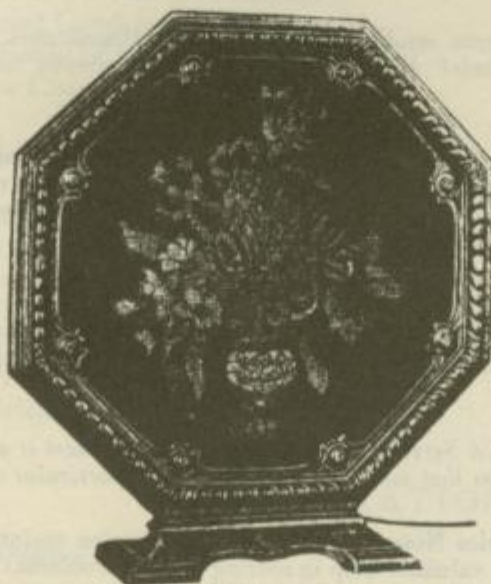


RCA

Loudspeaker 103

SERVICE NOTES

*Prepared Especially for
RCA Distributors*



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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 RCA Authorized 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 RCA Loudspeaker and Radiola owners may be entirely satisfied.

Obviously this service can best be rendered by properly equipped service organizations having a thoroughly trained personnel with a knowledge of the design and operation of RCA Loudspeakers and Radiolas.

Such service organizations have been established by the RCA Distributors, and the RCA Authorized Dealers are advised to refer any major work or replacement to their selected Distributors.

Minor replacements and mechanical and electrical adjustments may be undertaken by the RCA Dealer. To assist in promoting this phase of the Dealer's business the Service Division of the RCA has prepared a series of Service Notes containing technical information and practical helps in servicing RCA Loudspeakers and Radiolas.

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

The Distributors edition of the RCA Service Notes—of which this booklet is a part—contains full information on the service problems that may be encountered on a particular model.

In addition to supplying the Service Notes the RCA Service Division maintains a corps of engineers who are qualified to render valuable help in solving service problems. These engineers call upon the trade at frequent intervals to advise and assist RCA Distributors in the performance of service work.

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RCA Loudspeaker 103

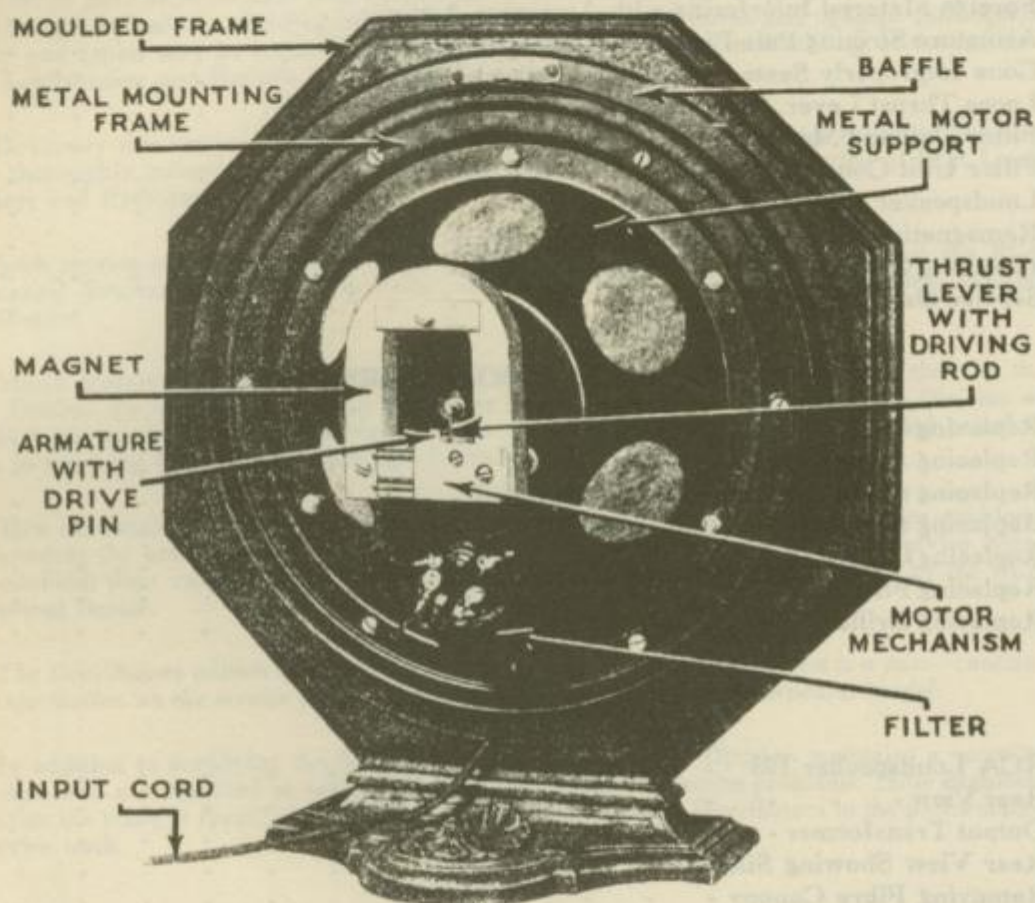


Figure 1—Rear view showing principal parts

RCA LOUDSPEAKER 103

SERVICE NOTES

Prepared by RCA Service Division

INTRODUCTION

RCA Loudspeaker 103 is an improved design of the extensively used RCA Loudspeaker 100A—the improvements resulting in better reproducing qualities and an artistic appearance which entirely removes it from any semblance to a mechanical device. It is especially designed for use with RCA Radiolas and standard receivers. The loudspeaker consists essentially of a moulded frame with a tapestry grille, a baffle board, cone support, cone, motor mechanism and filter unit. (See Figure 1.)

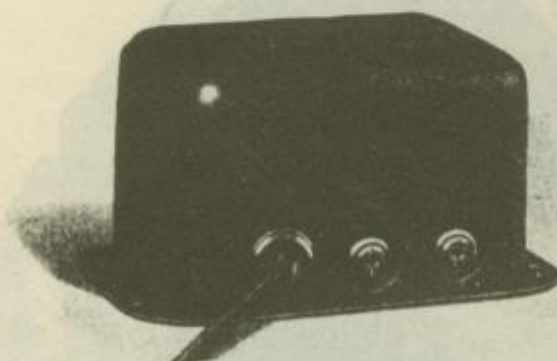


Figure 2—RCA output transformer

A fibre frame is provided to cover the entire mechanism, and a silk cover is tied over this frame to give an artistic finish and provide easy access to the mechanism when necessary.

Some method of coupling the output of the receiver to the loudspeaker should be employed when Loudspeaker 103 is used in conjunction with receivers using plate voltages passing current in excess of 10 milliamperes through the loudspeaker windings. The RCA output transformer (Figure 2) is especially designed for this purpose and should be used wherever it is found necessary. A choke and condenser arrangement will also give satisfactory results for this purpose when properly connected. Figure 3 shows the correct values and connections of either a transformer, or choke and condenser to the loudspeaker.

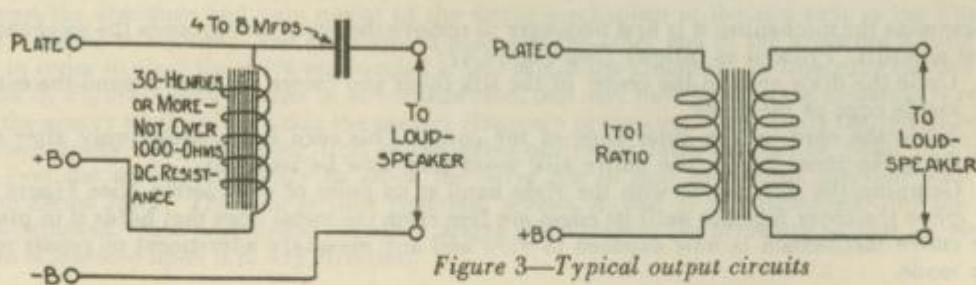


Figure 3—Typical output circuits

PART I—SERVICE DATA

The service problems of loudspeakers deal with conditions evidenced by weak reproduction, no reproduction, distortion, noise and rattle. These conditions and their attending causes, while not common to Loudspeaker 103, are explained in these notes and corrections noted so that service men may be provided with helpful information in any service work that may be required on Loudspeaker 103.

[1] RECEIVER OUTPUT

Before inspecting the loudspeaker for imperfect reproduction check the receiver output with headphones. Any distortion in the receiver will be faithfully reproduced in the loudspeaker. If a signal of good quality and volume is being delivered by the receiver, the loudspeaker must be examined for the cause of any imperfect reproduction that may occur.

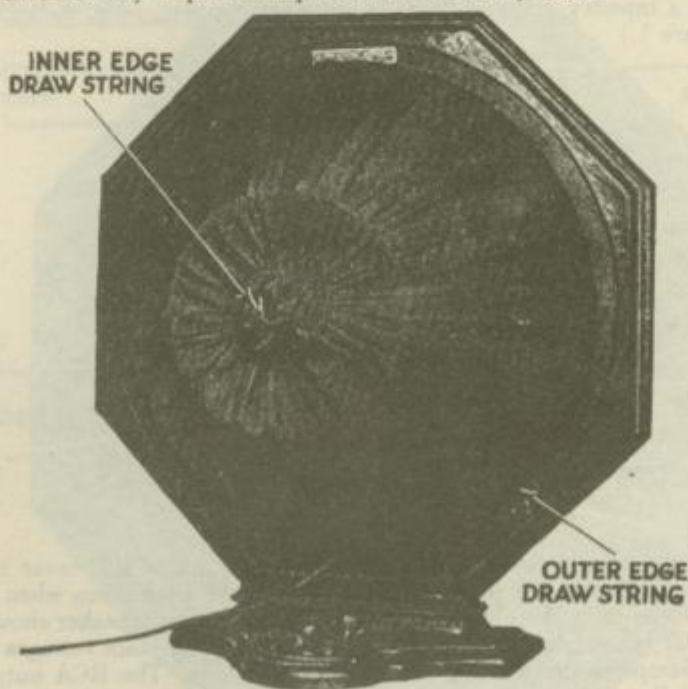


Figure 4—Location of draw strings used to fasten silk cover over canopy

[2] PROCEDURE FOR REMOVING MECHANISM COVER

To examine the mechanism it is first necessary to remove the cover that protects the mechanism from dust and dirt. Proceed as follows (See Figure 4):

- (a) Untie the draw cord in the center of the silk cover and loosen the cord around the entire inside edge of the cover.
- (b) Untie the cord on the outer edge of the cover. This cord is accessible only after untying the inner cord. The entire silk cover may now be removed.
- (c) Gripping the fibre cover with the right hand at its point of contraction (See Figure 5) press the cover together until its edges are free from the metal edge that holds it in place.

The entire mechanism is now exposed to view and any necessary adjustment or repair may be easily made.

[3] FOREIGN MATERIAL INTERFERING WITH ARMATURE ACTION

An inspection of the armature will generally disclose any foreign matter interfering with the armature action, resulting in poor reproduction. A small piece of heavy paper or a piece of copper or brass not over .010" thick may be used between the armature and pole pieces to remove dirt, dust or other interfering substances. The spacer tool, described in Section 4 may also be used for this purpose.

[4] ARMATURE STRIKING POLE PIECES

Distortion and rattle may be caused by the armature striking either or both of the pole pieces. This is generally determined by inspection, though in some cases the contact may be so slight it may be necessary to adjust the armature to check on this condition. In any case an adjustment of the armature is necessary.

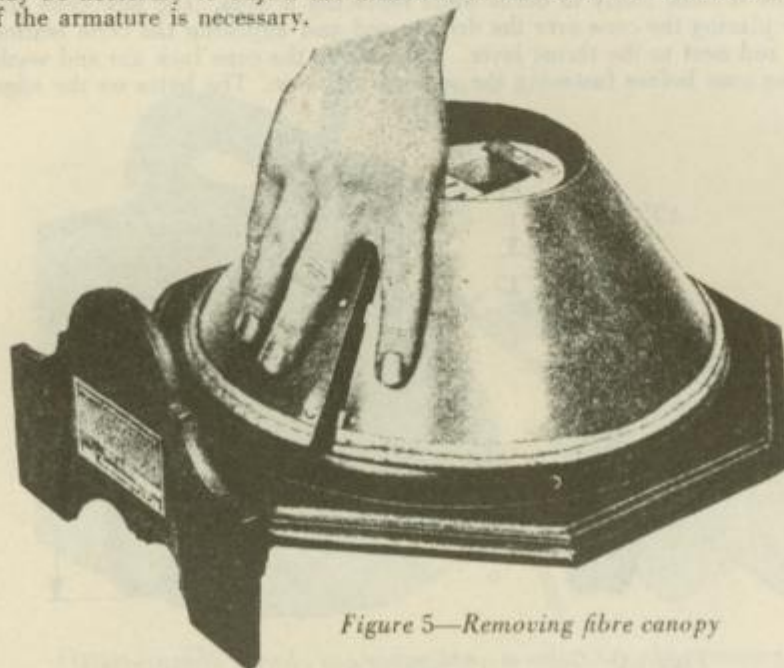


Figure 5—Removing fibre canopy

To adjust the armature use a set of spacer tools. Figure 6 illustrates the general appearance and correct dimensions of these tools for the information of those who desire to construct them. However, they may be purchased from the RCA Service Division (Stock No. 2321). The material—obtainable on the open market—should be phosphor bronze strip .010" thick and .25" wide. It is bent as illustrated and soldered to hold the ends fairly rigid. The two ends are tapered as illustrated to a .15" width at their extremities.

Two of these tools are necessary when adjusting the armature. Place one tool in the space between the armature and pole pieces of the motor mechanism at the end next to the filter unit. This is shown in Figure 7. The other tool is placed at the other end of the armature a little to one side in order to clear the drive pin located at this end of the armature. By loosening the two screws A and B, Figure 7, any tension in either direction, that may have been on the armature is released, and the spacer tools will provide the correct clearance or spacing. Now while the spacer tools are in place apply a hot soldering iron to the drive pin thrust lever connection point F, Figure 8, and heat the solder sufficiently to allow the drive pin to find its normal position with regard to the thrust lever. The iron is then removed, screws A and B are tightened and the spacer tools removed. This adjustment correctly aligns and balances the armature so that no abnormal strain is imposed upon it in any direction.

[5] CONE IMPROPERLY SEATED

In order to inspect the cone it is necessary to remove the mechanism assembly from the baffle board in the following manner:

- (a) Remove mechanism cover as described in Part I, Section 2.
- (b) Remove the six machine screws holding the metal mounting frame to the baffle board. Be careful to support the assembly so that it will not fall and become damaged.
- (c) Remove the six bolts and nuts holding the motor metal mounting support and cone to the mounting frame.

In some cases a cone may be off center or improperly seated. Poor reproduction is the result and inspection of the armature drive-pin may indicate a slight torque or twist.

This trouble is most likely to occur when replacing a cone. The new cone should be carefully seated by placing the cone over the driving rod and adjusting the cone seating nut located on the driving rod next to the thrust lever. Then attach the cone lock nut and washer lightly on the inside of the cone before fastening the edge of the cone. The holes on the edge of the cone

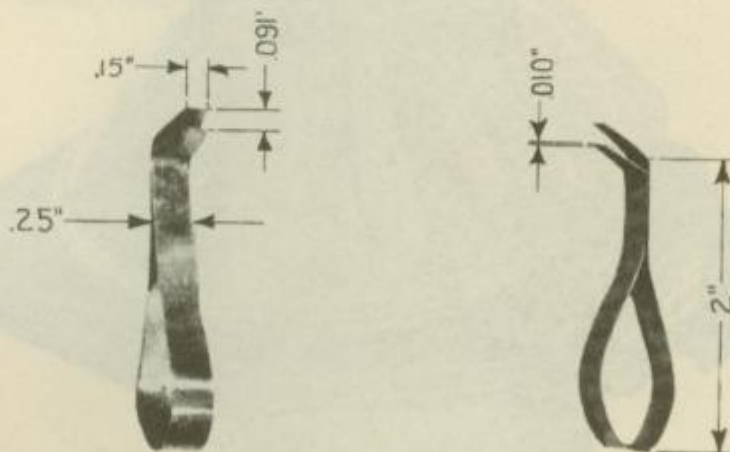


Figure 6—General appearance and correct dimensions of armature spacing tools

can now be lined up with those of the metal frame, and the outside frame lightly attached with screws and nuts. The cone lock nut is then tightened and sealed in place with ordinary sealing wax so that the vibration of the cone will not cause it to loosen. This nut can best be tightened by means of a small socket wrench made to fit a 3/16" hex nut (Stevens "Spintite No. 3 can be used). The six screws at the outside edge are then seated properly. In doing this take up on each screw a little at a time, causing a gradual seating of the screws.

[6] LOOSE THRUST LEVER, NUTS AND SCREWS

Rattle and noisy reception are sometimes caused by a loose thrust lever. To correct this condition tighten the thrust lever mounting clamps by means of screw G, Figure 9. Sometimes when this is done a readjustment of the armature as described in Part I, Section 4 may be necessary. Any loose screw or nut in the motor mechanism may cause an audible rattle when the speaker is in operation. If any trouble is experienced along this line all the screws and nuts in the motor mechanism should be gone over and the loose ones tightened.

[7] FILTER UNIT AND MAGNET COIL TESTS

A defective filter unit or a filter unit not properly connected in the circuit will cause distortion. Defective magnet coils will also cause imperfect reproduction. The circuit diagram and correct connections are shown in Figure 10. The reference letters in the circuit diagram refer to the filter terminals shown in the small halftone illustration in Figure 10. These should correspond electrically, otherwise distorted or no reception will occur. A click test will indicate whether or not the unit is electrically O. K. The following continuity will indicate an electrical defect either in the coils or in the filter unit.

A pair of headphones and a $4\frac{1}{2}$ -volt battery connected together in series or a voltmeter and sufficient battery to give a full scale deflection should be used.

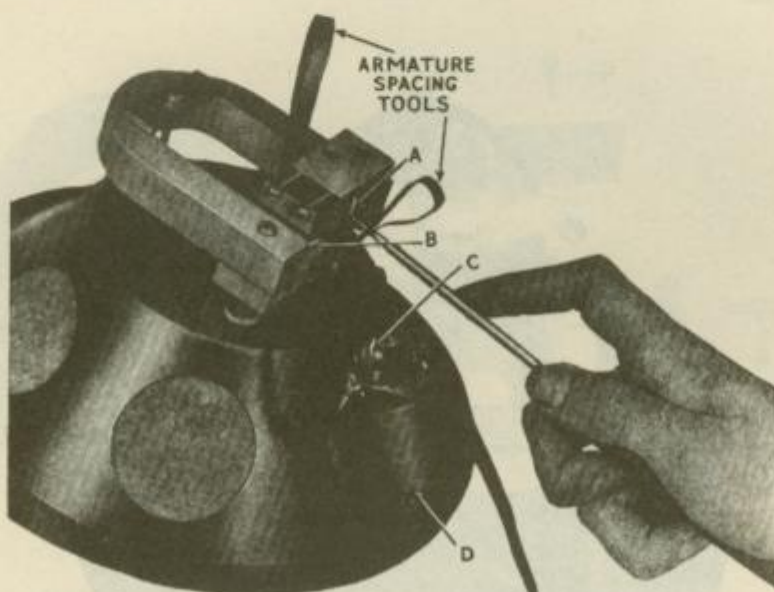


Figure 7—The use of the spacing tools in adjusting the armature

FILTER UNIT CONTINUITY TESTS

Remove all connections and refer to Figure 10

Test	Correct Effect	Incorrect Effect Caused By
N to M	Open	Shorted Condenser
N to L	Closed	Open Coil

A short of the condenser across the coil can be determined by checking the resistance of the coil with a resistance bridge or the method indicated in R-17 Service Notes. The correct resistance for this coil is 230 ohms.

The magnet coils may now be checked for an open by testing from one lead to the other. An open indicates a defective coil which must be replaced.

[8] LOUDSPEAKER CORD AND CONNECTIONS

A defective connection, either in the loudspeaker cord or coil connections may cause distorted, noisy or no reproduction. As there is not much wear and tear on the coil connections, the most likely place to find trouble of this nature is in the connecting cord. The point where the cord enters the loudspeaker housing and the ends on which the pin terminals are located may become frayed and worn, causing a possible short or open circuit. If these points prove O. K. and there are no indications of any defects external to the speaker housing, the cover should be removed and the lugs of the cord soldered to the filter unit examined. If there is no apparent defect the cord should be disconnected and tested by means of a battery and pair of phones. It should be click tested for the continuity of the leads and also for a short between the leads. Shake the cord while conducting the continuity test to disclose any breaks which will be indicated by interrupted clicks.

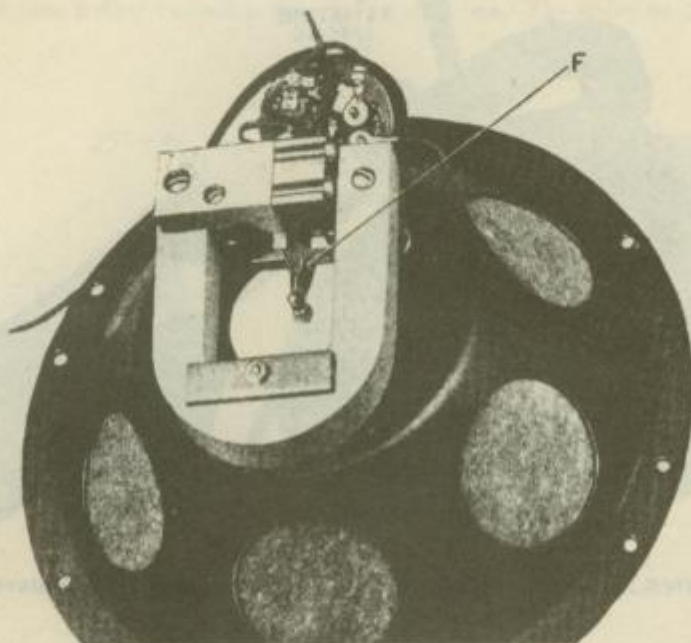


Figure 8—Drive-pin thrust-lever soldered connection (F)

[9] REMAGNETIZING LOUDSPEAKER MAGNETS

At times there may be occasion to remagnetize the large permanent magnet used in Loudspeaker 103. In order to do this a powerful electro-magnet is necessary. The construction of such a magnet is quite difficult and requires direct current of considerable amperage. It is suggested that this work be turned over to automobile or ignition shops specializing in the repair of magnets. Distributors maintaining contact with shops of this character are in a position to obtain immediate service on remagnetizing jobs.

[10] CHECKING OUTPUT OF REPAIRED LOUDSPEAKERS

After a repair job has been completed it is always desirable to have a definite means of checking the output of the speaker against a speaker known to be in good condition. Two general methods

can be used to accomplish this—one by alternately connecting each speaker to a radio receiver tuned to a nearby broadcasting station, the other by alternately connecting each speaker to the output of a power amplifier being driven from a phonograph pick-up. The latter method is preferable as a standard record may be used that has a much wider frequency range than would be obtained by random tuning with a broadcast receiver. When checking a speaker under these conditions a volume control should be used and the speaker checked at both the soft and loud positions. At the minimum position the speaker under test can be compared with the standard for sensitivity and at the loud position a check can be made on its ability to handle volume without distortion or rattle. These checks should be made at both high and low frequencies. The sections of the record containing these frequencies can be indicated to run such a test.

A test of this kind is quite conclusive for quality and volume of reproduction and will indicate if further repair work or adjustments are necessary.

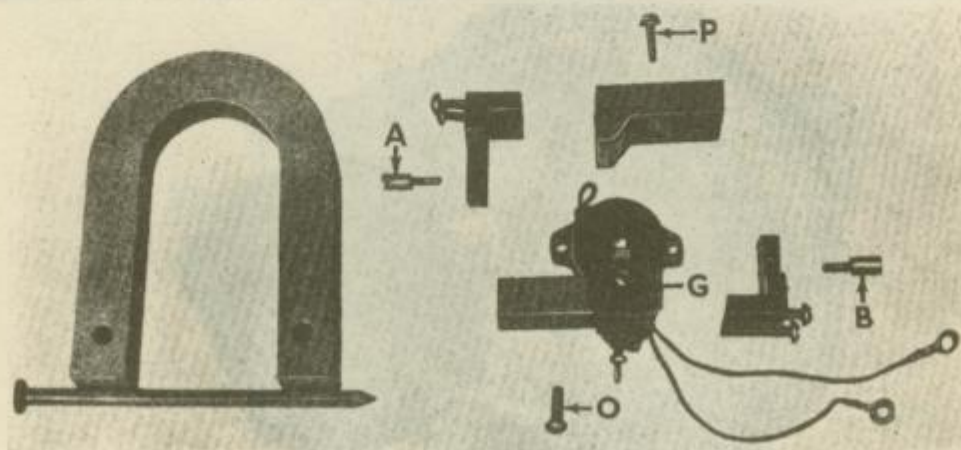


Figure 9—Motor mechanism partly exploded

PART II—MAKING REPLACEMENTS

Due to the simple design of Loudspeaker 103 replacement of any particular part is easily and quickly accomplished. The following detailed procedure should be used when performing work of this kind.

[1] REPLACING MAGNET COILS

To replace the magnet coils:—

- (a) Remove mechanism cover as described in Part I, Section 2.
- (b) Remove mechanism from baffle by removing the six machine screws that hold it to the baffle board (See Figure 11).
- (c) Remove the cone by removing six bolts and nuts around the edge and the cone center nut located at Y, Figure 12.
- (d) The motor mechanism may now be removed by removing nuts F, G, H, Figure 12. The magnet coil leads must be unsoldered before the motor can be cleared of the frame. Place a large nail or soft iron bar across the poles of the permanent magnet to act as a keeper (See Figure 9).

- (e) Remove the thrust lever supporting screw G, Figure 9, and apply a hot soldering iron to the thrust lever armature drive pin connection point F, Figure 8. The thrust lever and driving rod may now be removed.
- (f) Disassemble the motor mechanism by removing screw O, Figure 9, and the corresponding screw on the other side of the mechanism. Also remove screws A and B, Figure 9. The magnet coils may now be removed by slipping one off the armature and the other off the armature and drive pin.

The reassembling is a reversal of the preceding operation.

- (a) Place the new coils over the armature in the same position occupied by the old ones.

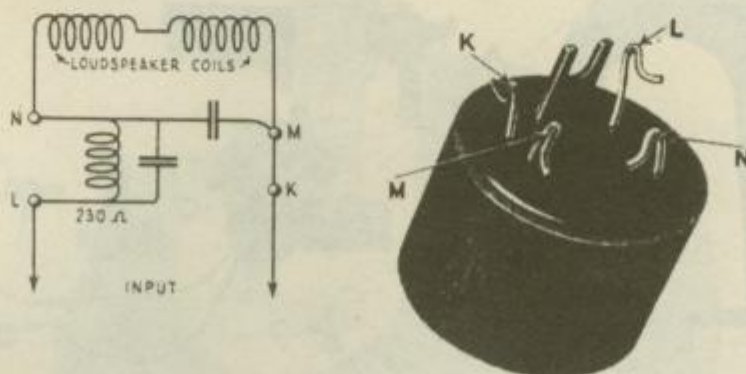


Figure 10—Schematic circuit of Loudspeaker 103 coils and filter and photo of filter unit

- (b) Reassemble the motor mechanism and replace the thrust lever. Do not solder the thrust lever to the drive pin at this time.
- (c) Remove keeper and replace motor mechanism on magnet with supporting screws and bushings. Mount the reassembled unit in its correct position on the frame.
- (d) Replace cone and center carefully. Replace, but do not seat the screws, nuts and lock washers around the edge. Tighten the cone lock nut and seal with sealing wax. Seat screws around edge.
- (e) Place spacer tools in position to adjust the armature and tighten screws A and B, Figure 7.
- (f) Resolder drive pin to thrust lever and allow it to find its normal position. Remove spacer tools.

- (g) Solder coil leads to filter unit as indicated in Figure 10. At this point it is good practice to test the mechanism on a receiver of good quality and make any further adjustments that may be necessary.
- (h) Replace the fibre cover and silk cloth as described in Part I, Section 2.

[2] REPLACING ARMATURE AND DRIVE PIN

The procedure for replacing the armature and drive pin is identical with that of replacing the magnet coils with the exception of the new part substituted. The new armature should be clean and free from any dust or dirt.

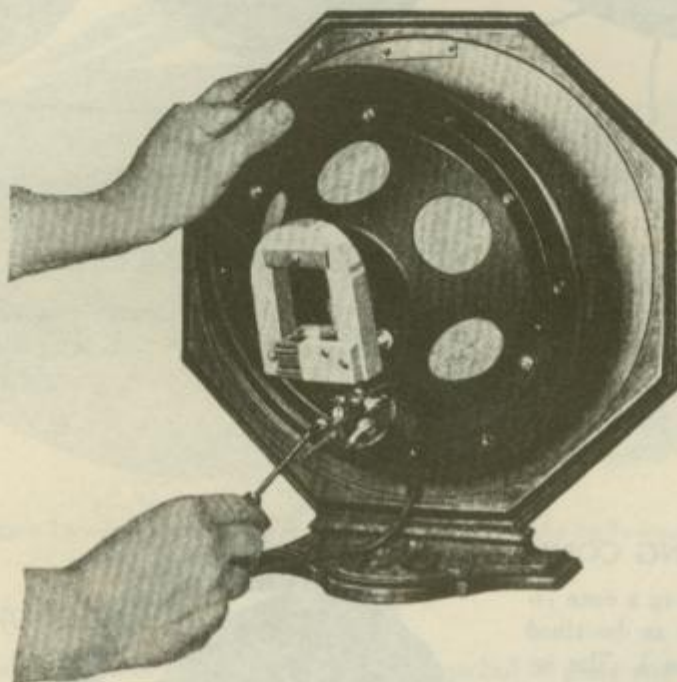


Figure 11—Removing reproducer assembly from baffle

[3] REPLACING THE THRUST LEVER AND DRIVING ROD

Ordinarily the driving rod and thrust lever are not likely to become damaged or require replacement. However, should it be necessary, remove the cover from the mechanism as described in Part I, Section 2. Then disassemble the mechanism as described in Part II, Section 1 until the thrust lever and driving rod are removed.

The new one should be placed in the position occupied by the old one, making sure the clamp holds it tightly in place. Reassemble in the reverse order of that used to disassemble it. The armature should be checked for adjustment as described in Part I, Section 4. The cover should now be replaced and the speaker returned to normal operation.

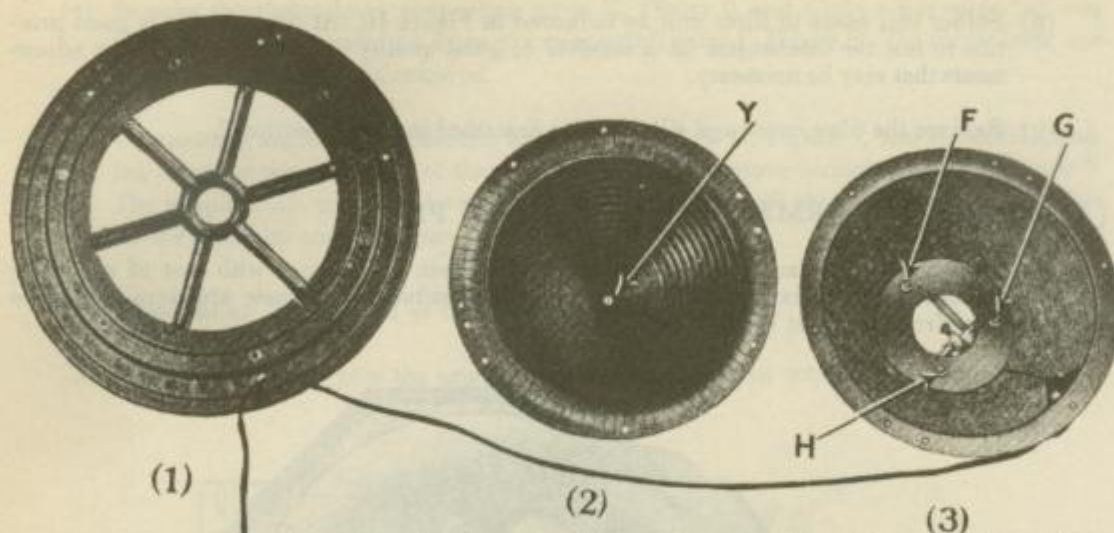


Figure 12—(1) Mounting frame; (2) cone; (3) metal support for motor

[4] REPLACING THE MOTOR ASSEMBLY COMPLETE

When replacement of the complete motor mechanism is necessary remove the cover from the mechanism as described in Part I, Section 2. Then remove the cone, the motor and magnet and install the new motor.

The reassembly will be a reversal of the foregoing procedure.

[5] REPLACING CONE

When replacing a cone remove the old one as described in Part II, Section 1. The installation of the new cone is a reversal of the removal procedure.

- (a) Place cone over driving rod in center.
- (b) Adjust the cone seating nut so as to properly seat the cone and provide clearance for the thrust lever from the pole piece.

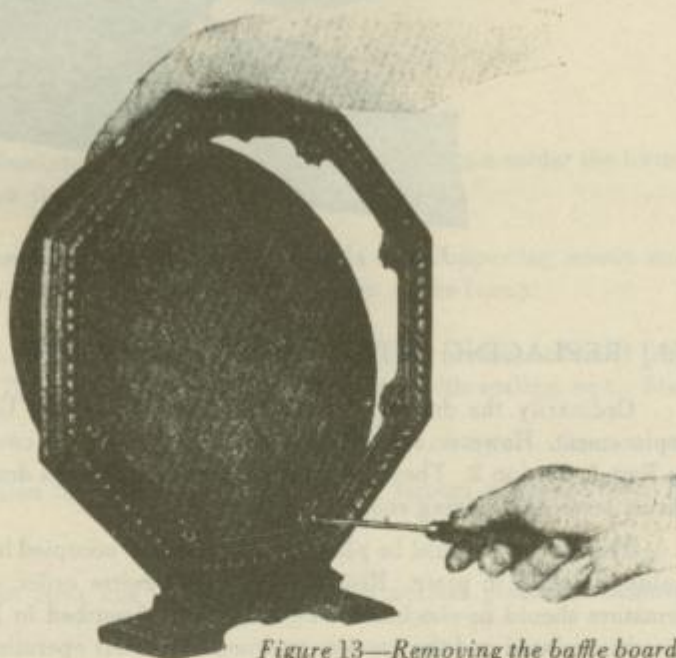


Figure 13—Removing the baffle board

[6] REPLACING FILTER UNIT

The following procedure should be used when replacing the filter unit.

- (a) Remove cover from mechanism as described in Part I, Section 2.
- (b) Unsolder all leads to the filter terminals.
- (c) Remove the filter unit mounting nuts and washers C and D, Figure 7. The unit may now be removed and replaced by a new one.
- (d) Replace the mounting nuts and washers previously removed. Then resolder the leads that were removed from the filter terminals.
- (e) Replace mechanism cover previously removed and return loudspeaker to normal operation.



Figure 14—Tacking the grille tapestry in place on the baffle board

[7] REPLACING GRILLE CLOTH

RCA Loudspeaker 103 uses a tapestry grille that is tacked in place and used to cover the front opening of the speaker. To replace this tapestry proceed in the following manner:

- (a) Remove the mechanism by removing the six machine screws that hold it to the baffle board and remove the baffle board by removing the eight wood screws that hold it to the moulded frame (See Figure 13).
- (b) This releases the mechanism and the frame and permits access to the baffle board on which the tapestry is tacked.
- (c) Remove all the tacks that hold the tapestry to the baffle board.
- (d) The tapestry may now be removed and the new one placed in position. If the material used is different from the original tapestry its porosity should be checked to see that it is approximately the same. This may be tested by blowing through the cloth and noticing any difference in the opposition of one compared with the other.
- (e) Tack the new tapestry tightly in position (See Figure 14).
- (f) Replace entire assembly in the moulded frame and return the eight screws to their original position.

The speaker may now be returned to normal operation.

SERVICE DATA CHART

The following table of information provides a handy reference when servicing Loudspeaker Model 103, and a working knowledge of it will enable service men to handle service problems readily and efficiently. Reference to Part No. and Section No. in the "Service Notes" is noted for detailed information.

<i>Indication</i>	<i>Cause</i>	<i>Remedy</i>
No Reproduction	No output from receiver Defective coils Defective filter Defective cord Loose or broken connections Drive pin not soldered	Examine receiver, Part I, Sec. 1 Replace coils, Part I, Sec. 7; Part II, Sec. 1 Replace filter, Part I, Sec. 7; Part II, Sec. 6 Repair or replace cord, Part I, Sec. 8 Repair connections, Part I, Sec. 8 Solder drive pin, Part I, Sec. 4
Weak Reproduction	Weak receiver output Dirt interfering with armature action Loose thrust lever mounting screw Improperly aligned cone Drive pin poorly soldered Weak magnet	Examine receiver, Part I, Sec. 1 Remove foreign matter from mechanism, Part I, Sec. 3 Tighten screw and resolder drive pin, Part I, Sec. 6; Part II, Sec. 3 Align cone correctly, Part I, Sec. 5 Solder drive pin, Part I, Sec. 4 Remagnetize
Distorted or noisy Reproduction (Rattle)	Distorted output from receiver Improperly adjusted cone Filter incorrectly connected Filter defective Loose screws or nuts in assembly Armature striking pole piece Excessive pressure on drive pin Filter unit not connected	Examine receiver, Part I, Sec. 1 Adjust cone correctly, Part I, Sec. 5; Part II, Sec. 5 Connect filter correctly, Part I, Sec. 7; Part II, Sec. 6 Replace filter, Part I, Sec. 7; Part II, Sec. 6 Tighten all loose screws or nuts, Part I, Sec. 6 Adjust armature correctly, Part I, Sec. 4; Part II, Sec. 1 Resolder drive pin to thrust lever, Part I, Sec. 4; Part II, Sec. 1 Connect filter unit, Part I, Sec. 7; Part II, Sec. 6