

Radiola

Balanced Amplifier

INTRODUCTION

Radiola Balanced Amplifier is a two-tube balanced audio frequency power amplifier, especially designed for use with the Radiola III, thus providing loud speaker operation under all conditions of reception. It gives an advantage over the ordinary cascade amplifier, as the balanced system minimizes distortion of the voice or music. The apparatus is mounted on a horizontal panel and enclosed in a wood cabinet from which a flexible wire cable is provided for connection to the batteries.

EQUIPMENT

The equipment includes the following:

1. Radiola Balanced Amplifier (less batteries).
2. WD-11 Radiotrons.

BATTERIES

When the Radiola Balanced Amplifier is used with the Radiola III Receiver, a common "A" battery for both units is recommended and the connections are shown in Figure 1.

As the combined units employ four WD-11 Radiotrons, five ordinary $1\frac{1}{2}$ volt dry cells, all connected in PARALLEL, are recommended.

BATTERIES REQUIRED

- (A) Refers to Filament Lighting or "A" Battery
 (B) Refers to Plate or "B" Battery
 (C) Refers to Negative Grid Bias or "C" Battery

- (A) Four or six $1\frac{1}{2}$ Volt Dry Cells connected in PARALLEL, such as:
- | | | |
|--|---|-----|
| 4 or 6 Eveready Dry Cell Radio "A" Batteries | ($2\frac{1}{2}$ " x $6\frac{1}{2}$ ") | or, |
| 4 or 6 Manhattan Red Seal Dry Cells | ($2\frac{1}{2}$ " x $6\frac{1}{2}$ ") | or, |
| 4 or 6 Burgess No. 6 Dry Cells | ($2\frac{1}{2}$ " x 6") | or, |
| 4 or 6 Burgess Super Six Dry Cells | ($2\frac{1}{2}$ " x 6") | or, |
| 4 or 6 Ray-O-Vac No. 1211 Dry Cells | ($2\frac{1}{2}$ " x $6\frac{1}{2}$ ") | or, |
| 4 or 6 Ace No. 6 Dry Cells | ($2\frac{1}{2}$ " x $6\frac{1}{2}$ ") | or, |
| 4 or 6 Columbia Ignitor No. 6 Dry Cells | ($2\frac{1}{2}$ " x $6\frac{1}{2}$ ") | or, |

NOTE—A two volt Storage Battery may be used if desired.

OR EQUIVALENT

(B) When the Radiola III is used alone, a "B" battery voltage of 45 is recommended with a "C" battery voltage of 1.5. When the Radiola III and the Radiola Balanced Amplifier are used together, a "B" battery voltage of 90 is recommended for both. The proper "C" battery voltage is then 4.5. A total of four $22\frac{1}{2}$ volt blocks of "B" battery will be needed.

- (B) Four $22\frac{1}{2}$ Volt Plate Batteries connected in SERIES, such as:
- | | | | |
|-------------------------|-----------------|--------------------------------|-----|
| 4 Eveready No. 766 | Plate Batteries | ($6\frac{5}{8}$ " x 4" x 4") | or, |
| 4 Burgess No. 2156 | Plate Batteries | ($6\frac{5}{8}$ " x 4" x 3") | or, |
| 4 Ray-O-Vac No. 2151 | Plate Batteries | ($6\frac{5}{8}$ " x 4" x 3") | or, |
| 4 Kwik-Lite No. 225 | Plate Batteries | ($6\frac{5}{8}$ " x 4" x 3") | or, |
| 4 Ace No. 115 | Plate Batteries | ($6\frac{5}{8}$ " x 4" x 3") | or, |
| 4 Yale No. 1512-V | Plate Batteries | ($6\frac{5}{8}$ " x 4" x 3") | or, |
| 4 Bright Star No. 15-90 | Plate Batteries | ($6\frac{5}{8}$ " x 4" x 3") | or, |
| 4 Novo No. 268 | Plate Batteries | ($6\frac{5}{8}$ " x 4" x 3") | or, |

OR EQUIVALENT

Two 45 Volt Plate Batteries may be used instead of four $22\frac{1}{2}$ Volt blocks if desired, such as:

- | | | | |
|-------------------------|----------------------------|--|-----|
| 2 Eveready No. 767 | Plate Batteries (45 Volts) | (6" x $6\frac{5}{8}$ " x 3") | or, |
| 2 Burgess No. 2306 | Plate Batteries (45 Volts) | ($7\frac{1}{8}$ " x $6\frac{5}{8}$ " x 3") | or, |
| 2 Ray-O-Vac No. 2301 | Plate Batteries (45 Volts) | ($8\frac{1}{2}$ " x $6\frac{5}{8}$ " x $3\frac{1}{4}$ ") | or, |
| 2 Novo No. 276 | Plate Batteries (45 Volts) | (8" x $6\frac{1}{2}$ " x 3") | or, |
| 2 Kwik-Lite No. 245 | Plate Batteries (45 Volts) | ($8\frac{1}{4}$ " x $6\frac{1}{4}$ " x 3") | or, |
| 2 Bright Star No. 30-90 | Plate Batteries (45 Volts) | (13" x 4" x 3") | or, |
| 2 Yale No. 3045-V | Plate Batteries (45 Volts) | (8" x $6\frac{5}{8}$ " x 3") | or, |
| 2 Ace No. 130 | Plate Batteries (45 Volts) | ($13\frac{1}{4}$ " x 4" x 3") | or, |

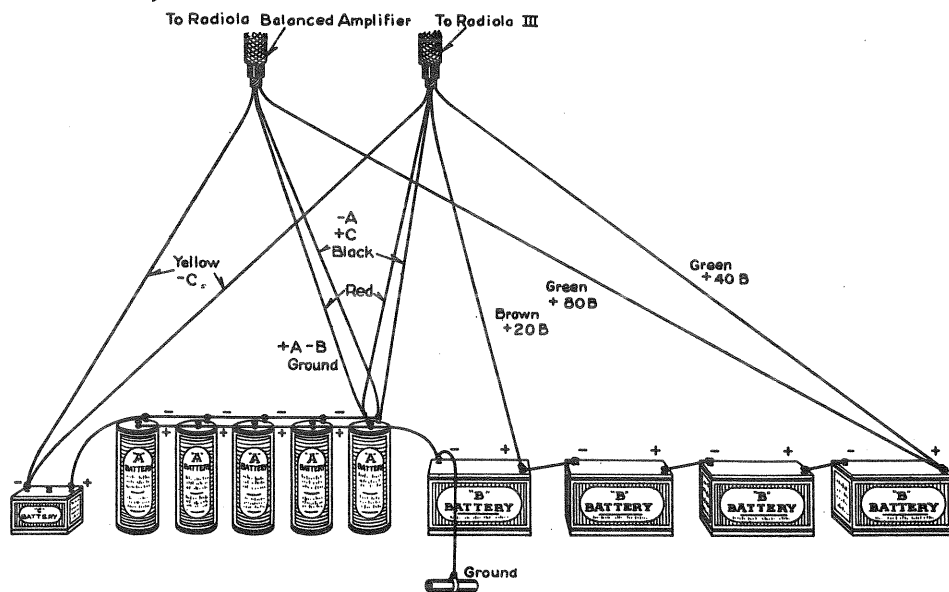


Fig. 1—Showing Connections for Batteries

OR EQUIVALENT

NOTE—The plate or "B" batteries listed are of the large sizes which are most economical. Other intermediate sizes may be used equally well.

(C) One $4\frac{1}{2}$ Volt Negative Grid Bias or "C" Battery, such as:
1 Eveready No. 771 Negative Grid Bias Battery ($4'' \times 3'' \times 1\frac{3}{8}''$) or
1 Ray-O-Lite No. 231-R Negative Grid Bias Battery ($4'' \times 3'' \times 1\frac{3}{8}''$) or,
1 Burgess No. 2370 Negative Grid Bias Battery ($4'' \times 3'' \times 1\frac{3}{8}''$) or,
1 Yale No. 312 Negative Grid Bias Battery ($4'' \times 3'' \times 1\frac{3}{8}''$) or,
1 Bright Star No. B-34-17 Neg. Grid Bias Battery ($4'' \times 3'' \times 1\frac{3}{8}''$) or,
1 Novo No. 288 Negative Grid Bias Battery ($4'' \times 3'' \times 1\frac{3}{8}''$)

OR EQUIVALENT

INSTALLATION

Location:

The input jacks on the Radiola Balanced Amplifier will be in line with the output jacks of the Radiola III when the Amplifier is placed at the left. Connections may be made by the jumpers furnished with the amplifier.

Connections to Batteries:

All battery connections are made through the flexible cables. Proceed as follows:

Connect the five $1\frac{1}{2}$ volt dry cells in parallel, that is, connect all the center binding posts (positive) together with one piece of wire and then connect all the outside binding posts (negative) together with another piece of wire. Under no circumstances allow these two wires to touch each other.

Find the two black cable leads which are tagged "—A+C" and connect them to one of the outside (negative) battery binding posts.

Find the two red cable leads which are tagged "+A—B Gnd" and connect them to one of the center (positive) battery binding posts.

Turn the knobs marked "Battery Setting" to the left until the pointer rests on "Off". Remove the WD-11 Radiotrons from their packages and place them in the sockets taking care to push them in firmly until the bases rest against the socket panels. The large pin is toward the front of the set. Turn the "Battery Settings" until the pointers extend to the left. Look directly into each Radiotron to see that the filament glows dimly.

Then connect one end of a short piece of wire to the positive (+) terminal of the "C" battery and the other end to an outside (negative) terminal of one of the "A" battery cells.

Find the two yellow cable leads which are tagged "—C" and connect them to the "—4— $\frac{1}{2}$ " terminal of the "C" battery.

Connect the four "B" batteries in series as shown in the figure. Using short pieces of wire, connect the negative (—) terminal of one block to a center (positive) terminal of one of the "A" battery cells. Then connect the positive terminal of the same block to the negative terminal of the second block and similarly, the positive of the second to the negative of the third and the positive of the third to the negative of the fourth.

Find the brown lead from the Radiola III cable which is tagged "+ 20 B" and connect it to the positive terminal of the first "B" battery.

Find the two green cable leads, the one from the Radiola III being tagged "+40B" while the one from the amplifier is tagged "+80B" and connect them to the positive terminal of the fourth "B" battery.

Connect one of the center (positive) terminals of an "A" battery cell to the ground clamp.

Connection of Loud Speaker—Push the tips on the end of the loud speaker cord into the jacks at the left side of the Amplifier panel.

OPERATION

Turn the knob marked "Battery Setting" to the right until both filaments glow with a dull red color. No other adjustments of the Amplifier can be made or need to be made. The Radiola III Receiver is to be operated according to the instructions supplied with it.

When the set is put out of use, turn the knob marked "Battery Setting" as far to the left as possible.

Difficulties—If the set fails to operate, there is always a definite reason. Carefully check all connections to see that they correspond with the directions given (See Figure 1) noting particularly the polarity of all the batteries. See that the filaments of both Radiotrons glow at a dull red heat. If there is no sound whatsoever and the Radiola III Receiver is known to be operating well, the "B" battery connections to the Amplifier are probably reversed.

MAINTENANCE

Radiotrons—The WD-11 Radiotrons may become inoperative through a broken filament or otherwise, in which case they should be replaced by new ones of the same type.

Filament or "A" Battery—When the dry cells used for this purpose become discharged to the point where they will no longer heat the filaments to the proper brilliancy, they should be replaced by new ones.

Plate or "B" Battery—If large size "B" batteries are used, they should last for several months and frequently longer. When signals become weak with the filaments at proper temperature, the "B" batteries should be replaced by new ones.

Bias or "C" Battery—If the bias battery is replaced by a new one every time the "B" battery is replaced, it should give no trouble.

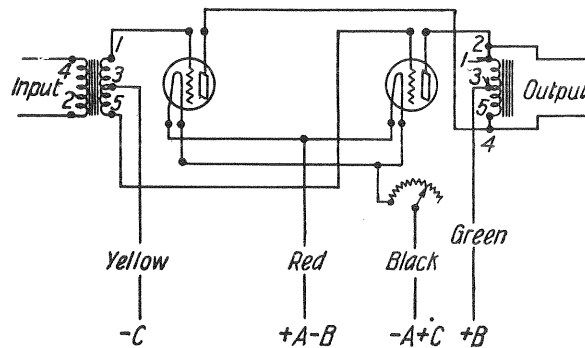


Fig. 2—Diagram of Connections

RADIOLAS III, III-A AND BALANCED AMPLIFIER USING RADIOTRONS UX-199 AND UX-120

AS Radiolas III, III-A and Balanced Amplifier were originally designed and equipped with Radiotrons WD-11 a few slight changes in connections and operation become necessary when Radiotrons UX-120 are used, as follows:

RADIOLA III-A

In the case of the Radiola III-A two approved methods of use are suggested: the first being particularly recommended to the layman because of its simplicity; the second being recommended to the dealer who has a service man at his disposal, or to the owner who has the equipment for making the necessary changes.

Method I: (See Figure 1)

A six ohm Rheostat is connected in the battery circuit as shown in Figure 1. The following equipment will be required:

- 1 Radiola III-A (Stripped)
- 1 Radiola Loud Speaker UZ-1325 or Model 100
- 1 Radiotron UX-199 for detector socket
- 3 Radiotrons UX-120 for other sockets
- 4 Na-Ald Adapters Model No. 421-X or Marco Adapters No. 206
- 1 Six ohm Rheostat (table mounting type)
- 1 Five foot length lamp cord.
- "A" Battery consisting of six standard dry cells, $1\frac{1}{2}$ volts each, such as:
 - 6 Burgess No. 6 Dry cells or
 - 6 Eveready Dry Cell Radio "A" Batteries No. 7111 or
 - 6 Columbia Ignitor No. 6 Dry Cells or
 - 6 Ray-O-Vac No. 1211 Dry Cells

OR EQUIVALENT

"B" Battery consisting of three 45 volt extra large Heavy Duty plate batteries, such as:

- 3 Burgess No. 10308 plate batteries or
- 3 Eveready No. 770 or No. 486 plate batteries or
- 3 Ray-O-Vac No. 9303 plate batteries

OR EQUIVALENT

"C" Battery consisting of one $22\frac{1}{2}$ volt plate battery (with taps for variable voltage) such as:

- 1 Burgess No. 2156 or
- 1 Eveready No. 766 or
- 1 Ray-O-Vac No. 2151

OR EQUIVALENT

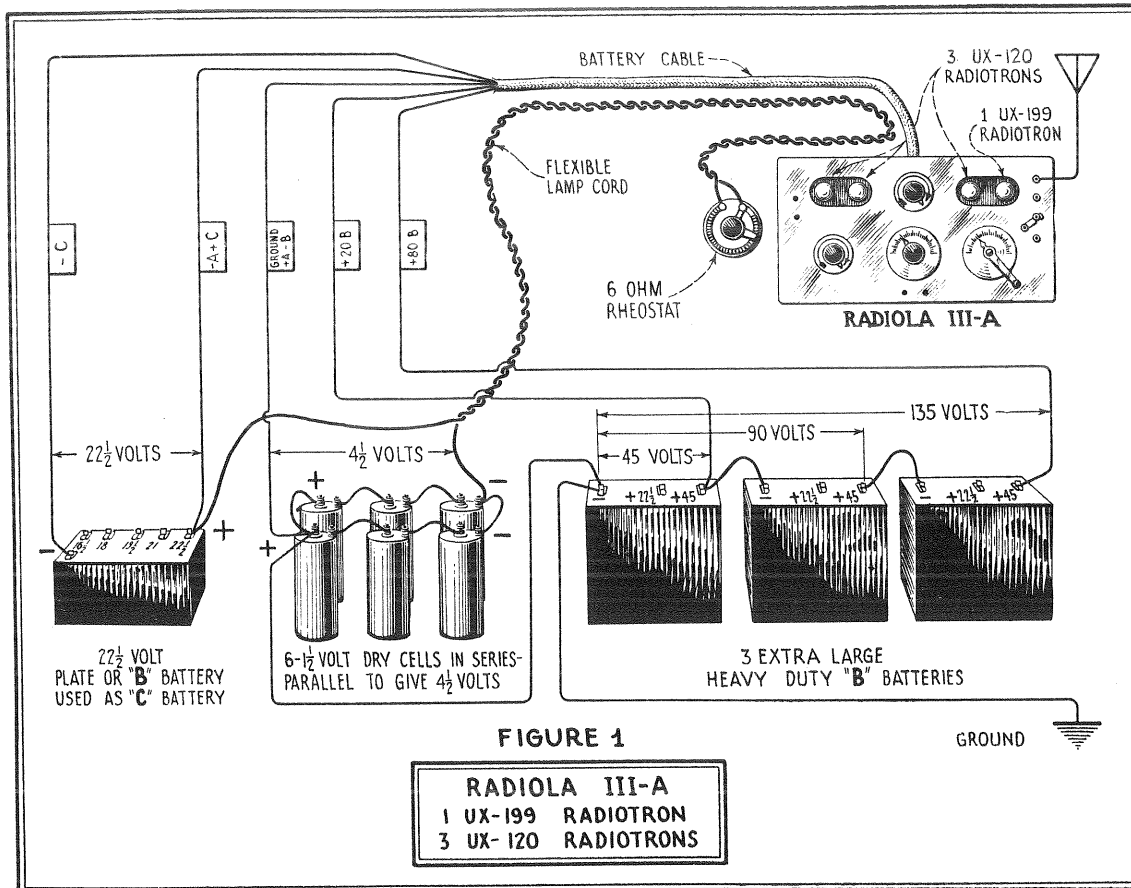
Before connections are made, the external Rheostat should be turned to its "OFF" position (so that movable arm does not touch resistance winding). All connections should then be checked against Figure 1.

It is important that adapters be fastened to the Radiotrons *before* they are inserted in the sockets of the Radiola. The UX-199 Radiotron is inserted in the detector socket, which is the one nearest the antenna binding posts.

Both "BATTERY SETTING" controls should be set and *permanently* left FULL ON, —that is, turned as far as possible in a clockwise direction.

The filament current to the Radiotrons is turned ON and OFF and is entirely regulated by means of the *external* six ohm Rheostat, which for convenience may be mounted on the side or end of the case of the Radiola.

To insure long life to both Radiotrons and batteries, the external Rheostat should not be advanced any further than necessary to obtain normal results. However, as the voltage of the



"A" battery decreases thru use, it will be necessary to advance the setting of the external Rheostat to maintain normal filament terminal voltage. "A" battery renewal is not required until it becomes necessary to advance the external Rheostat to its maximum current position to obtain normal results.

Important: Do not attempt to operate the set with only two of the Radiotrons lighted, for by so doing, excessive filament voltage will be applied.

Method II: (See Figure 2)

No additional Rheostat is required. Only the controls on the panel are used. Two changes in the wiring by which the rheostats of the Radiola are connected in series, will be required as shown in Figure 2.

Equipment required for operation is the same as in Method I above except the external Rheostat and lamp cord are not required. The following tools are necessary to make the change:

- 1 Screw Driver
- 1 Small pair pliers
- 1 Soldering iron.

If it becomes necessary to use additional solder, rosin core string solder is recommended. In order to avoid trouble resulting from corrosion, soldering paste or acid should not be used.

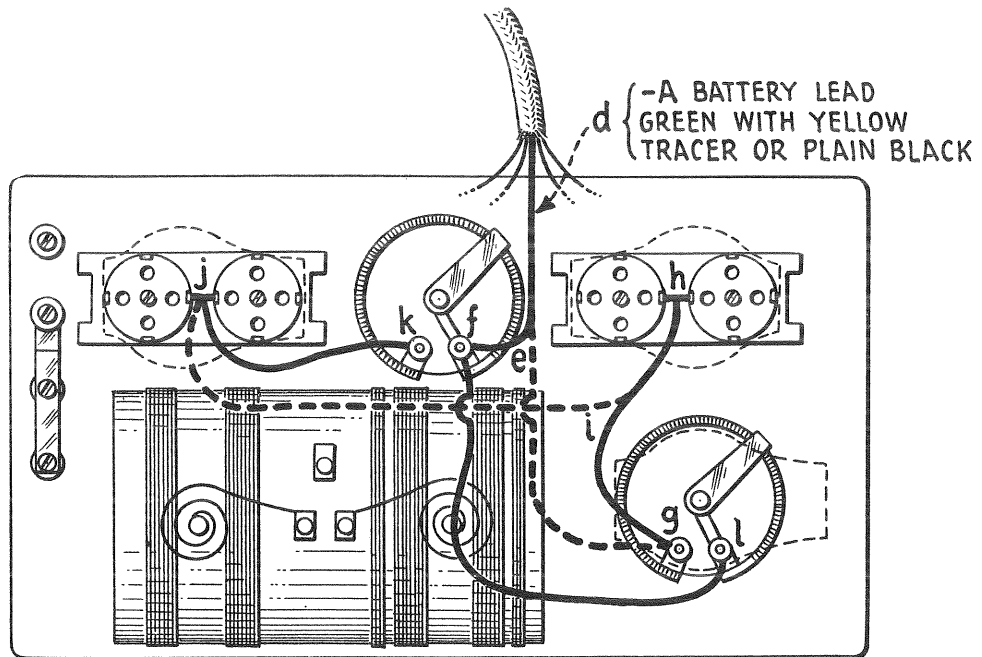


FIGURE 2

RADIOLA III-A

CHANGE WIRES AS FOLLOWS:-

d-e-f TO d-e-g

h-i-g TO h-i-j

j-k AND f-l REMAIN THE SAME

To change wiring of Radiola III-A refer to Figure 2 and proceed as follows:

- (1) Remove screws at sides of wooden case. Push several inches of battery cable into case and lift panel.
- (2) Untie strain cord which holds cable to frame of transformer.
- (3) Unsolder black flexible lead "h-i-g" at "g" (fig. 2) and resolder it to "j".
- (4) Without disturbing bus-bar "l-f", unsolder flexible battery cable lead "d-e-f" and resolder to "g" (from which a connection was just removed) thus forming the connection "d-e-g".
- (5) Fasten strain cord to frame of transformer so that the individual cable leads are relieved of possible tension.

After either or both "BATTERY SETTING" controls have been set at "OFF", the UX-199 Radiotron with adapter attached should be placed in the socket nearest the Antenna Bind-

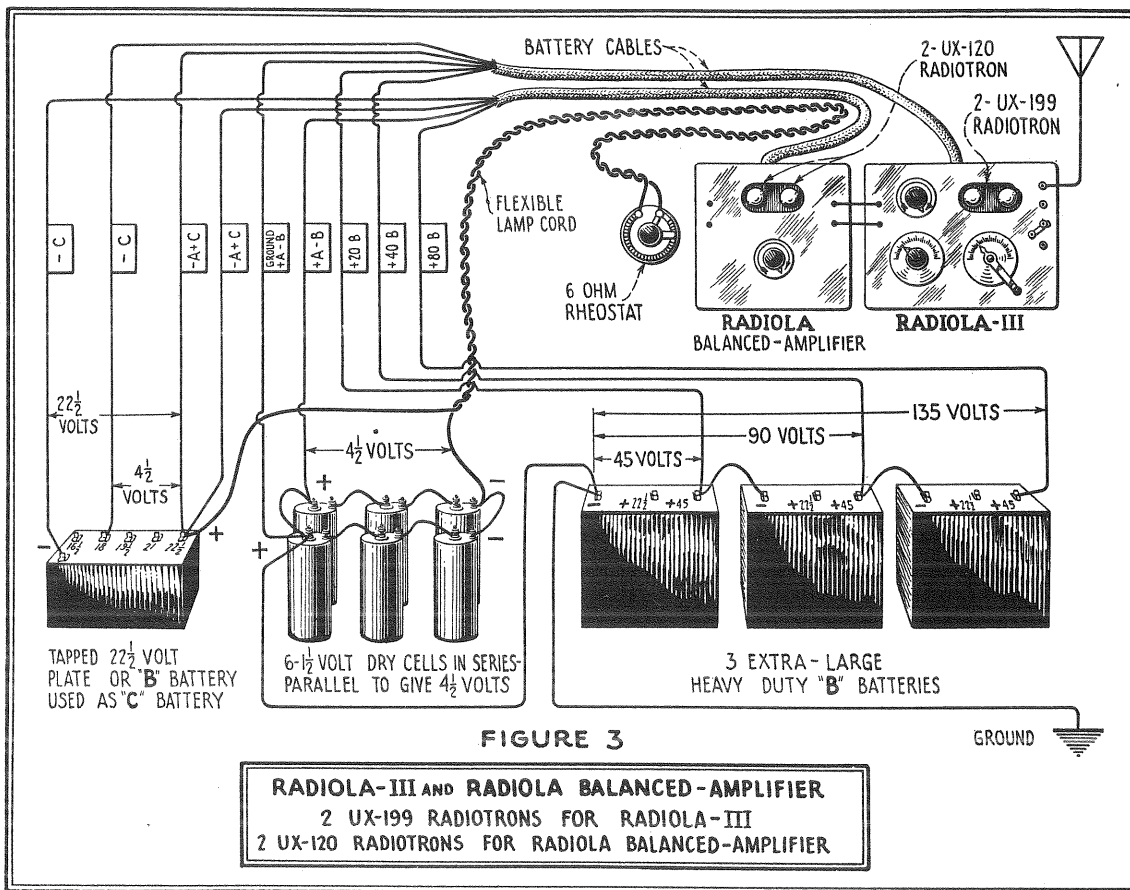
ing Posts. The UX-120 Radiotrons with adapters should be inserted in the other sockets. Batteries should be connected in the same manner as shown in Figure 1 except that the external rheostat and lamp cord are omitted, and a connecting wire must be added to join the "+C" and "-A" battery terminals.

In operation, both "BATTERY SETTING" controls must be slightly advanced from the "OFF" position to light the filaments of the Radiotrons. Regulation may then be obtained by means of either "BATTERY SETTING" control. "A" Battery renewal is not required until it becomes necessary to advance both "BATTERY SETTING" controls (in a clockwise direction) to their maximum current positions to obtain normal results.

Keeping the "BATTERY SETTING" controls as low as possible consistent with normal operation, insures long life to both Radiotrons and batteries.

RADIOLA III AND BALANCED-AMPLIFIER

Best operation of the Radiola III and Balanced-Amplifier will be realized when Radiola III is equipped with 2 UX-199 Radiotrons and Radiola Balanced-Amplifier with 2 UX-120 Radiotrons.



A six ohm external rheostat is connected in the battery circuit according to the diagram in Figure 3. The following apparatus will be required:

- 1 Radiola III (stripped)
- 1 Radiola Balanced-Amplifier (stripped)
- 1 Radiola Loud Speaker UZ-1325 or Model 100
- 2 Radiotrons UX-199 for Radiola III
- 2 Radiotrons UX-120 for Radiola Balanced-Amplifier
- 4 Na-Ald Adapters Model 421-X or Marco Adapters No. 206
- 1 Six ohm Rheostat (table mounting type)
- 1 Five foot length lamp cord.
- "A" Battery consisting of six standard dry cells, 1½ volts each, such as:
 - 6 Burgess No. 6 Dry Cells or
 - 6 Eveready Dry Cell Radio "A" Batteries No. 7111 or
 - 6 Columbia Ignitor No. 6 Dry Cells or
 - 6 Ray-O-Vac No. 1211 Dry Cells

OR EQUIVALENT

"B" Battery consisting of three 45 volt extra large Heavy Duty plate batteries, such as:

- 3 Burgess No. 10308 plate batteries or
- 3 Eveready No. 770 or No. 486 plate batteries or
- 3 Ray-O-Vac No. 9303 plate batteries

OR EQUIVALENT

"C" Battery consisting of one 22½ volt plate battery *with taps for variable voltage* (tapped battery necessary in this case) such as:

- 1 Burgess No. 2156 or
- 1 Eveready No. 766 or
- 1 Ray-O-Vac No. 2151

OR EQUIVALENT

Before connections are made, the external rheostat should be turned to its "OFF" position (so that movable arm does not touch resistance winding). All connections should then be checked against Figure 3.

It is important that adapters be fastened to the Radiotrons *before* they are inserted in the sockets of the Radiola. The 2 UX-199 Radiotrons with adapters are then inserted in the Radiola III and the 2 UX-120 Radiotrons with adapters in the Balanced-Amplifier unit.

Both "BATTERY SETTING" controls should be set and permanently left FULL ON, that is, turned as far as possible in a clockwise direction.

The filament current to the Radiotrons is turned ON and OFF and is entirely regulated by means of the *external* six ohm Rheostat, which for convenience may be mounted on the side or end of the case of either receiver or amplifier unit.

To insure long life to both Radiotrons and batteries the rheostat should not be advanced any further than necessary to obtain normal results. As the voltage of the "A" battery decreases thru use, however, it will be necessary to advance the setting of the external rheostat to maintain normal filament terminal voltage. "A" battery renewal is not required until it becomes necessary to advance the external rheostat to its maximum current position to obtain normal operation.

Important: Do not attempt to operate the set with only two of the Radiotrons lighted, for by so doing, excessive filament voltage will be applied.

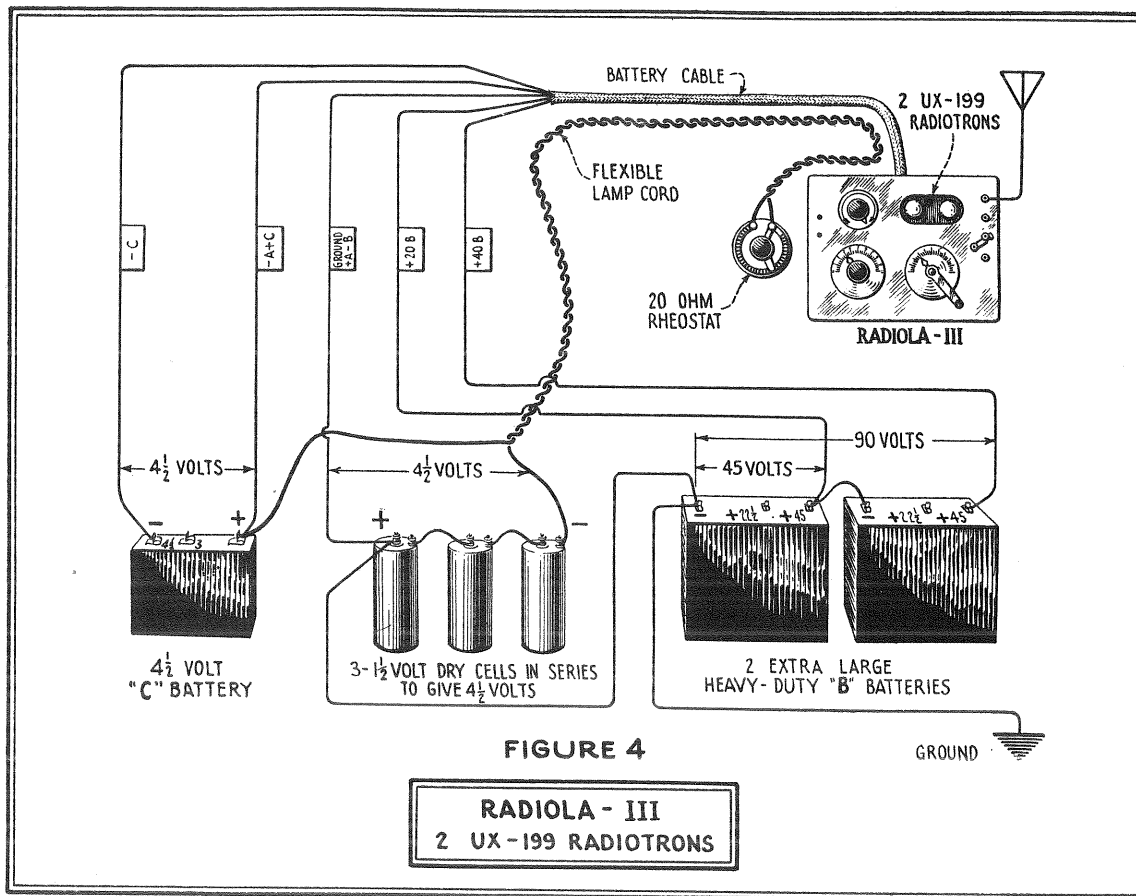
RADIOLA III

Improved operation of the Radiola III may be realized when it is equipped with the new type Radiotrons. Two methods are here suggested: the first is particularly recommended for reception of signals from distant broadcast stations where higher voltage amplification is desired; and the second, which makes available greater loud speaker output without distortion, is particularly recommended for loud speaker operation from local stations where the input energy to the receiver is high.

Method I: (See Figure 4)

Two UX-199 Radiotrons are used with a 20 ohm external Rheostat to control the filament current. The following equipment is required.

- 1 Radiola III (Stripped)
- 1 Radiola Loud Speaker UZ-1325 or Model 100
- 2 Radiotrons UX-199
- 2 Na-Ald Adapters Model 421-X or Marco Adapters No. 206



- 1 Twenty ohm Rheostat (table mounting type)
- 1 Five foot length of lamp cord.
- "A" Battery consisting of three standard dry cells 1½ volts each, such as:
- 3 Burgess No. 6 Dry cells or
- 3 Eveready Dry Cell Radio "A" Batteries No. 7111 or
- 3 Columbia Ignitor No. 6 Dry Cells or
- 3 Ray-O-Vac No. 1211 Dry Cells

OR EQUIVALENT

"B" Battery consisting of two 45 volt large or extra large plate batteries, such as:

- | | <i>Large</i> | | <i>Extra Large</i> |
|-------------|--------------|----|--------------------|
| 2 Burgess | No. 2308 | or | 10308 or |
| 2 Eveready | No. 772 | or | 486 or 770 or |
| 2 Ray-O-Vac | No. 2303 | or | 9303 |

OR EQUIVALENT

"C" Battery of 4½ volts, such as:

- 1 Burgess No. 2370 or
- 1 Eveready No. 771 or
- 1 Ray-O-Vac No. 231-R

OR EQUIVALENT

Method II: (See Figure 5)

One UX-199 Radiotron is used in the detector socket (nearest the antenna binding posts), and one UX-120 Radiotron is used in the amplifier or left hand socket. As in Method I, a 20 ohm external Rheostat is used to control the filament current.

The following equipment is required.

- 1 Radiola III (stripped)
- 1 Radiola Loud Speaker UZ-1325 or Model 100
- 1 Radiotron UX-199 for the detector socket
- 1 Radiotron UX-120 for the amplifier socket
- 2 Na-Ald Adapters Model 421-X or Marco Adapters No. 206
- 1 Twenty ohm Rheostat (table mounting type)
- 1 Five foot length of lamp cord.
- "A" Battery consisting of three standard dry cells 1½ volts each, such as:
- 3 Burgess No. 6 Dry Cells or
- 3 Eveready Dry Cell Radio "A" Batteries No. 7111 or
- 3 Columbia Ignitor No. 6 Dry Cells or
- 3 Ray-O-Vac No. 1211 Dry Cells

OR EQUIVALENT

"B" Battery consisting of three 45 volt large or extra large plate batteries, such as:

- | | <i>Large</i> | | <i>Extra Large</i> |
|-------------|--------------|----|--------------------|
| 3 Burgess | No. 2308 | or | 10308 or |
| 3 Eveready | No. 772 | or | 486 or 770 or |
| 3 Ray-O-Vac | No. 2303 | or | 9303 |

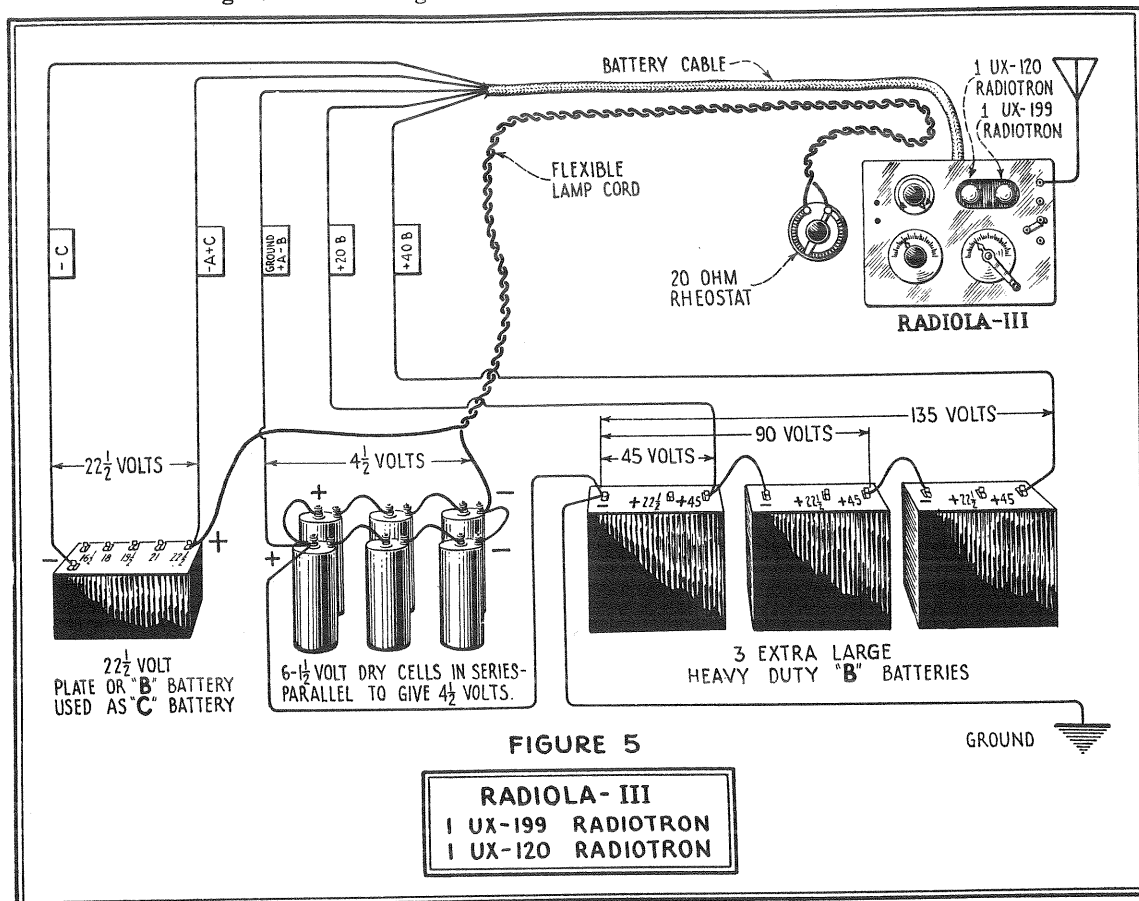
OR EQUIVALENT

"C" Battery consisting of one 22½ volt plate battery (with taps for variable voltage), such as:

- 1 Burgess No. 2156 or

1 Eveready No. 766 or
 1 Ray-O-Vac No. 2151
 OR EQUIVALENT

Figure 5 shows diagram of connections.



Before connections are made the *external* Rheostat should be turned to its "OFF" position (so that movable arm does not touch resistance winding). All connections should then be checked against Figure 5.

It is important that adapters be fastened to the Radiotrons *before* they are inserted in the sockets of the Radiola. The UX-199 Radiotron is inserted in the detector socket which is the one nearest the antenna binding posts.

The "BATTERY SETTING" control should be set and permanently left FULL ON, that is, turned as far as possible in a clockwise direction.

The filament current to the Radiotrons is turned ON and OFF and is entirely regulated by means of the *external* twenty ohm Rheostat, which for convenience may be mounted on the side or end of the case of the receiver.

Important: Keep the external Rheostat setting as low as possible consistent with normal operation to insure long life to Radiotrons and batteries.