NAVSHIPS 91642(A)

SCANNED

INSTRUCTION BOOK

for

RADIO RECEIVING SET AN/URR-21A

AIR ASSOCIATES, INCORPORATED
ELECTRONICS DIVISION
ORANGE, NEW JERSEY

BUREAU OF SHIPS NAVY DEPARTMENT

Approved by BuShips: 15 May 1952

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
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DEPARTMENT OF THE NAVY
BUREAU OF SHIPS
WASHINGTON 25, D. C.

IN REPLY REFER TO
Code 993-100
15 May 1952

From: Chief, Bureau of Ships
To: All Activities Concerned with the Installation, Operation and Maintenance of the Subject Equipment

Subj: Instruction Book for Radio Receiving Set AN/URR-21A NAVSHIPS 91642(A)

1. This is the instruction book for the subject equipment and is in effect upon receipt, superseding NAVSHIPS 91642.

2. When superseded by a later edition, this publication shall be destroyed.

3. Extracts from this publication may be made to facilitate the preparation of other Department of Defense Publications.

4. All Navy requests for NAVSHIPS Electronics publications should be directed to the nearest District Publications and Printing Office. When changes or revised books are distributed, notice will be included in the Bureau of Ships JOURNAL and in the Index of Bureau of Ships General and Electronics Publications, NAVSHIPS 250-020.

H. N. WALLIN
Chief of Bureau

RECORD OF CORRECTIONS MADE

CHANGE NO.	DATE	SIGNATURE OF OFFICER MAKING CORRECTION

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GUARANTEE

The equipment, including all parts and spare parts, except vacuum tubes, batteries, rubber and material normally consumed in operation, is guaranteed for a period of one year from the date of delivery of the equipment to and acceptance by the Government with the understanding that all such items found to be defective as to material, workmanship or manufacture will be repaired or replaced, f.o.b. any point within the continental limits of the United States designated by the Government, without delay and at no expense to the Government; provided that such guarantee will not obligate the Contractor to make repair or replacement of any such defective items unless the defect appears within the aforementioned period and the Contractor is notified thereof in writing within a reasonable time and the defect is not the result of normal expected shelf life deterioration.

To the extent the equipment, including all parts and spare parts, as defined above, is of the Contractor's design or is of a design selected by the Contractor, it is also guaranteed, subject to the foregoing conditions, against defects in design with the understanding that if ten percent (10%) or more of any such said item, but not less than two of any such item, of the total quantity comprising such item furnished under the contract, are found to be defective as to design, such item will be conclusively presumed to be of defective design and subject to one hundred percent (100%) correction or replacement by a suitable redesigned item.

All such defective items will be subject to ultimate return to the Contractor. In view of the fact that normal activities of the Naval Service may result in the use of equipment in such remote portions of the world or under such conditions as to preclude the return of the defective items for repair or replacement without jeopardizing the integrity of Naval communications, the exigencies of the Service, therefore, may necessitate expeditious repair of such items in order to prevent extended interruption of communications. In such cases the return of the defective items for examination by the Contractor prior to repair or replacement will not be mandatory. The report of a responsible authority, including details of the conditions surrounding the failure, will be acceptable as a basis for effecting expeditious adjustment under the provisions of this contractual guarantee.

The above one year period will not include any portion of time the equipment fails to perform satisfactorily due to any defects, and any items repaired or replaced by the Contractor will be guaranteed anew under this provision.

INSTALLATION RECORD

Contract Number NObsr-52171 Date of Contract 5 January, 1951

Serial Number of Equipment.....

Date of acceptance by the Navy.....

Date of delivery to contract destination.....

Date of completion of installation.....

Date placed in service.....

Blank spaces on this page shall be filled in at time of installation. Operating personnel shall also mark the "date placed in service" on the date of acceptance plate located below the model nameplate on the equipment, using suitable methods and care to avoid damaging the equipment.

REPORT OF FAILURE

Report of failure of any part of this equipment, during its entire service life, shall be made to the Bureau of Ships in accordance with current regulations using form NAVSHIPS NBS 383 (revised) except for Marine Corps equipment, in which case the "Signal Equipment Failure Report" form shall be used and distributed in accordance with instructions pertaining thereto. The report shall cover all details of the failure and give the date of installation of the equipment. For procedure in reporting failures see Chapter 67 of the *Bureau of Ships Manual* or superseding instructions.

ORDERING PARTS

All requests or requisitions for replacement material should include the following data:

1. Federal stock number or, when ordering from a Marine or Signal Corps supply depot, the Signal Corps stock number.
2. Name and short description of part.

If the appropriate stock number is not available the following shall be specified:

1. Equipment model or type designation, circuit symbol and item number.
2. Name of part and complete description.
3. Manufacturer's designation.
4. Contractor's drawing and part number.
5. JAN or Navy type number.

DESTRUCTION OF ABANDONED MATERIAL IN THE COMBAT ZONE

In case it should become necessary to prevent the capture of this equipment, and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED, OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

Means:

1. Explosives, when provided.
2. Hammers, axes, sledges, machetes, or whatever heavy object is readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper or wood.
4. Grenades and shots from available firearms.
5. Burying all debris, where possible and when time permits.
6. Throwing overboard or disposing of in streams or other bodies of water.

Procedure:

1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
2. Demolish all panels, castings, switch and instrument boards.
3. Destroy all controls, switches, relays, connections and meters.
4. Rip out all wiring and cut interconnections of electrical equipment. Smash gas, oil, and water cooling systems in gas engine generators, etc.
5. Smash every electrical or mechanical part, whether rotating, moving or fixed.
6. Break up all operating instruments such as keys, phones, microphones, etc.
7. Destroy all classes of carrying cases, straps, containers, etc.
8. Bury or scatter all debris.

DESTROY EVERYTHING!

SAFETY NOTICE

The attention of officers and operating personnel is directed to Chapter 67 of the *Bureau of Ships Manual* or superseding instructions on the subject of radio-safety precautions to be observed.

This equipment employs voltages which are dangerous and may be fatal if contacted by operating personnel. Extreme caution should be exercised when working with the equipment.

While every practicable safety precaution has been incorporated in this equipment, the following rules must be strictly observed.

KEEP AWAY FROM LIVE CIRCUITS:

Operating personnel must at all times observe all safety regulations. Do not change tubes or make adjustments inside equipment with high voltage supply on. Under certain conditions dangerous potentials may exist in circuits with power controls in the off position due to charges retained by capacitors. To avoid casualties always remove power and discharge and ground circuits prior to touching them.

DON'T SERVICE OR ADJUST ALONE:

Under no circumstances should any person reach within or enter the enclosure for the purpose of servicing or adjusting the equipment without the immediate presence or assistance of another person capable of rendering aid.

DON'T TAMPER WITH INTERLOCKS:

Do not depend upon door switches or interlocks for protection but always shut down motor generators or other power equipment. Under no circumstances should any access gate, door, or safety interlock switch be removed, short-circuited or tampered with in any way, by other than authorized maintenance personnel, nor should reliance be placed upon the interlock switches for removing voltages from the equipment.

RESUSCITATION

AN APPROVED POSTER ILLUSTRATING THE RULES FOR RESUSCITATION BY THE PRONE PRESSURE METHOD SHALL BE PROMINENTLY DISPLAYED IN EACH RADIO, RADAR, OR SONAR ENCLOSURE. POSTERS MAY BE OBTAINED UPON REQUEST TO THE BUREAU OF MEDICINE AND SURGERY.

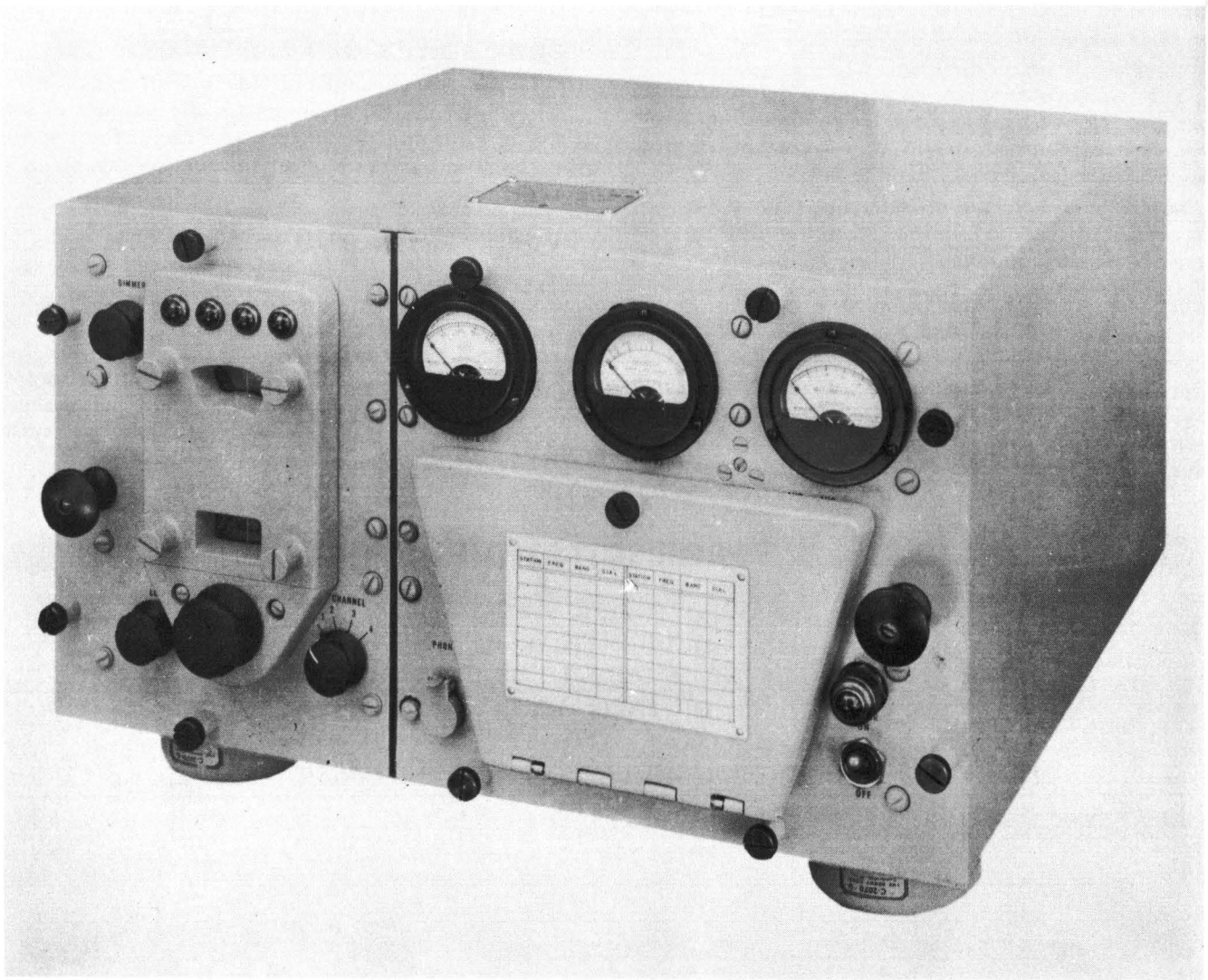


Figure 1-1. Radio Receiving Set AN/URR-21A

SECTION 1

GENERAL DESCRIPTION

1. GENERAL.

This instruction book covers the installation, operation and maintenance of the Model AN/URR-21A Radio Receiving Set. It should be read and studied with great care before installation or operation of the set is attempted in order that optimum performance may be obtained.

2. PURPOSE AND BASIC PRINCIPLES.

a. The Model AN/URR-21A Radio Receiving Set is primarily intended for use aboard naval aircraft carriers and naval shore stations for the purpose of providing reception of type A^3 (amplitude-modulated telephone) signals from facilities transmitting in the range 115 to 156 megacycles.

b. The set operates on the superheterodyne principle, utilizing four quickly selectable pre-set crystal channels in conjunction with an RF amplifier to produce a 12 megacycle intermediate frequency which is amplified and detected in the conventional manner. Special features in addition to crystal-controlled operation include a front panel dial detent mechanism for rapid selection of channels, high stability, freedom from cross-modulation, continuous tuning of all RF circuits by means of a single dial mechanism, and extremely low oscillator radiation. This last feature precludes detection of craft carrying the Radio Receiving Set by enemy direction-finding equipment.

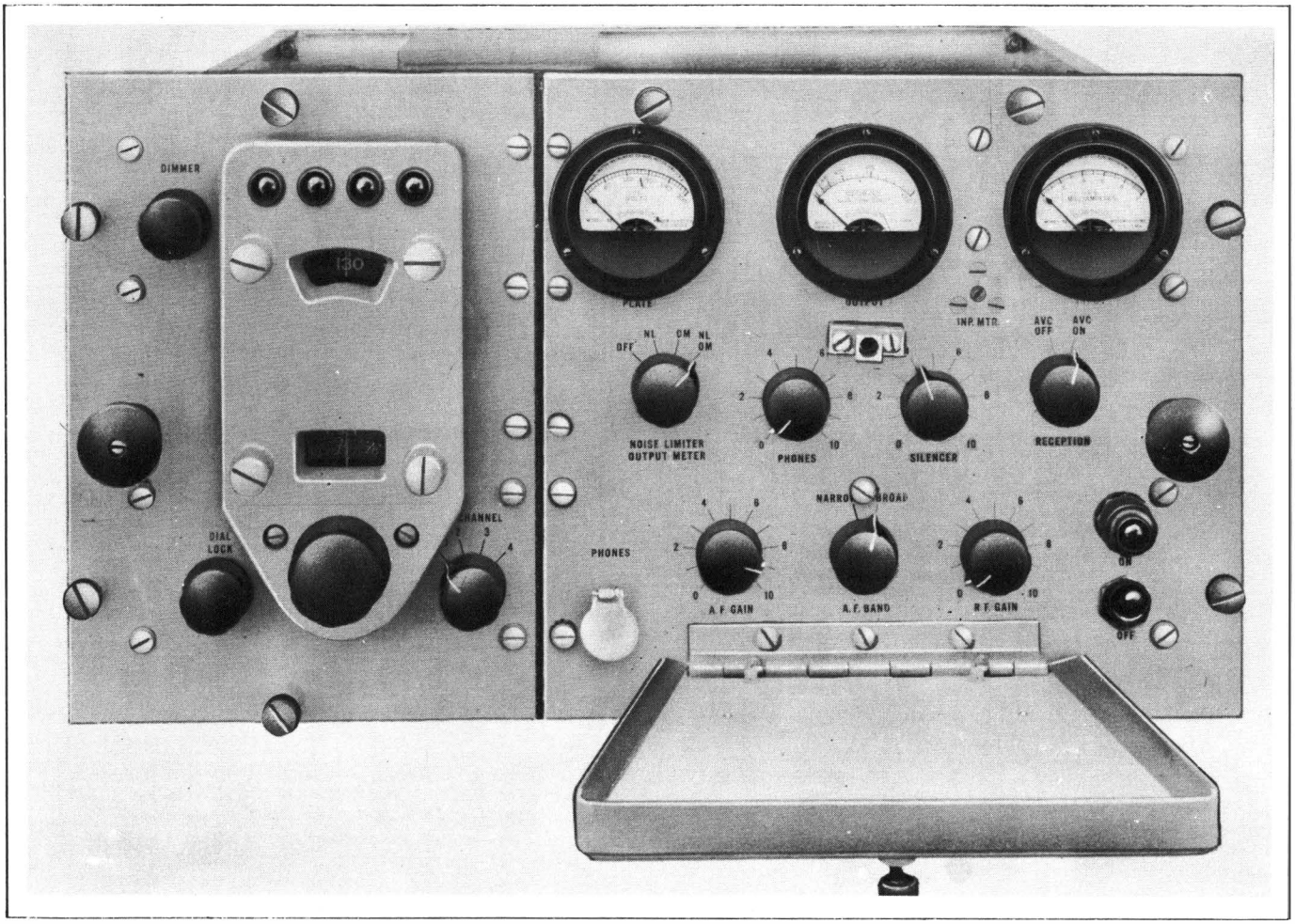


Figure 1-2. Radio Receiver R-432A/URR-21, Knob Cover Down

3. DESCRIPTION OF UNITS.

The main component of the Model AN/URR-21A Radio Receiving Set is Radio Receiver R-432A/URR-21. It is an 18 tube crystal-controlled superheterodyne covering the single frequency band of 115 to 156 megacycles. A dial detent and switch mechanism on the front panel permits setting it to any one of four positions corresponding to the four crystal-controlled channels. The detent mechanism is continuously adjustable so that any four channels within the tuning range may be used. The receiver also employs noise limiting and squelch circuits.

The receiver employs the cabinet type construction, with the cabinet suitably shock-mounted and designed for top of table or bench mounting. Three unitary chassis bolt together and slide into the cabinet as a single unit. Each of these units, in functional order, will be described below.

a. PRESELECTOR UNIT.—The Preselector Unit consists of one of the three chassis and a portion of the front panel of the receiving set. The Preselector Unit is fastened to the IF/AF Unit and the Power Supply Unit to form the complete receiving set. In this arrange-

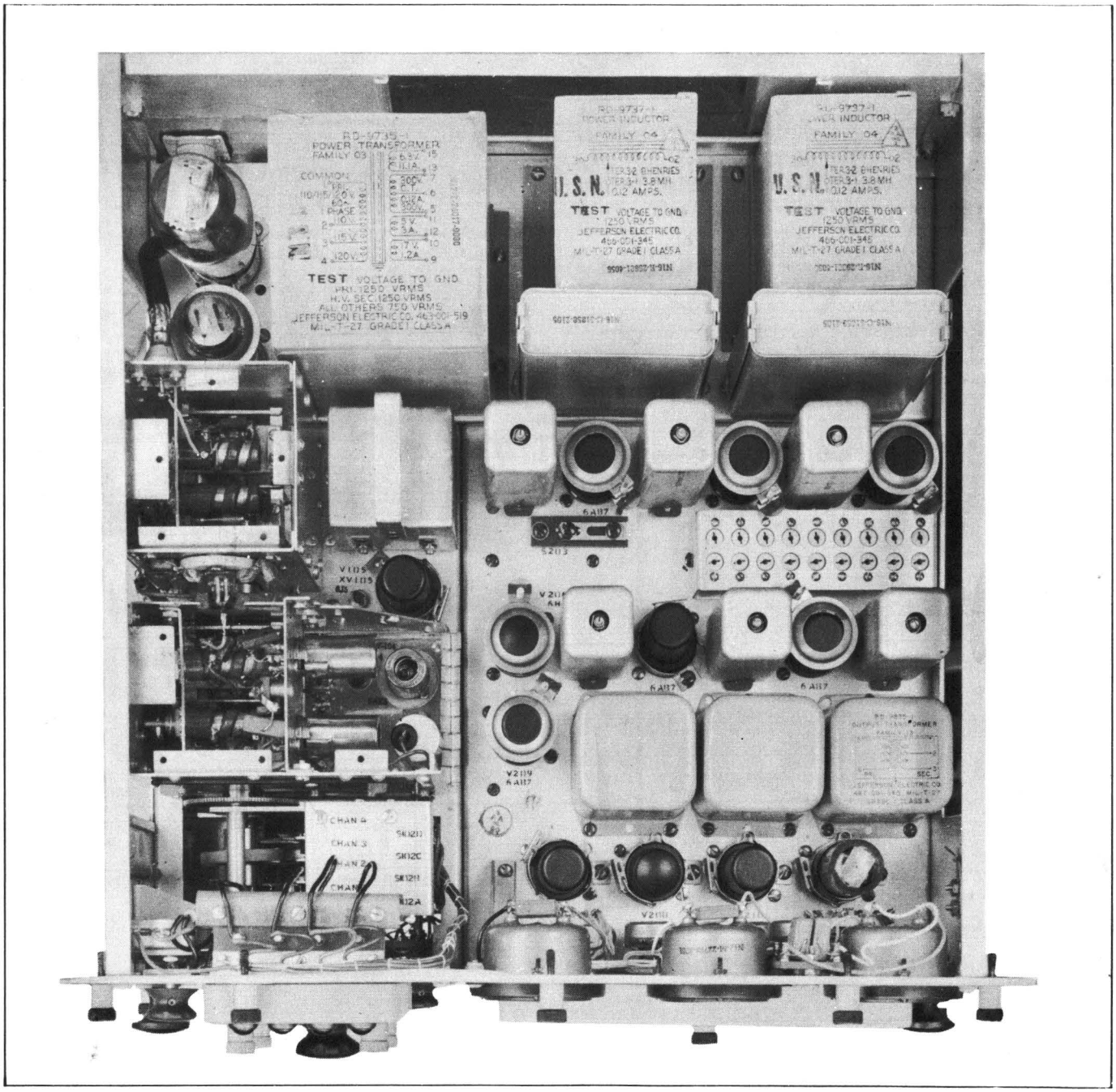


Figure 1-3. Radio Receiver R-432A/URR-21, Top View

ment the Preselector Unit is located to the left of the IF/AF Unit and in front of the Power Supply Unit.

The dial detent mechanism which is used to drive the tuning elements of the Preselector Unit is mounted in a recess in the preselector chassis directly behind the front panel.

The preselector chassis contains all of the RF circuit elements from the antenna through the primary of the first IF transformer. The circuits contained in the Preselector Unit are an antenna input stage, one RF amplifier, one crystal oscillator, two frequency tripler stages, a mixer and the primary of the first IF transformer.

The Preselector Unit has been especially designed so that the signal generated by the crystal oscillator and multiplier circuits is not radiated into the atmosphere. This is accomplished by isolating the antenna circuits from the first detector (or mixer) circuits and the high-frequency oscillator and multiplier circuits through the use of extensive shielding, filtering and the employment of a type of construction which reduces to practical limits undesirable circuit coupling by virtue of circulating currents in common shields. In order to isolate the VHF circuits, floating-rotor, split-stator type variable capacitors are used throughout the design.

A separate shielded compartment, designed as a complete subassembly and detachable as such from the chassis, contains all of the circuit elements between the antenna input and the signal grid of the RF amplifier tube. The RF tube itself is mounted in a socket attached to the outside of this compartment and, except for the grid pin, is completely supplied by external leads. The grid is supplied from within the compartment. The sub-assembly is mounted at the rear left-hand side of the Preselector Unit and located entirely above the chassis. By disconnecting a small number of leads and unfastening the screws in the variable capacitor couplings and in the base of the compartment, it is possible to remove the unit by sliding it slightly toward the rear of the chassis.

A second shielded compartment, also designed as a complete sub-assembly, but larger in over-all dimensions, contains all of the circuit elements from the plate terminal of the RF amplifier tube to the plate lead of the mixer tube. The first frequency multiplier tube and the second frequency multiplier tube with the associated circuit elements are included in this compartment which is mounted on the preselector chassis between the antenna compartment and the dial detent mechanism.

Access to electron tubes in these two compartments is provided by removing the thumb screws which hold their metal cover plates in place. Small sliding plates on the sides of the two compartments may be shifted for access to the several inductance and capacity adjustments for the VHF circuits. Additional adjustments may be made through holes in the metal plate which covers the entire bottom of the chassis.

Crystals for the four operating channels are mounted in sockets on top of the chassis in the right rear corner. They are shielded and protected by an easily removable metal cover.

The front panel is fastened to the chassis by machine screws. On it are mounted the dial mechanism and a rheostat for controlling the brilliancy of the channel indicator lamps. A terminal board for wiring these to the channel switch is also mounted on the back of the front panel.

b. IF/AF AMPLIFIER UNIT.—The chassis for this unit is arranged to provide space for the intermediate frequency amplifier, the associated detection and control circuits, and the audio frequency amplifier. The tubes, IF transformers, and audio filter units are mounted above the chassis. The controls and meters associated with these circuits are mounted on the front panel. Components such as resistors and fixed capacitors are either mounted on terminal boards below the chassis or fastened to the tube sockets. Because of the large number of intermediate frequency stages employed in this unit, it has been necessary to arrange all wiring and components for a minimum of common coupling, either through proximity of parts or through ground circuits. In order to mount most of the resistance and capacity components on terminal strips it has been necessary to resort to two large terminal boards with uninsulated leads arranged for minimum coupling and the most direct connection possible under the circumstances.

Powdered iron cores are provided in each of the IF transformers for inductance trimming and can be reached through either the top or bottom of the units, depending on the circuit to be adjusted. All sub-chassis components are protected by a removable bottom cover plate.

c. POWER SUPPLY UNIT.—The chassis for the power supply unit contains all the components necessary to furnish power to the receiver. On its top are mounted the power transformer, filter chokes, filter capacitors and rectifier and regulator tubes. Fuses, power input, antenna, output and remote control receptacles are mounted on the rear. The line filter and certain small resistors and capacitors are mounted underneath the chassis on small terminal boards.

4. REFERENCE DATA.

a. All nomenclature of equipment is listed in Table 1-1.

b. Contract number—NObsr-52171, dated 5 January 1951.

c. Contractor—Air Associates, Incorporated, Electronic Division, 511 Joyce Street, Orange, New Jersey.

d. Cognizant Naval Inspector — Bureau of Aeronautics Representative, Teterboro, N. J.

e. Number of packages involved per complete shipment, including equipment maintenance spares—2.

f. Total cubical contents, including equipment spares —Crated: Radio Set, 8.3 cu. ft.; spares, 1.42 cu. ft. Uncrated: Radio Set, 7.4 cu. ft.; spares, 1.4 cu. ft.

g. Total weight, including equipment spares—Crated: Radio Set, 140 lbs.; spares parts, 47 lbs. Uncrated: Radio Set, 117 lbs. spare parts, 18½ lbs.

h. Frequency range—115 to 156 megacycles.

i. Tuning bands—One, range as above.

j. Number of pre-set frequencies—Four.

k. Type of frequency control—Crystal.

l. Type of receiver—Superheterodyne.

m. Intermediate frequency—12 megacycles.

n. Receiver output—Approximately 65 milliwatts into a 600 ohm load ('phones and/or line).

o. Type of reception—A^3 (telephone-double sideband, full carrier).

p. Crystals—Supplied by Navy (Type FT-243).

q. Squelch circuit characteristics — Squelch operates when the signal strength is below a predetermined level. Operating level is adjustable by means of the front panel control.

r. The antenna circuit is especially designed to match a 50 ohm coaxial cable.

s. Characteristics of power supply — 110/115/120 volts, 55/65 cycle, 0.965/0.92/0.885 ampere, power factor 0.95 or more, depending upon operating conditions.

t. Heat dissipation—106 watts.

TABLE 1-1. EQUIPMENT SUPPLIED.

QUANTITY PER EQUIPMENT	NAME OF UNIT	NAVY TYPE DESIGNATION	OVER-ALL DIMENSIONS			VOLUME IN CU. FT.	WEIGHT IN POUNDS
			HEIGHT	WIDTH	DEPTH		
1	Radio Receiver	R-432A/URR-21	11-21/64	18⅛	17½	7.4	117

TABLE 1-2. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED.

QUANTITY PER EQUIPMENT	NAME OF UNIT	NAVY TYPE DESIGNATION	REQUIRED USE	REQUIRED CHARACTERISTICS
4	Crystal Unit	FT-243	Frequency Control	p/m 0.01% of marked frequency

TABLE 1-3. SHIPPING DATA.

SHIPPING BOX NO.	CONTENTS		OVER-ALL DIMENSIONS			VOLUME IN CU. FT.	WEIGHT IN POUNDS
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Radio Receiver	R-432A/URR-21	20	27	25	8.3	140
2	Equipment Spares		12	17	12	1.42	47

TABLE 1-4. VACUUM TUBE COMPLEMENT.

UNIT	NUMBER OF TUBES OF TYPE INDICATED								
	956	6AK5	6J5	6AB7	6H6	6V6GT	5U4G	VR-150/30	TOTAL NO. OF TUBES
Preselector	1	3	1						5
IF/AF Amplifier				8	2	1			11
Power Supply							1	1	2
Total No. of Each Type	1	3	1	8	2	1	1	1	18

SECTION 2

THEORY OF OPERATION

1. GENERAL DESCRIPTION OF CIRCUITS.

Radio Receiver R-432A/URR-21 operates in general in the same manner as an ordinary superheterodyne. However, the addition of crystal control, additional IF amplification, and squelch circuit minimizes drift over long operating periods, increases signal senstivity, and provides quiet operation. The extra circuits incorporated in the design necessarily make it rather complex; therefore, the theory of operation of the receiver will be explained by a circuit analysis, in functional order, of each of the three main units: the preselector, the IF/AF amplifier, and the power supply.

2. CIRCUIT ANALYSIS.

a. PRESELECTOR UNIT. *(Figure 7-13.)*

(1) VHF SIGNAL CIRCUITS.—Signal input to the receiver through coaxial antenna receptacle J-101 is connected to the primary winding of antenna input transformer T-101 through a short length of RG-8/U 50-ohm transmission line. The secondary winding of T-101 together with variable air capacitor C-101A, trimmer capacitor C-102, and fixed capacitor C-103, constitutes the first tuned circuit. Inductance trimming is also provided by the adjustable silver-plated copper core inside of transformer T-101. The RF current flowing in the secondary of transformer T-101 induces a voltage in L-102 by inductive coupling. L-102 is tuned to resonance with the incoming signal by variable capacitor C-101B and trimmer capacitor C-104. L-102 also has a silver-plated copper core for inductance trimming. A portion of the signal is tapped off L-102 and is coupled to the grid of the RF amplifier tube V-101 by coupling capacitor C-105. The low potential end of the tuned circuit is returned to ground. AVC is applied to the grid through R-101.

Plate potential from the high-voltage dc bus is applied to the plate of the RF amplifier tube V-101 through decoupling filter resistor R-104, by-passed to ground by capacitor C-112. The suppressor grid is connected to ground. The screen potential, also obtained from the high-voltage dc bus, is applied to the screen through decoupling filter resistor R-103 and by-passed to ground through capacitor C-111. Capacitor C-107 by-passes the screen at the tube terminal. The amplifier signal voltage in the plate circuit of RF amplifier tube V-101 is developed across the primary winding of RF transformer

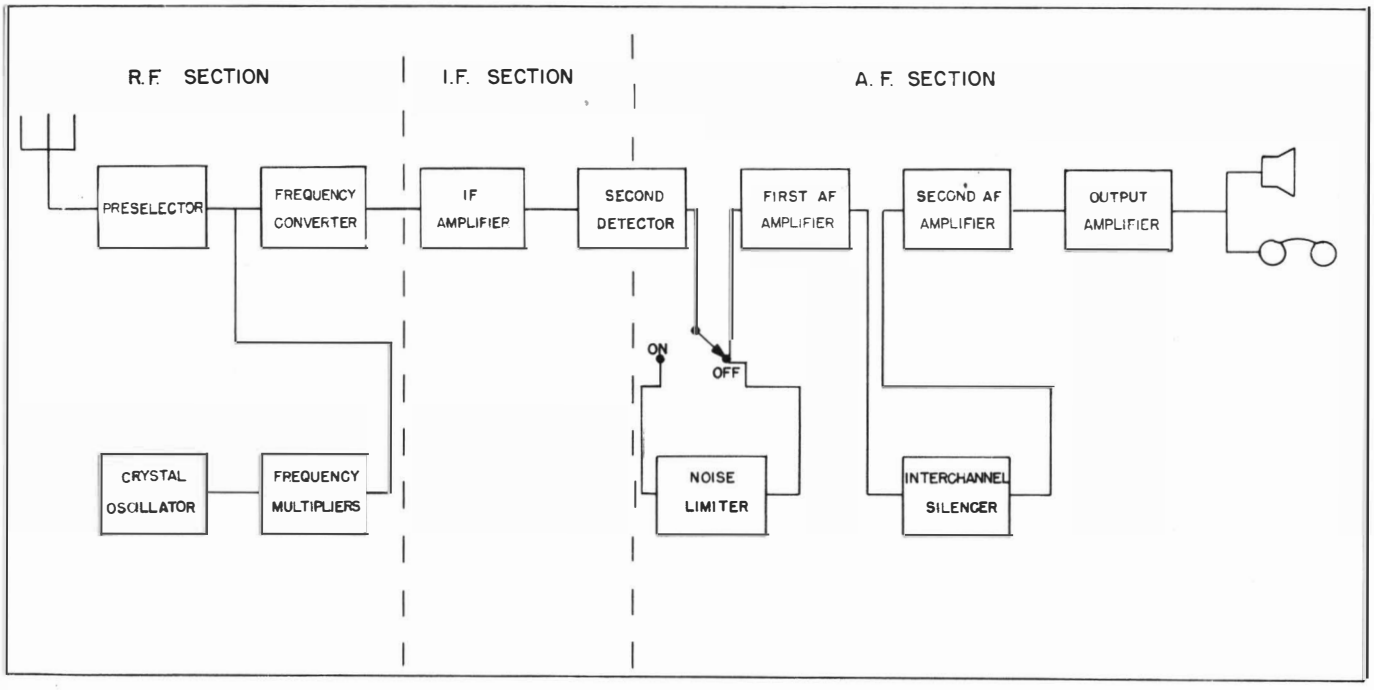


Figure 2-1. Radio Receiver R-432A/URR-21, Functional Block Diagram

T-102. The secondary winding of T-102 together with variable air capacitor C-113A, trimmer capacitor C-114, and padder capacitor C-141 constitutes the third and final tuned circuit operating at the signal frequency. The secondary winding of this transformer is connected to the grid of the mixer tube V-102 by a coupling capacitor C-115. Inductance trimming is provided by a silver-plated copper core.

(2) OSCILLATOR AND MULTIPLIER CIRCUITS.—The conversion frequency is obtained by starting with a crystal-controlled medium-frequency triode oscillator and multiplying the frequency in successive stages until a VHF signal, having a frequency 12 megacycles higher than the incoming signal frequency, and of sufficient magnitude, is applied to the mixer tube. The crystal is cut and mounted so that it is forced to vibrate at the third harmonic of its fundamental frequency. The third harmonic signal appears at the plate of the oscillator tube and is tripled in frequency in each of the succeeding multiplier tubes. Thus, when it reaches the mixer grid, it has a frequency nine times its original.

A four-position switch S-101B in the input grid circuit of the oscillator tube V-105 selects any one of four crystals which are plugged into the sockets provided on the preselector chassis. An additional set of contacts on S-101B provides for grounding the three crystals not in use. Resistors R-114 and R-115 return the circuit to ground. R-115 acts as a meter shunt when grid current is measured between J-104 and ground. RF bypass is effected by C-136.

The plate circuit of V-105 is tuned by variable capacitor C-126C, trimmer capacitor C-133, and RF inductor L-104. These elements resonate at a frequency slightly higher than that of the crystal in order to provide maximum grid current for a definite tuning indication when a milliammeter is connected between J-104 and ground. Dc plate voltage is supplied from a regulated 150 volt source by a regulator tube V-302 in the power supply. Capacitor C-134 by-passes this line to localize any RF currents to the crystal oscillator.

Capacitor C-132 connects the high potential side of L-104 to the input grid of the first multiplier tube V-104. The ground return path is through resistor R-113. A shield plate attached to the gang between C-126C and C-126B isolates the oscillator from the first multiplier. The suppressor grid and cathode are

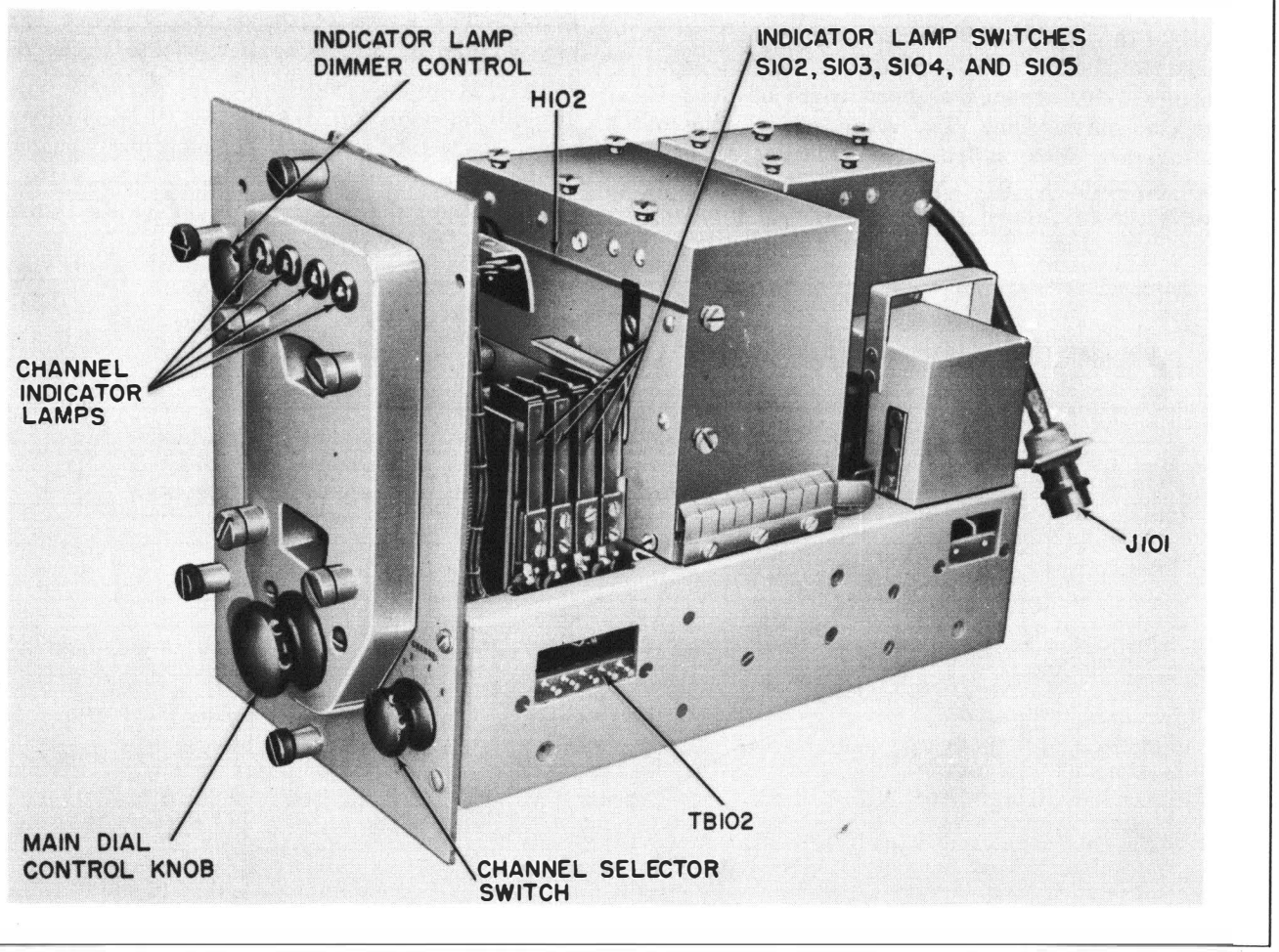


Figure 2-2. Preselector Unit, Right Oblique View

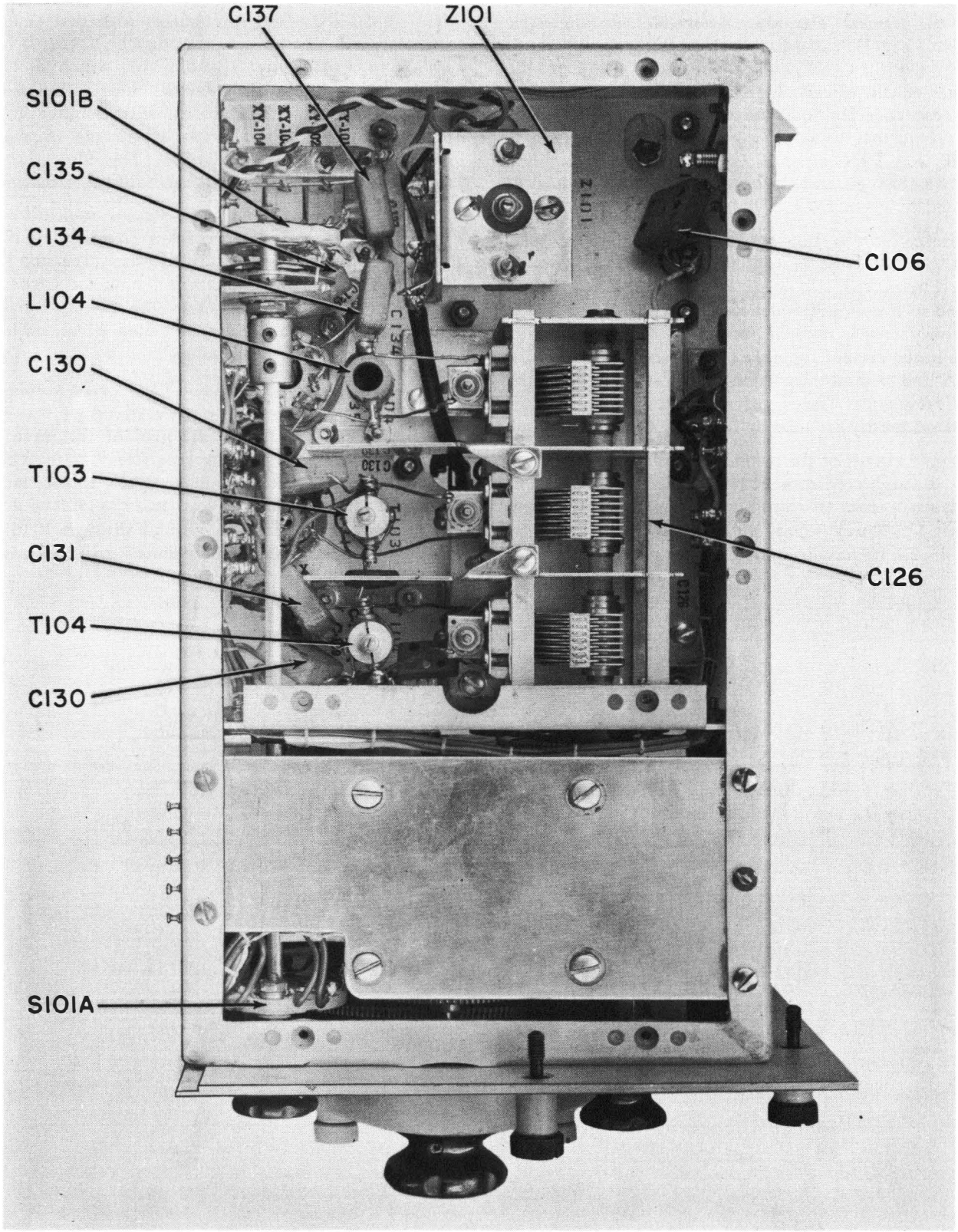


Figure 2-3. Preselector Unit, Bottom View, Cover Plates Removed

grounded externally, and the screen derives its potential through R-112, which is by-passed by C-131. The plate of V-104 connects to a tuned circuit resonant at three times the crystal frequency. Variable air dielectric capacitor C-126B, variable trimer capacitor C-128, shunt padder capacitor C-127, and transformer T-103 form the elements of this circuit. T-103 is provided with a powdered iron core for inductance adjustment so that this tuned circuit may be accurately tracked with the remaining HF and VHF circuits. Plate potential is supplied to V-104 through decoupling resistor R-111, which is by-passed by capacitor C-130.

By inductive coupling between the primary and secondary of T-103 the multiplier signal is transferred to a link circuit for coupling to a second tuned circuit adjusted to the same frequency. The primary of T-104 is inductively coupled to the secondary, which forms the second tuned circuit, together with variable air capacitor C-126A and trimmer capacitor C-125, at three times the crystal frequency. The signal is coupled to the grid of the second multiplier tube by capacitor C-124.

The grid circuit of the second multiplier tube is closed to dc through resistors R-109 and R-110. R-110 is provided to permit the connection of a dc microammeter between J-103 and ground to measure the grid current of V-103. RF by-pass around R-110 is provided by C-123. The suppressor grid and cathode of V-103 are externally grounded and the screen grid is connected to the main dc bus through R-108, by-passed by C-121. The filament of V-103 is connected in common with that of V-102, and after being by-passed to ground by C-122, it is connected to an RF filter choke L-101, which in turn is connected to the main filament supply terminal. A by-pass capacitor C-139 acts to further filter any RF potentials which might be conducted out of the preselector through the filament line. This filter also helps to reduce oscillator and harmonic voltage radiation.

The plate terminal of the second multiplier tube V-103 is connected to a resonant circuit consisting of variable air capacitor C-113B, trimmer capacitor C-119, fixed padder capacitor C-118 and inductor L-103. This circuit resonates at nine times the crystal frequency. Inductance trimming is accomplished by an adjustable silver-plated copper core, which moves inside L-103.

(3) MIXER CIRCUIT.—The VHF voltage developed across the resonant plate circuit of the second multiplier stage is fed to the grid of the mixer tube V-102 through a coupling capacitor C-116. The RF signal from the plate circuit of V-101 is also fed into this grid through coupling capacitor C-115. The dc path in this circuit is closed to ground through R-105 and R-106 in series. R-105 is the primary grid leak resistor;

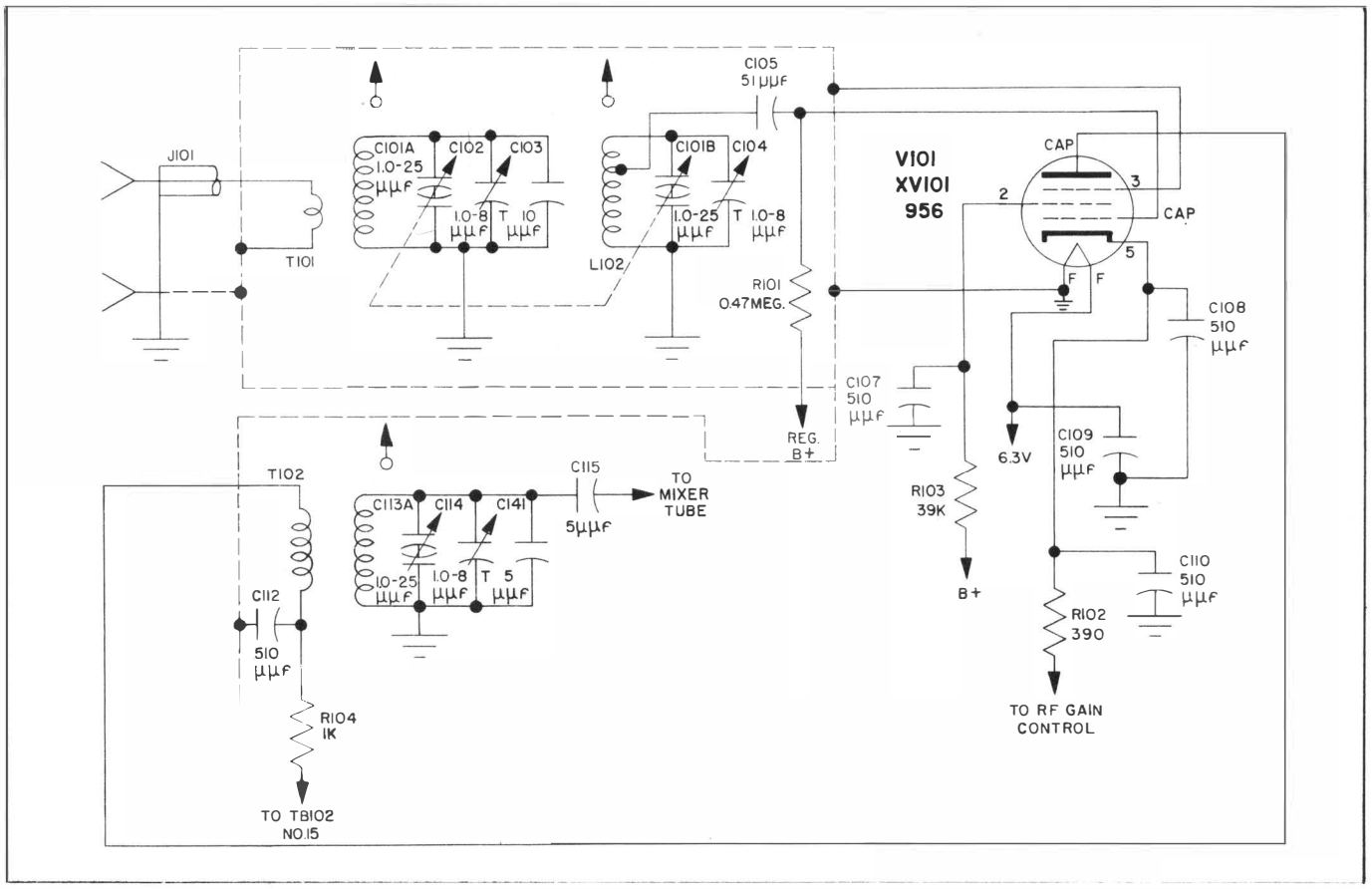


Figure 2-4. VHF Signal Circuit, Schematic Diagram

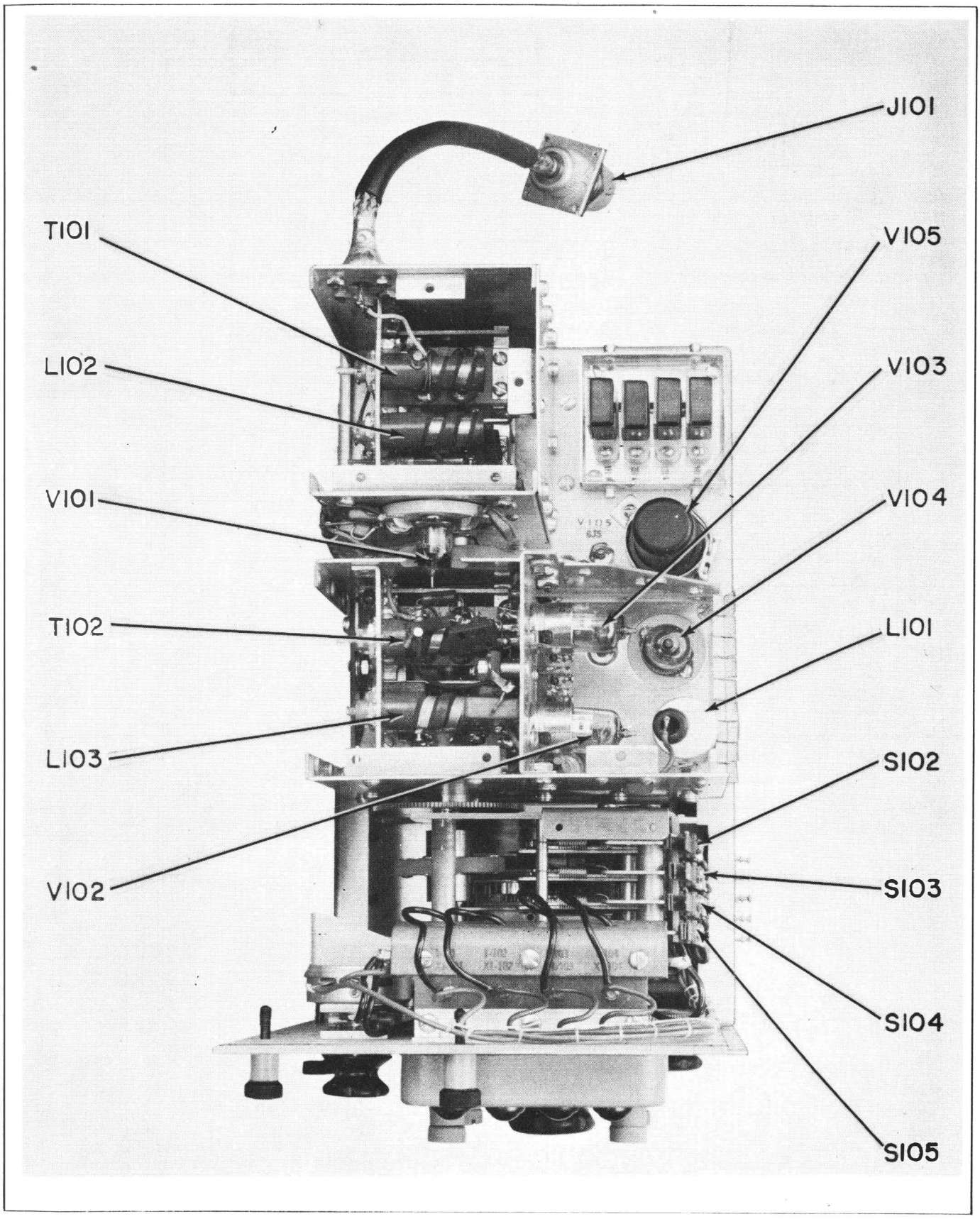


Figure 2-5. Preselector Unit, Top View with Compartment Shields Removed

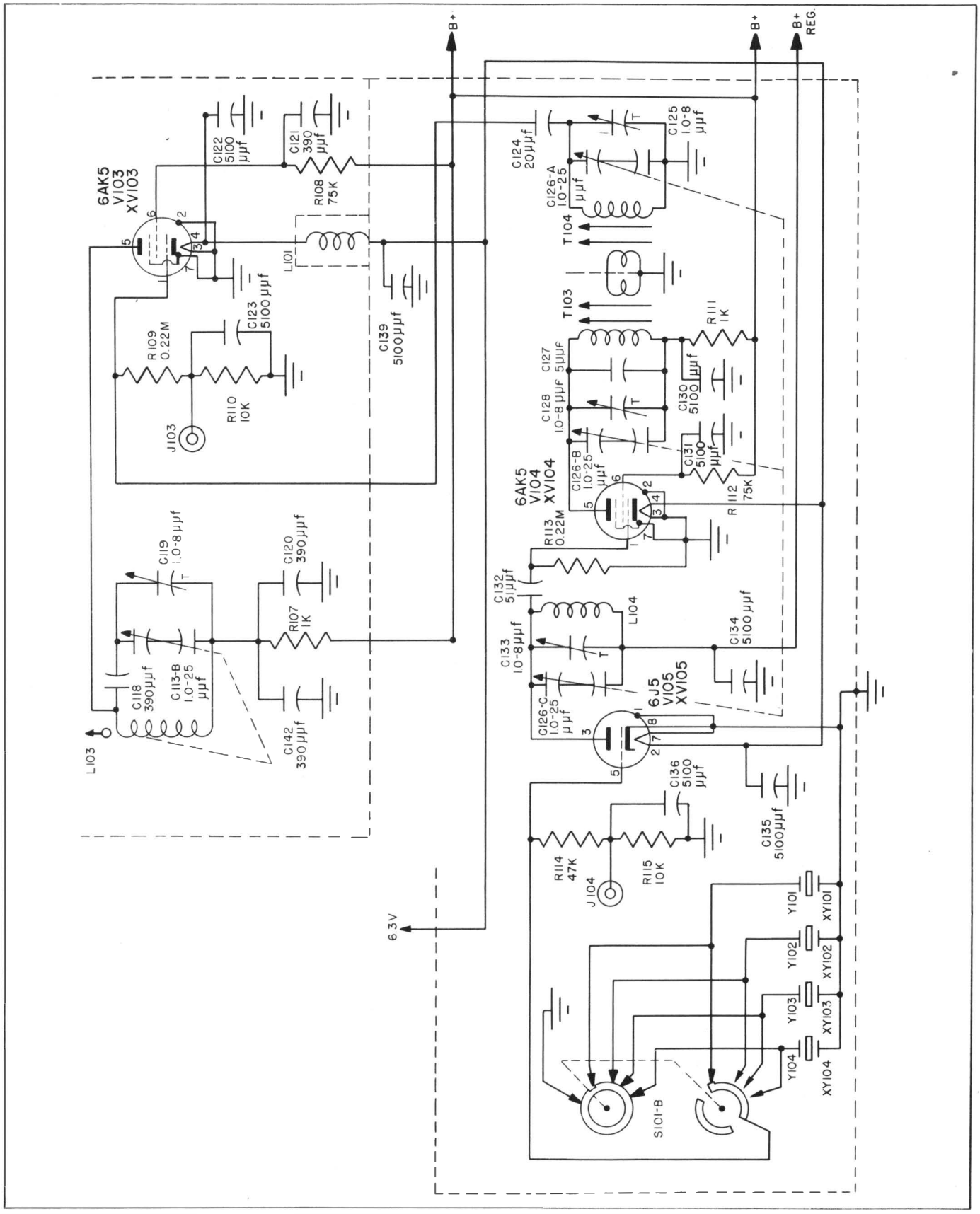


Figure 2-6. Oscillator and Multiplier Circuits, Schematic Diagram

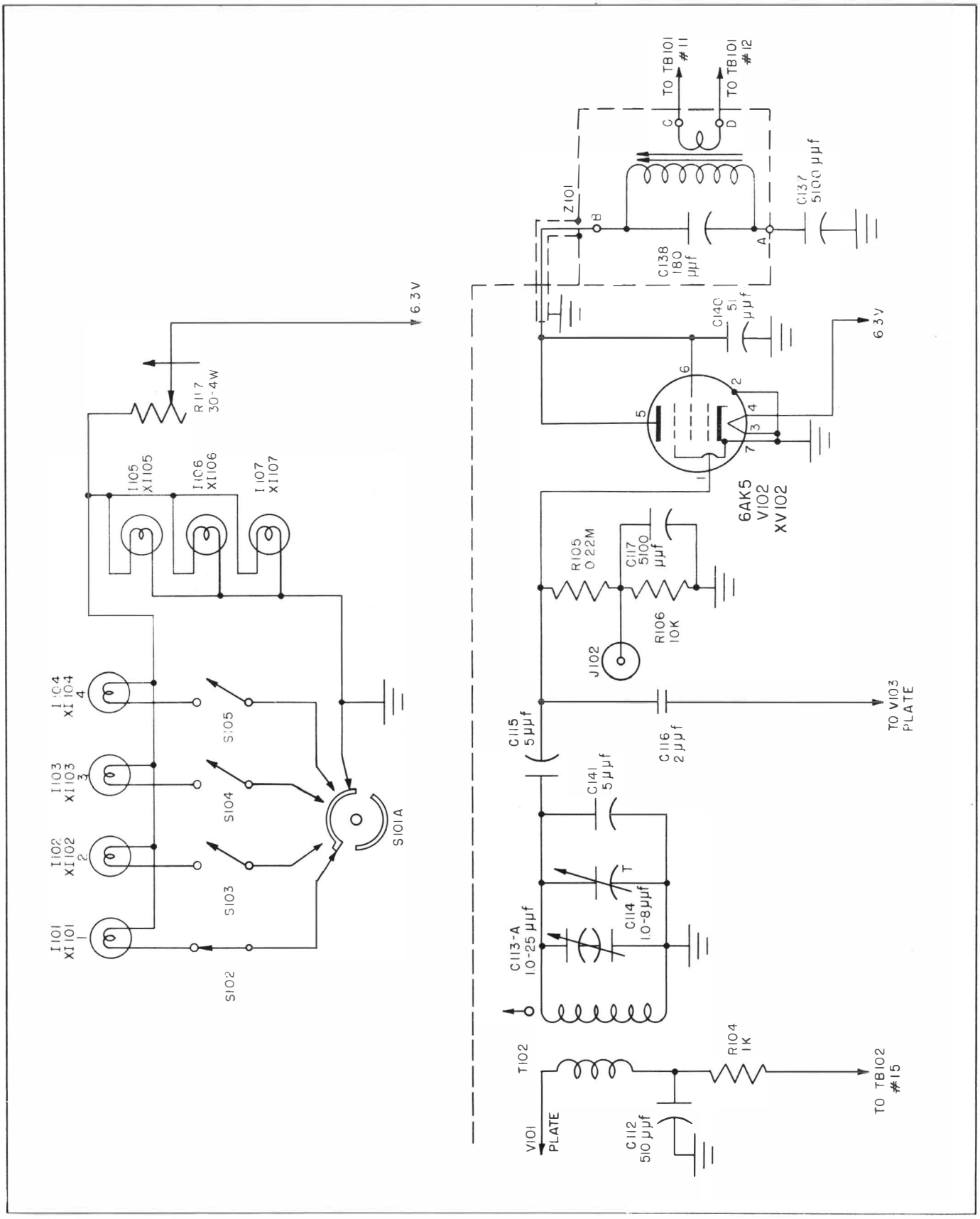


Figure 2-7. Mixer Circuit and Channel Indicating Lamps, Schematic Diagram

R-106 is in the circuit to permit the insertion of a microammeter to indicate the oscillator plus RF signal voltage developed at the mixer control grid. The meter may be inserted between J-102 and ground. C-117 prevents any RF from disturbing the meter indication by by-passing it to ground. The mixer tube V-102 obtains its filament voltage from the same source as the second multiplier tube V-103. The suppressor grid and cathode are connected to ground externally while the screen is connected to the plate externally. The mixing action in the grid circuit of V-102 combines the two VHF voltages in that circuit to produce an intermediate frequency voltage of 12 megacycles which is developed across the resonant circuit in the plate of the same tube. This circuit consists of a fixed capacitor C-138 and transformer Z-101. The secondary of Z-101, which is inductively coupled to the primary, comprises the input portion of a link circuit for transferring the intermediate frequency signal to the IF/AF Unit. The dc plate potential for V-102 is obtained through decoupling resistor R-116, by-passed by capacitor C-137.

A four-position switch S-101A, operating on the same shaft as the crystal selector switch S-101B, provides connection of filament potential to the proper channel indicating lamp when S-102, S-103, S-104 or S-105, as pertinent, is closed by the dial detent lever that positions the main tuning capacitor on the desired channel frequency. A rheostat R-117 controls the brilliancy of the channel indicator lamps I-101, I-103 and I-104 and the dial lamps I-105, I-106 and I-107.

b. IF/AF UNIT. *(Figure 7-14.)*

(1) IF AMPLIFIER CIRCUITS.—Transfer of intermediate frequency energy from the first detector tube V-102 to the second detector tube V-206A is accomplished by inductive coupling through IF transformers Z-101, Z-201, Z-202, Z-203, Z-204, Z-205 and Z-206 and amplified through IF amplifier tubes V-201, V-202, V-203, V-204 and V-205. The first IF transformer Z-101 is located on the preselector chassis and is link-coupled

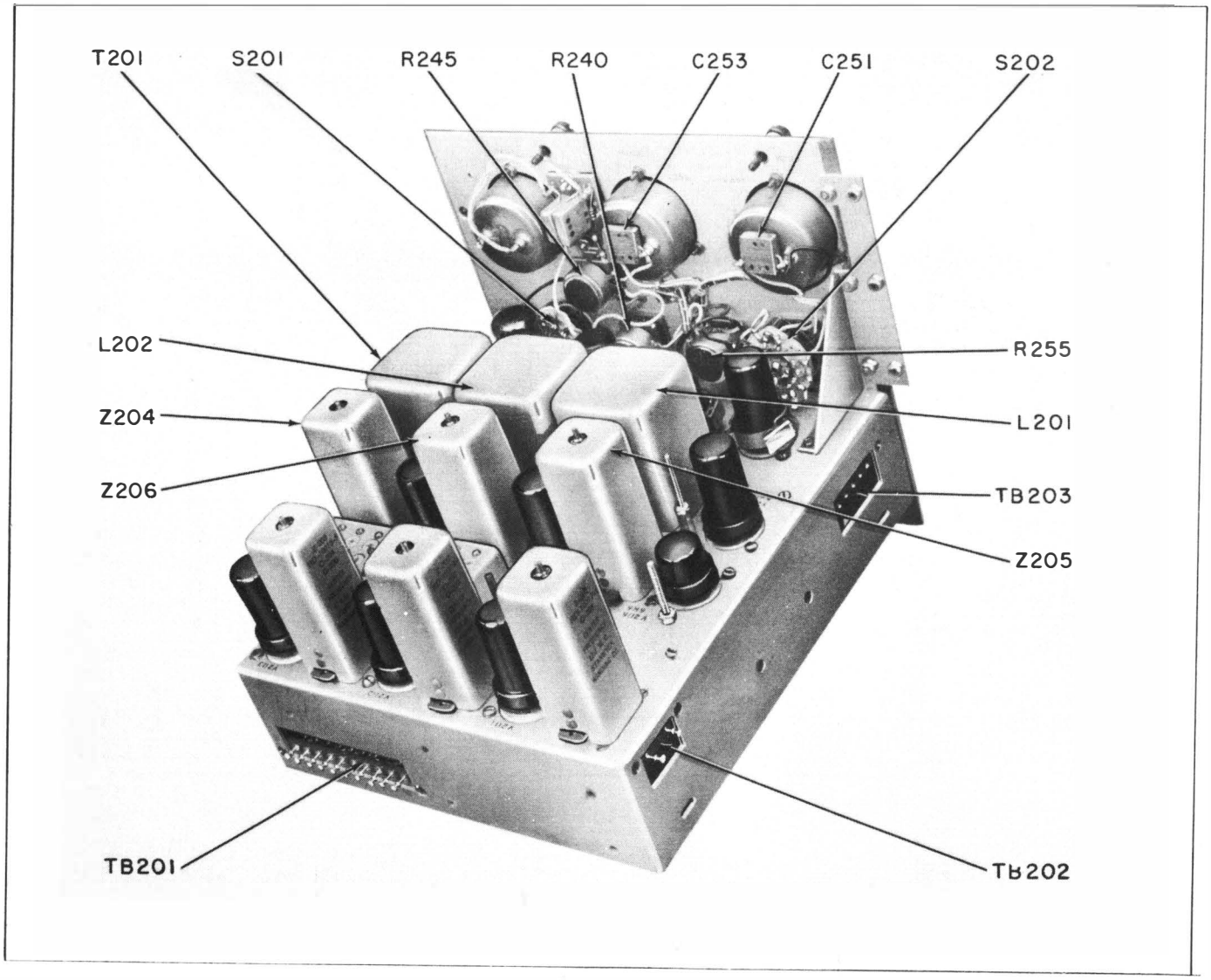


Figure 2-8. IF/AF Unit, Top View

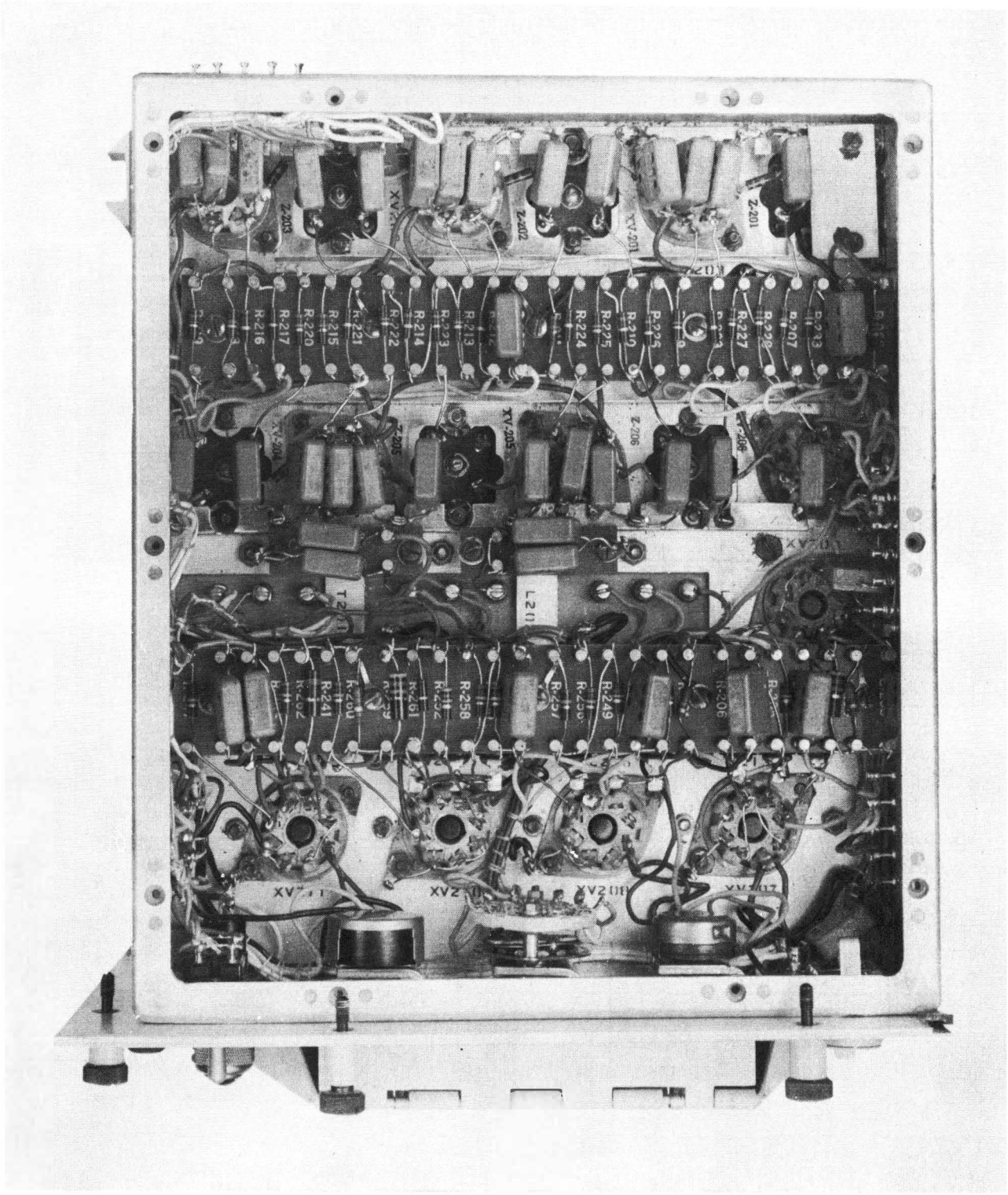


Figure 2-9. IF/AF Unit, Bottom View, Cover Plate Removed

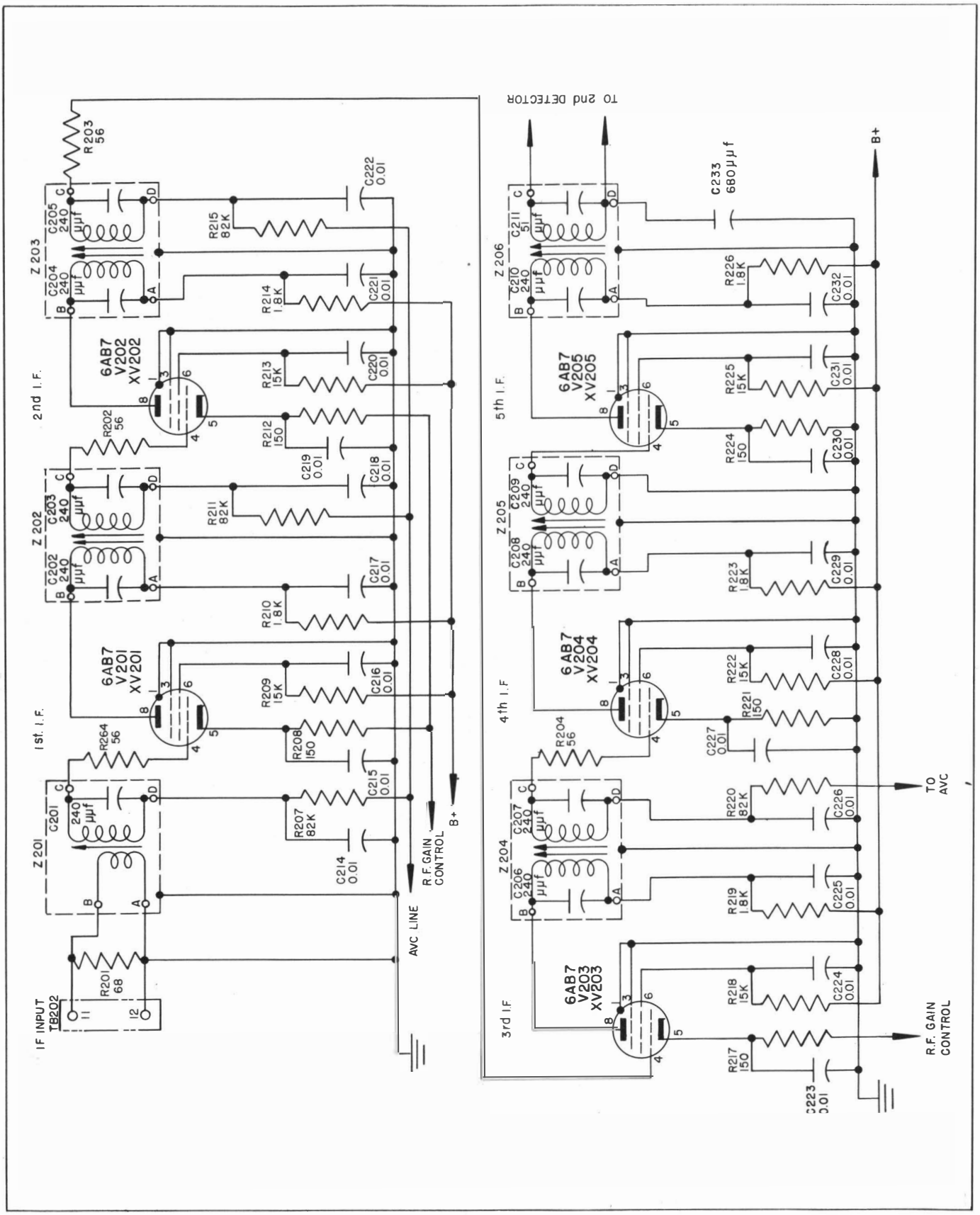


Figure 2-10. IF Amplifier Circuits, Schematic Diagram

to IF transformer Z-201 on the IF/AF unit. The secondary of Z-101 connects to the primary of Z-201 through terminal strips TB-101 and TB-202. R-201 is connected across the primary of Z-201 to keep it at a low impedance to RF signals. The secondary of Z-201 is inductively coupled to its primary and is tuned to 12 megacycles by a powdered iron core and fixed capacitor C-201. The high potential end of Z-101 is connected to the grid of the first IF tube V-201 through a series resistor R-264, which acts as a grid suppressor to minimize

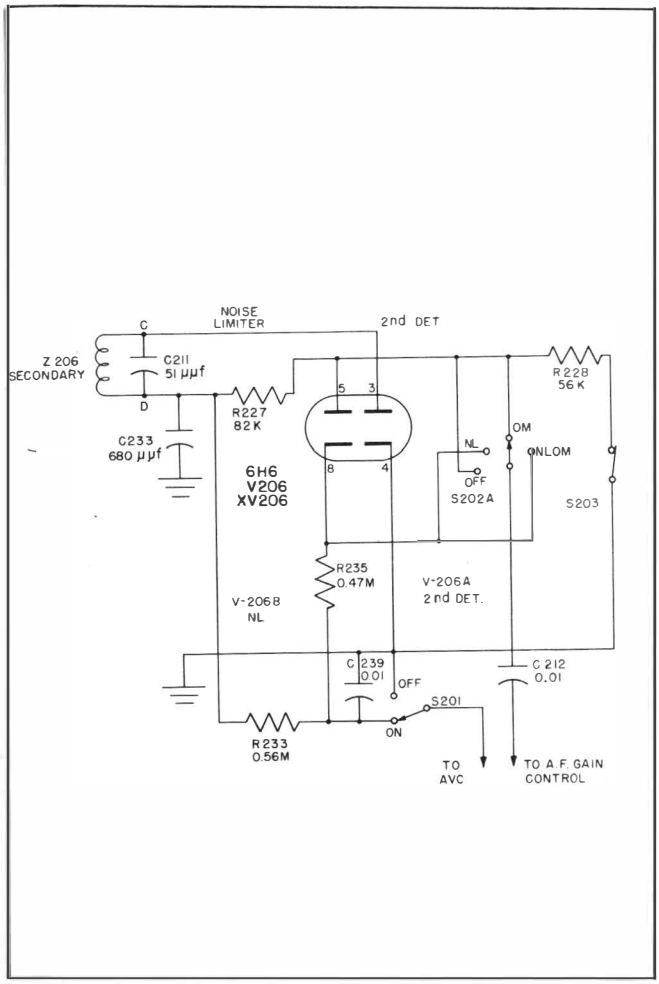


Figure 2-11. Second Detector, AVC and Noise Limiter Circuits, Schematic Diagram

plate to grid feedback. AVC bias is introduced at the first stage of IF amplification by connecting the AVC bus to the low potential end of Z-201 through R-207 by-passed by C-214. The suppressor grid of V-201 is externally grounded. Dc potential is applied to the screen of the first IF amplifier tube V-201 through decoupling filter resistor R-209, by-passed to ground by capacitor C-216. Bias is obtained through resistor R-208, by-passed by capacitor C-215. The outer shield is grounded to pin No. 1.

The third IF transformer Z-202 consists of two tuned circuits. The primary and secondary windings are tuned to 12 megacycles by fixed capacitors C-202 and C-203 and by adjustable powdered iron cores. The cores can be reached for tuning through the top of the can and through the holes provided in the bottom plate. The high potential end of the primary connects to the plate of the first IF while the low potential end connects to the dc bus through decoupling resistor R-210 by-passed by C-217. The circuit arrangement of the second, third and fourth IF amplifier tubes V-202, V-203 and V-204 is the same as that of the first, except for symbol designations. A measure of the strength of the incoming RF signal can be obtained by observing the cathode current, measured by M-201, of the third IF amplifier. This meter is automatically placed in operation when the RECEPTION switch S-201 is turned to AVC ON.

The fourth, fifth and sixth IF transformers Z-203, Z-204 and Z-205 are the same in construction and electrical values as the third Z-202; except for symbol designation, circuit description is the same. The fifth IF amplifier is connected in the same manner as are the others except that there is no series resistor in the grid circuit, and there is no connection to the AVC, the low potential end of Z-205 being grounded. The seventh IF transformer Z-206 has a higher inductance and consequently a lower capacitance than the others but is the same as the others in all other respects.

(2) SECOND DETECTOR CIRCUITS.—The second detector utilizes one section of a twin diode tube V-206. The incoming RF signal from the secondary of Z-206 is impressed upon the plate of V-206A, which conducts current only during the time the polarity of the signal is positive with respect to its cathode, which is grounded to the chassis. The tube, therefore, functions as a half-wave rectifier for the incoming RF signal, resulting in the development of an audio voltage across load resistances R-227 and R-228. Provisions for measuring the current through the diode have been made by inserting a link S-203 in the ground return lead.

(3) AUTOMATIC GAIN CONTROL CIRCUITS.—Automatic gain control is provided by the same section of the twin diode tube V-206 as is used as the second detector. Rectified RF potential is obtained from the low side of the secondary of Z-206, filtered by resistor R-233 and capacitor C-239, and used to provide AVC bias to tubes V-101, V-201, V-202 and V-203. A small amount of AVC voltage is obtained by tapping between R-236 and R-237, connected between the AVC bus and ground, and applied to the fourth IF amplifier V-204 and first audio amplifier V-207.

(4) AUTOMATIC PEAK NOISE LIMITER.—The second section of the dual diode tube V-206 operates as a noise peak limiter. The audio voltage appearing at the junction of R-227 and R-228, as a result of the voltage developed across R-227 and R-228 by the demodulating action of the second detector, is normally coupled to the input of the first AF amplifier when

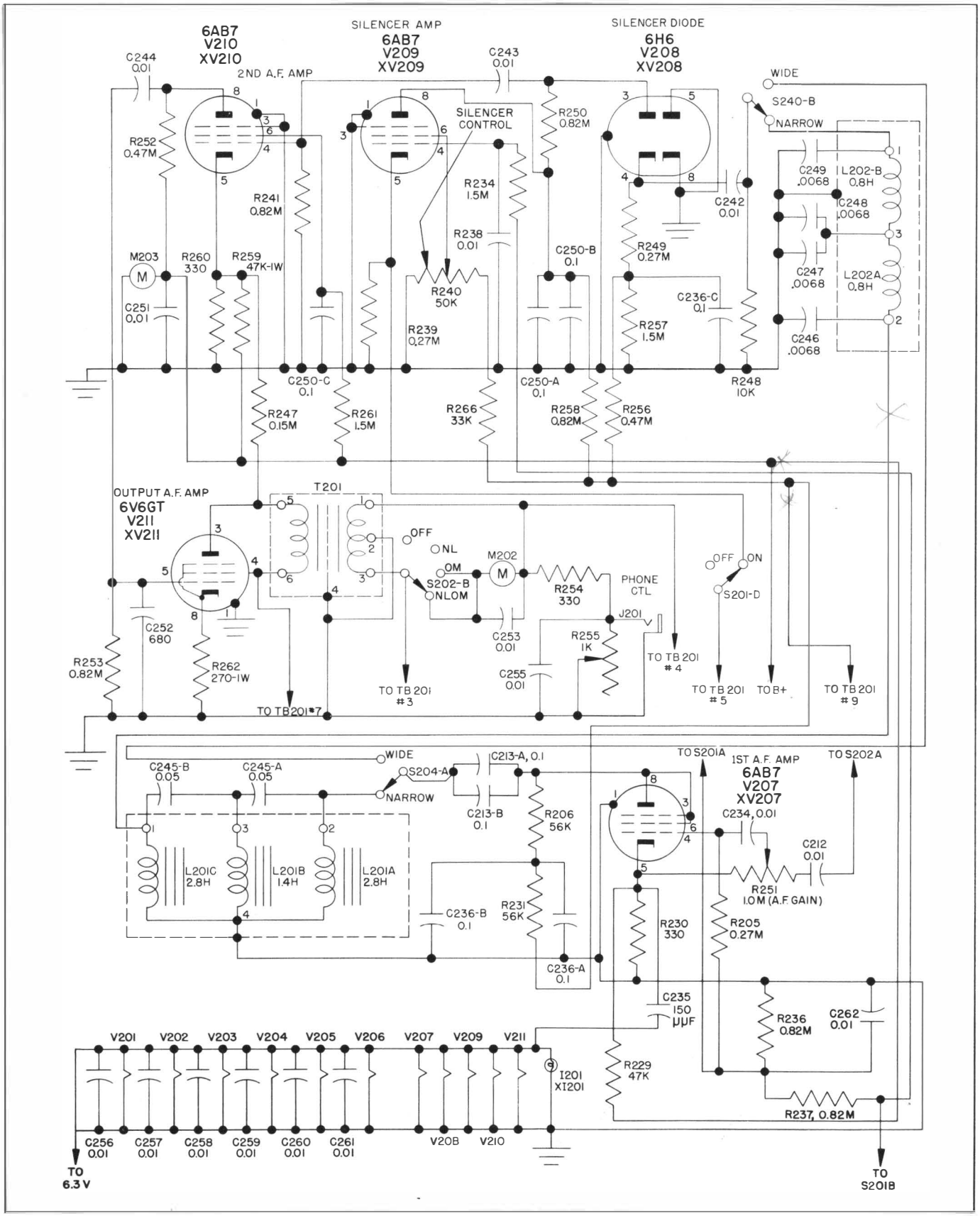


Figure 2-12. AF and Output Circuits, Schematic Diagram

S-202A is in the OFF position. This is the connection used for the "limiter off" condition. When the limiter is switched on by means of S-202A, the input to the first audio amplifier is coupled to the cathode of V-206B, the plate of which is connected at the junction of R-227 and R-228. The cathode of V-206B also connects to the transformer end of R-227 through resistors R-233 and R-235, whose junction point is grounded through C-239. The operation of the circuit is such that under conditions of reception of a steady or slow-varying carrier, the plate of the diode V-206B is positive with respect to its cathode, permitting current to flow through the tube. However, if a surge noise potential suddenly appears across R-227 and R-228, the plate momentarily assumes a less positive or even negative potential with respect to its cathode. This decreases or even cuts off the current flow through the diode and thus serves to decouple it from the input of the first AF amplifier. By the time the cathode has begun to assume an appreciably higher negative potential, the noise pulse usually has decayed and enough current again flows in the diode to allow the signal to pass to the AF amplifier.

(5) AF AMPLIFIER CIRCUITS.—The audio voltage developed across the diode load resistors R-227 and R-228 as a result of the demodulating action of tube V-206A is applied to the grid of the first AF amplifier V-207 through coupling capacitor C-212 and VOLUME control potentiometer R-251, followed by another coupling capacitor C-234.

A small amount of AGC bias is applied to the grid through filter resistor R-205.

Further amplification of the AF signals from the second detector is accomplished by resistance-capacity coupling between the first audio amplifier V-207 and the second audio amplifier V-210. The cathode of V-207 is biased to ground through resistor R-230 and is also tapped into the B+ line through R-229. This combination is for the purpose of maintaining a more constant bias. At the same point there is a capacitor C-235 connecting the cathode to the filament line. This places a small amount of 60 cycle voltage on the cathode which, since it is out of phase with any incoming hum voltages picked up from preceding stages, effectively cancels them. A band-pass filter and interchannel silencer circuit may be interposed between the first and second AF amplifiers to improve speech intelligibility and cut down noise. The filter passes only that band of frequencies associated with male speech and attenuates all others. L-201A, L-201B and L-201C with their ossociated by-pass capacitors C-245A and C-245B filter out all frequencies below voice range and L-202A and L-202B together with C-246, C-247, C-248 and C-249 filter out those frequencies above.

The interchannel silencer operates when there is in-

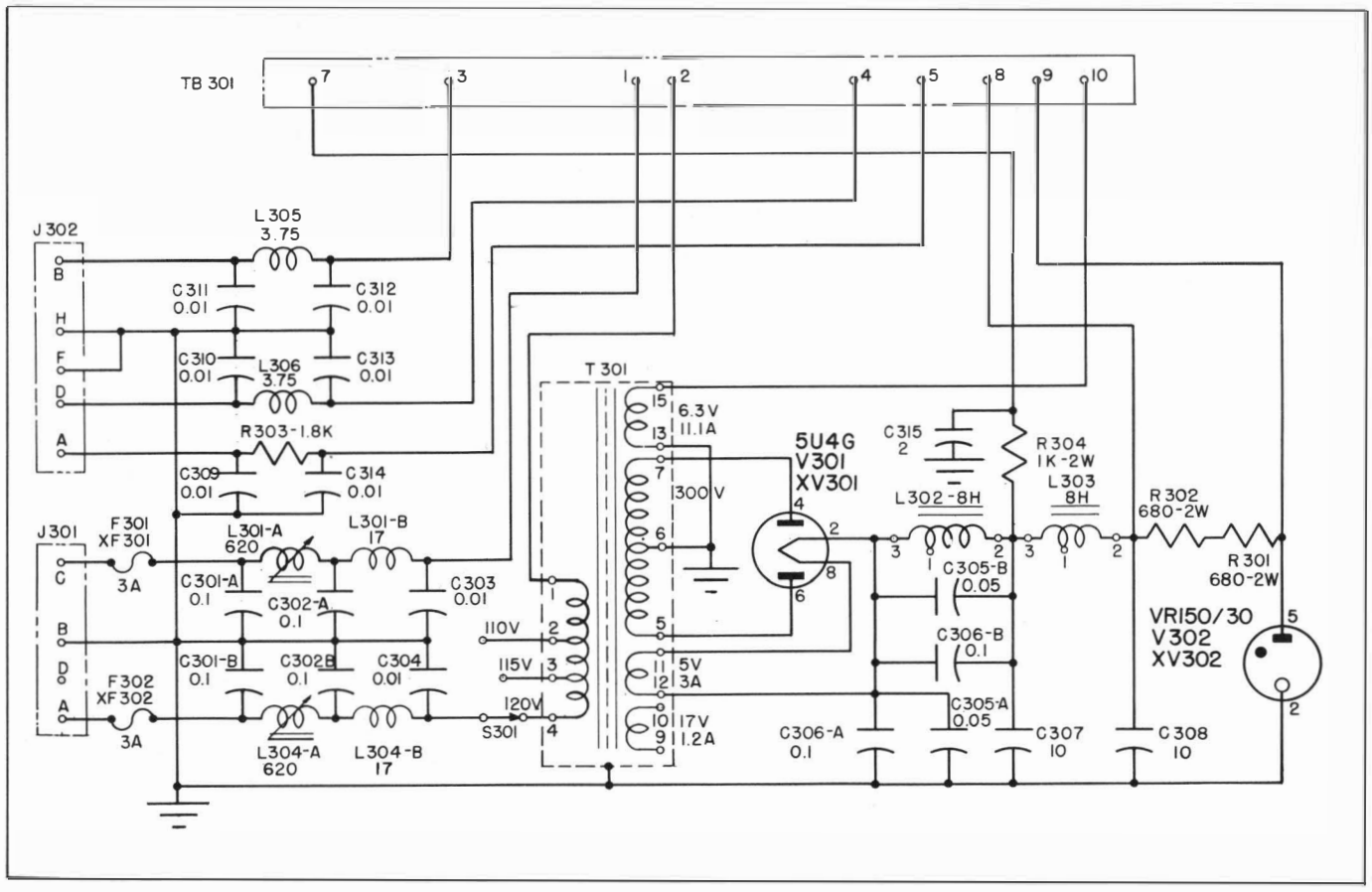


Figure 2-13. Power Supply, Schematic Diagram

sufficient AVC voltage to bias the control amplifier V-209 to cut-off. Its plate current, flowing through R-258, reduces the voltage on the plate of diode V-208 so that it becomes non-conducting. The voltage on the screen of V-209, which may be varied by potentiometer R-240, is the dominant factor in determining the cut-off point of the diode because of its influence on the control amplifier plate current. When silencing action is not desired, the ground is removed from the cathode of V-209 by opening S-201D and it is biased to nearly cut-off. J-302 can be used for remote operation of the silencer. Those signals passing through the second AF amplifier V-210 are resistance coupled to output amplifier V-211. Transfer of audio energy from the plate of this tube to the headphone jack J-201 and the output receptacle J-302 is accomplished through output transformer T-201. The secondary of T-201 has 600 ohms impedance. The output terminals are shunted by C-253 and an output meter when S-202B is in the "OM" or "NL OM" positions. The headphone output is by-passed by C-255 and level is controlled by rheostat R-255. (See figure 2-12) for schematic diagram of AF and output circuits.)

c. POWER SUPPLY UNIT.—*(Figure 7-15.)* This chassis occupies the rear of the receiver. On it are mounted all components associated with supplying the proper operating potentials to the circuits previously described. The ac power input line to the primary winding of the power transformer T-301 is filtered by a two-section RF filter on each leg. This filter is formed by chokes L-301A, L-301B and capacitors C-301A, C-302A and C-303 in one leg and chokes L-302A, L-302B and capacitors C-301B, C-302B and C-304 in the other. The input line is fused on both sides by F-301 and F-302. THESE FUSES SHOULD NEVER BE REPLACED WITH ANY HAVING A HIGHER RATING THAN 3 AMPERES. The primary winding of T-301 is provided with link S-301 for selecting the proper voltage tap. The proper ac. heater potential for all vacuum tubes except the rectifier is obtained from one winding of the secondary. One side of this wind-

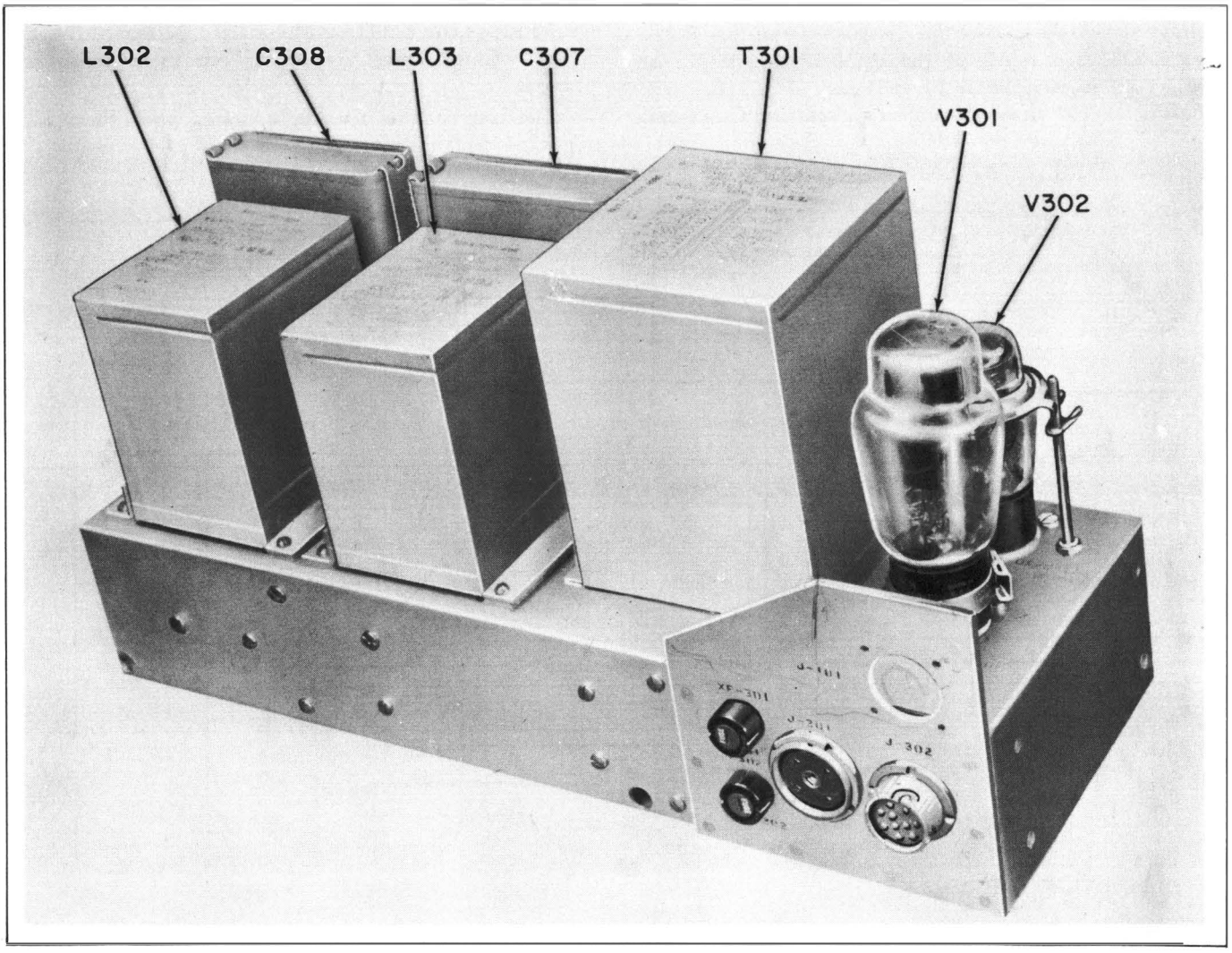


Figure 2-14. Power Supply Unit, Top View

ing is grounded. Filament voltage for the rectifier tube V-301 is obtained from another winding, and a third winding provides plate potential for full-wave rectification of the voltage wave developed across it. The rectified dc pulses are filtered by a two-section filter plate voltage for the output tube V-211 is taken from the output of the first filter section, while plate voltage for the rest of the tubes is taken from the output of the second section. Regulated voltage is supplied to the plates of tubes V-102, V-105, V-207, V-208 and V-209. The center tap of the high voltage winding is grounded, providing a dc return path.

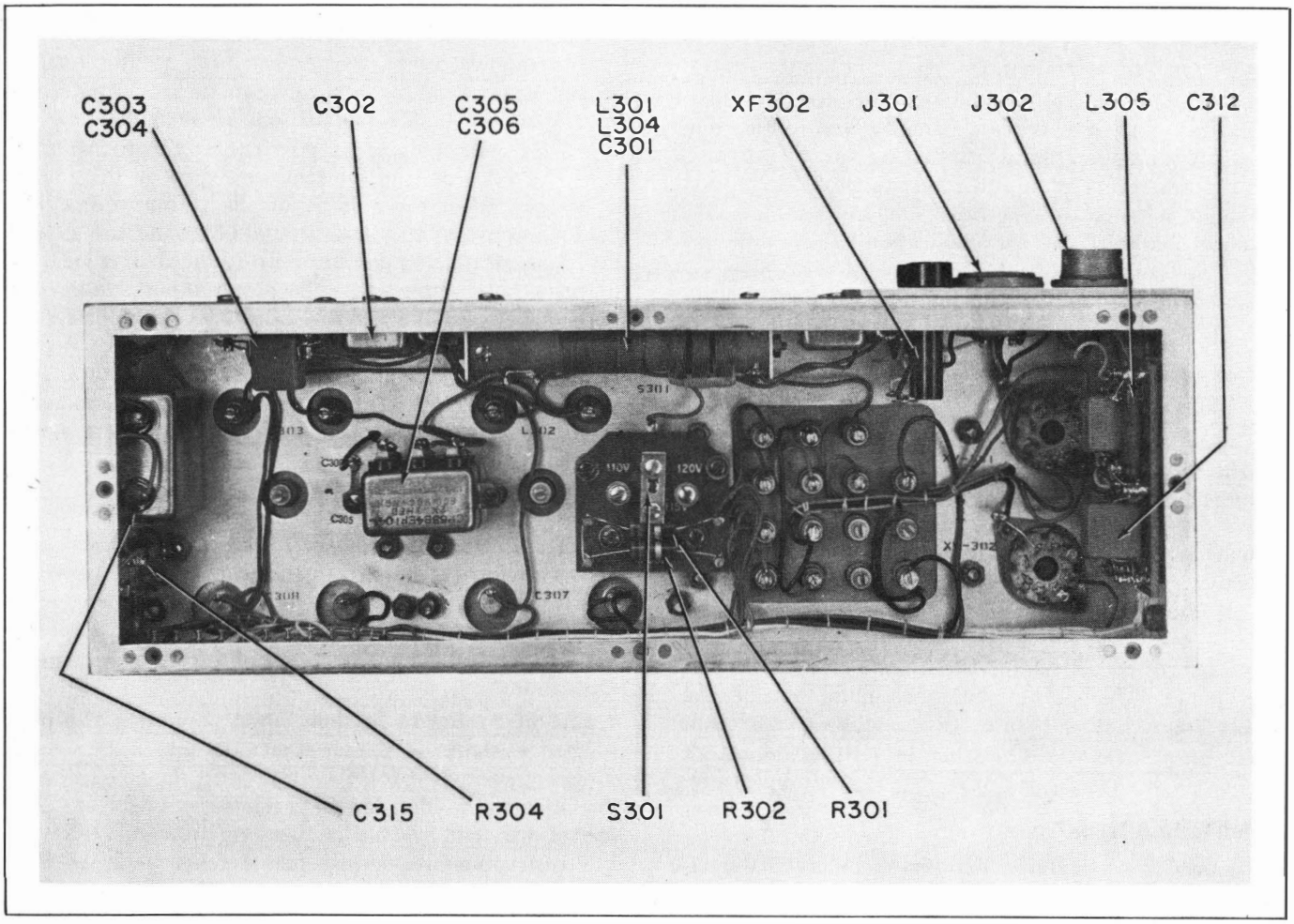


Figure 2-15. Power Supply Unit, Bottom View, Cover Plate Removed

SECTION 3
INSTALLATION

1. GENERAL.

The Model AN/URR-21 Radio Receiving Set, equipped with one full complement of electron tubes, one output and remote control plug and cable, one concentric antenna-ground connecting plug and one female power input plug and cable assembly is shipped in a single wooden packing box. Two instruction books are also contained in the same box. There are no crystals or headphones supplied. Spare parts are shipped concurrently with the unit in another wooden packing box.

2. UNPACKING.

(Figures 3-1, 3-2.)

A reasonable amount of care should be used in unpacking the equipment so that it is not excessively jarred or scratched. After unpacking, the equipment should be inspected for any possible damage that may have occurred from careless handling in transit. Make sure all electron tubes are firmly seated in their sockets. Inspection of the chassis and electron tubes can readily be made by removing the chassis from its cabinet. This is accomplished by loosening the thumb screws on the front panel. The chassis will then slide out of the cabinet when pulled by the two knobs on the front panel. Never remove the receiver by pulling on any of the control knobs, as this will impair their operation.

3. INSTALLATION.

The dust cover of Radio Receiver R-432A/URR-21 is equipped with shock mountings under each corner, through which bolts may be inserted for fastening to a table, bench or shelf. When mounting the receiver on one of these, care should be taken to provide adequate clearance (6 inches, as shown in Figure 3-5) from its back to the bulkhead or nearest obstruction in order that access may be gained to the rear receptacles and fuses. The front of receiver should be mounted in 6 inches from the edge of the table, bench, or shelf so that the knob cover, when opened, will have a supporting surface to rest on. An outline drawing is shown in Figure 3-5.

Make connection to the proper 110, 115 or 120 volt, 55-65 cycle single phase line by means of a three conductor shielded cable. Proper matching to the voltage source is provided by a three-position link connector, S-301, on the under side of the power unit (Figure 2-15). Measure voltage of power source with Multimeter TS-352/U, setting the selector switch on the 150 V ac range. When the voltage of the power source has been ascertained, the link should be connected to the tap closest to that value, thus putting the correct amount of primary winding across the power input. Make connection between the antenna cable (RG-8/U, not supplied) and P-101 as shown in figure 3-3. P-101, N.T.49121A is then inserted in J-101, N.T.49120. The third receptacle, J-302, and corresponding plug and cable assembly W-302 have been provided for remote audio and silencing circuits.

4. INITIAL ADJUSTMENTS.

After the receiver has been installed according to the above instructions, a performance check should be made before turning the receiver over to operating personnel. This should consist of actual operation of the receiver. For instructions on operating procedure, see Section 4, Operation.

The first thing to be done upon beginning the performance check is to see that all dial detents are properly positioned for operation with the four crystals in the crystal holder. If this is not done, operating personnel will not be able to properly tune the receiver. For instructions on setting dial detents, refer to Section 4, Operation.

The remainder of the performance check should include a comparison while in actual operation of all voltage and current readings with those representative readings given in Section 7, Corrective Maintenance. The two sets of reading should agree closely. If possible an actual signal from a naval transmitter should be used. Otherwise, use a signal generator with an output of 5 microvolts, modulated 30 percent at 1000 cycles. (RF Signal Generator AN/URM-250R26 series.) The generator should be coupled to antenna input jack J-101 with a nominal 52 ohm coaxial line. Also check need for realignment as described in Section 7.

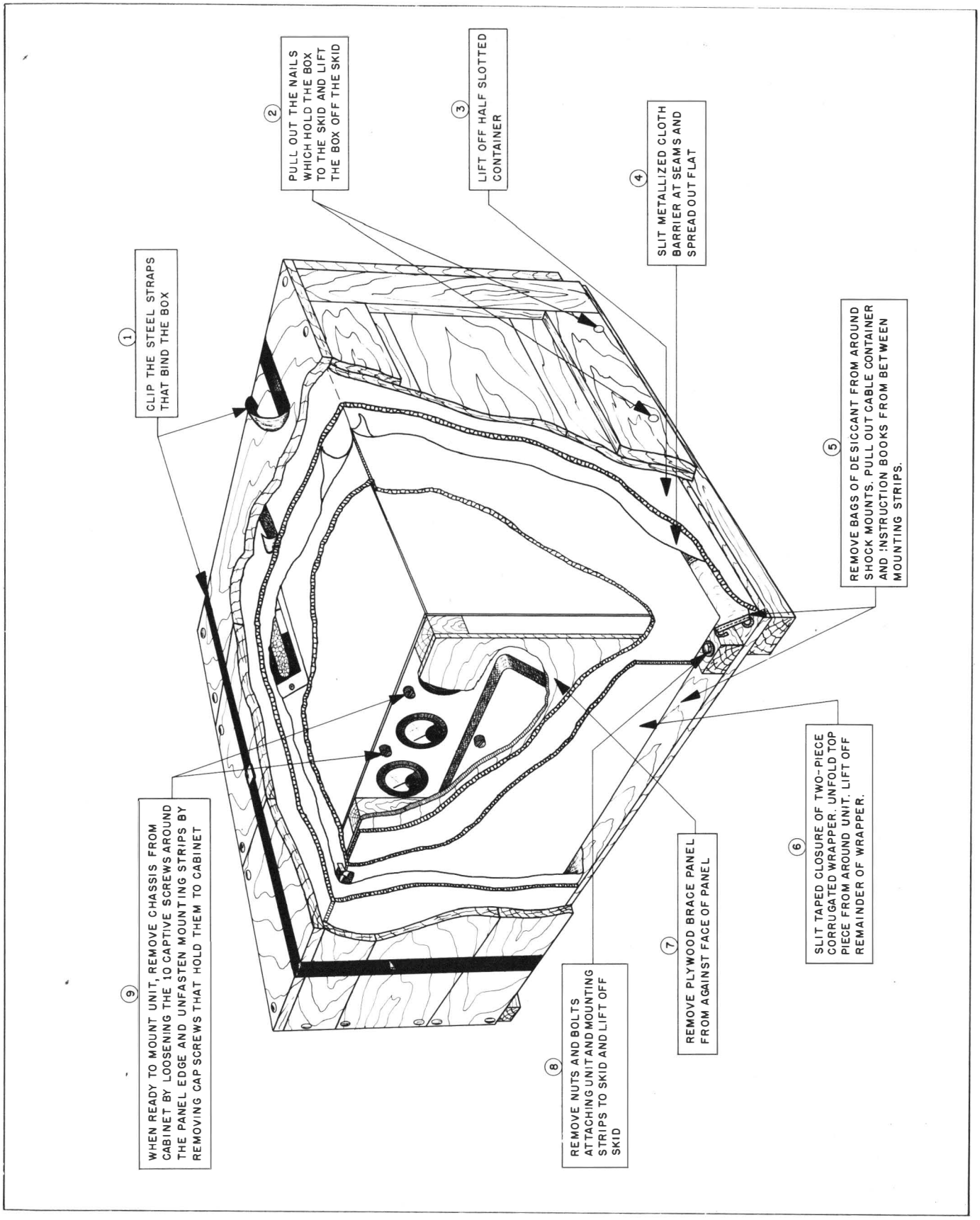


Figure 3-1. Radio Receiving Set AN/URR-21A, Unpacking Procedure

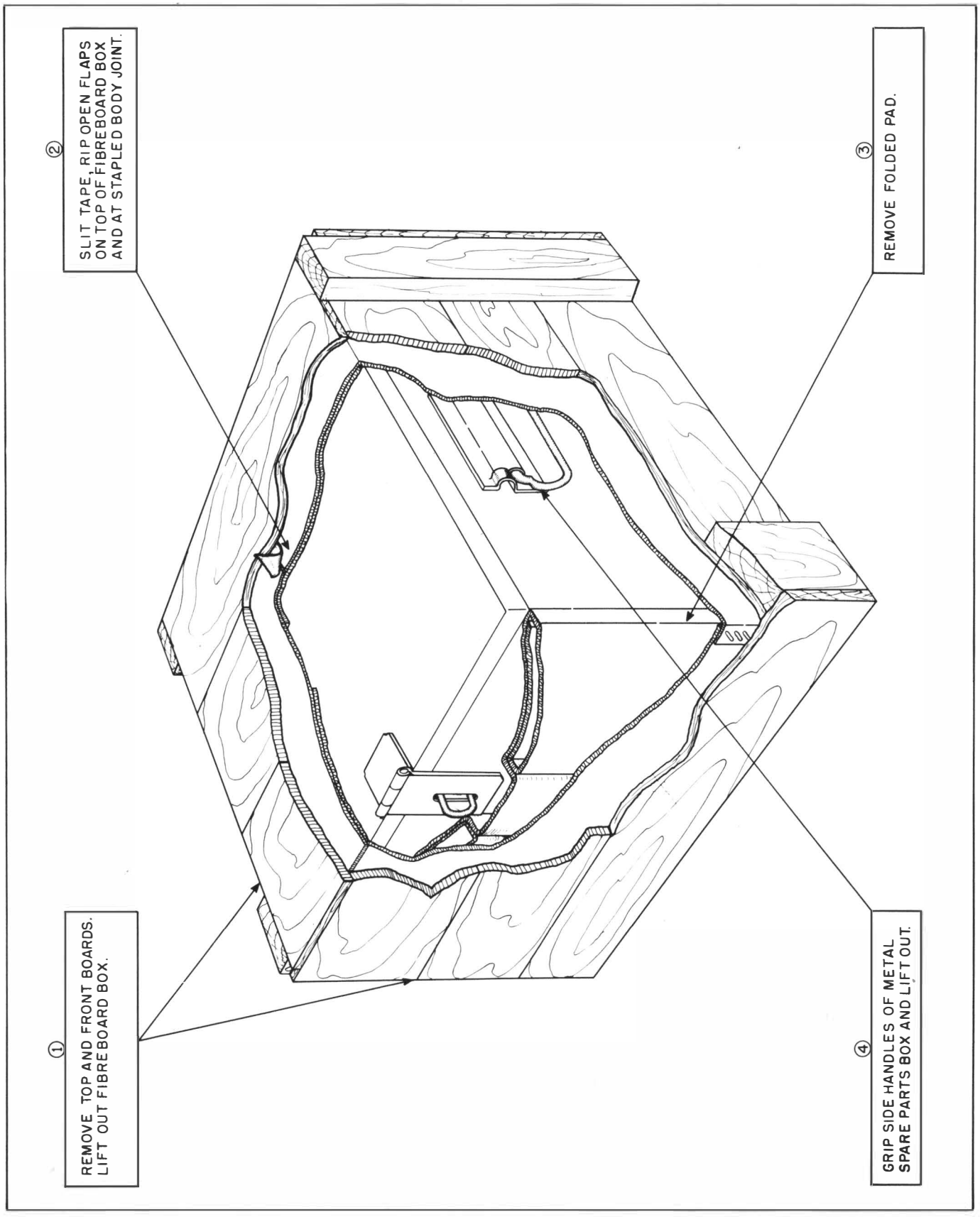
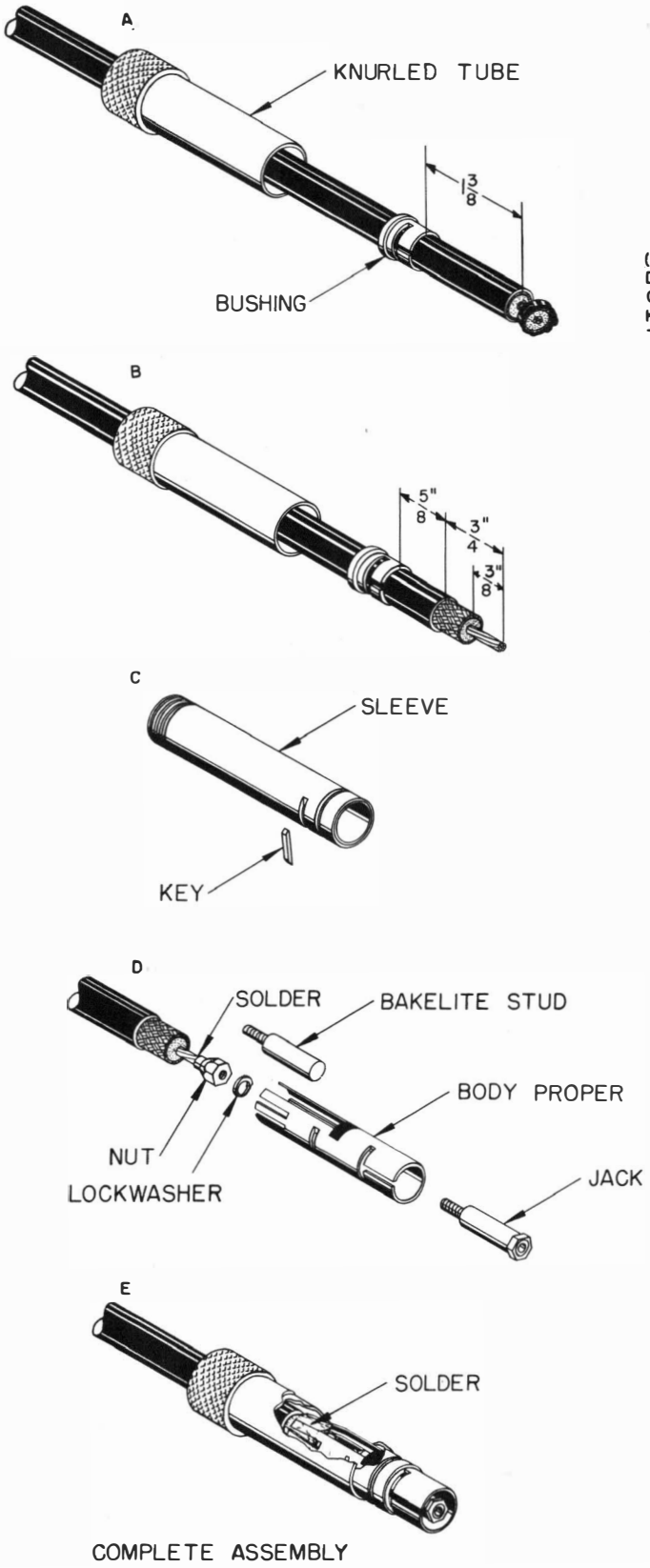


Figure 3-2. Radio Receiving Set AN/URR-21A, Unpacking Procedure for Spare Parts Box



(A)
DISASSEMBLE THE CONNECTOR BY UNSCREWING THE OUTER KNURLED TUBE FROM THE BODY. SLIDE THE KNURLED TUBE, TOGETHER WITH ITS BUSHING, OVER THE CABLE. SQUARE OFF THE END OF THE CABLE.

(B)
CUT THE OUTER JACKET OF THE CABLE 3/4" FROM THE END. BE CAREFUL NOT TO NICK THE COPPER BRAID UNDERNEATH. CUT COPPER BRAID AND INSULATION 3/8" FROM END. CLINCH BUSHING ONTO CABLE 5/8" FROM END OF OUTER JACKET.

(C)
DISASSEMBLE THE BODY BY PUSHING OUT THE KEY AND SLIDING THE BODY PROPER FROM THE SLEEVE.

(D)
REMOVE NUT FROM BODY PROPER AND SCREW ONTO # 6-32 BAKELITE STUD BEFORE SOLDERING INNER CONDUCTOR OF CABLE INTO UNIT OPENING.

(E)
REMOVE STUD AFTER SOLDERING SECURELY AND SCREW BODY PROPER BACK ONTO NUT. BEND BODY CONTACT PRONGS TO CONFORM WITH CABLE SHIELD AS SHOWN, AND SOLDER THROUGH SLOTS. REASSEMBLE CONNECTOR, SLIDING SLEEVE OVER BODY, THREADED END FIRST. REPLACE KEY SO THAT KNURLED TUBE WILL SLIDE OVER BODY, AND SCREW TUBE INTO PLACE.

Figure 3-3. Installation of N.T.49121A Connector on Cable RG-8/U

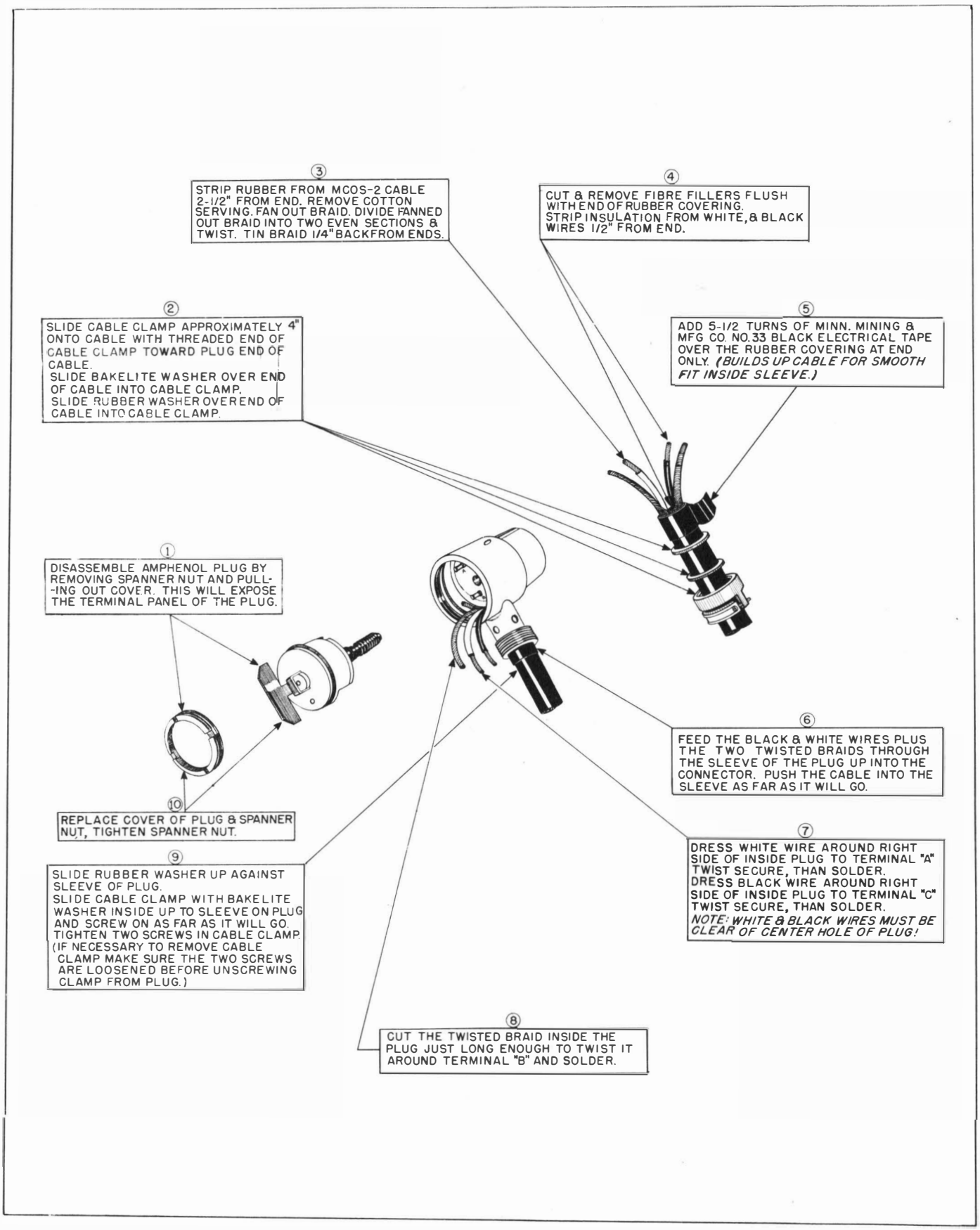


Figure 3-4. Installation of Connector P-301 on Power Cable

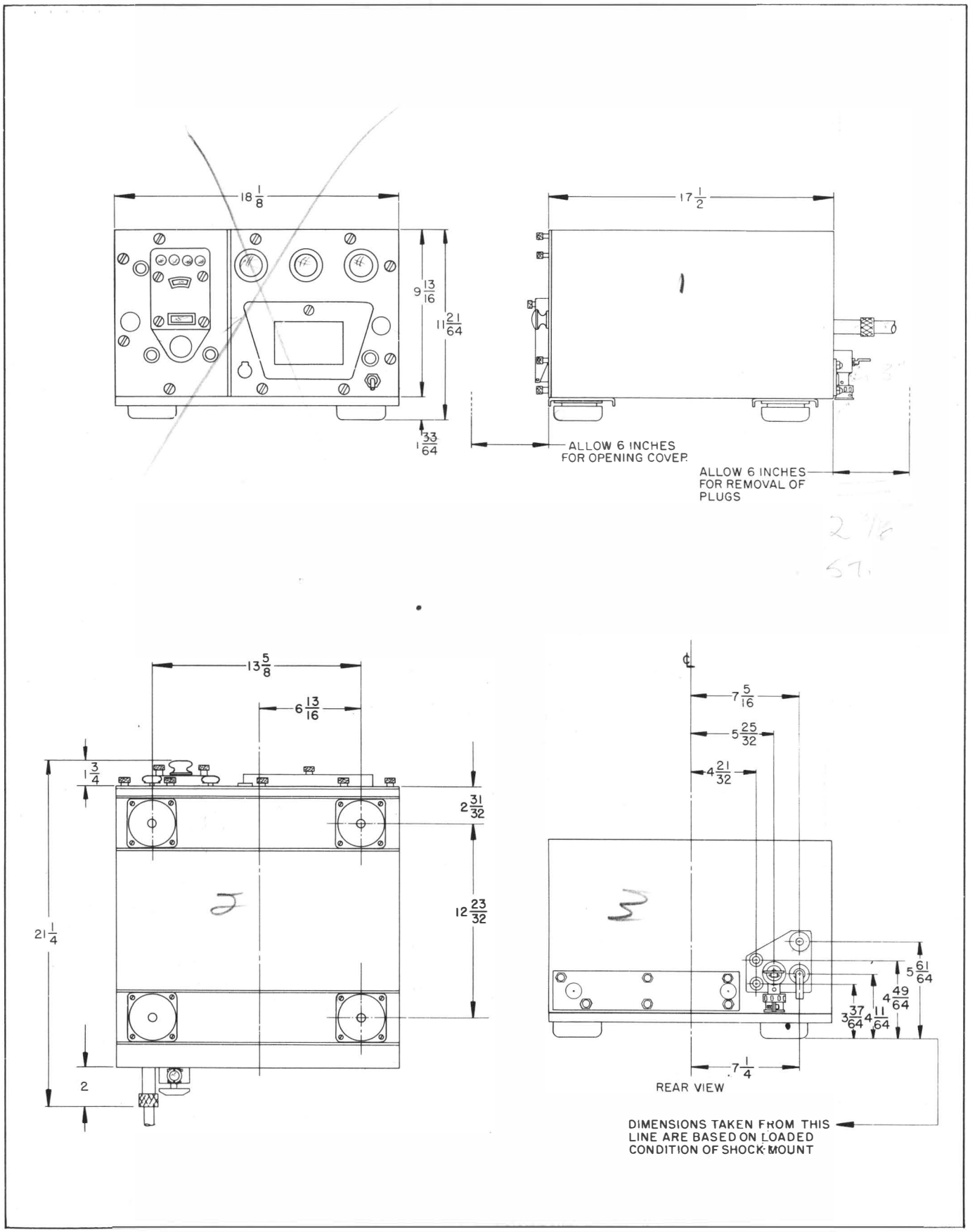


Figure 3-5. Radio Receiver R-432A/URR-21, Outline Drawing

SECTION 4
OPERATION

1. CAPABILITIES AND LIMITATIONS.

Radio Receiving Set AN/URR-21A will reproduce satisfactorily AM radio signals exceeding 5 microvolts signal strength at its antenna input terminals. The capabilities of the receiver with regard to sensitivity, selectivity, automatic volume control, and fidelity are shown in Figures 7-3, 7-4, 7-5 and 7-6.

Although the receiver dial is continuously calibrated, only four channels can be tuned within the frequency range at any one time because the frequency of the oscillator is controlled for four individually selectable crystals. Aside from this, there are no particular limitations on the performance or operation of the receiver.

2. OPERATING PROCEDURE.

a. Turn POWER switch to the ON position. The lamp above the switch will now light. Allow about half a minute for tubes to attain operating temperature.

b. Set CHANNEL switch to channel desired and rotate tuning knob until the channel indicator lamp lights. At this point a detent will catch and will be felt through the knob. The receiver is now tuned to the approximate frequency indicated by the main dial, and the dial can be locked, if desired, by turning the knob engraved DIAL LOCK clockwise until it stops. To unlock the dial reverse the above procedure.

c. Plug headphones into PHONES jack. Rotate AF GAIN control until signal is heard in headphones.

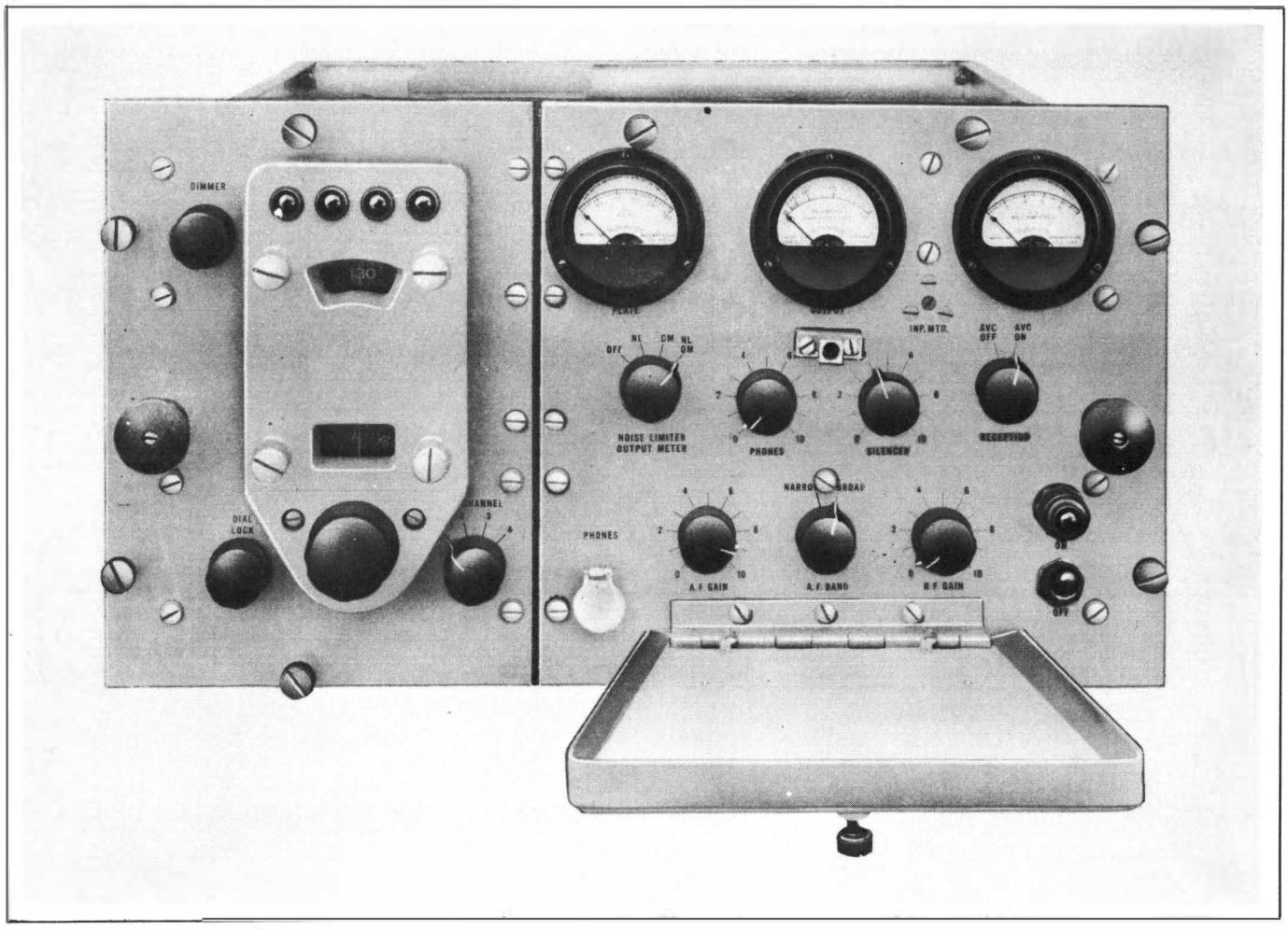


Figure 4-1. Radio Receiver R-432A/URR-21, Panel Controls

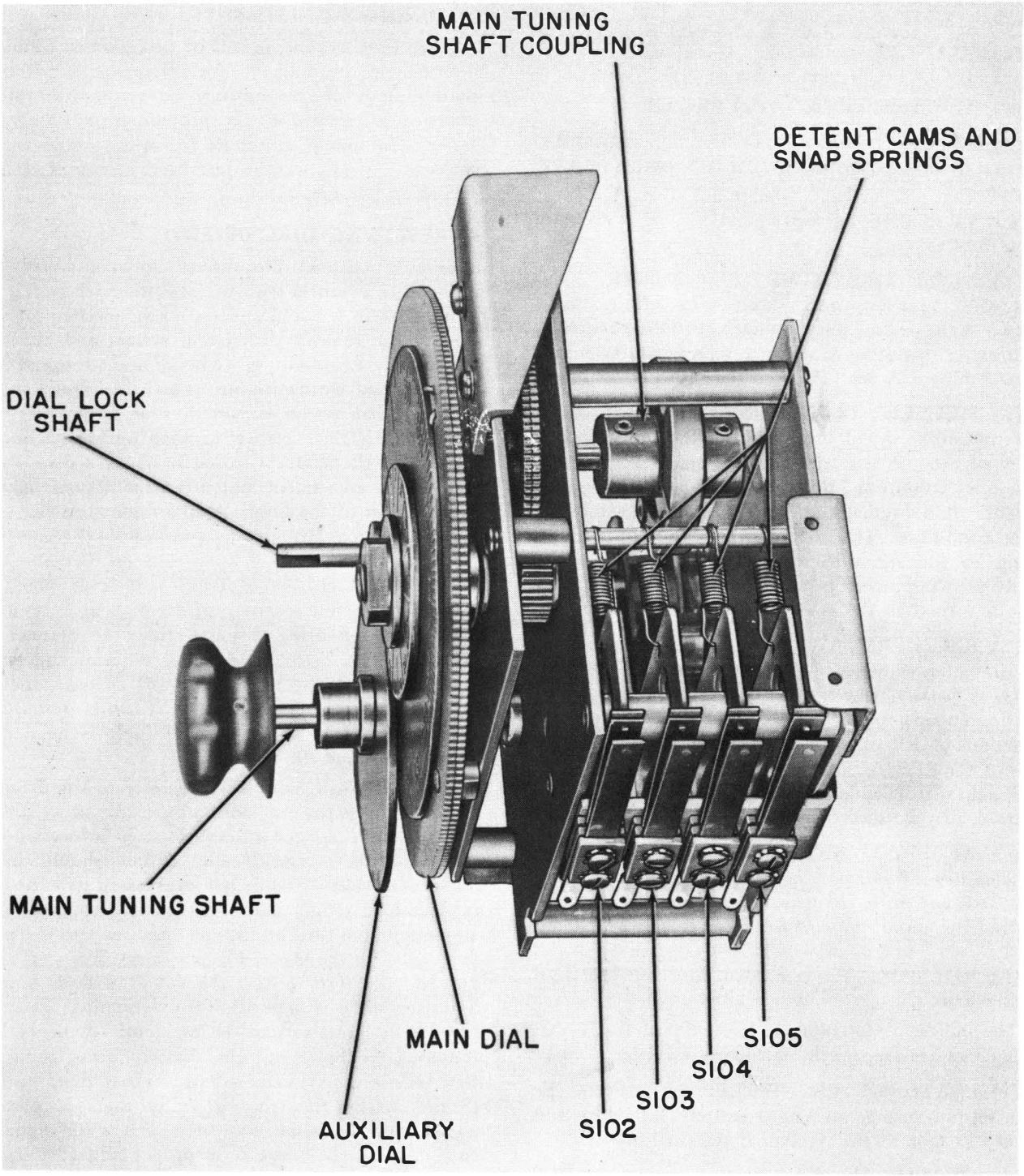


Figure 4-2. Dial Detent System Removed from Chassis

Headphone volume can be adjusted with the PHONES control.

d. For operation under normal conditions other controls will be set as follows:

(1) NOISE LIMITER/OUTPUT METER — OFF position.

(2) SILENCER—set at 0.

(3) RECEPTION switch—set at AVC ON.

(4) AF BAND switch—set at BROAD.

(5) RF GAIN control—position not critical because it is inoperative with RECEPTION switch in AVC ON position.

e. For other than normal operation, the above are used as follows:

(1) NOISE LIMITER/OUTPUT METER CONTROL.—NL position—noise limiter on to clip excessive transient noise peaks—output meter off. OM position—output meter operative to indicate relative audio output —noise limiter off. NL OM position—both operating.

(2) SILENCER CONTROL.—This control determines the audio signal level below which the receiver will be silenced. Noise adds to the signal level, so that under noisy conditions, the control should be advanced to silence at a higher audio output than usual under quieter conditions. The control should be adjusted according to the signal-to-noise ratio prevalent at the time. If silencing action is not desired, the RECEPTION switch is turned to the AVC OFF position.

(3) RECEPTION SWITCH.—This switch controls AVC and silencer action. When in the AVC OFF position (as is usually the case under noisy or other unusual operating conditions), it permits the operator to control the amount of RF signal applied to the IF amplifier by means of the RF GAIN control. In this way a very weak RF signal, which under normal conditions would not be passed, may be received.

(4) AF BAND SWITCH. — Under particularly noisy conditions this switch is set to the NARROW position so that any noise frequencies which would normally be within the audio range of the receiver will be filtered out.

(5) RF GAIN.—Set as needed. Clockwise rotation increases gain.

f. The indicating instruments at the top of the IF/AF chassis panel are used in the following manner:

(1) PLATE METER.—This should indicate the power supply voltage of approximately 190 volts and will read as soon as the receiver is switched on.

(2) OUTPUT METER.—This indicates the audio output of the receiver. A reading of 10 db indicates an output power of 60 mw. This meter will read in the last two positions (OM and NL OM) of the NOISE LIMITER/OUTPUT METER switch.

(3) INPUT METER.—This indicates the relative strength of the incoming signal, and should be set at zero with the IMP. MTR. screwdriver adjustment with the receiver operative and no signal. This meter will not indicate with the RECEPTION switch in the AVC OFF position.

3. TUNING ADJUSTMENTS.

From time to time, it will be necessary to change the location of the four channel frequencies within the tuning range of the receiver. To accomplish this, the operator is referred to *the procedures in Paragraph 4 below.* The tuning procedure for operation on the four channels already set has just been summarized in the preceding paragraphs.

4. RESETTING DIAL DETENTS.

Because channel frequencies are constantly being changed to conform with net operating schedules, operating personnel should understand the mechanical operation of the receiver dial detent system and be able to accomplish its resetting. General and sectional views of the detent mechanism are shown in Figures 4-2 and 4-3. The dial detents consist of four large cams which engage with their respective snap springs. These are secured to the shaft by Allen head set screws for the purpose of adjustment and driven at a speed equal to the rotation of the knob. At the same time the switch lever cams turn through a gear train with the same speed as the dial. The ratio of knob rotation to dial rotation is 13 to 1. Each one of the switch lever cams, once during a complete scanning of the dial, operates a lever which raises a spring clip and closes the channel lamp switch (S-102, S-103, S-104 or S-105). If the channel switch S-101 is also set at the same channel, the lamp will light. As the detent catches, it can be felt through the tuning knob, and additional force is necessary to move it through the setting.

Caution should be observed in setting the detents so as not to injure the mechanism. Especially make sure that each detent is engaged in its spring clip before loosening the adjusting screw. If any detent should become loosened accidently while not engaged in its spring clip, it should be retightened and the knob rotated until it engages. It can then be loosened and reset to the proper frequency. In the event the cam drops down, it will be necessary to turn it with the detent wrench until the adjusting screw is in position for tightening. The equipment is designed so that the oscillator frequency is determined by the crystal and two frequency multipliers that follow the crystal oscillator. These must be tuned to the correct frequency in order that the oscillator signal may reach the converter. The VHF signal circuits must also be tuned to the proper frequency in order to produce an intermediate frequency signal of 12 megacycles. Since there are only four crystals in the crystal holder at any one time, there are only four places on the dial where a signal can be received.

The equipment needed for resetting consists of a signal generator capable of generating a signal within the

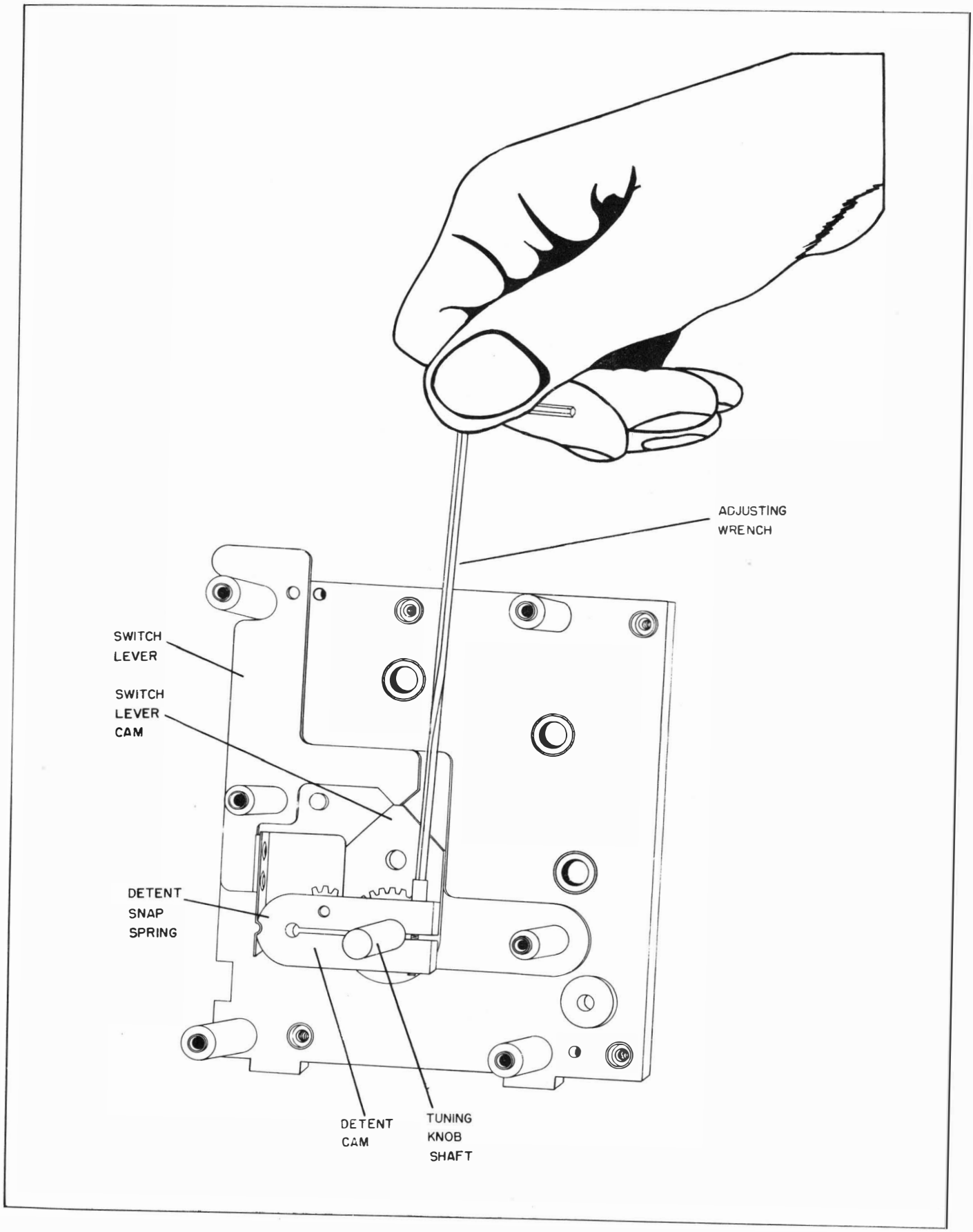


Figure 4-3. Cutaway Model Showing the Setting of One Detent Position

frequency range of the receiver, a 0-100 scale microammeter, and a dial detent wrench, which will be found clipped to the front of the converter compartment. After removing the receiver partially from its cabinet, remove the cover from the crystal holder and insert the desired crystals in ascending order according to frequency; that is, the lowest in frequency should be placed in the number one position. Connect the microammeter in the grid circuit of the converter tube, V-102, grounding the positive lead and inserting the negative lead in pin jack J-102. Connect the generator to antenna jack J-101, through a nominal 52 ohm coaxial line, grounding the low side and clipping the high side in the center hole of the jack.

Receiver settings are as follows:

(1) RECEPTION switch to AVC OFF.

(2) NOISE LIMITER/OUTPUT METER switch to OM.

(3) AF GAIN control 1 to 10.

(4) RF GAIN control to a reading of -5db on output meter. (This indicates the noise level and should not be exceeded.) To set the first detent turn the CHANNEL switch to number one position and rotate the tuning knob until lamp #1 lights. Detent one is then engaged and can be loosened with the detent wrench. The Allen head set screw will be on top of the shaft for easy access. It should be loosened until it is just free, one turn usually being enough. Tune the dial toward the approximate frequency desired and then rotate it carefully until a deflection is indicated on the microammeter. The amount of deflection is not critical; the fact that there is grid current indicates that a signal is being passed to the converter tube. Next tune the signal generator until a deflection shows on the output meter. Now alternately tune the signal generator and receiver very carefully until a maximum deflection is indicated on the output meter. The set is now tuned to the frequency desired. Lock the dial by turning the knob marked DIAL LOCK clockwise until it is tight; then tighten the detent carefully, using no more than a normal amount of pressure. It is now set. Unlock dial by turning dial lock counterclockwise to its stop and, if necessary, proceed to next detent, following the procedure just described.

5. REMOTE OPERATION.

When the RECEPTION switch is set at ON, the silencing circuits can be remotely controlled by an external switch connected between terminals A and F of cable assembly P-302.

SECTION 5

OPERATOR'S MAINTENANCE

1. ROUTINE CHECK.

Verify that the frequency values stamped on the crystals agree with those posted on the frequency schedule being used.

2. EMERGENCY MAINTENANCE.

NOTICE TO OPERATORS

Operators shall not perform any of the following emergency maintenance procedures without proper authorization.

a. REPLACEMENT OF TUBES AND FUSES.

(1) PROBABLE FUSE FAILURE.—Probable failure of either one or both of the power line fuses F-301 and F-302 is indicated when all of the dial lamps do not light and there is no indication on the B+ supply voltmeter M-203.

WARNING

Never replace these fuses with other of higher rating unless continued operation of equipment is more important than probable damage. If a fuse burns out immediately after replacement do not replace a second time until cause of burnout has been corrected. F-301 and F-302 are the only two fuses in the equipment. For their location see Figure 2-14.

(2) ELECTRON TUBES.—Failure of an electron tube in the receiver may reduce the sensitivity of the equipment to radio signals, produce intermittent operation, or cause the equipment to become completely inoperative. In such cases check all tubes in a standard tube checker such as tube tester TV-3U or equivalent or replace all tubes with those of proven quality. When any tube is tested, it should be tapped or jarred to make sure it has no loose internal connections or intermittent short circuits. When replacing tubes, make sure all retainers are in place to protect tubes against vibration.

When tube replacement becomes necessary substitution of new tubes may, in some cases, alter alignment of RF or IF amplifier circuits, inasmuch as the tube constants may differ slightly from those of the tubes previously employed. Need for realignment and alignment procedures are discussed in Section 7. Location of tubes is shown in Figure 5-1.

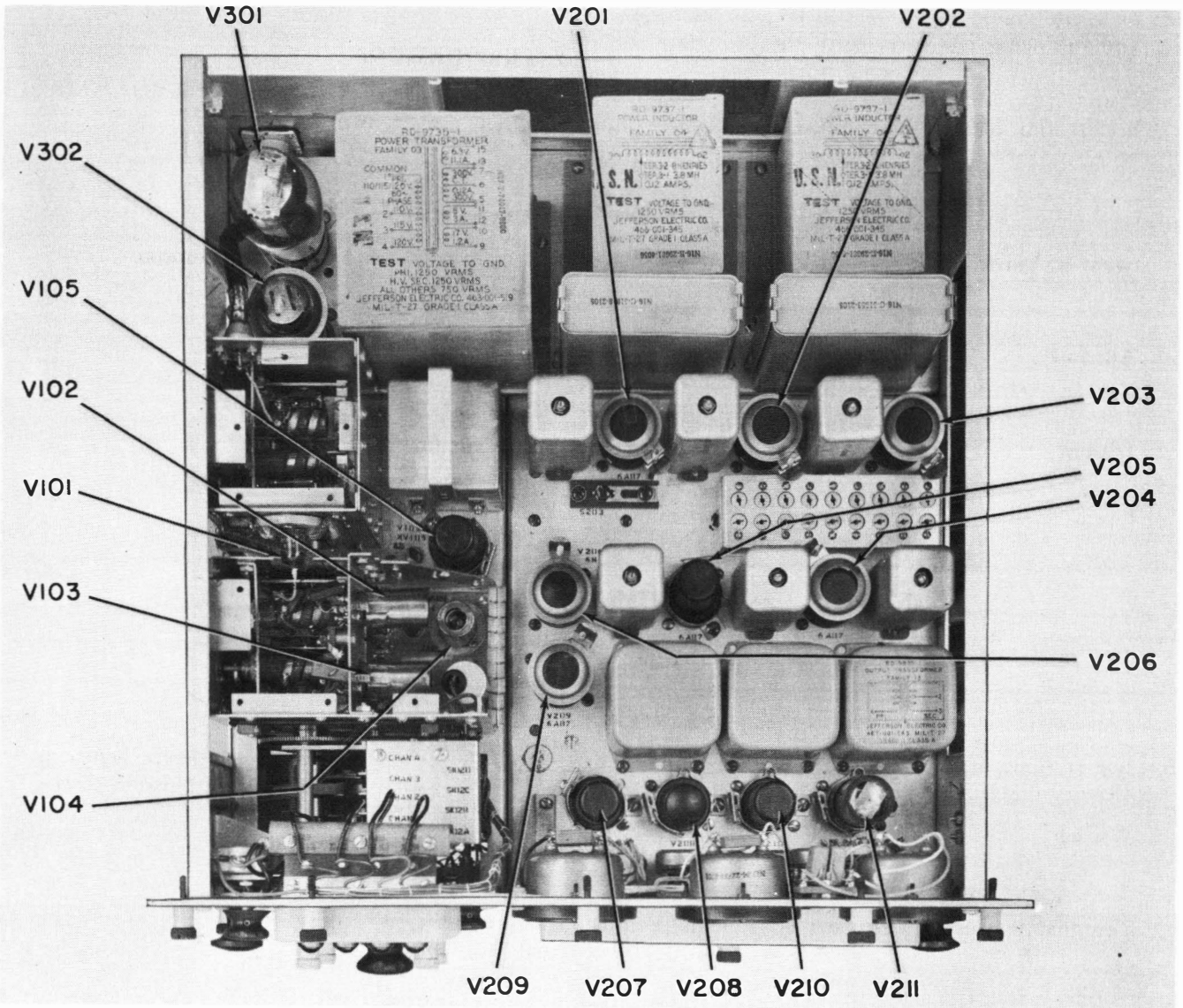


Figure 5-1. Radio Receiver R-432A/URR-21, Tube Locations

SECTION 6

PREVENTIVE MAINTENANCE

1. ROUTINE MAINTENANCE.

Periodic mechanical and electrical checks should be made to assure continuity of service at peak performance. The following table sets forth the procedure to follow:

NOTE

The attention of maintenance personnel is invited to the requirements of Chapter 67 of the *Bureau of Ships Manual* of the latest issue.

2. LUBRICATION.

No lubrication of Radio Receiver R-432A/URR-21 is required.

TABLE 6-1. ROUTINE MAINTENANCE CHECK CHART.

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
	WEEKLY	
1. Antenna	Inspect antenna to make sure that it is not damaged, grounded, or does not show signs of endangering personnel or structures.	
2. Lead-in	Inspect lead-in insulations and entry point for signs of possible grounding.	
3. Connections	Inspect all external connections for loose connection and signs of corrosion.	
	MONTHLY	
1. Sensitivity	Perform sensitivity checks as outlined in Section 7.	
	QUARTERLY	
Interior sections of Receiver	Remove receiver from cabinet.	Disconnect all power before performing the following checks.
1. Wiring	Inspect all wiring for signs of wear, broken or split insulation, discoloration due to overheating.	
2. Terminal Boards	Inspect all terminal boards for cracks, dirt, loose connections, and terminals for corrosion.	
3. Filter Capacitors	Inspect filter capacitors for leakage and bulging.	
4. Resistors & Capacitors	Inspect resistors and capacitors for blistering and discolorations due to overheating.	
5. Power Transformer	Inspect power transformer T-301 for excessive heating.	
6. Fuses	Inspect fuses and fuseholders for corrosion, cracks and lack of tension sufficient to insure good contact.	

TABLE 6-1. ROUTINE MAINTENANCE CHECK CHART—(Continued)

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
	QUARTERLY—(Continued)	
7. Switches	Inspect all switches for dirty or corroded contacts, cracked and broken insulation and loose connections.	
8. Mechanical Fittings	Inspect all mountings, screws, and nuts for looseness. Inspect moving parts for binding and wear.	
9. Variable Capacitors	Inspect variable capacitors for dirt and corrosion, broken and cracked insulations and loosened parts.	Extreme care to be taken so plates will not be bent or damaged as this will cause loss of sensitivity.
10. Detent Mechanism	Inspect for dirt, binding and wear.	
11. Tube Sockets	Check for dirty, corroded, broken or loose contacts.	

SECTION 7
CORRECTIVE MAINTENANCE

1. FAILURE REPORTS.

(Figure 7-1.)

2. THEORY OF LOCALIZATION.

The best method of corrective maintenance on Radio Receiver R-432A/URR-21 is systematic localization of a particular fault by visual, aural, and instrumental means. A preliminary inspection of fuses, tube illumination, and meter readings will, in many cases, localize the trouble to a particular circuit. Abnormal performance may also be detected by varying each panel control and listening in the headphones for intermittent or distorted signals. Finally, a definite location of the fault or faults may be made by instruments such as a tube checker and a volt-ohm-milliammeter. Actual readings may be checked against tabulated representative readings in this last method. All electron tubes should be checked before further investigation is attempted.

3. TROUBLE SHOOTING AND REPAIR.

Faults in the receiver can be divided into three types: (a) faults in the power supply section; (b) faults in the RF section; (c) faults in the IF/AF section. When the receiver is completely inoperative, the power supply section should obviously be checked first. If noise but no signal is coming through, either or both the RF and IF/AF sections are at fault; if a distorted signal is coming through, the AF section is probably faulty.

a. POWER SUPPLY.

(1) PILOT LAMPS FAIL TO LIGHT.

(a) Fuses F-301 and F-302 burned out.

(b) Check 6.3 volt winding of power transformer.

(c) Check lamps for burnouts.

(d) Open line filter choke or shorted line filter capacitor.

(2) LAMPS ILLUMINATED BUT NO VOLTMETER INDICATION.

(a) Open in B+ bus.

(b) Voltmeter faulty.

(c) High voltage secondary open.

(d) Faulty filter choke or capacitor.

b. and c. Trouble shooting of the RF and IF/AF sections can be accomplished in the same manner. Assuming that all tubes are found good, a socket voltage measurement and check against representative voltage charts as shown in Figures 7-8 and 7-10 should be tried next; and then a point-to-point resistance check should be made and compared with Figures 7-8 and 7-10. These two checks should be made in the order indicated if there is no clue to the faulty circuit. Signal tracing should then be tried.

It must be remembered that the data in Figures 7-8 and 7-10 will not always locate faults. An open circuited by-pass capacitor will not appear in point-to-point resistance measurements and may introduce regeneration or oscillation in certain circuits, which will affect the gain of other circuits which may be trouble-free. Similarly, a short circuit occurring in a low resistance inductor will not appear in point-to-point resistance tests, and if the short appears in an RF coil a false indication of need for alignment may result.

By-pass or filter capacitors which develop poor internal connections or become short-circuited may cause decreased sensitivity or poor stability. The defective unit

FAILURE REPORTS

A FAILURE REPORT must be filled out for the failure of any part of the equipment whether caused by defective or worn parts, improper operation, or external influences. It should be made on Failure Report, form NBS-383, which has been designed to simplify this requirement. The card must be filled out and forwarded to BUSHIPS in the franked envelope which is provided. Full instructions are to be found on each card.

Use great care in filling the card out to make certain it carries adequate information. For example, under "Circuit Symbol" use the proper circuit identification taken from the schematic drawings, such as T-803, in the case of a transformer, or R-207, for a resistor. Do not substitute brevity for clarity. Use the back of the card to completely describe the cause of failure and attach an extra piece of paper if necessary.

The purpose of this report is to inform BUSHIPS of the cause and rate of failures. The information is used by the Bureau in the design of future equipment and in the maintenance of adequate supplies to keep the present equipment going. The cards you send in, together with those from hundreds of other ships, furnish a store of information permitting the Bureau to keep in touch with the performance of the equipment of your ship and all other ships of the Navy.

This report is not a requisition. You must request the replacement of parts through your Officer-in-Charge in the usual manner.

Make certain you have a supply of Failure Report cards, and envelopes on board. They may be obtained from any Electronics Officer.

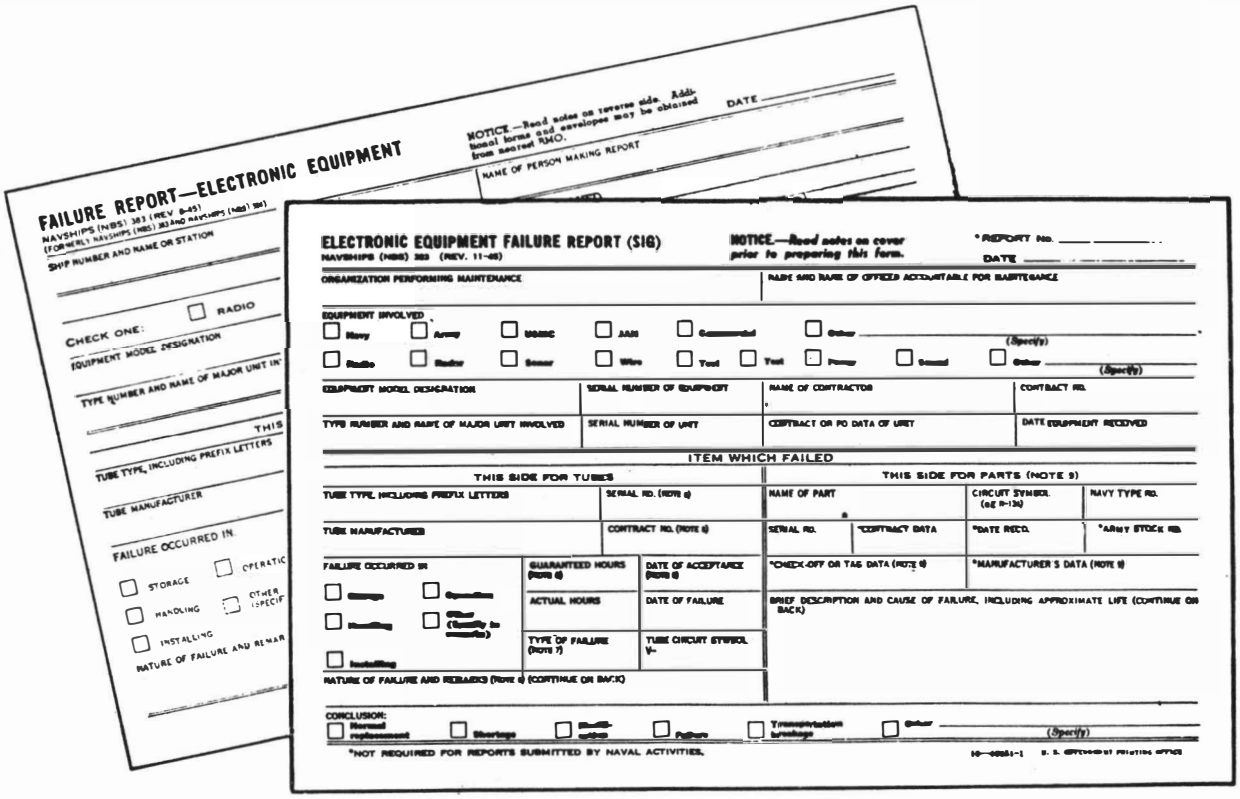


Figure 7-1. Failure Reports, Sample Form

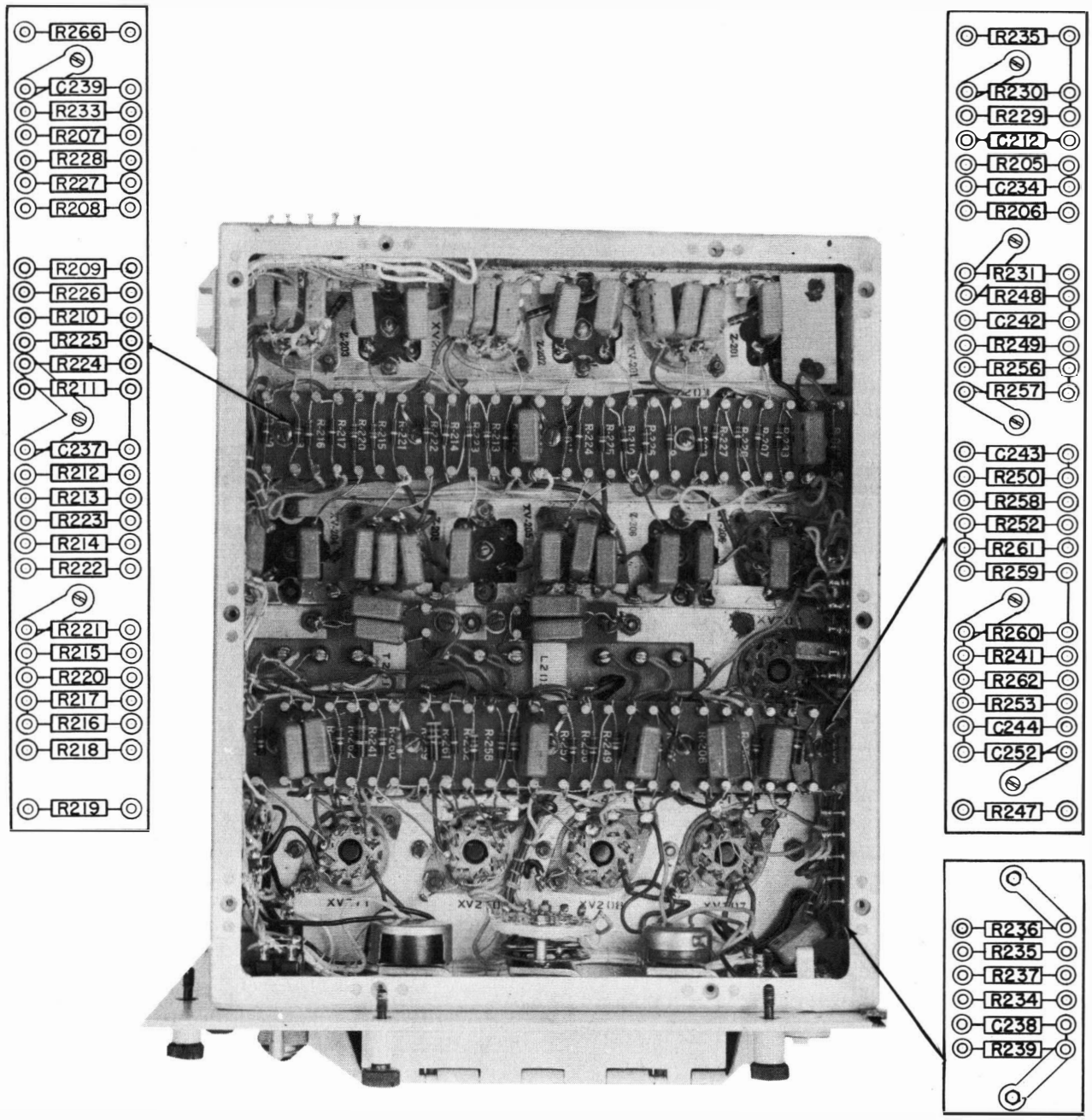


Figure 7-2. IF/AF Unit, Resistor and Capacitor Location Diagram

can generally be located by temporarily connecting a good capacitor across each one under suspicion.

Failures of any by-pass or filter capacitors may seriously overload resistors of associated circuits. Overloads of a sufficient magnitude to permanently damage a resistor will cause the painted surface of the resistor to become scorched, making the defective unit easy to locate by visual inspection.

Open or short-circuited resistors can be definitely located only by testing each resistor while it is disconnected from its particular circuit. Intermittent connections in resistors and other circuit elements that do not show up in point-to-point resistance tests may be located by tapping or shaking while the receiver is adjusted for normal operation.

4. ALIGNMENT.

If, after all faults have been corrected, the receiver still performs unsatisfactorily, it probably requires realignment. Alignment of Radio Receiver R-432A/URR-21 is accomplished in three distinct steps: (a) IF amplifier alignment; (b) oscillator-multiplier alignment; and (c) RF alignment. Since maximum indication on the output meter is the criterion of best alignment, circuits are aligned from the meter backwards in order. Equipment necessary for alignment consists of:

(1) A signal generator covering the ranges 12 megacycles and 115 to 156 megacycles. The test signal should be modulated 30% with a 1000 cycle tone. (Use RF Signal Generator Set AN/URM-250R26 Series for 12 mc; use RF Signal General Set AN/URM-26 Series for 114-156 mc.)

(2) A 0-1000 scale microammeter, such as Navy Type 60107.

(3) An alignment tool, symbol H-101 which will be found clipped to the left side brace just in back of the panel. (Figure 5-1.) NEVER USE ANY METAL ALIGNMENT TOOL. Before proceeding with alignment of the receiver, make the following preliminary preparations:

(1) Remove the receiver from its cabinet.

(2) Connect a 600 ohm pure resistance load across terminals B and D of output receptacle J-302.

(3) Set receiver controls as follows:

(a) S-205 (POWER) to ON.

(b) S-201 (RECEPTION) to AVC OFF.

(c) R-232 (RF GAIN) to 10.

(d) R-251 (AF GAIN) to 10.

(e) S-202 (NOISE LIMITER/OUTPUT METER) to OM.

a. IF AMPLIFIER ALIGNMENT.—The intermediate frequency of the receiver is 12 megacycles. IF transformer tuning is provided by adjustable powdered iron cores in the transformers. The alignment of the IF amplifier is very critical and should be checked following any circuit change, repair or tube replacement.

Remove cover from larger compartment of preselector unit and connect output lead of signal generator to grid terminal (#1) of mixer tube socket XV-102. Connect ground lead of generator to any adjacent metal part. Adjust the generator to 12 megacycles and regulate its output so that a deflection occurs on output meter. Beginning with the iron core in the secondary of Z-206, work backwards through the IF amplifier, adjusting each core so that a maximum deflection on the output meter is obtained. As alignment progresses, it will be necessary to reduce the RF and AF gain to keep the output meter deflection within the safe operating reading of 7 db. If adjustments begin to appear broad, generator signal level should be reduced to prevent overloading of the second detector and audio circuits. The last core to be adjusted is that in the primary of transformer Z-101. An alternate method of alignment is to use an electronic multimeter (such as Multimeter ME-25/U) as the visual indicating instrument. Connect the positive dc probe of the multimeter to the plate terminal of the noise limiter section (pin #5) of tube V-206, and the negative terminal to the chassis. Set multimeter on 1.5V dc scale. Adjust signal generator to 12 megacycles. Connect output lead of generator to grid terminal (#1) of mixer tube socket XV-102. Regulate generator output so that a deflection occurs on the upper two-thirds of the 1.5 volt scale of the multimeter. Beginning with the iron core in the secondary of Z-206, work backwards through the IF amplifier, adjusting each core so that a maximum deflection occurs on the multimeter. As alignment progresses, the scale on the multimeter will have to be changed because of the increasing gain of the circuits. If adjustments begin to appear broad, reduce generator output, keeping RF and AF gains at 10. The last core to be adjusted is that in the primary of transformer Z-101.

b. OSCILLATOR - MULTIPLIER ALIGNMENT. — The need for oscillator-multiplier alignment should be determined by the following procedure before any alignment is begun:

(1) Connect the 0-100 scale microammeter between ground and jack J-102 near the mixer tube V-102.

(2) Insert a crystal for 151.2 megacycles or the nearest frequency within ±2 megacycles of it in the number 4 crystal holder XY-104.

(3) Set channel switch to position 4.

(4) Rotate dial until detent number 4 is engaged and loosen detent locking screw on band 4.

(5) Tune the dial carefully to the channel frequency as marked on the crystal. The microammeter should read maximum grid current when the dial is tuned to within ±0.5 megacycle of the channel frequency. The grid current should be within the limits of 8-15 microamperes. If the grid current meter reads maximum when the dial is detuned more than 0.5 megacycle from the channel frequency, it indicates need for realignment of the multiplier circuits. The above

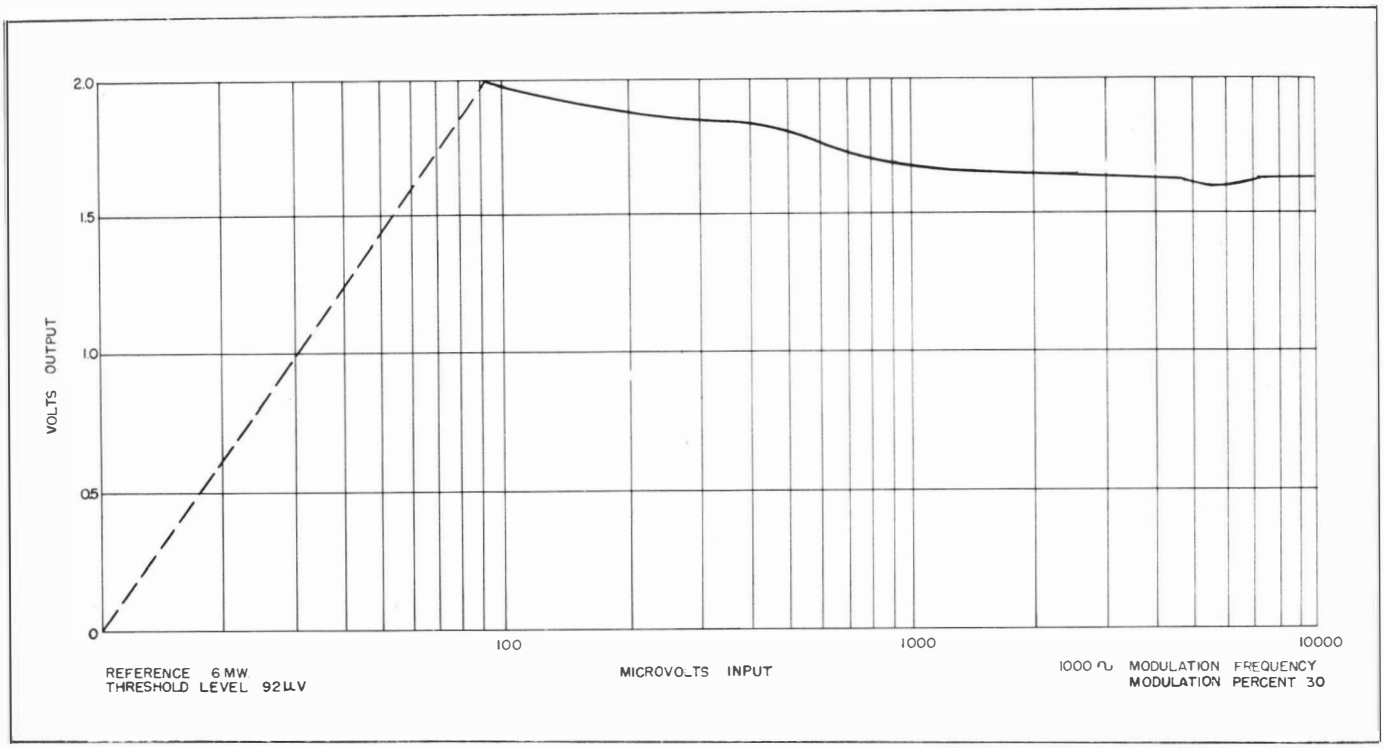


Figure 7-3. Radio Receiver R-432A/URR-21, AVC Curve

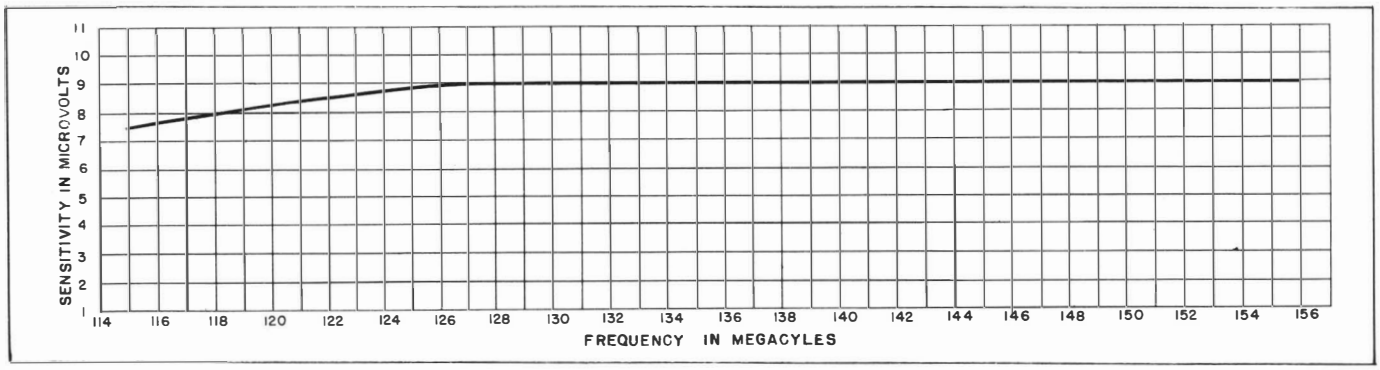


Figure 7-4. Radio Receiver R-432A/URR-21, Sensitivity Curve

procedure should also be repeated on channel 1 at the low end of the dial using a crystal frequency of 117.9 megacycles or one within ±2 megacycles of it.

If need for oscillator-multiplier alignment has been established, the following procedure should be followed:

(1) Connect the 0-1000 microammeter in the grid circuit of the oscillator tube V-105 by plugging the negative lead in J-104 and grounding the positive lead to the chassis.

(2) Plug crystal for 151.2 megacycles (or one within ±2 megacycles of it) into crystal holder number 4, XY-104.

(3) Turn CHANNEL switch to 4.

(4) Engage detent number 4 and loosen it with the detent wrench from in back of the panel.

(5) Tune dial carefully to channel frequency as marked on crystal and tighten the detent.

(6) Tune oscillator for maximum grid current by adjusting C-133. The milliammeter should read between 0.25 and 0.4 milliampere.

The latter value may sometimes be exceeded. The first mutliplier has its plate circuit tuned and is link-coupled to the grid circuit of the second multiplier.

Both circuits are adjustable by inductance and capacity trimming because they are extremely sharp in tuning; therefore, the utmost care should be used in their alignment. The first multiplier is aligned as follows:

(1) Plug the 0-100 scale microammeter into jack J-103 of the second multiplier grid circuit.

(2) Tune trimmers C-128 and C-125 so that maximum grid current (approximately 50 microamperes) flows.

(3) Plug a crystal whose marked frequency is near 117.9 megacycles on the number one crystal holder. If this frequency crystal is not available use one within ±2 megacycles of it.

(4) Set CHANNEL switch to position 1.

(5) Rotate dial until number one detent engages and loosen it with wrench.

(6) Tune dial to the frequency channel as shown on crystal and tighten detent.

(7) Carefully adjust core in transformer T-103 and then core in transformer T-104 until maximum grid current is indicated.

(8) Turn CHANNEL switch to position 4 and engage detent.

(9) Again check C-128 and C-125. Very little

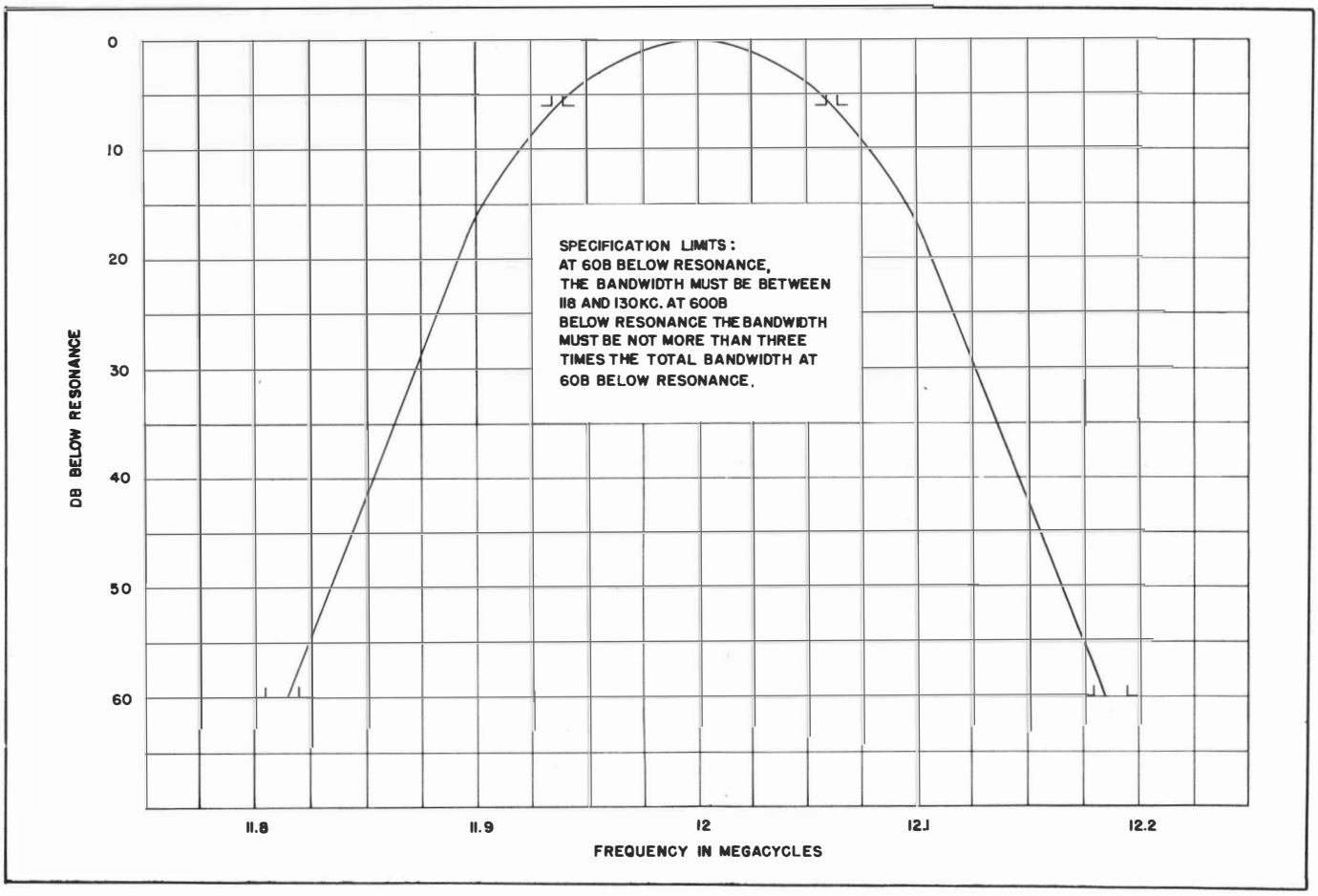


Figure 7-5. Radio Receiver R-432A/URR-21, Selectivity Curve

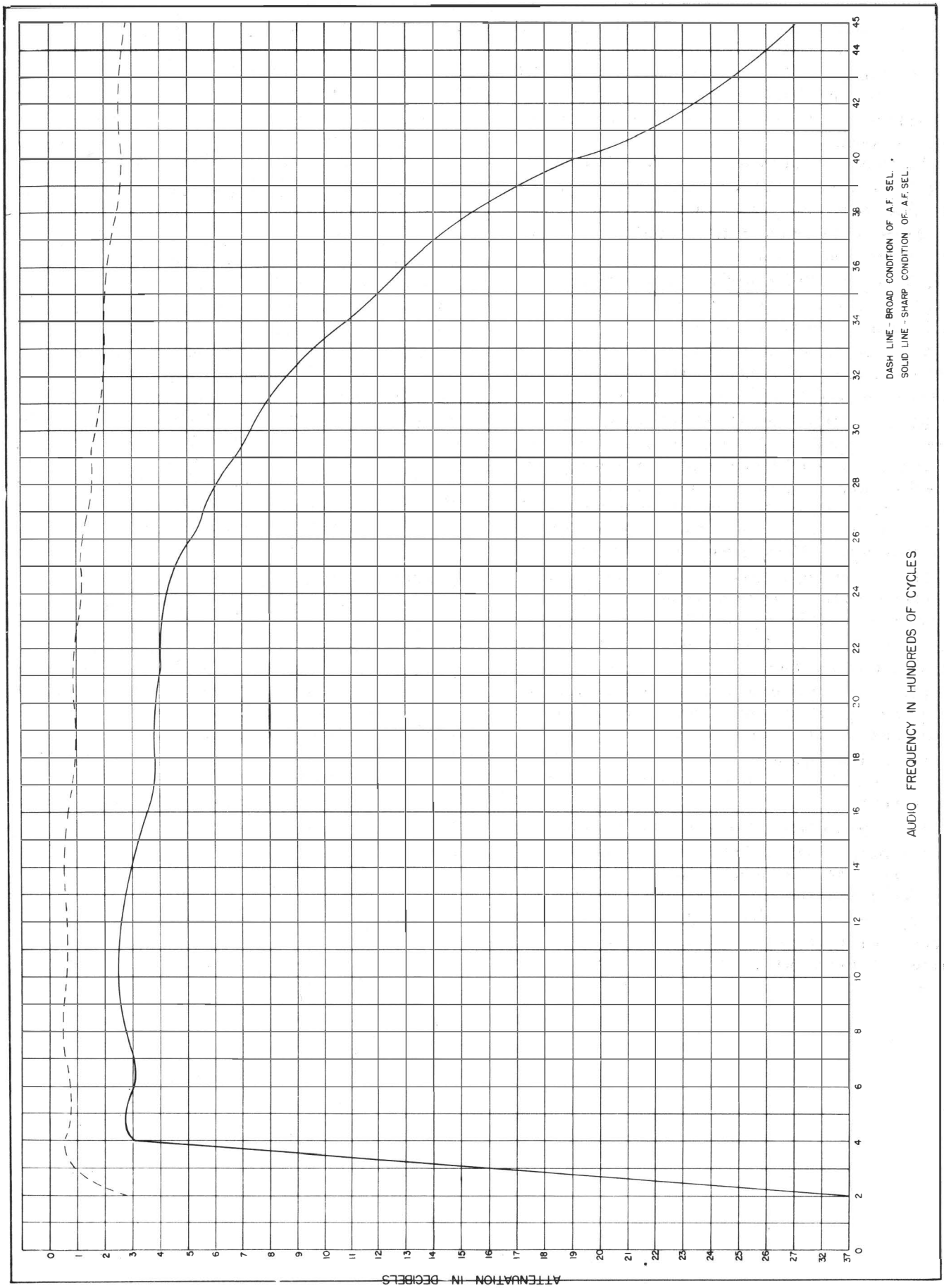


Figure 7-6. Radio Receiver R-432A/URR-21, Fidelity Curve

adjustment should be necessary and tuning should be done slowly and carefully.

(10) Change to channel number 1 and again check cores in T-103 and T-104.

(11) Repeat above until no more change in grid current is noted.

The second multiplier stage is aligned as follows:

(1) Insert the 0-100 scale microammeter in the mixer grid circuit, using jack J-102.

(2) Set CHANNEL switch to position 1 and engage number four detent.

(3) Tune C-119 for maximum grid current.

(4) Change to number 1 channel and tune iron core inductance trimmer in L-103.

(5) Check tuning of C-119 at high end (channel 4) of dial and of inductance trimmer at low end until no further increase in grid current is noted.

c. RF AMPLIFIER ALIGNMENT.—The alignment of the RF amplifier involves aligning the input and output circuits of the RF tube V-101. The signal generator will be needed and control settings remain the same as in the beginning of IF alignment except that the RF GAIN control is set at noise threshold (about -5 db on the output meter). The alignment is as follows:

(1) Connect signal generator to antenna input jack (50 ohm impedance) using a nominal 52 ohm signal generator or correcting for any other impedance output.

(2) Set CHANNEL switch on position 4 and engage detent number four.

(3) Tune signal generator to dial frequency and slowly rock generator until reading is indicated on output meter M-202 in the equipment.

(4) Adjust capacitors C-102, C-104 and C-114 in the order named until maximum reading is indicated on output meter.

(5) Repeat (3) and (4) on channel number 1.

(6) Adjust iron core inductance trimmers in T-101, L-102 and T-102 in numerical order until output meter deflection is maximum.

(7) Repeat above steps until no further increase in output is noted. This step may have to be carried out a number of times before the absolute maximum is reached.

5. SENSITIVITY MEASUREMENTS.

The sensitivity measurements listed below are made under the following conditions:

(1) Radio Receiver R-432A/URR-21 removed from cabinet; bottom cover plate of IF/AF unit removed.

(2) AN/URM-250R26 Signal Generator set at 12 megacycles; test signal modulated 30% at 1000 cycles.

(3) Output of signal generator connected to grid of stage measured through 0.001 mfd capacitor

(4) RECEPTION switch on AVC OFF. RF and AF GAIN controls at 10. NL OM switch on OM. AF BAND switch on WIDE.

The noise level will be high at the grid terminals of tubes V-102, V-201 and V-202; therefore, when measuring sensitivity at these points, adjust RF GAIN control R-232 so that with a 600 ohm load connected across terminals B and D of output receptacle J-302, the audio voltage, measured with Multimeter ME-25/U across terminals B and D is 0.19 volt ac with the modulation off, and 1.9 volts ac with the modulation on. These conditions represent a 10 db signal plus noise-to-noise ratio. The sensitivity of the rest of the tubes is measured under these same conditions except that the RF and AF GAIN controls are set at 10.

6. MECHANICAL ADJUSTMENTS.

In performing corrective maintenance on Radio Receiver R-432A/URR-21, it may sometimes be necessary to replace components such as switches and variable resistors which are mounted on the panel by means of shaft nuts. Before removing these, it is necessary to take off the control knobs, which are held on the shafts by ±8 Allen head set screws. A special wrench symbol H-201, for loosening these will be found clipped to the right side brace just in back of the panel.

Adjustment of trimmer capacitors and slugs is accomplished by an aligning tool, as mentioned in Section 7, paragraph 4(4). Adjustment of the detent system is accomplished by a detent wrench symbol H-102, as explained in Section 4, paragraph 4.

7. COMPONENT CHARACTERISTICS.

a. ELECTRON TUBES. *(Tables 7-2 and 7-3.)*

b. WINDING DATA. *(Table 7-5.)*

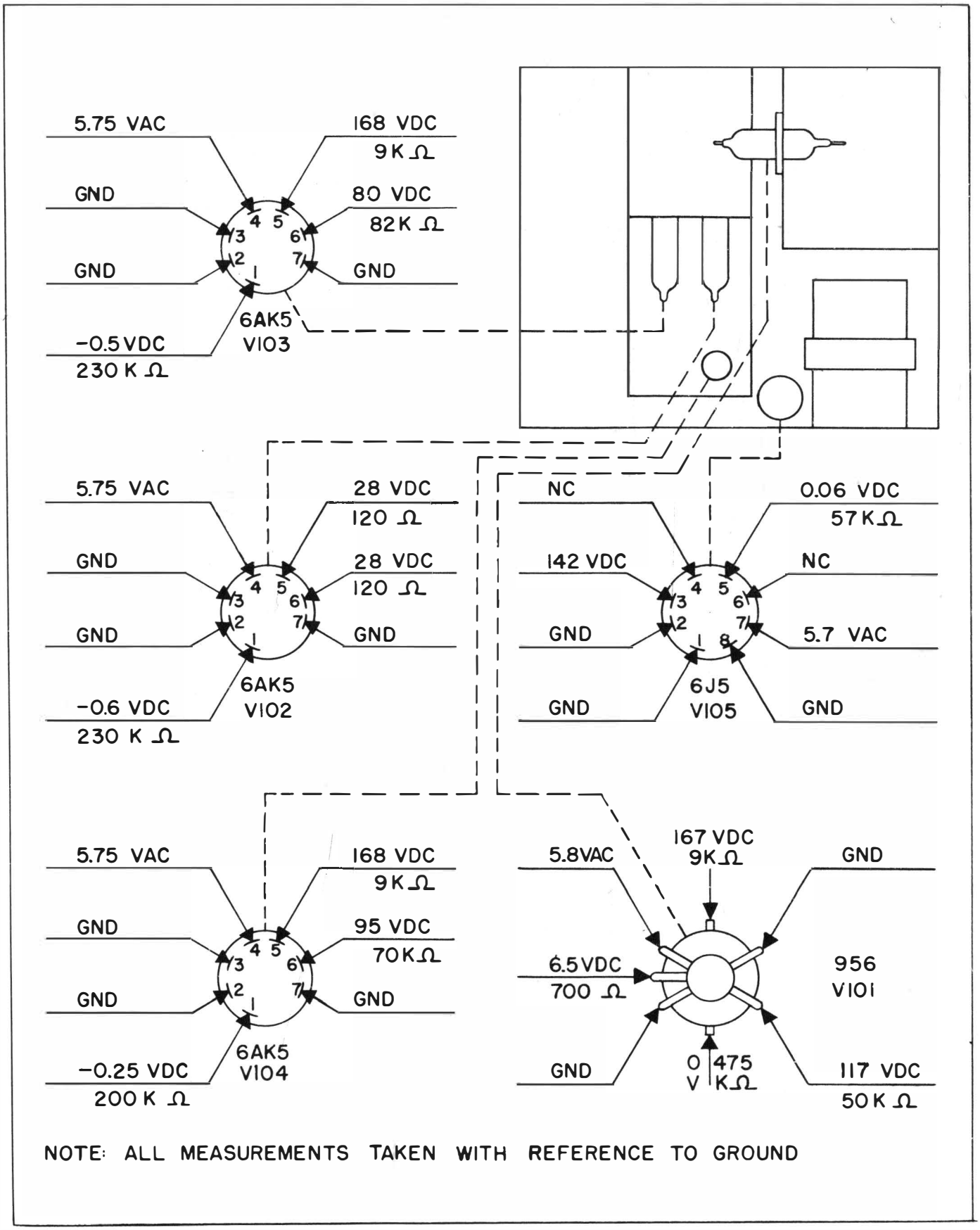


Figure 7-7. Preselector Unit, Voltage and Resistance Chart

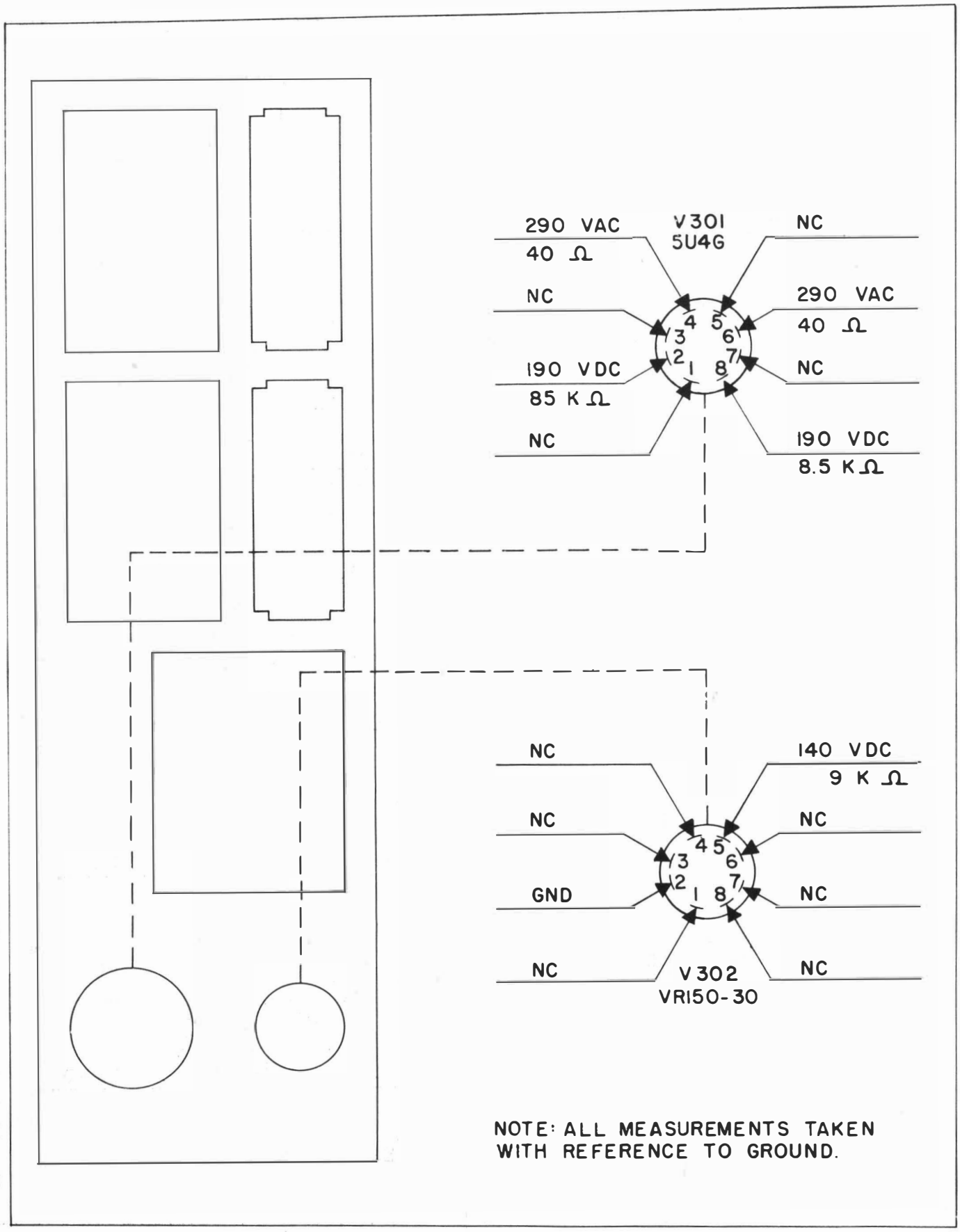


Figure 7-8. Power Supply Unit, Voltage and Resistance Chart

TABLE 7-1. TROUBLE SHOOTING CHART.

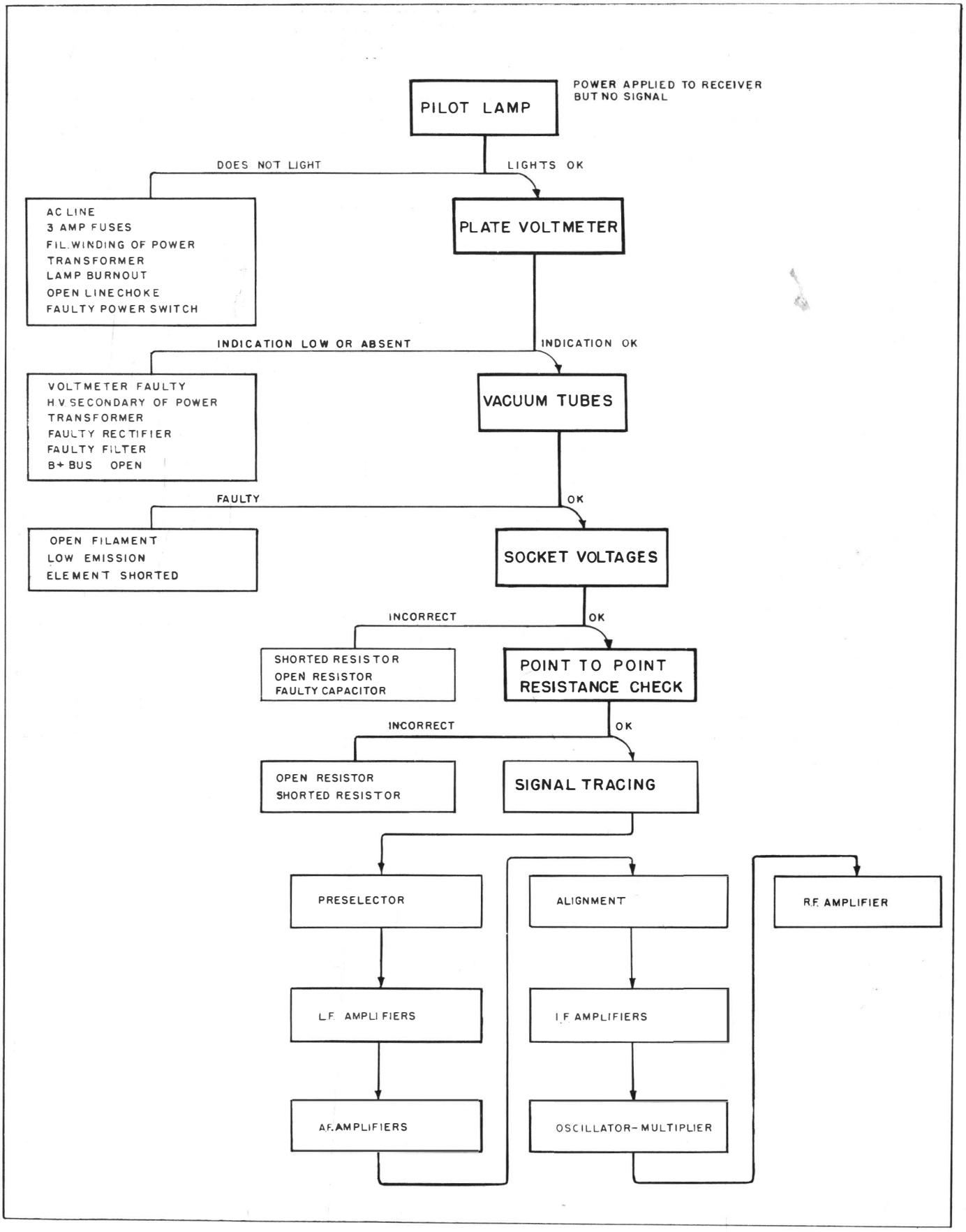


TABLE 7-2. TUBE OPERATING VOLTAGES AND CURRENTS

TUBE TYPE	FUNCTION	PLATE (V)	PLATE (MA)	SCREEN (V)	SCREEN (MA)	SUPP. (V)	CATH. (V)	GRID (V)	HEATER (VXA-C)
956	RF Amp.	167		117		Gnd	Gnd	0	5.8
6AK5	1st Mult.	168		95		Gnd	Gnd	0.25	5.75
6AK5	2nd Mult.	168		80		Gnd	Gnd	0.5	5.75
6AK5	Mixer	28		28		Gnd	Gnd	0.6	5.75
6J5	Osc.	142					Gnd	0.06	5.7
6AB7	1st IF	167		162		Gnd	4.7	0	5.75
6AB7	2nd IF	167		148		Gnd	4.7	0	5.7
6AB7	3rd IF	167		162		Gnd	4.7	0	5.75
6AB7	4th IF	157		137		Gnd	1.7	0	5.75
6AB7	5th IF	160		137		Gnd	1.4	0	5.75
6H6	2nd Det. & Anl.	-0.2 (NL.) -0.6 (Det.)					0.2(NL) Gnd (Det)		5.6
6AB7	1st AF	40		40		40	0.05	0.2	5.65
6AB7	Sil. Amp.	24		0		Gnd	0.05	0.2	5.65
6H6	Sil. Diode	85*					85		5.65
6AB7	2nd AF	24		27		Gnd	1.75	0	5.65
6V6GT	Output Amp.	155		152		6.8	68	0	5.65
5U4G	Rectifier	290							190 DC 5 AC
VR150	Volt. Regulator	140					Gnd		

* Only one plate and cathode connected, other plate and cathode grounded.

TABLE 7-3. TUBE CHARACTERISTICS.

TUBE TYPE	FILAMENT VOLTAGE (V)	FILAMENT CURRENT (A)	PLATE VOLTAGE (V)	GRID BIAS (V)	SCREEN VOLTAGE (V)	PLATE CURRENT (MA)	SCREEN CURRENT (MA)	A. C. PLATE RESISTANCE (OHMS)	VOLTAGE AMPLIFICATION FACTOR (MU)	TRANSCONDUCTANCE (MICROMHOS		EMISSION	
										NORMAL	MINIMUM	IS (MA)	TEST VOLT
956	6.3	0.15	250	−3	100	5.5	1.8	800,000	1440	1800	1300	20	15
6AK5	6.3	0.175	180	−2	120	7.7	2.4	500,000	2650	5100	4300	10	5
6J5	6.3	0.3	250	−9	—	9	—	6,700	20	3000	2600	40	30
6AB7	6.3	0.45	300	−3	300	12.5	3.2	700,000	3500	5000		65	20
6H6	6.3	0.3										15	20
6V6GT	6.3	0.45	315	−13	225	35	6	80,000	300	4100	3700	100	30
5U4G	5.0	3.0										*225	*75

* Each Diode.

TABLE 7-4. SENSITIVITY MEASUREMENTS.

TERMINAL	IF SENSITIVITY, MICROVOLTS*
V-102 Grid (Pin #1)	9
V-201 Grid (Pin #4)	16
V-202 Grid (Pin #4)	13
V-203 Grid (Pin #4)	132
V-204 Grid (Pin #4)	1250
V-205 Grid (Pin #4)	12000

* Measurements may vary within p/m 20%.

TABLE 7-5. WINDING DATA

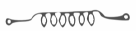
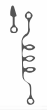
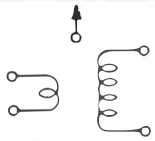
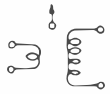
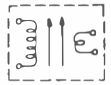
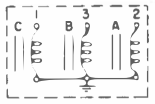
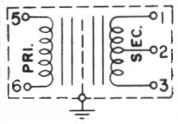
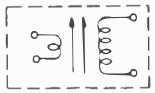
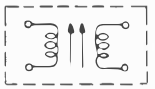
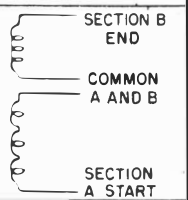
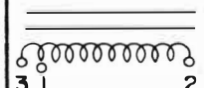
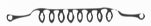
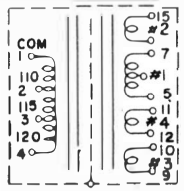
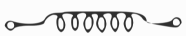
SYMBOL DESIG.	MFR'S PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	DC RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
L-101	RD-11318-2		Single Layer Close Wound	#20	15	0.028 ±10%		500	L=1.18 microhenries ±10% @ 7.9 mc Q=126 ±5% @ 7.9 mc
L-102, L-103	RD-11886-2		Single	0.010" x 0.156" Copper Strip	2 2	0.00196 0.0025		500	
L-104	RD-11890-2		Single Layer Close Wound	±24 Formvar	14½	0.048		500	L=1.98 microhenries
T-101	RD-11882-2		Primary Secondary	#24 (Plastic Insul.) 0.010" x 0.156"	2 2	0.0107 0.00196		500 500	
T-102	RD-11884-2		Primary Secondary	#26SSE 0.010" x 0.156" Copper Strip	6 2	0.0416 0.00196		500 500	
T-103, T-104	RD-11888-2		Primary Secondary	#24 Form V #24 Form V	2 4½	0.008 0.019		500 500	L=0.127 microhenries (pri.) L=0.340 microhenries (sec.)
Z-101	RD-10833-1		Primary Secondary	#26E #26E	8 2			500 500	Nominal Frequency 12 mc
L-201	RD-9837-1		C A B	#37E #37E #37E	2250 2250 1600	255 255 170		500	Inductances: 1-4, 2.8h ±7.5% 2-4, 2.8h ±7.5% 3-4, 1.4h ±7.5%
L-202	RD-9839-1		B A	#34E #34E	1700 1700	95 95		500	Terms. 1-3, 0.8h Terms. 2-3, 0.8h DC through L-201 and L-202=0.0A
T-201	RD-9835-1		Primary Secondary	#34E #25E	1500 82	115 0.5	18.3 to 1	500 500	Max. pri. dc current 30 ma. Term. #2 (CT) grounded. Pri. impedance 30 ohms, sec. impedance 10,000 ohms

TABLE 7-5. WINDING DATA — (Continued)

SYMBOL DESIG.	MFR'S PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	DC RES. IN OHMS	IMPED-ANCE RATIO	HIPOT AC VOLTS	REMARKS
Z-201	RD-10833-1		Primary Secondary	#26E #26E	7¼ 2	0.5 0.14		500	Nominal frequency 12 mc.
Z-202, Z-203, Z-204, Z-205	RD-11344-1		Primary Secondary	#26 #26	7¼ 7¼	0.5 0.5		500	Bandwidths; -6 db - 118 - 130 kc; -60 db - 354 - 390 kc Nominal Frequency 12 mc
L-301, L-304	RD-9738-1		Section A-3 pie univ. Section B-Single Layer Close Wound	#22 SCE #22 SCE	49 per pie	0.07 ±10% 0.014 ±10%		500	Inductance 620 microhenries Inductance 17 microhenries
L-302, L-303	RD-9737-1		Single			110		1250	Inductance 8.0 h tap at 3.8 mh (ter. 1 & 3)
L-305	RD-9740-1		Single Close Wound	#26SNE	47	0.015 ±5%		500	Inductance 3.75 microhenries @ 7.9 mc Q=95 ± 5 @ 7.9 mc
T-301	RD-9734-2		Primary Sec. #1 Sec. #2 Sec. #3 Sec. #4	#18E #31E 2X#14E DCC #20E #16E	218 1130 12 32½ 9½	1.15 98 0.015 0.33 0.04		1250 1250 750 750 750	110/115/120V 60 cps tapped at 241.5 & 251.5 turns 275 v.c.t. 0.12 amp 6.3V 11.1 amp 17V 1.2 amp 5V, 3 amp
L-305, L-306	RD-9740-1		Single	#26 SNE	47	0.015 ±5%		250	Inductance 3.75 microhenries ±5% @ 7.9 mc

WIRE TABLE (REF)	
COLOR	TYPE NUMBER
ORANGE	SRIR-1(7)-20U33
BLACK	SRIR-1 1/2 (7)-8U00
BROWN	SRIR-1 1/2 (7)-8U11
RED	SRIR-1 (7)-20U22
GREEN	SRIR-1 (7)-20U55
BLUE	SRIR-1 (7)-20U66
WHITE	SRIR-1 (7)-20U99
NONE	BARE, TINNED, SOLID NO. 18 (A.W.G.) COPPER BUS WIRE.
NONE	BARE, TINNED, SOLID NO. 16 (A.W.G.) COPPER BUS WIRE.
NONE	STRAP-.156 X .010 THK. COPPER, SILVER PLATE
YELLOW	SRIR-1 (7)-20U44

ALL UNDESIGNATED LEADS ARE NO. 18 BUS, NO. 16 BUS AND STRAP ARE SO NOTED.

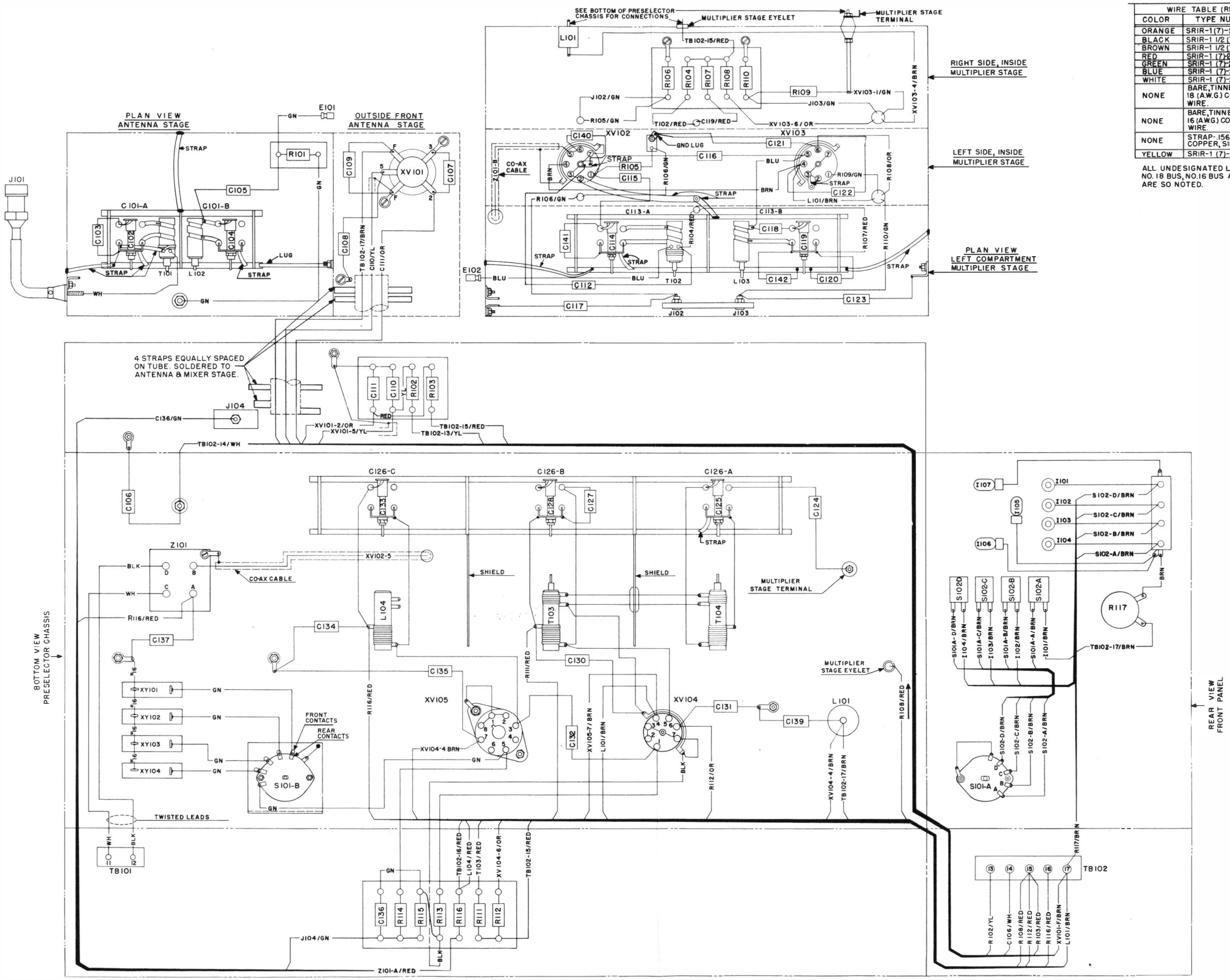
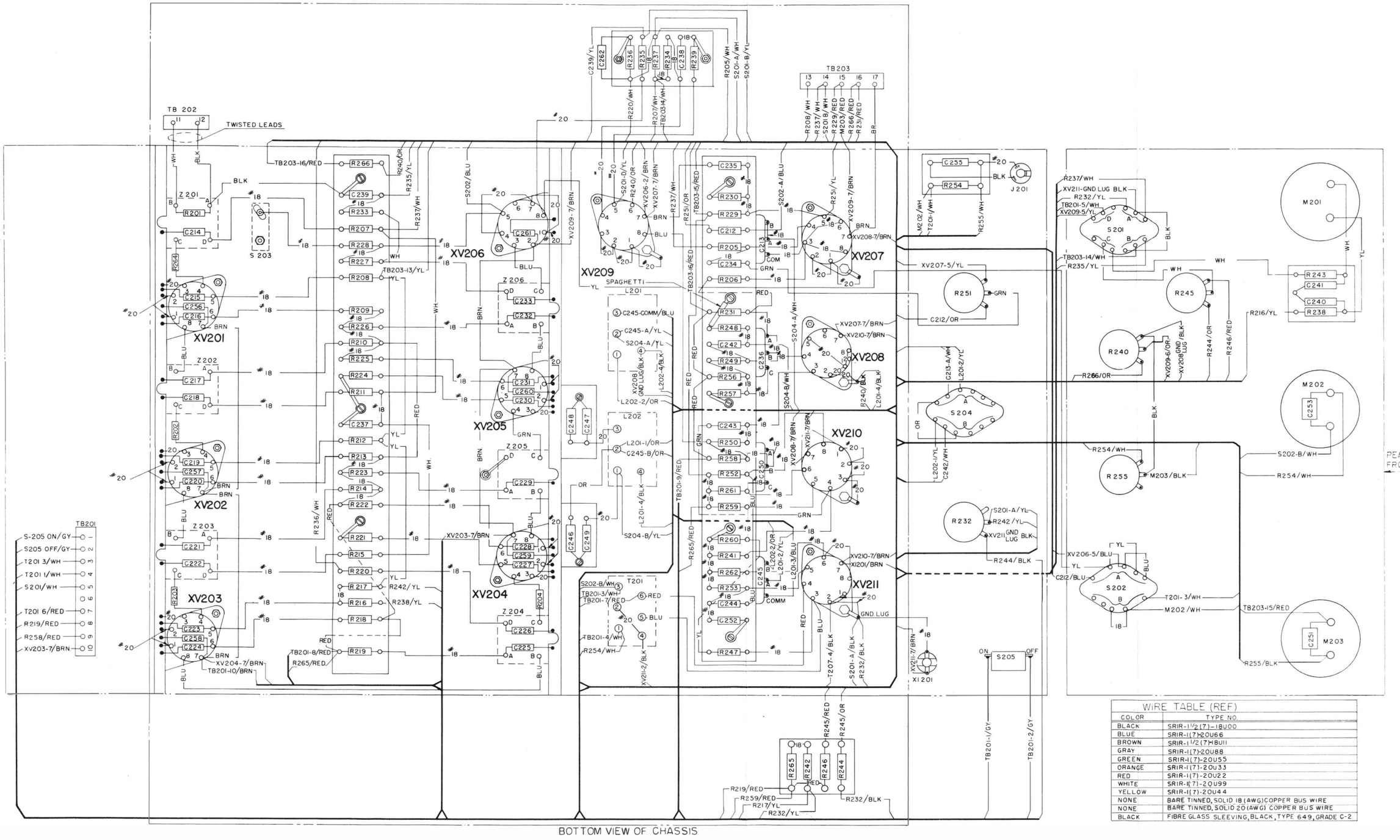
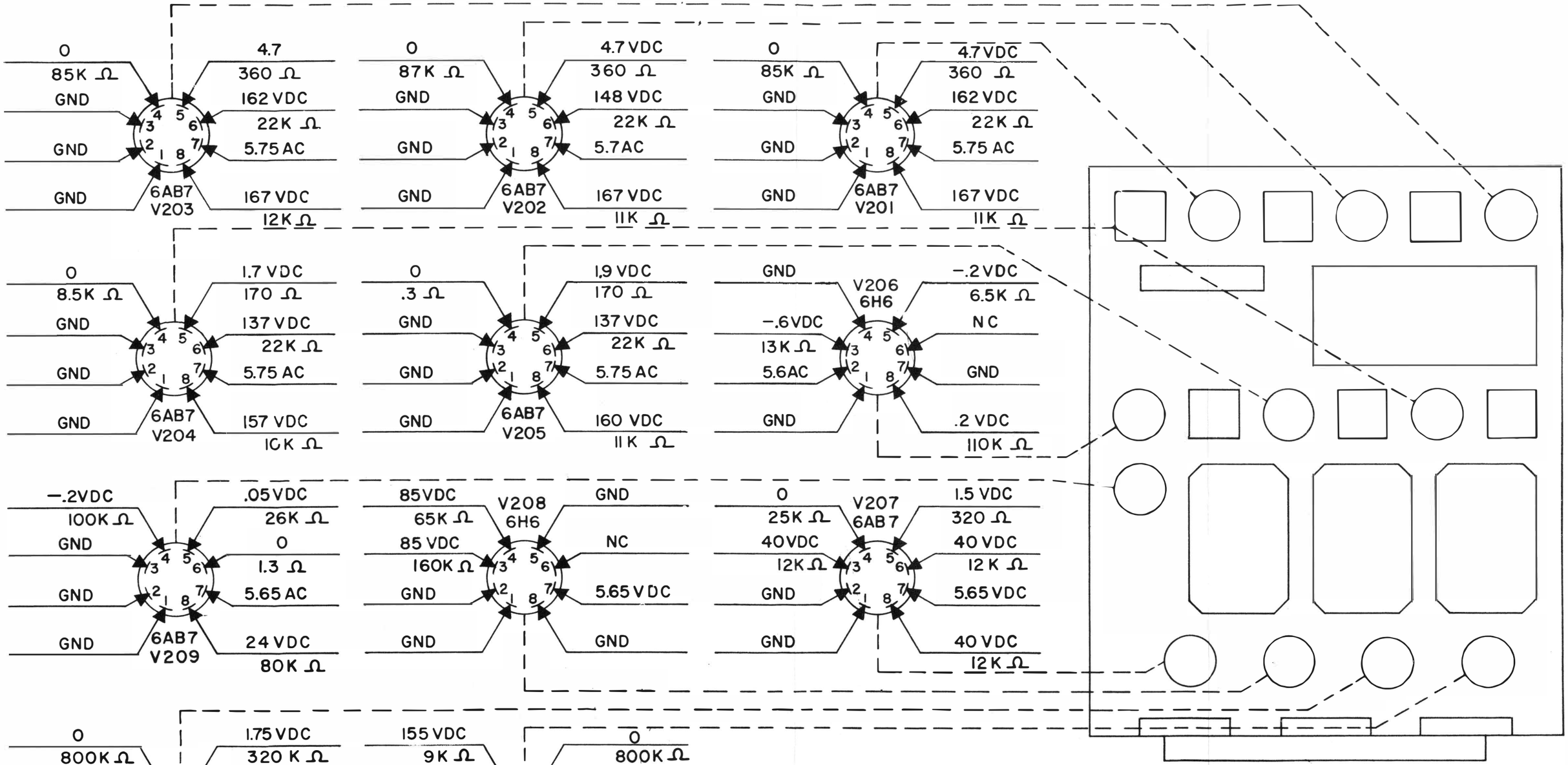


Figure 7-9. Preselector Unit, Wiring Diagram



WIRE TABLE (REF)	
COLOR	TYPE NO.
BLACK	SRIR-I 1/2(7)-18U00
BLUE	SRIR-I(7)20U66
BROWN	SRIR-I 1/2(7)18U11
GRAY	SRIR-I(7)20U88
GREEN	SRIR-I(7)-20U55
ORANGE	SRIR-I(7)-20U33
RED	SRIR-I(7)-20U22
WHITE	SRIR-I(7)-20U99
YELLOW	SRIR-I(7)-20U44
NONE	BARE TINNED, SOLID 18 (AWG) COPPER BUS WIRE
NONE	BARE TINNED, SOLID 20 (AWG) COPPER BUS WIRE
BLACK	FIBRE GLASS SLEEVING, BLACK, TYPE 649, GRADE C-2

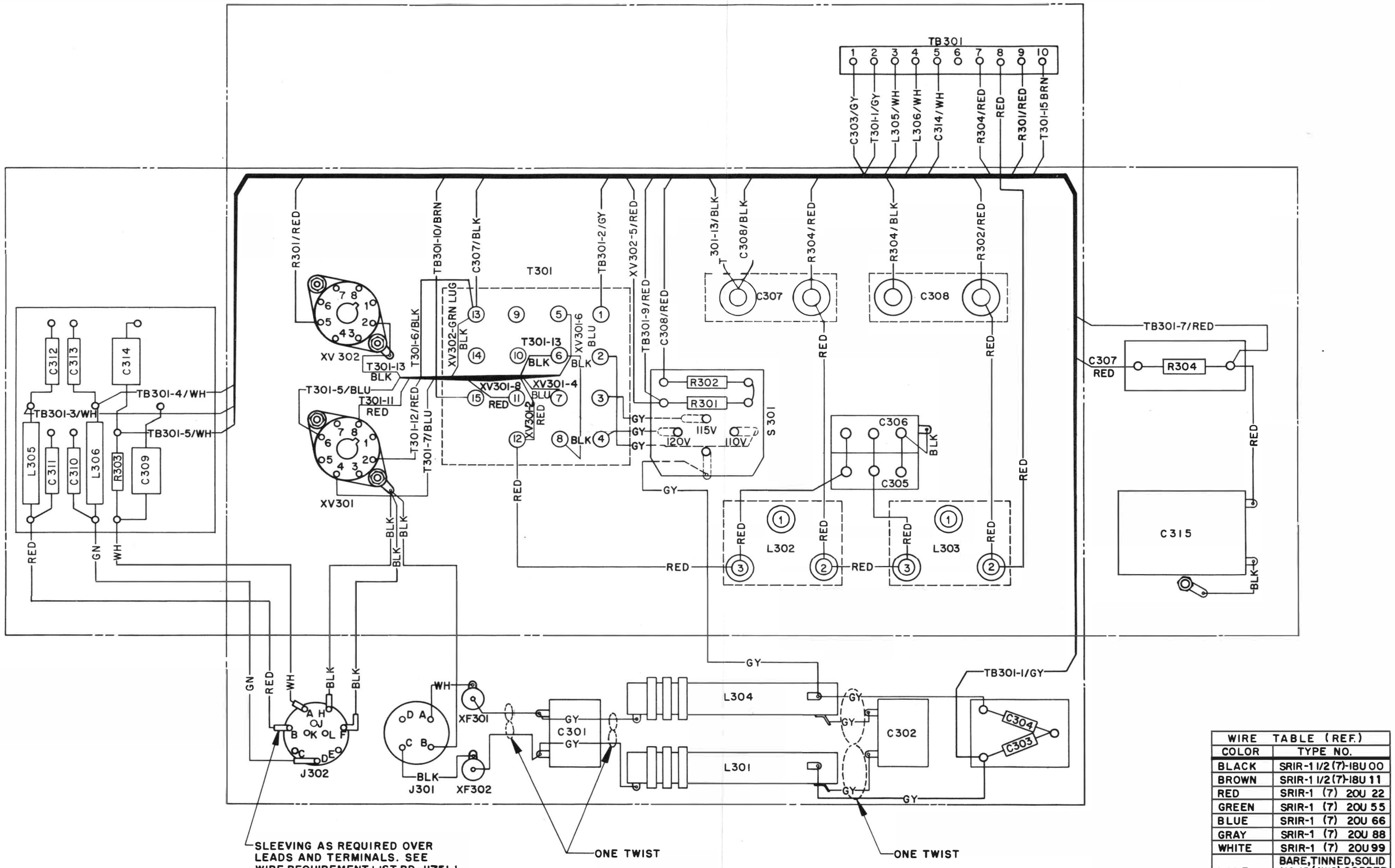
Figure 7-10. IF/AF Unit, Wiring Diagram



NOTE:

ALL MEASUREMENTS TAKEN WITH REFERENCE TO GROUND.

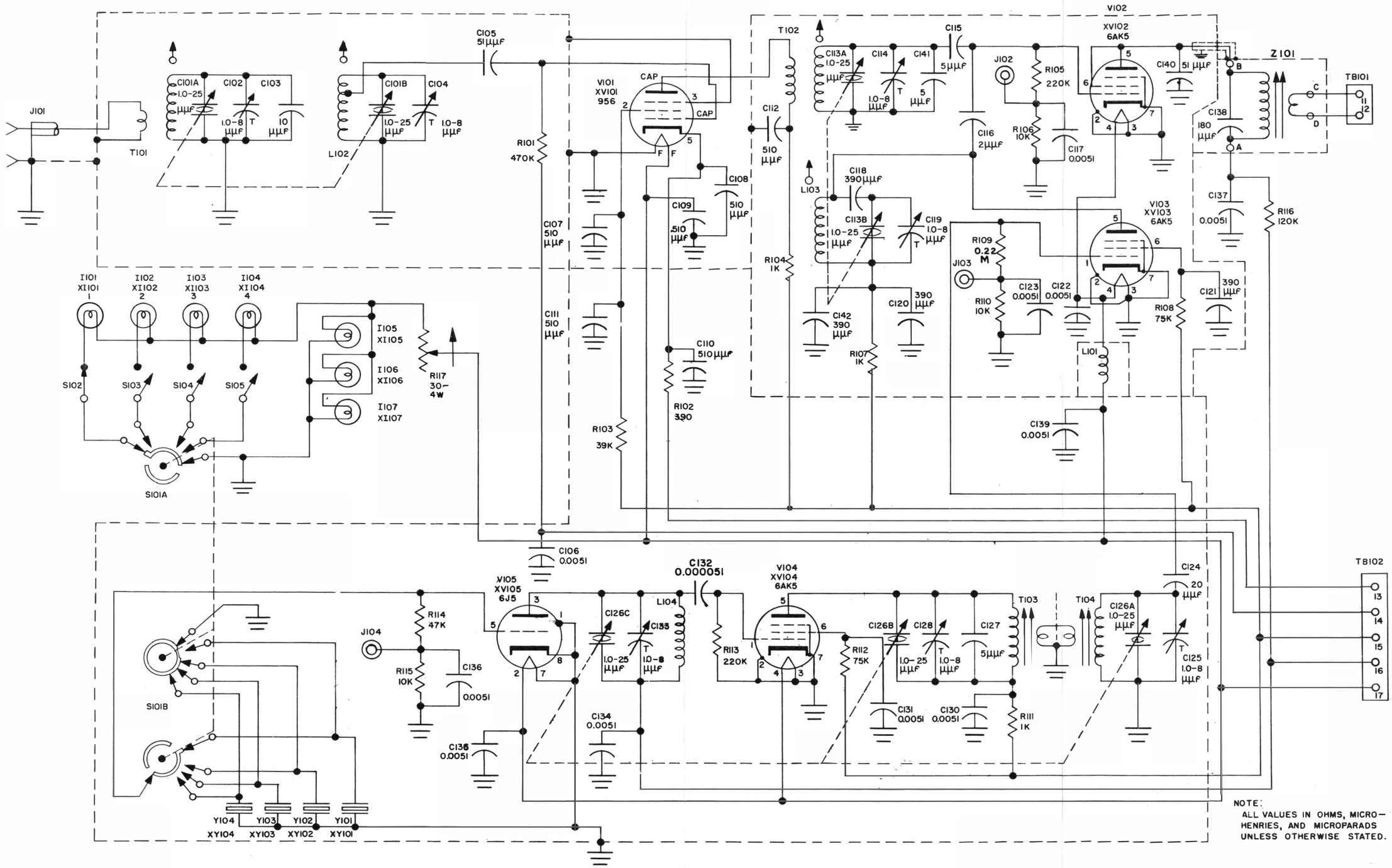
Figure 7-11. IF/AF Unit, Voltage and Resistance Chart



BOTTOM VIEW OF CHASSIS

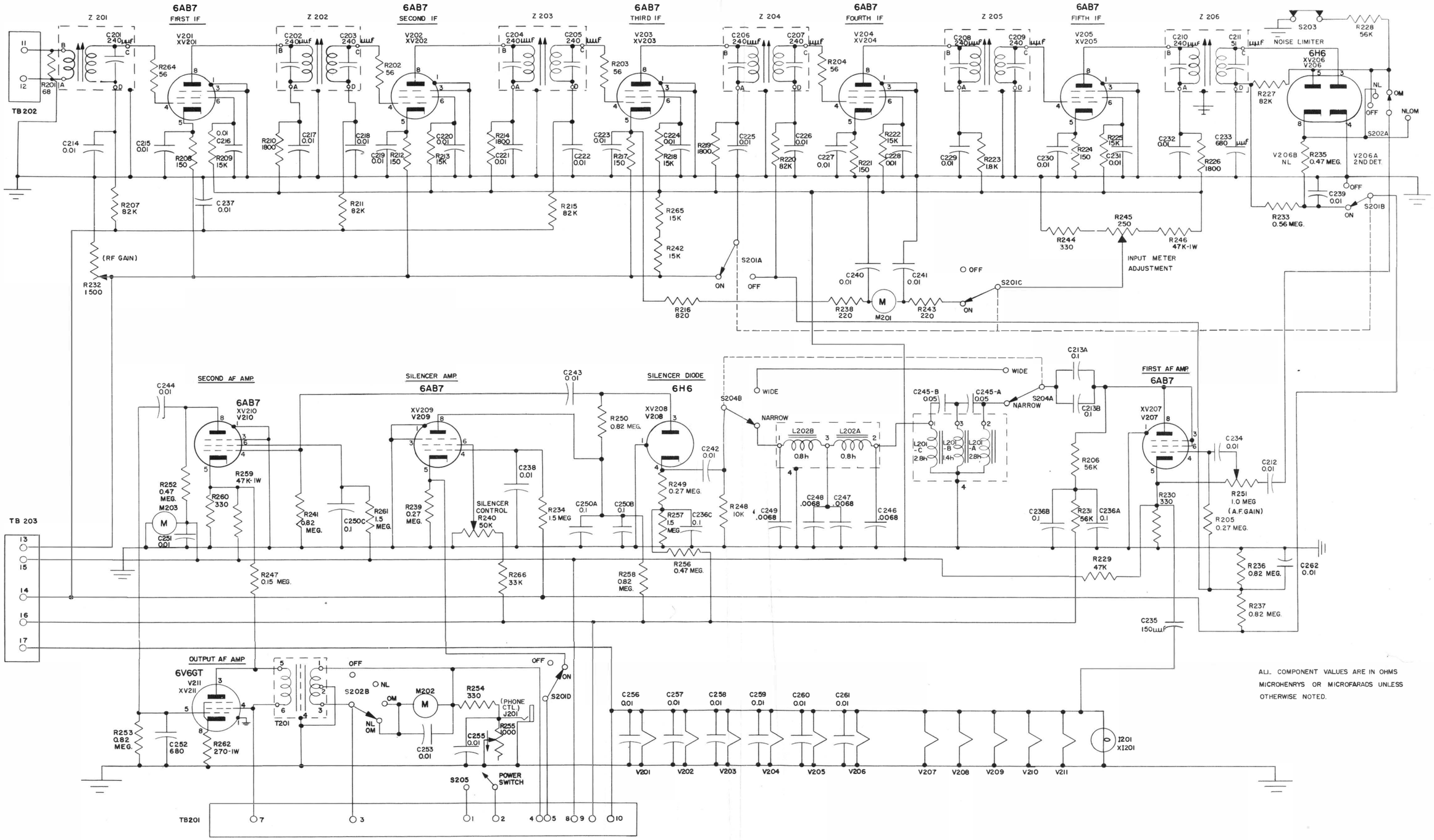
WIRE TABLE (REF.)	
COLOR	TYPE NO.
BLACK	SRIR-1 1/2(7)-18U 00
BROWN	SRIR-1 1/2(7)-18U 11
RED	SRIR-1 (7) 20U 22
GREEN	SRIR-1 (7) 20U 55
BLUE	SRIR-1 (7) 20U 66
GRAY	SRIR-1 (7) 20U 88
WHITE	SRIR-1 (7) 20U 99
NONE	BARE, TINNED, SOLID NO. 18 (AWG) COPPER BUS WIRE

Figure 7-12. Power Supply Unit, Wiring Diagram



NOTE:
ALL VALUES IN OHMS, MICRO-HENRIES, AND MICROPARADS UNLESS OTHERWISE STATED.

Figure 7-13. Preselector Unit, Schematic Diagram

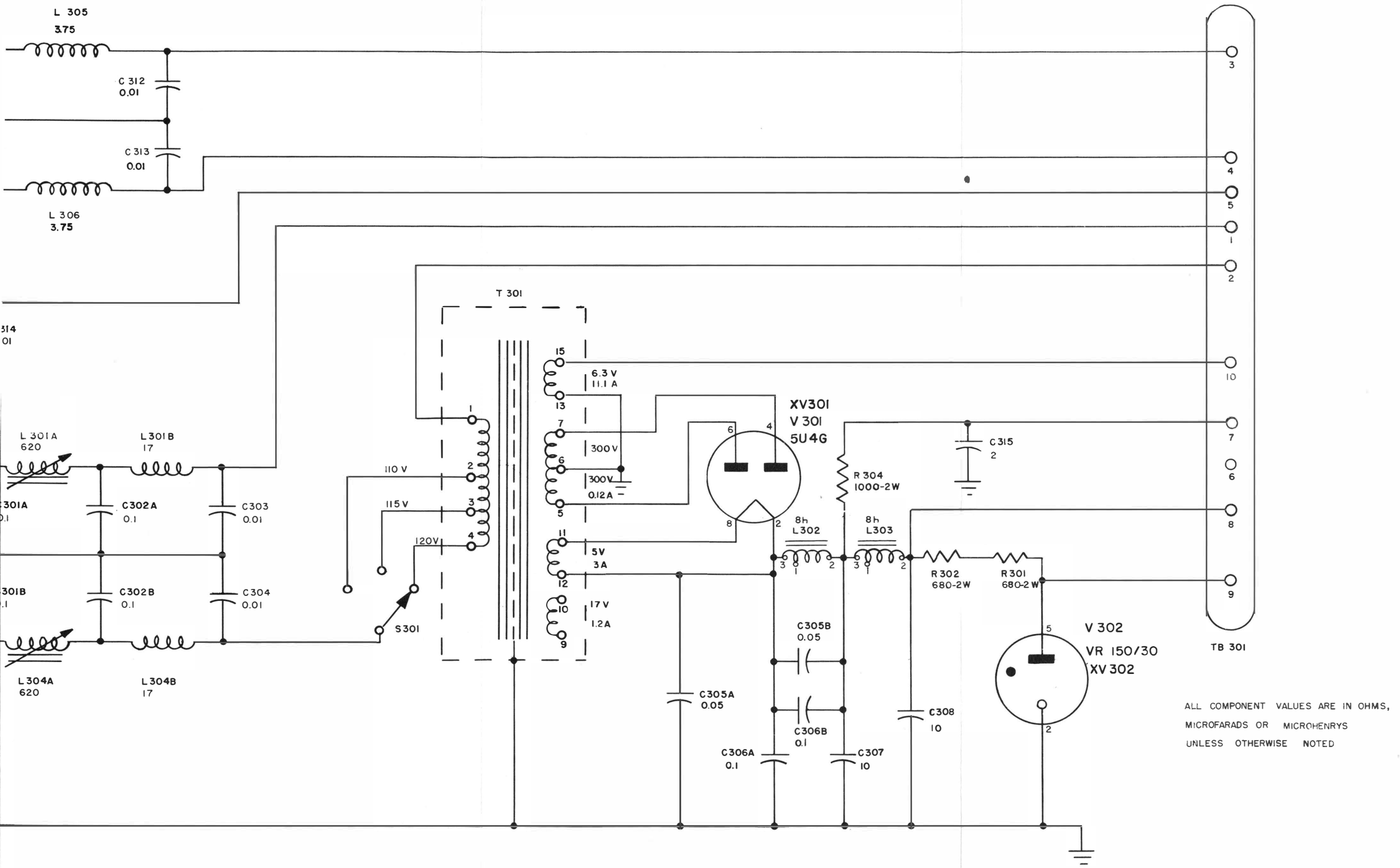


ALL COMPONENT VALUES ARE IN OHMS MICROHENRYS OR MICROFARADS UNLESS OTHERWISE NOTED.

Figure 7-14. IF/AF Unit, Schematic Diagram

J302
B
H
F
D
A
L 305
3.75
C 311
0.01
C 312
0.01
C 310
0.01
C 313
0.01
L 306
3.75
R 303
1800
C309
0.01
C314
0.01
J301
C
B
D
A
F 301
XF301
3A
XF 302
F302
3A
L 301A
620
L301B
17
C301A
0.1
C302A
0.1
C303
0.01
C301B
0.1
C302B
0.1
C304
0.01
L304A
620
L304B
17
110 V
115 V
120V
S301
T 301
15
13
7
6
5
11
12
10
9
6.3 V
11.1 A
300 V
300V
0.12A
5V
3A
17 V
1.2A
XV301
V 301
5U4G
6
4
8
2
C315
2
R 304
1000-2W
8h
L302
8h
L303
R302
680-2W
R301
680-2W
V 302
VR 150/
XV 302
5
2
C305B
0.05
C305A
0.05
C306B
0.1
C306A
0.1
C307
10
C308
10

Figure 7-15. Power Supply Unit, Schema



ALL COMPONENT VALUES ARE IN OHMS, MICROFARADS OR MICROHENRYS UNLESS OTHERWISE NOTED

Figure 7-15. Power Supply Unit, Schematic Diagram

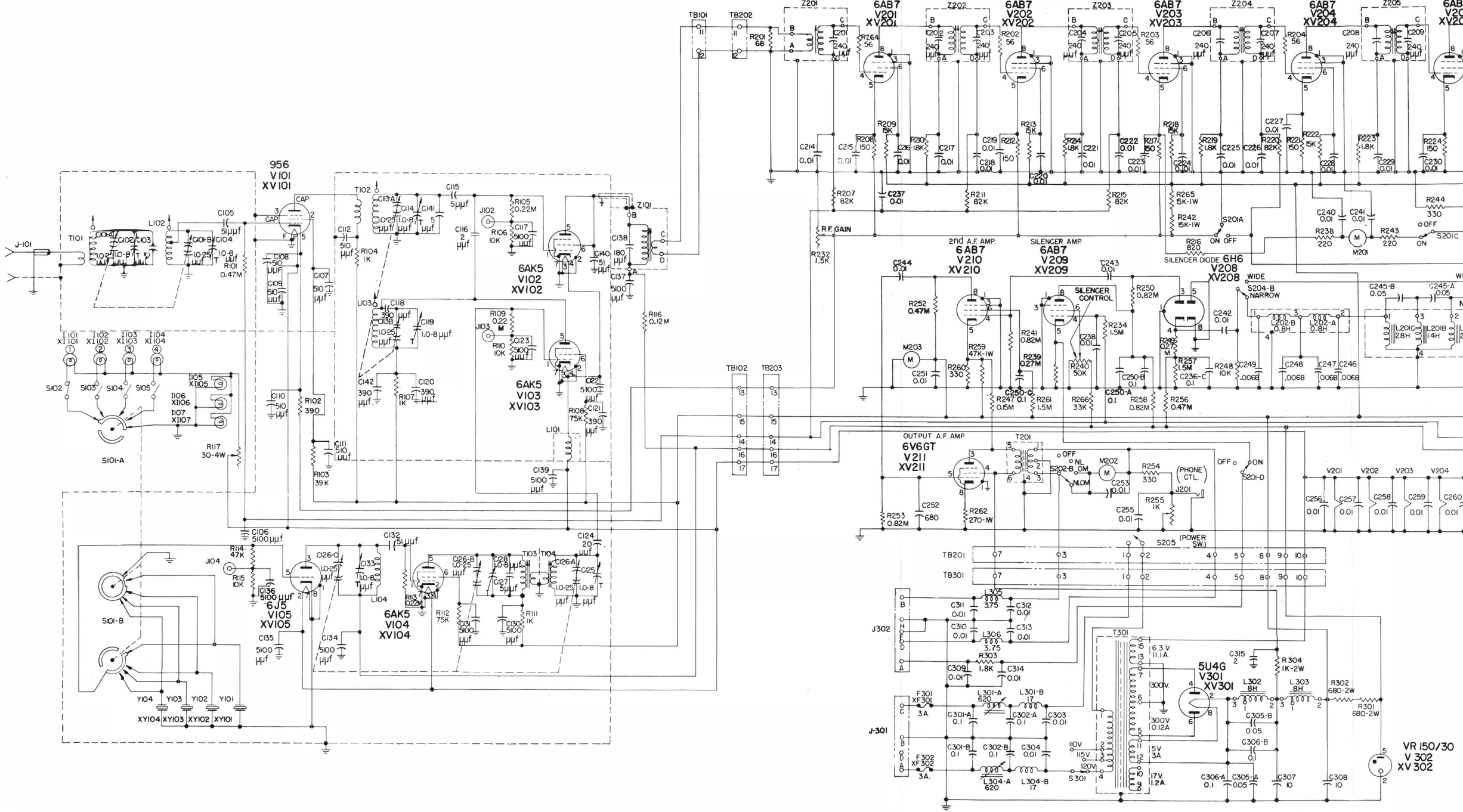
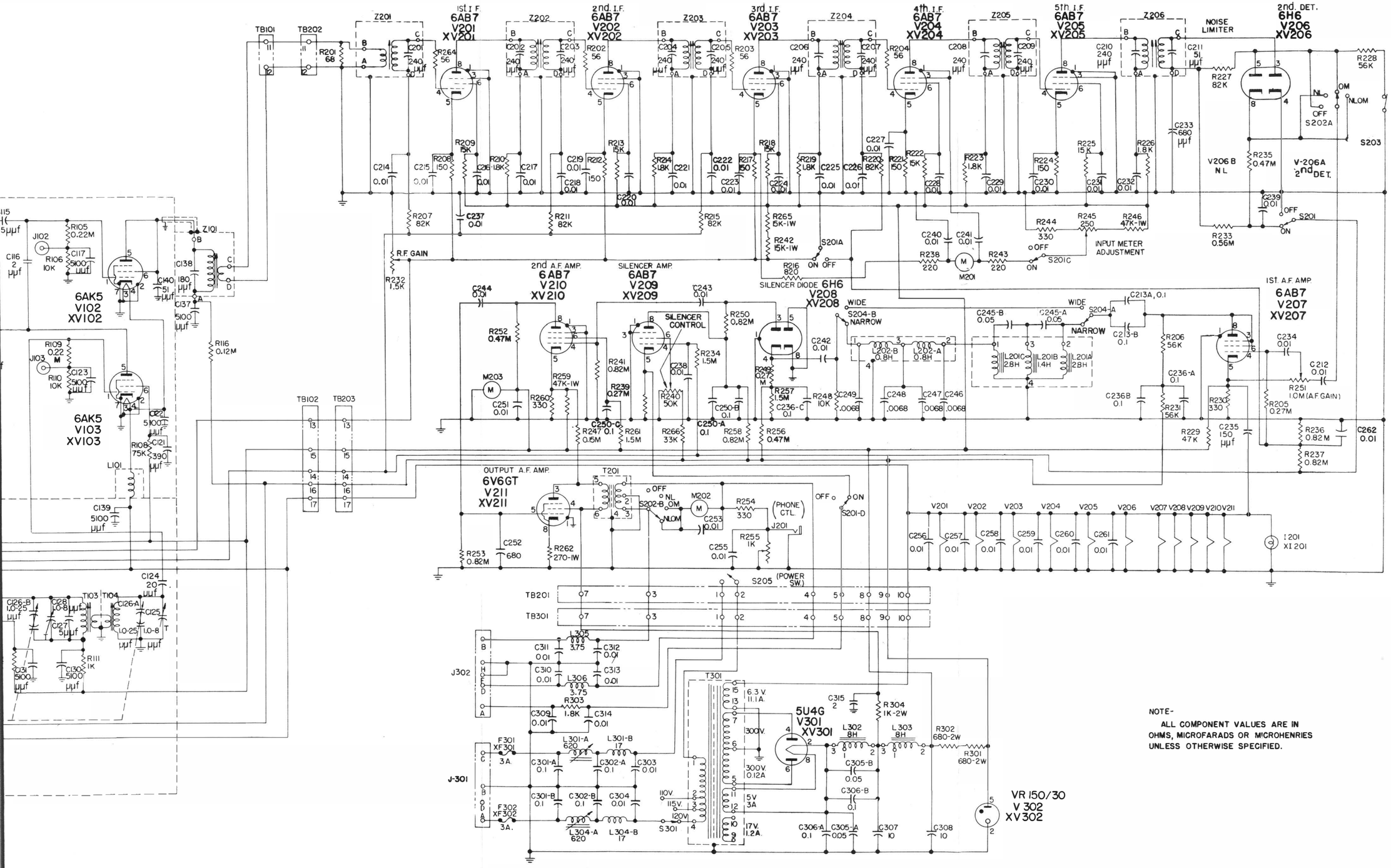


Figure 7-16. Radio Receiver R-432A/URR-21, Compl



NOTE-

ALL COMPONENT VALUES ARE IN OHMS, MICROFARADS OR MICROHENRIES UNLESS OTHERWISE SPECIFIED.

Figure 7-16. Radio Receiver R-432A/URR-21, Complete Schematic Diagram

SECTION 8

PARTS LISTS

This section contains the tables listed below:

TABLE 8-1. WEIGHTS AND DIMENSIONS OF SPARE PARTS BOXES

EQUIPMENT SPARES					
SPARE PARTS BOX	OVERALL DIMENSIONS IN INCHES			VOLUME IN CU. FT.	WEIGHT IN POUNDS
	HEIGHT	WIDTH	DEPTH		
Spares	9.125	12.5	9.5	1.4	18.5

TABLE 8-2. SHIPPING WEIGHTS AND DIMENSIONS OF SPARE PARTS BOXES.

EQUIPMENT SPARES						
SHIPPING BOX NO.	SPARE PARTS BOX	OVERALL DIMENSIONS IN INCHES			VOLUME IN CU. FT.	WEIGHT IN POUNDS
		HEIGHT	WIDTH	DEPTH		
2	Spares	12	17	12	1.42	47

TABLE 8-3. LIST OF MAJOR UNITS.

SYMBOL GROUP	QUANTITY	NAME OF MAJOR UNIT	NAVY TYPE	DESIGNATION
		Radio Receiver	R-432A/URR-21	
100		Preselector (Amplifier, RF)		
200		IF/AF Amplifier		
300		Power Supply		

TABLE 8-4. TABLE OF REPLACEABLE PARTS.

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
101 to 199 201 to 299 301 to 399		RADIO RECEIVING SET, A3 reception, MBCA ref. dwg. group 5; 115-156 megacycles, 1 band, 4 channels, variable channel freq.; 110/115/120 volts a.c., 55/65 cycles, single phase, 106 watts; mounted in steel cabinet 18 1/8 in. long x 17 1/2 in. wide x 11-21/64 in. high; crystal controlled; dial detent system of selecting proper channels; 3 major components, preselector, IF/AF amp.; power supply; mfd. by CAOV; R-432A/URR-21	Used for Communications
		AMPLFIER, RF: 115 to 156 megacycles—freq. range; output data—10 microvolts required for excitation, 50 ohms impedance; operating power requirements—dc, 195 volts, 0.025 amps.; enclosure—metal cabinet; over-all dimensions—11 5/8 in. long, 9-13/16 in. wide, 7-5/16 in. deep; rack mounted; mfd. by CAOV; part/dwg. No. RD-9850-6	
C-101		CAPACITOR, VARIABLE: air dielectric, plate meshing type, 2 section, both section 5.0 mmf min., 25.2 mmf max., 2.992 in. long by 2 in. wide x 2 5/8 in. deep, mounted by (2) #8-32 NC-2 x 5/16 in. high studs and one 8-32 NC-2 tapped hole, 15 plates per sect., includes trimmers C-102 & C-104; mfd. by CAOV; part/dwg. No. RD-9882-4	
C-101A			L-101 Tuning
C-101B			L-102 Tuning
C-102	N16-C-64452-1501	CAPACITOR, VARIABLE: glass dielectric, concentric type; one section, 8.0 mmf max. 0.1 mmf min.; no standard tuning characteristics; 1-1/32 in. long by 5/16 in. dia. excluding shaft and bushing, 3/8-32 by 1/4 in. long bushing, 1/2 in. long by 1/16 in. shaft, screwdriver adjustment, insulated base, one tab type terminal, mounts in a 1/4-32 tapped hole, p/o-C-101; mfd. by CAOV; part/dwg. No. RD-11891-2	C-101A Trimmer
C-103	N16-C-15921-2998	CAPACITOR, FIXED: silvered ceramic, 10 mmf p/m 10%, 500 volts dc working JAN No. CC21CH100F	C-101A Shunt
C-104		Same as C-102, p/o C-101	C-101B Trimmer
C-105		CAPACITOR, FIXED: silvered mica dielectric, 51 mmf p/m 5%, 500 volts dc working; JAN No. CM15C510J	L-102 to V-101 Coupling
C-106		CAPACITOR, FIXED: mica dielectric; 5100 mmf p/m 20%, 500 volts dc working; JAN No. CM35B512M	V-101 Grid Return By-pass
C-107		CAPACITOR, FIXED: mica dielectric, 510 mmf p/m 10%, 500 volts dc working; JAN No. CM20B511K	V-101 Screen By-pass
C-108		Same as C-107	V-101 Cathode By-pass
C-109		Same as C-107	V-107 Heater By-pass
C-110		Same as C-107	V-101 Cathode By-pass
C-111		Same as C-107	V-101 Screen By-pass

TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
C-112		CAPACITOR, FIXED: mica dielectric, 510 mmf p/m 10%, 500 volts dc working. JAN No. CM15B511K	V-101 Plate Filter By-pass
C-113		CAPACITOR, VARIABLE: air dielectric, plate meshing type, 2 section, both sections 5.0 mmf min., 25.2 mmf max.; 2.992 in. long by 2 in. wide by 2⅝ in. deep; mounted by (2) #8-32 NC-2 x 5/16 high studs and one #8-32 NC-2 tapped hole; 15 plates per section. Includes trimmer C-114 & C-113 mfd. by CAOV; part/dwg. No. RD-9883-4	
C-113A			T-102 Tuning
C-113B			L-103 Tuning
C-114		Same as C-102, p/o C-113	C-113A Trimmer
C-115	N16-C-15627-9158	CAPACITOR, FIXED: silvered ceramic, 5 mmf p/m 10%, 500 volts dc working, JAN No. CC21CH050D	T-102 to V-102 Coupling
C-116	N16-C-15432-5867	CAPACITOR, FIXED: silvered ceramic, 2 mmf p/m 10%, 500 volts dc working. JAN No. CC21CK020C	V-103 Plate to V-102 Grid Coupling
C-117		Same as C-106	V-102 Grid Return By-pass
C-118		CAPACITOR, FIXED: silvered mica dielectric, 390 mmf p/m 5%, 500 volts dc working. JAN No. CM15C391J	"L"103 Padder
C-119		Same as C-102, p/o C-113.	C-113B Trimmer
C-120	N16-C-29898-3601	CAPACITOR, FIXED: mica dielectric, 390 mmf p/m 5%, 500 volts dc working. JAN No. CM20C391J	V-103 Plate Filter
C-121		Same as C-120	V-103 Screen By-pass
C-122		Same as C-106	V-103 Heater By-pass
C-123		Same as C-106	V-103 Grid Filter
C-124	N16-C-26732-9601	CAPACITOR, FIXED: silvered mica dielectric; 20 mmf p/m 5%, 500 volts dc working. JAN No. CM20C200J	T-104 to V-103 Coupling
C-125		Same as C-102, p/o C-126	C-126A Trimmer
C-126		CAPACITOR, VARIABLE: air dielectric, plate meshing type, 3 sections both sections 5.0 mmf min., 25.2 mmf max.; 5 in. long by 2 in. wide by 2-3/64 in. high; mounted by (3) #6-32 NC-2 tapped holes; 15 plates per section; includes trimmers C-128, C-125, C-133; mfd. by CAOV; part/dwg. No. RD-9878-4	
C-126A			T-104 Tuning
C-126B			T-103 Tuning
C-126C			L-104 Tuning
C-127		Same as C-115	C-126B Shunt
C-128		Same as C-102, p/o C-126	C-126B Trimmer
C-129		NOT USED	
C-130		Same as C-106	V-104 Plate Filter
C-131		Same as C-106	V-104 Screen By-pass

TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
C-132	N16-C-27656-2601	CAPACITOR, FIXED: silvered mica, 51 mmf, p/m 5%; 500 volts dc working, JAN No. CM20C510J	V-104 Grid to V-105
C-133		Same as C-102, p/o C-126	C-126 Trimmer
C-134		Same as C-106	V-105 Plate Filter
C-135		Same as C-106	V-105 Heater By-pass
C-136		Same as C-106	V-105 Grid Filter
C-137		Same as C-106	V-102 Plate Filter
C-138	N16-C-29133-4001	CAPACITOR, FIXED: silvered mica, dielectric; 180 mmf p/m 5%, 500 volts dc working; JAN No. CM20C181J	Z-201 Pri. Tuning
C-139		Same as C-106	Heater By-pass
C-140		Same as C-132	V-102 Plate By-pass
C-141		Same as C-115	C-113A Shunt
C-142		Same as C-120	V-103 Plate Filter
E-101		CLIP, ELECTRICAL: silver plated brass, 1/4 in. dia. by 5/16 in. long, uninsulated one solder-lug type termination, no jaw opening, provided with set screw fastener; mfd. by CAOV; part/dwg. No. RD-13023-1	V-101 Grid Connector
E-102		Same as E-101	V-101 Plate Connector
E-103		KNOB: Type A; fits 1/4 in. dia. shaft; 5/8 in. thick by 1/16 in. dia.; has pointer; two #8-32 by 3/16 in. long headless hex socket, w/o point, steel, set screws; located, (1) 60° to right of pointer, (2) 180° from pointer; cadmium plated mfd. by CAOV; part/dwg. No. RD-9972-1	Dimmer
E-104		Same as E-103	Channel Selector
E-105		KNOB: Type F; fits 1/4 in. dia. shaft; 1 1/2 in. dia. by 7/8 in. thick; no pointer; two #8-32 by 1/4 in. long headless hex socket, cup point, steel set screws, located 120° apart; cadmium plated; mfd. by CAOV; part/dwg. No. RD-10031-1	
E-106		KNOB: Brass, black nickel finish, 1 1/4 in. dia. by 1 1/8 in. thick; mounted by bolt through a 0.180 in. dia. hole counter-sunk 9/32 in. dia. by 3/16 in. deep; used as an aid in removing chassis; mfd. by CAOV; part/dwg. No. RD-9867-1	Unit Chassis
H-101		ALIGNMENT TOOL: straight; screwdriver tip; tip is 0.093 in. long by 0.015 in. thick to 0.030 in. thick by 0.127 in. wide, made of brass and nickel plated; tube covers tip and insert; mfd. by CAOV; part/dwg. No. RD-10742-1	Aligning Tool
H-102		WRENCH: steel; angle hex; 4.8687 in. long by 0.9062 in. wide by 0.0937 in. thick across flats; fits #10 set screw; mfd. by Allen Mfg. Co.; size No. 10	*Detent Wrench
H-103	*N43-S-4799-1245	BOLT, REDUCED SHANK: brass, silver plated; round, knurled, slotted head; head dimensions— 3/8 in. dia. by 1/8 in. thick with a 1/16 in. wide by 1/16 in. deep slot; shank dimensions— 3/16 in. long by 0.125 in. dia.; thread—#8-32 NC-2; mfd. by CAOV; part/dwg. No. RD-9875-1	Cover Fastener

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TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
H-104	*N43-S-99500-219	BOLT, REDUCED SHANK: brass, light gray enamel, zinc chromate primer, nickel plated head; round, knurled, slotted head; head dimensions—9/16 in. dia. by 1/4 in. thick with a 1/16 in. wide by 3/32 in. deep slot; shank dimensions—0.532 in. long by 0.141 in. dia.; thread—#10-32 NF-2; over-all nominal length—1 in.; mfd. by CAOV; part/dwg. No. RD-9911-1	Cover Fastener
I-101	N17-L-6297	LAMP, INCANDESCENT: 6.3 volts 0.15 amps. miniature bayonet base, shape T-3 1/4 any burning position, 2 tungsten filaments; 1 1/8 in. high o/a mfd. by CAOV; part/dwg. No. RD-11790-1	Channel #1 Indicator Lamp
I-102		Same as I-101	Channel #2 Indicator Lamp
I-103		Same as I-101	Channel #3 Indicator Lamp
I-104		Same as I-101	Channel #4 Indicator Lamp
I-105		Same as I-101	Dial Lighting Lamp, Top
I-106		Same as I-101	Dial Lighting Lamp, Right
I-107		Same as I-101	Dial Lighting Lamp, Left
I-108		LENS, LIGHT: 1/2 in. dia. lens, focusing red glass, integral bushing mtd. 19/32 in. long by 19/32 in. dia. includes disc marked number 1; mfd. by CAOV; part/dwg. No. RD-12314-1-1	Channel 1 Indicator Lens
I-109		LENS, LIGHT: 1/2 in. dia. lens, focusing red glass, integral bushing mtd. 19/32 in. long by 19/32 in. dia. includes disc marked number 2; mfd. by CAOV; part/dwg. No. RD-12314-1-2	Channel 2 Indicator Lens
I-110		LENS, LIGHT: 1/2 in. dia. lens, focusing red glass, integral bushing mtd., 19/32 in. long by 19/32 in. dia., includes disc marked number 3; mfd. by CAOV; part/dwg. No. RD-12314-1-3	Channel 3 Indicator Lens
I-111		LENS, LIGHT: 1/2 in. dia. lens, focusing red glass, integral bushing mtd., 19/32 in. long by 19/32 in. dia., includes disc marked No. 4; mfd. by CAOV; part/dwg. No. RD-12314-1-4	Channel 4 Indicator Lens
J-101	N17-C-73411-2793	CONNECTOR, RECEPTACLE: one round male contact; straight type; approx. 7/8 in. dia. x 1-5/16 in. lg. o/a excluding term. and mtg. fl.; cylindrical brass body, nickel plate, bakelite insert; mts. in 3/4 in. dia. chassis cut out by means of mtg fl. and one 3/4 in. —20 tapped nut; concentric receptacle; Navy Type -49120	Antenna Input Jack
J-102	N17-C-78502-1001	CONTACT, CONNECTOR: single plug, 1/16 in. dia. by 1/2 in. long, contact arrangement J1 MBCA ref. dwg. group 4, 13/16 in. long by 1/4 in. dia. 1/4 in. mtg. hole required one 1/4-52 hex nut, one external toothwasher, nickel plated, included; mfd. by CAOV; part/dwg. No. RD-11791-1	V-102 Grid Current Jack
J-103		Same as J-102	V-103 Grid Current Jack
J-104		Same as J-102	V-105 Grid Current Jack

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TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
L-101	N16-C-72782-6284	COIL, RF: filter choke, one section, 1.18 microhenrys p/m 10%, not tapped, 0.028 ohms p/m 10% 200 volts rms, totally enclosed aluminum case, 2-3/16 in. high by 1 in. dia. mtd. by 2 spade bolts, #6-32 NC-2 on 1-1/32 in. centers, (2) solder lug terminals, mfd. by CAOV; part/dwg. No. RD-11318-2	Heater Supply Filter Choke
L-102		COIL, RF: 2 turns 0.010 in. by 0.156 in. silver plated copper ribbon, uninsulated, one winding, single layer wound, untapped, unshielded, mica filled bakelite form, copper core, 1-17/32 in. long by 0.593 in. dia. adjustable copper core, (2) solder lug terminals, bushing mounted, 3/8-32 NEF-2 thread, 127 to 168 megacycle frequency range, mfd. by CAOV; part/dwg. No. RD-11886-2-1	Antenna Coupling Inductor
L-103		COIL, RF: one section 2 turns .010 by .156 silver plated copper ribbon, uninsulated, one winding, single layer wound, untapped, unshielded mica-filled bakelite form copper core, 1-17/32 in. long by .593 in. dia., adjustable copper core, (2) solder lug terminals, bushing mounted, 3/8-32 NEF-2 thread, mfd. by CAOV; part/dwg. No. RD-11886-2-2	V-103 Plate Tuning Inductor
L-104		COIL, RF: one section, 14 turns #24E copper wire, one winding, single layer wound, untapped, unshielded, mica-filled bakelite form, copper core, 1-29/32 in. long by 1 in. high by 1/2 in. wide, adjustable copper core, 4 solder-lug terminals, bushing mounted, #10-32 thread, mfd. by CAOV; part/dwg. No. RD-11890-2	V-105 Plate Tuning Inductor
O-101		CLAMP, ELECTRICAL: stainless steel; one spring type fastening device; 1 1/4 in. dia. by 9/16 in. high; bracket with clearance hole for #10 screw; holds material 1 1/4 in. dia.; no tools required to remove; used as a tube clamp; Birtcher—926B37.	Holds V-105
O-102	N17-C-98378-4454	COUPLING, FLEXIBLE: 1 3/4 in. dia. by 1 in. deep; accommodates a 1/4 in. dia. shaft; four set screw type fasteners; mfd. by CAOV; part/dwg. No. RD-10757-1-1	
O-103	N17-C-98378-9068	COUPLING, FLEXIBLE: 1 3/4 in. dia. by 1 in. deep; accommodates a 0.376 in. dia. shaft and a 0.317 in. dia. shaft; four set screw type fasteners; mfd. by CAOV; part/dwg. No. RD-10757-1-2	
P-101	N17-C-71120-4869	CONNECTOR, PLUG: one round female cont.; straight type, 13/16 in. dia. by 2-5/16 in. long o/a; cylindrical brass body, nickel plate, bakelite insert; 17/32" dia., cable opening, concentric type plug, Navy Type 49121-A	Antenna Connecting Plug
R-101		RESISTOR, FIXED, COMPOSITION: 0.47 meg. p/m 10%, 1/2 watt pigtail terminals; JAN No. RC20AE474K	V-101 Grid Leak
R-102		RESISTOR, FIXED, COMPOSITION: 390 ohms, p/m 10%, 1/2 watt, pigtail terminals; JAN No. RC20AE391K	V-101 Cathode Bias
R-103	N16-R-50444-0796	RESISTOR, FIXED, COMPOSITION, 39,000 ohms p/m 10%, 1/2 watt, pigtail terminals; JAN No. RC20AE393K	V-101 Screen Filter

TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
R-104	N16-R-49922-0796	RESISTOR, FIXED, COMPOSITION: 1000 ohms p/m 10%, 1/2 watt, pigtail terminals; JAN No. RC20AE102K	V-101 Plate Filter
R-105		RESISTOR, FIXED, COMPOSITION: 0.22 meg p/m 10%, 1/2 watt, pigtail terminals; JAN No. RC20AE224K	V-102 Grid Leak
R-106	N16-R-50282-0796	RESISTOR, FIXED, COMPOSITION: 10,000 ohms p/m 10%, 1/2 watt, pigtail terminals; JAN No. RC20AE103K	V-102 Grid Leak
R-107		Same as R-104	V-103 Plate Filter
R-108		RESISTOR, FIXED, COMPOSITION: 75,000 ohms, p/m 10%, 1/2 watt, pigtail terminals; JAN No. RC20AE753K	V-103 Screen Filter
R-109		Same as R-105	V-103 Grid Leak
R-110		Same as R-106	V-103 Grid Filter
R-111		Same as R-104	V-104 Plate Filter
R-112		Same as R-108	V-104 Screen Filter
R-113		Same as R-105	V-104 Grid Leak
R-114	N16-R-50480-0796	RESISTOR, FIXED, COMPOSITION: 47,000 ohms p/m 10%, 1/2 watt, pigtail terminals; JAN No. RC20AE473K	V-105 Grid Leak
R-115		Same as R-106	V-105 Grid Filter
R-116	N16-R-50651-0796	RESISTOR, FIXED, COMPOSITION: 0.12 meg p/m 10%, 1/2 watt, pigtail terminals; JAN No. RC20AE124K	V-102 Plate Filter
R-117	N16-R-89826-8125	RESISTOR, VARIABLE: wire wound, rotating brush type, one section, 30 ohms, 4 watts, standard A taper MBCA ref. dwg. group 3, (3) solder-lug terminals, enclosed metal case, 3 in. high by 9/16 in. deep by 1 5/8 in. dia. round metal shaft, .248 in. dia. by 25/32 in. long, normal torque, insulated contact arm, no OFF position, bushing mounted 3/8-32 by 3/8 in. lg; mfd. by CAOV; pt/dwg. No. RD-11793-1	Dial Light Dimmer Control
S-101	*	SWITCH, ROTARY: sectional type; two sections; four switching position; non-pile up type, 8 fixed contacts, 4 throws; non-shorting type; brass, silver-plated contacts; ceramic sections; 3/4 in. long by 1 3/8 in. wide by 1 7/8 in. high; mounting bushing 3/8 in. by 32 thds. per in. by 14 in. long; flatted shaft—11/16 in. long by 1/4 in. dia. by 0.218 in. flat; solder-lug terminals; mfd. by Oak Mfg. Co.; Type #HC	
S-101A	N17-S-91897-8907	WAFER SWITCH, ROTARY: one section, 4 position, 5 stator contacts, silver plated brass ceramic section, 1 in. wide by 1 1/4 in. high by 3/16 in. thick, solder-lug terminals; mfd. by CAOV; part/dwg. No. RD-12045-1	Channel Lamp Indicating Switch
S-101B		SWITCH, ROTARY: one section 4 position, 5 stator contacts, silver plated brass ceramic section, 1 in. wide by 1 1/4 in. high by 3/4 in. long includes a 3/8-32 ANS bushing; solder-lug terminals; mfd. by CAOV; part/dwg. No. RD-12052-1	Crystal Selector Switch

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TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
S-102	N17-C-84338-4151	SWITCH, LEVER: pile-up 2 positions, locking, phenolic body, 2-13/16 in. long by 15/32 in. high by 1/2 in. wide, cam type lever, (2) solder-lug terminals, (2) 1/8 in. dia. mtg. holes on 3/8 in. centers; mfd. by CAOV; part/dwg. No. RD-11366-2	Channel #1 Lamp Switch
S-103		Same as S-102	Channel #2 Lamp Switch
S-104		Same as S-102	Channel #3 Lamp Switch
S-105		Same as S-102	Channel #4 Lamp Switch
T-101		TRANSFORMER, RADIO FREQUENCY: 2 windings, single layer wound, primary (2) turns #24 AWG tinned copper wire, secondary (2) turns 0.010 in. by 0.156 in. silver plated copper ribbon, 115 to 156 megacycles frequency range, untapped, unshielded, 2 1/4 in. long by 9/16 in. dia., phenolic form, adjustable copper core, bushing mtd. 3/8-32 NEF-2 thread, 3 solder-lug terminals; mfd. by CAOV; part/dwg. No. RD-11882-2	Antenna Input
T-102		TRANSFORMER, RADIO FREQUENCY: 2 windings, single layer wound, primary (6) turns #26 SSE tinned copper wire; secondary (2) turns 0.010 in. by 0.156 in. silver plated copper ribbon; 115 to 156 megacycle frequency range; untapped, unshielded; 2 1/4 in. long by 9/16 in. dia.; phenolic form, adjustable copper core; bushing mtd. 3/8-32 NEF-2; mfd. by CAOV; part/dwg. No. RD-11884-2	V-101 to V-102 Coupling
T-103		TRANSFORMER, RADIO FREQUENCY: 2 windings, single layer wound; primary (2) turns #24E tinned copper wire; secondary 4 1/2 turns #24E tinned copper wire; 57 to 78 megacycle frequency range; untapped, unshielded; 3 3/4 in. long by 1/2 in. dia.; bakelite form, adjustable copper core; (4) solder-lug terminals; mfd. by CAOV; part/dwg. No. RD-11888-2	V-104 Plate Tuning Inductor
T-104		Same as T-103	V-103 Grid Tuning Inductor
TB-101	*N17-B-77535-7294	TERMINAL BOARD: plastic, w/o barriers; 1 7/8 in. lg. by 1/2 in. wide by 1/2 in. deep; (2) .169 in. dia. holes centered 1.562 in. apart; accommodates 2 solder-lug terminals marked 11 and 12; mfd. by CAOV; part/dwg. No. RD-9996-1	IF Input Connector
TB-102	*N17-B-77687-4729	TERMINAL BOARD: plastic; w/o barriers; 2-9/16" lg. by 5/8 in. wide by 13/16 in. deep, (2) .169 in. dia. holes centered 2.250 in. apart, accommodates 10 solder-lug terminals marked 13 thru 17 respectively, mfd. by CAOV; part/dwg. No. RD-9978-1	Preselector Power Input Connector
TB-103	*N17-B-77414-1225	TERMINAL BOARD: plastic; w/o terminals, barriers or markings; 3 1/4 in. long by 1-5/16 in. wide by 1/8 in. thick; six 0.169 in. dia. mounting holes; accommodates four terminals; mfd. by CAOV; part/dwg. No. RD-9957-1	Terminal Board

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TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
TB-104	*N17-B-77408-1443	TERMINAL BOARD: plastic; w/o terminals, barriers or markings; 1¾ in. long by 1⅜ in. wide by ⅛ in. thick; two 0.189 in. dia. mounting holes; accommodates eight terminals; mfd. by CAOV; part/dwg. No. RD-9997-1	Terminal Board
TB-105	*N17-B-77412-4563	TERMINAL BOARD: plastic; w/o terminals, barriers or markings; 2-27/32 in. long by 1⅜ in. wide by ⅛ in. thick; two 0.169 in. dia. mounting holes; accommodates fourteen terminals; mfd. by CAOV; part/dwg. No. RD-10005-1	Terminal Board
TB-106	*N17-B-77407-1228	TERMINAL BOARD: plastic; w/o terminals, barriers or markings; 1½ in. long by ⅝ in. wide by ⅛ in. thick; two 0.169 in. dia. mounting holes; accommodates one terminal; mfd. by CAOV; part/dwg. No. RD-10014-1	Terminal Board
TB-107	*N17-B-77409-8494	TERMINAL BOARD: plastic; w/o terminals, barriers or markings; 2-3/16 in. long by 1⅜ in. wide by ⅛ in. thick; two 0.169 in. dia. mounting holes; accommodates ten terminals; mfd. by CAOV; part/dwg. No. RD-9772-1	Terminal Board
V-101	N16-T-69560	TUBE, ELECTRON, super-control amplifier pentode; JAN No. 956	RF Amplifier
V-102	N16-T-56191	TUBE, ELECTRON, miniature type, sharp cut-off pentode; JAN No. 6AK5	1st Detector Mixer
V-103		Same as V-102	2nd Multiplier
V-104		Same as V-102	1st Multiplier
V-105	N16-T-56350	TUBE, ELECTRON, medium, triode, small octal; JAN No. 6J5	Oscillator
XI-101	N17-L-51623-4191	LAMPHOLDER, single holder accommodates a miniature bayonet base lamp, 8 volts, 0.15 amps, metal body, 1-1/16 in. high by 11/16 in. wide by 7/16 in. deep, no switch, one 6 in. wire lead terminal, one #4 clearance hole; mfd. by CAOV; part/dwg. No. RD-11834-1	Channel Indicator Lamp Socket #1
XI-102		Same as XI-101	Channel Indicator Lamp Socket #2
XI-103		Same as XI-101	Channel Indicator Lamp Socket #3
XI-104		Same as XI-101	Channel Indicator Lamp Socket #4
XI-105		Same as XI-101	Dial Lamp Socket Top
XI-106		Same as XI-101	Dial Lamp Socket Right
XI-107		Same as XI-101	Dial Lamp Socket Left
XV-101	N16-S-61646-7026	SOCKET, ELECTRON TUBE: 5 contact acorn type, ceramic base, silver plated contacts, mfd. by CEJ; No. 121-265	Socket for V-101
XV-102		SOCKET, ELECTRON TUBE: 7 contact miniature, ceramic with silver plated contacts; JAN No. TSE7T102	Socket for V-102
XV-103		Same as XV-102	Socket for V-103
XV-104		Same as XV-102	Socket for V-104

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TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
XV-105	N16-S-63524-6492	SOCKET, ELECTRON TUBE: 8 contact octal, plug-in type with retainer and saddle; Navy Type 49373	Socket for V-105
XY-101	N16-S-54548-7001	SOCKET, CRYSTAL HOLDER: 2 contact ceramic, mfd. by CAOV; part/dwg. No. RD-11819-1	Crystal Socket for Channel #1
XY-102		Same as XY-101	Crystal Socket for Channel #2
XY-103		Same as XY-101	Crystal Socket for Channel #3
XY-104		Same as XY-101	Crystal Socket for Channel #4
Z-101	N17-T-68059-6459	TRANSFORMER, IF: 12.0 megacycles, 1⅜ in. wide by 1⅜ in. deep by 2-1/16 in. high; bracket mounted, 4 solder-lug terminals, ceramic coil form, air core, single mica capacitor tuned, mfd. by CAOV; part/dwg. No. RD-10832-1	V-102 to TB-101 Coupling
		IF/AF AMPLIFIER UNIT: power output rating 65 mw; rated frequency response with 2 db between 200 and 5000 cycles per second; overall dimensions 10-13/16 in. long, 11⅝ in. high and 9-13/16 in. wide; input voltage 110/115/120 volts, 60 cycles, single phase, 1 input signal 68 ohms resistance, 600 ohms output impedance; mounted in a metal cabinet; drip proof, mfd. by CAOV; part/dwg. No. RD-9800-6	
C-201	N16-C-29449-8806	CAPACITOR, FIXED: silvered mica dielectric; 240 mmf; 5%, 500 volts dc working; JAN No. CM20D241J	Sec. T-201 Tuning
C-202		Same as C-201	Pri. T-202 Tuning
C-203		Same as C-201	Sec. T-202 Tuning
C-204		Same as C-201	Pri. T-203 Tuning
C-205		Same as C-201	Sec. T-203 Tuning
C-206		Same as C-201	Pri. T-204 Tuning
C-207		Same as C-201	Sec. T-204 Tuning
C-208		Same as C-201	Pri. T-205 Tuning
C-209		Same as C-201	Sec. T-205 Tuning
C-210		Same as C-201	Pri. T-206 Tuning
C-211		Same as C-132	Sec. T-206 Tuning
C-212	N16-C-33627-7705	CAPACITOR, FIXED: mica dielectric; 0.1 mfd. p/m 20%, 300 volts dc working; JAN No. CM35B103M	V-206 to AF Gain Control Coupling
C-213 C-213A C-213B	N16-C-53192-8190	CAPACITOR, FIXED: paper dielectric; 0.1/0.1 mfd; each section 600 volts dc working; hermetically sealed; JAN No. CP53B4EF104L	V-207 to C-204A Coupling
C-214		Same at C-212	T-201 Sec. Filter By-pass
C-215		Same at C-212	V-201 Cathode By-pass
C-216		Same at C-212	V-201 Screen By-pass
C-217		Same at C-212	T-202 Pri. Filter
C-218		Same at C-212	T-202 Sec. Filter By-pass

TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
C-219		Same as C-212	V-202 Cathode By-pass
C-220		Same as C-212	V-202 Screen By-pass
C-221		Same as C-212	T-203 Pri. Filter By-pass
C-222		Same as C-212	T-203 Sec. Filter By-pass
C-223		Same as C-212	V-203 Cathode By-pass
C-224		Same as C-212	Screen By-pass
C-225		Same as C-212	T-204 Pri. Filter By-pass
C-226		Same as C-212	T-204 Sec. Filter By-pass
C-227		Same as C-212	V-204 Cathode By-pass
C-228		Same as C-212	V-204 Screen By-pass
C-229		Same as C-212	T-205 Pri. Filter By-pass
C-230		Same as C-212	V-205 Cathode By-pass
C-231		Same as C-212	V-205 Screen By-pass
C-232		Same as C-212	T-206 Pri. Filter By-pass
C-233	N16-C-30536-4764	CAPACITOR, FIXED: mica dielectric; 680 mmf., 10%, 500 volts dc working; JAN No. CM30B681K	T-206 Sec.
C-234		Same as C-212	R-251 to V-207 Grid Coupling
C-235	N16-C-28980-2076	CAPACITOR, FIXED: mica dielectric, 150 mmf., 10%, 500 volts, dc working; JAN No. CM20B151K	V-207 Cathode to V-209 Heater
C-236	N16-C-54460-4450	CAPACITOR, FIXED: paper dielectric, 0.1/0.1/0.1 mfd. 10%, each section, 600 volts dc working; hermetically sealed; JAN No. CP53B5FF104V	
C-236A			V-207 Plate Filter By-pass
C-236B			V-207 Plate Filter By-pass
C-236C			V-208 Cathode Filter By-pass
C-237		Same as C-212	AVC By-pass
C-238		Same as C-212	V-209 Input Filter By-pass
C-239		Same as C-212	V-206B Noise Limiter Filter By-pass
C-240		Same as C-212	Input Meter Filter By-pass
C-241		Same as C-212	Input Meter Filter By-pass
C-242		Same as C-212	S-204B to V-208 Cathode Coupling
C-243		Same as C-212	V-208 Plate to V-210 Coupling
C-244		Same as C-212	V-210 Plate to V-211 Coupling
C-245	N16-C-53002-4345	CAPACITOR, FIXED: paper dielectric, 0.05/0.05 mfd 10%, each section 600 volts dc working; heremetically sealed; JAN No. CP53B4EF503L	L-201 Tuning
C-245A		Part of C-245	
C-245B		Part of C-245	
C-246	N16-C-33068-5823	CAPACITOR, FIXED: mica dielectric, 6800 mmf, 10%, 500 volts dc working; JAN No. CM35B682K	L-202 Filter

TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
C-247		Same as C-246	L-202 Filter Center
C-248		Same as C-246	L-202 Filter Center
C-249		Same as C-246	L-202 Filter Output
C-250		Same as C-246	
C-250A			V-208 Plate By-pass
C-250B			V-208 Plate Filter By-pass
C-250C			V-210 Screen By-pass
C-251		Same as C-212	DC Voltmeter By-pass
C-252		Same as C-233	V-211 Grid By-pass
C-253		Same as C-212	Output Meter Shunt
C-254		NOT USED	
C-255		Same as C-212	Phone Jack By-pass
C-256		Same as C-212	V-201 Heater By-pass
C-257		Same as C-212	V-202 Heater By-pass
C-258		Same as C-212	V-203 Heater By-pass
C-259		Same as C-212	V-204 Heater By-pass
C-260		Same as C-212	V-205 Heater By-pass
C-261		Same as C-212	V-206 Heater
C-262		Same as C-212	AVC By-pass
E-201		Same as E-103	Silencer Control R-240
E-202		Same as E-103	RF Gain R-232
E-203		Same as E-103	Audio Gain Control R-251
E-204		Same as E-103	Phone Control R-255
E-205		Same as E-103	Noise Limiter S-202
E-206		Same as E-103	Reception Switch S-201
E-207		Same as E-103	Audio Filter S-204
H-201		WRENCH: steel; angle hex; 1.8531 in. long x 0.6881 in. wide x 0.0781 in. thick across flats; used to remove knobs; mfd. by Allen Mfg. Co.; size #8	Knob Wrench
H-202	*N43-S-4799-1567	BOLT, REDUCED SHANK: brass, black nickel plated; round, knurled, slotted head, 9/16 in. dia. x 1/4 in. thick with 1/16 in. wide x 3/32 in. deep slot; shank—0.555 in. long x 0.140 in. dia.; thread—#10-32 NF-2 x 0.312 in. long; 1 1/8 in. over-all nominal length; mfd. by CAOV; part/dwg. No. RD-9841-1	Captive Screw
H-203	*N43-S-4799-1214	BOLT, REDUCED SHANK: brass, black nickel plated; round, knurled, slotted head; head dimensions—9/16 in. dia. x 1/4 in. thick with a 1/16 in. wide x 3/32 in. deep slot; shank dimensions—1/2 in. long x 0.184 in. dia.; thread —1/4-20 NC-2; mfd by CAOV; part/dwg. No. RD-9845-1	Cover Fastener

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless items cannot be repaired or fabricated.

TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
I-201		Same as I-101	Pilot Lamp
J-201	N17-J-39248-4418	JACK, HEADPHONE: for 2 cond. 0.25 in. dia. plug; 1.271 in. long by 1 in. wide by 3/4 in. high over-all approx.; J1 contact arrangement; includes 3/8-32 thd. bushing, hex nut and washer; 3/8 in. dia. mtg. hole; includes 0.093 in. dia. locating pin, type JJ-034; Navy Type 49025A	Headphone Jack
L-201 A, B & C	N16-R-29870-1901	REACTOR: high pass filter choke, 3 sections; section A, terminals 2-4, 2.8H, 210 ohms dc resistance; section B, terminals 3-4, 1.4H, 140 ohms dc resistance; section C, terminals 1-4, 2.8H, 210 ohms dc resistance; hermetically sealed case; mfd. by CAOV; part/dwg. No. RD-9836-2	High Pass Filter
L-202 A & B	N16-R-29769-3001	REACTOR: low pass filter choke, 2 section, section A, terminals 2-3, 0.8H, 69 ohms dc resistance; section B, terminals 1-3, 0.8H, 69 ohms dc resistance; hermetically sealed case; mfd. by CAOV; part/dwg. No. RD-9838-2	Low Pass Filter
M-201	N17-M-19253-1717	AMMETER; panel mtd., radio frequency, 2 wires, marked in milliamperes, 0 to 1 ma, graduated in 50 scale divisions, marked MR26W001DCMA cylindrical metal case, 2.695 in. dia. by .38 in. thick flange 2.21 in. dia body 1.60 in. deep, 2% accuracy at full scale reading, 50 millivolts p/m 5% across terminals, magnetically shielded, black markings on white background, self contained (3) .125 in. dia. mtg. holes on a 1.22 in. radius, 2 solder-lug terminals, .69 in. lg.; JAN No. MR26W001DCMA	RF Input Indicator Meter
M-202	N17-M-22724-6701	METER: audio level, ac rec. type, range minus 10 to 0 to plus 20 db, round plastic flush mtd. case, 2.21 in. dia., max. 1.6 in. dia. behind fl., max., 2.695 in. dia, round fl, 5% accuracy for full scale reading, D'Arsonval movement, 0 level is for 1.9V calibrated for non-magnetic panel, 30 scale divisions, black numerals on white background, self-contained, three mtg. holes 0.125 in. dia. spaced 120° apart on 1.22" rod. Similar to Navy type 22427 except is hermetically sealed. 2 stud terminals 0.69 in. lg. x 1/4-28 thd, for use across 600 ohms source, reference level 6 mw expanded scale, aluminum shield; mfd. by CAOV; part/dwg: No. RD-11837-2	Audio/Output Indicator Meter
M-203	N17-M-35567-6056	VOLTMETER; panel mtd; radio frequency, 2 wires, marked volts, 0 to 300 volts, graduated in 30 scale divisions, marked MR26W300DCVV, cylindrical metal case, 2.695 in. dia. .38 in. thick; flange size, 2.21 in. dia. by 1.60 in. deep body size, 2% accuracy at full scale reading 1000 ohm per volt p/m 10% sensitivity magnetically shielded, black markings on a white background, self contained, (3) .125 in. dia. mtg. holes on a 1.22 in. radius, 2 solder-lug terminals, .69 in. long; JAN No. MR26W300DCVV	DC Voltmeter
O-201		CLAMP, ELECTRICAL: stainless steel, one spring type fastener 1 3/8 in. dia. by 3/4 in. high, mounted by a #10 screw, designed to hold material 1 1/4 in. dia. Birtcher 926B22	Tube Clamp Holds V-208, V-210, V-211

TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
O-202	N16-C-300442-704	CLAMP, ELECTRICAL: stainless steel, one spring type fastener 1⅜ in. dia. by ¾ in. high, mounted by a #10 screw, designed to hold material 1¼ in. dia. Birtcher 926B38	Tube Clamp Holds V-205, V-207
O-203	*N17-C-945002-150	COVER, ELECTRICAL CONNECTOR: aluminum, light grey enamel; 1-1/32 in. long x 13/16 in. wide x 9/16 in. high; mounted on a ⅜ in. jack bushing; water proof; mfd. by CAOV; part/dwg. No. RD-9897-1	
R-201		RESISTOR, FIXED COMPOSITION: 68 ohms, ±10%, ½ watt, pigtail terminals JAN No. RC20AE680K	T-201 Pri. Shunt
R-202		RESISTOR, FIXED COMPOSITION: 56 ohms, ±5%, ½ watt, pigtail terminals JAN No. RC20AE560J	V-202 Grid Series
R-203		Same as R-202	V-203 Grid Series
R-204		Same as R-202	V-204 Grid Series
R-205	N16-R-50741-0796	RESISTOR, FIXED COMPOSITION: 0.27 meg. 10%, ½ watt, pigtail terminals JAN No. RC20AE274K	V-207 Grid Return
R-206		RESISTOR, FIXED COMPOSITION: 56,000 ohms 10%, ½ watt, pigtail terminals JAN No. RC20AE563K	V-207 Plate Load
R-207		RESISTOR, FIXED COMPOSITION: 82,000 ohms, 10%, ½ watt, pigtail terminals JAN No. RC20AE823K	V-201 Grid Return
R-208		RESISTOR, FIXED, COMPOSITION: 150 ohms, 10%, ½ watt, pigtail terminals JAN No. RC20AE151K	V-201 Cathode Bias
R-209	N16-R-50336-0796	RESISTOR, FIXED, COMPOSITION: 15,000 ohms, 10%, ½ watt, pigtail terminals JAN No. RC20AE153K	V-201 Screen Filter
R-210	N16-R-49985-0796	RESISTOR, FIXED, COMPOSITION: 1800 ohms, 10%, ½ watt, pigtail terminals JAN No. RC20AE182K	V-201 Plate Filter
R-211		Same as R-207	V-202 Grid Return
R-212		Same as R-208	V-202 Cathode Bias
R-213		Same as R-209	V-202 Screen Filter
R-214		Same as R-210	V-202 Plate Filter
R-215		Same as R-207	V-203 Grid Return
R-216	N16-R-49877-0796	RESISTOR, FIXED, COMPOSITION: 820 ohms, 10%, ½ watt, pigtail terminals JAN No. RC20AE821K	Input Meter Series
R-217		Same as R-208	V-203 Cathode Bias
R-218		Same as R-209	V-203 Screen Filter
R-219		Same as R-210	V-203 Plate Filter
R-220		Same as R-207	V-204 Grid Filter
R-221		Same as R-208	V-204 Cathode Bias

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TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
R-222		Same as R-209	V-204 Screen Filter
R-223		Same as R-210	V-204 Plate Filter
R-224		Same as R-208	V-205 Cathode Bias
R-225		Same as R-209	V-205 Screen Filter
R-226		Same as R-210	V-205 Plate Filter
R-227		Same as R-207	V-206 Diode Filter
R-228		Same as R-206	V-206 Diode Load
R-229	N16-R-50481-0216	RESISTOR, FIXED, COMPOSITION: 47,000 ohms, 10%, 1 watt, pigtail terminals JAN No. RC30AE473K	Cathode Bleeder
R-230		RESISTOR, FIXED, COMPOSITION: 330 ohms, 10%, ½ watt, pigtail terminals JAN No. RC20AE331K	V-207 Cathode Bias
R-231		Same as R-206	V-207 Plate Filter
R-232	N16-R-90803-1488	RESISTOR, VARIABLE: Wire-wound type, rotating brush, one section, 1500 ohms p/m 10%, 2 watts, std 'A" taper; ref. dwg. group 3 MBCA, 3 solder-lug terminals; enclosed metal case 1¼ in. dia. x 19/32 in. deep, round metal shaft .250 in. dia. by 1⅛ in. lg., insulated contact arm with no OFF position, ⅜-32 x ¼ in. lg. bushing; mfd. by CAOV, part/dwg. No. RD-12835-1	RF Gain Control
R-233		RESISTOR, FIXED, COMPOSITION: 0.56 meg, 10%, ½ watt, pigtail terminals JAN No. RC20AE564K	V-206 Noise Limiter Filter
R-234		RESISTOR, FIXED, COMPOSITION: 1.5 meg, 10%, ½ watt, pigtail terminals JAN No. RC20AE155K	V-209 Grid
R-235		Same as R-101	V-206B Cathode
R-236		RESISTOR, FIXED, COMPOSITION: 0.82 meg, 10%, ½ watt, pigtail terminals JAN No. RC20AE824K	AVC Voltage Divider
R-237		Same as R-236	AVC Voltage Divider
R-238		RESISTOR, FIXED, COMPOSITION: 220 ohms, 10%, ½ watt, pigtail terminals JAN No. RC20AE221K	Input Meter Filter
R-239		Same as R-205	V-209 Cathode
R-240	N16-R-87849-4273	RESISTOR, VARIABLE, COMPOSITION: rotating brush, one section 50,000 ohms p/m 10%, 2 watts, std. "A" taper MBCA ref. dwg. group 3, solder-lug terminals, enclosed metal case 1-1/16 in. dia. by 9/16 in. deep, round metal shaft .250 in. dia. by ⅞ in. long, normal torque, insulated contact arm, no OFF position, ⅜-32 by ⅜ in. long bushing Navy Type -632183-N10	Silencer Control
R-241		Same as R-236	V-210 Grid Return
R-242		RESISTOR, FIXED, COMPOSITION: 15,000 ohms, 10%, 1 watt, pigtail terminals JAN No. RC30AE153K	RF Gain Control Bleeder

TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
R-243		Same as R-238	Input Meter Filter
R-244		Same as R-230	Input Meter Adj. Series
R-245	N16-R-50678-0796	RESISTOR, VARIABLE, COMPOSITION: rotating brush, one section, 250 ohms, p/m 10%, 2 watts, std. 'A" taper MBCA ref. dwg. group 3, (3) solder-lug terminals, enclosed metal case 1-1/16 in. dia. by 9/16 in. deep, round metal shaft, .250 in. dia. by 7/8 in. lg., normal torque, insulated contact arm, no OFF position, 3/8-32 by 3/8 in. long bushing Navy Type -637178-N10	Input Meter Adjustment
R-246		Same as R-229	Input Meter Bleeder
R-247	N16-R-50678-0796	RESISTOR, FIXED, COMPOSITION: 0.15 meg, 10%, 1/2 watt, pigtail terminals JAN No. RC20AE154K	V-211 to V-210 Feedback
R-248		Same as R-106	V-208 Input Shunt
R-249		Same as R-205	V-208 Cathode
R-250		Same as R-236	V-208 Plate Load
R-251	N16-R-88342-5274	RESISTOR, VARIABLE, COMPOSITION: rotating brush, one section, 1.0 meg p/m 10%, 2 watts, std. 'C" taper MBCA ref. dwg. group 3, (3) solder-lug terminals, enclosed metal case 1-1/16 in. dia. by 9/16 in. long, round metal shaft .250 in. dia by in. long, normal torque, insulated contact arm, no OFF position, 3/8-32 by 3/8 in. long bushing; mfd. by CAOV; Navy Type -632882-N10	Audio Gain Control
R-252		Same as R-101	V-210 Plate Load
R-253		Same as R-236	V-211 Grid Return
R-254		Same as R-230	Phone Pad
R-255	N16-R-87349-4294	RESISTOR, VARIABLE, COMPOSITION: rotating brush, one section, 1000 ohms, p/m 10%, 2 watts, std. 'C" taper MBCA ref. dwg. group 3, (3) solder-lug terminals, enclosed metal case 1-1/16 in. dia. by 9/16 in. deep, round metal shaft, .250 in. dia. by 7/8 in. long, normal torque, insulated contact arm w/o OFF position, 3/8-32 by 3/8 in. long bushing; mfd. by CAOV; part/ dwg. No. RD-11798-1	Phone Control
R-256		Same as R-101	V-208 Cathode Bleeder
R-257		Same as R-234	V-208 Cathode Bias
R-258		Same as R-236	V-209 Plate Load
R-259		Same as R-229	V-210 Cathode Bleeder
R-260		Same as R-230	V-210 Cathode Bias
R-261		Same as R-234	V-210 Screen Filter
R-262	N16-R-49689-0216	RESISTOR, FIXED, COMPOSITION: 270 ohms, 10%, 1 watt, pigtail terminals JAN No. RC30AE271K	V-211 Cathode Bias
R-263		NOT USED	
R-264		Same as R-202	V-201 Grid Series

TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
R-265		Same as R-242	RF Gain Control Bleeder
R-266	N16-R-50417-0796	RESISTOR, FIXED, COMPOSITION: 33,000 ohms, 10%, 1/2 watt, pigtail terminals JAN No. RC20AE333K	Silencer Control Series
S-201	N17-S-62522-3406	SWITCH, ROTARY: one section, 2 position, 4 poles, silver plated brass contacts, ceramic sections, 27/32 in. long by 1 5/8 in. wide by 1 7/8 in. high, flatted type shaft 1 1/8 in. lg. by 1/4 in. dia., solder-lug type terminals, mounts by one 3/8-32 ANS thd. bushing 1/4 in. long, mfd. by CAOV; part/dwg. No. RD-9912-1	
S-201A			AVC Switch
S-201B			NL Output Switch
S-201C			Input Meter Switch
S-201D			Silencer Switch
S-202	N17-S-61361-1683	SWITCH, ROTARY: one section, 4 positions, 4 throw, 2 pole, silver plated brass contacts, ceramic sections, 27/32 in. long by 1 5/8 in. wide by 1 7/8 in. high; 1 1/8 in. lg. by 1/4 in. dia. shaft, solder-lug type terminals, mounts by one 3/8-32 ANS threaded bushing 1/4 in. long, mfd. by CAOV; part/dwg. No. RD-9913-1	
S-202A			NL ON-OFF Switch
S-202B			Output Meter Switch
S-203	*	SWITCH, SLIDE: SPST, phenolic body, 2-1/16 in. long by 5/8 in. wide by 1/8 in. thick, link-bar actuator, locking action, surface mtd., (2) 0.189 in. dia. mtg. holes spaced 1.562 in. apart; mfd. by CAOV; part/dwg. No. RD-9813-1	Diode Current Link Switch
S-204		Same as S-201	
S-204A			Audio Filter Input Switch
S-204B			Audio Filter Output Switch
S-205	N17-S-73082-9003	SWITCH, TOGGLE: 3 amp., 125 volts, silver plated contacts DPST; Type ST23K	Power Switch
T-201	N17-T-64538-4870	TRANSFORMER, AUDIO FREQUENCY: plate coupling type, primary impedance 5000 ohms o/a; secondary impedance 600 ohms o/a, secondary center tapped, primary windings rated at 30 ma, 500 volts rms test, upright steel case, 2-7/16 in. long by 2-5/16 in. wide by 3-1/16 in. high, 2 watts max. power output, 200 to 3000 cps frequency range, not tuned, 5 slotted terminals located on bottom, (6) mtg. holes 3/16 in. dia. spaced (3) 7/8 in. apart on each side of mtg. flange 2-11/16 in. apart, marked with part number, schematic diagram, impedance, power output, frequency response and test voltage, wax impregnated; mfd. by CAOV; part/dwg. No. RD-9834-2	V-211 to Speaker

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TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
TB-201	*N17-B-77936-3845	TERMINAL BOARD: plastic; w/o barriers and markings, 4¼" lg. x ⅝ in. wide x 13/16" high, (2) .169 in. dia. mtg. holes on 3.937 in. centers, accommodates 10 solder-lug terminals; mfd. by CAOV; part/dwg. No. RD-9794-1	Terminal Strip
TB-202	*N17-B-77535-7300	TERMINAL BOARD: plastic, w/o barriers, 1⅞ in. lg. x ½ in. wide x 13/16 in. deep, 2 .169 in. dia. holes centered 1-7/16" apart, accommodates 4 solder-lug terminals marked 11 and 12; mfd. by CAOV; part/dwg. No. RD-9786-1	Terminal Strip
TB-203	*N17-B-77687-4728	TERMINAL BOARD: plastic, w/o barriers, 2-9/16" lg. x ⅝" wd. x ½" deep, (2) .169" dia. mtg. holes centered 2.250 in. apart, accommodates 5 solder-lug terminals marked 13 thru 17 respectively; mfd. by CAOV; part/dwg. No. RD-9768-1	Terminal Strip
TB-204	*N17-B-77411-3251	TERMINAL BOARD: plastic; w/o terminals, barriers or markings; 2-9/16 in. long x ⅝ in. wide x ⅛ in. thick; two 0.169 in. dia mounting holes; accommodates five terminals; mfd. by CAOV; part/dwg. No. RD-9766-1	Terminal Board
TB-205	*N17-B-77409-3601	TERMINAL BOARD: plastic; w/o terminals, barriers or markings; 2-1/16 in. long x ⅝ in. wide x ⅛ in. thick; two 0.169 in. dia mounting holes; accommodates two terminals; mfd. by CAOV; part/dwg. No. RD-9769-1	Terminal Board
TB-206	*N17-B-77411-1321	TERMINAL BOARD: plastic; w/o terminals, barriers or markings; 2½ in. long x 1⅜ in. wide x ⅛ in. thick; two 0.169 in. dia. mounting holes; accommodates twelve terminals; mfd. by CAOV; part/dwg. No. RD-9781-1	Terminal Board
TB-207	*N17-B-77408-5781	TERMINAL BOARD: plastic, w/o terminals and barriers; 1⅞ in. long x ½ in. wide x ⅛ in. thick; two 0.169 in. dia. mounting holes; accommodates two terminals; marked 11 and 12; mfd. by CAOV; part/dwg. No. RD-9785-1	Terminal Board
TB-208	*N17-B-77418-1001	TERMINAL BOARD: plastic, w/o terminals; accommodates ten terminals; w/o barriers or markings; 4¼ in. long x ⅜ in. wide x ⅛ in. thick; two 0.169 in. dia. mounting holes, 3.937 in. center to center; mfd. by CAOV; part/dwg. No. RD-9792-1	Terminal Board
TB-209	*N17-B-77407-1351	TERMINAL BOARD: plastic; w/o terminals, barriers or markings; 1½ in. long x 1⅜ in. wide x ⅛ in. thick; two 0.189 in. dia. mounting holes; accommodates eight terminals; mfd. by CAOV; part/dwg. No. RD-9807-1	Terminal Board
TB-210	*N17-B-77408-3251	TERMINAL BOARD: plastic; w/o terminals, barriers or markings; 1-13/16 in. long x 1¼ in wide x ⅛ in. thick; two 0.169 in. dia. mounting holes; accommodates five terminals; mfd. by CAOV; part/dwg. No. RD-9776-1	Terminal Board
TB-211	*N17-B-77438-7891	TERMINAL BOARD: plastic, w/o terminals, barriers or markings; 9-7/16 in. long x 1⅜ in. wide x ⅛ in. thick; five 0.169 in. dia. mounting holes; accommodates fifty-two terminals; mfd. by CAOV; part/dwg. No. RD-9762-2	Terminal Board

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TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
V-201	N16-T-56127	ELECTRON TUBE: receiving metal, amplifier pentode, small wafer octal 8 pin base, heater-current 0.45 amp. at 6.3 volts ac or dc. JAN No. 6AB7	1st IF Amplifier
V-202		Same as V-201	2nd IF Amplifier
V-203		Same as V-201	3rd IF Amplifier
V-204		Same as V-201	4th IF Amplifier
V-205		Same as V-201	5th IF Amplifier
V-206	N16-T-56346	ELECTRON TUBE: receiving metal twin diode; intermediate shell octal 7 pin base, heater current 0.3 amps. at 6.3 volts JAN No. 6H6	
V-206A			Second Detector
V-208B			Noise Limiter
V-207		Same as V-201	First AF Amplifier
V-208		Same as V-206	Silencer Diode
V-209		Same as V-201	Silencer Amplifier
V-210		Same as V-201	Second AF Amplifier
V-211	N16-T-56758	ELECTRON TUBE: receiving glass, beam power amplifier, intermediate shell 7 pin octal base, heater current 0.45 amps. at 6.3 volts ac or dc JAN No. 6V6GT	Output AF Amplifier
XI-201	N17-L-76854-4325	LIGHT INDICATOR: supplied with ½" dia. frosted red lens; accommodates a miniature bayonet base T-3-¼ lamp, chrome-plated brass shell; 2-5/16" lg. x 1" dia.; mounts in a 11/16" dia. hole; 1/16" max. panel thickness, horizontally mounted lamp replaceable from front; two solder-lug terminals grounded to frame; includes two polaroid discs for dimming; cork gasket under cap, neoprene gasket under flange, internal tooth lockwasher; mfd. by CAOV; part/dwg. No. RD-11788-1	Pilot Lamp
XV-201	N16-S-63524-6492	SOCKET, ELECTRON TUBE: 8 contact octal, plug-in type, with retaining ring and saddle; mfd. by CUF; No. 115376 Navy Type -49373	Socket for V-201
XV-202		Same as XV-201	Socket for V-202
XV-203		Same as XV-201	Socket for V-203
XV-204		Same as XV-201	Socket for V-204
XV-205		Same as XV-201	Socket for V-205
XV-206		Same as XV-201	Socket for V-206
XV-207		Same as XV-201	Socket for V-207
XV-208		Same as XV-201	Socket for V-208
XV-209		Same as XV-201	Socket for V-209
XV-210		Same as XV-201	Socket for V-210
XV-211		Same as XV-201	Socket for V-211

TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
Z-201	N17-T-68059-7011	TRANSFORMER, IF: 12.0 megacycles, input shielded, 1⅜ in. wide by 1⅜ in. deep by 4-11/16 in. high, mounted by two spade bolts, 4 solder-lug terminals located on bottom, primary 2 turns, secondary 7¼; mfd. by CAOV; part/dwg No. RD-10017-1	T-101 to V-201 Coupling
Z-202	N17-T-68060-8350	TRANSFORMER, IF: 12.0 megacycles, input shielded, 1⅜ in. wide by 1⅜ in. deep by 4¼ in. high, mounted by two spade bolts, 4 solder-lug terminals located on bottom, primary 7¼ turns, secondary 7¼ turns, mfd. by CAOV; part/dwg. No. RD-10019-1	V-201 to V-202 Coupling
Z-203		Same as Z-202	V-202 to V-203 Coupling
Z-204		Same as Z-202	V-203 to V-204 Coupling
Z-205		Same as Z-202	V-204 to V-205 Coupling
Z-206	N17-T-68060-8345	TRANSFORMER, IF: 12.0 megacycles, interstage shielded 1⅜ in. deep by 4-11/16 in. high, mounted by two spade bolts, 4 solder-lug terminals on bottom, primary 7¼ turns, secondary 15 turns, ceramic coil form, air core, double mica capacitor tuned; mfd. by CAOV; part dwg. No. 10021-1	V-205 to V-206 Coupling
		POWER SUPPLY: Rectification data; electronic type, 5U4G tube type; full wave; output regulated; input AC-110/115/120 volts; 55/65 cycles, 2 phase, 106 watts; overall dimensions 16½ inches high by 8¼ inches deep by 5½ inches wide; filter included; mounting data; mounted by 9 #12 (.189) diameter mounting holes irregularly spaced; impregnated for tropical use; mfd. by CAOV; part/dwg. No. RD-9750-6	
C-301 A & B	N16-C-53192-8189	CAPACITOR: paper dielectric 0.1/0.1 mfd; 600 volts dc working JAN No. CP53B6EF104L	Power Input Filter
C-302 A & B		Same as C-301	Power Input Filter
C-303		Same as C-212	Power Input Filter
C-304		Same as C-212	Power Input Filter
C-305		Same as C-245	
C-305A			L-302 Input Filter
C-305B			L-302 Tuning
C-306		Same as C-213 A & B	
C-306A			L-302 Input Filter
C-306B			L-302 Tuning
C-307	N16-C-51858-2105	CAPACITOR: paper dielectric 10.0 mfd. JAN No. CP70B1FF106K	Power Supply Filter Centers
C-308		Same as C-307	Power Supply Filter Output
C-309		Same as C-212	J-304 #3 By-pass
C-310		Same as C-212	J-304 #2 By-pass
C-311		Same as C-212	J-304 #3 By-pass
C-312		Same as C-212	Audio Output Filter

TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
C-313		Same as C-212	Audio Output Filter
C-314		Same as C-212	Silencer Output
C-315	N16-C-49197-3879	CAPACITOR: paper dielectric 2.0 mfd. JAN No. CP53B1FF205K	300 Volt Supply Filter
E-301	N17-M-75387-1823	MOUNTING: medium steel and natural rubber, cadmium plated, holds item with 3/8-16 bolt, (4) .266 dia. mtg. holes on 2½ in. by 2½ in. mtg. centers, utilizes natural rubber in compression, isolates frequencies over 2000 cpm mfd. by CAOV; part/dwg. No. RD-10811-1	Mounting Radio Receiver
E-302		GASKET: rubber per JAN R-1149, 20-25 durometer, rectangular shape 17¾ in. by 9-15/32 in.	Water-proofs Cabinet
F-301	N17-F-16302-120	FUSE, CARTRIDGE: 3 amp., 250 volts, instantaneous type; ferrule type contacts ¼" long x ¼" dia.; enclosed glass body 1¼" long x ¼" dia.; one time non-indicating; mfd. by CAOV; part/dwg. No. RD-11789	AC Line Fuse
F-302		Same as F-301	AC Line Fuse
J-301	N17-C-73187-1890	CONNECTOR, RECEPTACLE: 4 round female type contacts, polarized, straight type, 1⅛ in. lg. by 1-7/16 in. dia., 20 amps, 800 volts, cylindrical body, molded bakelite insert, one 1-17/64 in. dia. mtg. hole ⅜ in. deep max. Little-fuse type 341001; mfd. by CAOV; part/dwg. No. RD-11839-1	Power Receptacle
J-302	N17-C-73564-2226	CONNECTOR, RECEPTACLE: (10) male type button contacts, polarized, straight type, 1-1/16 in. lg. by 1-9/32 in. dia., 1 amp 500 volts, cylindrical body, molded bakelite insert, one 1-1/64 in. dia. mtg. hole 5/32 in. deep max., mfd. by CAOV; part/dwg. No. RD-11848-1	AF Output Silencer Receptacle
L-301 A & B		CHOKE, RADIO FREQUENCY: ac line input filter, wide band; cylindrical body 5⅜" long x 1-5/16 in. dia.; 3 solder lug terminals, mfd. by CAOV; part/dwg. No. RD-9738-2	AC Line Input Filter
L-302	N16-R-29681-4056	REACTOR: Input filter choke; one section; 8 henries 120 ma dc; tapped at 3.8 mh; 110 ohms, 2750 volts; hermetically sealed metal case; 2⅞" long by 4" wide by 4½ in. deep; four .189 dia. mtg. holes on 3⅜" x 3⅜ in. centers. 3 slotted type terminals located on top. Sprayed with moisture and fungus-resistant lacquer, marked on top with part no., schematic diagram, inductance, current, test voltage, and mfr's name, mfd. by CAOV; part/dwg. No. RD-9736-2	B+ Input Filter Choke
L-303		Same as L-302	B+ Output Filter Choke
L-304 A & B		Same as L-301	AC Line Input Filter
L-305		CHOKE, RF: wide band audio line output filter choke, cylindrical shape 1¼" lg. x 5/16" dia. 2 wire pigtail terminals located on longitudinal centerline, mfd. by CAOV; part/dwg. No. RD-9740-1	AF Output Filter Choke
L-306		Same as L-305	AF Output Filter

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless items cannot be repaired or fabricated.

TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
O-301	*N16-C-300798-866	CLAMP, ELECTRICAL: stainless steel; one spring type fastening device 1¾" dia. by ¾" in. high; bracket has clearance hole for #10 screw; holds material 1⅜" dia.; no tools required; used as a tube clamp. Birtcher—926C.	Holds V-301
O-302	*N16-R-503580-212	CLAMP, ELECTRICAL: stainless steel, one bolt-type fastener, 2-1/32 in. long by 1-7/16 in. wide by 23/32 in. high, designed to fit material 27/32 in. dia. to 1⅛ in. dia. RC-140-1	Tube Clamp
O-303		CLAMP, ELECTRICAL: stainless steel, one bolt-type fastener, 2-5/16 in. long x 1-13/16 in. wide x 11/16 in. high; designed to fit material 1-3/16 in. dia. to 1-7/16 in. dia. RC-140-2	Tube Clamp
P-301		CONNECTOR, PLUG: 4 contact male plug 1-7/16" x 1-9/16"; 20 amps, 800 V RMS; Waterproof by means of "O" ring at front and sealing ferrule at back; locking mechanism; power input plug (.545 I.D. of cable entrance). Amphenol #164-2; part/dwg. No. RD-13639-2	Power Input Plug
R-301		RESISTOR, FIXED, COMPOSITION: 680 ohms p/m 10%, 2 watts JAN No. RC40AE681K	V-302 Anode Supply
R-302		Same as R-301	V-302 Anode Supply
R-303	N16-R-49985-0796	RESISTOR, FIXED, COMPOSITION: 1800 ohms p/m 10%, ½ watt JAN No. RC20AE182K	Silencer Output Filter
R-304		RESISTOR, FIXED, COMPOSITION: 1000 ohms p/m 10%, 2 watts JAN No. RC40AE102K	300 Volt Series Filter
S-301	*N17-B-77637-2561	BOARD, TERMINAL: 4 screws with feed thru solder-lug movable link type; 250 volts 10 amps AC; 4 solder-lug terminals located on back; 3 position movable link contact arrangement; 2⅜" long x 2-7/16" wide x 0.821" deep; 4 mtg. holes on 2.062" x 1.062" x 1.375" mtg. centers, 2 terminals marked R-301, 2 marked R-302; 1 link contact marked 110 volts, 1 marked 115 volts, 1 marked 120 volts, mfd. by CAOV; part/dwg. No. RD-9715-2	Power Input Primary Switch
T-301	N17-T-74017-9980	TRANSFORMER POWER STEP DOWN & STEP UP; hermetically sealed metal case, 110/115/120 volts input, 60 cycles, single phase 4 output winding, #1 secondary 6.3 volts, 11.1 amps; #2 secondary 300 volts 0.12 amps; #3 secondary 5.0 volts 3.0 amps, #4 secondary 17.0 volts 1.2 amps, 1250 volts to ground; 4¼" long x 4" wide x 5¼" high; 15 solder-post terminals located on top, four .189 dia. mtg. holes spaced 2¼" x 4⅜" on center; electrostatic shield between primary and secondary, marked with part number, schematic diagram, mfr's name and test voltage; mfd. by CAOV; part/dwg. No. RD-9734-2	Power Transformer
TB-301	*N17-B-77936-3835	TERMINAL BOARD: plastic, w/o barriers; 4¼ in. long x ⅝ in. wide by ½ in. deep, (2) .169 in. dia. holes centered 3.937 in. apart, accommodates 10 solder-lug terminals marked 1 thru 10 respectively, mfd. by CAOV; part/dwg. No. RD-9711-1	Power Supply Terminal Strip

* Not furnished as a maintenance part. If failure occurs, do not request replacement unless items cannot be repaired or fabricated.

TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
TB-302	*N17-B-77410-1241	TERMINAL BOARD: plastic, w/o terminals, barriers or markings, 2¼ in. long by ⅞ in. wide by ⅛ in. thick, (2) .169 in. dia. mtg. holes, accommodates 2 terminals, mfd. by CAOV; part/dwg. No. RD-9714-1	Terminal Board
TB-303	*N17-B-77410-8226	TERMINAL BOARD: plastic, w/o terminals, accommodates 4 terminals, w/o barriers, 2-7/16 in. long by 2-3/16 in. wide by ⅛ in. thick, (4) .169 in. dia mtg. holes, w/o markings, mfd. by CAOV; part/dwg. No. RD-9716-1	Terminal Board
TB-304	*N17-B-77414-8001	TERMINAL BOARD: plastic, w/o terminals, barriers or markings, 3-7/16 in. long x 2-9/16 in. wide by ⅛ in. thick; (2) .169 in. dia. mtg. holes, accommodates 12 terminals, mfd. by CAOV; part/dwg. No. RD-9731-2	Terminal Board
TB-305	*N17-B-77408-8001	TERMINAL BOARD: plastic, w/o barriers, terminals or markings, 1-15/16 in. long by 1⅜ in. wide by ⅛ in. thick, 2 mtg. holes .169 in. dia. and .242 in. dia., accommodates 2 terminals, mfd. by CAOV; part/dwg. No. RD-9733-1	Terminal Board
TB-306	*N17-B-77406-6801	TERMINAL BOARD: plastic, w/o terminals, barriers and markings, 1-13/32 in. long by 1⅜ in. wide by 1/ε in. thick, (2) .169 in. dia. mounting holes, accommodates 4 terminals, mfd. by CAOV; part/dwg. No. RD-9787-1	Terminal Board
TB-307	*N17-B-77418-1001	TERMINAL BOARD: plastic, w/o terminals, barriers and markings, 4¼ in. long x ⅝ in. wide x ⅛ in. thick, accommodates 10 terminals, (2) .169 in. dia. mtg. holes, mfd. by CAOV; part/-dwg. No. RD-9712-1	Terminal Board
V-301	N16-T-55464	ELECTRON TUBE: receiving glass, full wave high vacuum rectifier; 5 pin medium shell octal base; heater current 3 amps at 5 volts ac. JAN No. 5U4G	Rectifier
V-302	N16-T-53060	ELECTRON TUBE: receiving glass, 6 pin small octal base, 30 ma, 150 volts dc, JAN No. VR150/30	Voltage Regulator
W-301		Not Used	
W-302	*	CABLE, ASSEMBLY, SPECIAL PURPOSE ELECTRICAL: General Insulated Wire Works Inc. cable, (4) #20 AWG stranded conductors, rubber insulated; rubber jacketed cable; covered tinned copper braid shield, 10 feet over-all length; one Amphenol plug on end #164-8; 26 strands per conductor, mfd. by CAOV; part/dwg. No. RD-11340-2	Audio Output Silencer Input Plug
W-303	N15-C-12200-0600	CABLE, RF: coaxial, 52 ohms, 29.5 mmf/ft, one stranded plain copper wire of 7 strands No. 21 AWG, polyethylene dielectric, single braid copper outer conductor, .340 in. dia., synthetic resin jacket, 13/32 in. dia. o/a JAN No. RG-8/U	Cabling

*Not furnished as a maintenance part. If failure occurs, do not request replacement unless items cannot be repaired or fabricated.

TABLE 8-4. TABLE OF REPLACEABLE PARTS — (Continued)

REFERENCE DESIGNATION	STOCK NUMBERS	NAME AND DESCRIPTION	LOCATING FUNCTIONS
W-304	*N16-C-11582-3641	CABLE ASSEMBLY, RF: coaxial radio frequency cable, type RG-8/U, 52 ohms, 4000 volts rms, 2 conductors, inner seven strand, outer single braid, plain finish copper, 0.285 in. dia. polymeric resin core, plain copper single shield, round shaped 13/32 in dia. o/a, synthetic resin jacket, 8¾ in. long terminated with antenna input jack; JAN No. RG-8/U	Antenna Input Cable
XF-301	N17-F-74266-9201	FUSEHOLDER: extractor type, 250 volt 15 amp., accommodates one cartridge type fuse 1¼" long by ¼" dia.; bakelite body; brass pressure type contacts; 2-9/64" long by 1-1/16" across flats hex nut; two solder-lug terminals, mounts in a .500 dia. hole, water-proofed; mfd. by CAOV; part/dwg. No. RD-11792-1	Fuse Holder
XF-302		Same as XF-301	Fuse Holder
XV-301		Same as XV-201	Socket for V-301
XV-302		Same as XV-201	Socket for V-302

*Not furnished as a maintenance part. If failure occurs, do not request replacement unless items cannot be repaired or fabricated.

TABLE 8-5. MAINTENANCE PARTS KIT.

KEY DESIGNATION	QUANTITY	KEY DESIGNATION	QUANTITY
E-101	1	S-202	1
L-101	1	S-204	1
L-102	1	T-101	1
L-103	1	T-102	1
L-104	1	T-104	1
L-201	1	T-201	1
L-202	1	T-301	1
L-301	1	Z-101	1
L-305	1	Z-201	1
S-101A	1	Z-202	1
S-101B	1	Z-206	1
S-201	1		

TABLE 8-6. CROSS REFERENCE PARTS LISTS.

JAN NUMBER	KEY SYMBOL	JAN NUMBER	KEY SYMBOL
CC21CH0500D	C-115	RC20AE154K	R-247
CC21CH100F	C-103	RC20AE155K	R-234
CC21CK020C	C-116	RC20AE182K	R-210
CM15C391J	C-118	RC20AE221K	R-238
CM15C510J	C-105	RC20AE224K	R-105
CM20B151K	C-235	RC20AE274K	R-205
CM20B511K	C-107	RC20AE331K	R-230
CM20C181J	C-138	RC20AE333K	R-266
CM20C200J	C-124	RC20AE391K	R-102
CM20C391J	C-120	RC20AE393K	R-103
CM20C510J	C-132	RC20AE473K	R-114
CM20D241J	C-201	RC20AE474K	R-101
CM30B681K	C-233	RC20AE560J	R-202
CM35B103M	C-212	RC20AE563K	R-206
CM35B512M	C-106	RC20AE564K	R-233
CM35B682K	C-246	RC20AE680K	R-201
CP53B1FF205K	C-315	RC20AE753J	R-108
CP53B4EF104L	C-213	RC20AE821K	R-216
CP53B4EF503L	C-245	RC20AE823K	R-207
CP53B5FF104V	C-236	RC20AE824K	R-236
CP53B6EF104L	C-301	RC30AE153K	R-242
CP70B1FF106K	C-307	RC30AE271K	R-262
MR26W001DCMA	M-201	RC30AE473K	R-229
MR26W300DCVV	M-203	RC40AE102K	R-304
RC20AE102K	R-104	RC40AE681K	R-301
RC20AE103K	R-106	RG-58/U	W-303
RC20AE124K	R-116	ST-23K	S-205
RC20AE151K	R-208	TSE7T102	XV-102
RC20AE153K	R-209	VR150/30	V-302

JAN NUMBER	KEY SYMBOL
5U4G	V-301
6AB7	V-201
6AK5	V-102
6H6	V-206
6J5	V-105
6V6GT	V-211
956	V-101

NAVY TYPE NO.	KEY SYMBOL
49025A	J-201
49120	J-101
49121A	P-101
49373	XV-105
632183-N10	R-240
632882-N10	R-251
637178-N10	R-245

STANDARD NAVY STOCK NO.	KEY SYMBOL
N15-C-12201-0050	W-303
N16-C-11582-3641	W-304
N16-C-15432-5867	C-116
N16-C-15627-9158	C-115
N16-C-15921-2998	C-103
N16-C-26732-9601	C-124
N16-C-27656-2601	C-132
N16-C-28980-2076	C-235
N16-C-29133-4001	C-138

STANDARD NAVY STOCK NO.	KEY SYMBOL
N16-C-29449-8806	C-201
N16-C-29898-3601	C-120
N16-C-300442-704	O-202
N16-C-300798-866	O-301
N16-C-30536-4764	C-233
N16-C-33068-5823	C-246
N16-C-33627-7705	C-212
N16-C-49197-3879	C-315
N16-C-51858-2105	C-307
N16-C-53002-4345	C-245
N16-C-53192-8189	C-301
N16-C-53192-8190	C-213
N16-C-54460-4450	C-236
N16-C-64452-1501	C-102
N16-C-72782-6284	L-101
N16-R-29681-4056	L-302
N16-R-29769-3001	L-202
N16-R-29870-1901	L-201
N16-R-49689-0216	R-262
N16-R-49877-0796	R-216
N16-R-49922-0796	R-104
N16-R-49985-0796	R-210
N16-R-50282-0796	R-106
N16-R-50336-0796	R-209
N16-R-503580-212	O-302
N16-R-50417-0796	R-266
N16-R-50444-0796	R-103
N16-R-50480-0796	R-114
N16-R-50481-0216	R-229

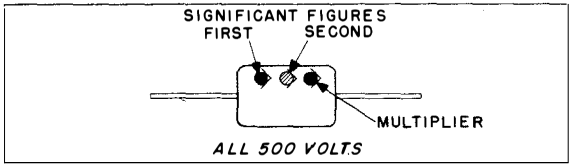
TABLE 8-6. CROSS REFERENCE PARTS LISTS — (Continued)

STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	STANDARD NAVY STOCK NO.	KEY SYMBOL	ASO STOCK NO.	KEY SYMBOL
N16-R-50651-0796	R-116	N17-B-77409-3601	TB-205	N17-F-16302-120	F-301	R16-C-9813-14-500	C-124
N16-R-50678-0796	R-247	N17-B-77409-8494	TB-107	N17-F-74266-9201	XF-301	R16-C-9954-25	C-235
N16-R-50741-0796	R-205	N17-B-77410-1241	TB-302	N17-J-39248-4418	J-201	R16-C-9965-77-550	C-138
N16-R-503580-212	Electrical Clamp	N17-B-77410-8226	TB-303	N17-L-51623-4191	XI-101	R16-C-10495-7-800	C-212
		N17-B-77411-1321	TB-206	N17-L-6297	I-101	R16-J-3125	J-201
N16-R-87089-2975	R-245	N17-B-77411-3251	TB-204	N17-L-76854-4325	XI-201	R16-S-6186	XV-105
N16-R-87349-4294	R-255	N17-B-77412-4563	TB-105	N17-M-19253-1717	M-201		
N16-R-87849-4273	R-240	N17-B-77414-1225	TB-103	N17-M-22724-6701	M-202		
N16-R-88342-5274	R-251	N17-B-77414-8001	TB-304	N17-M-35567-6056	M-203		
N16-R-89826-8125	R-117	N17-B-77418-1001	TB-208	N17-M-75387-1823	E-301		
N16-R-90803-1488	R-232	N17-B-77438-7891	TB-211	N17-S-61361-1683	S-202		
N16-S-54548-7001	XY-101	N17-B-77535-7294	TB-101	N17-S-62522-3406	S-201		
N16-S-61646-7026	XV-101	N17-B-77535-7300	TB-202	N17-S-73082-9003	S-205		
N16-S-63524-6492	XV-105	N17-B-77637-2561	S-301	N17-S-91897-8907	S-101A		
N16-T-53060	V-302	N17-B-77687-4728	TB-203	N17-T-64538-4870	T-201		
N16-T-55464	V-301	N17-B-77687-4729	TB-102	N17-T-68059-6459	Z-101		
N16-T-56127	V-201	N17-B-77936-3835	TB-301	N17-T-68059-7011	Z-201		
N16-T-56191	V-102	N17-B-77936-3845	TB-201	N17-T-68060-8345	Z-206		
N16-T-56346	V-206	N17-C-71120-4869	P-101	N17-T-68060-8350	Z-202		
N16-T-56350	V-105	N17-C-73187-1890	J-301	N17-T-74017-9980	T-301		
N16-T-56758	V-211	N17-C-73411-2793	J-101	N41-W-2444-30	H-201		
N16-T-69560	V-101	N17-C-73564-2226	J-302	N43-S-4799-1214	H-203		
N17-B-77406-6801	TB-306	N17-C-78502-1001	J-102	N43-S-4799-1245	H-103		
N17-B-77407-1228	TB-106	N17-C-84338-4151	S-102	N43-S-4799-1567	H-202		
N17-B-77407-1351	TB-209	N17-C-945001-673	Jack Cover	N43-S-99500-219	H-104		
N17-B-77408-1443	TB-104						
N17-B-77408-3251	TB-210	N17-C-945002-150	O-203				
N17-B-77408-5781	TB-207	N17-C-98378-4454	O-102				
N17-B-77408-8001	TB-305	N17-C-98378-9068	O-103				

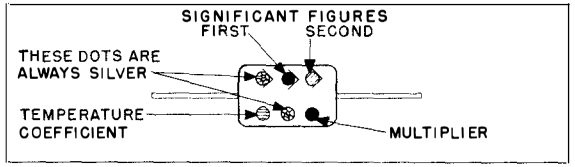
TABLE 8-7. APPLICABLE COLOR CODES AND MISCELLANEOUS DATA.

CAPACITOR COLOR CODE

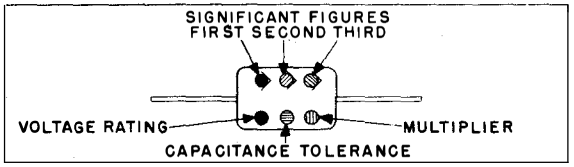
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



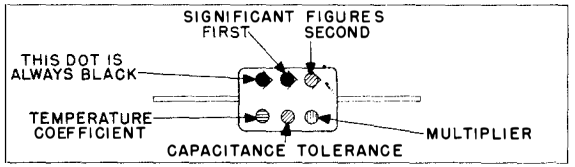
JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



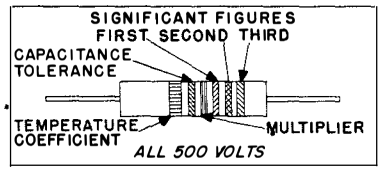
RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

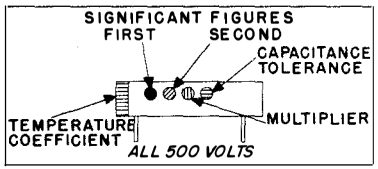


RMA COLOR CODE FOR TABULAR CERAMIC-DIELECTRIC CAPACITORS

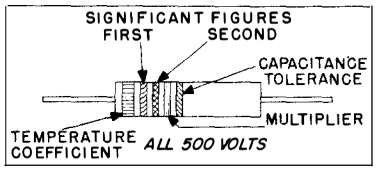


JAN CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS

RADIAL TYPE NON-INSULATED



AXIAL TYPE INSULATED

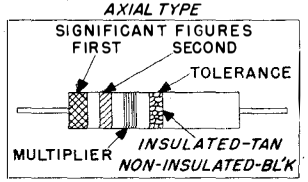


RESISTORS		CAPACITORS						
				MULTIPLIER				
TOLERANCE	MULTIPLIER	SIGNIFICANT FIGURE	COLOR	RMA MICA AND CERAMIC-DIELECTRIC	JAN MICA AND PAPER-DIELECTRIC	JAN CERAMIC DIELECTRIC	VOLTAGE RATING	TEMPERATURE COEFFICIENT
	1	0	BLACK	1	1	1		A
	10	1	BROWN	10	10	10	100	B
	100	2	RED	100	100	100	200	C
	1,000	3	ORANGE	1,000	1,000	1,000	300	D
	10,000	4	YELLOW	10,000			400	E
	100,000	5	GREEN	100,000			500	F
	1,000,000	6	BLUE	1,000,000			600	G
	10,000,000	7	VIOLET	10,000,000			700	
	100,000,000	8	GRAY	100,000,000		0.01	800	
	1,000,000,000	9	WHITE	1,000,000,000		0.1	900	
5	0.1		GOLD	0.1	0.1		1000	
10	0.01		SILVER	0.01	0.01		2000	
20			NO COLOR				500	

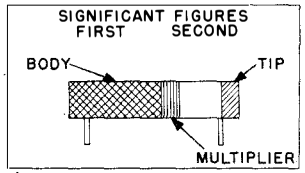
RESISTOR COLOR CODE

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE

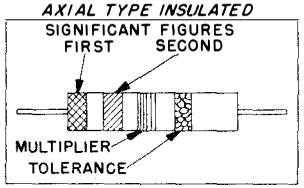


RADIAL TYPE



JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE INSULATED



RADIAL TYPE NON-INSULATED

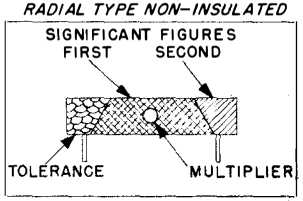


TABLE 8-8. LIST OF MANUFACTURERS.

ABBREVIATIONS	PREFIX	NAME	ADDRESS
Air Assoc.	CAOV	Air Associates, Inc., Electronics Division	511 Joyce St., Orange, N. J.
AB	CBZ	Allen-Bradley Co.	118 W. Greenfield Street, Milwaukee, Wisconsin
Amphenol	CPH	American Phenolic Corp.	1830 S. 54th Ave., Chicago, Illinois
Birnbach	CYB	Birnbach Radio Co., Inc.	145 Hudson St., New York, N. Y.
Burlington Instr.	CAVK	Burlington Instrument Co.	4th & Valley St., Burlington, Iowa
Buss	CFA	Bussman Mfg. Co.	2538 W. University St., St. Louis, Mo.
Cinch	CMG	Cinch Mfg. Co.	2339 W. Van Buren St., Chicago 12, Ill.
Corning Glass	CBI	Corning Glass Works	1943 Crystal St., Corning, N. Y.
Dialco		Dial Light Co. of America	90 West St., New York, N. Y.
		Dietz Design & Mfg. Co.	Grandview, Mo.
Erie	CER	Erie Resistor Corp.	644 W. 12th St., Erie, Pa.
GE	CG	General Electric Co.	1 River Road, Schenectady 5, N. Y.
Guardian Elec.	CGE	Guardian Electric Co.	1623 W. Walnut St., Chicago, Illinois
Jeffersonelec	CJE	Jefferson Electric Co.	910 25th Ave., Bellwood, Ill.
Johnson E F	CEJ	Johnson, E. F., Co.	Waseca, Minn.
Kings Electron	CANS	Kings Electronics, Inc.	372 Classon Avenue, Brooklyn 5, N. Y.
Millen	CJE	Millen, James, Mfg. Co., Inc.	150 Exchange St., Malden, Mass.
Oak	OOC	Oak Mfg. Co.	1200 N. Clybourn Ave., Chicago, Ill.
RCC	CRK	Radio Condenser Co.	Camden, N. J.
Stanwyck	CACY	Stanwyck Winding Co.	Newburgh, N. Y.
Ucinite	CUF	Ucinite Co., The	450 Main St., Cambridge, Mass.

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