

INSTRUCTION BOOK
for
NAVY TYPE CRF-20337
VIBRATOR POWER SUPPLY

(For Use With Navy Models TBX-7 or TBX-8
Transmitting-Receiving Equipments)

THE RADIART CORPORATION
Cleveland, Ohio

NAVY DEPARTMENT

BUREAU OF SHIPS

Contract NXsr-48365

Approved 8 May 1945

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RECORD OF CORRECTIONS MADE

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CONTRACTUAL 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 appeared 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 per cent (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 per cent (100%) correction or replacement by a suitably 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 affecting 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 such defects, and any items repaired or replaced by the contractor will be guaranteed anew under this provision.

INSTALLATION RECORD

Contract Number: NXsr-48365. Date of Contract: 9 February 1944.

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.

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REPORT OF FAILURE

Report of failure of any part of this equipment during its service life, shall be made to the Bureau of Ships in accordance with current instructions. 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.

REPLACEMENT MATERIAL

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

1. Navy stock number or, when ordering from an Army supply depot, the Army stock number.
2. Name of part.

If the Navy stock number has not been assigned, the requisitions should specify the following:

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

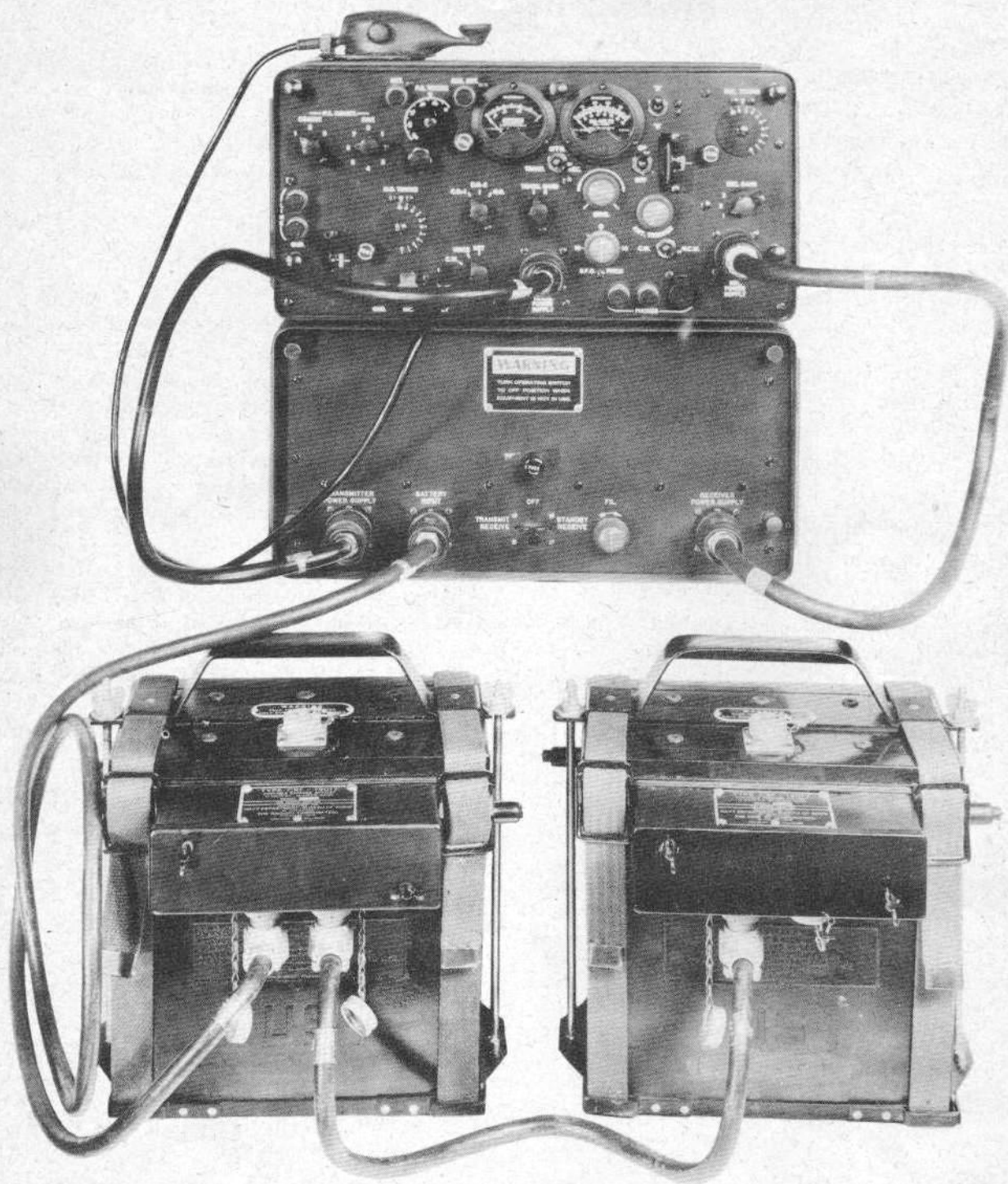
SAFETY AND WARNING NOTICES

THE 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

THE ATTENTION OF OFFICERS AND OPERATING PERSONNEL IS DIRECTED TO CHAPTER 67 OF BUREAU OF SHIPS MANUAL OR SUPERSEDING INSTRUCTIONS ON THE SUBJECT OF "RADIO—SAFETY PRECAUTIONS TO BE OBSERVED."

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.



VIBRATOR POWER SUPPLY, NAVY TYPE 20337, WITH ACCESSORIES
(SHOWN CONNECTED TO TBX-8 TRANSMITTER-RECEIVER)

FIGURE 1-1

SECTION I

GENERAL DESCRIPTION

1. QUICK REFERENCE DATA

a. Nomenclature—Navy Type 20337 Vibrator Power Supply Equipment.

b. Contract: NXsr 48365. Date: 9 February 1944.

c. Contractor: The Radiart Corporation, Cleveland, Ohio.

d. Cognizant Naval Inspector: Inspector of Naval Material, Cleveland, Ohio.

e. Nominal output:

1. Transmitter:

1. Plate 500 volts 70 ma.
2. Filament 12.5 volts 2 amps.

2. Receiver:

1. Plate 90 volts 10 ma.
2. Bias—6 volts 0 ma.
3. Filament 1.4 volts 250 ma.

f. Power supply required for operation: One or two 12 volt storage batteries, Navy Type 19017.

g. Vacuum Tube Complement: One JAN-1006.

h. Number of packages involved per complete shipment of equipment: Two packages.

i. Total cubical contents:

1. Installed: 2.5 cu. ft.
2. Packed for shipment: 9.9 cu. ft.

j. Total weight:

1. Installed: 105 lbs.
2. Packed for shipment: 266 lbs.,

2. FUNCTION

The Navy Type 20337 Vibrator Power Supply is designed as a silent portable power supply for operation of Models TBX-7 and TBX-8 radio transmitter-receiver equipments from a 12 volt portable storage battery. The entire equipment is designed to provide the maximum practical resistance to the corrosive action of salt water. The Basic Equipment as packed for transportation is designed to be submergence proof.

For ready reference only, condensed operating and installation instructions for Type 20337 Vibrator Power Supply are included in the cover of the Power Supply Unit and do not obviate the necessity of a careful study of this Instruction Book.

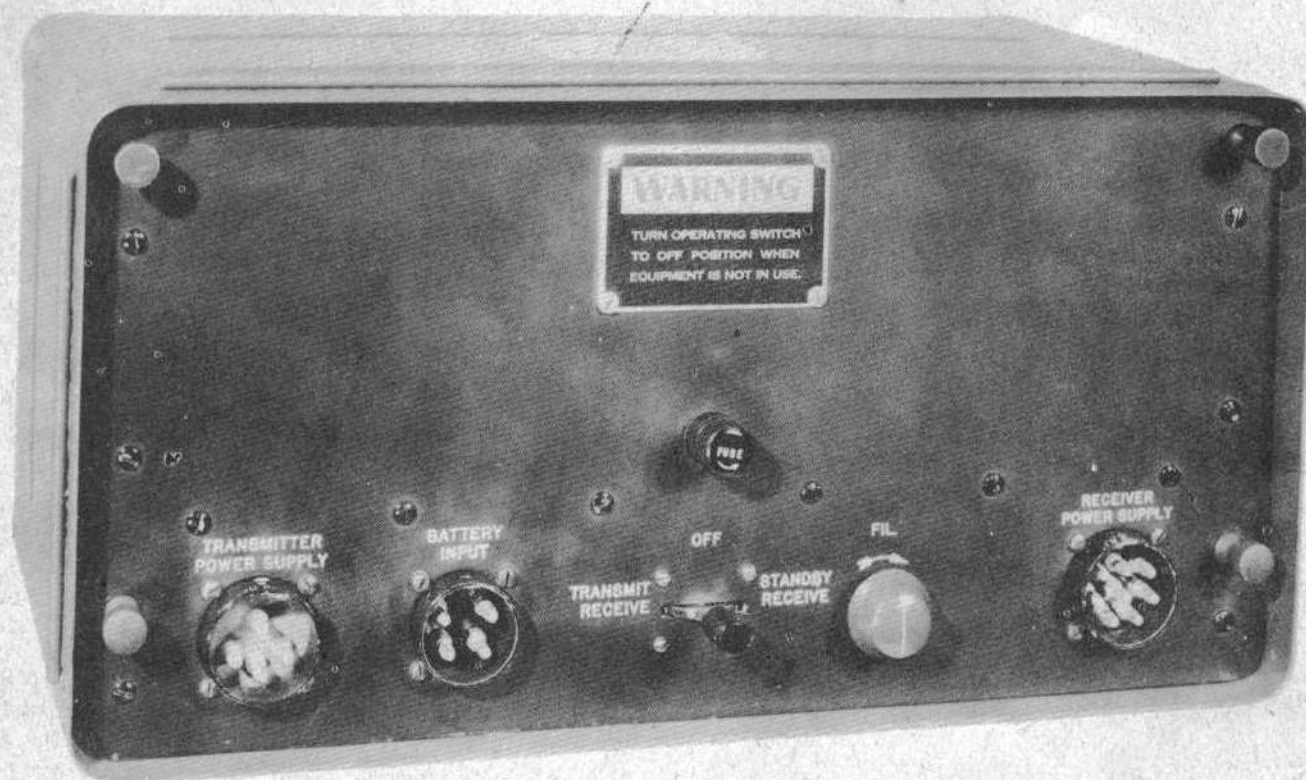
3. EQUIPMENT SUPPLIED

Quantity	Numerical Series of Reference Symbols	Name of Unit	Navy Type Designation	Overall Dimensions	Volume	Weight
1		Shipping Chest: (For power supply, accessory kit, and spare parts)	10403	H-16¼" W-30½" D-13¼"	3.8 cu. ft.	33.25 lbs.
1	1200-1299	Vibrator Power Supply	20337	H- 9" W-17" D-11"	.96 cu. ft.	33.5 lbs.
1		Canvas Carrying Case	10027-A			3.5 lbs.
1		Accessory Kit containing:				
1		Battery Supply Cable		6 ft. long		1.2 lbs.
1		Battery Connecting		2 ft. long		.4 lb.
1		Transmitter Output Cable		3 ft. long		.75 lb.
1		Set of equipment spares		H- 7½" W-10" D- 9½"	.41 cu. ft.	8 lbs.
1		Shipping Chest (For Storage Batteries)	10402	H-14½" W-23" D-16½"	3.1 cu. ft.	31.3 lbs.
2		12 v. Storage Batteries	19017	H- 9" W-17" D-11"	1.5 cu. ft.	69 lbs.

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EQUIPMENT SUPPLIED— (Continued)

Quantity	Numerical Series of Reference Symbols	Name of Unit	Navy Type Designation	Overall Dimensions	Volume	Weight
1		Battery Filler Shipping Chest 10402 with contents		11" long Uncrated H-14½" W-23" D-16½"	Uncrated 3.1 cu. ft.	.25 lb. Uncrated 101 lbs.
				Crated H-16½" W-26½" D-18¼"	Crated 4.6 cu. ft.	Crated 136 lbs.
		Shipping Chest 10403 with contents		Uncrated H-16¼" W-30½" D-13¼"	Uncrated 3.8 cu. ft.	Uncrated 85 lbs.
				Crated H-17¾" W-33¾" D-15¼"	Crated 5.3 cu. ft.	Crated 130 lbs.



VIBRATOR POWER SUPPLY, NAVY TYPE 20337
FRONT VIEW, COVER REMOVED

FIGURE 1-2

4. DESCRIPTION OF MAJOR UNITS

a. **VIBRATOR POWER SUPPLY**—Navy Type 20337 Vibrator Power Supply is enclosed in a steel case with a cover fitted with gaskets and clamps to make it water tight. The Power Supply is fastened in its case by means of four latch devices attached to the operating panel of the equipment so that the power supply may be easily removed for service or maintenance.

The power supply is of the chassis type of construction allowing access to all components. All components of the plug-in type are held securely to the chassis by means of clamps or hold down brackets. This includes high-voltage filter-condensers, vibrators, and rectifier tubes. Trans-

formers, chokes, and by-pass condensers are fastened directly to the chassis. Resistors are mounted on terminal strips which in turn are mounted directly on the chassis.

The vibrators supplied with this equipment are of a special construction, designed to reduce audible noise to a minimum.

Connection to the primary source of power and the output connections to the transmitting-receiving equipment which the power supply is to operate, is made through connectors on the front panel by means of cables furnished for this purpose. See Figs. 1-1 and 1-2.

The Type 20337 Power Supply Unit furnishes all voltages necessary to operate the type TBX-7

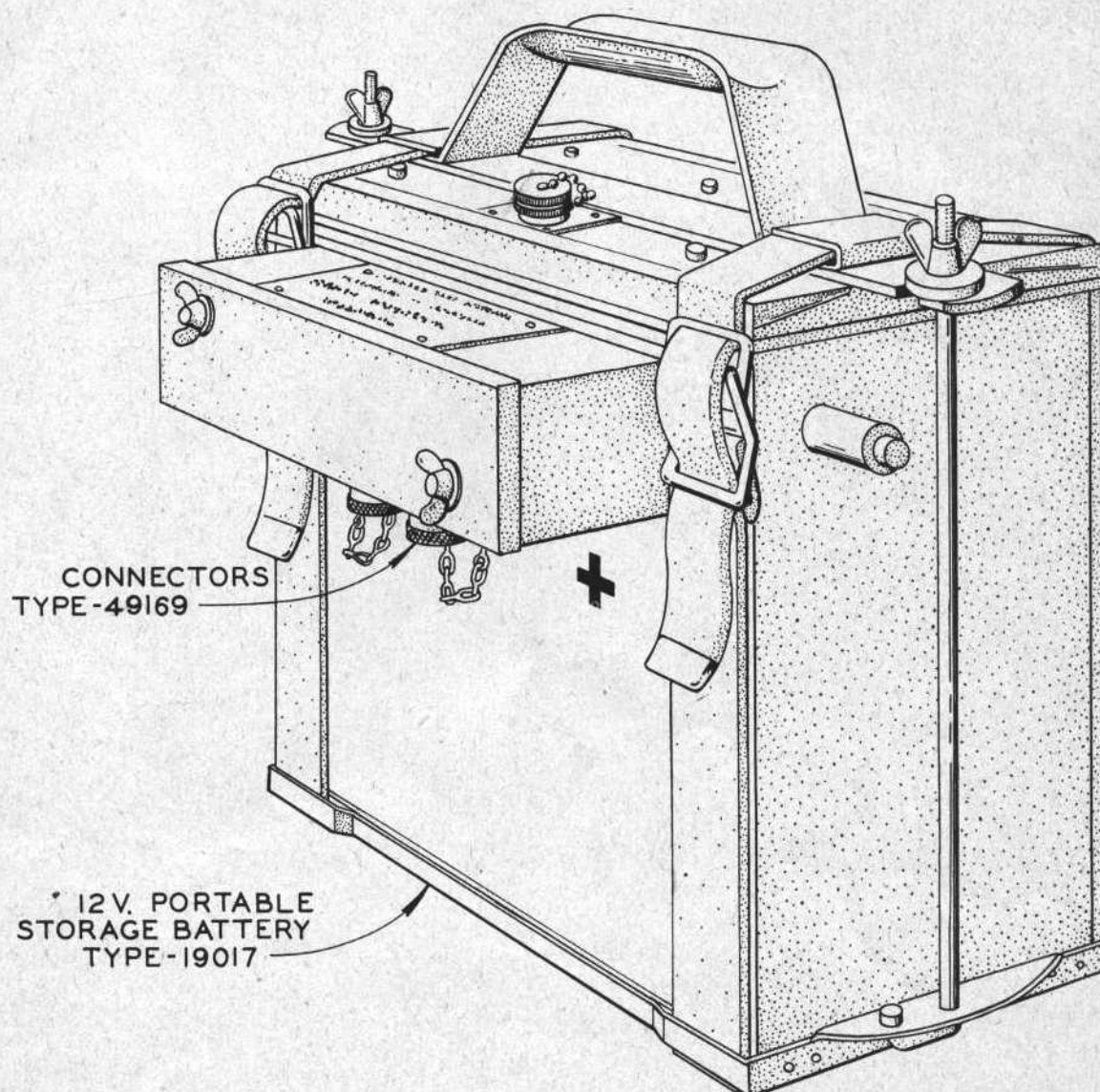


FIGURE 1-3 12-VOLT PORTABLE STORAGE BATTERY, TYPE 19017

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Section I
Paragraph 4

and TBX-8 series transmitting-receiving equipment, all properly filtered to prevent objectionable hum and radio interference. Primary power for operating the power supply is obtained from a twelve volt storage battery. Operation of the receiver power supply only or transmitter and receiver power supply simultaneously is obtained by moving the Operating Switch on the front panel to the proper position. When in the "Standby-Receive" position, only the receiver power supply is in operation. When the switch is in the "Transmit-Receive" position, both the transmitter and receiver power supplies are in operation. In the "OFF" position, both power supplies are disconnected.

b. STORAGE BATTERY—The Storage Battery Type 19017 is designed to be waterproof and

spill proof and to have maximum resistance to the corrosive action of salt water and battery acid. The battery is encased in a cast aluminum housing with a tight fitting cover equipped with gasket. The cover is held in place by means of clamp screws and wing nuts. Connections from the battery are brought out to connectors which are mounted in a waterproof connector box. This connector box is mounted on the side of the battery case. The connectors are fitted with watertight screw-on covers equipped with a chain to prevent loss. A carrying handle is provided, held in place with two web straps which completely encircle the storage battery unit. See Fig. 1-3.

The Type 19017 Battery is of the lead acid type. It consists of six cells connected in series; with a nominal combined voltage of twelve volts.

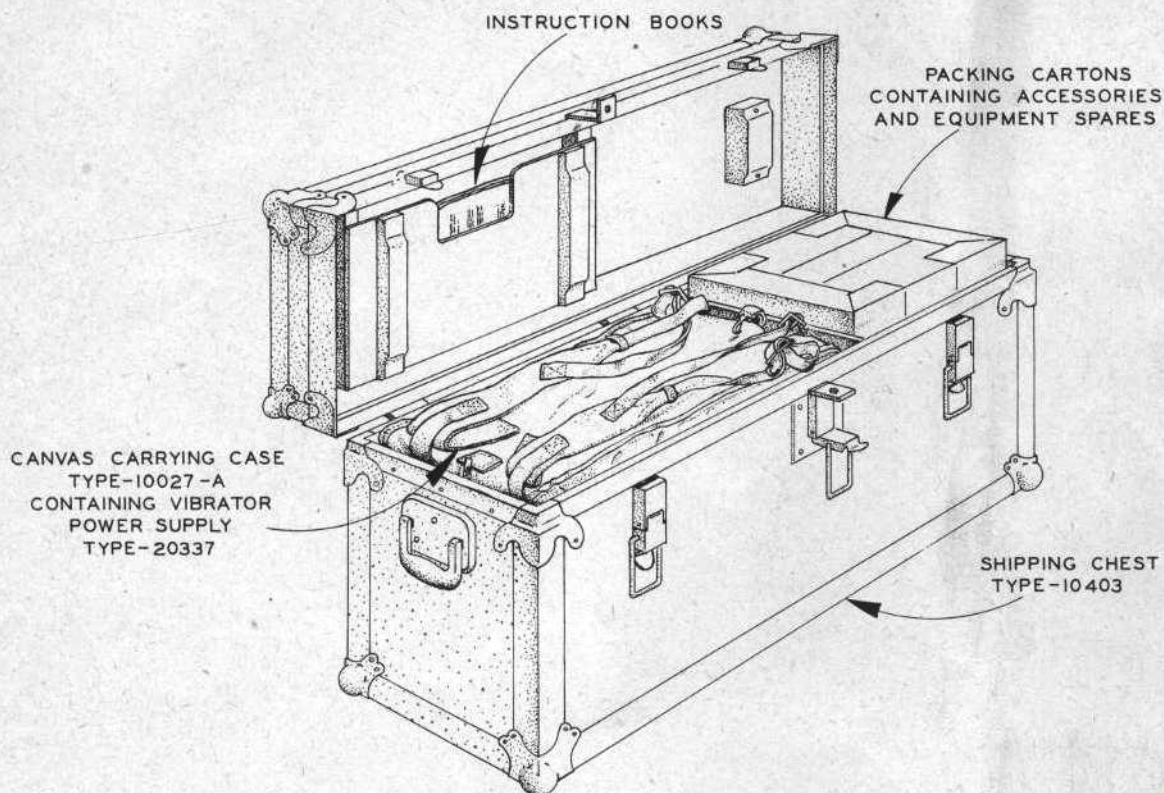


FIGURE 1-4 SHIPPING CHEST WITH CONTENTS, TYPE 10403

c. SHIPPING CHESTS—Shipping chests are provided for stowing the Vibrator Power Supply equipment and batteries, constructed along the lines of a steamer trunk.

Type 10403 chest is arranged for transporting the vibrator power supply unit in its canvas carry-

ing case, the accessory cables, equipment spare parts and two instruction books. See Fig. 1-4.

Type 10402 chest is arranged for transporting two storage batteries and the battery filler. See Fig. 1-5.

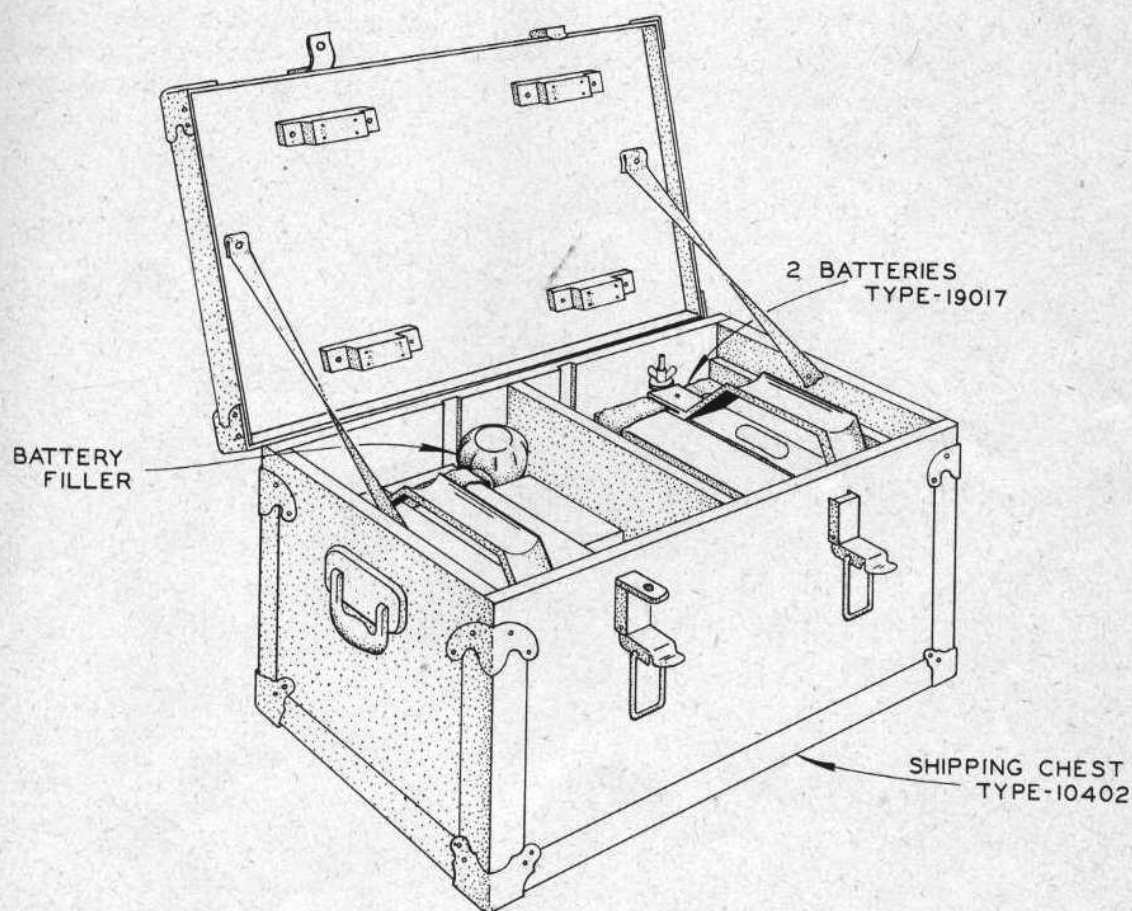


FIGURE 1-5 SHIPPING CHEST WITH CONTENTS, TYPE 10402

d. MISCELLANEOUS — A canvas carrying case, Type 10027A, is provided for the vibrator power supply unit. This carrying case is arranged with canvas web straps to permit field transportation of the power supply as a back pack.

Several cables are furnished for use with this equipment, comprising a battery supply cable, six feet long, a battery interconnecting cable two feet long and a transmitter cable, three feet long.

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SECTION II INSTALLATION AND ADJUSTMENT

1. INSTALLATION

The Type 20337 Vibrator Power Supply, with its accessories and spare parts, is normally transported and stowed in a Type 10403 shipping chest. The contents of this chest should be checked against the list given on the cover plate to insure completeness. To unpack and install the vibrator power supply and accessories, proceed as follows:

a. Remove the Vibrator Power Supply unit from the canvas carrying case. Remove the lid and locate it conveniently near the Vibrator Power Supply unit.

b. Remove the connecting cables from the shipping chest compartment.

c. Remove the storage batteries from the shipping chest and remove the vent hole cover from the top of each battery. Note: Dry charged batteries will need the addition of electrolyte before using (See Paragraph 2.)

d. Locate the vibrator power supply unit close

to the transmitter-receiver unit, preferably with one above the other as shown in Fig. 1-1.

e. Connect one end of the battery supply cable W-1201 (6 ft.) to the socket marked "Battery Input." Connect the Transmitter Cable W-1203 (3 ft.) to the sockets marked "Transmitter Power Supply" on the power unit and the transmitter-receiver. Connect the battery cable W-401 (3 ft.) supplied with the transmitter-receiver equipment to the sockets marked "Receiver Power Supply," on the power unit and the transmitter-receiver. See Fig. 2-1 for cording diagram.

f. Be sure the operating switch on the power supply is in the "OFF" position. Connect the other end of the battery supply cable W-1201 to the storage battery. The battery terminals are brought out to the polarized receptacles on the lower side of the connection box. The storage batteries may be operated in parallel by connecting together with the battery Interconnecting cable W-1202 (2 ft.).

g. The equipment is now ready for operation.

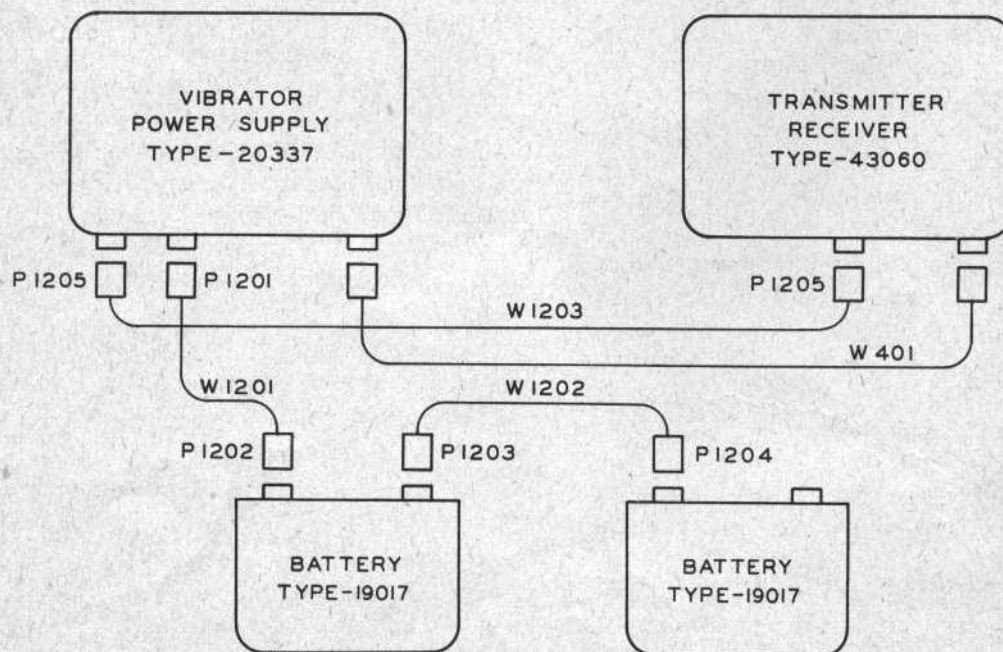


FIGURE 2-1 CORDING DIAGRAM

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2. STORAGE BATTERIES— PREPARATION FOR USE

Instructions for preparing the batteries for use are furnished with each battery, since they vary somewhat between batteries of different manufacture. However, typical instructions are furnished herewith for convenience.

Note

Do not cut or damage the soft rubber grommets in the top or side vent holes, since this will destroy the watertight integrity of the battery. Venting of the battery is accomplished by opening the removable vent hole cover in the top of the battery.

a. INITIAL PLACEMENT IN SERVICE

1. The two Type 19017 portable storage batteries which are supplied with the Type 20337 vibrator power supply equipments are shipped "dry" in initial delivery of the equipments. The addition of electrolyte is necessary for their operation. In order to eliminate the necessity of transporting containers of electrolyte in field service, it is recommended that the batteries be given the necessary conditioning at a base station before placing in initial service.

b. UNPACKING AND HANDLING

1. The containers of the batteries are made of aluminum which is protected outside and inside with a special acid resisting lacquer. Care should be taken in unpacking and handling the batteries to avoid scratching this lacquer and thus permitting corrosion of the case by acid fumes and liquid acid from the batteries. The batteries should be handled carefully at all times, to prevent denting or deforming the case or covers, and thus affecting the security of the watertight seals.

c. ADDING ELECTROLYTE

The electrolyte is added to the battery by means of a special syringe furnished with each battery chest, in the following manner:

1. Loosen the canvas straps which hold the carrying handle in place. Loosen and remove the two wing nuts which hold the top of the battery case in position.

2. Remove the top of the battery case carefully by lifting directly upward on the hold-down bar across the top of the case. **DO NOT ATTEMPT TO PRY THE COVER FROM THE CASE.** This may bend the case out of shape and make it impossible for the watertight seals to function when the cover is replaced.

3. Remove the non-spill vent plugs from the six vent holes in the top of the battery.

4. With the syringe fill each cell of the battery with dilute sulphuric acid of 1.275 specific gravity until the level of the electrolyte is approximately $\frac{1}{2}$ -inch above the protector on top of the separators.

5. Allow the battery to stand at least one hour after filling and check to see if the level falls below the proper level ($\frac{1}{2}$ -inch above the protector on top of the separators in each cell). If the level has fallen, restore to proper level by adding more sulphuric acid.

6. Carefully wipe off any electrolyte spilled in the top of the battery with a cloth.

7. If time permits, charge the batteries 10 hours at a charging rate of 3 amperes. For charging instructions, see Section V, paragraph 3. Permit the batteries to stand at least one hour after charging to permit exit of gasses.

8. Replace the non-spill vent plugs, replace the cover on the battery and secure tightly with the wing nuts to obtain a watertight seal, and secure the carrying straps and handle in position. The battery is now ready for field service.

3. ADJUSTMENT

a. The Type 20337 vibrator power supply is designed to operate TBX-7 and TBX-8 equipments and under normal conditions no adjustments are necessary. However, due to variations in equipments and operating conditions, an adjustment has been provided to regulate the 1.4 filament voltage to the receiver. This adjustment is located on the front panel of the power supply and may be utilized to compensate for variations such as low or high input battery voltage, ageing of the dry rectifier unit, or a dropping off of the vibrator efficiency. See Fig. 1-2 for location of the filament control.

b. The procedure to be followed in making the above adjustment when necessary is as follows:

1. Connect the power supply to the transmitter-receiver equipment.

2. Turn selector switch on power supply to "Standby-Receive" position.

3. Adjust the filament control until the pointer of the filament meter on the transmitter-receiver unit indicates 250 ma. Turning the control to the left decreases the filament current and to the right increases the filament current.

SECTION III OPERATION

WARNING

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.

1. **RECEIVING ONLY:** Turn the operating switch to the "Standby-Receive" position. This places the receiver power supply only in operation. This method of operation should be employed during "standby" periods, since it will provide longer

storage battery life than other modes of operation.

2. **TRANSMITTING OR ALTERNATE TRANSMITTING AND RECEIVING:** Turn the operating switch to "Transmit-Receive" position. This places both the transmitter and receiver power supplies in operation, so that during alternate periods of transmission and reception, such as "break-in" operation, no switching is necessary on the power supply.

3. When the transmitting-receiving equipment is not being operated, return the switch on the power supply to the "OFF" position.

SECTION IV THEORY OF OPERATION

1. TRANSMITTER SECTION OF POWER SUPPLY (Refer to Schematic Diagrams, Figs. 7-1 and 7-2.

a. When switch S-1201 is thrown to the "Transmit-Receive" position, contacts 1 and 2 on the switch are closed, thereby closing the primary circuit through fuse F-1201. This starts the vibrator and connects the primary source directly to pins 63 and 64 of J-1201, furnishing the 12 volts necessary for the operation of the transmitting tube filaments. Microphone current is taken through filter choke L-1201 to pin No. 66 on J-1201. Ripple from the vibrator supply is filtered out by choke L-1202-B and condenser C-1206. Additional hum filtering for the microphone supply is accomplished by C-1201.

b. Plate power is obtained from the vibrator supply. The vibrator Y-1201 is of the non-synchronous type. The contacts of this vibrator convert the direct current to an alternating current. C-1215 acts as the primary buffer condenser. This low voltage alternating current is stepped up to a high voltage alternating current by transformer T-1201. The high voltage alternating current is then rectified to a high voltage direct current by the rectifier tube V-1201. Filament power for V-1201 is obtained from T-1201. Capacitor C-1205 acts as the secondary buffer condenser. This high voltage direct current is filtered by audio choke L-1202-A and filter condensers C-1211 and C-1212. It will be noted that two condensers in series are used for both input and output of the high voltage filter. Resistors R-1201, R-1202, R-1203, and R-1204 are used as equalizing resistors across these condensers. The 500 volts for the transmitter plate terminates at terminal 65 on J-1201.

Note

(Contacts 4 and 5 of switch S-1201 are also closed in the "Transmit-Receive" position and serve to start the receiver power supply simultaneously. See paragraph 2 below).

2. RECEIVER SECTION OF POWER SUPPLY

a. When switch L-1201 is moved to the "Standby-Receive" position, contacts 3 and 4 are closed, thereby closing the primary circuit to the receiver section only, of the vibrator power supply.

b. The common return for all filament, bias, and plate voltages of the receiver section is made through terminal No. 50 on J-1203.

c. Plate, bias, and filament voltages are obtained from the vibrator supply. The vibrator Y-1202 differs from that of the transmitter section of the power supply, in that Y-1202 is of the split reed synchronous type and is not interchangeable with Y-1201.

d. The primary contacts change the low voltage direct current to alternating current. This low voltage alternating current is stepped up to high voltage alternating current by transformer T-1202, and the secondary contacts of the vibrator rectify this high voltage alternating current to a high voltage direct current. Capacitor C-1217 across the secondary windings of T-1202 acts as the buffer condenser, and resistor R-1206 is a hash filter. The high voltage direct current is filtered by audio choke L-1204-B and filter condensers C-1213-A and C-1213-B and terminates at terminal 41 on J-1203. R.F. currents are suppressed by R.F. chokes L-1205-A, L-1205-B, and capacitor C-1204-A.

e. The 6 volt bias voltage terminating at terminal 48 is secured by placing resistor R-1207 in the negative return to the secondary reed of the vibrator. Capacitor C-1214 is the hum filter for the bias line. R.F. currents are by-passed by capacitor C-1204-B. Capacitors C-1218 and C-1219 connected to the primary contacts of the vibrator are used to suppress R.F. hash.

f. The 1.4 volt filament voltage is obtained from the low voltage secondary winding of T-1202, being rectified to a DC voltage by the dry rectifier of the copper sulphide type CR-1201. Hum filtering for the filament is accomplished by iron core choke L-1203 and capacitors C-1207, C-1208 and C-1210. Capacitors C-1203 and C-1204-C act to keep RF currents out of the filament lines.

SECTION V MAINTENANCE

This equipment is designed to minimize maintenance requirements. However, with any such intricate electrical and mechanical device, certain precautions and periodic inspections will assure good performance and reduce probabilities of failure.

1. TEST OF VIBRATOR

a. The vibrators should be replaced after approximately 500 hours of actual operation. The vibrators may be removed from the power supply by loosening the clamps which hold the two working vibrators and the two spare vibrators in their respective sockets. The power supply must be turned "OFF" before removing the vibrators.

b. A vibrator may be checked at any time as to its operating condition by determining whether or not it will start on a discharged primary battery (10 volts). Turn the switch on and off several times and each time the vibrator should start. If the vibrator does not start, it should be replaced.

2. TEST OF POWER SUPPLY

Troubles due to possible failures of parts such as transformers and resistors can be traced by the following typical 1000-ohm-per-volt voltmeter readings. Since these readings must be taken with the case off and power on PRECAUTION MUST BE TAKEN TO PREVENT COMING IN CONTACT WITH PARTS OF THE POWER SUPPLY CARRYING HIGH POTENTIALS.

a. RECEIVER SECTION

Terminal Designation	Meter Readings
Receiver Receptacle J-1203	
From Term. No. 50 Common	
To Term. No. 42	Not used
To Term. No. 41	+93 volts
To Term. No. 51	Not used
To Term. No. 48	-6.1 volts
To Term. No. 49	Not used
To Term. No. 40	-1.45 volts

b. TRANSMITTER SECTION

Terminal Designation	Meter Readings
Transmitter Receptacle J-1202	
From Term. No. 63 Common	To Ground
To Term. No. 64	+12.4
To Term. No. 65	+512
To Term. No. 68	+12.0

3. STORAGE BATTERY MAINTENANCE

The battery containers are made of aluminum which is protected outside and inside with a special acid resisting lacquer. Care should be taken in handling the batteries to avoid scratching this lacquer and thus permitting corrosion of the case by acid fumes and liquid acid from the batteries. The batteries should be handled carefully at all times, to prevent denting or deforming the case or covers, and thus affecting the security of the watertight seals.

a. CHARGING PROCEDURE

1. Before charging of the battery is attempted, the electrolyte level should be checked. Loosen the canvas straps which hold the carrying handle in place. Loosen and remove the two wing nuts which hold the top of the battery case in position. Remove the top of the battery case carefully by lifting directly upward on the hold-down bar across the top of the case. DO NOT ATTEMPT TO PRY THE COVER FROM THE CASE. This may bend the case out of shape and make it impossible for the watertight seals to function when the cover is replaced. Remove the non-spill vent plugs from the six vent holes in the top of the battery. Check the level of the electrolyte in each cell. If necessary, add distilled water to bring the level to approximately one-half inch above the protector on top of the separators in each cell.

2. The top cover and vent plugs shall be off to facilitate the exit of gasses during the charging period.

3. Attach the charging connections to the battery posts in the top of the battery making certain that the positive cable from the charger is connected to the positive terminal of the battery and the negative cable from the charger is attached to the negative terminal of the battery. The polarity of the battery terminals may be determined by the indications on the battery terminals or on the outside of the case below the connection box. The positive terminal is indicated by a "+" or "Pos" marking or is painted red, while the negative terminal is indicated by a "-" or "Neg" marking or is painted black.

Charging connections may be made through either of the receptacles on the bottom of the battery connection box, if a suitable cable and plug are available. The positive battery terminal is connected to pin number 1 of each of the two receptacles, and the negative battery terminal is connected to pin number 2. See Fig. 5-1.

4. Charge at a rate of 6 amperes (per battery) until the batteries gas freely, or until the voltage, read across the battery terminals while the 6 ampere charge is being delivered to the battery, is 14.1 volts. The charging rate should then be reduced to 3 amperes, and charging continued until two hourly voltage readings are the same.

5. The temperature of the electrolyte during charge should not exceed 115°F. If necessary in order to keep the temperature from exceeding this value, the charging rate should be reduced.

6. After the battery has been completely charged, it should be allowed to stand for at least one hour before replacing the vent plugs to permit exit of gasses; shaking the battery will expedite this process.

7. Replace the non-spill vent plugs, replace the cover on the battery and secure tightly with the wing nuts to obtain a watertight seal, and secure the carrying straps in position. The battery is now ready for field service.

b. FIELD MAINTENANCE

The following routine maintenance procedure should be followed to maintain the batteries in good operating condition:

1. Examine the level of the electrolyte in each cell of the battery each time the equipment is moved, and at a period not longer than once each week.

2. If necessary add distilled water to bring the level of the electrolyte 1/2-inch above the protector on the top of the separators of each cell.

3. Wipe out with a dry rag any excess moisture in the top of the case, especially after transportation.

4. Inspect the inside of the connector box on the side of the battery at regular intervals. The cover of this connector box may be removed by releasing the two wing bolts on the cover. **DO NOT PRY OFF THE COVER.** To do so may bend the box or cover, preventing a watertight seal when reassembled. The connections should be inspected and tightened if loose. When replacing the cover, tighten the wing bolts securely to make the watertight seal effective.

5. Make certain that the carrying straps are securely buckled to avoid dropping the battery while being handled or transported.

6. Whenever the voltage of the battery drops to 11.0 volts the batteries may be considered to be in a discharged state and should be recharged.

7. The specific gravity of the electrolyte with the cells fully charged and the electrolyte well mixed and at high level within the battery should be 1.275 to 1.285 at 80°F.

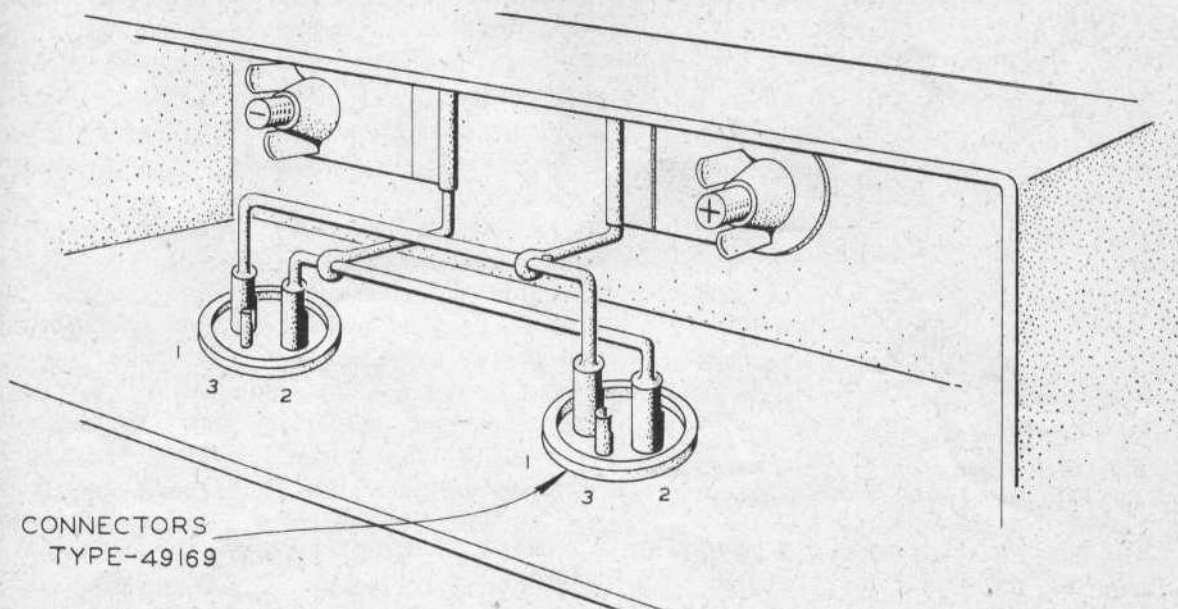
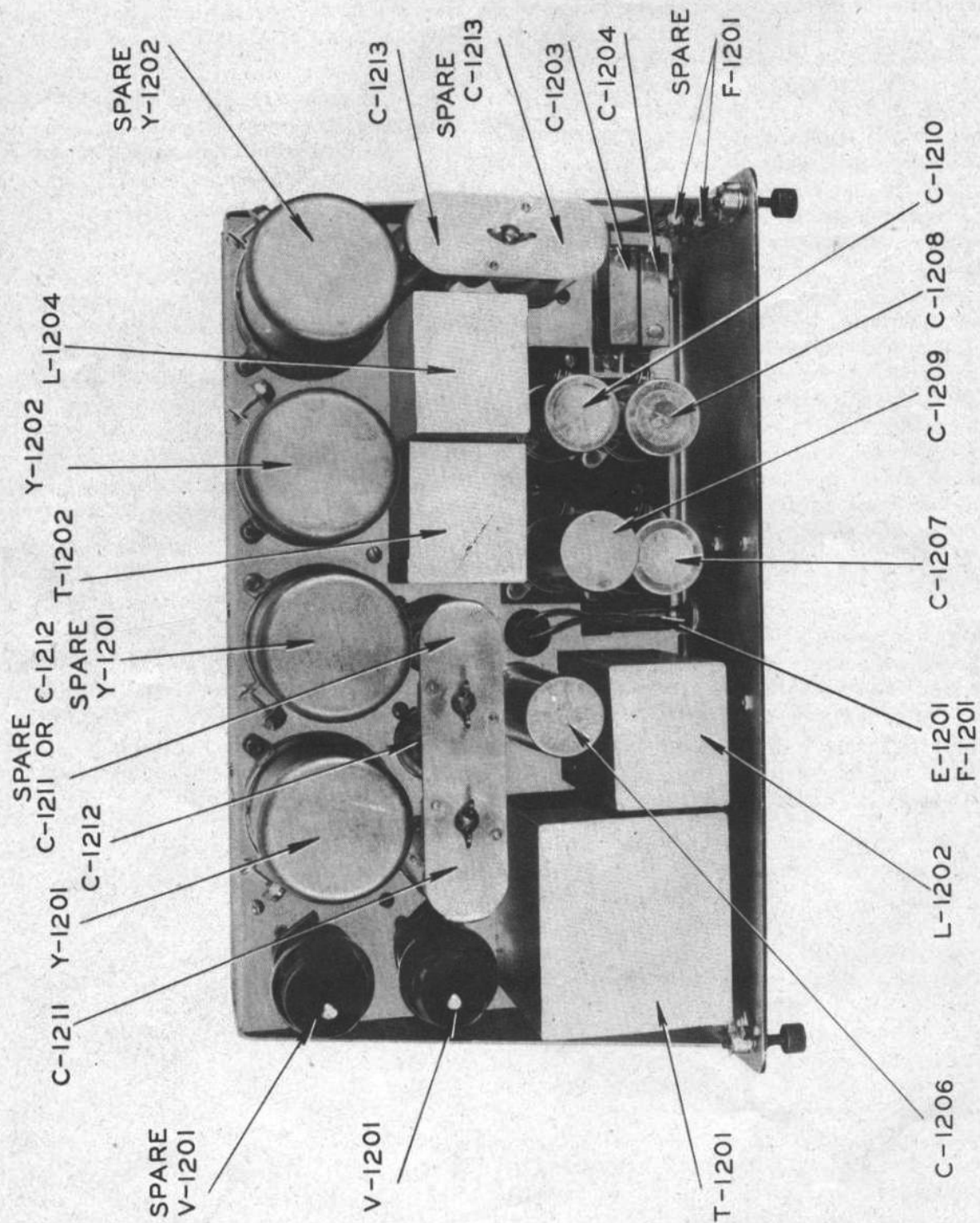


FIGURE 5-1 STORAGE BATTERY CONNECTIONS

RESTRICTED



VIBRATOR POWER SUPPLY, NAVY TYPE 20337
TOP VIEW OF CHASSIS

FIGURE 5-2

4. TROUBLE-SHOOTING

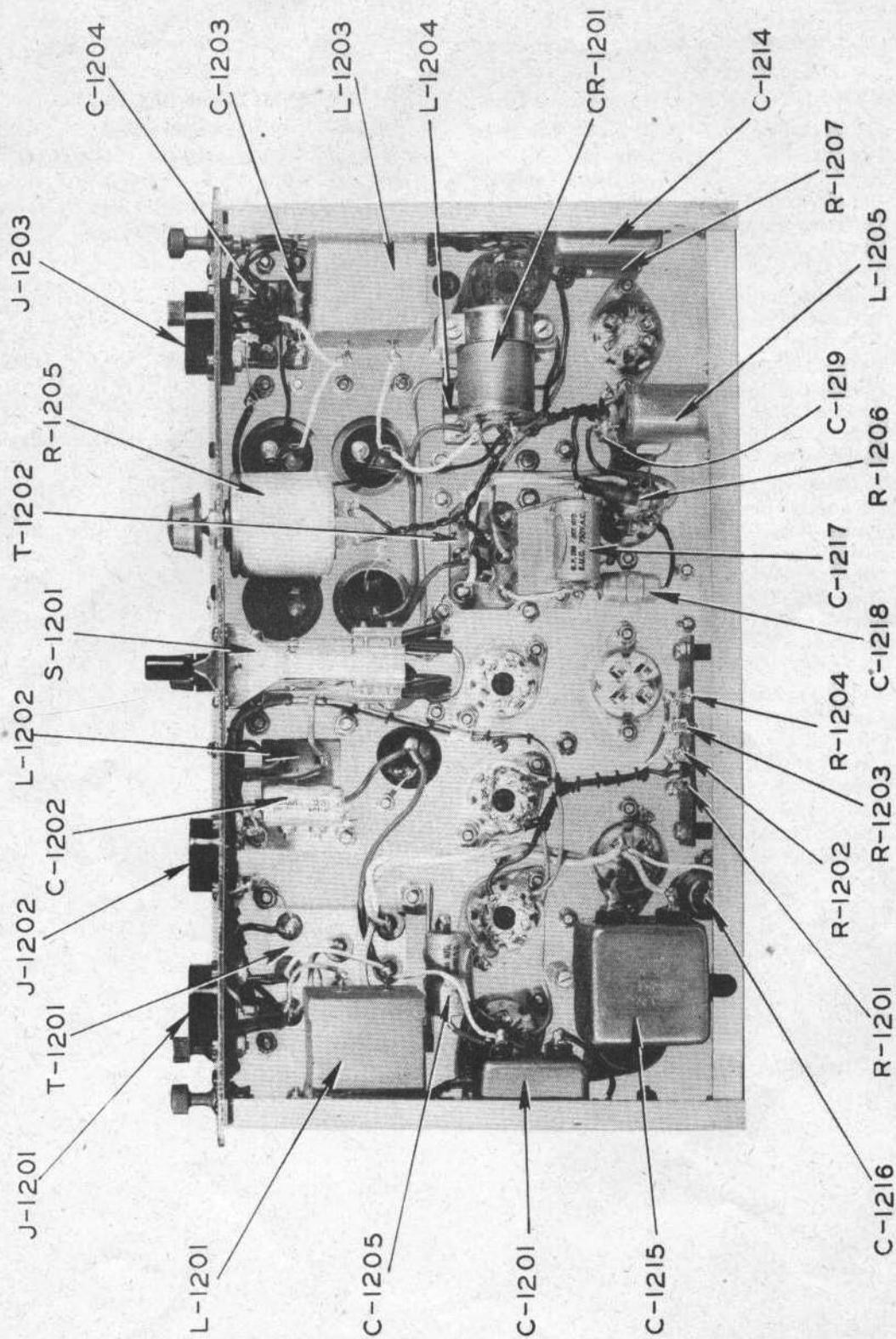
(See Figs. 5-2 and 5-3 for location of components.)

a. RECEIVER SECTION OF POWER SUPPLY

Trouble	Probable Cause	Remedy
No Voltages	Dead battery	Replace or recharge battery
	Defective fuse F-1201	Replace F-1201
	Defective contact S-1201	Clean and adjust
	Open ground con. J-1202	Repair
No 1.4 v. filament	Open L-1204-A	Replace L-1204
	Open winding on T-1202	Replace T-1202
	Defective rectifier CR-1201	Replace CR-1201
	Open R-1205	Replace R-1205
	Open L-1203	Replace L-1203
	Shorted C-1208	Replace L-1208
	Shorted C-1210	Replace C-1210
	Shorted C-1203-A	Replace C-1203
No 90 v. plate	Defective vibrator Y-1202	Replace Y-1202
	Open center tap T-1202	Replace T-1202
	Open L-1205-A	Replace L-1205
	Open L-1205-B	Replace L-1205
	Open L-1204-B	Replace L-1204
	Shorted C-1213	Replace C-1213
	Open R-1207	Replace R-1207
	Shorted C-1217	Replace C-1217
	Shorted C-1204-A	Replace C-1204
	Defective vibrator Y-1202	Replace Y-1202
1.4 v. normal but 90 v. low	Open half secondary T-1202	Replace T-1202
	Open or shorted C-1217	Replace C-1217
	Open R-1206	Replace R-1206
	Open C-1213	Replace C-1213
	Shorted C-1214	Replace C-1214
No 6 v. bias	Open R-1207	Replace R-1207
	Shorted C-1204-B	Replace C-1204

b. TRANSMITTER SECTION

Trouble	Probable Cause	Remedy
No voltages	Dead battery	Replace or recharge battery
	Defective fuse F-1201	Replace F-1201
	Defective contacts on S-1201	Clean and adjust contacts
No 12v. filament	Defective contacts on S-1201	Clean and adjust contacts
	Open L-1201	Replace L-1201
No 12v. microphone voltage	Shorted C-1201	Replace C-1201
	Open L-1202A	Replace L-1202
No 500 v. or 500 v low	Shorted C-1211 or C-1212	Replace C-1211 or C-1212
	Defective V-1201	Replace V-1201
	Shorted C-1205	Replace C-1205
	Open center tap T-1201	Replace T-1201
	Defective Y-1201	Replace Y-1201
	Open L-1202-B	Replace L-1202
	Open C-1205	Replace C-1205
	Open C-1215	Replace C-1215
	Open half secondary T-1201	Replace T-1201



VIBRATOR POWER SUPPLY, NAVY TYPE 20337
BOTTOM VIEW OF CHASSIS

FIGURE 5-3

RESTRICTED

5. VACUUM TUBE DATA

a. The Type 20337 vibrator power supply employs one vacuum tube of the gaseous type, which is used as the rectifier for the transmitter plate supply. An additional tube is mounted on the chassis as a spare.

b. Pertinent Tube Data:

Type: Jan-1006.

Filament Voltage: 1.75 volts.

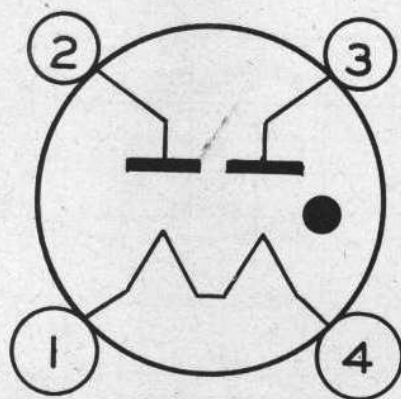
Filament Current: 2.25 amps.

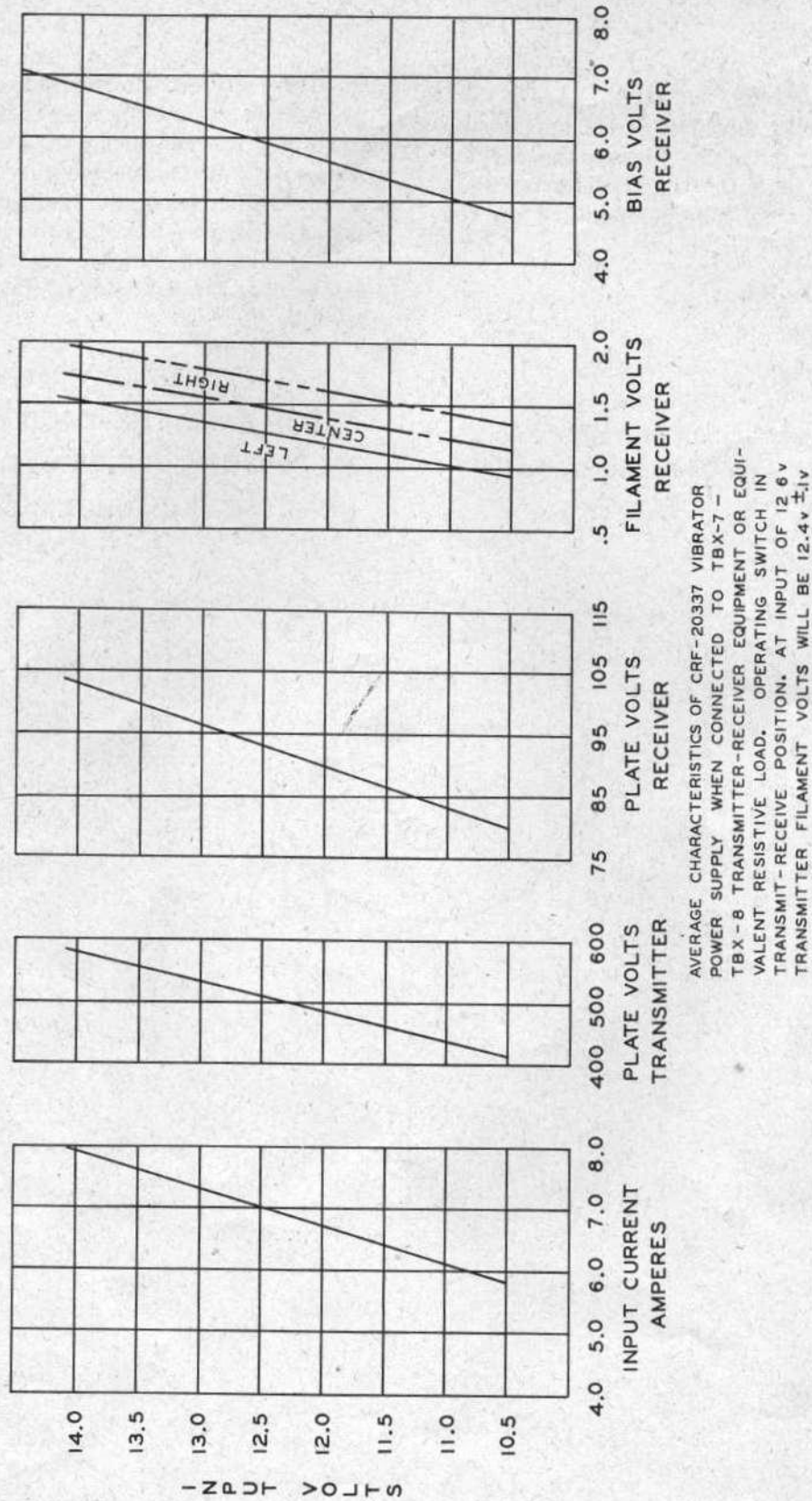
Function: Rectifier, full wave, gas filled.

Base: Medium 4 pin (see base diagram).

c. The rectifier tube should be replaced when it has reached its useful end of life. This may be determined by measuring the transmitter output voltage with the suspected tube, then substitute a good rectifier tube and again measure the voltage. An increase in voltage using the substitute rectifier tube will indicate that the original tube has reached the useful end of its operating life and should be discarded.

ALL TUBES OF A GIVEN TYPE SUPPLIED WITH THE EQUIPMENT SHALL BE CONSUMED PRIOR TO EMPLOYMENT OF TUBES FROM GENERAL STOCK.

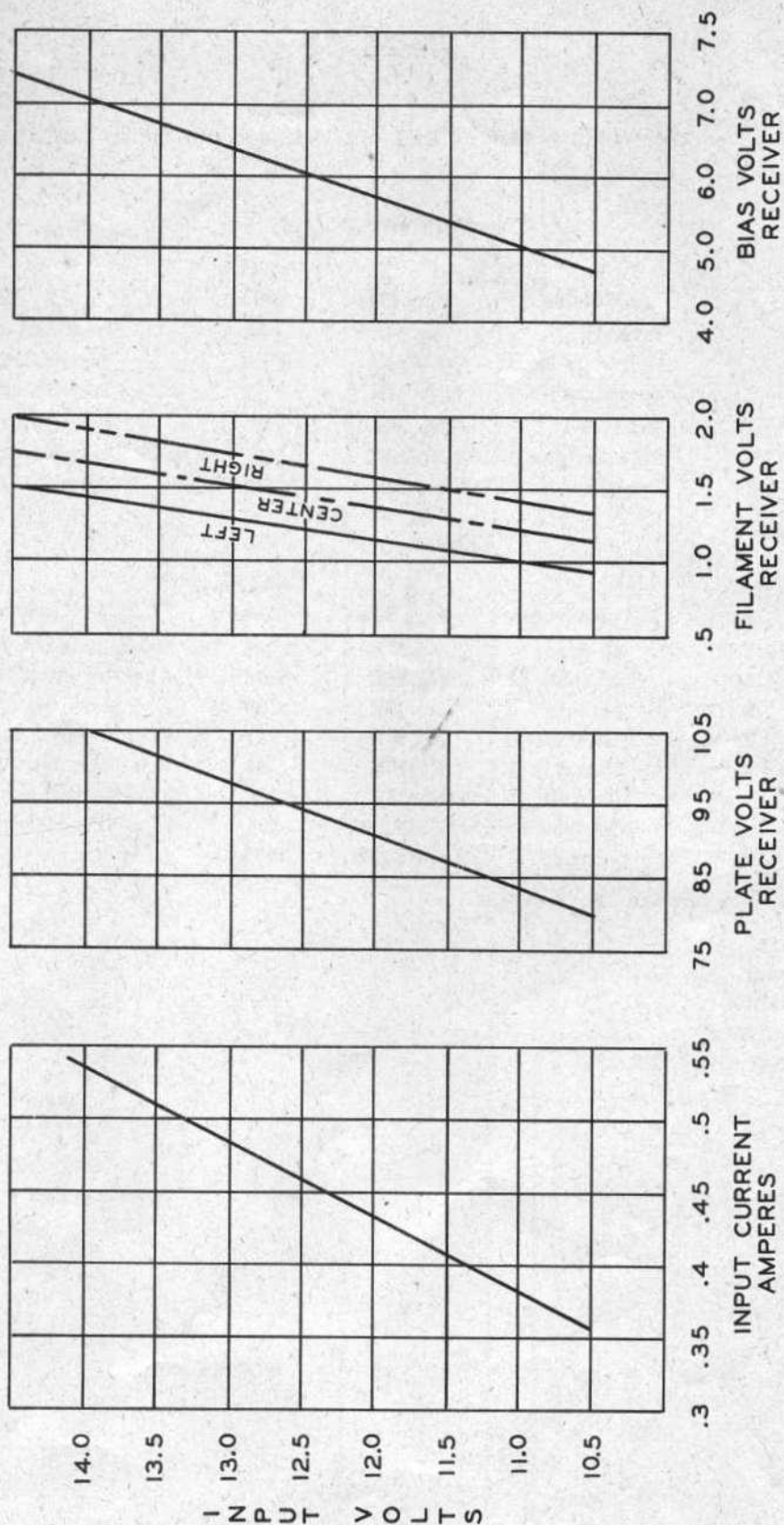




AVERAGE CHARACTERISTICS CHART, TRANSMIT-RECEIVE POSITION

FIGURE 5-4

RESTRICTED



AVERAGE CHARACTERISTICS OF CRF-20337
VIBRATOR POWER SUPPLY WHEN CONNECT-
ED TO TBX-7-TBX-8 TRANSMITTER-RE-
CEIVER EQUIPMENT OR EQUIVALENT RESIST-
IVE LOAD. OPERATING SWITCH IN RE-
CEIVE-STANDBY POSITION.

AVERAGE CHARACTERISTICS CHART, STANDBY-RECEIVE POSITION

FIGURE 5-5

RESTRICTED

6. TECHNICAL INFORMATION

a. The following table gives the winding data on all wire wound components used in the Type 20337 vibrator power supply.

Transformers

Symbol Designation	Terminal No.			Winding	Wire Size	Total No. Turns	D. C. Resistance
	S.	CT.	F.				
T-1201	4	5	6	Primary	No. 14E	80	Terminals 4 to 6, .13 ohms
	1	8	7	Secondary No. 1	No. 34E	4100	Terminals 1 to 7, 665 ohms
	2		3	Secondary No. 2	No. 16E	7	Terminals 2 to 3, .04 ohms
T-1202	1	3	5	Primary	No. 26E	186	Terminals 1 to 5, 2.5 ohms
	2	4	6	Secondary No. 1	No. 40E	1650	Terminals 2 to 6, 650 ohms
	7		8	Secondary No. 2	No. 23E	30	Terminals 7 to 8, .25 ohms

Chokes

Symbol Designation	Terminal No.		D. C. Resistance	Wire Size	Total No. Turns	Inductance
	S.	F.				
L-1201	1	2	5.5 ohms	No. 27E	400	100 millihenries with .1 amp. D.C.
L-1202-A	2	4	125 ohms	No. 30E	2576	6 henries with .070 amps. D.C.
L-1202-B	1	3	.05 ohms	No. 12E	30	1.5 millihenries with no D.C.
L-1203	1	2	1.85 ohms	No. 25E	225	45 millihenries with no D.C.
L-1204-A	1	3	.5 ohms	No. 20E	95	20 millihenries with no D.C.
L-1204-B	2	4	100 ohms	No. 33E	1780	2 henries with .020 amps. D.C.
L-1205-A			12.5 ohms	No. 34S.S.E.	294	1.1 millihenries
L-1205-B			12.5 ohms	No. 34S.S.E.	294	1.1 millihenries

List of abbreviations used in above tables:

- S — Start.
- CT — Center Tap.
- F — Finish.
- E — Enameled.
- SSE — Single silk enameled.

SECTION VI

PARTS AND SPARE PARTS LISTS

TABLE 6-1

LIST OF MAJOR UNITS

Navy Type Designation	Name	Mfr. Assembly Drawing	Symbol Group
10027-A	Carrying Case for Type CRF-20337 Vibrator Power Supply		
10402	Shipping Chest for Type CRF-19017 Storage Batteries		
10403	Shipping Chest for Type CRF-20337 Vibrator Power Supply, Accessories Spares		
19017	12v. Storage Battery		1200-1299
20337	Vibrator Power Supply		

TABLE 6-2

PARTS AND SPARE PARTS LIST BY SYMBOL DESIGNATION FOR MODEL CRF-20337 VIBRATOR POWER SUPPLY

Symbol Desig.	Function	Description	Navy Type Desig.	Navy Dwg. or Spec. No.	Mfr.	Mfr. Desig.	Contra- tor's Dwg. and Part No.	Spare Parts				All Symbol Desig. Involved
								Number Per Equipment	Mobile Spares	Equipment Spares	Stock Spares	
Capacitors												
C-1201	Microphone filter	Capacitor, electrolytic, 50 mfd. +100% —10%, 25 v. D.C.W. lug terminals	CE64C500F	JAN-C-62	12	D-9248	CE-45	1	1	3	C-1201	
C-1202	R.F. by-pass	Capacitor, paper, 0.1 mfd. ±10%, 100 v. D.C.W. lug term.			2	10905-1	CP-104	2	1	5	C-1202, C-1216	
C-1203		Capacitor, triple section lug terminals, case common			12	CA-255	CP-69	2	1	5	C-1203, C-1204	
A.	R.F. by-pass	Capacitor, paper, 0.1 mfd. ±, 400 v. D.C.W.										
B.	R.F. by-pass	Same as C-1203-A										
C.	R.F. by-pass	Same as C-1203-A										
C-1204		Same as 1203										
A.	R.F. by-pass	Same as C-1203-A										
B.	R.F. by-pass	Same as C-1203-A										
C.	R.F. by-pass	Same as C-1203-A										
C-1205	Transmitter secondary buffer	Capacitor, paper, .0025 mfd. ±10%, 2000 v. D.C.W. lug term.			2	10941	CP-103	1	1	3	C-1205	
C-1206	Transmitter "A line" filter	Capacitor, electrolytic, 1500 mfd. +100% —10%, 25 v. D.C.W. lug terminals			12	1089	CE-46	2	2	6	C-1206, C-1209	

TABLE 6-2 (Continued)

**PARTS AND SPARE PARTS LIST BY SYMBOL DESIGNATION
FOR MODEL CRF-20337 VIBRATOR POWER SUPPLY**

Symbol Desig.	Function	Description	Navy Type Desig.	Navy Dwg. or Spec. No.	Mfr. Desig.	Contrac- tor's Dwg. and Part No.	Spare Parts				All Symbol Desig. Involved
							Number Per Equipment	Mobile Equipment	Spare Equipment	Stock Spare	
Capacitors (Continued)											
C-1207	Receiver fl. filter	Capacitor, electrolytic, 2000 mfd. + 100% —10%, 6 v. D.C.W. lug terminals Same as C-1207			12 1090	CE-47	3		3	9	C-1207, C-1208, C-1210
C-1208	Receiver fl. filter										
C-1209	Receiver "A line" filter	Same as C-1206									
C-1210	Receiver fl. filter	Same as C-1207									
C-1211		Capacitor, electrolytic, dual section, plug-in-type			12	D-9247	3	2	3	9	C-1211, C-1212, C-1213
A.	Transmitter plate supply filter	Capacitor, electrolytic, 25 mfd. + 50% —10%, 450 v. D.C.W.									
B.	Transmitter plate supply filter	Same as C-1211-A									
C-1212		Same as C-1211									
A.	Transmitter plate supply filter	Same as C-1211-A									
B.	Transmitter plate supply filter	Same as C-1211-A									
C-1213		Same as C-1211									
A.	Receiver plate supply filter	Same as C-1211-A									
B.	Receiver plate supply filter	Same as C-1211-A									
C-1214	Receiver bias filter	Capacitor, electrolytic, 25 mfd. —100% —10%, 25 v. D.C.W. lug terminals			12	CE-36	1		1	3	C-1214

TABLE 6-2 (Continued)

PARTS AND SPARE PARTS LIST BY SYMBOL DESIGNATION
FOR MODEL CRF-20337 VIBRATOR POWER SUPPLY

Symbol Desig.	Function	Description	Navy Type Desig.	Navy Dwg. or Spec. No.	Mfr. Desig.	Contrac- tor's Dwg. and Part No.	Spare Parts				All Symbol
							Number Per Equipment	Mobile Equipment	Spare Equipment	Spares Stock	
Capacitors (Continued)											
C-1215	Transmitter primary buffer	Capacitor, paper, 4 mfd. $\pm 10\%$, 100 v. D.C.W. lug terminals			6	CP-39	1	1	1	3	C-1215
C-1216	R.F. by-pass	Same as C-1202									
C-1217	Receiver sec- ondary buffer	Capacitor, paper, .055 mfd. $\pm 10\%$, 750 v. A.C., lug. term.			2	CP-106	1	1	1	3	C-1217
C-1218	R.F. by-pass	Capacitor, paper, .05 mfd. $\pm 20\%$ — 10%, 100 v. D.C.W. wire leads			2	10812 CP-30	2	1	1	5	C-1218, C-1219
C-1219	R.F. by-pass	Same as C-1218									
Rectifier (Dry Disc											
CR-1201	Rectifier	Copper sulphide dry disc recti- fier, 3.6 v. A.C. max. input, 1.5 v D.C. at 250 ma. output, hermetically sealed			1	XD-4 XD-4	1			2	CR-1201
Fuses											
F-1201	Input fuse	Fuse, cartridge type, 10 amp., 25 v., $1\frac{1}{4}$ " overall, $\frac{1}{4}$ " dia. ferrule ends			9	3AG FC-2	1	2	2	50	F-1201
Receptacles											
J-1201	Transmitter output receptacle	Receptacle, 4 terminals, circular shell type, ceramic insulation	49041		3	PM-14	1			2	J-1201
J-1202	Input receptacle	Receptacle, 4 terminals, circular shell type, ceramic insulation			3	PM-17	1			2	J-1202
J-1203	Receiver output receptacle	Receptacle, 8 terminal, circular shell type, bakelite insulation	49043		3	PM-15	1			2	J-1203

RESTRICTED

TABLE 6-2 (Continued)

PARTS AND SPARE PARTS LIST BY SYMBOL DESIGNATION
FOR MODEL CRF-20337 VIBRATOR POWER SUPPLY

Symbol Design.	Function	Description	Navy Type Design.	Navy Dwg. or Spec. No.	Mfr. Design.	Contractor's Dwg. and Part No.	Spare Parts				All Symbol Design. Involved
							Number Per Equipment	Mobile Spare	Equipment Spare	Stock Spare	
Reactors											
L-1201	Microphone filter choke	Filter choke, hermetically sealed, iron core. See Sec. V., Par. 6 for technical data		RE-13A553B	7	LI-137	1			3	L-1201
L-1202		Dual filter choke, hermetically sealed. See Sec. V., Par. 6 for technical data		RE-13A553B	7	T-7827	1			3	L-1202
A.	Transmitter audio filter choke	Filter choke, iron core. Assembled with L-1202-B									
B.	Transmitter input smooth- ing choke	Filter choke, iron core. Assembled with L-1202-A									
L-1203	Receiver filament choke	Filter choke, hermetically sealed. Iron core. See Sec. V., Par. 6 for technical data		RE-13A553B	7	LI-138	1			3	L-1203
L-1204		Dual filter choke, hermetically sealed. See Sec. V., Par. 6 for technical data		RE-13A553B	7	T-7825	1			3	L-1204
A.	Receiver input smooth- ing choke	Filter choke, iron core, assem- bled with L-1204-B									
B.	Receiver audio filter choke	Filter choke, iron core, assembled with L-1204-A									
L-1205		Dual R.F. choke, hermetically sealed. See Sec. V., Par. 6 for technical data.			1	LA-27	1			1	L-1205
A.	Receiver plate R.F. choke	R.F. choke, air core wound on ½" wood dowel									
B.	Receiver plate R.F. choke	Same as L-1205-A									

TABLE 6-2 (Continued)

PARTS AND SPARE PARTS LIST BY SYMBOL DESIGNATION FOR MODEL CRF-20337 VIBRATOR POWER SUPPLY

Symbol Desig.	Function	Description	Navy Type Desig.	Navy Dwg. or Spec. No.	Mfr. Desig.	Contrac- tor's Dwg. and Part No.	Spare Parts				All Symbol Desig. Involved
							Number Per Equipment	Mobile Spare	Equipment Spare	Stock Spare	
Plugs											
P-1201	Battery cable plug	Plug, female, 4 terminal, phe- nolic insulation, circular. Metal shell. Part of W-1201			3	PL-74-S	PC-17	1		2	P-1201
P-1202	Battery cable plug	Plug, right angle female, 3 ter- minals, phenolic insulation, aluminum shell with mounting ring. Part of W-1201	49169		5	WK-C3- 23C-1/2"	PC-15	3		6	P-1202, P-1203, P-1204
P-1203	Battery cable plug	Same as P-1202									
P-1204	Battery cable plug	Part of W-1202									
P-1205	Transmitter cable plug	Same as P-1202									
P-1205	Transmitter cable plug	Plug, female, 4 terminal, ceramic insulation, circular metal shell, part of W-1203	49040		3		PC-18	2		4	P-1205, P-1206
P-1206	Transmitter cable plug	Same as P-1205									
P-1206	Transmitter cable plug	Part of W-1203									
Resistors											
R-1201	Equalizing resistor	Resistor, composition, .27 meg. ohms, $\pm 10\%$, 1/4 watt, pigtail type terminals	RC-21BE- 274K	JAN-R-11	8	EB-2741	RC-24	4	1	10	R-1201, R-1202, R-1203, R-1204
R-1202	Equalizing resistor	Same as R-1201									
R-1203	Equalizing resistor	Same as R-1201									
R-1204	Equalizing resistor	Same as R-1201									

TABLE 6-2 (Continued)
PARTS AND SPARE PARTS LIST BY SYMBOL DESIGNATION
FOR MODEL CRF-20337 VIBRATOR POWER SUPPLY

Symbol Desig.	Function	Description	Navy Type Desig.	Navy Dwg. or Spec. No.	Mfr. Desig.	Contrac- tor's Dwg. and Part No.	Spare Parts				All Symbol Desig. Involved
							Number Per Equipment	Mobile Spare	Equipment Spare	Stock Spare	
Resistors (Continued)											
R-1205	Filament ad- justing rheostat	Resistor, variable 2 ohms $\pm 10\%$, 25 watt, enclosed type	RP111RD 2ROKK	JAN-R-22	4	RV-1	1			5	R-1205
R-1206	Hash suppressor	Resistor, composition, 4700 ohm $\pm 10\%$, 1 watt, pigtail leads	RC31BE 472K	JAN-R-11	10	RC-31	1		1	5	R-1206
R-1207	Receiver bias resistor	Resistor, composition, 620 ohm $\pm 5\%$, 1 watt, pigtail leads	RC31BE- 621J	JAN-R-11	10	RC-30	1		1	5	R-1207
Switches											
S-1201	"Standby- Receive" "Off" "Transmit- Receive" Switch	Switch, 3-position lever type, lock in all position. Consists of 1-SPDT and 1 SPST sets of con- tacts. Mid-position off. Single break per circuit. Silver alloy contacts rated 10 amps., 110 v., A.C.			15	4203 SN-2	1			1	S-1201
Transformers											
T-1201	Transmitter power trans- former	Power transformer, hermeti- cally sealed. See Sec. V, Par. 6 for data	RE-13A- 553B		7	T-7826 LI-112	1			3	T-1201
T-1202	Receiver power trans- former	Power transformer, hermeti- cally sealed. See Sec. V, Par. 6 for data	RE-13A- 553B		7	T-7824 LI-110	1			3	T-1202
Vacuum Tubes											
V-1201	Rectifier	Rectifier tube, gas filled. Base, medium 4-pin. Heater, 2.25 amp. at 1.75 volts	JAN-1006	JAN-1A	13	1006 CK-1006	1			1	V-1201

TABLE 6-2 (Continued)

PARTS AND SPARE PARTS LIST BY SYMBOL DESIGNATION
FOR MODEL CRF-20337 VIBRATOR POWER SUPPLY

Symbol Desig.	Function	Description	Navy Type Desig.	Navy Dwg. or Spec. No.	Mfr. Desig.	Contrac- tor's Dwg. and Part No.	Spare Parts				All Symbol Desig. Involved
							Number Per Equipment	Mobile Spares	Equipment Spares	Stock Spares	
Cables											
W-1201	Battery input cable	Two conductor cable, 6 ft. long with 1 P-1201 and 1 P-1202 plugs attached	DCOP-6	15CI(INT)	1	WM-6	1	2			W-1201
W-1202	Battery conn. cable	Two conductor cable, 2 ft. long with 1 P-1203 and 1 P-1204 plug attached	DCOP-6	15CI(INT)	1	WM-7	1	2			W-1202
W-1203	Transmitter cable	Four conductor shielded cable, 3 ft. long with 1 P-1205 and 1 P-1206 plugs attached	MCOS-4	15CI(INT)	1	WM-9	1	2			W-1203
Sockets											
X-1201	Rectifier tube socket	Vacuum tube socket, wafer type ceramic, 4 contact solder type terminals		RE-49A- 300B	14	RSS-4M SX-2	4	4			X-1201, X-1205, X-1206, X-1211
X-1202	Capacitor socket	Socket, wafer type octal ceramic, 8 contact solder type terminals		RE-49A- 300B	14	RSS-8M SX-1	5	5			X-1202, X-1203, X-1204, X-1208, X-1209
X-1203	Capacitor socket	Same as X-1202									
X-1204	Capacitor socket	Same as X-1202									
X-1205	Vibrator socket	Same as X-1201									
X-1206	Vibrator socket	Same as X-1201									
X-1207	Vibrator socket	Socket, wafer type ceramic, 6 contact solder type terminals		RE-49A- 300B	14	RSS-6 SX-5	2	2			X-1207, X-1210
X-1208	Capacitor socket	Same as X-1202									
X-1209	Capacitor socket	Same as X-1202									
X-1210	Vibrator socket	Same as X-1207									
X-1211	Rectifier tube	Same as X-1201									

TABLE 6-2 (Continued)

PARTS AND SPARE PARTS LIST BY SYMBOL DESIGNATION
FOR MODEL CRF-20337 VIBRATOR POWER SUPPLY

Symbol Desig.	Function	Description	Navy Type Desig.	Navy Dwg. or Spec. No.	Mfr. Desig.	Contrac- tor's Dwg. and Part No.	Spare Parts				All Symbol Desig. Involved
							Number Per Equipment	Mobile Spare	Equipment Spare	Stock Spare	
Vibrators											
Y-1201	Interrupter	Vibrator, non-synchronous nitro- gen filled, hermetically sealed, plug-in type, medium 4 prong base. Input voltage 12.6 volts		1	VG-10	VG-10	1	1	1	5	Y-1201
Y-1202	Interrupter and rectifier	Vibrator, synchronous, nitrogen filled, hermetically sealed, plug- in type, medium 6 prong base. Input voltage 12.6 volts		1	VG-11	VG-11	1	1	1	5	Y-1202
Miscellaneous											
E-1201	Fuse holder	Panel mounting fuse receptacle. Bakelite		9	HKM	SF-2	1			1	E-1201
E-1202	Capacitor in- sulation strip	Flat bakelite, 5 7/16" x 3 5/16" overall. 1/8" thick. Drilled		1	IP-59	IP-59	1			2	E-1202
E-1203	Capacitor insulating mtg. strip	Flat bakelite 5 7/16 x 3 5/16" overall. 1/32" thick. Drilled		1	IP-60	IP-60	1			2	E-1203
H-1201	Tube clamp	Tube clamp, stainless steel, lock- ing type, for medium 4 pin base		11	926-C	MP-212	2			1	H-1201
H-1202	Vibrator clamp	Vibrator clamp, circular, 2 1/2" dia. screw adjustment		1	MB-94	MB-94	4			1	H-1202
H-1203	Capacitor clamp	Capacitor clamp, circular, 1 3/4" I.D.		12	4586- 97-A	MP-251	4			1	H-1203
E-1204	Capacitor clamp mtg. post insulator	Bushing, bakelite, 15/32" dia. 1/4" thick with .175 hole in center		1	IW-12	IW-12	1			2	E-1204
E-1205	Capacitor clamp mtg. post insulator	Washer, bakelite, 5/8" dia. 1/8" thick with .175 hole in center		1	IW-7	IW-7	1			2	E-1205
E-1206	Resistor mtg. strip spacer	Spacer, bakelite, 1/2" lg. 5/16" dia.		1	IS-17	IS-7	2			2	E-1206

TABLE 6-3

**R. M. A. STANDARD COLOR CODE FOR RESISTORS IN OHMS
FOR NAVY TYPE CRF-20337 VIBRATOR POWER SUPPLY**



A—Color for 1st significant figure.
B—Color for 2nd significant figure.
C—Color for No. of ciphers of multiplier.
D—Gold or silver indicate tolerance, when applied.

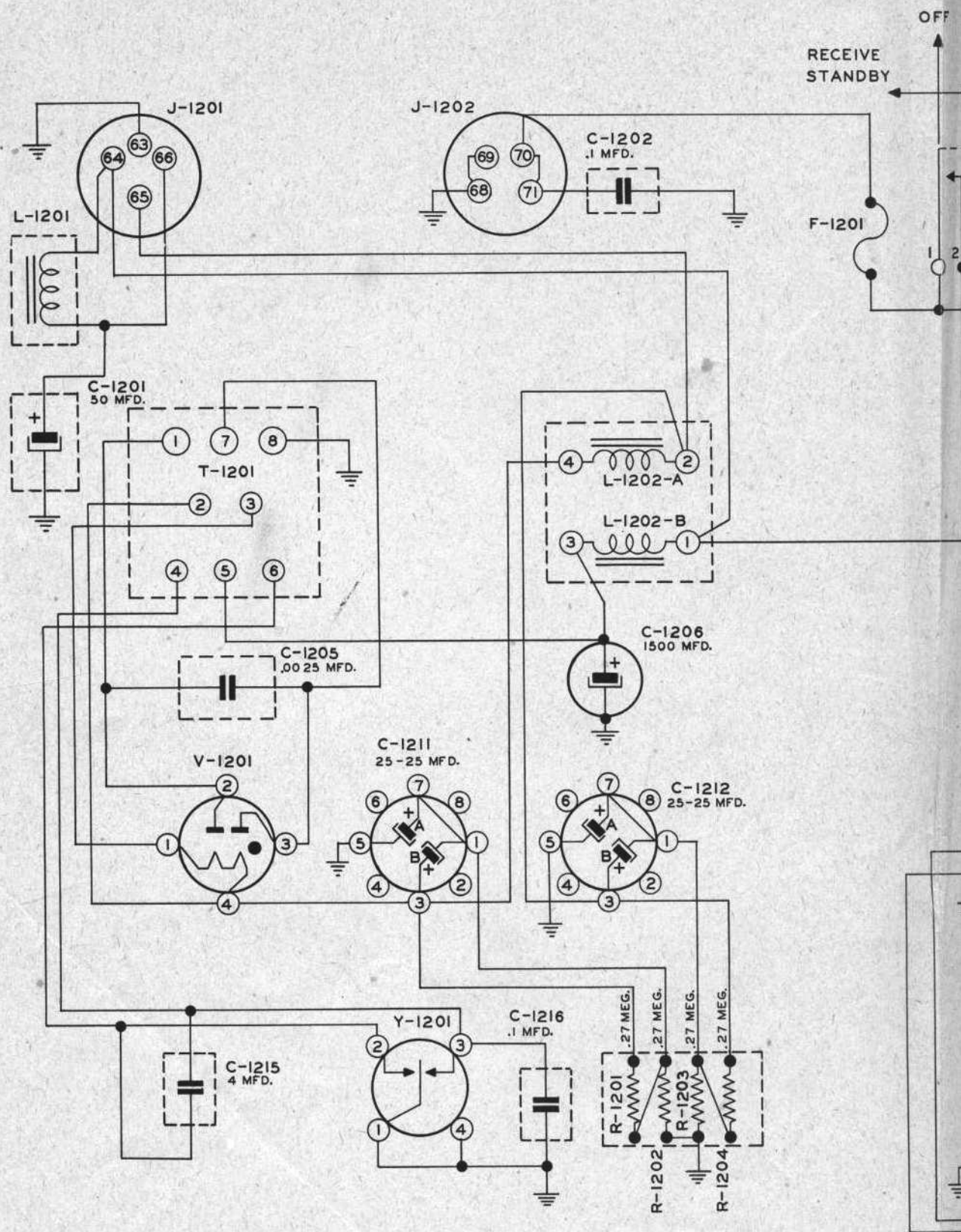
Color	Significant Figure	Multiplier Value	Color	Significant Figure	Multiplier Value
Black	0	1	Violet	7	10,000,000
Brown	1	10	Gray	8	100,000,000
Red	2	100	White	9	1,000,000,000
Orange	3	1,000	Gold	5% Tolerance	0.1
Yellow	4	10,000	Silver	10% Tolerance	0.01
Green	5	100,000	No Color	20% Tolerance	
Blue	6	1,000,000			

EXAMPLES

50,000 Ohms	Green	(5)	Black	(0)	Orange (x1000)
3,500 Ohms	Orange	(3)	Green	(5)	Red (x100)
50 Ohms	Green	(5)	Black	(0)	Black (x0)

TABLE 6-4
LIST OF MANUFACTURERS

Code No.	Mfr. Prefix	Name	Address
1	CRF	The Radiart Corp.	Cleveland, Ohio
2	CEU	Electrical Utilities Corp.	Chicago, Ill.
3	CUA	A. J. Ulmer Co.	New York, N. Y.
4	COM	Ohmite Mfg. Co.	Chicago, Ill.
5	CED	Cannon Electric Develop. Co.	Los Angeles, Calif.
6	CPC	The Potter Co.	No. Chicago, Ill.
7	CCV	The Acme Electric Co.	Cuba, N. Y.
8	CBZ	The Alien-Bradley Co.	Milwaukee, Wis.
9	CFA	The Bussman Mfg. Co.	St. Louis, Mo.
10	CIR	The International Resistance Co.	Philadelphia, Pa.
11		The Birtcher Corp.	Los Angeles, Calif.
12	CSF	Sprague Electric Co.	No. Adams, Mass.
13	CRP	Raytheon Production Corp.	Newton, Mass.
14	CPH	American Phenolic Corp.	Chicago, Ill.
15	CDM	Donald P. Mossman, Inc.	Chicago, Ill.



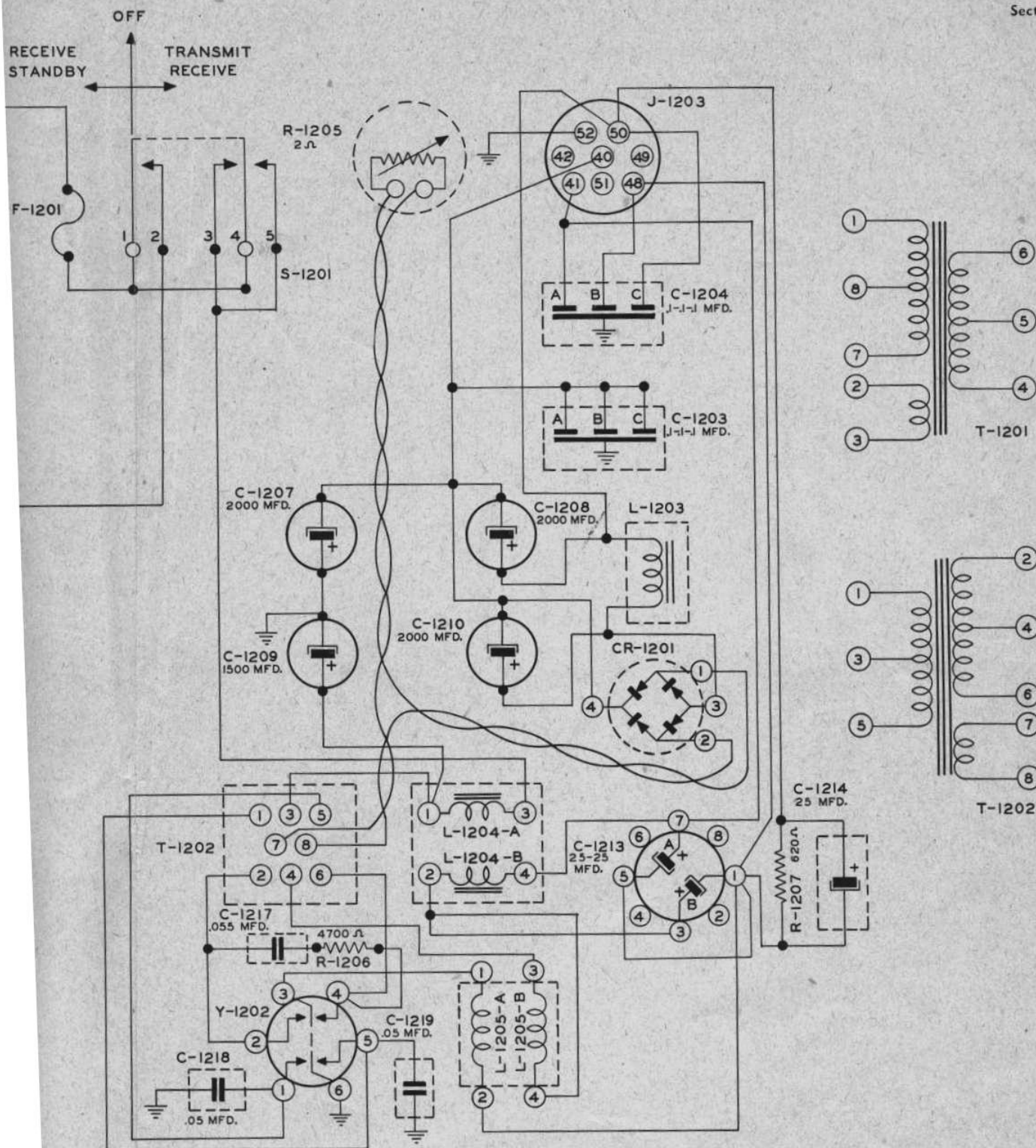
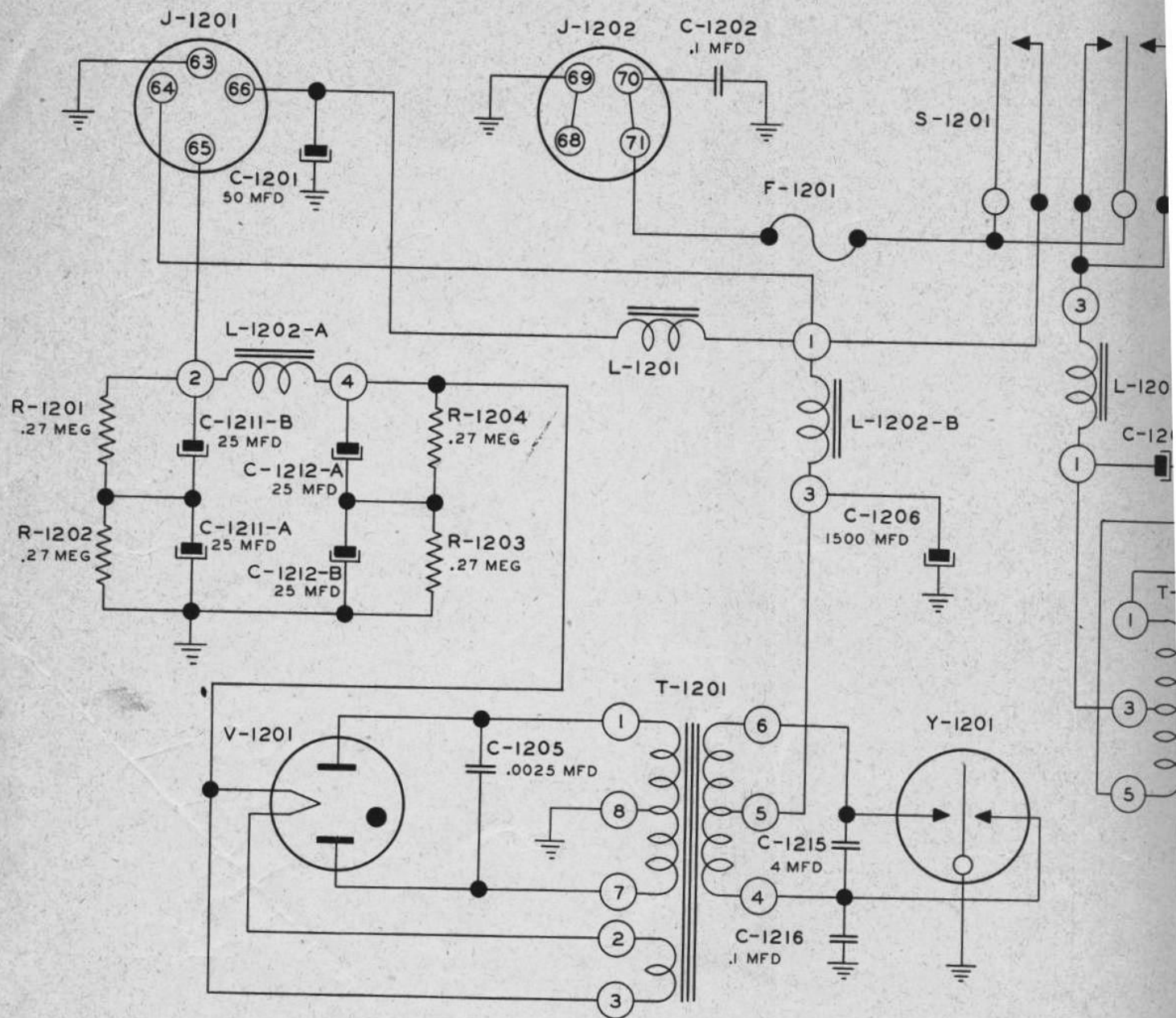


FIGURE 7-1 PICTORIAL WIRING DIAGRAM

RESTRICTED



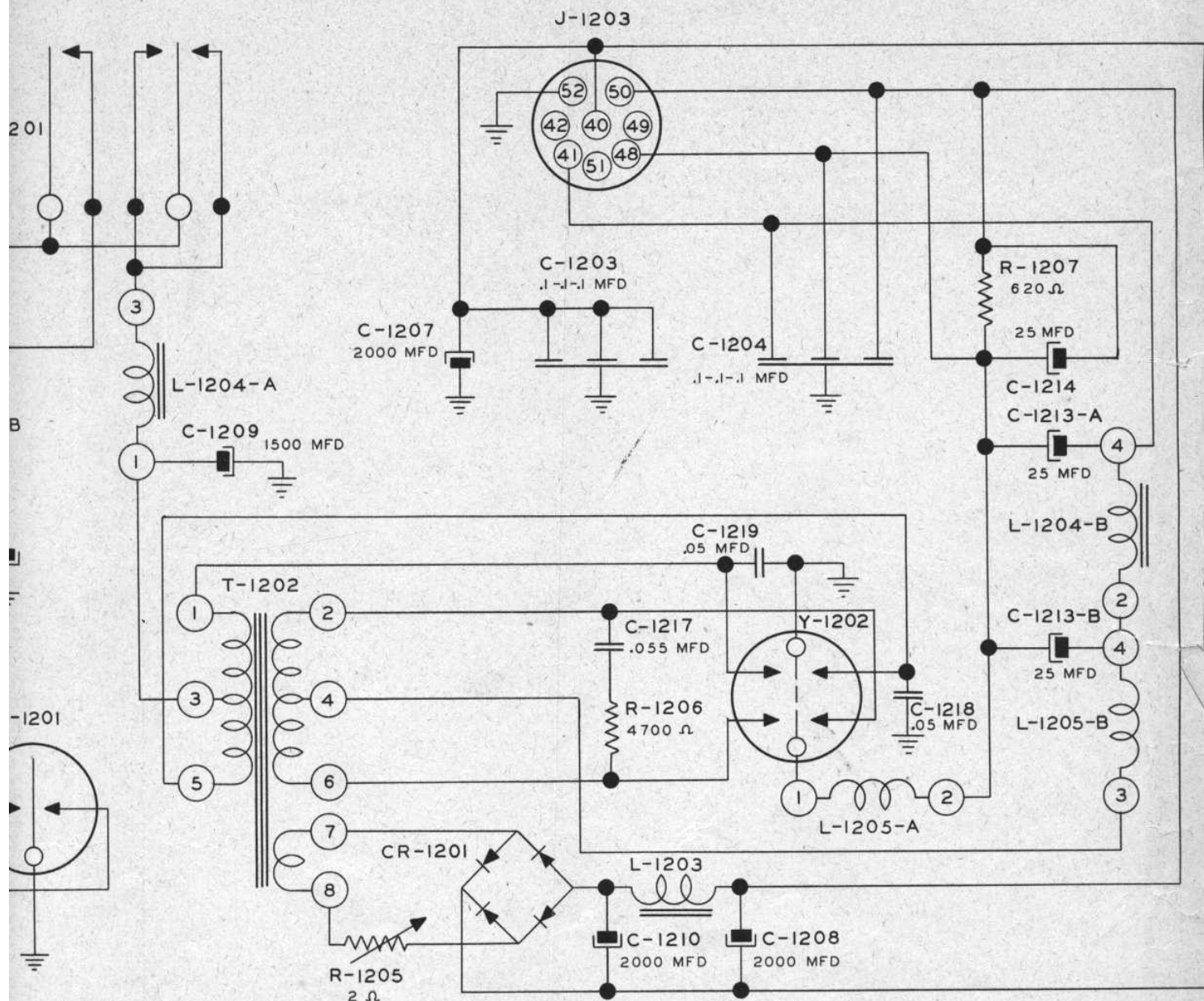


FIGURE 7-2 SCHEMATIC DIAGRAM

RESTRICTED