

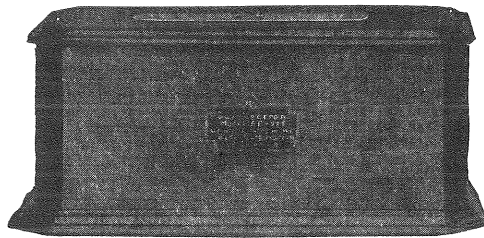
RCA

"B" Battery Eliminator

(DUO-RECTRON—MODEL AP-937)

SERVICE NOTES

Third Edition—5M—June, 1928



RCA Duo-Rectron—Model AP-937

Radio Corporation of America

SERVICE DIVISION OF THE PRODUCTION AND SERVICE DEPARTMENT

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A WORD OR TWO ABOUT SERVICE

Service goes hand in hand with sales. The well informed Radiola Dealer renders service at time of sale in affording information as to proper installation and upkeep. Subsequent service and repair may be required by reason of wear and tear and mishandling, to the end that Radiola owners may be entirely satisfied.

Obviously this service can best be rendered at point of contact and therefore Dealers and Distributors, who are properly equipped with a knowledge of the design and operation of Radiolas, occupy a favorable position to contract for this work.

To assist in promoting this phase of the Dealers' business the Service Division of the RCA has prepared a series of Service Notes—of which this booklet is a part—containing technical information and practical helps in servicing Radiolas.

This information has been compiled from experience with Radiola Dealers' service problems, and presents the best practice in dealing with them. A careful reading of these Service Notes will establish their value to Dealer and Distributor, and it is suggested they be preserved for ready reference.

In addition to supplying the Service Notes the RCA, through its Service Stations, has available to Dealer and Distributor the services of engineers who are qualified to render valuable help in solving service problems.

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RCA "B" BATTERY ELIMINATOR

(DUO-RECTRON—MODEL AP-937)

SERVICE NOTES

PREPARED BY RCA SERVICE DIVISION

INTRODUCTION

The RCA Duo-Rectron or "B" Battery Eliminator is a rectifier unit which will operate from an alternating current house lighting circuit rated at 110-125 volts, 50 to 60 cycles. No attempt should be made to operate it from a direct current circuit or from an alternating current source of a voltage or frequency different from that specified above. Such misuse may result in serious damage to the Duo-Rectron.

RCA Duo-Rectron is furnished with one Rectron UX-213 and one Radiotron UX-874. Rectron UX-213 is a full wave rectifier having two parallel filaments and two plates, thus utilizing both halves of the alternating current wave. The RCA Radiotron UX-280 is interchangeable with Rectron UX-213 and has the advantage of increased operating life. Radiotron UX-874, the "glow tube," is connected across from the —B to the +90 terminal and serves to maintain a constant voltage across these two points under varying load conditions. It has in its base a strap, connecting two of its contacts, which closes the primary circuit of the power transformer. There is, therefore, no voltage impressed on the power transformer until the "glow-tube" is in place.

The Duo-Rectron will supply "B" plate voltages of 22½, 45, 90 and 135 volts to a Radiola or other radio receiver. Under normal conditions, it is rated to furnish 2 milliamperes (0.002 ampere) at the 45-volt post, 20 milliamperes (0.020 ampere) at the 90-volt post, and 10 milliamperes (0.010 ampere) at the 135-volt post. If the radio receiver in use does not require 135 volts on the plate of any Radiotron, a larger plate current output may be obtained by connecting the +90-volt post to the +135-volt post by a short jumper. Under these conditions the Duo-Rectron will furnish its maximum output of 50 milliamperes (0.050 ampere) at 90 volts.

If the Duo-Rectron is over-loaded beyond its rated capacity, the operation of the "glow-tube" and of the rectifier unit is likely to be erratic. Also, if the current drain of the radio receiver is heavy the "glow-tube" may fail to function if the Duo-Rectron is started with the load on. It is, therefore, desirable not to light the filaments of the radio receiver until the Duo-Rectron is in operation.

PROTECTIVE SEALS AND THEIR USE

The lead seals placed on Duo-Rectrons by the RCA are for the protection of the dealer. Broken seals indicate tampering.

A service man may find it necessary to break the seals in order to make repairs. In such instances he should replace those broken by suitable substitute seals when the tear of assembled parts. This information by the condition of the seal in determining repair work is finished. Thus he is aided is due to tampering or ordinary wear and whether any trouble that may develop later places the dealer in a preferred position when it is found necessary to render a bill for service.

PART I—SERVICE DATA

Rectron UX-213 and Radiotron UX-874 in their proper sockets and see
are firmly seated. Having made certain that the power supply is alter-
ent of the proper voltage and frequency, plug in the unit and turn "on" the
l up Duo-Rectron operating switch to the "on" position.
ubes should light up, Radiotron UX-874 showing a purple or pink glow.

EITHER TUBE LIGHTS

Trouble may be due to:

- Blown fuse in lighting circuit (may be checked by means of a test lamp).
- Loose plug in lighting socket.
- Operating switch on Duo-Rectron not making proper contact.
- Open in power supply cord.
- Radiotron UX-874 not making proper contact.
- Strap in base of Radiotron UX-874 open. (Try another "glow tube".)
- Open in transformer. (Run continuity test.)

13 LIGHTS, BUT UX-874 DOES NOT

- Low line voltage. (Check with A.C. voltmeter.)
- Duo-Rectron started under load.
- Short in B battery leads in radio receiver. ("Click" radio receiver with
leads disconnected from Duo-Rectron.)
- Rectron has low emission. (Try another Rectron UX-213.)
- Radiotron UX-874 defective. (Try another Radiotron UX-874.)
- Open resistor. (Run continuity test.)
- Open in chokes or connections. (Run continuity test.)
- Shorted condenser.
- Open plate coil in transformer secondary. (Run continuity test.)

"-TUBES LIGHT, BUT "GLOW TUBE" DIES WHEN EVER RADIOTRONS ARE LIGHTED

- Excessive load on Duo-Rectron.
- Possible short in radio receiver.
- Defective Radiotron UX-874.
- Low emission Rectron UX-213.

SSIVE HUM IN OPERATION

- Open or defective filter condenser.
- Rectron UX-213 not properly seated on base.
- Defective Rectron UX-213.
- Loose transformer laminations or poorly soldered joints.
- Low emission rectifying tube.

W TUBE" HOWL

usually a high-pitched intermittent or continuous howl heard in the Loud-
sets in after the Duo-Rectron has been in operation for some time. The
ometimes be temporarily stopped by jarring the "glow-tube." The trouble
fective "glow-tube" and may be eliminated by replacing it with a new one.

PART II—SERVICE PROCEDURE

(1) TEST INDICATIONS

The following indications, in conjunction with the "click" tests given on page 6, will isolate any trouble that may appear. (See Table 1, page 7).

(A) *Condition of the plate of Rectron UX-213:*

When overloaded, as in the case of a short across the tube, the plates will become a dull red in color when the Duo-Rectron is in operation.

(B) *Magnetic pull of choke A.*

This pull, which may be tested by means of a steel screw driver placed in the space between the two chokes as shown in Figure 1, will show whether there is any current flowing through the coil of the choke. The arrows in Figure 2 indicate where the magnetic pull may be tested.

(C) *Magnetic pull of choke B*

This pull, tested as in the case of choke A, will indicate whether there is any current flowing through the coil of choke B.

(D) *Voltage reading from —B to +45*

(E) *Voltage reading from —B to +90*

(F) *Voltage reading from —B to +135*

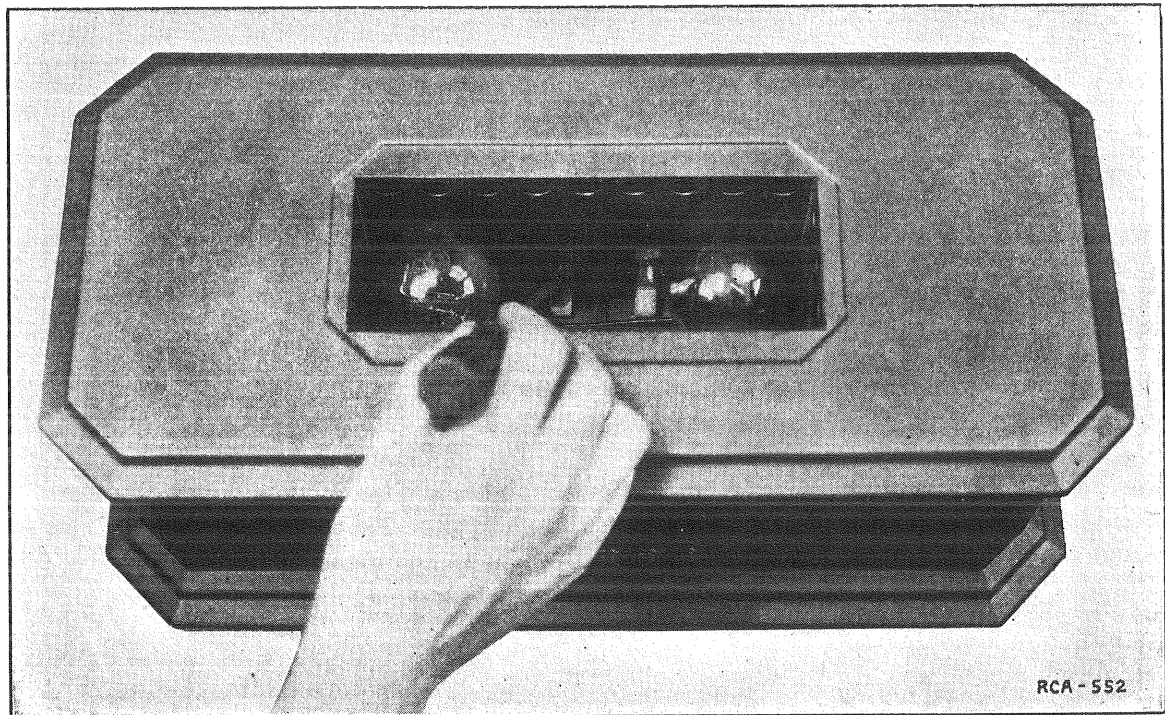


Figure 1—Screw driver used to test magnetic pull of chokes A and B.

In testing for the magnetic pull of chokes A and B, care should be taken not to allow the screw driver to touch any other part of the Duo-Rectron except the cores of the two chokes under test. The resistor element, located on the other side of the tube sockets, is wound with very fine resistance wire and may easily be damaged.

(2) ISOLATING TROUBLE

With the radio receiver cable or wires entirely disconnected from the Duo-Rectron, turn "on" the operating switch. If Rectron UX-213 lights with normal brilliancy, but Radiotron UX-874 fails to function.

- (a) Try another Radiotron UX-874.
- (b) Try another Rectron UX-213.

If these changes do not eliminate the trouble, shut "off" operating switch, remove AC plug, take out tubes and make the following continuity tests with a 4½ volt C battery in series with a pair of phones.

TERMINALS	CORRECT EFFECT	INCORRECT EFFECT CAUSED BY
—F1 and +F1 to +135	Click closed thru chokes and filament coil of transformer.	Open choke or open transformer mid-tap.
+135 to —B	Click, closed thru resistor.	Open resistor.
—B to G1 and P1	Click, closed thru plate coil of transformer.	Open transformer or mid-tap.

If all the above circuits "click" as indicated replace the tubes in the proper position, replace AC plug and turn "on" the Duo-Rectron. Take the six test indications outlined in Sec. 1, Part II (page 5) and refer to Table I (page 7), to isolate the trouble.

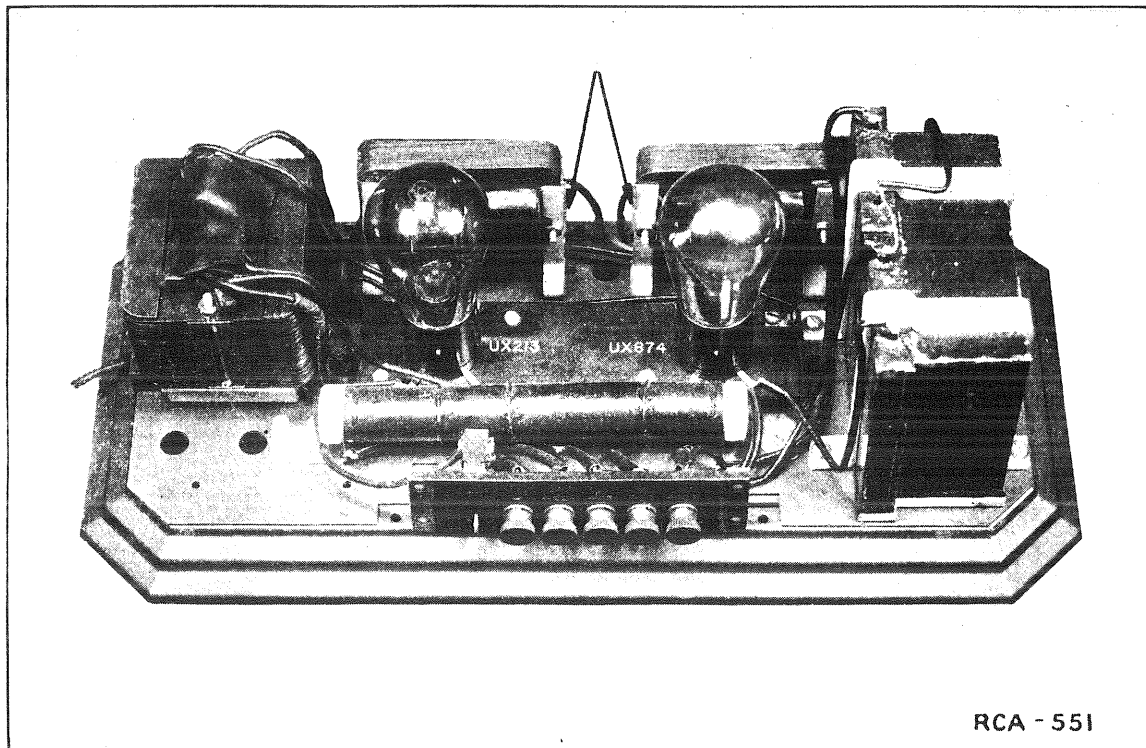


Figure 2—Top view of "B" Battery Eliminator with cover removed and showing arrows where magnetic pull of chokes may be tested.

TABLE I

Trouble Indicating Table

Conditions under which this chart is applicable:

- (1) Rectron UX-213 lights, but Radiotron UX-874 does not function.
- (2) Closed circuit from $-F1$ and $+F1$ to $+135$ to $-B$ to $G1$ and $P1$.

PLATES OF UX-213	PULL ON CHOKE A	PULL ON CHOKE B	VOLTAGE			TROUBLE
			$-B$ TO $+45$	$-B$ TO $+90$	$-B$ TO $+135$	
Dull Red	No	No	No	No	No	Condenser C shorted
Apparently normal	Strong	No	No	No	No	Condenser D shorted
Normal	Normal	Normal	No	No	No	Condenser E shorted
Normal	Normal	Normal	No	No	About 70	Condenser F shorted
Normal	Normal	Normal	No	Nearly normal, glow tube may light	Normal	Condenser G shorted

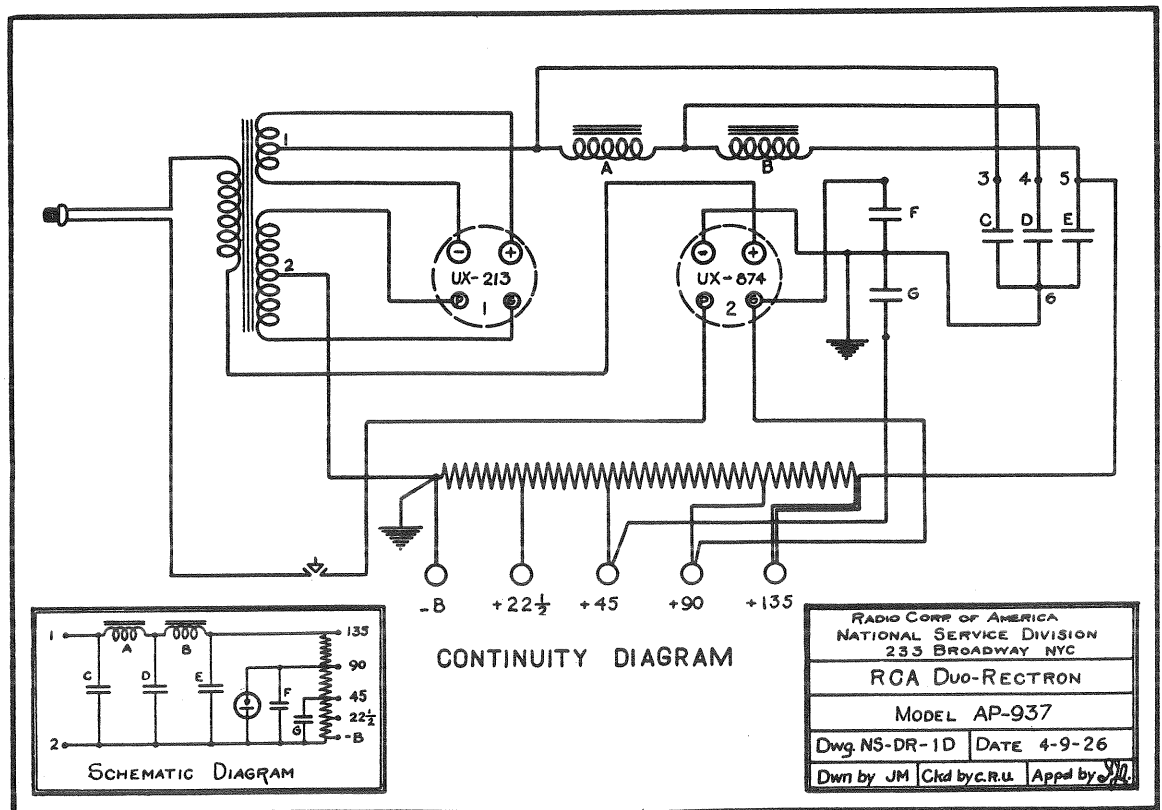


Figure 3—Continuity wiring diagram of RCA "B" Battery Eliminator.

A COMPLETE DUO-RECTRON CONTINUITY TEST

TERMINALS	CORRECT EFFECT	INCORRECT EFFECT CAUSED BY
(At plug) one side of AC line to +F2	Closed thru transformer	Open transformer primary
(At plug) other side of AC line to P2 (with switch "on").	Closed thru AC switch	Open in switch or leads
G1 to P1	Closed thru transformer plate coil	Open secondary coil
G1 or P1 to —B	Closed thru mid-tap and transformer secondary	Open mid-tap
+F1 to —F1	Closed thru transformer filament coil	Open secondary coil
+F1 or —F1 to +135	Closed thru mid-tap, transformer secondary coil and two chokes	Open mid-tap or open choke
—B to +22½	Closed thru resistor	Open resistor
+ 22½ to +45	Closed thru resistor	Open resistor
+45 to +90	Closed thru resistor	Open resistor
+90 to +135	Closed thru resistor	Open resistor
—F2 to G2	Closed thru resistor from —B to +90	Open in section of resistor or leads to glow tube

Above tests may be made without breaking seals or removing cover. If cover is removed further tests may be made to isolate trouble.

3 to 4	Closed thru choke A	Open in choke A
4 to 5	Closed thru choke B	Open in choke B

The test points referred to are shown in the Continuity Diagram, Figure 3 (page 7). The designations "P" and "G" refer to what would normally be the plate and grid socket contacts if three-element tubes were used. The number immediately following refers to the first or second socket. For example G2 would indicate the grid contact of the second socket. P1 would indicate the plate contact of the first socket. In the same manner the indication "F" denotes the filament contact of the tube socket indicated by the number.