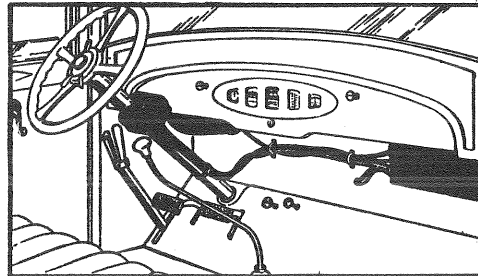


# RCA Victor Automobile Radiola M-30

## INSTALLATION AND SERVICE NOTES



First Edition—10M  
Copyright January, 1932

SERVICE DIVISION  
**RCA Victor Company, Inc.**  
Camden, N. J.

A RADIO CORPORATION OF AMERICA SUBSIDIARY

*Property of the RCA Victor Company, Inc. Confidential and to be used only by its  
Authorized Distributors and Dealers in furnishing service in connection  
with its apparatus.*

---

*Copyright 1932—RCA Victor Company, Inc.*

# CONTENTS

## INTRODUCTION

	Page
Introduction.....	5
Receiver Assembly.....	5
Control Box.....	6
Loudspeaker.....	6
Battery Box.....	6
Antenna Plate.....	6
Ignition Equipment.....	7

## PART I—INSTALLATION

Location and Mounting of Units.....	7
Receiver Unit.....	7
Loudspeaker.....	9
Control Unit.....	9
Flexible Shaft.....	9
Antenna Plate.....	10
"B" Batteries.....	10
Ignition Equipment.....	11
Connections.....	11
Installation of Roof Antenna.....	13
Installations on Model "A" Fords.....	14

## PART II—SUPPRESSION OF IGNITION INTERFERENCE

Ignition Adjustments on Motor.....	15
By-pass Capacitors.....	15
Ignition Coil.....	15
Antenna Plate.....	15
Cables.....	17

## PART III—SERVICE DATA

Electrical Description of Circuit.....	17
Radio Frequency and Oscillator Adjustments.....	18
Intermediate Frequency Adjustments.....	19
Voltage Readings.....	20
Testing Capacitors.....	21
Checking Resistance Values.....	21
Wiring Diagrams.....	21
Volume Control.....	23

## PART IV—REPLACEMENT PARTS

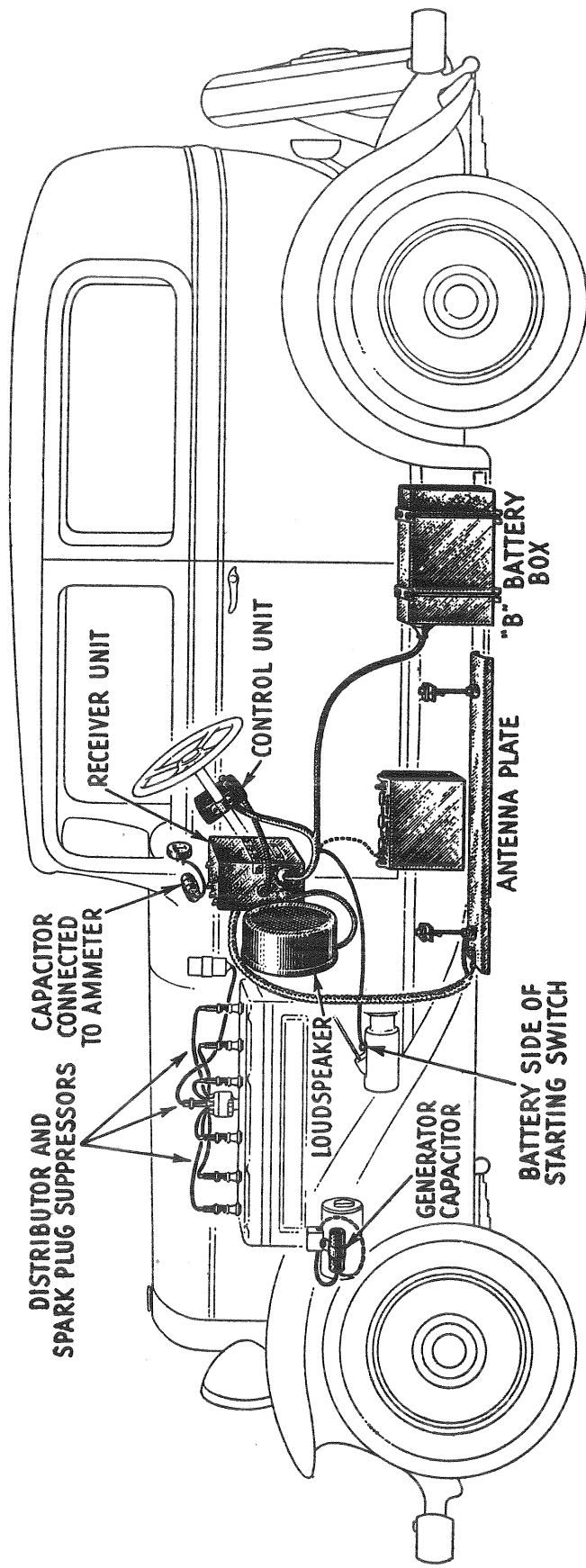
Numerical List of Replacement Parts.....	24
--	----

## PART V—INSTALLATION DATA ON INDIVIDUAL CARS

Installation Data.....	27
------------------------	----

## ILLUSTRATIONS

	Page		Page
General View.....	4	Battery Box Connections.....	11
Receiver Assembly.....	5	Typical Installation of Suppressors.....	11
Control Box.....	6	Grounding Antenna Shields.....	12
Loudspeaker.....	6	Cable Connections for Batteries.....	12
Battery Box.....	6	Details of Roof Antenna.....	13
Antenna Plate.....	6	Location of Units in Model "A" Ford.....	14
Ignition Equipment.....	7	Alternative Position for Speaker on Model A Ford.....	14
Various Locations of Units.....	8	Bracket Dimensions.....	14
Details of Receiver Mounting.....	8	Schematic Diagram.....	16
Radiotron Location.....	9	Suppressor Installations.....	17
Wiring Change.....	9	Location of Adjusting Screws.....	19
Control Box Adjustment.....	10	Control Box Wiring.....	21
Typical Location of Antenna Plate and Battery Box	10	Wiring Diagram.....	22
		Cable Wiring.....	23



*General View of Typical Installation of Automobile Radio*



# SERVICE AND INSTALLATION NOTES

for

## RCA Victor Automobile Radiola Model M-30

### INTRODUCTION

The RCA Victor Automobile Radiola, Model M-30, is a nine tube Super-Heterodyne radio receiver designed for automobile or motor boat use. Features of this receiver are; sensitivity and selectivity equal to that of high quality home receivers, high output Class B amplifier giving a large undistorted output with a small plate battery drain, permanent magnet dynamic loudspeaker requiring no external field supply, automatic volume control using entirely new principles of operation and extremely low battery consumption for both heater and plate supply. This feature allows the use of the automobile battery as "A" supply without imposing an additional load upon it that cannot be readily compensated for by a slight generator charging readjustment. The low plate current drain allows excellent "B" battery life. Use of the new automobile type Radiotrons eliminates the possibility of Radiotron failure due to vibration or varying heater voltage such as is encountered in automobile driving.

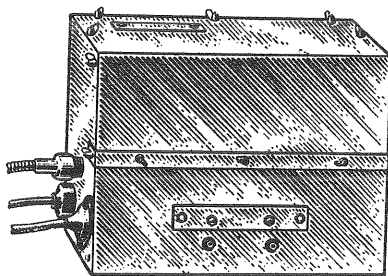


Figure 1—Receiver Assembly

In the design of this receiver, special attention has been given to the ease with which the installation may be made, and the elimination of interference originating in the ignition system. Thorough shielding of all parts together with proper design of the receiver makes it possible to reduce ignition interference to a negligible degree. This is done without any sacrifice in the sensitivity of the receiver.

A description of the various units follows.

### RECEIVER ASSEMBLY

The receiver assembly, Figure 1, is housed in a metal case that acts as an effective mechanical and electrical shield. A bracket is provided for mounting so that dismounting is a comparatively simple operation, requiring the removal of but one screw.

The top section of this container is fastened by means of wing nuts. This provides for easy removal for checking or replacing Radiotrons. The battery and control box cable, the loudspeaker cable and the flexible tuning cable are all held in place by means of fittings which allow their easy removal in case the box is to be removed from its mounting. The case is finished in a dull smooth black that is not easily scratched and harmonizes with the usual car finishes.

## CONTROL BOX

The control box, Figure 2, contains the station selector knob, the dial scale, the volume control and the key switch. It is provided with a felt strip and mounting clamp for attaching to the steering column of the car. The dial scale is marked in channels (multiply by 10 for kilocycles) and is of the non-glare type. The switch is provided with a key, which when removed, locks the radio at the "off" position.

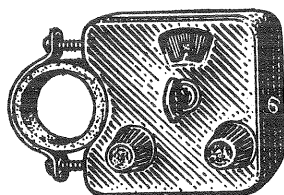


Figure 2—Control Box

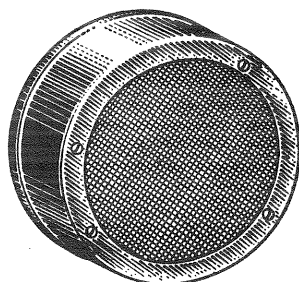


Figure 3—Loudspeaker

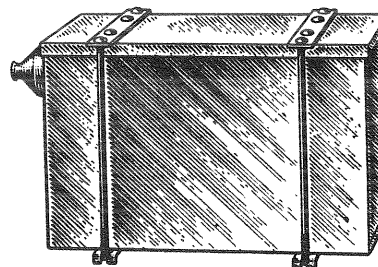


Figure 4—Battery Box

## LOUDSPEAKER

The loudspeaker, Figure 3, used in the automobile equipment is of the permanent magnet, dynamic type. It is housed in a smooth black finished metal container which also acts as an effective baffle. Due to the presence of the strong magnetic field, even when the set is turned off, special provision has been made to prevent metallic substances from being drawn into the air gap of the speaker and thereby cause rattles. The speaker edge and center is entirely closed, thus preventing such entry from the front. A fine gauze covering is placed over the back, thus eliminating any such matter from entering from that side. The cord outlet is provided with a rubber bushing that closes up its opening. The speaker has excellent frequency characteristics and is of extremely rugged construction.

## BATTERY BOX

A special heavy steel battery box, Figure 4, is furnished as optional equipment when it is either undesirable or impossible to install the batteries behind or under the seats or in the rear compartment of the car. This box is so constructed that the batteries may be mounted and connected therein and then lifted into position beneath the car. Four carriage bolts, each provided with two lock nuts, hold it in place.

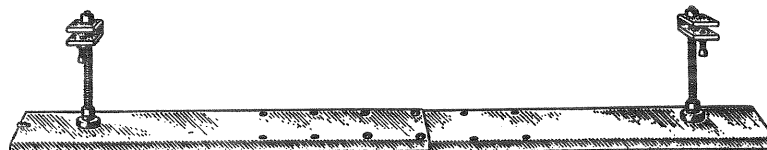


Figure 5—Antenna Plate

## ANTENNA PLATE

The antenna plate, Figure 5, is provided for use when a roof antenna is not already installed in the car. It is provided with special bolts and clamps that allow easy mounting to the frame of the car. Due to the high sensitivity of this receiver, satisfactory results may be obtained with the undercar antenna except in districts where the signal intensity of all stations is extremely low. In such cases a roof antenna must be erected in accordance with the instructions given in Part I, Section 3.

## IGNITION EQUIPMENT

Six spark plug type suppressors, one distributor type suppressor and two 0.75 mfd. capacitors, Figure 6, are provided for the suppression of ignition interference so that it does not materially affect radio reception. The details of installing this equipment are covered in Part I and varies somewhat in different cars.

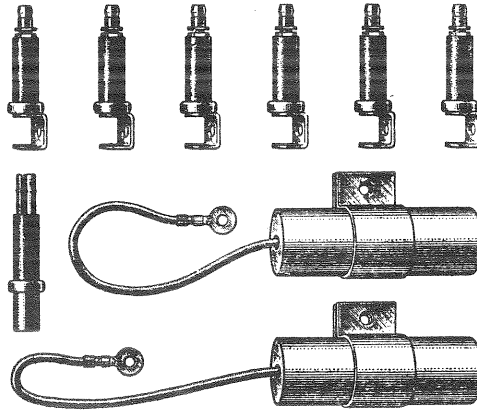


Figure 6—Ignition Equipment

## PART I—INSTALLATION

Due to the nature of the installation it is advisable that the RCA Victor Automobile Radiola be installed by a competent radio service man in conjunction with an automobile mechanic. The usual automobile repair shop has the necessary tools and lifts that are desirable in making the installation. If it is necessary to erect a roof antenna, this work must be done by a competent "trim" shop working under direction of the service man. However, after making several installations the service man may feel confident enough to attempt all the installation work himself, with the exception of the roof antenna. For such work the following list of equipment is provided which will be found useful when performing such work.

- |  |   |
|--|---|
| 1 Pair Gas Pliers                          | 1 Heavy Duty Soldering Iron                               |
| 1 Pair Diagonal Pliers                     | 1 Medium Soldering Iron                                   |
| 1 Pair Long Nose Pliers                    | Supply of Rosin Core Solder                               |
| 1 Small Crescent Wrench                    | Supply of Acid Core Solder                                |
| 1 No. 4 Spintite Wrench                    | Supply of $\frac{1}{2}$ " Belden Braid                    |
| 1 Thin Shank 6" Screw Driver               | Supply of Sheet Copper                                    |
| 1 Small Screw Driver                       | 1 Electric Drill with Set of Drills Up to $\frac{1}{2}$ " |
| 1 Large Screw Driver                       | 1 Set Seat and Door Protectors                            |
| 1 Pair Tin Shears                          | 1 Reamer— $\frac{3}{4}$ " maximum                         |
| 1 Set Analyzer or Miscellaneous Voltmeters |   |

### (1) LOCATION AND MOUNTING OF UNITS

The proper method of installing the equipment of the RCA Victor Automobile Radiola is covered in the Installation Instructions packed with each equipment. However, as there are many different types of installations, this information will be repeated together with a discussion of its numerous variations.

#### RECEIVER UNIT

**Location** The usual location for the receiver unit is on the right side of the engine compartment bulkhead directly under the dash. Figure 7 shows a typical installation. In some cars this will have to be on the opposite side directly over the steering column, Figure 8. It is important that the space selected have at least four inches clearance directly over the receiver, otherwise it cannot be removed from the mounting bracket. Interference with other equipment under the dash, and

interference of the mounting bolts with equipment on the engine side of the bulkhead must be avoided. Figure 8A shows an installation where the receiver is in the usual location, but the loudspeaker is in the center.

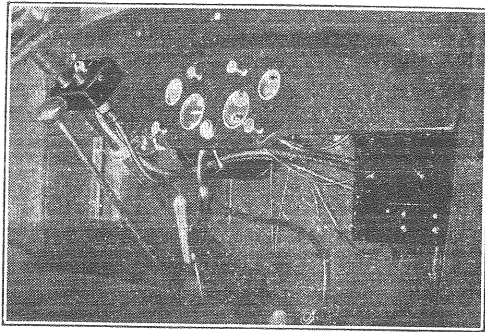


Figure 7—Usual Location of Receiver

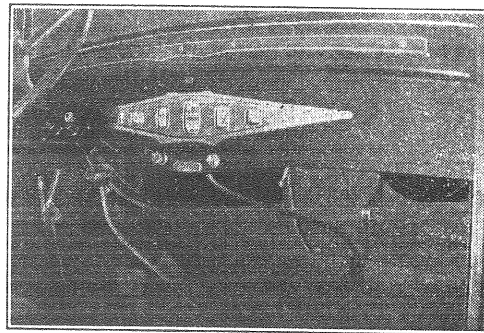


Figure 8—Receiver Over Steering Column

In some cars, the ignition coil is on the compartment side of the bulkhead or under the dash. If there is a choice of places available, the one at the greatest distance from the coil should be chosen. This is important as it reduces the ignition noise considerably.

**Mounting** Using the card inside of the Receiver Carton as a template, determine the proper location on the bulkhead and mark the location of the three holes with a center punch. A space at least four inches high must be left above the receiver. Extra holes are provided in the bracket to be used in case the regular holes are not satisfactory. If the bulkhead is curved, the template must be used flat and not follow the contour of the curved surface. In some cases, the receiver unit bracket must be mounted away from the bulkhead to clear obstructions. The center punch must be held perpendicular to the template when marking the holes to insure proper alignment. Next drill three  $\frac{7}{16}$  inch holes as marked. Then attach the bracket to the bulkhead by means of nuts and lockwashers furnished as shown in Figure 9.

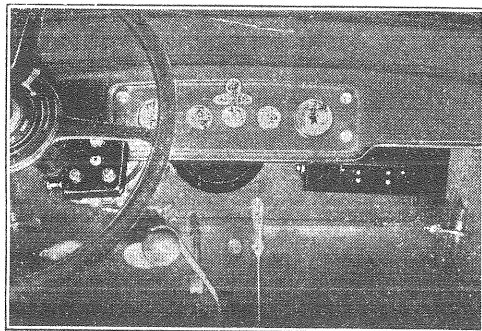


Figure 8A—Receiver on Right with Loudspeaker in Center

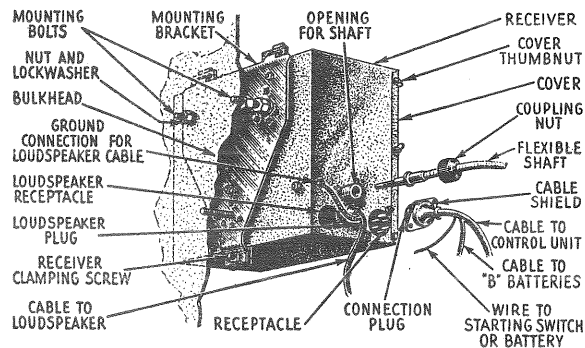


Figure 9—Details of Receiver Mounting

Remove the thumb-nuts from the top, front and sides of the receiver. Remove the packing material from around the Radiotrons and make certain that they are in the proper sockets. (See Figure 10).

Press the grid contact caps firmly over the contacts on top of all RCA-236 Radiotrons. Also make sure that the tuning capacitor rotor plates are fully meshed with the stator plates so that the flexible shaft may be easily mounted. If the positive terminal of the storage battery is grounded to the frame of the car, it will be necessary to remove the bottom of the receiver and change the yellow and blue wire from its normal position on the resistor board to that indicated by the dotted line in Figure 11. Replace the bottom, the cover and thumb-nuts making sure the nuts are tight. Hang the receiver on the bracket hooks, insert the clamp screw and washer at the bottom and tighten with a screw driver.

## LOUDSPEAKER

**Location** The Loudspeaker may be mounted at several locations, in most automobiles. However, the preferable location is on the bulkhead facing the rear of the car and on the opposite side from that of the receiver. If several locations are available, choose the one that gives the best acoustical results. This can easily be determined by experiment by not mounting the speaker until the rest of the equipment is in place and the receiver operating.

**Mounting** The instructions for mounting the receiver assembly apply equally well to the loud speaker, with the exception that the loudspeaker is mounted direct, there being no bracket provided. A template is also provided for this unit. No clearance space above the loudspeaker is required.

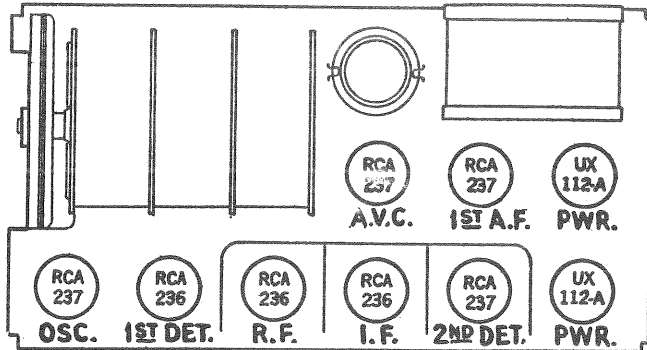


Figure 10—Radiotron Socket Location

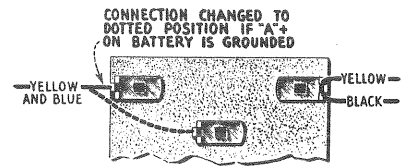


Figure 11—Wiring Change for Cars Having Positive Side of "A" Battery Grounded

## CONTROL UNIT

**Location** The control unit is mounted on the steering column at a convenient height for the driver. Due to the large size of the steering wheel hub on some cars, this distance must be adjusted for best visibility.

**Mounting** Place the felt around the steering column and hold it in place by means of string or a piece of tape. Remove one screw from the clamp and place the box and clamp around the felt. Replace the screw that was removed and tighten both screws equally.

## FLEXIBLE SHAFT

**Location** The flexible shaft is used to mechanically connect the tuning capacitor in the receiver assembly to the drive and dial in the control box. It should be placed and fastened to the car so that it connects these two points together and is clear of any foot room or instruments. On some cars a special length shaft will be required. Such flexible shafts are listed in Part IV, page 24.

**Mounting** Turn the Station Selector until the flat side of the shaft may be seen through the hole in the side of the unit. Insert the end of the shaft into the opening at the rear of the Control Unit making certain that it engages the end of the shaft inside of the latter. Turn the shaft until the set screw is visible and tighten the set screw against the flat side of the shaft. Thread the coupling nut of the shaft onto the Control unit.

Turn the Station Selector knob clockwise so that the dial is at the extreme counter-clockwise position. Then insert the free end of the shaft into the opening provided on the receiver, turning the Station Selector knob back and forth until the shaft meshes. Tighten the collar that holds the shaft to the receiver unit.

After completing these two operations, slowly turn the Station Selector knob to the extreme clockwise and then to the extreme counter-clockwise position. Normally, this will insure the use of the complete range of the dial. If, however, it is noticed that a slight amount of tension is present at either end of the dial, then the control unit must be turned on the steering column in the direction of the tension, while making this adjustment. Then returning it to its normal position will relieve this additional tension. Figure 12 gives the details of this latter adjustment.

## ANTENNA PLATE

**Location** The antenna plate, if used, should be mounted under the car and as far to the rear as possible. Also it must be as low (close to the road) as possible and still maintain the clearance of the lowest point of the car from the road.

Usually, it is mounted on the opposite side from the Muffler and exhaust pipe to prevent crowding. See Figure 13. In some cases, it is desirable to mount the plate crosswise to the car chassis. Avoid any location that will place the plate in a position that will impede the free motion of the chassis parts such as springs, drive shaft, or axles, as damage to the antenna will result.

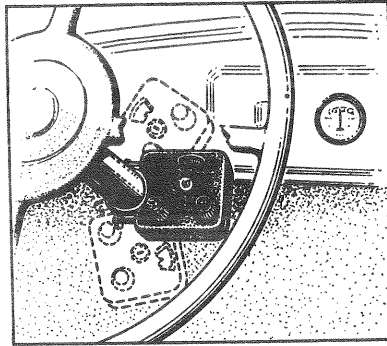


Figure 12—Position for Control Box in Order to Make Adjustments

**Mounting** After determining the proper location, fasten the plates together with the screws provided. Adjust the length so that the plate is as long as possible and still fulfill the foregoing conditions. Assemble the mounting bolts onto the plate as shown in Figure 5 and fasten the clamps to the car frame. Then tighten the bolt that holds the antenna plate to the bracket and the screw and lock nut that holds the bracket to the car frame. *Too much attention to the proper tightening of these screws is impossible, as any loosening of this plate that results in one end dropping while the car is driven at high speed may result in an accident.*

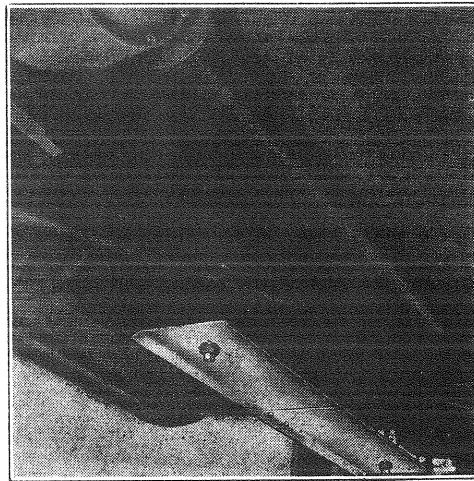


Figure 13—Typical Location of Antenna Plate and Battery Box

## “B” BATTERIES

**Location** If possible, the “B” batteries should be mounted under one of the seats or behind the back of the rear seat. In cars having a rear compartment or trunk, the batteries may be located therein.

However, if such a place is not possible, then a battery box must be used. This box can usually be mounted under the car by fastening to the floor boards. Its location should be as far from the muffler and exhaust pipe as possible, as the heat from these parts will have a detrimental effect on the life of the batteries.



**Mounting** Using the cover of the battery box as a template, locate the cover on the floor boards under the car and mark the boards for the center of the four mounting bolts. Drill four  $\frac{3}{8}$ " holes in the floor boards. Insert the four carriage bolts in the holes from the top. Make sure the hanger bolts are in place in the cover and fasten the cover to the four bolts in the floor board. In the case of cars having metal floor boards, machine screws with spacers must be used instead of carriage bolts. Make sure that the mounting bolts do not project too far down into the box so that they will fail to clear the batteries.

After fastening the top securely in place, place the "B" batteries in the box and connect them to the receptacle as shown in Figure 14. Slip the cambric cover over the fuse and place the paper strips and plate over the terminals. Then lift the box into place, swing the hanger bolts into place and tighten both nuts securely. Care should be taken to draw up on all four nuts gradually.

For mounting both the antenna plate and the battery box, it is desirable to place the car on a "lift."

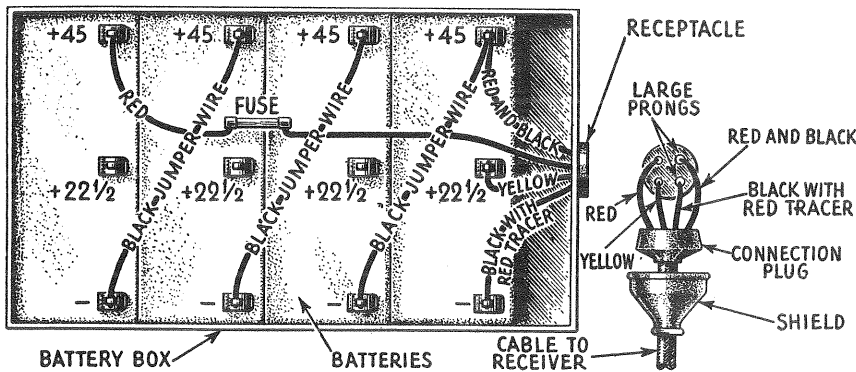


Figure 14—Battery Box Connections

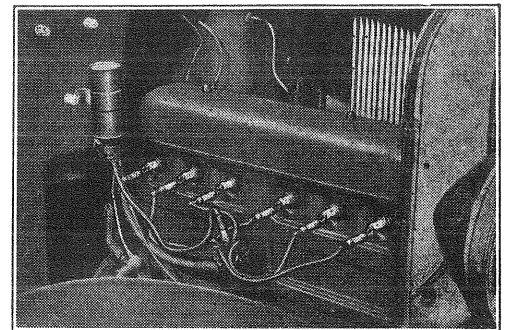


Figure 14A—Typical Installation of Suppressors

## IGNITION EQUIPMENT

Two .75 mfd. capacitors, six spark plug type suppressors and one distributor type suppressor are furnished to be installed in the car's ignition system so that its R.F. radiation may be reduced to a point so as not to interfere with radio reception.

One .75 mfd. capacitor is connected across the output of the generator. Remove a screw from the generator frame, usually the one holding the cut-out, insert the screw through the hole in the capacitor clamp and replace the screw. Connect the lead from the end of the capacitor to the terminal on the generator side of the cut-out switch.

The other capacitor is connected from the battery side of the ammeter to the car frame. Usually, one of the screws on the underside of the dash can be used to hold the capacitor, thereby making the ground connection. Then connect the lead to the ammeter terminal.

The spark plug type suppressors are inserted in series with each high tension lead at its point of connection to the plug. The distributor suppressor is inserted in series with the high tension lead from the coil at its point of connection to the distributor.

There are a number of variations in the installation of this ignition suppression equipment that are covered in Part II.

### (2) CONNECTIONS

**Loudspeaker to Receiver** Insert the plug on the end of the loudspeaker cable into the two-contact receptacle on the end of the receiver. Fasten the pigtail under the self-tapping screw as shown in Figure 9.

**Main Cable to Receiver** A long cable, from the control unit and battery box, is attached to the receiver by means of a six point female plug. Insert the plug into the receptacle on the receiver. A metal cap is fitted over two studs at the same time. Fasten the nuts over these studs securely.

**Main Cables to Batteries** Drill  $\frac{1}{2}$ " hole in the toe boards directly below the end of the receiver unit to which connections are made. (If any holes that may be used for this purpose are already available, drilling additional holes is unnecessary). Pass the free end of the cable through the hole and thence to the "B" Battery location. Possibly other holes must also be drilled. Connect the "B" batteries to the cable as shown in Figure 15. The metal braid must be pushed back from the free end and taped so that sufficient length leads are obtained for connecting the batteries. If the battery box is used, solder the four prong plug onto the end of the cable as shown in Figure 14.

The cable should be fastened to the chassis of the car by means of the clamps or staples provided. Take up any slack by making a loop and tape securely.

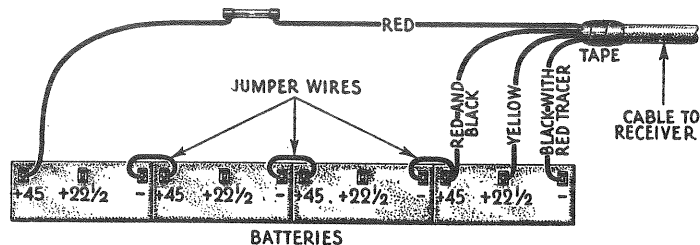


Figure 15—Cable Connections to "B" Batteries.

**Receiver to Antenna** The antenna lead should follow the shortest practical path between the receiver and the antenna. It is very desirable to avoid passing it through the engine compartment or close to the ignition coil, if mounted on the dash or compartment side of bulkhead.

If a roof antenna is used, cut the lead from the antenna as short as possible and still allow length for connection. Then cut the antenna lead and shield from the receiver to a proper length, allowing about two inches extra on the shield so that it may be slit and braided into a pigtail. Solder and tape the connections securely. Then solder the frayed part of the pigtail and either fasten or solder it securely to the car frame. The pigtail should be as short as possible and a good electrical joint made to the car frame.

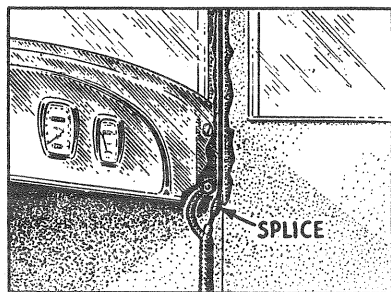


Figure 16—Proper Method of Grounding Shield When Using Roof Antenna

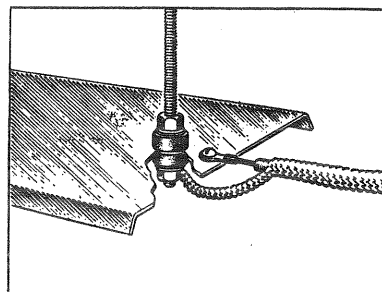


Figure 17—Proper Method of Grounding Shield When Using Plate Antenna

If the antenna plate is used, the antenna lead and shield should be cut in the same manner as for the top antenna, except that the pigtail must be slightly longer. An eyelet terminal is provided for soldering to the end of the antenna lead so that it may be held by the screw and nut at the end of the antenna plate. The pigtail should be fastened under one of the nuts that hold the plate to its mounting bolts. Figures 16 and 17 illustrate the correct manner in making both types of connections.

**Receiver to "A" Battery** One side of the "A" Battery connection is made through the frame of the car. The "hot" side is made by means of a single lead that is brought out from the main cable. This lead is provided with a lug that should be fastened under the nut that holds the battery connection to the starting motor switch.

This completes the installation. All cables should be fastened securely to the car so that interference with its operation is avoided. This is especially true of those under the dash which may



interfere with the driver's foot room. The switch may then be turned "on" and the receiver operated in the usual manner. Normally, starting the car engine will not introduce any objectionable noise. However, if ignition interference is present that is objectionable, then a reference to Part II will give the details for clearing up this trouble.

### (3) INSTALLATION OF ROOF ANTENNA

In cars not already equipped with roof antennae, the usual installation is that of the antenna plate. Due to the high sensitivity of this receiver, entirely satisfactory results are obtained from the plate antenna in most installations. However, if the car is to be operated in a locality remote from any stations and having a general low degree of signal strength, the erection of a roof antenna is advisable. The following details cover the procedure to be used in a majority of closed cars. This work should be done by a competent "trim" man as a degree of skill, only acquired by experience, is necessary in removing and replacing the fabric top of a car.

The antenna should be composed of copper screen having a total area of at least 10 square feet. It should be located as far to the rear as possible and insulated from any metal part of the car which may ground it. In some cars having a metal rib in the center, it will be advisable to make the antenna in two pieces and use insulated wire as straps for bonding it together. All joints together with the lead-in connections should be well soldered.

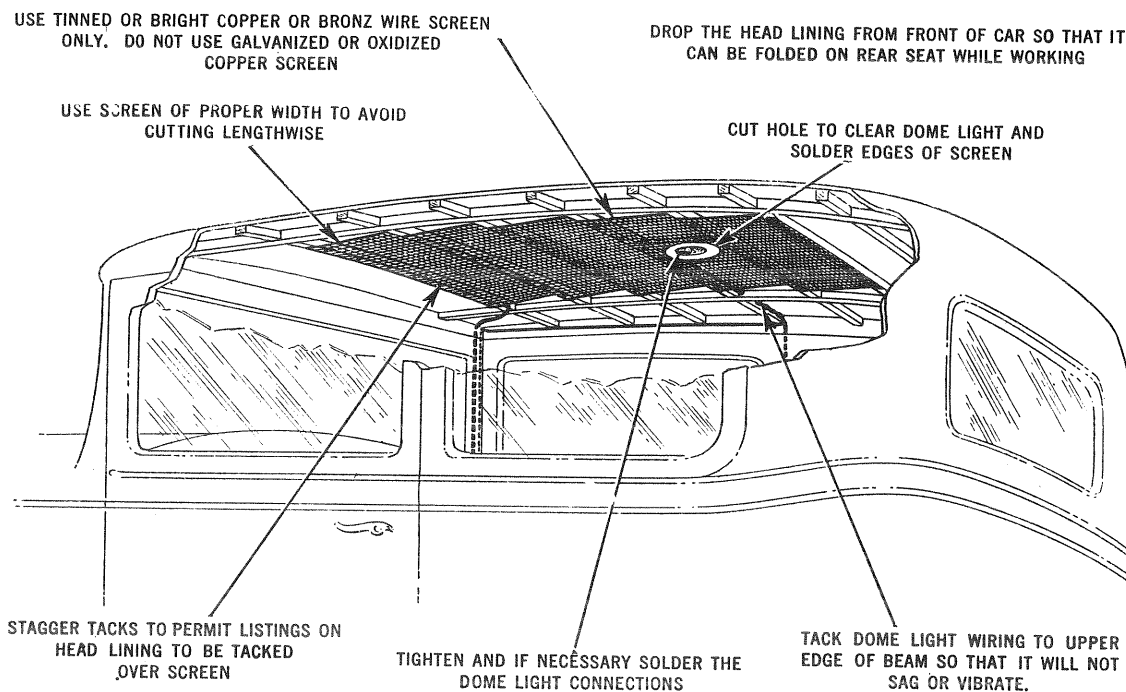


Figure 18—Details of Roof Antenna

1. First determine if there is a grounded metal screen in the roof of the car, as some cars use such a screen for the top material support. A sharp pointed instrument, connected on one side of a continuity tester, the other side being grounded, should be used. Push the point through the top lining and fish around until it comes in contact with the wire screen. If any reading is obtained, even though very small, the screen is grounded and it cannot be used for an antenna. If not, however, one corner of the head lining may be removed and a connection soldered to the screen which will make an excellent antenna.
2. If the screen is grounded or if no screen is present, it will be necessary to remove the head lining and a strip clipped from the screen several inches from all edges and from the dome light or insert a copper screen approximately of these same dimensions. If there is a possibility of the screen shifting, tack it to one of the ribs and lace the sides with cord.
3. Solder a length of shielded wire to the right front corner of the screen. Then solder or bond the shield securely to the car frame. The lead-in is then run down the right front roof

support. Usually, this can follow the path of the dome light lines. It should be noted however, that if the ignition coil is mounted on either side of the dash, it is preferable to run the lead-in down the column further from the coil.

4. Again test the antenna from the set end of the lead-in to ground for any possible shorts. If none exist then replace the head lining. Figure 18 shows a typical roof antenna installation.

#### (4) INSTALLATIONS ON MODEL A FORDS

The Model A Ford presents a somewhat involved problem for the installation of the RCA Victor Automobile Radiola. The reason for this is that due to the gasoline tank being part of the cowl, the usual location for the set and speaker cannot be used. Two positions for the receiver and three for the speaker are possible, each having several disadvantages.

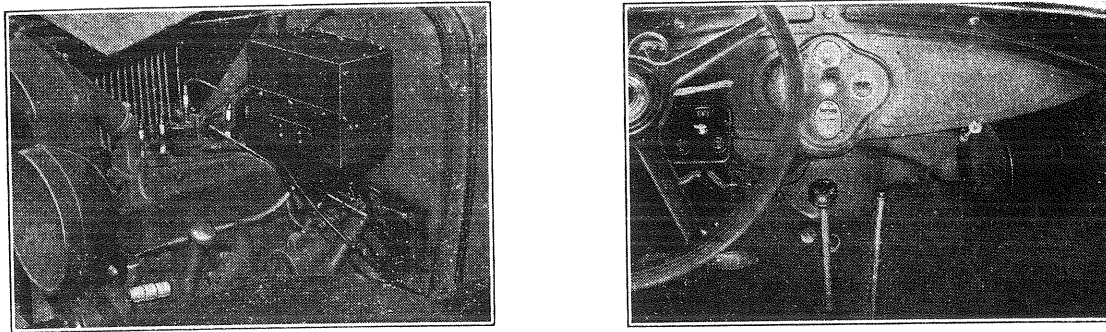


Figure 19—Location of Units in Model A Ford

The receiver unit may be mounted in the engine compartment as shown in Figure 19, more easily than at any other location. The disadvantage of this position is that due to the high noise level present even when suppressors are used, a satisfactory installation cannot always be made. The receiver is also subject to motor fumes, water and steam used in engine cleaning and the usual atmospheric conditions.

The other alternative position for the receiver is on the right side of the driving compartment as shown in Figure 20. The dimensions for a template to be mounted to the body to hold the receiver or loudspeaker are shown in Figure 21. The interference may be successfully eliminated at this location but the position of the receiver interferes with the leg room of the person riding beside the driver.

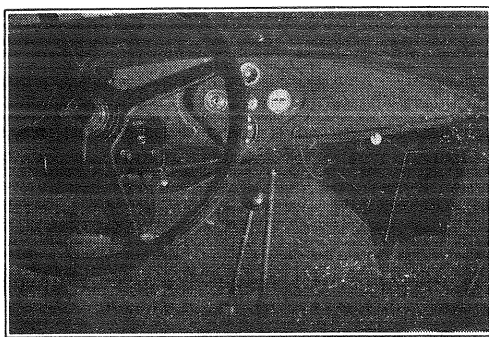


Figure 20—Alternative Position for Receiver and Loudspeaker

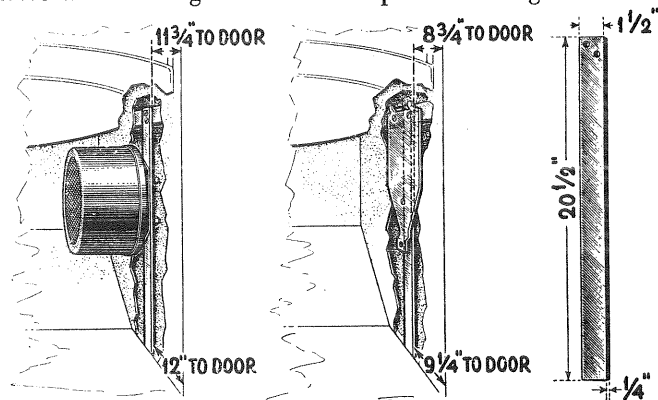


Figure 21—Dimensions of Bracket for Mounting Receiver or Loudspeaker to Side of Driver's Compartment

The loudspeaker may be mounted at either side of the car, using the same template for a bracket as that shown in Figure 21, on models not having pockets at either of these locations. On such models, such as the roadster, the loudspeaker can be mounted directly behind the gear shift lever and bolted to the seat base. This location is not seriously in the way and gives good acoustical results.

The batteries may be mounted behind the rear seat in the sedan models, in the rear compartment of coupes and roadsters or in a battery box on any model.

## PART II—SUPPRESSION OF IGNITION INTERFERENCE

In general, the use of the ignition suppressors and capacitors as described in Part I of this booklet will reduce the ignition interference to a negligible amount. However, on some installations it will be found that the noise is still present to a degree that is undesirable. In such cases, the following hints will aid the installation man in clearing up this trouble.

### (1) IGNITION ADJUSTMENTS ON MOTOR

The first step in clearing up a noisy installation is to thoroughly check and remedy any defects in the ignition system of the car. By this we mean the spark plugs should be cleaned and adjusted or replaced, the breaker points replaced or adjusted and synchronized if necessary, the distributor arm filled out with solder until it makes a full even contact, and the generator commutator cleaned and its brushes adjusted or replaced. Also all wiring should be cleaned and loose connections or poor joints remedied. This work is the first step in the clean-up job and it should be done by a competent ignition expert, who has been acquainted with the need of accurately making all adjustments.

Usually, such adjustments though made on a motor that is performing efficiently, will materially reduce the ignition noise in the radio receiver.

### (2) BY-PASS CAPACITORS

In some installations a re-arrangement of the connections of the by-pass capacitors will be found beneficial. For example, the by-pass capacitor connected to the battery side of the ammeter, if connected to the battery side of the ignition coil may be more effective.

In other cases using an additional capacitor at the coil, a total of three for the installation, will remedy the trouble. In all cases the generator capacitor is used, although if a clicking is heard when the cut-out makes and breaks its circuit, the pigtail should be connected to the load side rather than the generator side of the cut-out relay.

On some cars, two capacitors—one on each terminal—at the ammeter will greatly reduce the noise. This is especially true of 1932 Studebakers.

### (3) IGNITION COIL

The car ignition coil, due to the high electromagnetic field surrounding it, should be at as great a distance as possible from the receiver, preferably on the opposite side of the metal bulkhead. On cars that have the ignition coil mounted on the instrument board directly over the receiver unit, it may be necessary to place it in the engine compartment. Where the switch is mounted into one end of the coil, the switch assembly must be removed from the coil and a bracket provided for mounting it. The leads from the coil should be shielded and the shield grounded. (Use Packard High Tension Cable for the high tension lead to the distributor).

Another important point is that of the primary connections. While not affecting the ignition system in its relation to the car, due to the use of auto-transformers as coils, interchanging the primary leads to a coil will sometimes materially reduce the ignition noise.

### (4) ANTENNA PLATE

If grounding the antenna at its point of exit from the shield reduces or eliminates the noise, then it is feeding in through the antenna. The remedy in such a case is to place the antenna further toward the rear of the car. Also lowering it, slightly will greatly increase its signal pickup. Care must be exercised when doing this, to ascertain that the road clearance of the car is not reduced. Another important point to check is the grounding of the outer end of the antenna shield. Grounding this end of the shield to the chassis in practically all cases, materially reduces ignition noise. However, in certain cases, grounding this shield may increase the noise. In such cases the shield should be insulated with tape and left ungrounded.

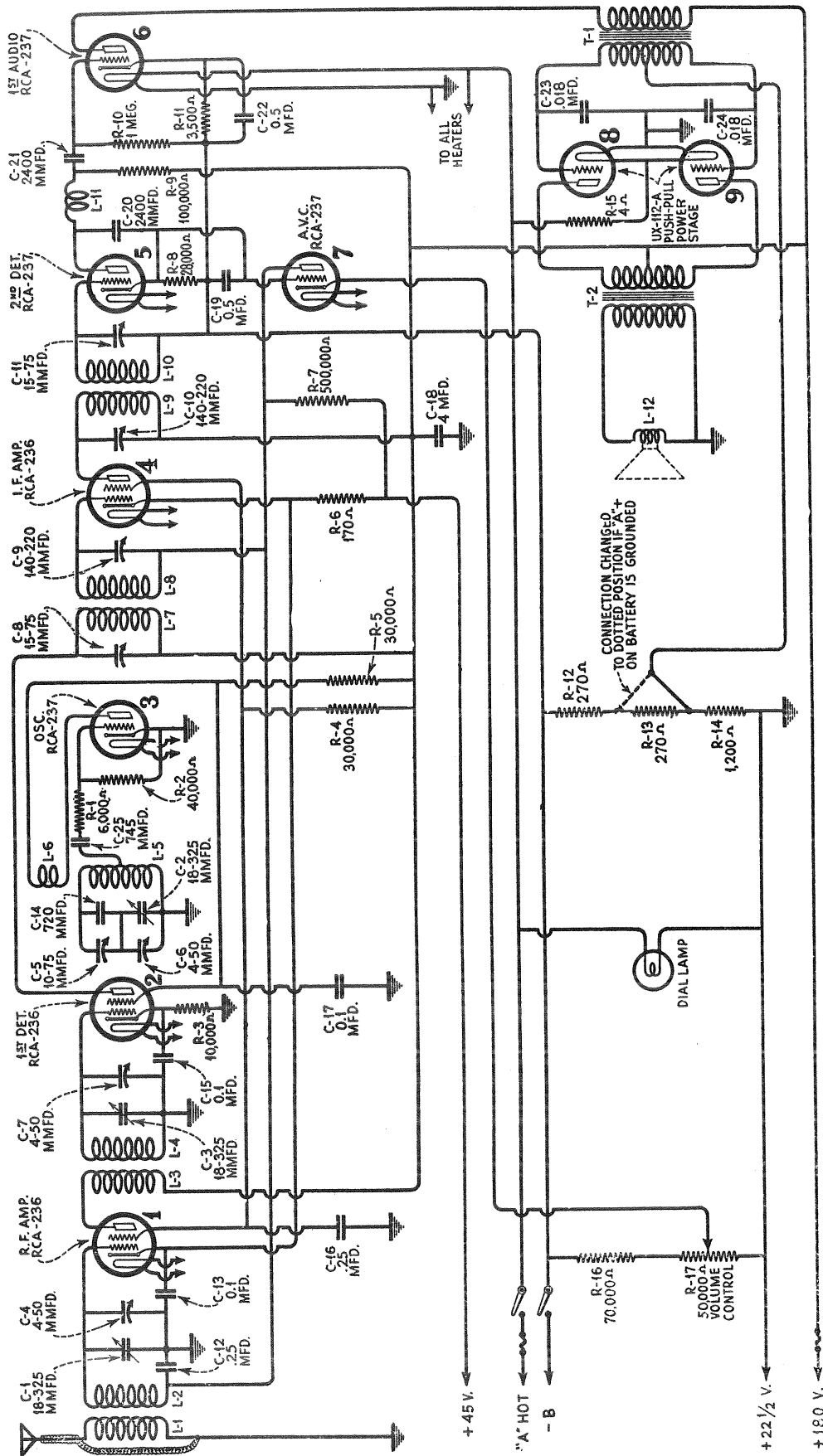


Figure 22—Schematic Wiring Diagram of Receiver Assembly

## (5) CABLES

Proper placing of the various shielded cables may have a bearing on the ignition noise picked up as well as contact noise caused by a variable contact between the cable shields and the car frame.

The antenna lead should follow the shortest path between the receiver unit and the antenna. If there is any possibility of the shield rubbing against any of the car frame, the cable should be taped or clamped in place. The "B" battery cable should be taut and any slack taken up by means of a loop. It should also be fastened or taped securely.

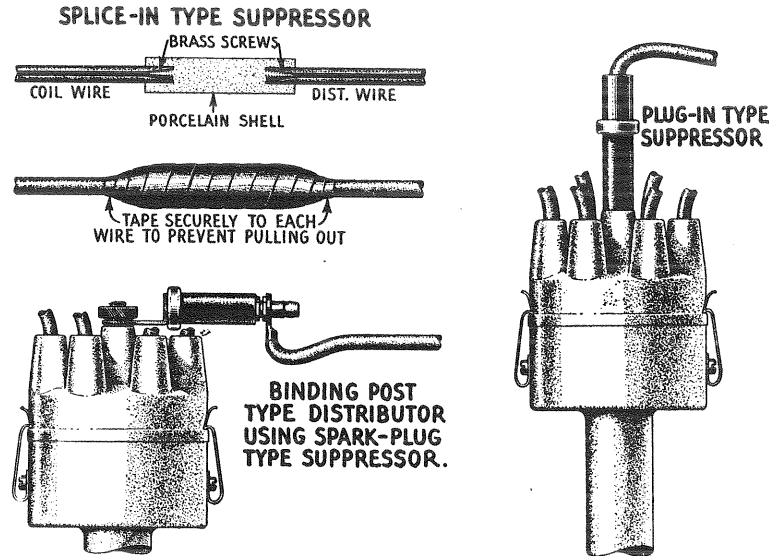


Figure 23—Installation of Various Types of Distributor Suppressors

## (6) DISTRIBUTOR SUPPRESSORS

Three different styles of distributor suppressors are used, due to the variations in the distributor head connections. These are illustrated in Figure 23. The plug-in type is supplied with this equipment and is used in the majority of cars. The spark plug type with the end flattened is used in Packard and other cars having the binding post connection. The splice-in type is used on cars that do not have a readily removable connection to the distributor head. It is spliced into the high tension head, as close to the distributor as possible. This type may also be used on cars not having much room at the spark plugs, such as the Buick. While not furnished with regular equipment, the splice-in type suppressor is listed in Part IV.

## PART III—SERVICE DATA

Service work in connection with the RCA Victor Automobile Radiola is very similar to that of the usual broadcast receiver. However, the following description of the circuit and method of making adjustments will be found helpful in locating and remedying any failure that may occur.

### ELECTRICAL DESCRIPTION OF CIRCUIT

The following description of the circuit will give the service man a better understanding of the functioning of the receiver and thereby help him in his work. Figure 22 shows the schematic circuit diagram.

The first tube is the tuned R.F. stage. This is the screen Grid Radiotron, RCA-236. The control grid bias for this Radiotron is varied by means of the automatic volume control tube.

The output of the R. F. stage is coupled inductively to the grid coil of the first detector. At this point the oscillator output is also coupled inductively to the grid coil of the first detector.

This is a tuned grid circuit oscillator using a Radiotron RCA-237 and having a closely coupled plate coil that gives sufficient feed-back to provide stable operation. The grid circuit is so designed that by means of a correct combination of capacity and inductance a constant frequency difference between the oscillator and the tuned R. F. circuits throughout the tuning range of the receiver is obtained.

The next circuit to examine is the first detector. The circuit is tuned by means of one of the gang condensers to the frequency of the incoming signal. Radiotron RCA-236 is used in this stage. In the grid circuit is present the incoming signal and oscillator frequencies. The beat frequency—175 K.C.—appears in the plate circuit of the first detector which is accurately tuned to 175 K.C.

The next stage is that of the I.F. amplifier. A single stage is used, requiring two I.F. transformers, consisting of four tuned circuits. The plate circuit of the first detector, the grid and plate circuit of the I.F. amplifier and the grid circuit of the second detector are all tuned to 175 K.C. Radiotron RCA-236 is used in this stage and its control grid voltage is also varied by means of the automatic volume control tube.

At this point it is well to consider the action of the automatic volume control tube as it controls the R.F. and I.F. amplifiers of the receiver. The grid of the automatic volume control tube, RCA-237, is connected direct to the cathode of the second detector.

The change in the bias voltage of the second detector, due to fluctuation of the signal, is applied to the grid of the A. V. C. tube. This produces a voltage drop across a resistor in the plate circuit which constitutes the control grid bias for the R. F. and I. F. amplifier. As the value of the plate current is a direct result of the voltage applied to the grid, a greater plate current gives a greater voltage drop across the resistor in its plate circuit and therefore a higher bias on the I. F. and R. F. stage. This results in less sensitivity and vice versa. The volume control varies the bias on the grid of the volume control tube.

The second detector is of the grid-biased type, using Radiotron RCA-237. The purpose of the second detector is to extract the audio frequency component of the R.F. signal which represents the voice or musical modulations produced in the studio of the broadcasting station. The audio component is extracted and used to drive the first A.F. tubes while the R.F. current is by-passed and not further used.

The output of the second detector is coupled by means of resistance coupling to the grid of the first A. F. Radiotron RCA-237. This audio stage is used as a driver for the Class B amplifier.

The output of the first audio stage is coupled by means of transformer coupling to the grids of the Radiotrons UX-112-A used as a push-pull Class "B" power stage. This stage is so biased that normally no plate current flows. However, as the grid swings positive due to the signal voltage being applied, plate current flows which is entirely of an audio character. As there is little residual current when no signal is present, this is a very economical amplifier as well as providing a high undistorted output—2 Watts.

The entire "A" battery current drain is 2.85 Amperes and the "B" current 12 M.A. minimum and 25 M.A. average maximum.

Filament and heater current is supplied from the storage battery in the car. Plate current is supplied by means of four medium size "B" batteries. A fuse is provided in both filament and plate circuits to protect the batteries and tubes.

## (1) R. F. AND OSCILLATOR ADJUSTMENTS

Four adjustable capacitors are provided for aligning the R. F. circuits and adjusting the oscillator frequency so that it will be at a 175 K. C. difference from the incoming R. F. signal throughout the tuning range of the set. Poor quality, insensitivity, and possible inoperation of the receiver may be caused by these capacitors being out of adjustment.



If the other adjustments have not been tampered with—the intermediate tuning capacitors—the following procedure may be used for adjusting these capacitors.

1. Loosen the receiver unit clamping screw and dismount the receiver from its mounting bracket. Do not remove any of the connections or the flexible cable.
2. Procure an R. F. oscillator giving a modulated signal at exactly 1400 K. C. and 600 K. C. Also procure a non-metallic screw driver—Stock No. 7065 — and a No. 5 Spintite socket wrench.
3. An output indicator is necessary. This should be a current-squared thermo-galvanometer substituted or connected in parallel to the loudspeaker leads.

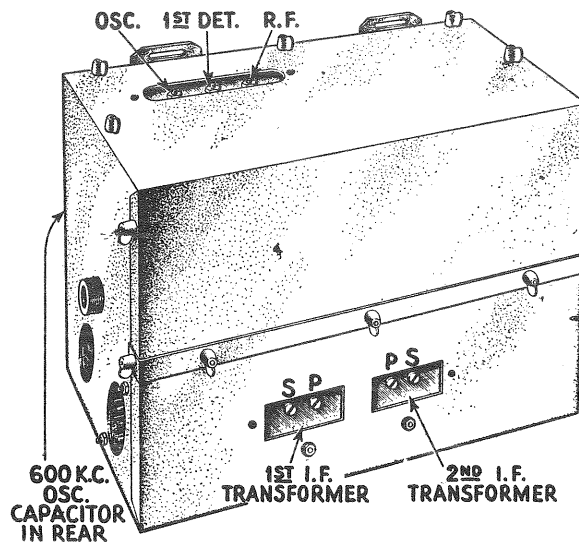


Figure 24—Location of Radio Frequency, Oscillator and Intermediate Frequency Adjustments

4. Remove the top cover of the receiver and remove the automatic volume control tube. Also ascertain that the tuning capacitor is fully meshed when the dial reads 150.
5. Place the oscillator in operation at exactly 1400 K. C. and couple it to the antenna. Set the dial at exactly 140 and adjust the coupling between the antenna and oscillator so that the output indicator does not give an excessive reading.
6. With the socket wrench, adjust the oscillator (see Figure 24), the first detector and the R. F. line-up capacitors until a maximum deflection is obtained in the output meter.
7. Set the oscillator at 600 K. C. Tune in this signal with the receiver and adjust for a deflection in the output meter. Now adjust the 600 K. C. series capacitor, Figure 24, until maximum output is obtained. Rock the tuning capacitor back and forth while making this adjustment.
8. Change the oscillator frequency to 1400 K. C. and set the dial at 140. Again make the adjustments given under 2, 3, 4, 5 and 6.

## (2) I. F. TUNING CAPACITOR ADJUSTMENTS

A single intermediate frequency amplifier stage is used in this receiver. Two transformers are used and all circuits are tuned to 175 K. C. The circuits are peaked and when alignment adjustments are made, the capacitors are adjusted for maximum output. It will be necessary to remove the chassis from its mounting bracket as is the case of the R. F. adjustments.

A detailed procedure for making these adjustments follows:

- a. Procure a modulated R. F. oscillator giving a signal at 175 K. C. The General Radio Type 360 is suitable. A non-metallic screw driver such as Stock No. 7065 is also necessary.
- b. Connect an output meter in the circuit. A current-squared galvanometer connected either in place of or across the loudspeaker leads is suitable.
- c. Remove the metal cover over the top of the receiver and then remove the oscillator and automatic volume control tube, Figure 10. Make a good ground connection between the receiver chassis and the car frame.
- d. Place the oscillator in operation and connect its output between the control grid connection of the first detector and ground, see Figure 10.
- e. Now adjust the secondary and primary of the second and first I. F. transformers until a maximum output is obtained in the output meter. Go through these adjustments a second time as a slight readjustment may be necessary. Be sure the output from the oscillator is not great enough to overload the first detector and I. F. tubes.
- f. When the adjustments are made, the set should perform at maximum efficiency. However, due to the interlocking of adjustments, it is a good plan to always follow the I. F. adjustments with the R. F. and oscillator lineup capacitor adjustments as described in Part III, Section I.

### (3) VOLTAGE READINGS AT RADIOTRON SOCKETS

The following voltages taken at each Radiotron socket with the receiver in operating condition should prove of value when checking with test sets such as the Weston Model 547, Type 3, or others giving similar readings. The plate currents shown are not necessarily accurate for each tube, as the cable in the test set will cause some circuits to oscillate, due to its added capacity. Small variations of voltages will be caused by different tubes. Therefore, the following values must be taken as approximately those that will be found under varying conditions. The numbers in column 1 indicate the tube socket numbers shown in Figure 26.

#### RADIOTRON SOCKET VOLTAGES

VOLUME CONTROL AT MINIMUM							
Tube No.	Cathode to Heater Volts	Cathode or Filament to Control Grid Volts	Cathode to Screen Grid Volts	Cathode or Filament to Plate Volts	Plate Current M. A.	Screen Grid Current M. A.	Heater or Filament Volts
1. R. F.	18	0.5	100	136	0	0	6.0
2. 1st Det.	1.0	3.0	42	150	0.25	0.1	6.0
3. Osc.	6.0	0	—	45	3.5	—	6.0
4. I. F.	18	1.0	100	136	0	0	6.0
5. 2nd Det.	12	10	—	110	0.5	—	6.0
6. 1st A. F.	15	2.0	—	165	3.5	—	6.0
7. A. V. C.	10	1.0	—	15	0	—	6.0
8. P. W. R.	—	20	—	155	1.5	—	4.5
9. P. W. R.	—	20	—	155	1.5	—	4.5

#### VOLUME CONTROL AT MAXIMUM (NO SIGNAL BEING RECEIVED)

1. R. F.	18	0.5	70	135	4.0	1.0	6.0
2. 1st Det.	1.0	3.0	42	150	0.25	0.1	6.0
3. Osc.	6.0	0	—	45	3.5	—	6.0
4. I. F.	18	0.5	70	135	4.0	1.0	6.0
5. 2nd Det.	12	10	—	110	0.5	—	6.0
6. 1st A. F.	15	2.0	—	165	3.5	—	6.0
7. A. V. C.	5.0	9.0	—	15	0	—	6.0
8. P. W. R.	—	20	—	155	1.5	—	4.5
9. P. W. R.	—	20	—	155	1.5	—	4.5



#### (4) TESTING CAPACITORS

The by-pass capacitors are in a metal container. The internal wiring diagram is shown in Figure 26.

The capacitors can best be tested by freeing their connections and charging them with approximately 180 volts D. C. (use the four "B" batteries) and then noting their ability to hold the charge. After charging, short circuiting the capacitor terminals with a screw driver should produce a flash the size of the flash depending on the capacity of the capacitor and the voltage used for charging. A capacitor that will not hold its charge is defective and requires replacement of the entire unit.

#### (5) CHECKING RESISTANCE VALUES

The values of the various resistance units in this receiver are shown in the schematic diagram, Figure 22. When testing a receiver for defects, the various values of resistance should be checked. This may be done by a resistance bridge; the voltmeter-ammeter method, or by the following method.

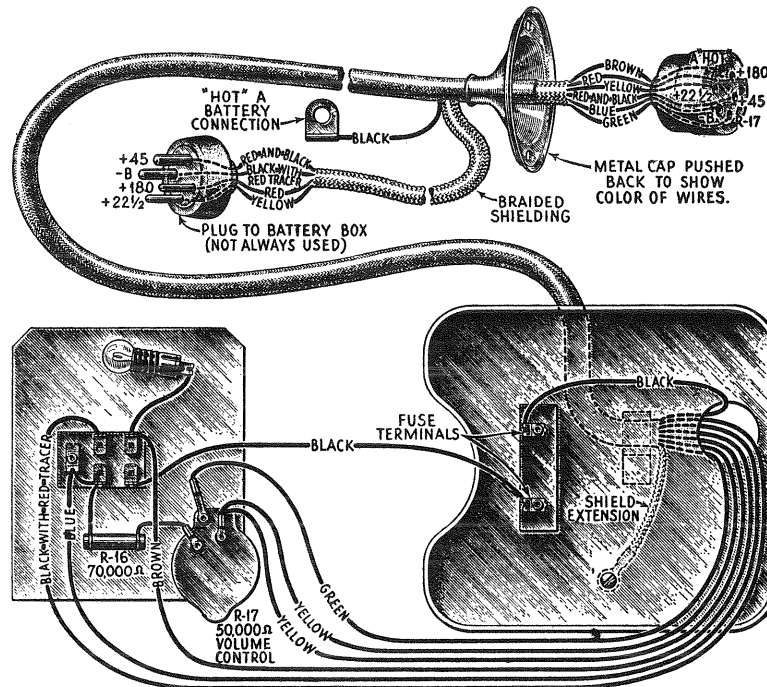


Figure 25—Control Box Wiring

For resistance of low value, 5000 ohms or less, use a voltmeter having a resistance not greater than 100 ohms per volt. For high values of resistance use a meter of 1000 ohms or more per volt. The Weston meters, Type 301 or 280, each have a resistance of 62 ohms per volt and are satisfactory for the low values. Use sufficient battery to give a good deflection on the meter, for example, a 45 volt "B" battery for a 0-50 voltmeter. Take two readings, one of the battery alone, and one of the battery with the unknown resistance in series. Then apply the following formula:

$$\left( \frac{\text{Reading obtained of battery alone}}{\text{Reading obtained with resistance in series}} - 1 \right) \text{Resistance of meter} = \text{Unknown Resistance}$$

#### (6) WIRING DIAGRAMS

The schematic wiring diagram is shown in Figure 22. The Control Unit wiring is shown in Figure 25 and the general wiring in Figure 26. A reference to these diagrams when locating trouble or replacing a unit will usually prove helpful. The internal connections of the cables are shown in Figure 27.

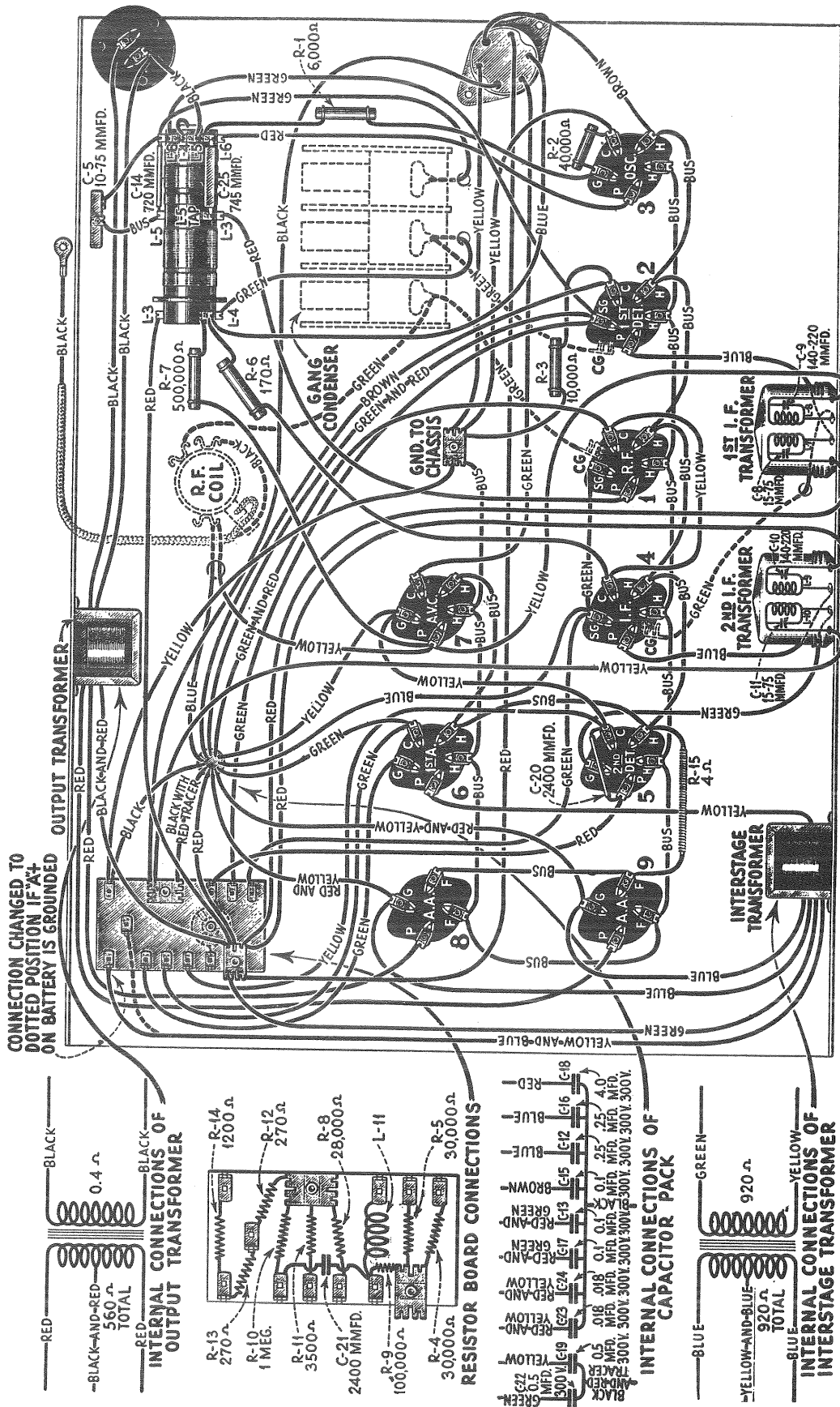


Figure 26—Wiring Diagram of Receiver Unit

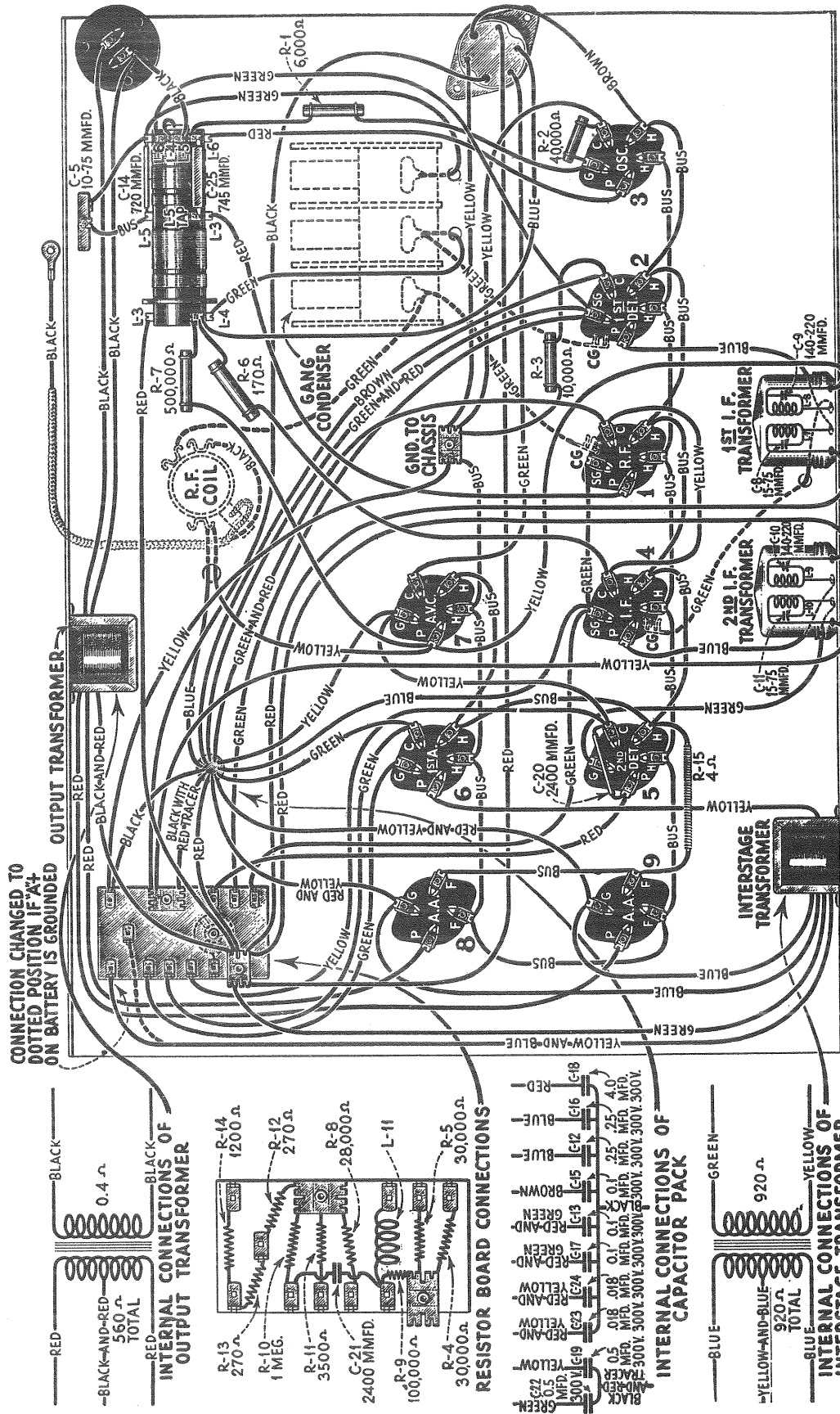


Figure 26—Wiring Diagram of Receiver Unit

## (7) VOLUME CONTROL

Normally, turning the volume control to the extreme counter-clockwise position will reduce the output volume of the receiver to zero. However, in event a powerful local station does not reduce to a satisfactory level, then check the following points.

- a. Automatic volume control tube. Try interchanging it with others of a similar type or replacing it with a new one.
- b. Volume control. Normally the volume control is of 50,000 ohms resistance. If for any reason it should be less, then the fixed resistor R-16 must also be reduced in value so that the proportion of 50,000 ohms to 70,000 ohms is maintained. For example—if the volume control measures 30,000 ohms, the fixed resistor should be replaced with one of 42,000 ohms. Such a replacement is much easier than a replacement of the complete volume control.

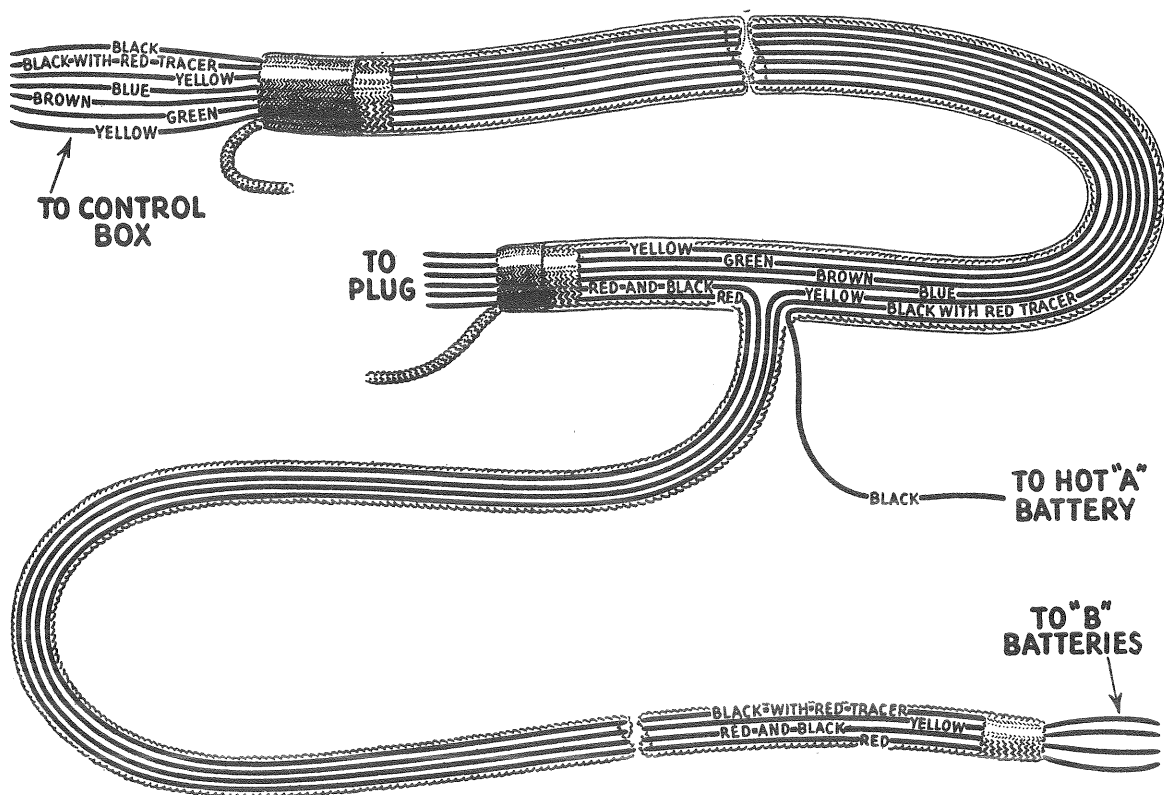


Figure 27—Internal Connections of Cables

## PART IV—REPLACEMENT PARTS

On the following pages the parts that are required for replacement use are listed. It will be noted that several parts not included in the standard equipment are also listed. There are respectively, several types of ignition suppressors and special length flexible shafts. Reference to these parts has been made in the text and on some special installations they will be required.

## REPLACEMENT PARTS

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
<b>RECEIVER ASSEMBLY</b>			<b>RECEIVER ASSEMBLY—Continued</b>		
2240	Resistor—30,000 ohms—Carbon type—1 watt.....	\$0.70	6151	Suppressor—Spark plug type suppressor.....	\$0.65
2546	Resistor—1 megohm—Carbon type—1 watt—Package of 5.....	3.00	6152	Suppressor—Distributor type suppressor.....	.65
2736	Resistor—170 ohms—Carbon type—1 watt—Package of 5.....	2.00	6175	Suppressor—Distributor splice-in suppressor.....	.65
2741	Idler—Tuning capacitor drive idler—Package of 5.....	.80	7062	Capacitor — Adjustable capacitor — 15–70 mmfd.....	1.00
2742	Spring—Tuning capacitor drive tension spring—Package of 5.....	.50	7065	Micarta Screw Driver—Used for I. F. and R. F. adjustment.....	1.10
2747	Cap—Grid contactor cap—Package of 5.....	.50	7299	Capacitor—745 mmfd.....	.70
2749	Capacitor—2400 mmfd.....	1.50	7421	Capacitor pack—Comprising two 0.5 mfd., two 0.018 mfd., three 0.1 mfd., two 0.25 mfd. and one 4.0 mfd. capacitors in metal container.....	5.25
2966	Resistor—28,000 ohms—Carbon type—1 watt—Package of 5.....	2.50	7422	Transformer—1st intermediate transformer.....	2.50
2994	Coil—2nd detector R.F. choke coil.....	.60	7423	Transformer—2nd intermediate transformer.....	2.50
3048	Resistor—500,000 ohms—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	2.50	7424	Transformer—Output transformer.....	1.85
3078	Resistor—10,000 ohms—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	2.50	7425	Transformer—Interstage transformer.....	2.20
3118	Resistor—100,000 ohms—Carbon type— $\frac{1}{4}$ watt—Package of 5.....	2.00	7426	Board—Resistor board complete, less resistors, coil and capacitor.....	.75
3288	Socket—UY Radiotron socket—Complete with insulation strip.....	.50	7427	Cover plate—Intermediate adjustment cover plate—Located on front receiver shield—Package of 5.....	.50
6133	Socket—UX Radiotron socket—Complete with insulation strip.....	.50	7428	Cover plate—Tuning capacitor trimmer adjustment cover plate—Located on top receiver shield—Package of 5.....	.50
6134	Resistor—1200 ohms—Carbon type—1 watt—Package of 5.....	2.00	7429	Capacitor—0.625 mfd.—In metal casing with mounting bracket.....	2.20
6135	Resistor—270 ohms—Carbon type— $\frac{1}{4}$ watt—Package of 5.....	2.00	8821	Capacitor assembly—Tuning capacitor assembly—Comprising 3 variable capacitors, drive bracket, drive cord, drive shaft and drum—Assembled.....	8.60
6136	Resistor—3500 ohms—Carbon type—1 watt—Package of 5.....	2.00	8822	Flexible drive shaft—Length 30"—From control box to receiver.....	4.90
6137	Coil—R.F. coil.....	1.90	8823	Shield—Back cover shield for receiver chassis.....	2.05
6138	Coil—1st detector and oscillator coil.....	3.30	8824	Shield—Front cover shield for receiver chassis.....	1.10
6139	Cord—Tuning condenser drive cord—Package of 5.....	.65	8825	Shield—Top cover shield for receiver chassis.....	1.15
6140	Plug—6 prong male plug and plug receptacle.....	.50	8826	Bracket—Receiver chassis mounting bracket complete with two rubber bumpers.....	1.20
6141	Receptacle—Two prong receptacle for speaker cord plug—Package of 2.....	.70	8827	Cable—Main cable less plug—From control box to receiver chassis and battery box.....	2.20
6142	Resistor—6,000 ohms—Carbon type— $\frac{1}{2}$ watt—Package of 5.....	2.00	8833	Flexible drive shaft—Length 42"—From control box to receiver.....	8.65
6143	Resistor—40,000 ohms—Carbon type— $\frac{1}{4}$ watt—Package of 5.....	2.00	8834	Flexible drive shaft—Length 54"—From control box to receiver.....	9.35
6144	Resistor—4 ohms—Flexible wire type—Package of 5.....	1.00	8835	Flexible drive shaft—Length 66"—From control box to receiver.....	9.65
6145	Cover Plate—Adjustable capacitor adjustment cover plate—Located on back receiver shield—Package of 5.....	.50	8836	Flexible drive shaft—Length 78"—From control box to receiver.....	10.40
6146	Screw—Self tapping hex head screw—For mounting cover plates to shield—Package of 40.....	.60			
6147	Nut—Wing nut for receiver shield—Package of 20.....	.60			
6148	Fuse—10 amperes—Package of 5.....	.50			
6149	Bumper—Rubber bumpers—Located on receiver mounting bracket—Package of 10.....	.50			
6150	Plug—Six prong female plug—Located on main cable.....	.50			

Order By Stock Number Only

## REPLACEMENT PARTS—(Continued)

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
<b>CONTROL BOX ASSEMBLY</b>			<b>LOUDSPEAKER ASSEMBLY</b>		
3287	Label—Metal trade mark label—Package of 5.....	\$0.75	—Continued		
6153	Clamp—For clamping control box to steering wheel shaft—Package of 5..	.50	8829	Cone—Speaker paper cone. Package of 5.....	\$8.00
6154	Screw — Clamp mounting screw — Package of 50.....	.50	8830	Housing—Speaker housing complete—Comprising front screen, back dust screen, case and mounting bracket..	3.00
6155	Shaft—Tuning dial shaft with gear and drive washer—Package of 5....	1.25	8831	Bracket assembly—Speaker housing bracket — Comprising bracket, 2 mounting bolts, 4 washers and 4 nuts.....	.95
6156	Switch—Lock switch—Complete with mounting nut and washer.....	.80	8832	Cable—Speaker shielded cable less plug.....	.55
6157	Volume control—Volume control complete with mounting nut.....	1.50	8838	Speaker complete—Comprising Speaker, housing case and cord—Assembled.....	13.50
6158	Nut—Knurled nut for lock switch—Package of 10.....	.50	<b>ANTENNA ASSEMBLY</b>		
6159	Resistor—70,000 ohms—Carbon type — $\frac{1}{2}$ watt—Package of 5.....	2.00	6129	Staple—Insulated staple—Package of 100.....	.75
6160	Dial scale—Package of 5.....	.50	6130	Screw and Nut—U bracket set screw — $\frac{3}{8}$ —16 x $\frac{1}{4}$ —Complete with lock nut—Package of 10.....	.50
6161	Knob—Tuning control knob—Package of 5.....	1.50	6131	Insulator—Insulator bushing for No. 7420—Package of 10.....	.70
6162	Spring—Knob tension spring—Package of 25.....	.50	7419	Bracket—U bracket for mounting antenna plates—Package of 2.....	1.00
6163	Knob—Volume control knob—Package of 5.....	1.50	7420	Stud—Antenna plate stud— $\frac{3}{8}$ —16 x 8"—Complete with 5 mounting nuts—Package of 5.....	1.90
6164	Key—Lock switch key—Package of 10.	.50	8819	Plate—Single antenna plate.....	1.75
6165	Lamp—Dial scale lamp—Package of 5.	1.75	<b>BATTERY BOX ASSEMBLY</b>		
6169	Felt—Felt strip for steering column—Package of 10.....	.50	2968	Receptacle—Four prong receptacle complete.....	.50
7430	Control box complete—Less flexible shaft and cable.....	5.25	6122	Clamp—Cable clamp—Package of 15..	.50
7431	Cover assembly—Comprising top and bottom covers.....	1.20	6123	Plug—Four prong male plug.....	.50
7432	Bracket assembly—Comprising brackets, studs, stop washer and lamp socket—Located inside of control box.....	3.45	6124	Cap—Plug cover rubber cap for No. 6123—Package of 5.....	1.50
<b>LOUDSPEAKER ASSEMBLY</b>			6125	Fuse— $\frac{1}{4}$ amperes—Package of 5.....	.50
2975	Rivet—Cone retaining ring mounting rivet—Package of 100.....	.50	6126	Clip—Fuse clip—Package of 12.....	.50
6166	Board—Terminal board with two terminals—Located on cone bracket —Package of 5.....	1.00	6127	Bolt—Carriage bolt for mounting top of box to car— $\frac{5}{16}$ —18 x $\frac{1}{4}$ "—Complete with lock nut—Package of 5.....	.50
6167	Plug—Two prong male plug—For cable No. 8832—Package of 5.....	.75	7418	Bolt—Hanger bolt $\frac{5}{16}$ —18 x $\frac{9}{4}$ "—Complete with two lock nuts—Package of 5.....	.50
6170	Rivet—For mounting speaker and front grille into housing—Package of 100.....	.50	8817	Box body assembly—Comprising bottom plate, 2 side plates, 2 bottom strips and receptacle—Assembled..	3.45
6171	Rivet—For mounting No. 8831 bracket to housing—Package of 100.....	.50	8818	Box cover assembly—Comprising cover plate, 2 strips and 2 rubber strips—Assembled.....	1.70
7433	Screen—Speaker housing case wire screen—Package of 5.....	1.50	8820	Plate and strip assembly—Cardboard plate and strip assembly comprising six strips and one plate —Package of 5.....	.75
7434	Screen—Dust screen for back of speaker housing case—Package of 5.....	1.75			
8702	Ring—Cone retaining ring.....	.80			
8828	Magnet assembly—Comprising cone bracket, core and magnet.....	4.60			

*Order By Stock Number Only*

## PART V—INSTALLATION DATA

On the following pages, data pertaining to the actual installation of the automobile radio on a number of standard cars is tabulated. On the back of each sheet, blank space is allowed for keeping notes on each individual job. Additional sheets will be issued on other models as this data becomes available.