additional provisions are made for leaving antenna active for calibrations against Bureau of Standards (W.W.V.) Crystal Frequency Adjustment is provided for this purpose.

POWER SUPPLY—arranged for either 110 volt or 220 volt 50-60 cycle operation. Other voltages and frequencies can be supplied on special order.

SPEAKER—Heavy duty, 10" Dynamic. P.M.

MEASUREMENTS—Receiver 20" wide, 16½" deep, 12" high. Speaker Unit 14" wide, 11" deep, 12" high.

WEIGHT—Shipping weight approximately 110 pounds.

NOTE—We regret that existing production problems make it impractical to list names and types of components and materials used in the manufacture of this receiver and we necessarily must reserve the privilege of variation from time to time until conditions become stable and fixed.

TERMINALS—Antenna and doublet terminals are located on rear panel of chassis as well as Phonograph in-put terminals, Sensitivity, Meter Set and Silent Tuning adjustments.

CHASSIS—The chassis is constructed of furniture steel of extra heavy gauge and it is so ribbed and fitted as to stand a weight of over 3000 pounds without collapse, thus assuring durability and permanent alignment.

METAL CABINETS—The cabinets are of the same rigid construction of furniture steel as chassis and are finished in baked crackled finish of fine velvety texture and extreme hardness.

REMOVING CHASSIS—The chassis and front panel are assembled as one unit, and are removable from the cabinet by removing screws at each side of front panel and at rear bottom of chassis.

TILTER—places dials in direct line of sight.

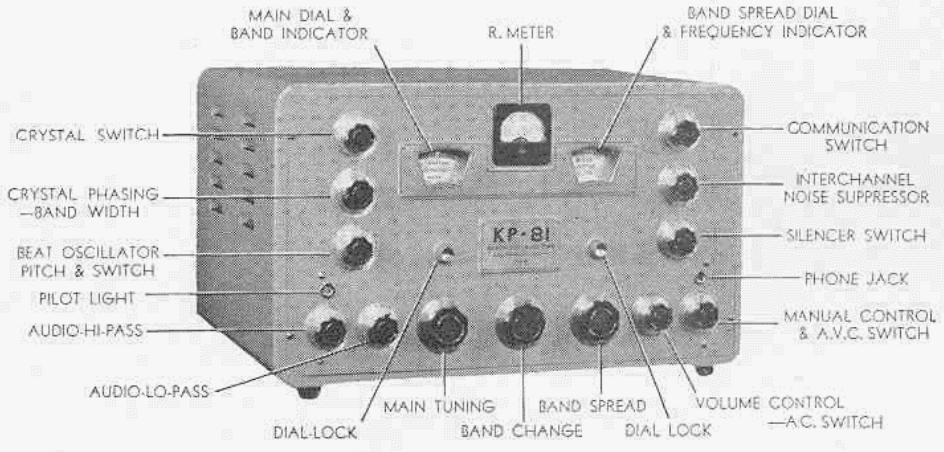
SHOCK-PROOF—Chassis, mounted on resilient rubber feet.

LICENSED—R. C. A.

CIRCUIT LINE-UP—18 TUBES—consisting of 2 stages of RF preselection, local oscillator, modulator or mixer, 3 IF stages, noise amplifier and rectifier, automatic threshold control, second detector, first audio, push-pull output, beat oscillator, squelch, calibrator and rectifiers.

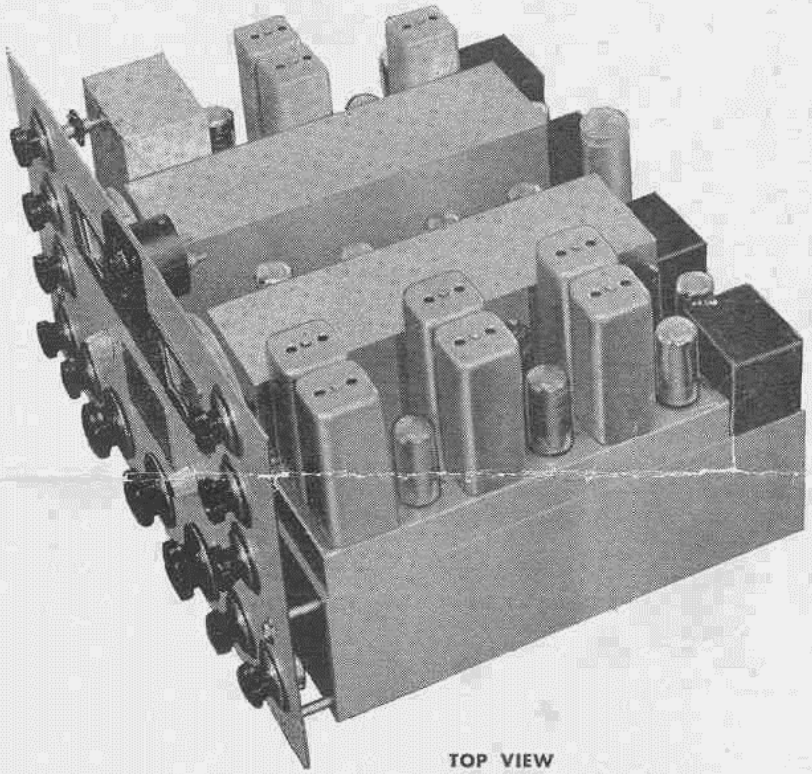
NEW IMPROVED SILENCER CIRCUIT—Completely automatic an far more effective than any silencer heretofore developed. Unde actual operating conditions it has made possible the perfect reception of signals of only 5 microvolts in strength through a noise level in excess of 100 microvolts, in other words noise 20 times stronger than signal. It is controlled by a 3 position switch on the front panel, 1 position "off", 2 position "CW", 3 position "phone". Must be heard in action to be appreciated.

RECEIVER PANEL—is standard relay rack size 19"x10½". Speaker and power chassis can also be furnished for relay rack mounting if desired.

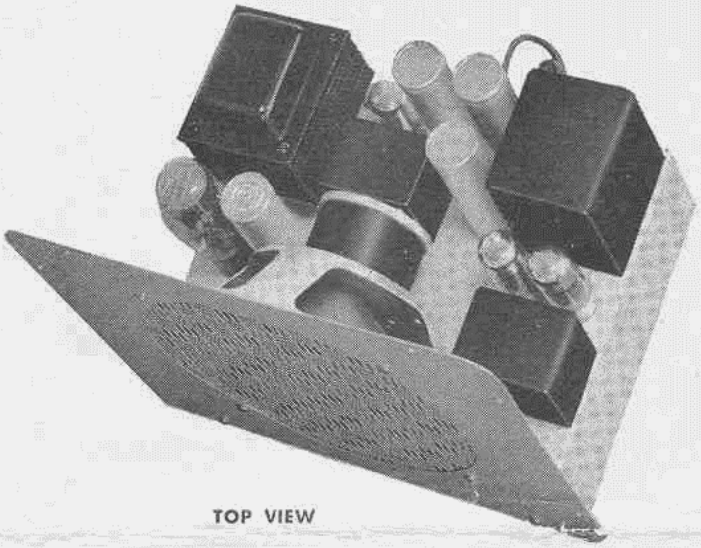


ENGINEERING • QUALITY • PERFORMANCE

- ★ NEW AUTOMATIC NOISE SILENCER
- ★ TWO PRE-SELECTOR STAGES
  (Built in all bands)
- ★ TURRET BAND CHANGE
  (Silver knife contact)
- ★ HI-Q SOCKETS
  (In all high frequency circuits)
- ★ FOUR GANG TUNING AND BAND SPREAD CONDENSERS
- ★ SERIES PARALLEL CRYSTAL FILTER
- ★ CALIBRATED BEAT OSC. PITCH CONTROL



TOP VIEW



TOP VIEW

- ★ CALIBRATED BAND SPREAD
- ★ NEW I.F. AMPLIFIER DESIGN
- ★ NEW PRINCIPLE TUNING SYSTEM
- ★ BUILT IN CRYSTAL CALIBRATOR
- ★ SINGLE SIGNAL AT ALL TIMES
- ★ VARIABLE HI AND LO PASS AUDIO FILTERS
- ★ CABINET TILTER
- ★ 550 KILOCYCLES TO 40 MEGACYCLES
- ★ ANTENNA COIL PROTECTOR

PIERSON ELECTRONIC CORPORATION

MANUFACTURERS OF COMMUNICATION AND COMMERCIAL RADIO EQUIPMENT

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I N S T R U C T I O N M A N U A L

PIERSON KP-81

PROFESSIONAL COMMUNICATIONS RECEIVER

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I N D E X

FIGURES

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ILLUSTRATIONS

SECTION I

PART ONE

GENERAL DESCRIPTION

The KP-81 Professional Communication Receiver is a twenty tube superheterodyne radio receiver covering a continuous frequency range of from 540 to 40,000 kilocycles. Particularly engineered to fill the composite requirements of the astute professional operator and the discerning amateur, the KP-81 possesses uniform gain over its entire range, and includes in its design a number of exceptional features which provide unusually high degrees of selectivity, sensitivity and stability.

Extreme selectivity is attained by employing two stages of pre-selection; 16 tuned circuits in the intermediate frequency amplifier; a crystal filter, and selective low and high pass audio filters. Sensitivity of the KP-81 is unusually high, 1-watt output being obtained for a signal input of but 0.5 microvolt. Stability is excellent, changes of local oscillator plate voltage ranging as much as 50 percent with negligible effect on frequency, even at the highest tuning range. Image rejection ratios are exceptionally high, providing a freedom from image interference hitherto unknown. Band changing is accomplished by the use of a slide coil drawer employing heavy silvered knife switch contacts. Tuning dials are accurately calibrated, bandspread tuning being accomplished electrically by means of an additional tuning condenser which also controls a 500 kc. crystal-controlled oscillator for purposes of dial calibration, providing a market signal every 500 kc. throughout the radio spectrum.

The noise silencer is completely automatic and far more effective than the "limiter" type so often encountered. A calibrated variable pitch beat frequency oscillator, together with a new method of detector coupling, permits for the first time in a superheterodyne CW reception of an order superior to that for which old-type "TRF" receivers have been noted. An adjustable squelch circuit is incorporated to permit "silent-between-station" operation at any signal level on any band, as desired. A signal strength meter, calibrated in "R" units, is provided for the measurement of signals received. All close tolerance coils, inductances, condensers, resistors and audio components are climatically sealed. The power output stage is capable of providing 12 watts of undistorted audio output. Other features include head-phone and phono jacks, and a communication switch which provides a means for not only placing the receiver in "stand-by" position but also for controlling a transmitter, as desired.

Physically, the KP-81 consists of two units, one containing the tuning mechanism, all r-f, i-f and other controllable circuits, whereas the other contains the power supply, filter circuits, power output stage and loudspeaker. Both chassis and their cabinets are ruggedly constructed of heavy gauge furniture steel, reinforced by ribbing. Weight of the complete receiver, uncrated, is 120 pounds.

Power requirements of the KP-81 are 115 volts, AC, 50-60 cycles. Provision is made within the standard power supply unit for operation of the receiver upon 230 volts, AC, 50-60 cycles. For operation at AC frequencies of 25 or 40 cycles, specification must be made upon ordering.

PART TWO

CIRCUIT

The circuit employed on all bands consists of two stages of radio frequency amplification, a separate modulator (mixer) and stabilized high frequency (local) oscillator, three stages of intermediate frequency amplification, an infinite impedance second detector, and two stages of audio amplification, the output stage employing two 7C5's in push-pull. In addition, separate tubes are used for such circuits as the beat frequency oscillator, calibration oscillator, noise silencer, squelch, "R" meter vacuum tube voltmeter, AVC-detector rectifier, and power supply rectifier.

The noise silencer is of the I-F noise-canceling type and employs three tubes for the purposes of threshold control, noise amplification, and noise rectification. A crystall filter is connected between the seond and third I-F stages, and permits either series or parallel operation. Sieries coupled twin I-F transformers are used to heighten selectivity. The AVC circuit is of balanced bridge design, across which a squelch circuit tube is connected. Also employing a balanced bridge type of design is the "R" meter vacuum tube voltmeter circuit. A crystal-controlled oscillator is provided at the receiver's R-F input section for calibration purposes, generating a marker signal every 500 kc. Stability of operation is enhanced by modern design, careful selection of components, and the isolation of heat-generating units such as rectifiers and audio output tubes from the R-F and I-F chassis. The incorporation of selective high and low pass audio filters permits adjustment of the audio output range to accommodate any condition of noise or interference normally encountered in communications work.

PART THREE

TUBE COMPLEMENT

The KP-81 is supplied complete with tubes, all of which have been tested in the receiver at the factory during final test and alignment procedures.

The tubes and their functions are given as follows:

NUMBER	FUNCTION	TUBE TYPE
V101	"R" Meter V.T.V.M.	7A7
V102	Squelch Circuit	7C7
V103	First Audio Amplifier	7B4
V201	500 KC. Crystal Cal. Osc.	7C7
V202	First R-F Amplifier	7A7
V203	Second R-F Amplifier	7A7
V204	Modulator (Mixer)	7B8
V205	H-F Oscillator	7B5
V301	First I-F Amplifier	7A7
V302	Second I-F Amplifier	6L7
V303	Noise Rectifier	7A6
V304	Noise Amplifier	7H7
V305	Noise Control	7A7
V401	Third I-F Amplifier	7H7
V402	Detector	7A4
V403	Beat Frequency Oscillator	7C7
V501	AVC-Detector Rectifier	7Y4
V502	Power Supply Rectifier	5U4G
V503	Audio Output Amplifier	7C5
V504	Audio Output Amplifier	7C5

PART FOUR

TUNING SYSTEM

The main tubing condenser, M.T.C. 201, plus the bandspread tuning condenser, B.S.C. 202, are used together with five sets of coils to tune the entire frequency range of the receiver in five tuning bands.

The frequency range of the five bands is given as follows:

Band Number	Frequency Range
No. 1	540 to 1700 KC.
No. 2	1.7 to 5.5 MC.
No. 3	5.5 to 12.0 MC.
No. 4	12.0 to 20.0 MC.
No. 5	20.0 to 40.0 MC.

All R-F transformers and coils used with the R-F amplifier, modulator, and high frequency oscillator stages, together with their associated padder and trimmer capacitors, are mounted in a rigid, heavy duty, aluminum casting which provides total shielding for all stages concerned. This is constructed to slide from one side of the chassis to the other, being moved by the band change control knob mounted at the lower front center of the control panel. The various coil assemblies are fitted with silvered, heavy duty, knife-edge contact pins which engage spring-actuated contact arms affixed directly below the tuning condensers. This means of accomplishing band-changing places the coils in the best position within the chassis, permitting shortest possible leads to exist between coils and tuning condensers, and disengaging all coils not required in the desired range. It is unnecessary to place the receiver in "stand-by" position (Communication switch in "send" position) when changing bands, any possibility of contact arcing being eliminated by the use of damping resistors in the circuits affected. Bandspread tuning is available on all bands, and when not used the dial should be set at 100 degrees, if calibration of the main tuning dial is to be accurate.

Two tuned R.F. or Pre-selector stages are in continuous operation at all times on all bands, and these have been carefully designed to provide the highest possible circuit efficiency. The result of the close attention paid to the design of these circuits provides the KP-81 with an exceptionally high image rejection ratio. A table showing the average image rejection ratio for each band is given herewith.

PART FOUR - TUNING SYSTEM

AVERAGE IMAGE REJECTION RATIO

Band No. 1	Above 7,000 to 1
Band No. 2	Above 4,000 to 1
Band No. 3	Above 3,000 to 1
Band No. 4	Above 1,500 to 1
Band No. 5	Above 1,000 to 1

* * *

TWIN I.F. AMPLIFIER

An unusually high degree of selectivity is achieved in the KP-81 through the employment of series-connected, twin i.f. transformers in the three-stage i.f. amplifier section. Operating at an intermediate frequency of 465 kc., this circuit feature permits a nominal band-width of 4 kc. to be obtained. Some indication of the selectivity thus provided is shown graphically in Figure No. 1. The attenuation of the high frequency audio component of an incoming signal is more than off-set by the degree of compensation afforded by the audio band-pass filters and infinite impedance detector.

Stability of operation and permanency of adjustment is assured by the use of permeability tuned i.f. transformer and molded silver mica fixed capacitors of close tolerance. The noise-silencer is incorporated in the circuit of the 2nd i.f. stage, and the crystal filter is incorporated in the circuit of the 3rd i.f. stage, permitting far more effective silencing action on CW signals than has heretofore been offered.

PART FIVE

CRYSTAL FILTER

One of the most effective crystal filters yet designed is incorporated in the KP-81. Maximum efficiency of operation is assured by the utilization of a precision, single-peak crystal, separate shielding of all component parts, air-dielectric phasing control, and isolantite insulation. Both series and parallel operation are provided, together with a variable phasing control which permits adjustment of crystal selectivity to accommodate almost any operating condition encountered. When operated in the series position, the crystal filter will provide a degree of selectivity ranging from 500 cycles to 3 kc. as adjusted by the Crystal Selectivity (phasing) control. In this position, the crystal filter is ideal for overcoming multiple interference from adjacent stations by isolating the desired carrier within very narrow limits of frequency. When used in the parallel position, the crystal filter affords sharp attenuation to any single undesired signal the frequency of which is sufficiently close to the desired signal as to be within the audible range. Careful retuning is required when using the crystal filter in parallel position so as to place its attenuation point at the frequency of the undesired signal. Whenever the crystal filter is not in use, detuning of the I-F circuit concerned is prevented by returning the Crystal Selectivity (phasing) control to the mark indicated as "Set."

PART SIX

NOISE SILENCER

The noise silencer of the KP 81 is of the noise canceling I-F amplifier type, completely automatic, and far more effective than any silencer or limiter heretofore developed. Under actual operating conditions, perfect reception has been attained through a noise level equal to 20 times or more that of the signal input level. It is controlled by a 3-position switch upon the control panel, the central position being "Off," the two other positions providing settings for "C.W." and "Fone", respectively. Since threshold control is fully automatic, the setting of the silencer control to the proper position for either type of reception will afford maximum noise silencing for the type of signal desired. It should be noted that greatest silencing action is obtained at the "C.W." position, but it is not recommended that this setting be used for broadcast or radiotelephone reception as distortion will result. In particularly noisy locations, it is beneficial to reduce the setting of the sensitivity control (rear panel) to a level indicated by the "R" meter as R2 to R3 at which point greater effectiveness will be obtained from the silencer.

PART SEVEN

CALIBRATION OSCILLATOR

A unique feature of the KP-81 is the crystal-controlled oscillator which serves to generate a marker signal every 500 kc. throughout the frequency range of the receiver. Employing a precision 500 kc. crystal and a stable oscillator circuit rich in harmonic output, the calibration oscillator is normally idle but maintained in a "stand-by" condition during normal operation of the receiver. The oscillator is placed in an operating condition by rotating the band-spread dial in a counter-clockwise direction until a red line, marked "XTAL CAL - ON," is reached. At this point a micro-switch operated by a cam upon the rotor shaft of the band-spread tuning condenser serves to short circuit the antenna input circuit and simultaneously completes the ground circuit of a portion of the oscillator circuit. The resulting carrier signal may be tuned in on the main tuning dial at any dial reading which is a multiple of 500 kc., thus providing a constant calibration reference point for any portion of any band. Once the desired calibration marker frequency has been properly tuned in, as indicated by the "R" meter, and the main tuning dial locked, the bandspread dial may be returned to its intial setting of 100 at which point it no longer causes the calibration oscillator to function. Bandspread (fine) tuning is then available, the frequency decreasing as the dial is rotated in a clockwise direction from 100 towards 0. Amateur bands are calibrated directly in megacycles upon the bandspread dial. The main tuning dial should be set at the highest frequency indicated on the bandspread dial for amateur bands, or at the next highest 500 kc. multiple above the frequency range for which calibrated bandspread tuning is desired.

PART EIGHT

AUDIO BAND PASS FILTERS

An exceptional feature of the KP-81 is the incorporation of both high and low pass audio filter circuits in the input of the first audio amplifier stage, permitting a degree of audio selectivity never before offered. Each filter circuit consists of five combinations of inductance, capacity and/or resistance, providing either resonance or attenuation at five different frequencies as selected by the associated switch. Twenty-five different combinations of audio selectivity are thus possible, depending upon the settings of the two band pass switches. This figure is increased even more if the additional combinations made possible through the use of the Communication-Normal switch and the Crystal Filter circuit also are considered. Some of the combinations possible at various settings of the two switches are indicated graphically in Figure No. 2, and vary from extended bass and treble ranges, (both switches at No. 1 position), to a sharply peaked 600-cycle band pass, (both switches at No. 5 position.) With both switches set at No. 3 position, an essentially flat response curve is obtained.

Musical programs are heard to best advantage when both band-pass filter switches are in No. 1 position. CW signals are most sharply peaked when both switches are in No. 5 position, providing of course that the incoming signals are properly tuned to resonate at the 600 cycle band-pass frequency. Other combinations may be found to the liking of the operator, it even being possible to differentiate between bass and tenor voices to some degree when interference of such nature presents itself, such as when two radiotelephone stations occupy the same channel simultaneously. A principal advantage of the audio band pass filters is observed when the Crystal Filter is used for increased selectivity of radiotelephone signals, the "bass" effect being attenuated and the treble frequencies boosted to improve intelligibility.

PART NINE

COMMUNICATION-NORMAL SWITCH

An added feature of the KP-81 is the Communication-Normal Switch, a device which, when placed in the Communication position, attenuates all audio frequencies above 1500 cps. This is particularly effective in reducing certain types of ionospheric and other noise, particularly at the higher frequencies. It may be used most effectively in conjunction with the Crystal Filter and the Audio Band Pass Filters in setting up an ideal receiving condition, attenuating noise frequencies, and enhancing intelligibility of voice transmissions.

PART TEN

SIGNAL STRENGTH METER

An integral part of the second intermediate frequency amplifier circuit, the "R" meter circuit is of the balanced bridge type having high inherent stability and a response curve of semi-logarithmic proportions. A distinct feature of the KP-81 is the fact that the "R" meter may be used to measure the strength of CW signals as well as that of radiotelephone signals. The input sensitivity of the bridge type vacuum tube voltmeter circuit employed with the meter is such that for an input signal value of 1 microvolt, the meter will indicate one "R" unit, or a reading of "R-1." Each additional "R" unit up to and including "R-9" indicates a change in signal strength equal to 6 db. Beyond "R-9", these proportions change, there being 12 db. difference between "R-9" and the first "+" sign. Another change occurs between the first "+" and the second "+", indicating 24 db. difference in signal strength. Beyond that point, the curve veers steeply, the degree of signal change between the second "+" and the calibrated stop line being infinite.

Large changes in line voltage have absolutely no effect upon the zero setting of the meter circuit due to its balanced bridge design. Furthermore, the meter may be removed from the circuit, shorted out or grounded without incurring damage either to the meter or to the associated circuit, nor would it affect the performance of the receiver. All possibility of shock due to high voltage has been eliminated at the meter terminals since a potential of only three volts appears at that point, with respect to chassis ground.

PART ELEVEN

"SQUELCH" CIRCUIT

A most useful feature of the KP-81 is the Squelch circuit, which provides inter-channel noise suppression, or "silence-between-stations." It may be switched in or out of any band at will, adjusted to open on a signal of any "R" strength down to and even below the noise level of any given location, and will be found of extraordinary benefit in stand-by applications where the carrier signal is turned off between transmission, as in aviation, police radio, etc. Its operation does not affect the sensitivity or performance of the receiver in any way other than to determine the level at which signals become audible.

PART TWELVE

AUDIO OUTPUT

Three audio output circuits are provided. These are:

(1) A headphone jack, mounted on the front panel, which is so wired as to completely silence the loudspeaker when the phone plug is inserted. The correct load impedance for the headphone circuit is 2,000 ohms, a value usually met by headphones having a d-c resistance of between 1,000 and 4,000 ohms. Maximum audio output power obtainable at the phone jack is 18 milliwatts.

(2) Included in the power supply and speaker unit is the audio output amplifier, consisting of 2 - 7C5's in pushpull, Class AB1, and having a plate-to-plate impedance of 10,000 ohms with an estimated power output, undistorted, of 12 watts. An output transformer is used to couple the amplifier output power to the voice coil of the built-in 10-inch dynamic type loudspeaker.

(3) An additional and separate output winding of the output transformer is connected to a terminal strip mounted on the rear panel of the power supply and speaker unit. Its impedance is 500 ohms and may be used to operate an external speaker. To retain a perfect match, it is necessary either to disconnect the voice coil connections of the built-in loudspeaker during operation of a remote loudspeaker, or to provide a high impedance coupling transformer and operate the two loudspeakers simultaneously. Since the former procedure is difficult for the non-technical operator, it is suggested that the primary winding of the coupling transformer used with the external loudspeaker have an impedance of 1,000 to 1,500 ohms, the secondary matching that of the voice coil of the speaker used. This will provide a relatively satisfactory match, though perhaps not ideal.

PART THIRTEEN

POWER SUPPLY

The standard KP-81 is designed for operation from a 115 or 230 volt AC 50/60 cycle power source, a terminal strip being provided inside the bottom portion of the power supply and speaker unit by which the dual primary circuit of the power transformer may be changed to permit operation from either voltage. As supplied by the factory, the receiver is ready for operation from a 115 volt source. Normal power consumption is approximately 125 volt-amps.

All voltages required by the heater and plate voltage supply circuits are provided by the power supply unit. Each side of the AC input circuit is fused by means of a 2 or 3 ampere fuse inserted in the sides of the fuse-holding AC male plug attached to the AC cord of the power supply unit. For operation on 115 volts, the higher value fuse is suggested, and is normally the value supplied with the receiver. Both 2 and 3 ampere fuses are suitable for operation on 230 volts.

PART FOURTEEN

LOUDSPEAKER

A heavy duty, 10-inch dynamic type loudspeaker is provided with each KP-81, being an integral part of the power supply unit, and utilizing the cabinet thereof as a baffle. The cabinet of the power supply and speaker unit, finished to match the receiver, also incorporates a lining of sound absorbent material behind the speaker panel, thus avoiding any undesirable mechanical resonance. Suitable coupling is provided by means of an audio output transformer, mounted on the power supply chassis, which matches the voice coil of the speaker to the output impedance of the audio amplifier system.

Note: Some models utilize permanent magnet type dynamic loudspeakers, whereas other use field-coil type dynamic loudspeakers. Since performance is identical in either case, no choice is given.

PART FIFTEEN

PHONO JACK

Mounted upon the rear panel of the receiver chassis is a Phono Input Jack which permits the receiver's audio system to be used with auxiliary apparatus, such as phonograph pick-ups, high level microphones, etc. The input circuit is of high impedance, and feeds directly into the first audio stage. Both the Audio Volume Control and the High and Low Pass Audio Filters are retained in the circuit, being fully operative during such usage. Insertion of the pick-up plug into the Phono Jack automatically disconnects the r-f portion of the receiver during such operation.

PART SIXTEEN

COMMUNICATION SWITCH

A communication switch is used to permit interruption of reception (such as during periods of transmission or for stand-by purposes) yet maintaining the receiver in a state of readiness to resume operation instantly whenever the switch is returned to its normal "Receive" position. In the KP-81, the Communication Switch (in "Send" position) applies power to the three terminals of terminal strip E-101 mounted upon the rear of the receiver chassis. (See Figure No. 6) The terminal indicated as G is grounded to the metal chassis and serves as a common lead for the return of the negative plate supply voltage appearing at the center terminal, and for the opposite side of the 6.3 volts, AC, appearing at the opposite end of the terminal strip.

Direct control of a transmitter, by means of the Communication Switch, may be secured by operating a 6.3 volt a-c relay (contacts normally open) from the correct terminals, and utilizing the relay contacts to apply power to the transmitter control circuits. By this means, rotation of the Communication Switch provides proper control both of the receiver and of a transmitter.

An alternate method necessitates leaving the Communication Switch in the "Send" position, and controlling the application of receiver plate supply voltage by employing a relay (contacts normally closed) which is operated by the transmitter control circuit. The relay contacts, being wired across the center and G terminals of terminal strip E-101, thus permitting the receiver to operate during the periods when the transmitter is inoperative.

PART SEVENTEEN

ANTENNA COIL PROTECTION

When a receiver is operated adjacent to a transmitter, it is possible for sufficient r-f energy to develop in the receiver's input circuit, particularly if the latter should be tuned to resonance with the transmitter's frequency, as to burn out and permanently damage the input circuit inductance. The KP-81 is provided with two 1/10 watt neon lamps (N201, N202) which are shunted across the input circuit of the antenna (1st r-f amplifier) stage. These function in such a manner as to detune and thus protect the input circuit whenever the r-f voltage there reaches a value approaching the breakdown voltage of the neon lamps. This point usually is reached long before a damaging value develops, and the detuning effect caused by the breakdown of the neon lamps (in effect, an r-f short circuit) affords ample protection even in the presence of 5 kilowatt transmitters.

SECTION TWO

PART ONE

INSTALLATION

After unpacking the KP-81 receiver and power supply/loudspeaker unit from the shipping cases, proceed as follows:

(1) Make certain all tubes are firmly seated in their sockets.

(2) Remove tape from rectifier tube in Power Supply Unit.

(3) Remove tape from AC line cord.

(4) Place Receiver on its back, and remove two large screws from bottom panel. These are painted red for ready identification and their removal permits the slide coil drawer to operate.

(5) Remove tape from interconnecting cable, and connect the cable to the Receiver and to the Pwoer Supply/Loudspeaker Unit. Be certain to fasten securely the ground straps to their respective binding post terminals.

(6) Connect the antenna to the terminals at the rear of the main Receiver chassis.

(7) Place AC plug in power receptacle. (Set is shipped ready for operation on 115 volts, AC. Where operation is desired on 230 volts, AC, do not place AC plug in power receptacle until change of power terminals has been effected inside the power supply/loudspeaker unit. By removing the power/supply loudspeaker unit from its cabinet, and viewing the bottom side of the chassis, a terminal strip may be seen. Its four terminals are numbered 1, 2, 3 and 4, respectively. By removing the jumpers between terminals 1 and 2, and between terminals 3 and 4, and then placing a jumper between terminals 2 and 3, the receiver is made ready for operation on 230 volts, AC. The power frequency should be 50/60 cycles. For operation at lower frequencies, such as 25 or 40 cycles, a special order is required. NEVER attempt to operate an AC receiver on DC power as immediate, serious damage will result. Fuses are located in the fuse-holding type of male AC plug affixed to the AC line cord of the Power Supply and Loudspeaker Unit.

(8) Placing the Power Supply/Loudspeaker Unit atop the Receiver is not recommended as acoustic feedback may result. It is suggested that the two units be separated to the extent

of their interconnecting cable, if possible, and that the Power Supply and Loudspeaker Unit be placed in such a position that the center of the loudspeaker will be approximately at ear level.

The Receiver is now ready for operation. Before applying power, however, consult the list of operating controls and study the initial operating procedure contained hereafter.

SECTION THREE

PART ONE

OPERATING CONTROLS

All operating controls are mounted upon the front panel as shown in Plate No. 1. As may be seen, these controls have been numbered to facilitate their identification and location, as given herewith:

(1) Crystal Filter Switch. (Normally OFF)

(2) Crystal Selectivity Control (Phasing) (Normally at SET)

(3) Normal-Communication Switch (Normally set at NORM)

(4) Beat Oscillator Switch and Pitch Control. (Normally in central OFF position during broadcast or radiotelephone reception.)

(5) Hi-Pass Audio Filter (See text)

(6) Lo-Pass Audio Filter (See text)

(7) Dial Locks.

(8) Main Tuning Control.

(9) Band Change Switch.

(10) Band Spread Tuning Control.

(11) A-C Switch (On-Off) and Audio Volume Control combined.

(12) Automatic Volume Control (AVC ON-Off) Switch and Manual Volume Control combined.

(13) Noise Silencer Switch (Normally OFF)

(14) Head Phone Jack

(15) Squelch Control (Normally OFF)

(16) Communication Switch (Normally at REC)

(17) Band Spread Tuning Dial.

(18) "R" Meter.

(19) Main Tuning Dial.

PART TWO

INITIAL OPERATION

Before applying power to the receiver, the controls must be set as follows:

(1) Crystal Filter in OFF position.

(2) Crystal Selectivity at SET position.

(3) Beat Oscillator pointed downwards, in OFF position.

(4) Normal-Communication Switch in NORMAL position.

(5) Set both Hi-Pass and Lo-Pass Audio Filters at position 1.

(6) Release dial locks on both tuning controls. These are operated by pulling out and turning to place shaft pin on shoulder of slotted mounting.

(7) Set Bandspread Tuning Dial at 100, as indicated on top scale.

(8) Place Audio Volume Control at extreme counter-clockwise position. (AC off.)

(9) Place Manual Volume Control at extreme counter-clockwise position. (AVC on)

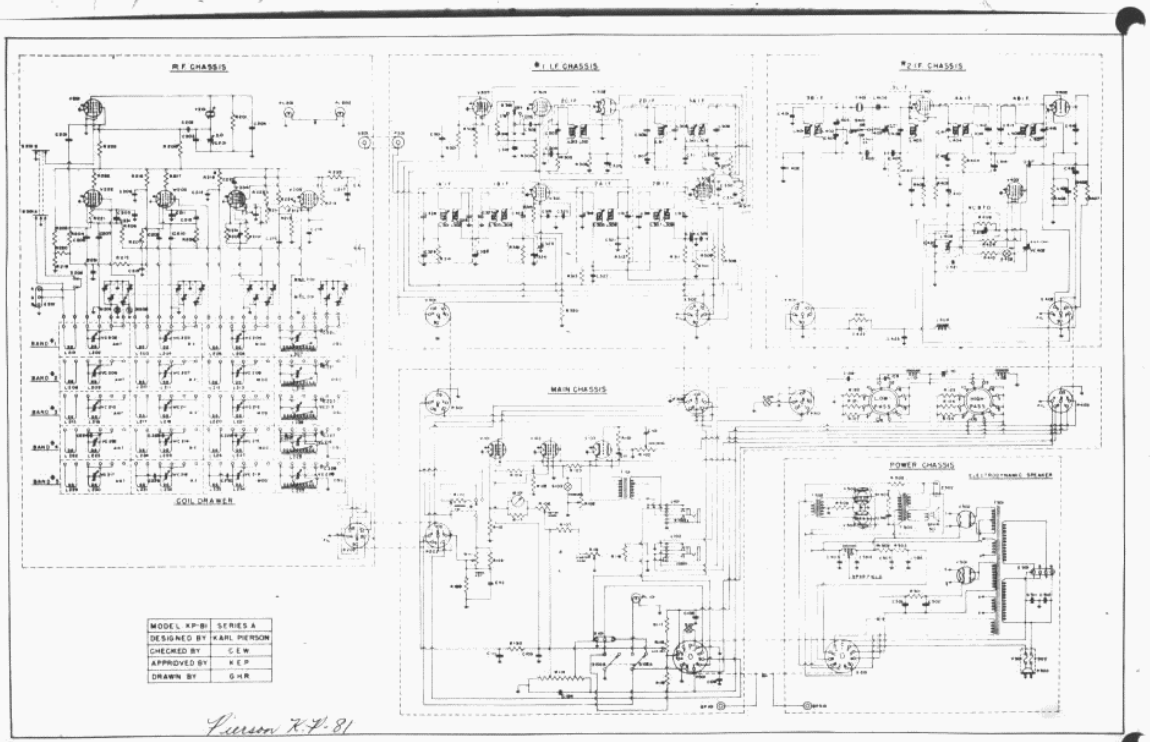
(10) Place Silencer in OFF position.

(11) Turn Squelch to OFF position.

(12) Place Communication Switch in Receive position.

The Receiver normally is shipped with the Band Changing Switch set for Band No. 3, since that is the position it is locked in for shipment. If the locking screws have been removed from beneath the chassis, the Band Change Switch may be set to any band upon which it is desired to operate. Be certain it is locked in well.

The Receiver is now ready for the application of power. This is accomplished by turning the Audio Volume Control Switch clockwise about one-quarter turn. Allow about 45 seconds for the tubes to reach operating temperature. At this point, signals should be received.



MODEL XP-81	SERIES A
DESIGNED BY	KARL PIERSON
CHECKED BY	C.E.W.
APPROVED BY	K.E.P.
DRAWN BY	G.H.R.

Pierson K.P. 81

ALIGNMENT PROCEEDURE FOR KP-81 AS RECEIVED FROM W.ADRIAN OF LA SALLE, ILLINOIS

IF: (USING SWEEP GENERATOR AND SCOPE.)

XTAL-OFF. SELECTIVITY ON SET.

2 KC WIDE ON TOP.
4 KC WIDE AT 1000 TIMES DOWN (60 DB)
4½ KC WIDE AT 10,000 TIMES DOWN
8½ KC WIDE AT 1 MILLION TIMES DOWN.

FOR BEST RESULTS ALIGN SIGNAL GENERATOR TO XTAL IN SERIES POSITION. THEN ALIGN ALL IF'S BOTH TOP AND BOTTOM USING SCOPE AND SWEEP GENERATOR TO OBSERVE THE BAND PASS OF THE IF'S.

IF. (USING SIGNAL GENERATOR AND OUTPUT METER.)

IF FREQUENCY INJECTED AT MIXER TUBE THROUGH AN UNGROUNDED TUBE SHIELD. OUTPUT METER ON 500 OHM OUTPUT OF RECEIVER. (HE DOESN'T SAY SO, BUT I GUESS THE SIGNAL GENERATOR WILL HAVE TO BE MODULATED)

(1) PEAK IF'S AT THE XTAL FREQUENCY. OBTAIN THIS WITH THE XTAL IN THE SERIES POSITION.

(2) [illegible] 1-A & 1-B PRIMARIES.(TOP). 2A-2B, 3A-3B-3C (WITH SELECTIVITY CONTROL AT SET) 4A-4B.

ADJUST EACH OF THESE FOR MAXIMUM OUTPUT.
ADJUST SECONDARY (BOTTOM) OF 2-A FOR MINIMUM OUTPUT.

(3) REMOVE GRID CAP OF 6L7 TUBE AND GROUND.

(4) TURN NOISE SILENCER TO PHONE; TURN RF GAIN UP.

(5) PEAK 2-C FOR MAX(SHOWN WITH TWO SLUGS, HAS ONLY ONE).

(6) TUNE 2-D FOR MINIMUM.

(7) IF THE IF IS UNSTABLE IT MAY BE CORRECTED BY DETUNING 2-A SECONDARY. TURN BOTTOM SLUG IN SLIGHTLY. ADJUST THIS ALSO TO OBTAIN EQUAL GAIN WITH SILENCER IN OFF-PHONE POSITION.

(8) SET SENSIVITY CONTROL FOR A NOISE BACKGROUND OF R1 OR R2 -MAX.

(9) SET BFO DIAL TO ZERO AND TUNE 4-C TO ZERO BEAT.

AVC ADJUSTMENT.

TURN BAND CHANGER KNOB AND SET COIL DRAWER BETWEEN BANDS.

ALL CONTROLS AT NORMAL - AVC ON.

REMOVE SQUELCH TUBE (7C7 V102).

ADJUST AVC SET FOR MAXIMUM HISS.

REPLACE 7C7 -- SET COIL DRAWER BACK TO NORMAL.

RF METER ADJUSTMENT.

ALL CONTROLS NORMAL. BAND SWITCH ON BC. NO BFO. XTAL ON SILENCE *

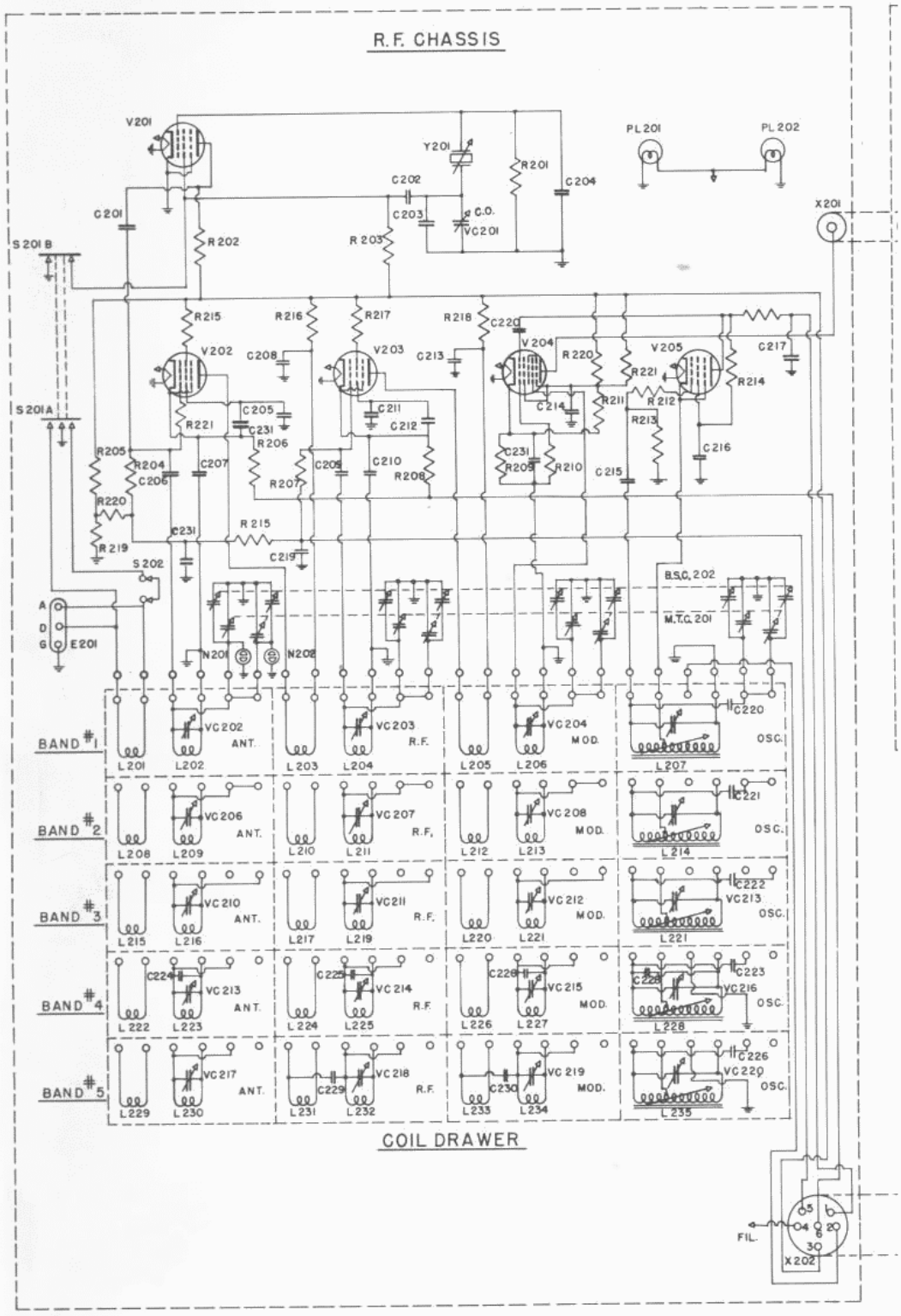
TURN RF GAIN TO MINIMUM AND ADJUST POT ON REAR APRON MARKED R METER REX ZERO. ADJUST TILL METER HAND READS "SET".

REMOVE R METER TUBE (V101), TURN RF GAIN ON AVC. ADJUST REAR APRON POT MARKED "R METER CAL". ADJUST TO THE LAST LINE ON RIGHT OF METER FACE.
THE VACUUM TUBE R METER BRIDGE IS NOW SET TO READ 1R UNIT FOR A SIGNAL INPUT OF 1 MICRO-VOLT.

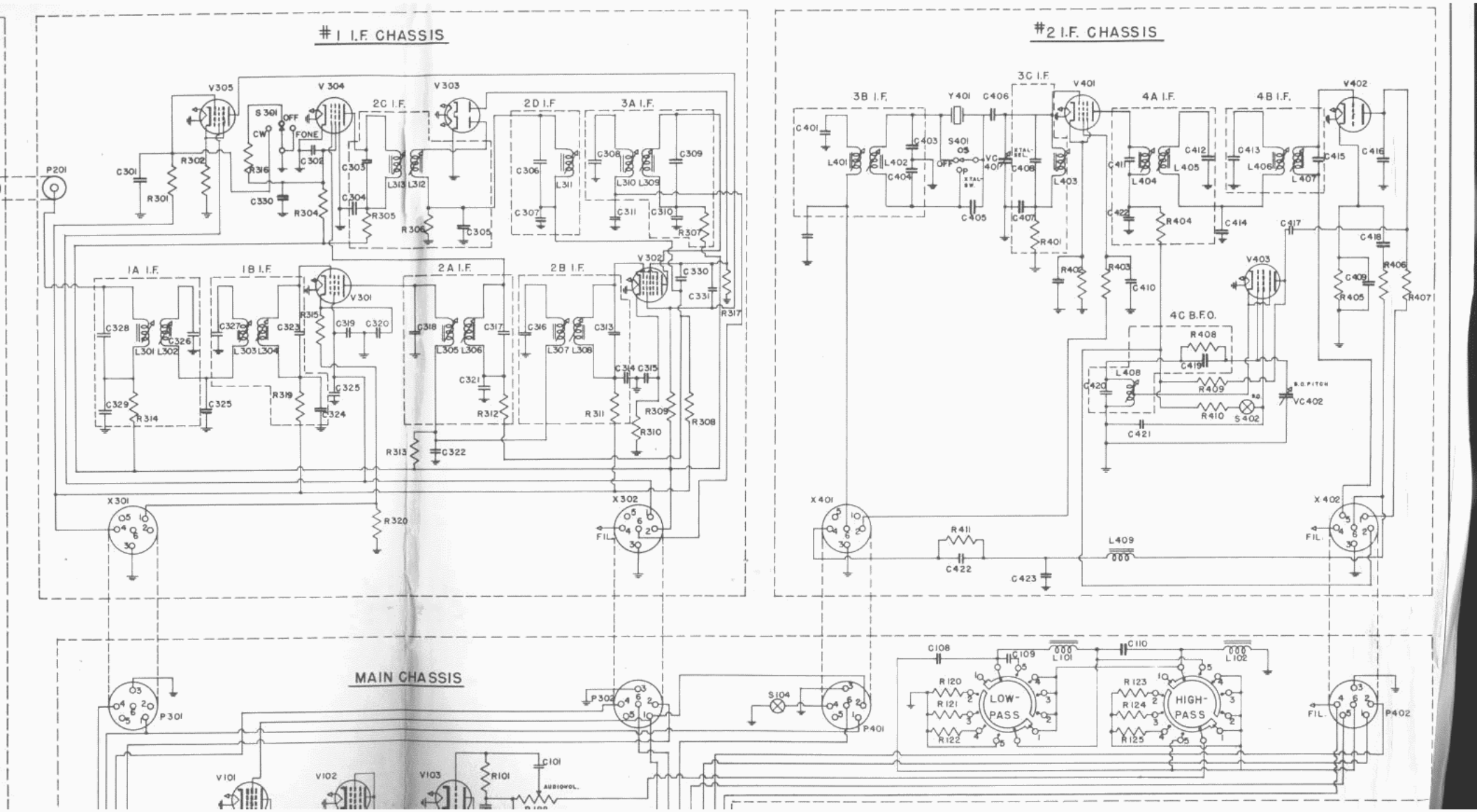
THESE NOTES WERE TYPED FROM A HANDWRITTEN LETTER AND SOME OF THE WRITING IS NOT TOO CLEAR. THE * MEANS THAT I DON'T THINK THERE IS A POSITION ON THE XTAL MARKED SILENCE. DON'T KNOW IF HE MEANS TURN XTAL TO SERIES, OR TURN NOISE SILENCER TO "SILENCE". IT WILL PROBABLY BE CLEAR WHAT TO DO WHEN YOU DO THE JOB. THIS IS GOOD DOPE -- HE DIDN'T MENTION THE RF COILS AND OSCILLATOR -- I'LL ASK HIM ABOUT THOSE.

This is the only service data (NB) I've ever seen and came from Pierson to the late W. Gordon Connie, W9IQC.

Hbz



MODEL KP-81	SERIES A
DESIGNED BY	KARL PIERSON
CHECKED BY	C.E.W.
APPROVED BY	K.E.P.
DRAWN BY	G.H.R.


#1 I.F. CHASSIS
#2 I.F. CHASSIS
MAIN CHASSIS
1A I.F.
1B I.F.
2A I.F.
2B I.F.
2C I.F.
2D I.F.
3A I.F.
3B I.F.
3C I.F.
4A I.F.
4B I.F.
4C B.F.O.
LOW-PASS
HIGH-PASS
AUDIO VOL.
B.F.O. PITCH
P201
P301
P302
P401
P402
X301
X302
X401
X402
S301
S401
S104
S402
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V303
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V402
V403
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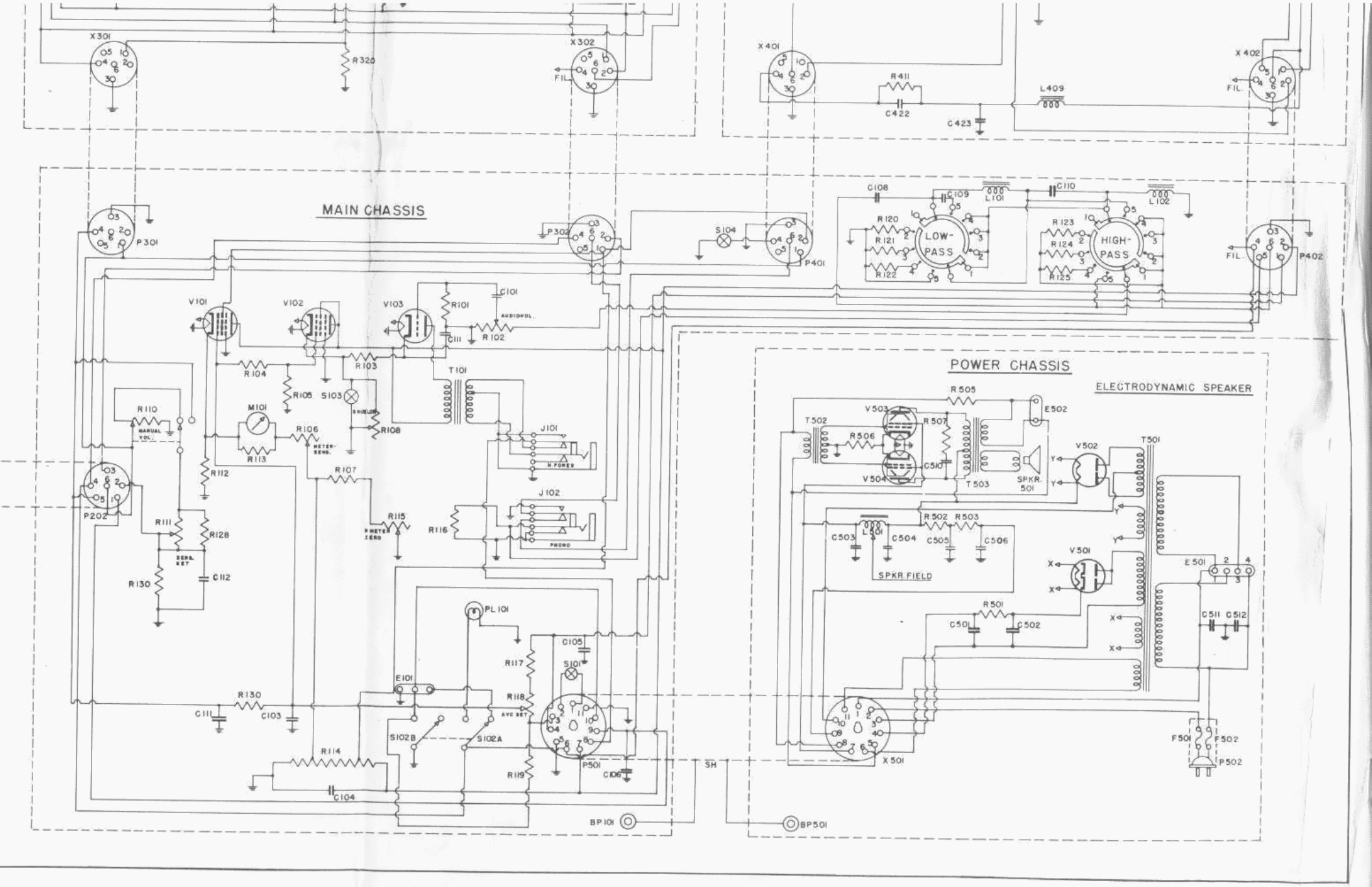
V102
V103
Y401
FIL.


MAIN CHASSIS
POWER CHASSIS
ELECTRODYNAMIC SPEAKER
LOW-PASS
HIGH-PASS
SPKR. FIELD
SPKR. 501
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X302
X401
X402
P301
P302
P401
P402
P202
P501
P502
X501
FIL.
R320
R411
C422
C423
L409
C108
C109
L101
C110
L102
R120
R121
R122
R123
R124
R125
S104
V101
V102
V103
C101
R101
R102
C111
AUDIO VOL.
R103
R104
R105
S103
T101
R110
MANUAL VOL.
M101
R106
METER SENS.
R108
SHUNTS
R113
R112
R107
J101
M. POWER
J102
PHONO
R115
METER ZERO
R116
R111
R128
BASS SET
C112
R130
PL101
C105
R117
S101
E101
R118
AVC SET
S102B
S102A
R114
C104
C111
R130
C103
R119
C106
SH
BP101
BP501
V503
V504
R505
R506
R507
C510
T502
T503
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V502
T501
R502
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C512
R501
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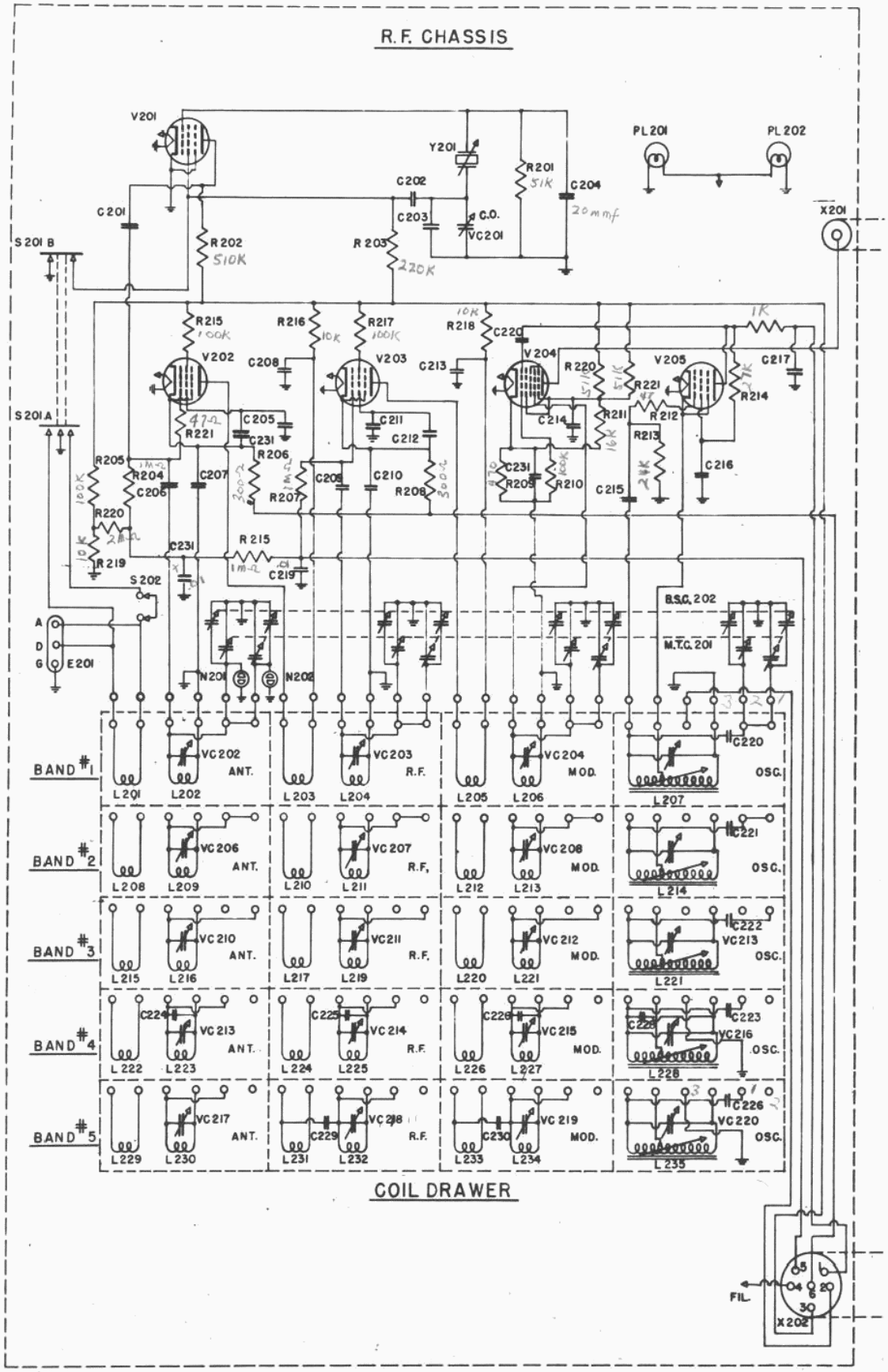
C502
F501
F502


R.F. CHASSIS
V201
Y201
C.O.
VC201
C201
C202
C203
C204
20 mmf
R201
51K
R202
510K
R203
220K
PL201
PL202
X201
S201 B
S201 A
V202
V203
V204
V205
R215
100K
R216
10K
R217
100K
R218
10K
C220
1K
C217
R214
C208
C213
R220
51K
R221
47
R211
16K
R212
47
R213
2.4K
C214
C215
C216
C205
C231
C211
C212
R206
R207
C209
C210
R208
300Ω
R205
1MΩ
R204
C206
C207
100K
R220
2MΩ
10K
R219
C231
R215
1mΩ
C219
S202
A
D
G
E201
N201
N202
B.S.C. 202
M.T.C. 201
BAND #1
BAND #2
BAND #3
BAND #4
BAND #5
ANT.
R.F.
MOD.
OSC.
VC202
VC203
VC204
C220
L201
L202
L203
L204
L205
L206
L207
VC206
VC207
VC208
C221
L208
L209
L210
L211
L212
L213
L214
VC210
VC211
VC212
C222
VC213
L215
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L227
L228
VC217
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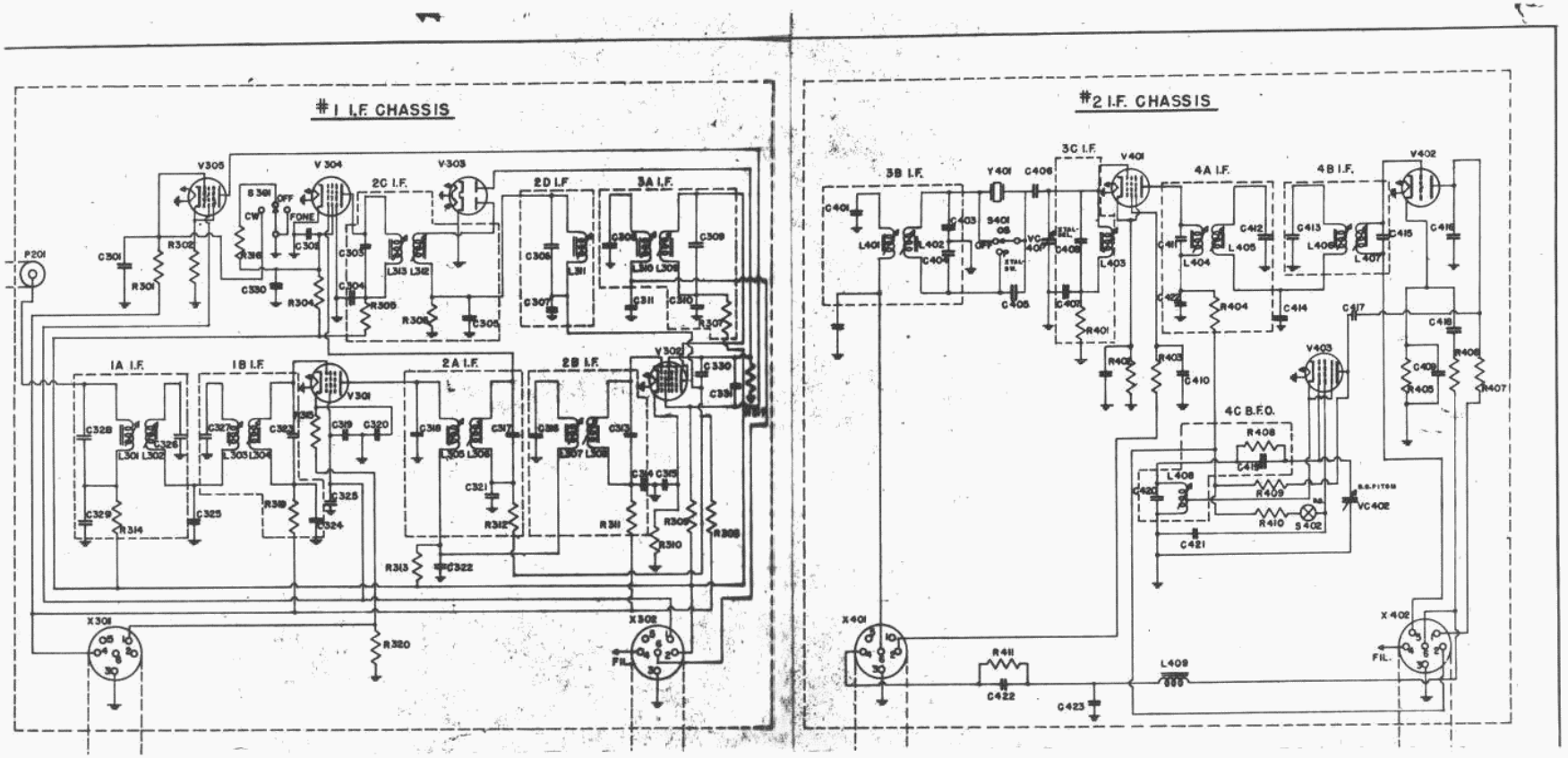
COIL DRAWER
FIL.
X202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1B I.F.
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2B I.F.
2C I.F.
2D I.F.
3A I.F.
3B I.F.
3C I.F.
4A I.F.
4B I.F.
4C B.F.O.
V305
V304
V303
V302
V301
V401
V402
V403
P201
X301
X302
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S301
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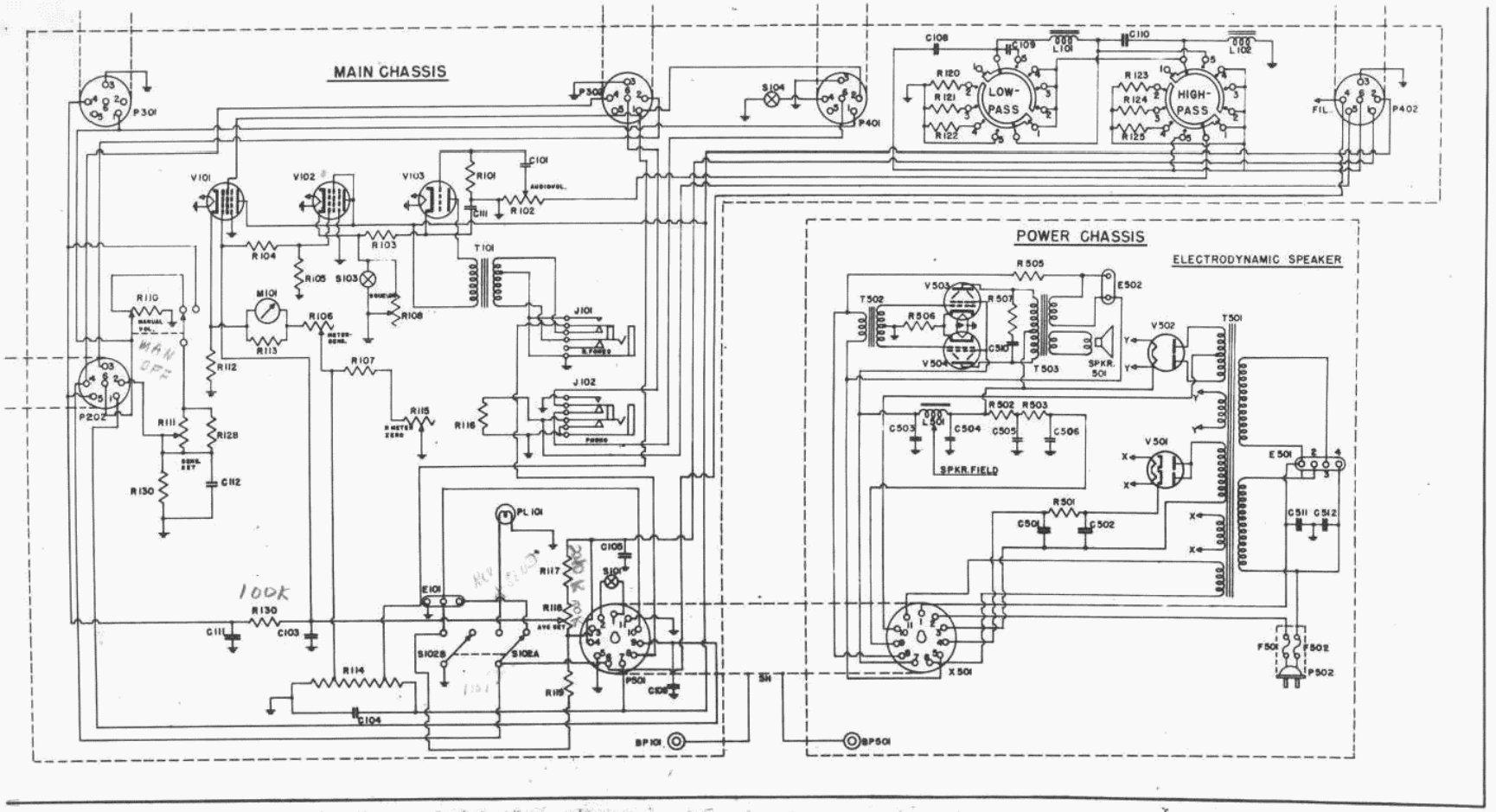
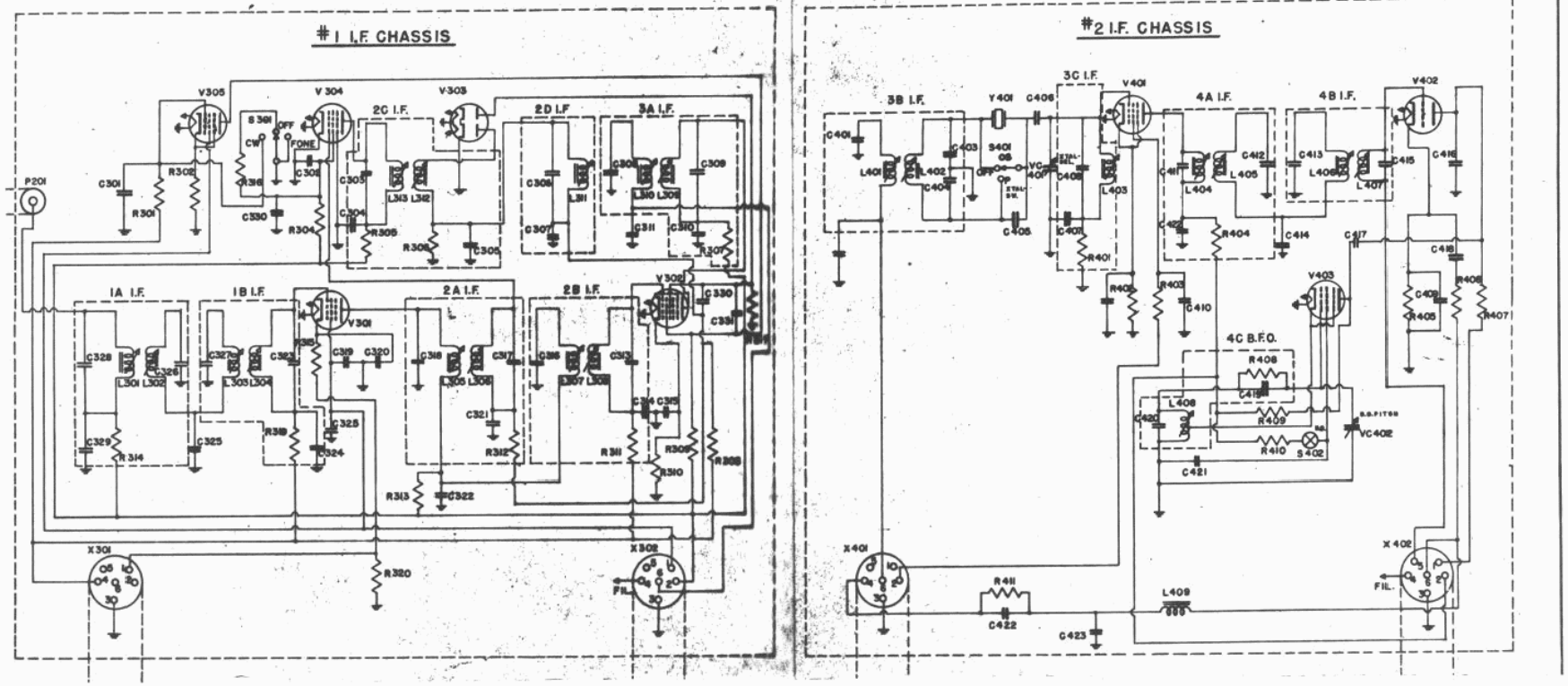
VC401
VC402
Y401
CW
PHONE
OFF
FIL.


MAIN CHASSIS
POWER CHASSIS
ELECTRODYNAMIC SPEAKER
LOW-PASS
HIGH-PASS
SPKR. FIELD
SPKR. 501
MAN OFF
100K
R 119 -- 240K


#1 I.F. CHASSIS
#2 I.F. CHASSIS
1A I.F.
1B I.F.
2A I.F.
2B I.F.
2C I.F.
2D I.F.
3A I.F.
3B I.F.
3C I.F.
4A I.F.
4B I.F.
4C B.F.O.
V305
V304
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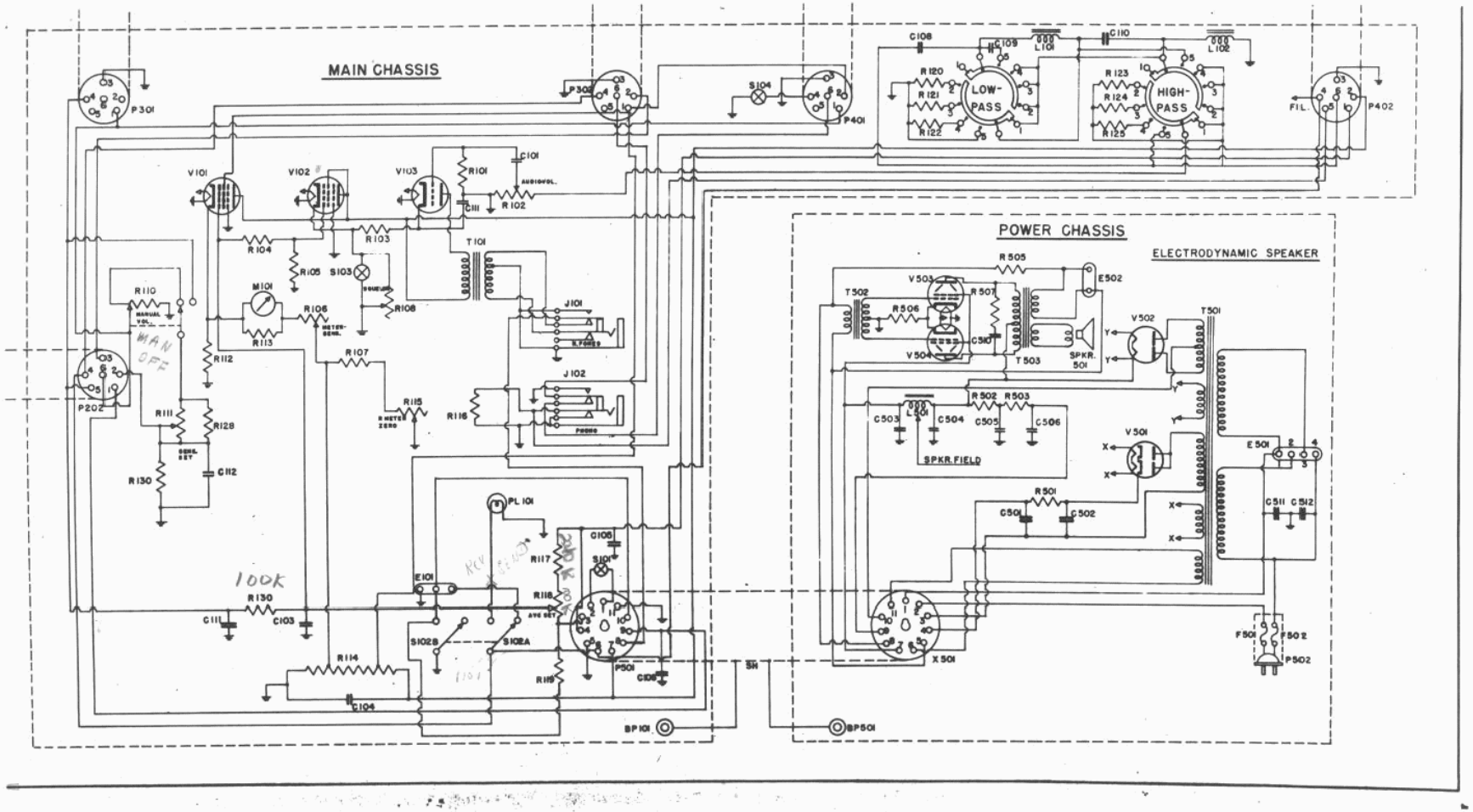
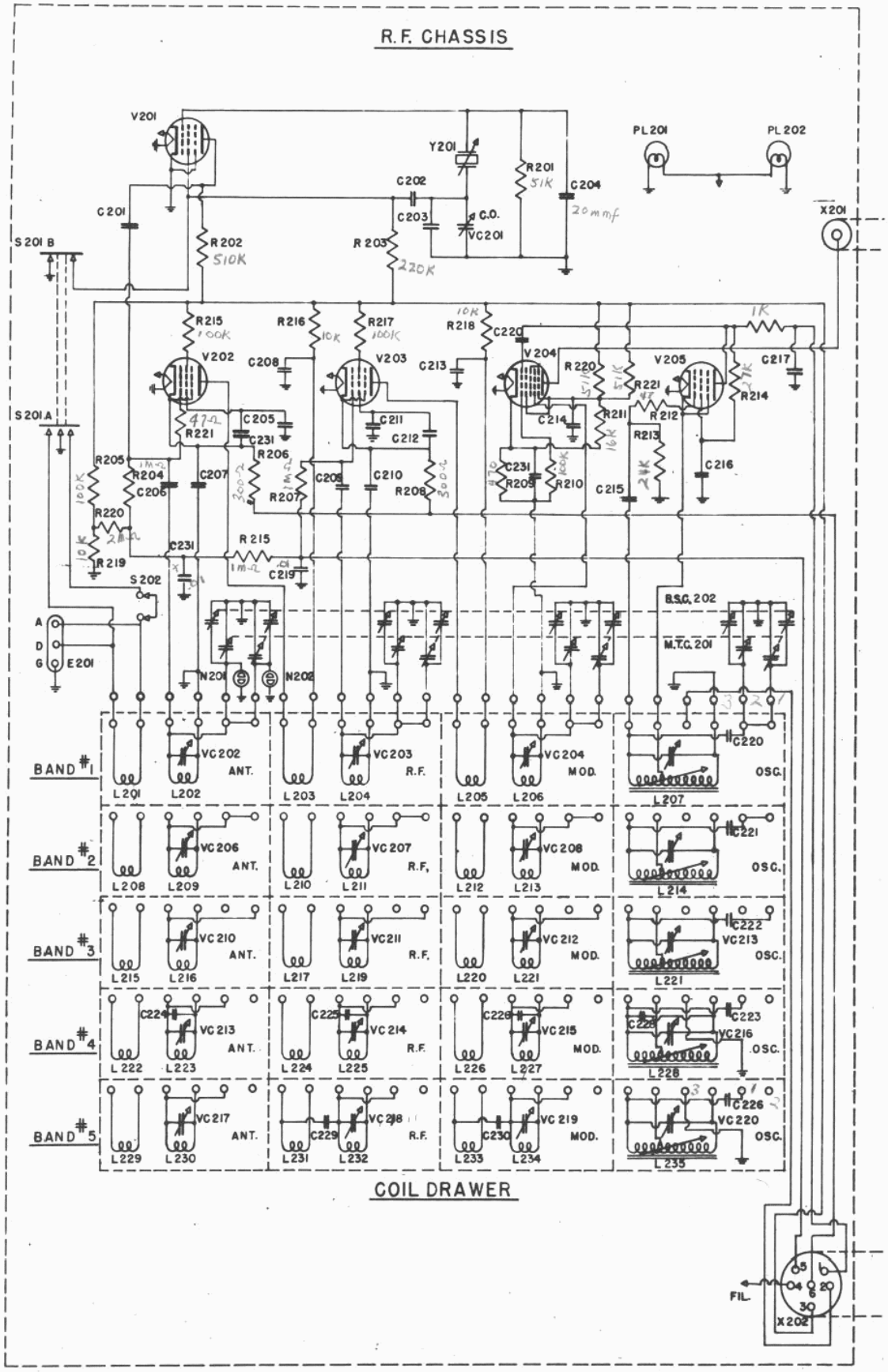
V403
P201
X301
X302
X401
X402
S301
S401
S402
OFF
CW
PHONE
FIL.


MAIN CHASSIS
POWER CHASSIS
ELECTRODYNAMIC SPEAKER
LOW-PASS
HIGH-PASS
SPKR. FIELD
SPKR. 501
MAN OFF
100K
R 119 -- 240K


R.F. CHASSIS
V201
Y201
PL201
PL202
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C.O.
VC201
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R201
51K
R202
510K
R203
220K
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S201 A
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100K
R216
10K
R217
100K
R218
10K
C220
1K
V202
V203
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B.S.C. 202
M.T.C. 201
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E201
N201
N202
BAND #1
BAND #2
BAND #3
BAND #4
BAND #5
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R.F.
MOD.
OSC.
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VC216
VC217
VC218
VC219
VC220
C220
C221
C222
C223
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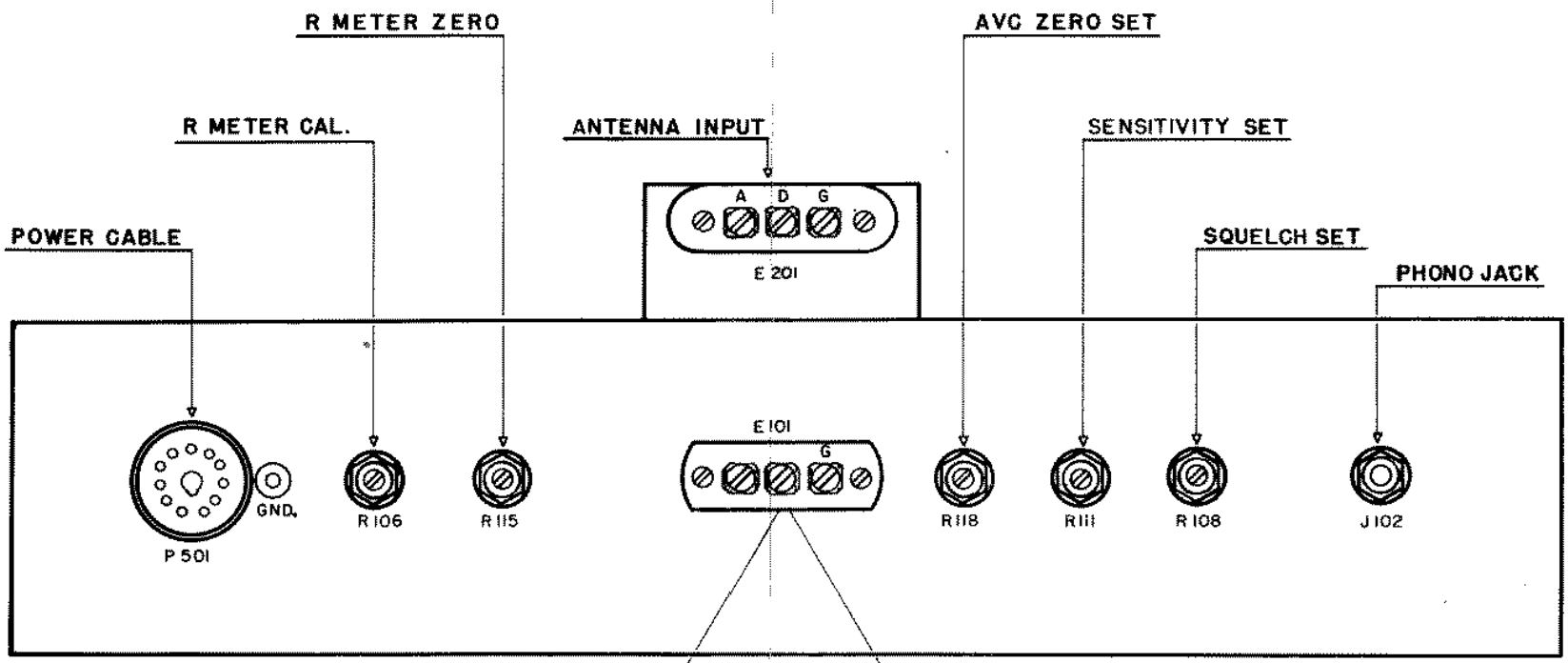
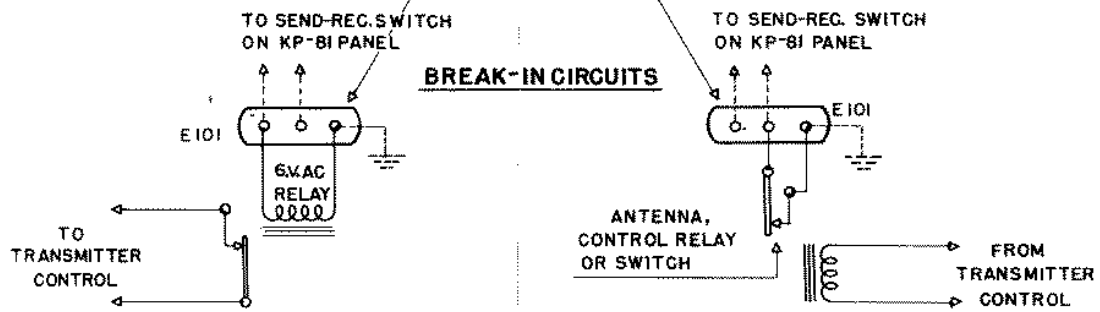
C225
C226
C227
C228
C229
C230
COIL DRAWER
FIL.
X202

BACK PANEL OF MODEL KP-81



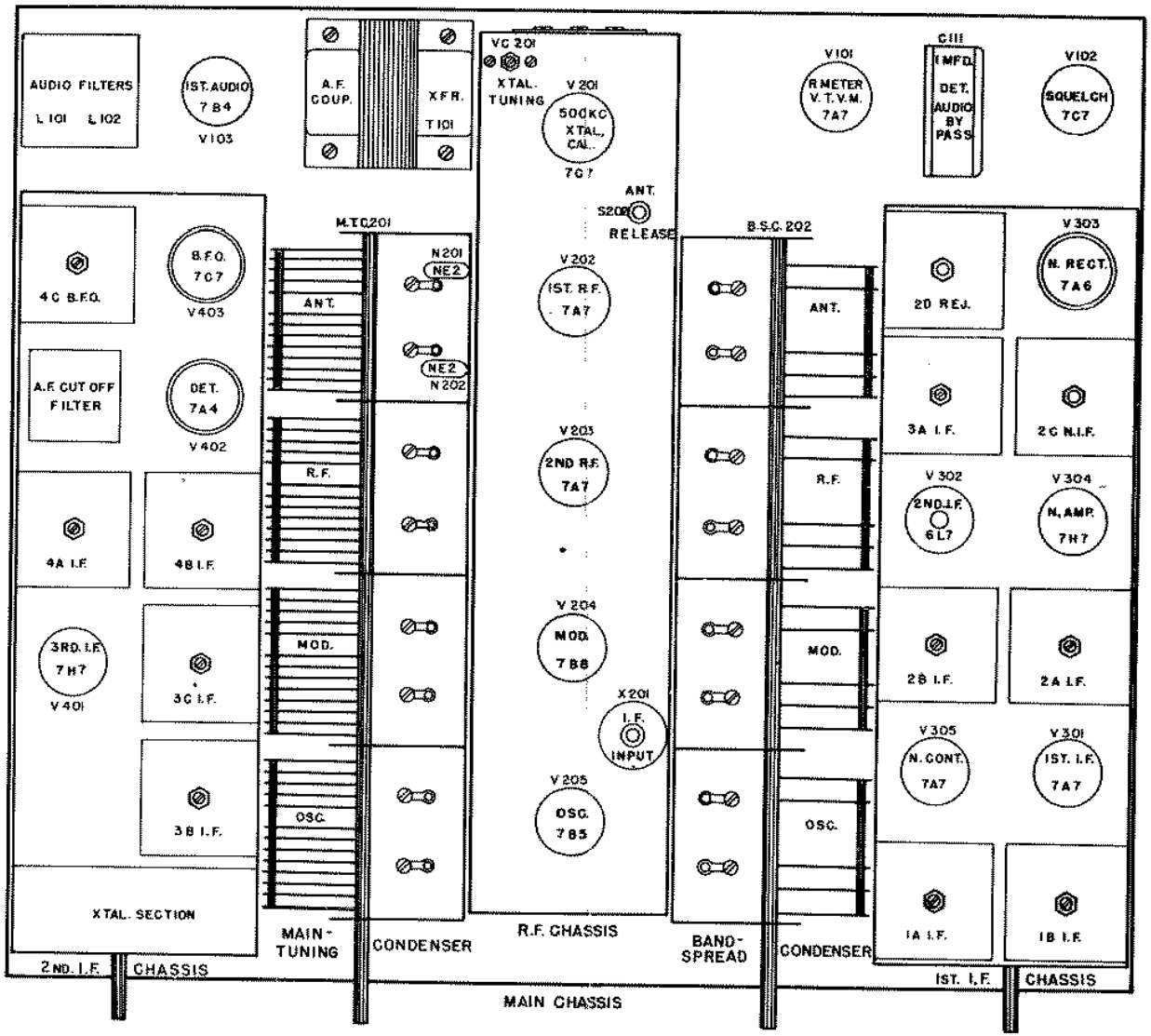


FOR OPERATING EXTERNAL TRANSMITTER RELAY

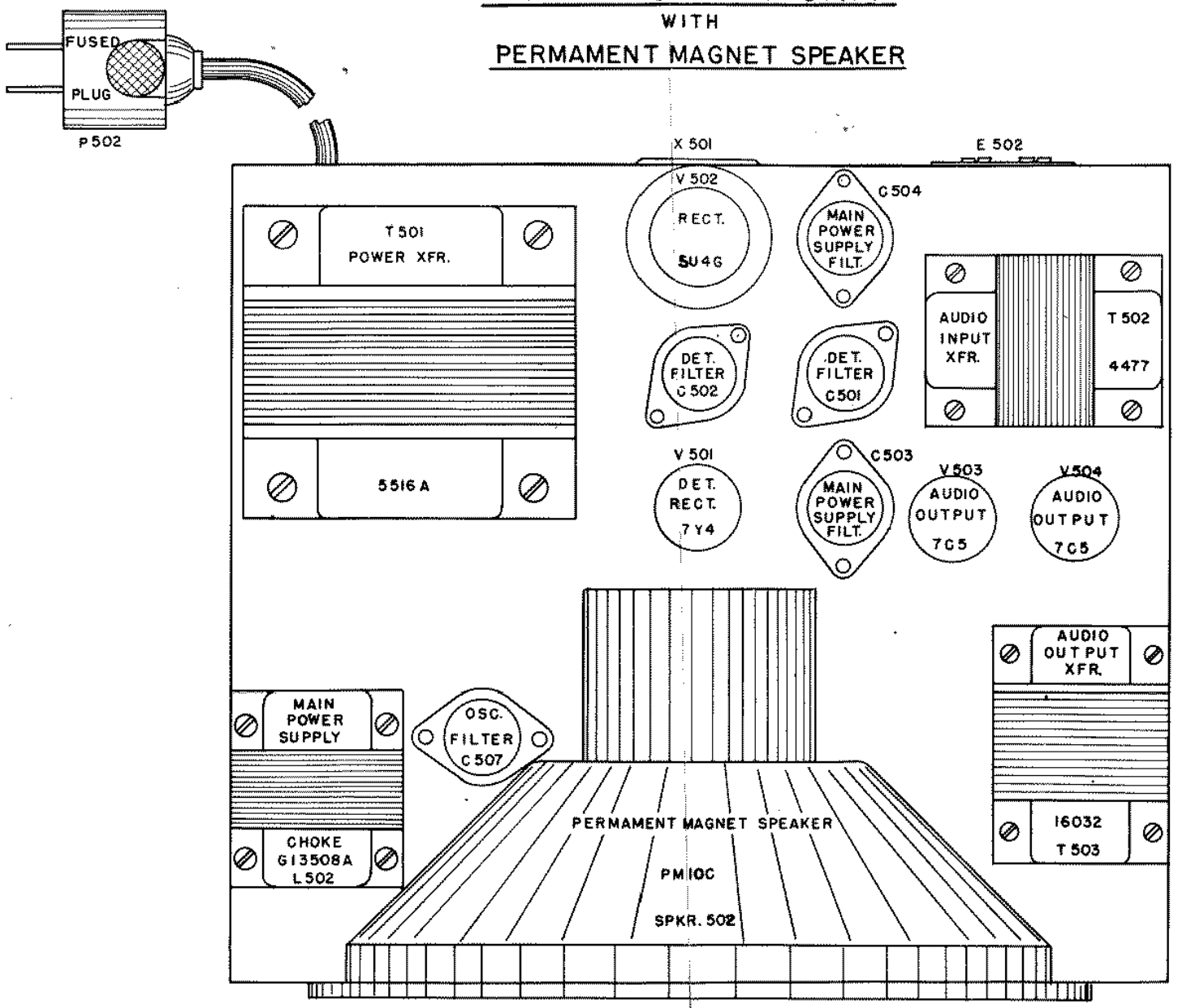
FOR OPERATING REC. STAND BY FROM TRANSMITTER CONTROL

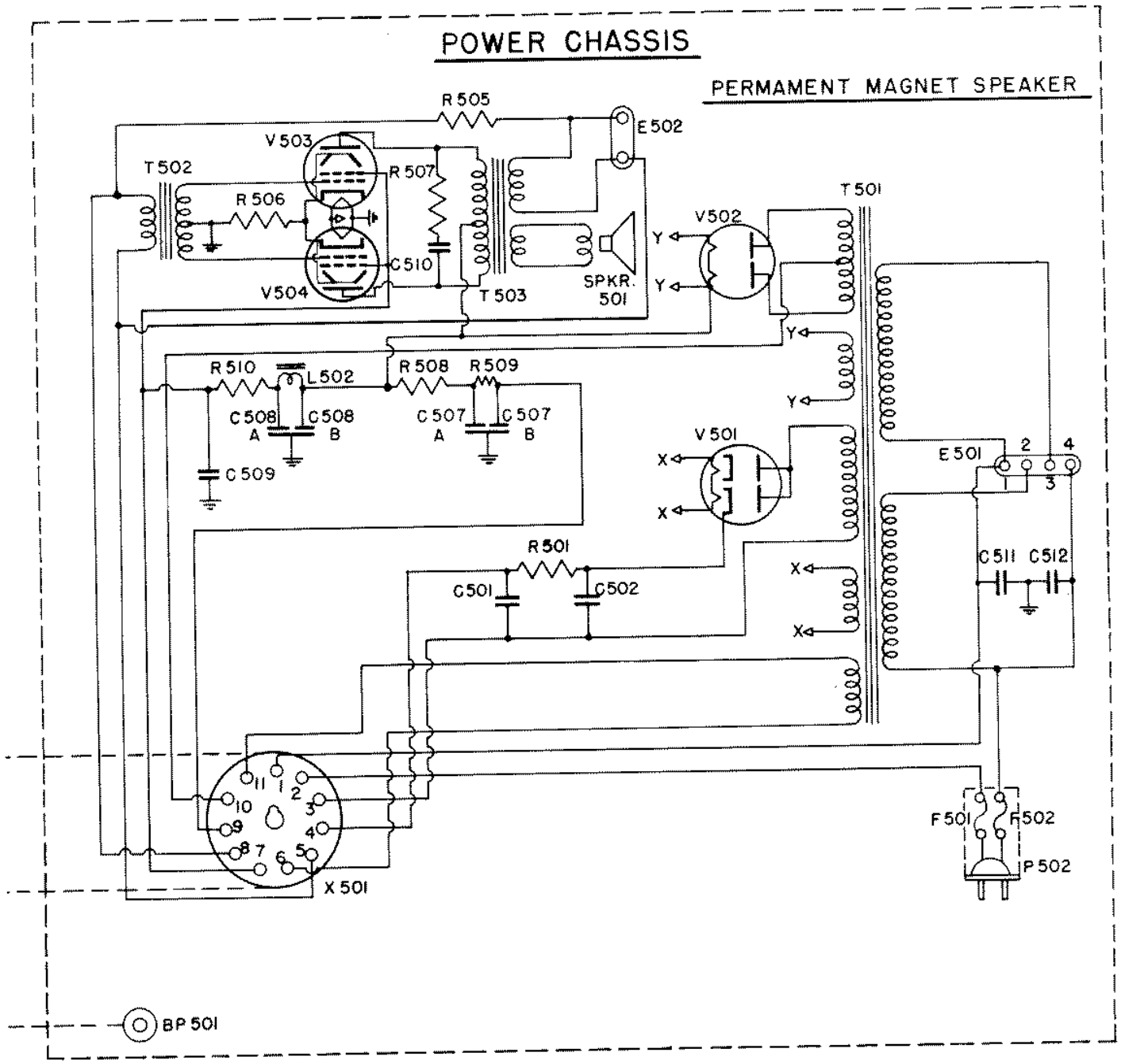
MAIN TUNING-UNIT OF MODEL KP-81

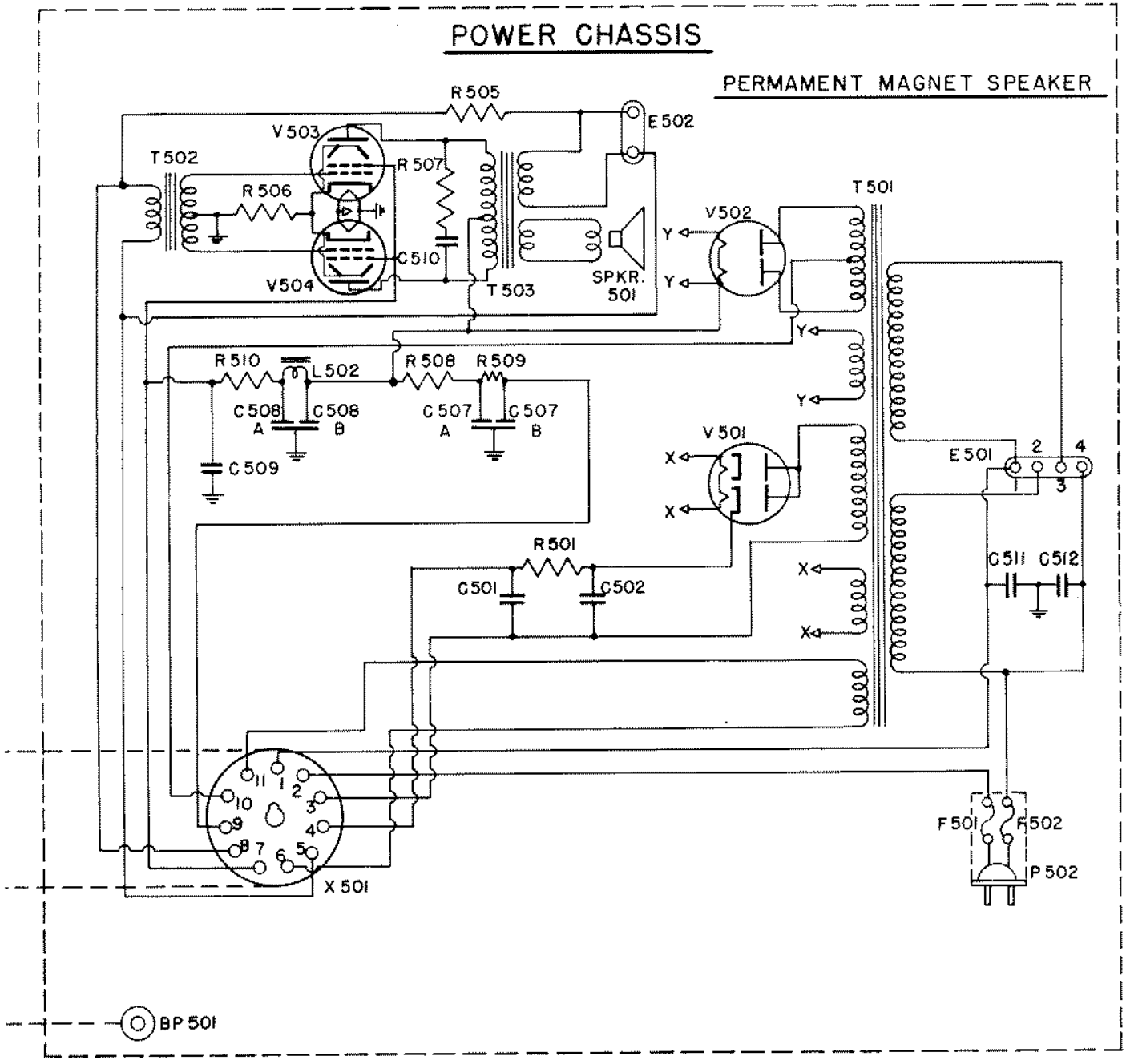
TOP VIEW



POWER SUPPLY-UNIT
WITH
PERMAMENT MAGNET SPEAKER




POWER CHASSIS
PERMAMENT MAGNET SPEAKER
R 505
E 502
V 503
T 502
R 507
R 506
C 510
V 504
T 503
SPKR. 501
T 501
V 502
Y
Y
Y
Y
R 510
L 502
R 508
R 509
C 508 A
C 508 B
C 507 A
C 507 B
C 509
V 501
X
X
E 501
2
4
3
R 501
C 501
C 502
X
X
C 511
C 512
11
1
2
10
3
9
4
8
7
6
5
X 501
F 501
R 502
P 502
BP 501


POWER CHASSIS
PERMAMENT MAGNET SPEAKER
R505
E502
V503
T502
R507
R506
V504
C510
T503
SPKR. 501
V502
T501
Y
Y
Y
Y
R510
L502
R508
R509
C508 A
C508 B
C507 A
C507 B
C509
V501
X
X
X
X
E501
2
4
1
3
R501
C501
C502
C511
C512
11
1
2
10
3
9
4
8
7
6
5
X501
F501
F502
P502
BP501

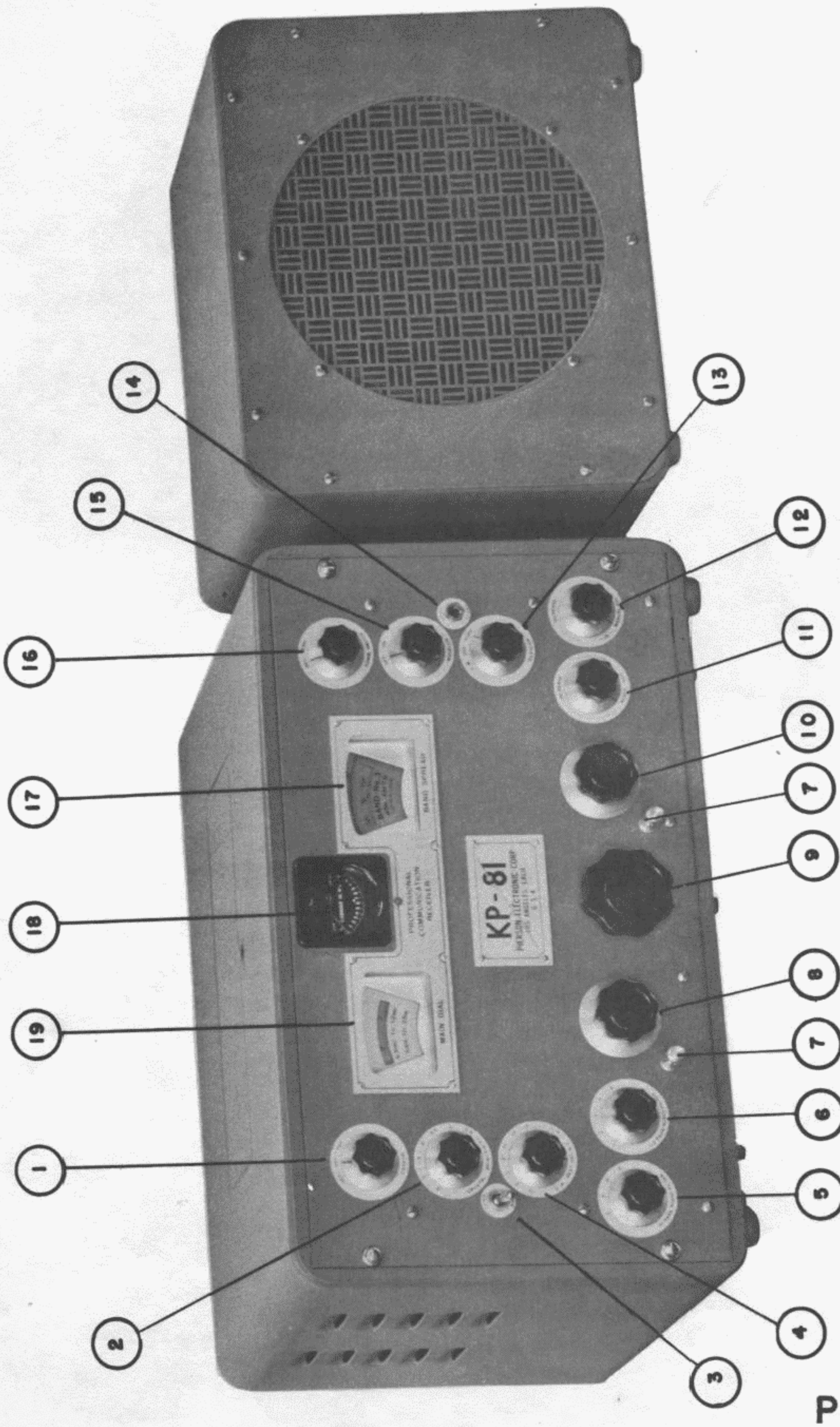

KP-81
PIERSON ELECTRONIC CORP.
PROFESSIONAL COMMUNICATION RECEIVER
MAIN DIAL
BAND SPREAD
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

PLATE I

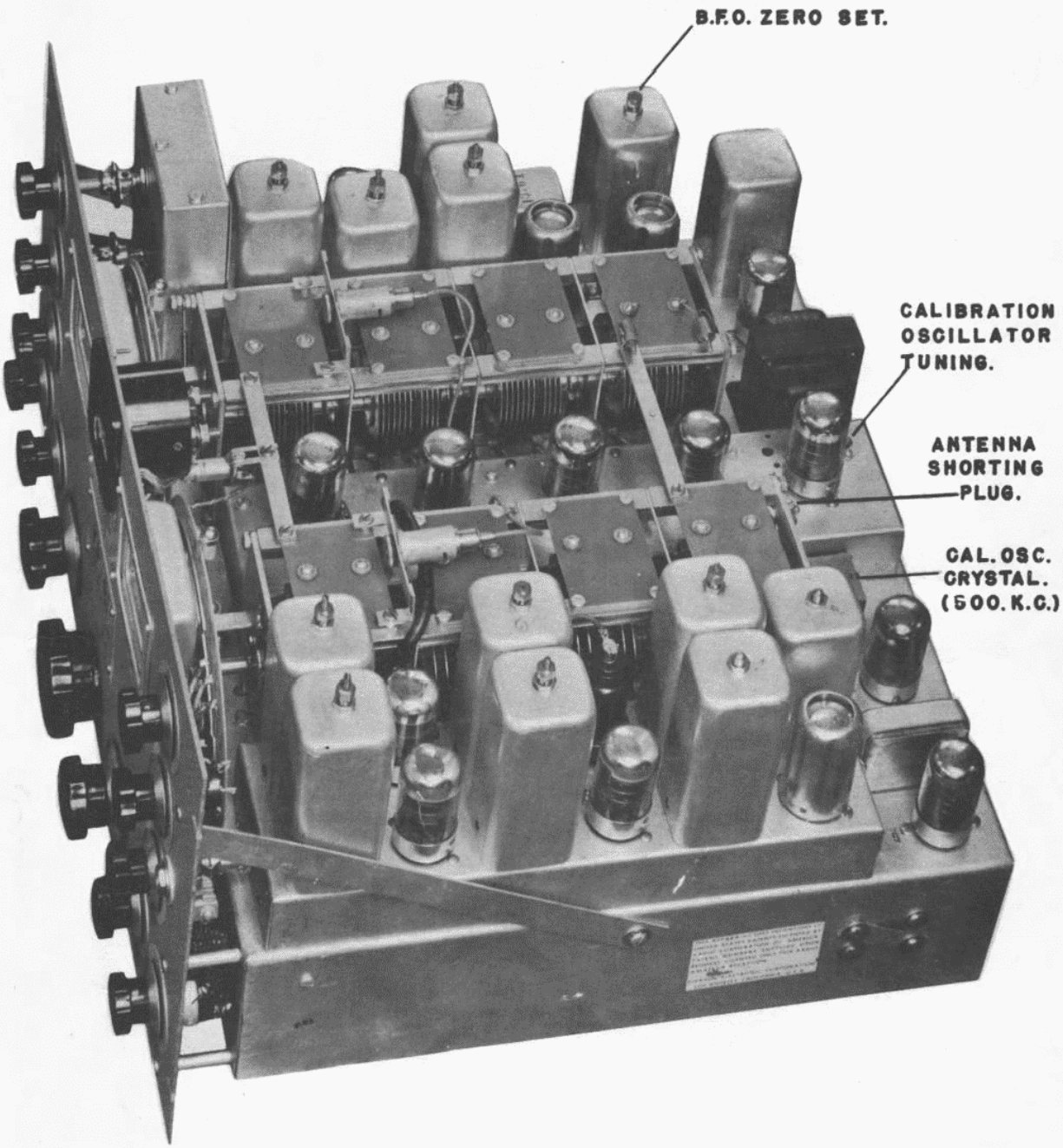

B.F.O. ZERO SET.
CALIBRATION OSCILLATOR TUNING.
ANTENNA SHORTING PLUG.
CAL. OSC. CRYSTAL. (500. K.C.)

PLATE 2

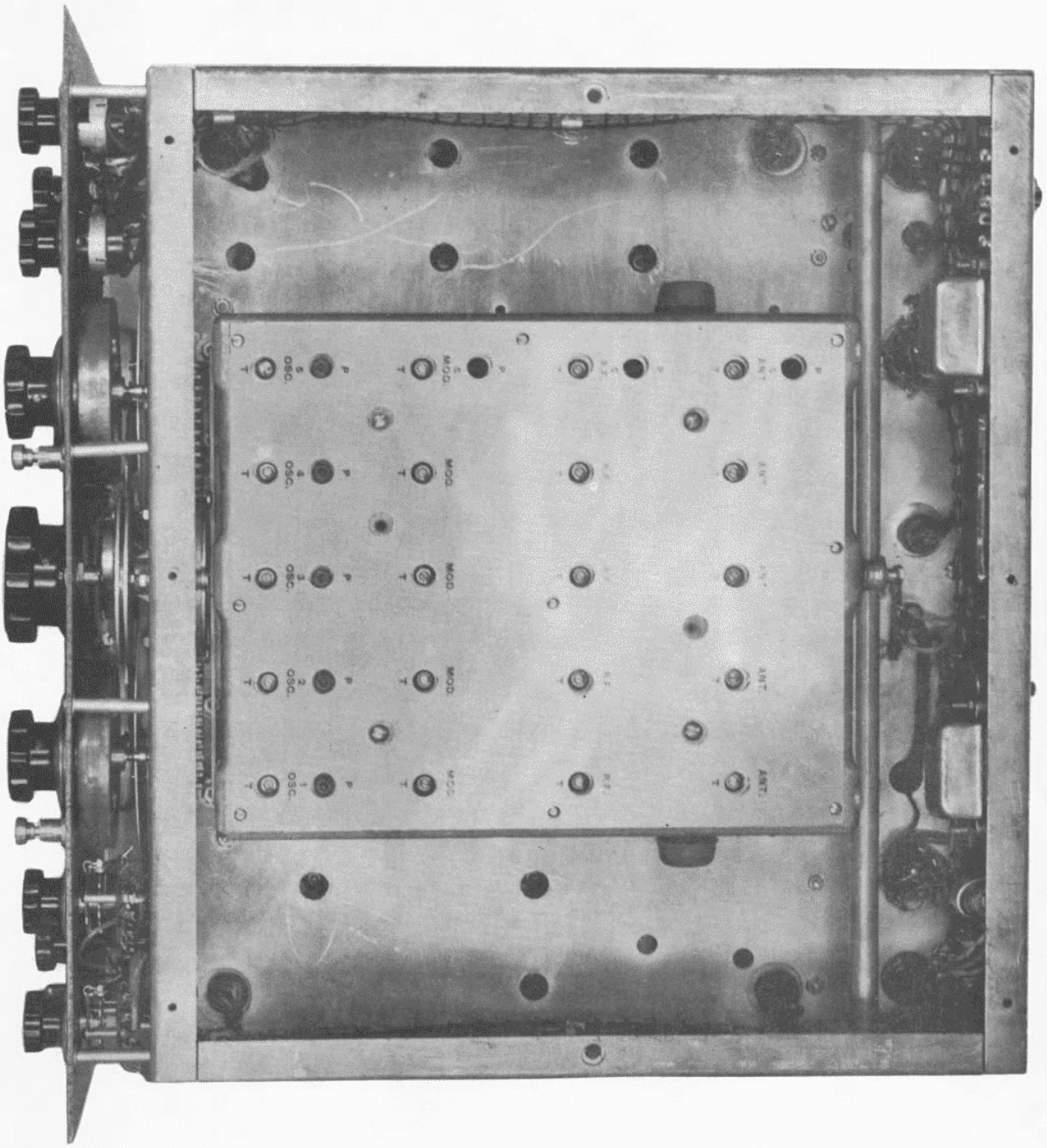


PLATE 3

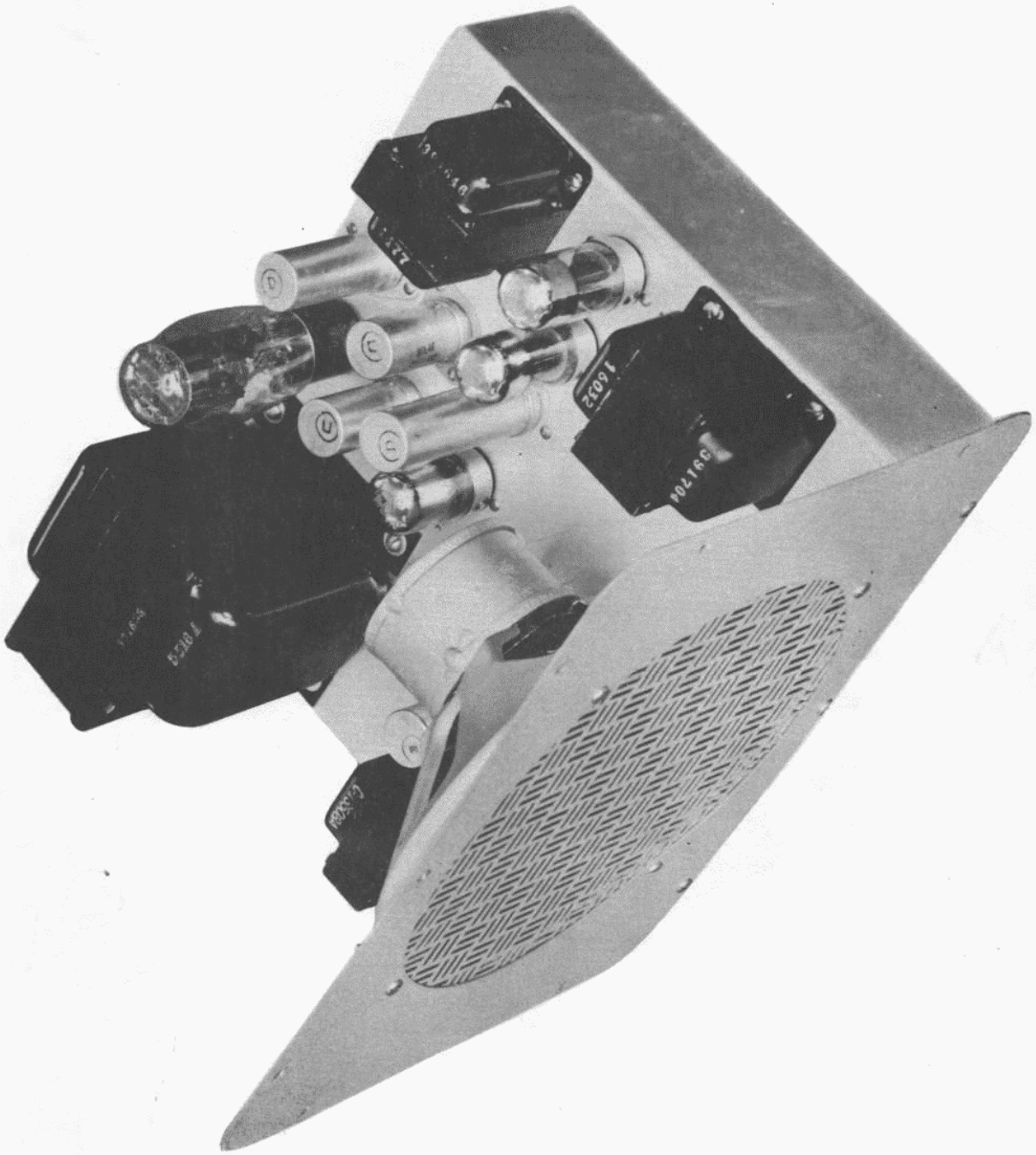


PLATE 4

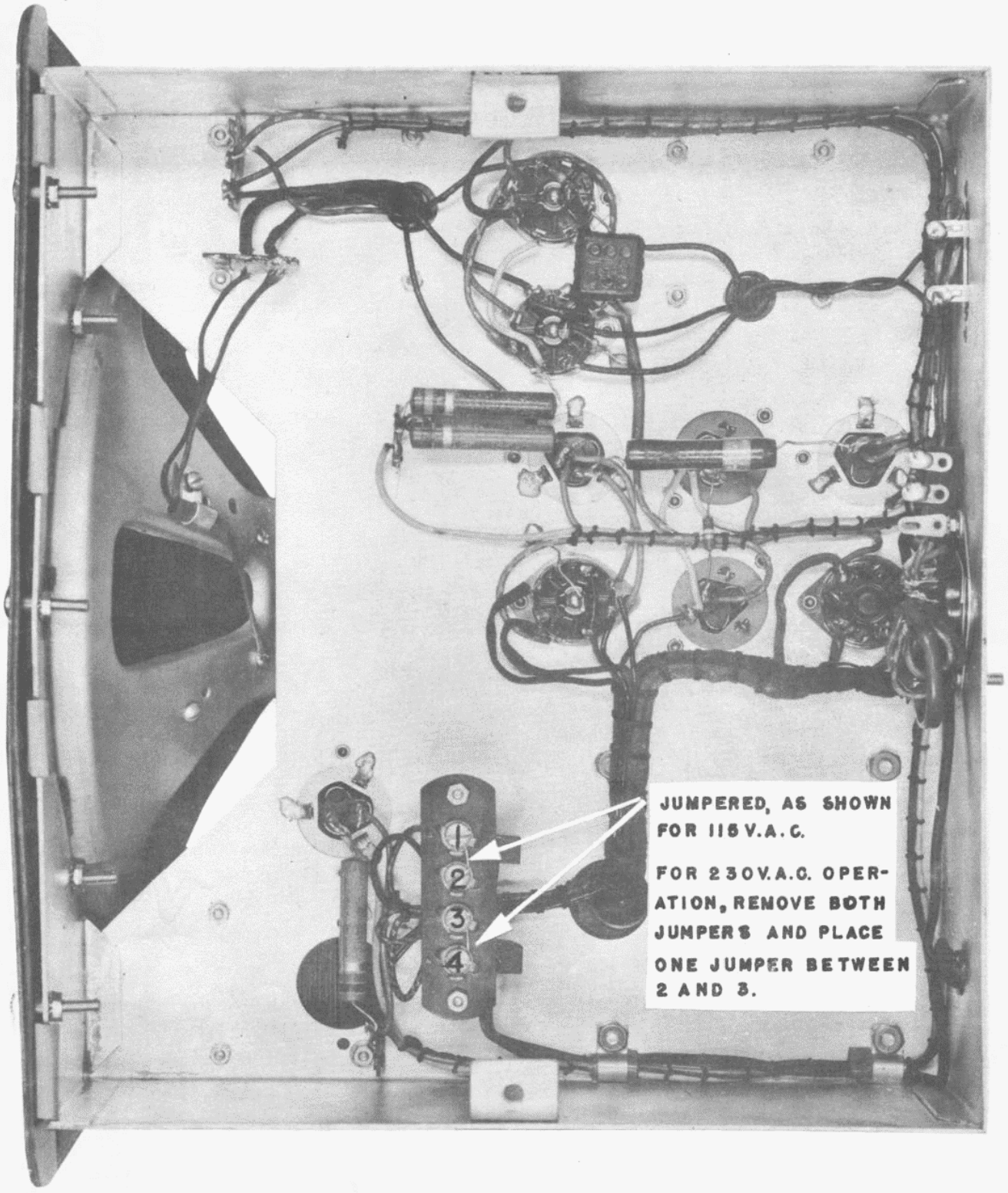
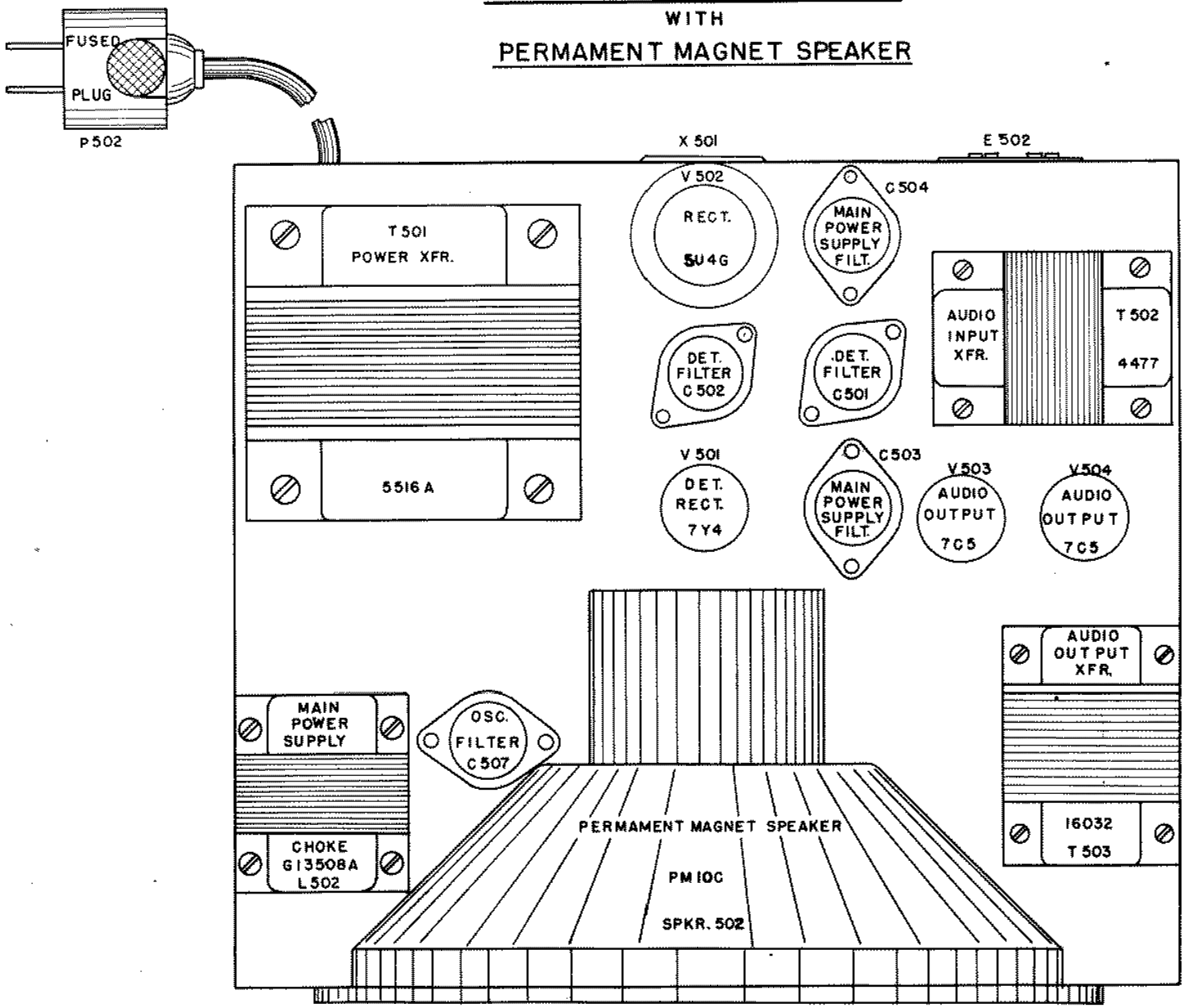
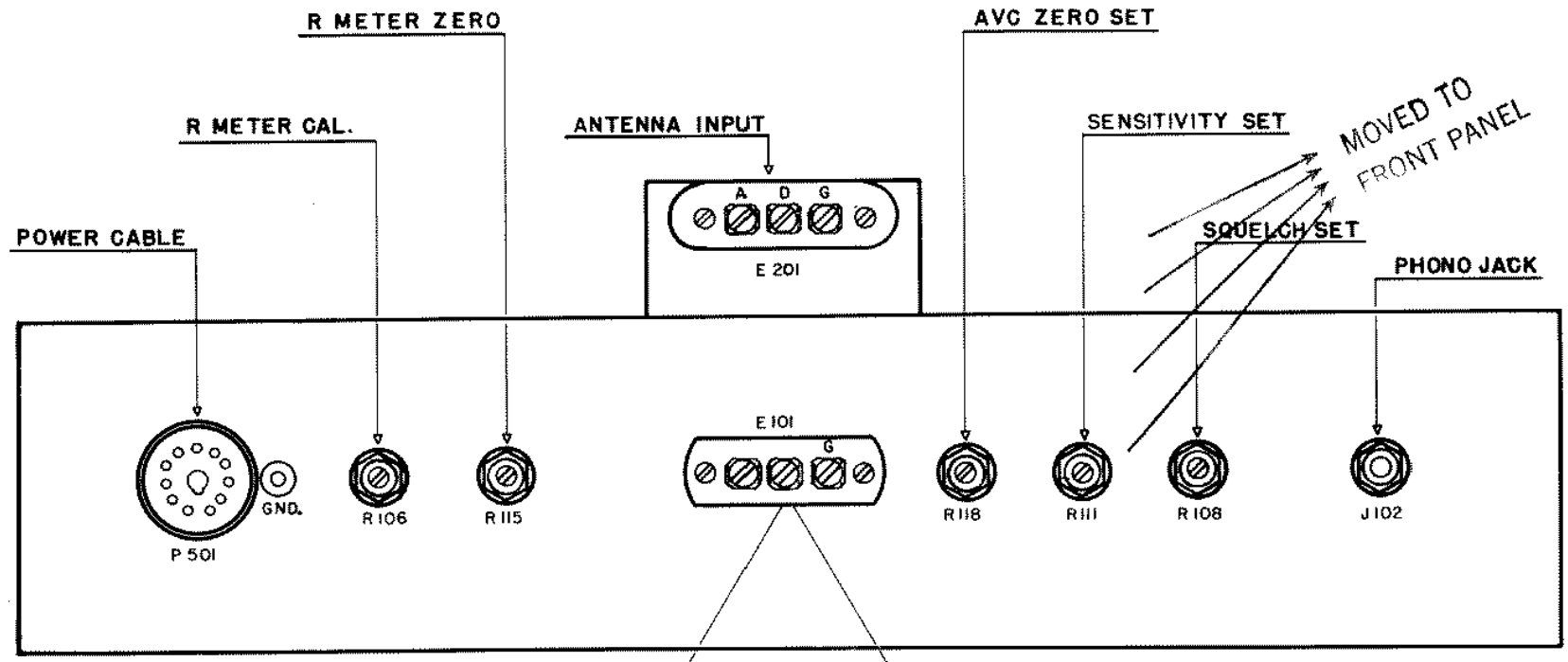

1
2
3
4
JUMPERED, AS SHOWN FOR 115 V.A.C.
FOR 230V.A.C. OPERATION, REMOVE BOTH JUMPERS AND PLACE ONE JUMPER BETWEEN 2 AND 3.

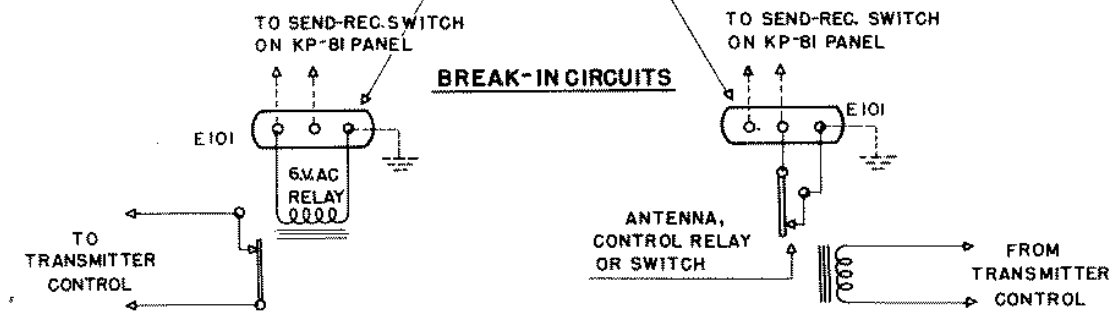
PLATE 5

POWER SUPPLY-UNIT
WITH
PERMAMENT MAGNET SPEAKER



BACK PANEL OF MODEL KP-81





FOR OPERATING EXTERNAL TRANSMITTER RELAY

FOR OPERATING REC. STAND BY FROM TRANSMITTER CONTROL