

TB 11-300-3

WAR DEPARTMENT TECHNICAL BULLETIN

RECTIFIER POWER UNIT RA-133

Ref: TM 11-300, Frequency Meter Sets SCR-211-A, -B, -C, -D, -E, -F, -J, -K, -L, -M, -N, -O, -P, -Q, -R, -T, -AA, -AC, -AE, -AF, -AG, -AH, -AJ, -AK, -AL, and AN.

War Department, Washington 25, D. C., 17 June 1947

	<i>Paragraph</i>
Description.....	1
Equipment Supplied.....	2
Packaging Data.....	3
Installation.....	4
Operation.....	5
Preventive Maintenance.....	6
Maintenance.....	7
Identification Table of Replaceable Parts for Rectifier Power Unit RA-133.....	8

1. DESCRIPTION. Rectifier Power Unit RA-133 (fig. 1) is an alternating-current (a-c) operated, two-tube power supply with regulated output designed to replace the regular battery pack supplying power for operation of Frequency Meter BC-221-(*). Throughout this bulletin, official nomenclature followed by (*) is used to indicate only those equipments with which satisfactory operation is obtained using Rectifier Power Unit RA-133; namely, Frequency Meters BC-211-B, -M, -N, -O, -P, -Q, -R, -T, -AA, -AC, -AE, -AF, -AG, -AH, -AJ, -AK, -AL, and AN. The rectifier power unit consists of a chassis assembly and a line control box. The line control box is part of and connected to the power cord, approximately 18 inches from the chassis assembly. All tubes, transformers, capacitors, chokes, fuses, and the 115-230 voltage selector switch are mounted on the chassis assembly. The line control box contains a line switch, S2, and a neon power on-off indicator lamp, E1, with its series resistor, R3. A double-pole, double-throw (DPDT) toggle switch, S1, mounted on the front of the chassis assembly is used as the 115-230 voltage selector switch. This switch can be locked in either position by means of a removable lock bracket (fig. 2). A 3/8-ampere fuse, F1, protects the tapped primary winding of the power transformer, T1 (fig. 3). Three secondary windings on transformer T1 provide plate and

filament voltage for full-wave rectifier Tube JAN-6X5GT/G (V1); and voltage for the filaments of the frequency meter tubes. The rectified current is taken from the cathode of tube V1 and smoothed by a pi-section filter consisting of hermetically sealed chokes L1 and L2 and triple section filter capacitor C1. The regulated direct current (dc) is taken from the supply through resistor R2 which is connected at the junction of voltage-regulating resistor R1 and voltage regulator Tube JAN-OD3/VR150 (V2).

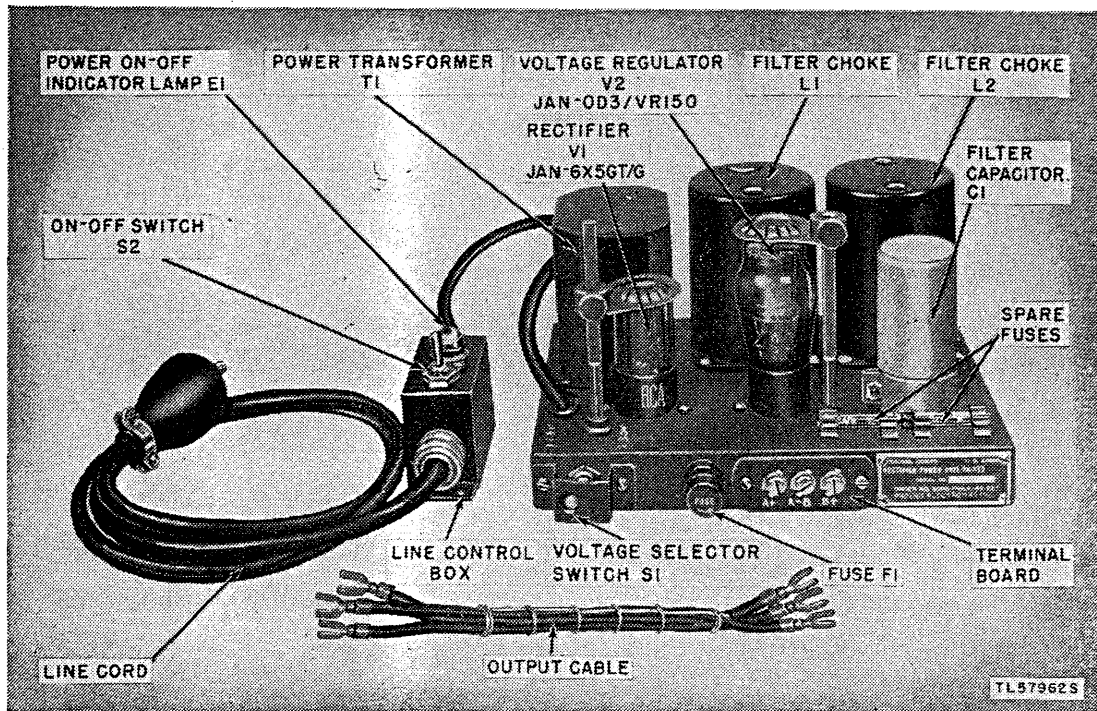


Figure 1. Rectifier Power Unit RA-133.

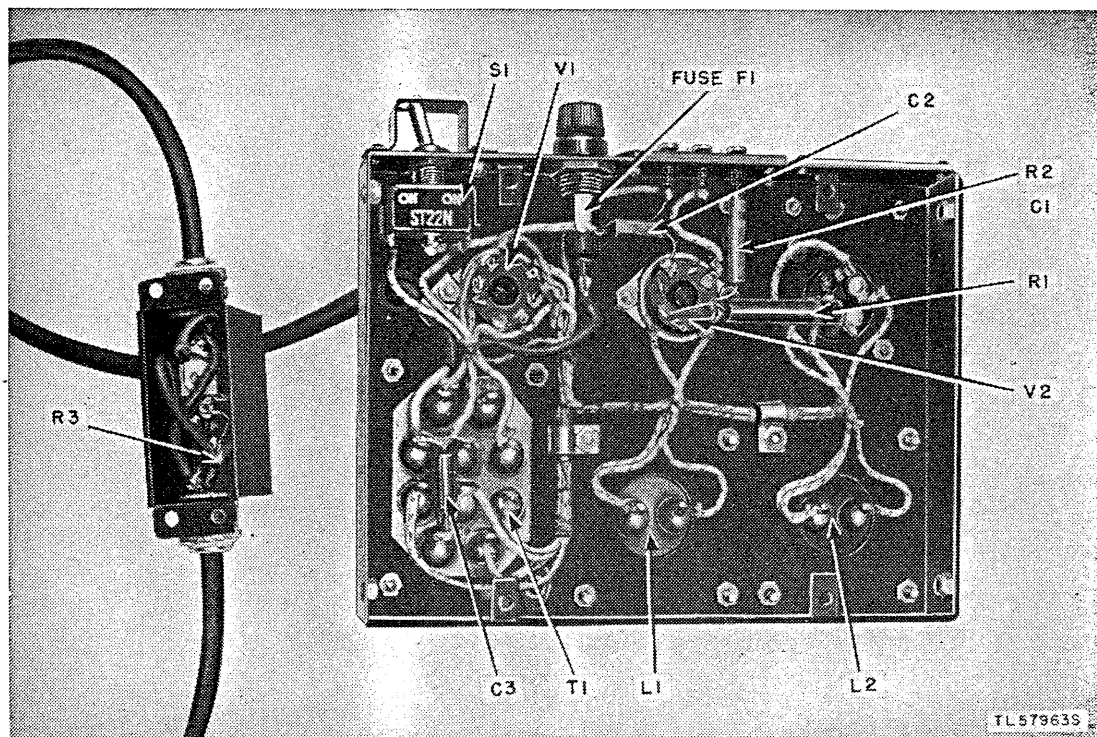


Figure 2. Rectifier Power Unit RA-133, bottom view.

2. EQUIPMENT SUPPLIED. The following is a list of equipment supplied with Rectifier Power Unit RA-133:

Quantity	Item
2	Tubes, JAN-6X5GT/G (1 installed, 1 spare).
2	Tubes, JAN-OD3/VR-150 (1 installed, 1 spare).
6	Fuses, $\frac{3}{8}$ ampere, 250-volt type 3AG Little fuse (1 installed, 2 in spare holders, 3 in cloth bag).
1	Output cable.
1	Template, drilling.
2	Decalcomanias.
1	Cement, liquid, $\frac{1}{2}$ ounce.
4	Screws, 10-32 x $\frac{5}{8}$ R. H. machine screw.
4	Lockwashers No. 10.
1	Cloth bag.
1	Chassis assembly.
1	Box, line control.
2	Technical Bulletins TB 11-300-3.

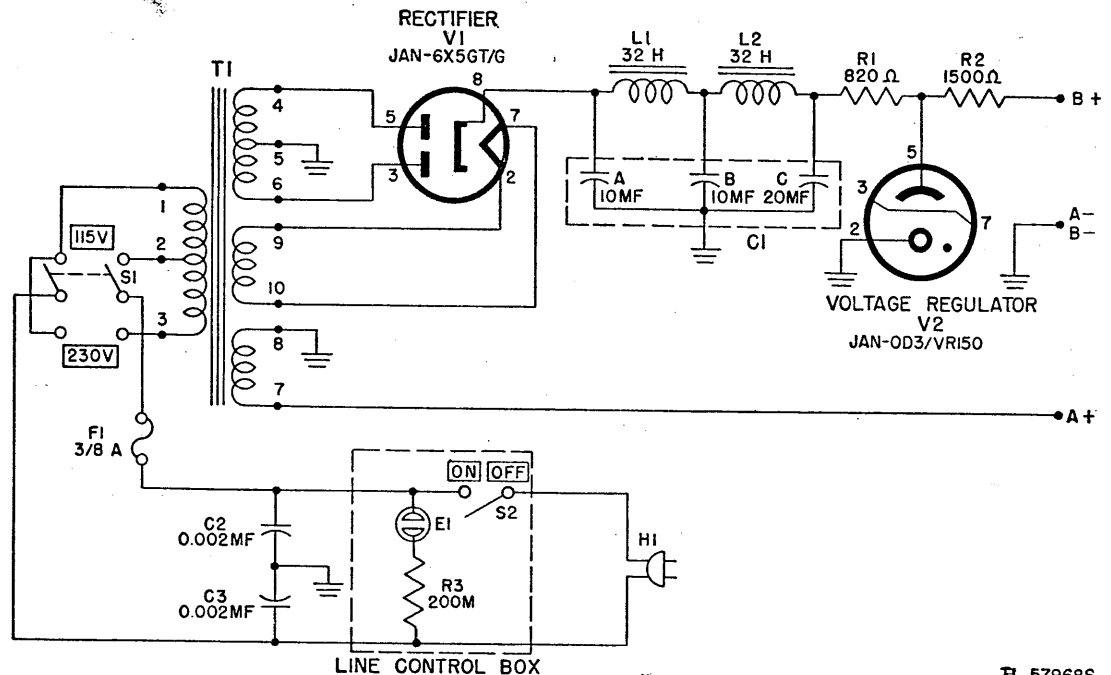


Figure 3. Rectifier Power Unit RA-133, schematic diagram.

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3. PACKAGING DATA. The container-barrier-container method of packing is used in preparing Rectifier Power Unit RA-133 for domestic shipment. The power unit, which is mounted on a wooden baseboard, and the spare parts box are contained within a corrugated fiberboard carton which is protected by a moisture-vaporproof barrier and an outer corrugated fiberboard container (fig. 4). The inner carton is subdivided by chipboard walls which separate the power unit from the spare parts box and the bag of desiccant. The outer dimensions of the carton are 10 by $8\frac{3}{4}$ by $6\frac{2}{3}$ inches and the packaged unit weighs approximately 12 pounds.

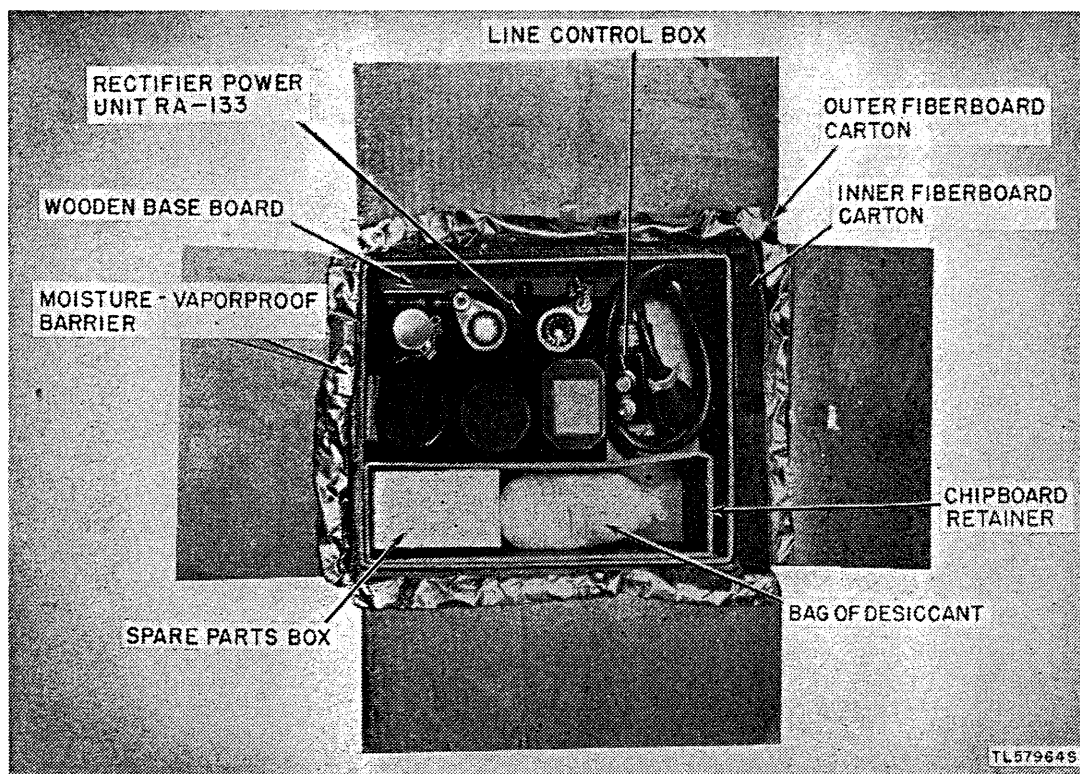


Figure 4. Domestic packaging of Rectifier Power Unit RA-133.

4. INSTALLATION. *a. Unpacking and checking.* Be careful when unpacking or handling this equipment as it may be easily damaged when not protected by the packing case.

(1) Slit the seal of the outer carton and lift out the moisture-vapor-proofed package.

(2) Slit the seam of the moisture-vaporproofed barrier and lift out the inner carton.

(3) Slit the seals of the inner carton and open the flaps. Lift out the rectifier power unit and the spare parts box.

(4) Remove the wooden baseboard from the power unit, remove any packing material clinging to the unit and inspect it for possible damage during shipment.

(5) Check all spare parts against the list in paragraph 2 to determine that the quantities specified are present and that the equipment is in good shape.

b. Modification to Frequency Meter BC-221-() Cabinet.* Rectifier Power Unit RA-133 will fit in the battery compartment of all models of the frequency meter but certain minor modifications to the cabinet of the frequency meter are necessary to prevent mechanical interference.

(1) Open the battery compartment door of the frequency meter. Remove the batteries and output cable.

(2) Position the drilling template (fig. 5) on the bottom of the frequency meter as directed by the printed instructions on the template.

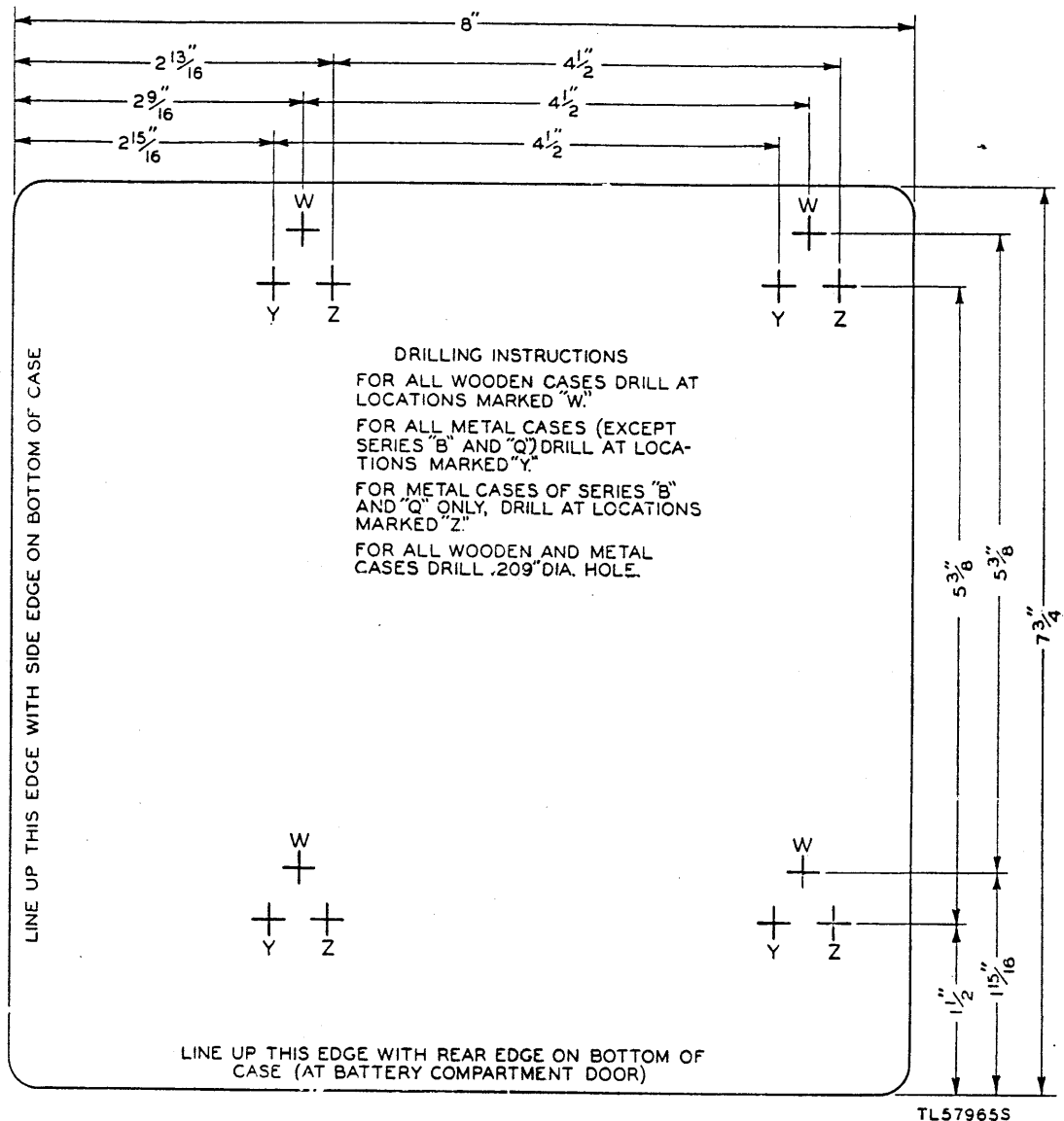


Figure 5. Drilling template for frequency meter cabinet.

(3) Drill the holes in the bottom of the frequency meter cabinet as directed by the printed instructions on the drilling template, taking care that the instructions for specific models are noted.

(4) Remove the accumulated wood shavings or metal dust, as the case may be.

c. Installation. (1) Place Rectifier Power Unit RA-133 in the battery compartment of the frequency meter with the terminal board side of the power unit towards the battery compartment door (fig. 6).

(2) Secure the power unit to the frequency meter cabinet by means of the 10-32 screws and No. 10 lockwashers supplied in the cloth bag.

(3) Connect the terminal board of the power unit to the battery terminal strip (fig. 7) on the frequency meter cabinet by means of the output cable (fig. 1) supplied with Rectifier Power Unit RA-133. Be sure that the B+, A+, B-A- terminals on the terminal board of the power unit are connected to the like-lettered terminals similarly lettered on the frequency meter cabinet terminal strip. Both ends

of the B+ lead of the output cable are painted red for identification purposes.

(4) Close and fasten the battery compartment door of the frequency meter cabinet.

Note.—Where Rectifier Power Unit RA-133 is used with wooden-cased Frequency Meters BC-221-(*), the battery compartment door should be left open during operation to provide ventilation.

(5) Apply the decalomania (decal) to the front control panel, cover of Frequency Meter BC-221-(*), as follows:

(a) Clean the cover surface where the decal is to be applied.

(b) Apply a thin coat of cement to the surface just cleaned.

(c) After the cement has become tacky, apply the decal to the cemented surface and roll down, removing all air bubbles.

(d) Allow the cement to dry for approximately 10 minutes.

(e) Apply a thin coat of cement over the face of the decal, allowing the cement to dry before any further attempt is made to handle the frequency meter.

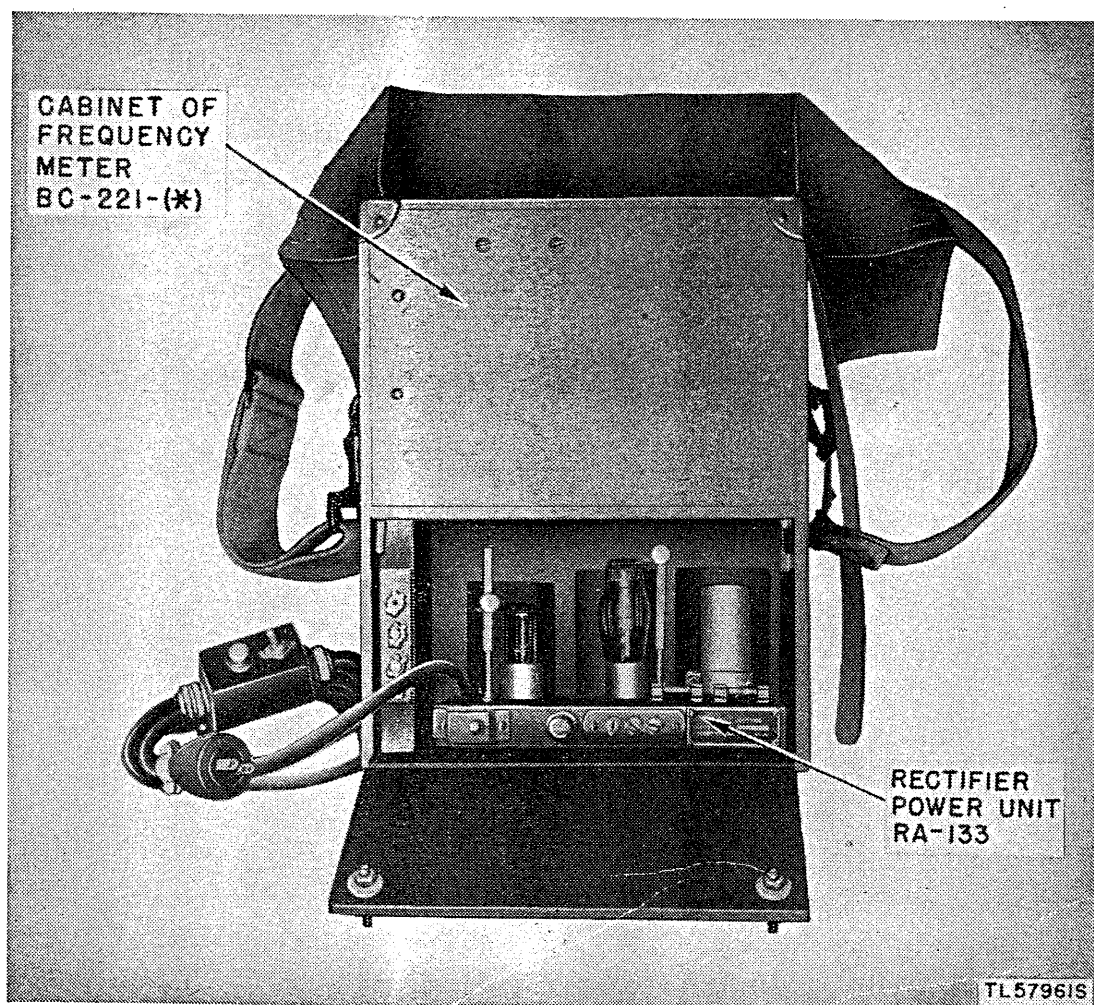


Figure 6. Frequency Meter BC-221-(*), with Rectifier Power Unit RA-133 in battery compartment.

5. OPERATION. *a. Controls.* Rectifier Power Unit RA-133 is provided with two toggle switches. Single-pole, single-throw (SPST) toggle switch S2 in the line control box (fig. 1) is used to turn the unit on and off. When this switch is set at the ON position, neon indicator lamp E1 in the line control box will light. DPDT toggle switch S1 (fig. 1) mounted on the power unit chassis is used for 115-230 volt line change-over. This switch can be locked in either the 115V or 230V position (fig. 7) by means of a removable lock bracket.

b. Operation.

Warning: Be sure that voltage selector switch S1 is in the proper position determined by the line voltage used. Failure to check the switch position may result in damage to the power unit.

(1) Determine the line voltage to be used and set the voltage selector switch to the proper position as shown in figure 7. Do this by removing the screws from the switch lock bracket and throwing the switch to the position required. When replacing the switch lock bracket, turn it 180° from its former position so that the hole in the bracket fits over the switch handle. Fasten the switch lock bracket to the chassis with the screws provided.

(2) Set the ON-OFF switch in the line control box to the ON position.

(3) To turn the unit off, set the ON-OFF switch in the line control box to the OFF position.

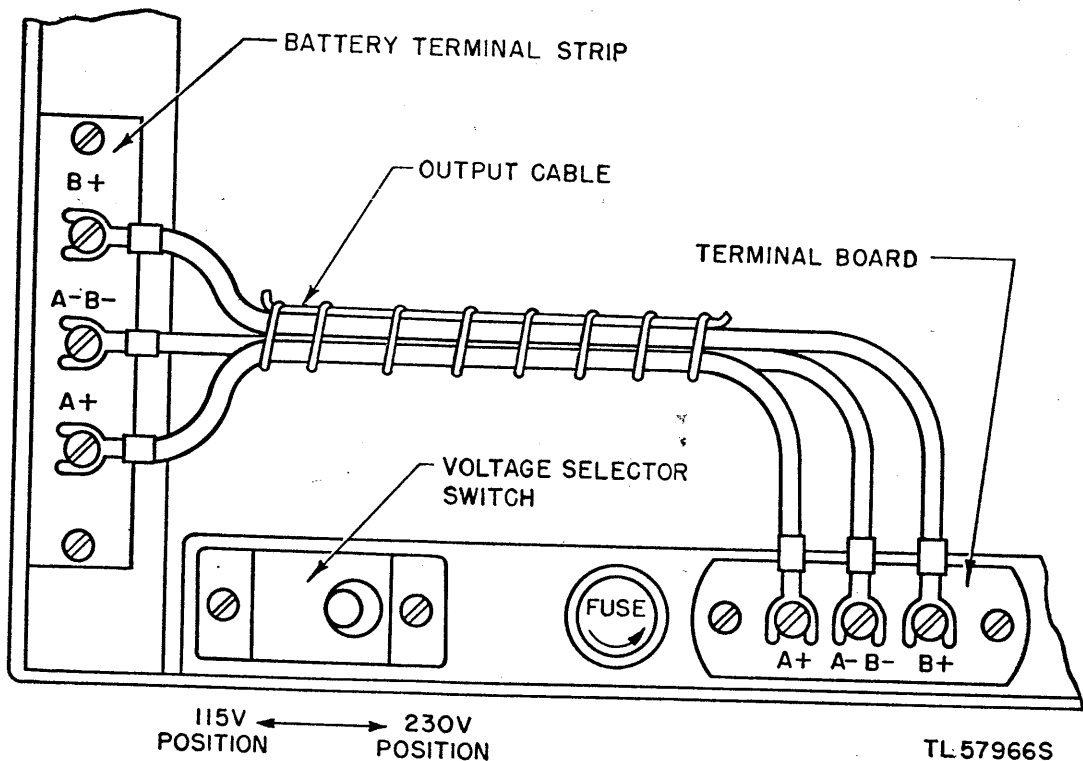


Figure 7. Output cable connections.

6. PREVENTIVE MAINTENANCE. Preventive maintenance (PM) is a system of periodic operations done on equipment at regular

intervals to sustain top efficiency, minimize unwanted interruptions in service, and eliminate major break-downs. This paragraph gives specific instructions and serves as a guide for personnel assigned to perform the six basic maintenance operations: Feel, inspect, tighten, clean, adjust, and lubricate.

Operation	Item	Interval
Feel.....	Transformer T1, choke coils L1 and L2, capacitor C1: transformer and choke coils for overheating; capacitor C1 for bulging of can or leakage of electrolyte.	Monthly.
Inspect.....	All components for dirt or corrosion. Carefully check fuse F1 and fuse holder, indicator lamp E1 and socket, and tube sockets VI and V2.	Quarterly.
	Outside of unit for dirt or corrosion..... Transformer T1, choke coils L1 and L2 for evidences of overheating or leakage of insulating compound. Capacitor C1 for leakage of electrolyte. Resistors R1, R2, and R3 for evidences of overheating.	Monthly. Quarterly.
	Cables for cracks, cuts, and deterioration of insulation.	Monthly.
	ON-OFF switch S2 in line control box for correct operation.	Daily.
Tighten.....	Contacts, connectors, bolts, and nuts.....	Quarterly.
Clean.....	Exterior of unit.....	Monthly.
	All components.....	Quarterly.
Adjust.....	Not applicable.	
Lubricate.....	Not applicable.	

7. MAINTENANCE. Under normal conditions, no servicing should be required other than testing the tubes every 6 months. Repairs beyond second echelon should not be made by operating personnel.

a. Operator's trouble chart.

Trouble	Probable cause	Remedy
No power output.....	Power cord not plugged in... Fuse blown.....	Plug cord in a-c socket. Replace fuse.
Low power output.....	Bad rectifier tube..... Rectifier tube VI.....	Replace tube VI. Replace tube VI.
	Voltage selector switch in 230-volt position.	Change position of voltage selector switch.
Neon indicator lamp does not glow.	Power cord not plugged into a-c source.	Plug cord in a-c socket
High B+ output.....	Defective neon lamp.....	Replace neon lamp.
	Defective voltage regulator tube V2.	Replace tube V2.

b. *Tube replacement.* The two Tubes JAN-6X5GT/G (V1) and JAN-OD3/VR150 (V2), are located at the front of the power unit chassis and can be removed when the unit is mounted in the frequency meter cabinet. Each tube is secured in its socket with a clamp which fits over the tube dome. Loosen the thumbscrew on this clamp before attempting to remove the tubes. After replacing the tubes, make sure that the clamp is tightened to prevent the tube from working out of the socket when vibrated.

c. *Voltage and resistance measurements.* Voltage and resistance measurements of the power unit are shown in figure 8.

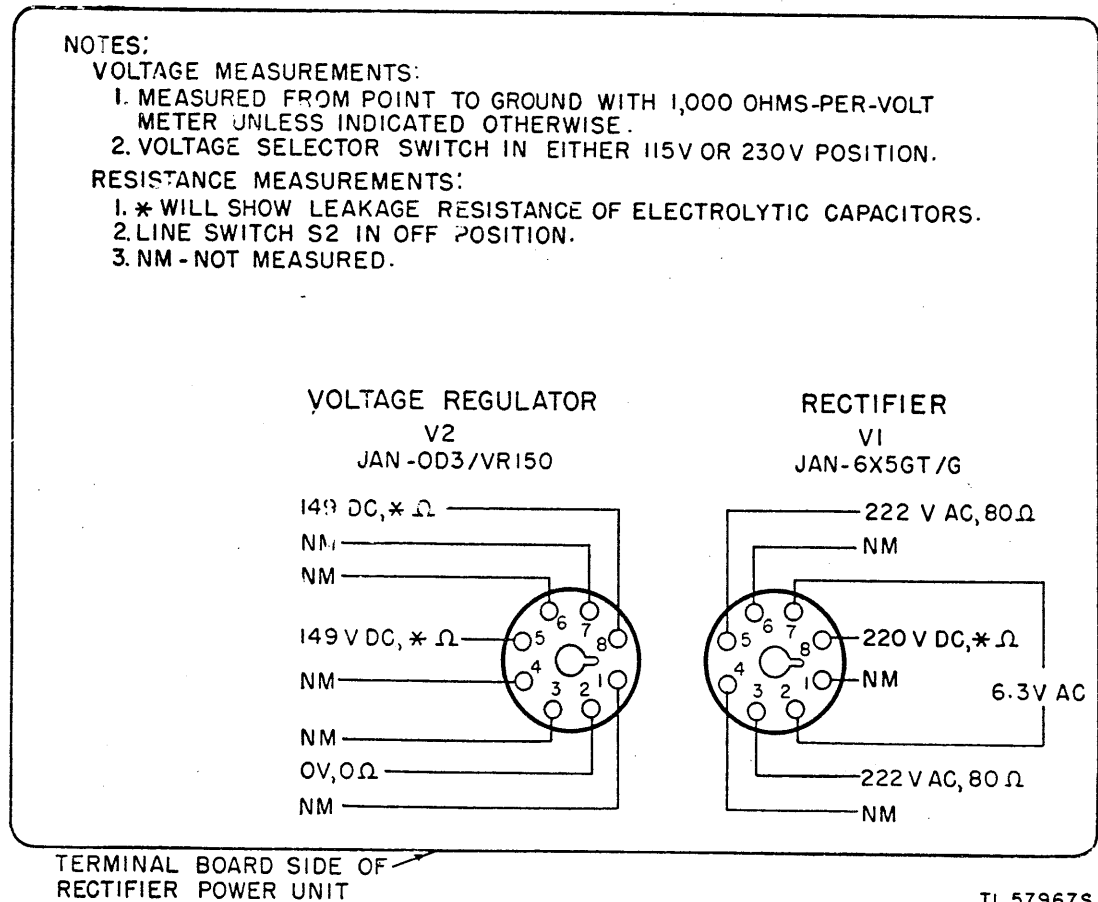


Figure 8. Rectifier Power Unit RA-133, voltage and resistance measurements.

d. *Lubrication.* Lubrication is not required in the maintenance of Rectifier Power Unit RA-133.

e. *Weatherproofing.* Weatherproofing for Rectifier Power Unit RA-133 is as follows:

(1) *Winterization.* Rectifier Power Unit RA-133 will perform satisfactorily at low temperatures. However, some difficulty may be experienced in loss of capacity and effective series resistance of electrolytic capacitor C1 at temperatures below 0° F. The capacitor will regain its normal characteristics when heated. To minimize these difficulties, always allow maximum possible warm-up time before operation. For further information, see TB SIG 66.

(2) *Dustproofing.* Precautions to prevent equipment failure due to dirt or dust infiltration as outlined in TB SIG 75 are adequate for Rectifier Power Unit RA-133.

(3) *Tropicalization.* Rectifier Power Unit RA-133 is treated against deterioration under tropical climatic conditions by a moisture-proofing and fungiproofing treatment applied at the time of manufacture. TB SIG 13 contains a detailed description of this treatment. If retreatment is required after a period of use, again moistureproof and fungiproof Rectifier Power Unit RA-133, following the procedure outlined in TB SIG 13. If the coating of protective varnish has been punctured or broken during repair and if complete treatment is not needed to reseal the equipment, brush-coat the affected part. Be sure the break is completely sealed.

8. IDENTIFICATION TABLE OF REPLACEABLE PARTS FOR RECTIFIER POWER UNIT RA-133. The following information was compiled on 19 May 1947. The appropriate pamphlet of the War Department Supply Catalog for Rectifier Power Unit RA-133 is:

Organizational and Higher Echelon Spare Parts: SIG 7 & 8 RA-133 (when published).

For an index of available catalog pamphlets, see the latest issue of War Department Supply Catalog SIG 1 & 2.

Ref.symbol	Name of part and description	Function of part	Signal Corps stock No.
	RECTIFIER POWER UNIT RA-133: electronic type; output 121.5 to 135 v dc, 0.02 amp, 5 to 6.6 v ac, 1 amp; input 110-130 or 220-260 v, 50/60 cyc, single ph; 8 $\frac{3}{8}$ " wd x 4 $\frac{3}{8}$ " h x 6" d; uses rectifier Tube JAN-6X5GT/G and regulator Tube JAN-OD3/VR150; Sig C spec No. 71-3177.		3H4691-133
	TECHNICAL BULLETIN TB 11-300.		(Order through AGO channels.)
	BOARD, terminal: general purpose; 3 metal screw term.; phenolite board; 2 $\frac{1}{2}$ " lg x $\frac{7}{8}$ " wd x $\frac{3}{32}$ " thk; Amer Rod Hdwe No. 1506.	Power supply terminal strip.	2Z9403. 31

Ref.symbol	Name of part and description	Function of part	Signal Corps stock No.
	CABLE, power: Sig C Cordage CO-144: Underwriters type "S"; 2 #18 AWG conductors comprising 41 #34 AWG strands; RC; 1/4" OD; Sig C spec No. 71-684.	Line cord-----	3E2144
C1-----	CAPACITOR, fixed: electrolytic; 3 sec.; 20-20-20 mf; 400 vdcw; body dimen; 3 1/4" lg x 1 3/8" diam; JAN type No. CE33C200Q.	Power supply filter--	3DB20-101
C2, C3--	CAPACITOR, fixed: mica; 2,000 mmf \pm 5%; 500 vdcw; max body dimen 5 3/4" lg x 5 3/4" wd x 3/32" thk; JAN type No. CM-30B202J.	A-C line filter-----	3K3020222
	CLAMP, cable: consists of body 7/8" OD x 5/8" lg x 3/16" ID, thd 3/4"-18 special pitch, lg of thd portion 3/8"; compression nut 7/8" diam x 7/16" ID w/knurled finish; rubber grommet 2 1/2" diam x 1/2" wd w/hole in center for 0.312" to 0.375" diam; for table 0.312" to 0.375" diam; water seal; Pyle-National Nos. RA-6, DB4-B, DB4-E.	For line control box.	2Z2636-161.
	CLAMP; tube; steel; zinc-coated; approx 2 3/8" lg x 1 1/2" wd x 1/2" thk; accommodates tube approx 7/8" diam across top; Sig C dwg No. SC-D-19920, items 3, 7, 8.	For VI and V2-----	2Z2643.61.
H1-----	CONNECTOR, plug: 2 flat parallel male cont; straight; 1 1/2" lg x 1 5/16" diam; 10 amp, 250 v; rubber; Hubbell No. 9940.	Line cord-----	6Z7565.3.
F1-----	FUSE, cartridge: 3/8 amp; 250 v; glass body; ferrule term.; 1 1/4" lg x 1/4" diam; Littelfuse No. 3AG.	Line fuse-----	3Z2588.2
	GROMMET: rubber; fits 1/2" diam hole; 3/8" ID, 1/16" wd groove x 1/4" thk x 5/8" OD; Atlan India Rub No. 230.	Main chassis for line cord.	6Z4856-8.

Ref.symbol	Name of part and description	Function of part	Signal Corps stock No.
	HOLDER, fuse: extractor post; for single No. 3AG fuse; bakelite body; 250 v, 18 amp; 2 $\frac{3}{32}$ " lg x 2 $\frac{5}{32}$ " diam over-all; Buss type HCM.	Fuse F1-----	3Z2876-6.1.
E1-----	LAMP LM-63: glow; 105-125 v, $\frac{1}{25}$ w; bulb T-2 clear; 1 $\frac{5}{16}$ " lg over-all; miniature bayonet base.	Power on-off indicator.	2Z5963
	LIGHT, indicator: w/lens; $\frac{1}{2}$ " diam red smooth lens; miniature bayonet base; 6 v, 0.15 amp; 1 $\frac{7}{8}$ " lg x 1" diam; Dialco No. 857-BS.	Lamp E1-----	2Z5991-33
L1, L2--	REACTOR: filter choke; single sec.; 32 hy, 40 ma; 540 ohms d-c resistance; herm sealed; 3 $\frac{1}{4}$ " h x 2 $\frac{1}{2}$ " diam; UTC No. 93131.	For d-c output of supply.	3C1084Z48-3
R1-----	RESISTOR, fixed: composition; 820 ohms $\pm 10\%$; 2 w; max body dimen 1.78" lg x 0.405" diam; JAN type No. RC41BF821K.	Voltage regulating.	3RC41BF821K
R2-----	RESISTOR, fixed: composition; 1,500 ohms $\pm 10\%$; 1 w; max body dimen 1.28" lg x 0.310" diam; JAN type No. RC31BF152K.	Series voltage dropping.	3RC31BF152K
R3-----	RESISTOR, fixed: composition; 200,000 ohms $\pm 5\%$; $\frac{1}{2}$ w; max body dimen 0.655" lg x 0.249" diam; JAN type No. RC21BF-204J.	E 1 c u r r e n t - limiting.	3RC21BF204J
	SOCKET, tube: octal; saddle mtg; mica-filled bakelite; 1 $\frac{3}{4}$ " lg x 1 $\frac{1}{4}$ " wd x $\frac{5}{8}$ " thk over-all; Cinch No. 51B 11936.	V1 and V2-----	2Z8678.268
S1-----	SWITCH, toggle: DPDT; 6 amp, 115 v; bakelite body; 1 $\frac{9}{32}$ " h x 2 $\frac{3}{32}$ " d x 2 $\frac{3}{8}$ " wd body dimen; bat handle; solder lug term.; JAN type No. ST22N.	115V-230V, voltage selector.	3Z9849.135

Ref.symbol	Name of part and description	Function of part	Signal Corps stock No.
S2-----	SWITCH, toggle: SPST; 6 amp, 115 v, bakelite body; body dimen 1 $\frac{1}{2}$ " h x 2 $\frac{3}{32}$ " d x 2 $\frac{3}{32}$ " wd; bat handle; solder lug term.; JAN type No. ST12A.	Power ON-OFF---	3Z9863-12A
T1-----	TRANSFORMER, power: fil and pl; pri 115/250 v, 60 cyc, single ph; sec. No. 1, 400 v, 45 ma, CT; sec. No. 2, 6.3 v, 1 amp; sec. No. 3, 6.3 v, 1 amp; herm sealed metal case; 3 $\frac{5}{8}$ " h x 2 $\frac{9}{32}$ " wd x 3 $\frac{1}{8}$ " lg; UTC No. B-4319.	Filament and high voltage.	2Z9608-71
V2-----	TUBE, electron: JAN-OD3/VR150.	Voltage regulator--	2J0D3/VR150
V1-----	TUBE, electron: JAN-6X5GT/G.	Rectifier-----	2J6X5GT/G

[AG 300.5 (5 Jun 47)]

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For explanation of distribution formula, see TM 38-405.