COMPLETE INDEX
for
PERPETUAL TROUBLE SHOOTER'S MANUALS
Volumes I, II, III, IV, V, VI, VII, VIII, IX, and X

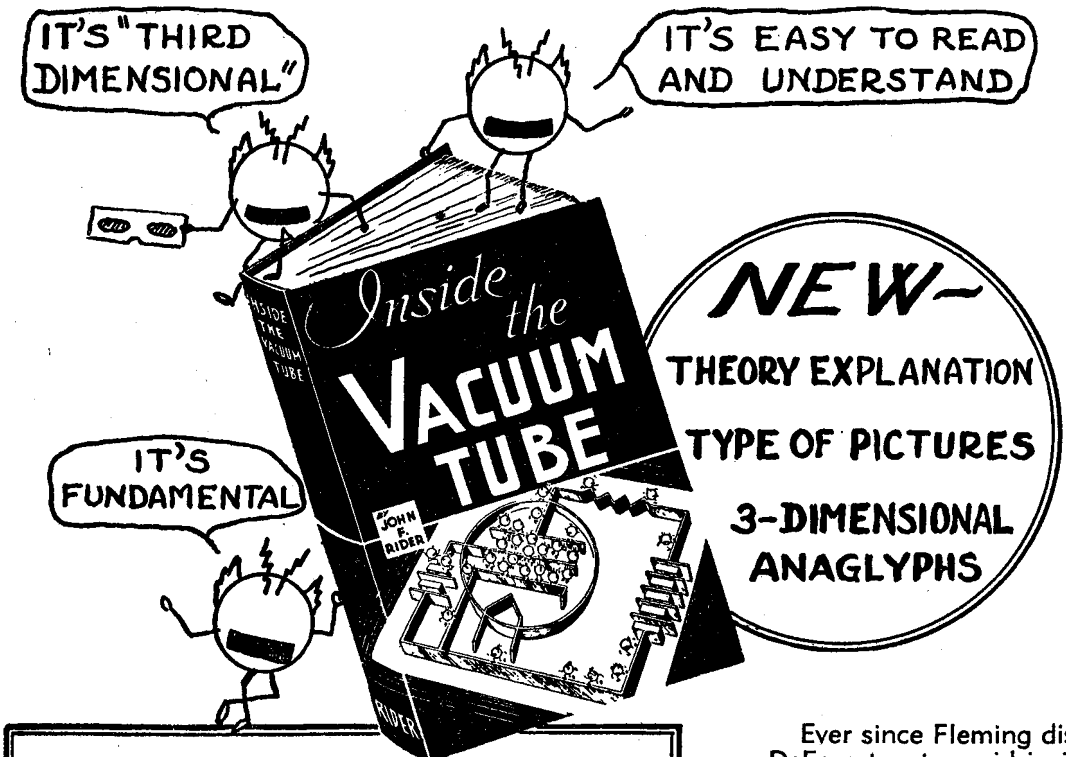
and

"HOW IT WORKS"
Special Section of Volume X

by
John F. Rider

404 Fourth Avenue New York 16, N. Y.

A New Book Explaining
Vacuum Tubes
in a Different Way



Contents

CHAPTERS

1. INTRODUCING THE ELECTRON
2. ELECTRON EMISSION
3. MOVEMENT OF CHARGES
4. SPACE CHARGE AND PLATE CURRENT
5. FUNDAMENTALS OF TUBE CHARACTERISTICS
6. THE DIODE
7. THE TRIODE
8. STATIC CHARACTERISTICS OF TRIODES
9. TRIODE DYNAMIC CHARACTERISTICS AND LOAD LINES
10. DYNAMIC TRANSFER CHARACTERISTICS
11. VOLTAGE AMPLIFICATION
12. THE TETRODE AND PENTODE VACUUM TUBES
13. THE CATHODE CIRCUIT
14. POWER AMPLIFIERS
15. MISCELLANEOUS VACUUM TUBES

Ever since Fleming discovered his "valve" and DeForest put a grid in it, thousands upon thousands of pages have been written on how and why the vacuum tube functions. Here is a new approach—one which affords the clearest understanding of the subject. The presentation is aimed for the man who is starting out in radio and who desires not only a solid grounding in the theory, but also a good working knowledge of tubes. At the same time it is a perfect refresher for the man who studied the subject long ago.

Throughout the book, which covers diodes, triodes, screen-grid tubes, and pentodes, the aim is to give the reader a clear physical picture of exactly what is happening within the tube—inclusive of the development of characteristic curves of all kinds. The anaglyphs giving a three-dimensional picture of phenomena heretofore seen in only two dimensions, are an innovation in radio texts. Two-colored spectacles are provided with the book for viewing these anaglyphs. Like the text—the illustrations are new—they live—show action—thereby simplify the explanation of tube behavior.

424 Pages — Hard Covers

Price $4.50

HOW IT WORKS

Special Section of Volume X

RIDER'S MANUAL

CONTENTS

PREFACE

1939 witnessed the start of commercial exploitation of modern television. With two stations in operation, one at each end of the continent and other stations under construction in a number of the larger centers of population, television received a very definite stimulus. As a matter of fact, a number of different makes of television receivers are being demonstrated here in New York, with the NBC station W2XBS as the source of signals.

It therefore is only natural that television receivers be included in Rider's Manual Volume X and concurrently with the appearance of these service notes, we feel that an explanation of the subject of television transmission and reception should be a part of this "How It Works" section.

In this discussion you will find not only an explanation of the "how" of television but also a breakdown of some of the circuits to be found in the commercial television receivers contained in Rider's Volume X. Inasmuch as a certain amount of standardization in television transmission has been accomplished, the facts given herein will be found of interest at least for several years to come.

The presentation of facts is by no means complete. To cover the subject fully would take volumes. However, we feel that what is here presented is the actual "meat" and will be sufficient to give an insight to the *modus operandi* of television.

You also will find some facts pertaining to another development in transmission, one with myriad possibilities, namely frequency modulation. At present only a few receivers suitable for the reception of such signals are in use, but if what the originators say is true, we can look forward in the years to come to a general transition from the present amplitude-modulated form of transmission to the frequency-modulated form of transmission, with a corresponding radical change in receivers.

Printed in the United States of America

TELEVISION—HOW IT WORKS

NO COMMENTS can be made on advances in the radio art during the past year without recognizing that after many years of development, television has finally reached the stage where servicemen can no longer afford to ignore its existence. In some parts of the country television is already an accomplished fact; hundreds of receivers have been installed and sold, and all signs point toward the gradual expansion of television facilities into sections which do not have coverage at the present time.

Recognizing, then, that the radio serviceman's job is being extended to include not only radio servicing as we know it today, but also the servicing of television receivers, this section explaining the fundamentals of television is being offered in the belief that it will be of help to many of you in dealing with the problems introduced by television. Throughout you will find that it is written from the viewpoint of the man who is called upon to install and service television receivers; and yet, although there is this emphasis on the practical aspects of television, you will find that an essential amount of theory is included. Lest any of you feel that this inclusion of what might be called "theoretical" material is unnecessary, it should be pointed out that television is an extremely complicated subject, much more so in fact than is radio, and that television receivers cannot be serviced efficiently by any one who does not understand the principles underlying the operation of the system. The different situations which can arise are so numerous that it is indeed impossible to list them, to explain the reasons for each, and in the case of faulty operation to locate the source of the trouble. As in radio servicing, so it is in television servicing: a thorough understanding of the fundamental principles of operation is invaluable.

Fortunately for the radio serviceman, the advent of television does not mean that an entirely new field must be learned. The more you study television, the more you will come to realize that television embodies every principle that has ever been used in radio—and more besides. You will marvel at the ingenuity of television engineers in using the same old time-proved principles of radio, in adapting these to the needs of television, and in discovering new principles and new techniques wherever the available ones were inadequate. Thus, for example, you will find the simple diode rectifier being used in clipping circuits, in d-c restoring circuits, in video detector circuits, and in many other applications. If you understand how the diode rectifier operates, then you will recognize in each one of these "new" circuits an old friend. True, it will take some time before you become familiar with the need for these circuits and the specific modifications to achieve certain results, still you will be amply repaid for the effort in the new opportunities which television offers to the trained serviceman and technician.

Comparison with Sound Broadcasting

Just as it is the problem of radio broadcasting to recreate sound at places distant from the actual sound, so it is the problem of television to recreate a scene at

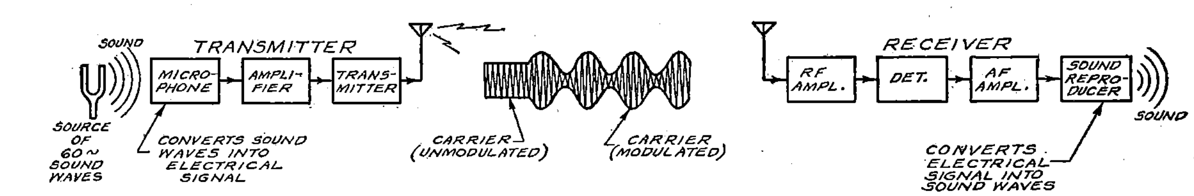


FIG. 1A - SOUND TRANSMISSION SYSTEM

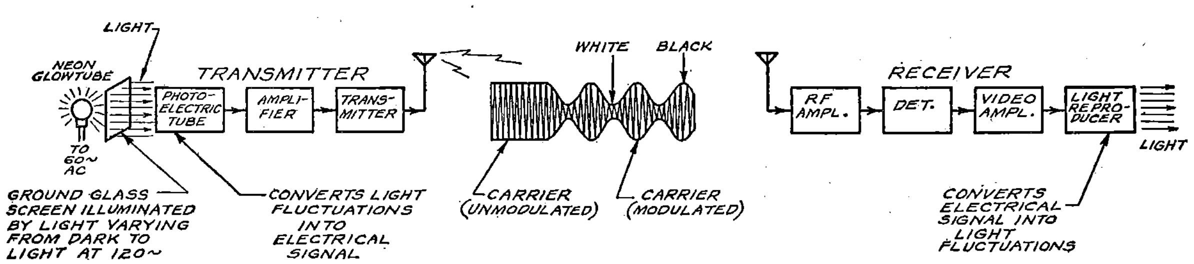


FIG. 1B - TELEVISION TRANSMISSION SYSTEM

FIGS. 1A, 1B.—A television system uses an arrangement similar to that employed in sound broadcasting. Note that in the television system the photoelectric tube replaces the microphone and the light reproducer replaces the speaker.

places distant from the original scene. In the case of sound broadcasting, as Fig. 1A shows, sound vibrations produced by, let us say, a tuning fork are picked up by a *microphone* which converts these vibrations into corresponding electrical vibrations. This electrical signal, which now carries an electrical image of the sound vibrations, is amplified, used to modulate the carrier, the radio wave is radiated, picked up by the receiver, amplified, detected and finally, as you know, the electrical impulses (similar in shape to those which were originally produced by the microphone) are used to actuate the speaker which in turn recreates the original sound.

Fig. 1B shows that a system very similar to this is used in television and that in general a very close resemblance exists between sound broadcasting and television. To simplify the explanation at the present time, we assume that only a very small part or element of a scene is being televised. For example, we might allow the light from a neon tube operated from the 60-cycle power line to fall on a small piece of ground glass. The illumination on the ground glass would then change from dark through various shades of brightness and back again to dark, and repeat this cycle 120 times per second. (Note that the rate is 120 cycles because both positive and negative cycles cause the neon tube to illuminate the screen.) In the same way that sound broadcasting uses a *microphone* to convert the sound pressure variations into electrical variations, so the heart of any television broadcasting system is the *"television camera"* which converts the time-variations in illumination of the scene into corresponding electrical variations. In the simple illustrations we have chosen, because only a single small area is being televised, an ordinary photoelectric cell can serve as the television camera.

Once the varying light values have been changed into corresponding electrical values by the television camera, the process of transmitting the information follows exactly the same procedure as in the case of sound broadcasting. Note that the carrier is modulated in the same way, and that it remains stationary in amplitude during the period before the screen is illuminated. Once the neon tube is turned on and illuminates the screen, the amplitude of the carrier varies in proportion to the amount of illumination. Note that the maximum amplitude of the carrier corresponds to a black image, and that the image gets progressively lighter as the amplitude of the carrier is decreased. In passing we might say that this is called negative modulation about which we shall have a great deal more to say later on.

For the present, the important thing to note is the similarity between the two systems, the one for transmitting information on light values, and the other for transmitting information on sound values. At the output of the television receiver, we of course have an important change. Whereas the output of the sound receiver is a speaker which converts the electrical impulses into corresponding sound impulses, the output of the television receiver is a *"picture tube"* or other device which converts the electrical impulses into corresponding light values.

We see then, that the sound system and the television system are identical with the exception that the television camera is substituted for the microphone and the picture tube for the loudspeaker. We might also mention here that in the RCA television system, the trade-mark name "Iconoscope" is used for the television camera tube and the trade-mark name "Kinescope" is used for the picture tube. As will be explained in detail later on, the Iconoscope consists of a very large number of minute photoelectric cells which create an *electrical* picture of the scene being televised, while the Kinescope consists of a cathode-ray tube on the screen of which is built up a visible image.

SCANNING

No doubt you have noticed by this time that in comparing television with sound broadcasting we limited ourselves to televising the simplest type of object, one which was uniformly illuminated over its entire area. We then showed that the two systems are identical provided that the television camera replaces the microphone and the picture tube replaces the loudspeaker. Unfortunately, however, television is not as simple as this or television would have "arrived" many years ago. In television, we are confronted with the problem of conveying information on the light value not at one point but at every point over the complete area of the scene being televised. Thus, the scene must be broken up into a great many elements or elemental areas and information on the light values over each one of these elements must be conveyed to the receiver and finally to the picture tube. And not only must this information be conveyed, but it must be reassembled in the correct order at the receiver and the corresponding light value reproduced for every one of the many elements into which the image has been broken down.

As a matter of fact, this process of breaking down a picture into a great number of elements is nothing new but is as old and as fundamental as the process of seeing itself. For, in viewing a scene, the image is carried to the brain by the eye over a huge network of transmission lines which tells the brain the intensity and the color of the light at every point in the field of vision. Because the number of elements into which the retina of the eye breaks down the scene is so great, we are not conscious that the picture is made up in this way but receive the impression that the picture is perfectly blended or continuous.

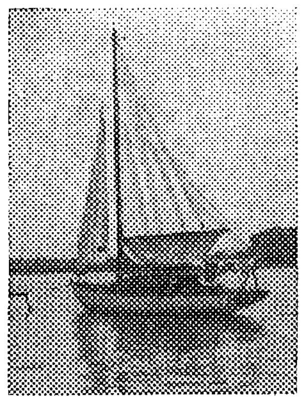
Some of you will be surprised to know that even photographs are made up of elementary particles even though they too appear to be continuous upon casual inspection. Actually the light and dark parts of a photograph are the result of the presence of black particles of silver which vary in number over the area of the picture. Where the picture is dark, these particles of silver are more numerous than where the picture is light. Because these particles are so small they are not ordinarily visible. We might note in passing that where photographs are to be enlarged appreciably so-called fine-grain film and special developers are used so that the individual grains or particles will not become visible.

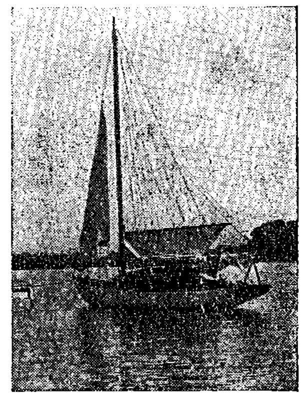
Number of Elements Required

It is important for an understanding of television to appreciate how the number of particles or areas into which a picture is broken up affects the type and quality of the reproduction which is obtained. As we should expect from the preceding discussion the quality of the picture will be improved as the number of elements is increased. In order to compare the effect of breaking up a picture into a varying number of elements, let us consider the two reproductions shown in Fig. 2a and Fig. 2b. These are reproductions of the same photograph, the only difference being the number of elements into which the picture is divided. If you examine these figures closely, you will see that they are composed of a large number of black dots of different sizes, and that Fig. 2b contains a larger number of dots than Fig. 2a. As a matter of fact, in printing as well as in the processes of seeing and photography, it is necessary for the picture to be broken down into a series of small areas before it can be printed. The engraver in making his halftone, places a fine mesh screen in front of his camera so that the image is broken down into a series of dots, the actual size of any one dot depending upon the amount of light on the area which the dot represents. Where the picture is dark, the size of the corresponding dot is large, and where the image is light the size of the black dot is correspondingly small. The number of dots into which Fig. 2a is broken down is 50 per inch, while Fig. 2b is broken down into 100 per inch.

The great improvement effected by breaking down the picture into a larger number of dots or elements is clearly apparent in the superiority of Fig. 2b over Fig. 2a. Because of the larger number of elements, the former presents more detail, appears finer, more blended and more continuous than the picture with the fewer number of elements.

The actual number of elements into which a picture





FIGS. 2a, 2b.—Fig. 2a is a halftone reproduction of a photograph using a 50 screen; in Fig. 2b greater detail is obtained by using a 100 screen.

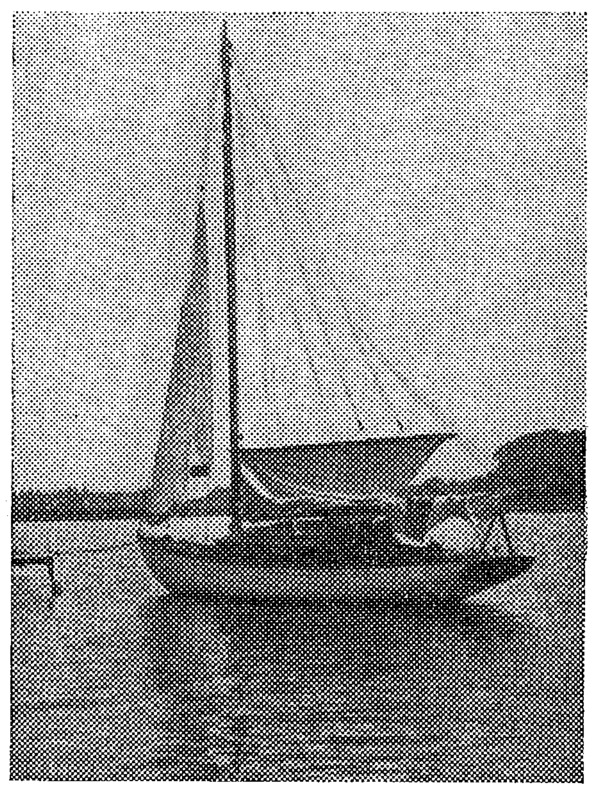


FIG. 3.—Fig. 2b enlarged to twice its original size. Note that this illustration can be viewed from twice the distance and still the same detail will be seen as in Fig. 2b.

must be divided depends upon several factors: the fineness of detail which it is desired to reproduce, the distance from which the picture is viewed and the size of the picture. Fineness of detail, as we have seen, requires a large number of elements for a given portion of a scene. In addition, the more closely the picture is viewed, the smaller must be the individual elements. This is necessary so that the individual elements will appear to the eye to merge into smooth lines and shades. If a picture of a given scene is enlarged, either the total number of elements must be increased, or the picture must be viewed from a greater distance. Figs. 2a and 2b illustrate the first two factors, fineness of detail and viewing distance. Fig. 3, which shows Fig. 2b *enlarged* to twice its original size, illustrates the third factor. Fig. 2b contains 100 dots per inch; Fig. 3 contains only 50 dots per inch. Each contains the same *total* number of elements, therefore the *fineness of detail* is the same in each. Because Fig. 3 has *larger* dots, it must be viewed from a greater distance. This consideration is important in television, since the total number of lines into which the scene is divided is the same at all times. Therefore, large pictures should be viewed from a greater distance than small ones to get the same effect.

An idea of the number of elements needed to reproduce fine details can be obtained from Fig. 2b. This has 100 dots or "elements" per inch in an area 1.5 by 2 inches, giving $150 \times 200 = 30{,}000$ total elements, or 10,000 elements per square inch. Television pictures may be considered to contain about 224,000 elements, regardless of picture size. Although this does not work out to be so great a number per square inch on large picture-tube screens, the fact that the scene is usually in motion compensates for some loss of detail. A point to remember about television is that increasing the number of elements increases the frequency bandwidth which must be transmitted. Thus there are technical and economic limitations to the degree of detail that may be provided.

We can now begin to appreciate the complexity of the problem with which television is confronted. For not only must information on the light value of each one of many thousands of elements be transmitted to the receiver, but also information as to the order or sequence in which these light values must be assembled to form the picture. To make the problem even more complex, all this information must be transmitted in approximately 1/30th of a second in order to prevent blurring due to movement in the scene and in order to make way for the next picture impression or "frame." In this respect the problem of television is more difficult than that of facsimile, since in the latter a still picture is transmitted and the time consumed may be ten minutes or more instead of 1/30th second.

Need for Scanning

By this time we have seen that to make television possible, the picture must be broken down into a large number of elements and information transmitted on the light value at each one of the elements. At the receiver this information is reassembled in the proper space relationship to form the original picture. How to transmit this information is the next problem.

Previously we saw that using a conventional system of radio we could transmit information on the light value at any *one* element of a scene by using a photoelectric cell pickup to convert the light value to an electrical value, and that this process was essentially the same as that of sound broadcasting and involved essentially the same transmitting and receiving equipment. This was shown and explained in Fig. 1. The first thought that arises is this: Why not use individual channels of the type shown in Fig. 1b to transmit information on the light values at each one of the points into which the picture is divided? But then, this would require some 100,000 individual pickups and transmission systems each of which would be similar to the system of Fig. 1b. Quite obviously such a system would be far too complex and expensive to be practicable, even if other problems of great difficulty at the receiving end did not exist.

Another more promising solution, which is the one that is used in all television systems today, works on the basic idea of transmitting information on the light value of one element at a time. In this way the picture is covered or "scanned" in a systematic way until finally the image is said to be completely scanned when information on the light values at every point in the picture has been obtained. In this way the need for more than one channel is avoided. However, the information must still be reassembled in the proper order at the receiving end before the picture can be obtained.

Scanning a scene is sometimes compared with the manner in which we read a printed page. For instance as you read this page your eyes start at the upper left-hand corner of the page and successively sweep to the right-hand side while examining every letter on the line; when the first line has been completed the eye snaps over rapidly to the left hand side, jumps down one line, and in the same way, examines every letter on the second line as it progresses at a uniform rate toward the right. This procedure continues until finally the eye reaches the last letter on the lower right-hand side of the page, at which time we can consider that the whole page has been scanned.

This same procedure is used when a television camera scans a scene which is to be televised. The only difference is that the television camera breaks down the scene into finer elements than the letters of a page and that the camera produces electrical impulses which vary in proportion to the amount of light on each element of the scene being scanned.

The following simple example will help to clarify the fundamental principles and requirements involved in scanning. Suppose we wish to reproduce by television the pattern shown at the left of Fig. 4. Let us assume in this example that a television camera (consisting essentially of a photoelectric cell with the proper lens equipment) is available which can be focused so as to pick off the light values on any one of the squares into which the picture has been divided. Let us also assume that we have a mechanical arrangement for moving the camera both horizontally and vertically so that it will scan the object. That is, it is possible to start with the camera focused on element 1 and to move it at a uniform rate across the screen until it reaches element 6. At this point the camera snaps back rapidly to element 7 at the beginning of the second line and moves at a uniform rate along the second line until it reaches element 12. The camera then returns very rapidly to the left and starting at element 13 on line 3 it scans the third line. In this manner the procedure continues until the entire pattern is scanned. Note that at any one instant the camera receives light only from the particular element at which it is aimed and focused and produces an electrical impulse which is proportional to the amount of light reflected by this element.

So much for the scanning at the transmitting end where the picture is being televised. At the receiving end let us assume that we have a projector which projects a narrow pencil of light on the screen equal in area to one of the square elements. This projector like the camera can be moved horizontally and vertically so that the light can be focused on any part of the screen. Suppose further that the electrical impulses from the television camera are fed to the projector and arranged to control the intensity of the light emitted by the projector in accordance with the amount of light registered by the camera at any particular instant.

Under these conditions before a picture can be obtained at the receiver, the motion of the camera at the scene being televised and the motion of the projector at the receiver must be properly coordinated or "synchronized." This means that the television camera and the projector must go through the same movements together, that the projector must at all times be focused on exactly the same element in the picture as that on which the camera is focused. In the figure we have assumed a sort of mechanical linkage between the camera and the projector to accomplish this; actually no such mechanical linkage is possible in television and we shall see later that electrical *synchronizing pulses* are used to control the camera at the transmitting end and the projector (or picture tube) at the receiver, so that both the scene being televised and the image which is being reproduced at the receiver are scanned in unison—so that the scanning is *synchronized.*

In the picture shown the image has been scanned only as far as element 13; element 14 is about to be scanned. As a result the image at the receiver is totally dark beyond this point since the lower elements have not yet been scanned and hence have not yet been illuminated. We shall explain later on that the observer sees the complete image at one time even

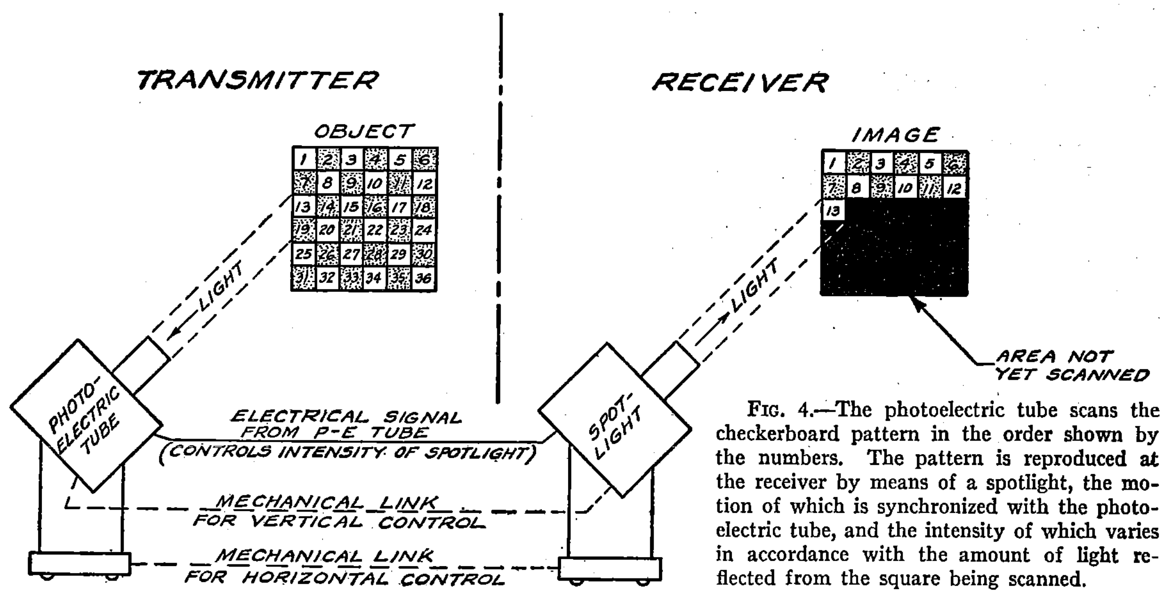


Fig. 4.—The photoelectric tube scans the checkerboard pattern in the order shown by the numbers. The pattern is reproduced at the receiver by means of a spotlight, the motion of which is synchronized with the photoelectric tube, and the intensity of which varies in accordance with the amount of light reflected from the square being scanned.

though only one element of it is receiving light at any particular instant. This is because the entire scanning process is repeated some thirty or more times a second, and the eye tends to see the image after it is no longer illuminated.

We can now summarize the requirements which must be met before a scene can be transmitted by television:

1. The scene must be systematically scanned by the television camera which interprets the light values at every element of the scene in terms of corresponding electrical values.

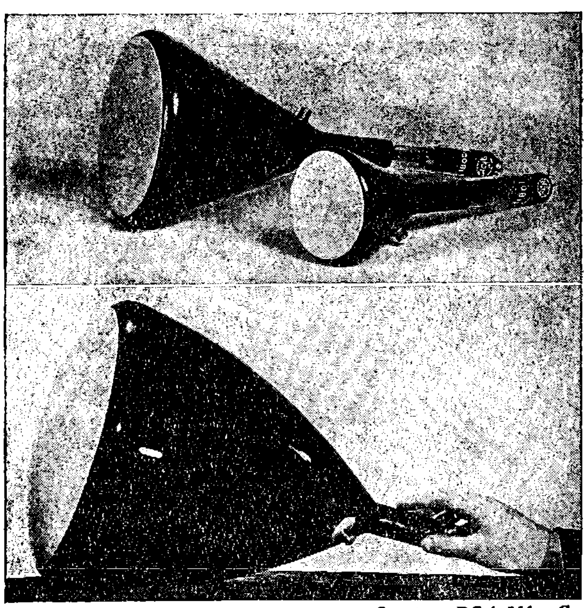
2. The image must be scanned at the receiving end according to the same systematic plan used by the television camera and the intensity of the light emitted by the light source in tracing the image must vary at every instant in accordance with the amount of light which the camera is receiving at that instant.

3. At every instant the camera and the light tracing the image must be synchronized so that the identical portion of the image is being traced out which corresponds to the element of area being scanned by the camera.

4. This scanning procedure or process must be completed over and over again at a rate of at least 30 times per second so that as far as can be determined by the eye a continuous image of the scene is formed.

THE CAMERA TUBE AND THE PICTURE TUBE

We have already seen that a complete television system, like a complete broadcasting system, requires a pickup at the transmitter and a reproducer at the receiver, and that the pickup is a photoelectric tube and the reproducer is a cathode-ray tube similar to those used in oscillographs. To avoid confusion of trade names let us call the pickup a "camera tube" (it "takes" the television picture) and the reproducer a "picture tube" (it reproduces the picture). Since we want to get a good general idea of how a television system works, we shall consider both these tubes here, although the serviceman in the field will naturally come in contact with only the picture tube.



Courtesy RCA Mfg. Co.

FIG. 5.—The left-hand Kinescope shown above has a 9-inch screen and the smaller has a 5-inch screen. Below is a 12-inch Kinescope.

The Picture Tube

Essentially the television picture tube is similar to the familiar cathode-ray oscillograph tube, so that those who have read Rider's "The Cathode-Ray Tube at Work" will have a good basis for understanding television picture tubes. For those who have not we will review the subject here.

Let us assume that television (video) signals are coming into a receiver; as we have said before, the amplitude of these signals is proportional to the light reflected by the object being televised. We want to use these signals to produce a picture. In sound work we know that the signals can be made to move the diaphragm of a loudspeaker, thus producing sound waves similar to the original. The picture tube, then, must be capable of converting the electrical video signals into *light* to produce a picture. It is a property of certain substances called fluorescent materials that they will glow when they are struck by a beam of electrons, and that the more electrons striking such a substance at a given instant, the brighter will be the glow. A picture tube, then, can be made if we have a source of electrons, means for controlling their motion and their quantity, and a fluorescent screen.

The external appearance of some typical picture tubes is shown by the photograph, Fig. 5. These are glass vacuum tubes specially shaped to withstand the high pressure exerted by the surrounding air, due to the high vacuum within the glass envelope. Servicemen should remember this, and handle picture tubes with great care. Even scratching the glass or careless handling may cause them to *collapse* as violently as if they exploded! The white appearance of the large end of these tubes is caused by the film of fluorescent

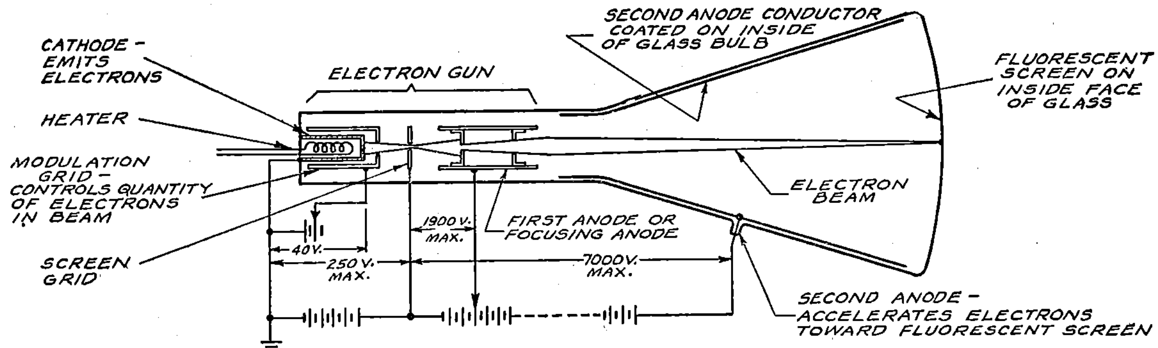
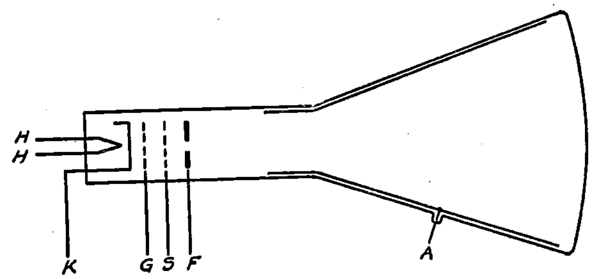


FIG. 6a.—The different elements of a picture tube are designated in the above sketch with typical voltages shown. Fig. 6b on the right shows a common schematic representation; where K is the cathode; G, the modulation grid; S, the screen grid; F, the focusing anode, and A, the second anode.



material deposited on the inside surface; this, of course, is where the television pictures are built up.

A cross-sectional view of a picture tube is shown in Fig. 6. As in the usual radio tube, the heater causes the cathode to emit electrons and the second anode (like the plate of the ordinary tube) strongly attracts them, giving them a high velocity. The modulation or control grid regulates the number of electrons which pass through it in a given time. In the picture tube are some additional elements such as a focusing anode, which forms the electrons into a narrow beam so that they will strike the fluorescent screen in a small round spot; in some tubes a screen grid is inserted between the modulation grid and the focusing anode to prevent the focusing action from affecting the modulating action. Fig. 6a shows the general arrangement of parts inside the tube, and Fig. 6b shows a common way of representing these in schematic form.

With the parts so far mentioned, the tube can produce a beam of electrons which will hit the center of the fluorescent coating on the inside of the picture tube and produce a small spot of light which can be seen through the glass end. We can focus this spot by varying the potential on the first (focusing) anode, and we can vary its brightness by applying a suitable potential to the modulation grid. The more negative the modulation grid becomes relative to the cathode, the dimmer the spot becomes; the less negative the grid, the brighter the spot. It now remains to provide some means for moving this spot rapidly enough over the fluorescent screen to give us a complete picture . . . in other words to provide scanning.

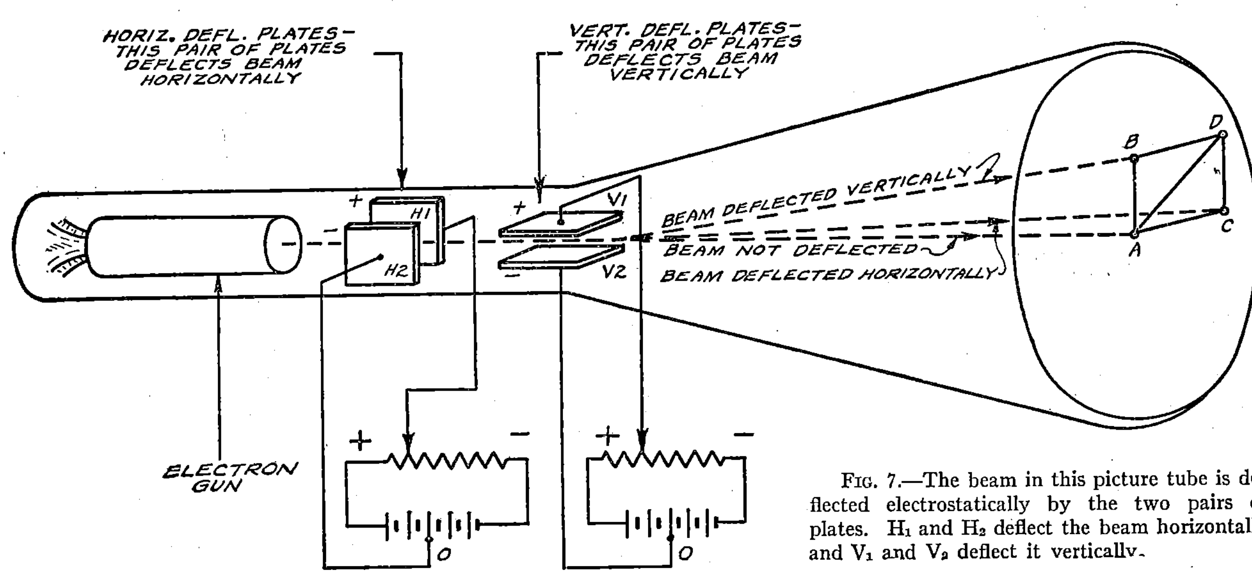


FIG. 7.—The beam in this picture tube is deflected electrostatically by the two pairs of plates. H_1 and H_2 deflect the beam horizontally and V_1 and V_2 deflect it vertically.

Two methods of deflecting the electron beam are now commonly used: *electrostatic* deflection and *electromagnetic* deflection. The first of these methods, which is probably the simplest to understand, takes advantage of the familiar fact that particles of matter having like charges of electricity repel each other, while particles having unlike charges attract each other. Since the electron beam consists of negative charges, we see immediately that the beam can be deflected by means of suitably shaped electrodes which are charged either positively or negatively as the case may require. In picture tubes, as in oscillograph tubes, this is done by building into the tube two pairs of metallic plates, arranged approximately as shown in Fig. 7.

The figure shows that plates H_1 and H_2 are parallel to each other but in a plane at right angles to plates V_1 and V_2. If no potential is applied to any of these plates, the electron beam will pass straight along the axis of the tube and cause a spot to appear on the screen at A. Now if we leave plates H_1 and H_2 alone, but make plate V_1 positive with respect to plate V_2, plate V_1 will tend to attract the negative electrons which make up the beam, thus causing the beam to bend, so that it strikes the screen at a new point, say at point B. We have thus deflected the beam upward in a vertical direction a distance AB. Similarly, if we leave V_1 and V_2 alone, but make H_1 positive with respect to H_2, H_1 will deflect the beam horizontally to the right until we get a spot at a point such as C.

If we combine these effects, by making both V_1 and H_1 positive at the same time, the beam will bend sidewise and upwards, causing the spot to appear at D. If the potentials of V_1 and H_1 have been the same as used in the first two tests, D will be located so that the distance AD is the hypotenuse of a right triangle whose sides are equal to AB and AC. Naturally, if V_2 is made positive with respect to V_1, the beam will be deflected vertically downward, and if H_2 is made positive with respect to H_1, the beam will be deflected horizontally to the left. The whole process of electrostatic scanning is simply a matter of varying the potentials on the deflecting plates in the picture tube so that the spot on the screen traces out the desired picture according to a regular plan. In a later section, we shall study the details of the plan actually used.

The second method of deflecting the electron beam is called *electromagnetic deflection,* because coils of wire carrying current act on the beam the way a magnet would. See Fig. 8a: The magnetic lines of flux from a permanent magnet pass from the north pole (N) to the south pole (S); the electron beam passes between the poles. If the magnet were not present, the beam would produce a spot at point A on the screen. When the magnetic field acts on the beam as in Fig. 8a, however, the beam is deflected vertically upward to produce a spot at point B. Compare this effect with that produced by the electrostatic field in Fig. 7, and you will notice that in Fig. 7 the electron beam was deflected *in the direction of the lines of elec-*

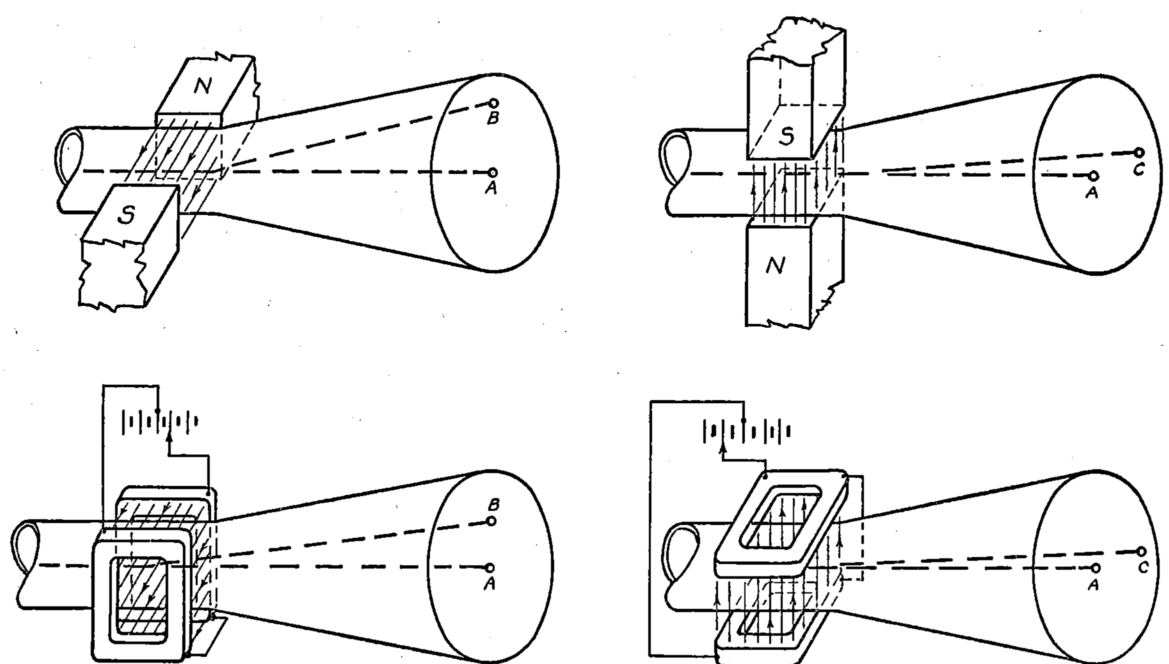
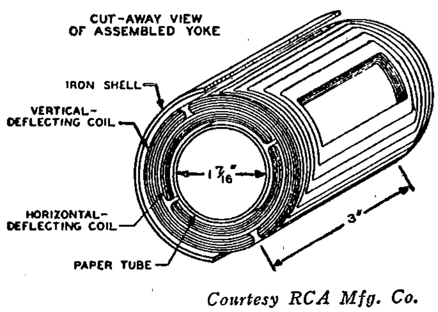


FIG. 8.—The magnetic deflection coils in Figs. 8c and 8d provide a magnetic field similar to that of the permanent magnets in Figs. 8a and 8b above. Note that the beam is deflected at right angles to the lines of force.

trostatic flux existing between plates V_1 and V_2, whereas in the case of magnetic deflection, the beam is deflected *at right angles to the lines of magnetic flux*. Thus in Fig. 8b the beam is deflected horizontally to the right, when another magnet is introduced whose influence is at right angles to the one shown in Fig. 8a.



Courtesy RCA Mfg. Co.

FIG. 9.—The magnetic deflecting yoke contains the horizontal and vertical deflection coils which are designated in the above sketch.

Of course, a permanent magnet gives a steady field and would therefore produce a constant deflection, whereas in television we must be able to vary the extent of the deflection from zero to maximum in various directions. Since we can also produce a magnetic field by passing a current through a coil, and in addition, can vary the strength of the field by varying the current, we use coils for electromagnetic deflection, as shown in Figs. 8c and 8d. Two pairs of coils are used, and these are often combined in a single compact cylindrical unit called a "deflecting yoke." Fig. 9 shows a partial cutaway view of an RCA deflecting yoke.

A point to remember about deflection systems is that when one tube has *electrostatic* deflection, a change of voltage on the deflecting plates is required to move the beam, whereas in *electromagnetic* deflection, a change of current through the deflecting coils is required.

The Camera Tube

Whereas the picture tube contains a fluorescent screen to convert an electric current into light, the camera tube contains a photosensitive screen to convert light into an electric current. The RCA type of camera tube, called the Iconoscope, the type in general use in this country at the present time, is illustrated in Fig. 10. The essential parts of this tube are shown in the cross-sectional view in Fig. 11: these are the mosaic, the signal plate, the collector and the electron gun. The important accessories external to the tube are the lens, the deflecting yoke, and the load resistor.

The mosaic consists of millions of individual photosensitive globules like metallic droplets deposited on one side of a thin sheet of mica. Each globule is like a minute island on the mica, so that the globules are insulated from each other. On the other side of the mica there is a layer of conducting material . . . the signal plate. Because the globules are separated from the signal plate by the mica, the mosaic consists of a myriad of mica-dielectric condensers, all having one plate in common. Fig. 12 shows in a general way what the mosaic looks like when viewed from the edge and enormously magnified. The collector ring is a metallic coating applied in the form of a ring around the inside of the tube and also extended down the neck of the tube near the electron gun.

Briefly the action of the Iconoscope is as follows: An optical image of the scene to be televised is focused on the mosaic by the lens. The electron gun projects

Courtesy RCA Mfg. Co.

FIG. 10.—Light images formed on the plate of the Iconoscope, the camera tube, are transformed into electrical energy by a scanning electron beam.

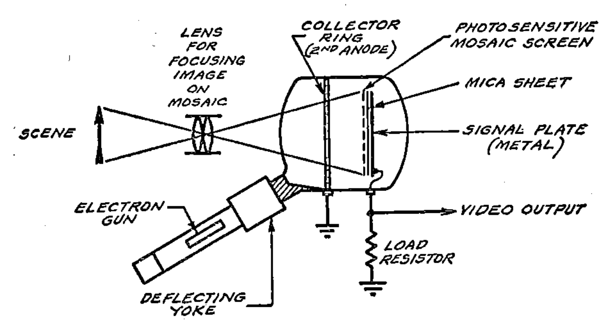


FIG. 11.—The elements of the Iconoscope can be identified in this sketch.

a stream of electrons over the mosaic, scanning it under control of the deflecting yoke, as already described in connection with the picture tube. The electron beam in traversing the mosaic causes a succession of voltages to appear on the signal plate which are proportional to the distribution of light in the image of the scene. The resultant current which flows in the load resistor causes a voltage drop. This constitutes the *video signal.* This signal is then amplified and used to modulate the television transmitter.

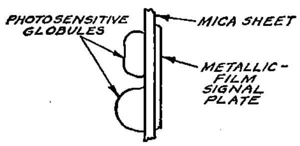


FIG. 12.—An enlarged view of how the photosensitive mosaic is arranged with respect to the signal plate of a picture tube.

The following more detailed description of the action of the Iconoscope is presented for those interested. When a scene is focused on the mosaic, each photosensitive globule emits electrons in proportion to the amount of light falling upon it; the more light that falls on a given area the more electrons are emitted from that area. This process is called "photoemission." Since a loss of electrons means a more positive charge, photoemission sets up a variety of different charges over the surface of the mosaic in accordance with the distribution of the light it is receiving. So far no video signal has been produced because the globules are insulated from the signal plate.

Since the path from the mosaic to the signal plate is through a condenser, the only way to get a signal across is to produce a sudden *change* of potential. In the Iconoscope type of camera tube, this change of potential is produced by the action of the electron beam from the gun. (The necessary orderly scanning action from left to right and top to bottom is provided by suitable currents through the deflecting yoke, as in the case of a magnetically deflected picture tube.) In order to understand the effects produced by this scanning beam, let us first consider three possible conditions on the surface of the mosaic *before* scanning. It has been found that the ordinary Iconoscope mosaic in *total darkness* (black scene) assumes a potential of —1.5 volts relative to the collector ring. When strong light (white scene) falls on a portion of the mosaic, a considerable number of electrons are lost by photoemission, and the potential is changed from, say, —1.5 volts to 0 volts. Illumination of medium intensity (gray scene) may cause the potential to change from —1.5 volts to —0.8 volt. These potentials of the mosaic, then, may be approximately as follows for these portions of the mosaic: black area, —1.5 volts; gray area, —0.8 volt; white area, 0 volts.

The electrons in the scanning beam travel so rapidly that when they strike a surface such as the Iconoscope mosaic, they knock off a great many electrons, more, in fact, than even bright light does. This kind of action is called "secondary emission." So many electrons are thus lost by secondary emission, that the portion of the mosaic directly under the action of the scanning beam is driven to a *positive* potential of +3 volts. Each portion of the mosaic is driven to +3 volts *during the instant the scanning beam acts upon it* and this +3-volt potential is reached *regardless of the light conditions prevailing* . . . a black area goes to +3 volts as well as a white or gray area. Although the *peak* potential reached by every area as the scanning beam passes over it is the same, the *change in potential* which this area undergoes at this time *will depend on the illumination* it has received. Thus the black area will change from —1.5 to +3 volts, a change of 4.5 volts; the gray area will change from —0.8 to +3 volts, a change of 3.8 volts; the white area will change from 0 to 3 volts, a change of 3 volts. It is this sudden *change of potential* which is induced on the signal plate that causes the video signal current to flow through the load resistor. The *difference between the changes* for black, gray and white areas is what indicates the difference in the illumination over the mosaic surface as it is scanned, and this difference is proportional to the distribution of light over the mosaic.

The important things to notice here are: (1) that we get a video signal across the load resistor (Fig. 11) only when a *change of potential* is produced on the mosaic, and that this is accomplished by the scanning beam; and (2) that the resultant *video signal is proportional to the light coming from the scene being televised,* the signal being of *maximum* amplitude for *black* portions of the scene, *minimum* amplitude for *white* portions.

The collector ring (2nd anode) serves to accelerate the electrons in the scanning beam, and also to collect some of the electrons emitted from the mosaic. In Fig. 11 you will notice that this element is grounded; it is, however, 500 to 1000 volts *positive* with respect to the cathode of the electron gun, because the gun is at a corresponding potential *negative* with respect to ground. This will not be the last time that you will find television tubes with elements at very high negative potentials, and the possibility of such circuits existing must always be borne in mind as a safety measure.

SCANNING AND SYNCHRONIZATION

In previous sections we discussed (1) the necessity for scanning both the camera tube and the picture tube, (2) the essential requirement that these operations must be synchronized, and (3) the devices which make it possible to control the motion of the electron beam in these tubes. In this section we shall describe the details of the path of the scanning beam on the tube screen, the waveshapes necessary to produce this path and some of the problems which arise in connection with scanning.

The Scanning Pattern

As we have already mentioned, the usual scan is from left to right and from top to bottom. In certain cases this order must be reversed, but the principle is the same. In Fig. 13 is shown a simplified diagram of a scanning pattern; this is often called a "raster." The rectangular diagram formed by the light lines connecting points A, B, C and D represents what we may call the "picture space." The width of this rectangle (AB) is drawn so as to be 4/3 times the height (AC); this is the proportion used in motion pictures. The ratio of width to height is called the "picture aspect ratio" and its value of 4/3 is one of the proposed RMA television standards. On a picture tube, the heavy lines ab, cd, etc., are caused by the fluorescent glow which occurs as the electron beam moves from point a to point b (in the direction of the arrow on line ab). You will notice that points a and A coincide, while point b is slightly *below* point B. In fact, *all* the lines in Fig. 13 slant downward. This slant is necessary to provide the *vertical* (top-to-bottom) part of the scanning process. In fact, the left-to-right component of scanning is called "horizontal scanning" or "line scanning"; the top-to-bottom component is called "vertical scanning" (also called "frame scanning" or "field scanning," for reasons which will be clear later on). This slant-line system of scanning is used because the characteristics of the electrical circuits which provide scanning make it impossible to scan in a series of truly horizontal lines, with an abrupt vertical drop at the end of each line.

After the beam reaches point b it is deflected back along the dotted line bc to start a new line, cd. On the picture tube the line bc would be much fainter than line ab because the *time* allowed for the beam to move from b to c is only about one-tenth the time allowed for it to travel from a to b. Lines like ab, cd, etc. are called "line traces"; lines like bc, de, etc. are called "line retraces" or "line flybacks."

Here some questions may arise: Why does the motion of the spot across the screen appear as a line? Why is the flyback dimmer than the trace? The eye is responsible for these effects. Any one who has ever swung a flashlight or a "sparkler" in a circle must have noticed that as the speed of the swinging is increased, the individual spot of light merges into an apparently continuous circle of light. The velocity of the scanning spot across the picture tube screen is so rapid (several thousand miles per hour) that the eye cannot distinguish the spot from a continuous streak. This property of the eye is called "persistence of vision."

The difference in brilliance between the trace and the flyback is due to the fact that the brilliance of the fluorescence produced on the picture-tube screen depends on the *time* during which the electron beam acts upon it. Although in both cases the actual time is very short, the *difference* in time (about 10 to 1) does result in a very marked difference in brilliance.

A complete set of lines such as shown in Fig. 13 is called a "frame." This particular frame is completed when the spot reaches point l; it then returns to point a to start a new frame. A frame like that shown in Fig. 13 is said to be built up by "progressive scanning" (the lines follow each other in a continuous chain). Six complete lines (retraces are not counted) are shown in this figure; a complete technical description of this figure would be: "A six-line frame (or raster) produced by progressive linear scanning." Of course, so few lines as we have shown would be insufficient to give a good picture, and a very great many more are actually used. In order to give the eye the illusion of motion, many complete frames must be

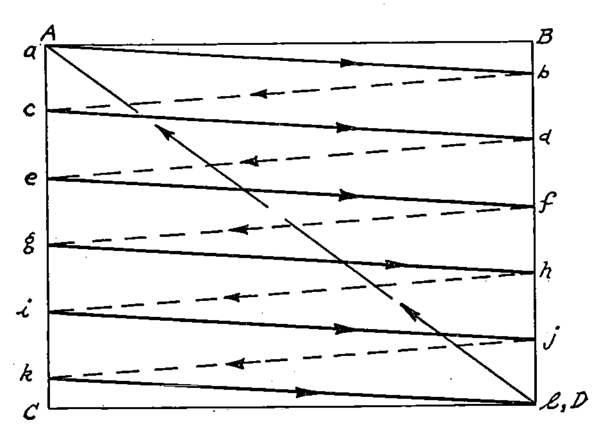


FIG. 13.—A simple progressive scanning pattern in which the picture is scanned in a series of lines which start at the upper left and slope down to the right.

traced out every second. The standard American procedure is to trace 30 complete frames every second; each frame consists of 441 lines.

Flicker and Hum on the Raster

It has been found that if the raster is bright a *flicker* will be observed when the number of frames per second (frame frequency) is less than a certain critical value. Although a satisfactory illusion of motion might be produced by about 12 frames per second, as many as 48 frames per second may be required to remove objectionable flicker. The more frames per second a television transmitter sends out, each having a large number of lines, the higher the modulation bandwidth required. One way to keep the bandwidth down is to send twice as many frames per second, each frame having half the number of lines. But a large number of lines is necessary for detail in the picture. It was therefore decided to divide the total number of lines in each frame between two rasters (called "fields"), each containing half the total number of lines required to make up a frame. These fields, transmitted at the rate of 60 per second, get rid of the flicker effect. The required number of lines per frame is supplied by sending the odd-numbered lines along with one field and the even-numbered lines along with the following field. The fields are transmitted so rapidly that as far as the eye can see, all the necessary lines appear in their proper positions on the raster simultaneously.

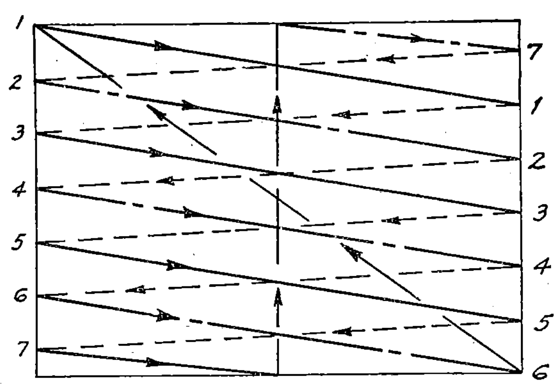


FIG. 14.—An interlaced scanning pattern in which the odd and even lines are scanned on successive fields.

The method of scanning just described is called "interlaced scanning," and is the system now in use. A simplified pattern of a frame produced by interlaced scanning is shown in Fig. 14. The general principles are the same as for progressive scanning; in fact, each *field* is itself progressively scanned. The lines transmitted during the first field scan, referring to Fig. 14, are lines 1, 3, 5 and the first half of line 7. The beam is then deflected to the top of the picture space to begin the second field. During the second field, line 7 is completed and lines 2, 4 and 6 are traced, thus completing the entire seven-line frame in two steps. (As in Fig. 13, the arrows show the direction of travel of the beam spot.) The use of an odd number of lines has been found advantageous in interlaced scanning; this method is called "odd-line interlacing." American practice calls for 220.5 lines in each field, making 441 total lines per frame. Sixty fields are transmitted each second, giving a field frequency of 60 per second.

The frame frequency chosen depends upon the a-c power-line frequency; it must be an even multiple or submultiple thereof. The reason for this is that if there is some hum present in the deflecting circuits, a certain amount of distortion will appear in the picture. If this distortion appears to be stationary, and is not excessive, it can probably be tolerated. On the other hand if the distortion moves so that the picture appears to have moving ripples in it, even slight distortion is most objectionable. By making the frame frequency an even submultiple of the power-line frequency, this type of hum pattern can be rendered stationary. Since most American power lines use 60-cycle a.c., the frame frequency chosen was 30 per second. (In England, with 50-cycle a.c., the frame frequency is 25.)

Scanning Waveform

In describing the picture tube, we showed that the beam can be deflected by applying suitable potentials to the deflecting plates or suitable currents through the deflecting coils. The nature of these voltages and currents depends on the kind of deflection to be produced. In Fig. 14 is shown the kind of deflection required in television scanning. The trace deflection required is a steady motion from left to right along a line slanting slightly downward to the right; the retrace travels from right to left along a line slanting downward to the left. We found out that such a motion will occur when both sets of deflecting plates or coils are in operation simultaneously. Thus in scanning, two deflection circuits are acting at once, one moving the beam horizontally (horizontal deflection circuit), the other moving it vertically (vertical deflection circuit).

The shape of the voltage (or current) wave which has to be applied to the deflecting plates (or coils) to produce the desired scan is shown in Fig. 15. At (a) is shown the waveform for horizontal or line scanning; at (b) the waveform for vertical or field scanning. Notice that the time of the line wave is equal to the time of the field wave divided by the number of lines per field (1/60 second divided by

$220.5 = 1/13230$ second). Also notice that the line retrace is allowed only about 1/6 the time allowed to the line trace; the field retrace is allowed 1/13 the time of the field trace. The total time-intervals allowed for these waves indicate that the line-scan fre-

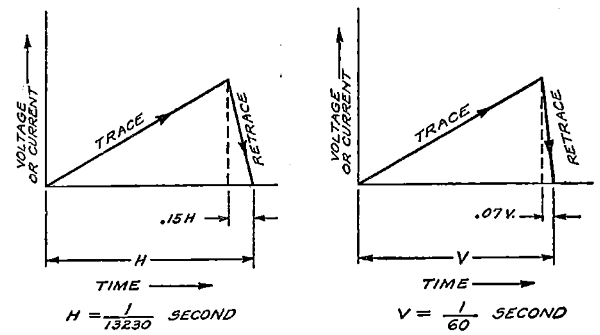


FIG. 15.—At the left is shown the sawtooth waveform required for horizontal scanning. A similar waveform, but of much lower frequency, is required for vertical deflection; it is shown at the right.

quency is 13,230 cycles and the field-scan frequency is 60 cycles. These waveforms are called sawtooth waves; circuits for generating them are described in a later section.

Overall View of a Television System

We are now in a position to obtain a bird's eye view of a complete television system. Such a step is advisable at this time because of the complexity of the system and the desirability of not losing sight of the function of the principal parts in the maze of detail associated with all the individual elements of the system.

Fig. 16 shows the general role played by each of the major units of a television system in causing the picture of the televised scene to appear on the screen of the picture tube. Referring to this illustration, you will note that the camera tube is focused on the scene to be televised with the result that an image of the scene is formed on the photoelectric mosaic of the camera tube. In this way each point of the mosaic takes on a voltage which is proportional to the light value associated with this point of the image. In order to transmit this information, the electron beam of the camera tube completely scans the image on the photoelectric surface 30 times in each second. As a result of this the video portion of the television signal is produced in which the electrical variations correspond with the light variations on the screen of the camera tube.

In order to fulfill the requirements of synchronization, the need for which has already been explained, a synchronizing signal (abbreviated "sync" signal) is applied to the camera tube deflecting circuits so that the scanning of the electron beam is at all times under the timing control of this sync signal.

At the same time this sync signal must also form a part of the television signal which is broadcast in order that the scanning at the picture tube in the receiver can be kept in synchronism (in step) with the scanning at the camera tube. For this reason you will note that the sync circuit also feeds the same sync signal to the video amplifier, and as a result the complete signal contains information not only on the light values but also the necessary control signals to synchronize the scanning at the picture tube with that at the camera tube.

The complete television signal is amplified by the video amplifier circuits in the transmitter and fed to the modulating circuits of the transmitter where it modulates the high-frequency radio wave which serves as the carrier. According to the present frequency allocations assigned by the Federal Communications Commission, the carrier frequencies used lie within the range between 44 and 108 megacycles, with the lower values being in greater use. The reasons for the use of carrier frequencies in the ultra-high frequency range and the actual make-up of the signal will be discussed later in detail.

The signal which is radiated by the transmitting antenna is picked up by the receiving antenna and fed to the television receiver. The television signal is

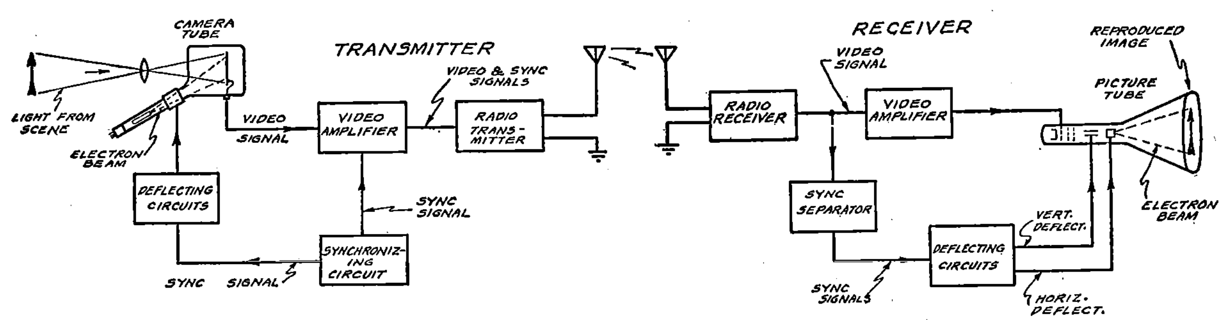


FIG. 16.—The principal elements of a complete television system. Note the provision made for synchronizing the scanning at the picture tube with that at the camera tube.

amplified in this receiver which incidentally is almost invariably of the superheterodyne type. After sufficient amplification the signal is demodulated in the second detector of the receiver and the video and sync signals are recovered. The video amplifier following the detector further amplifies the signal which is finally impressed on the control grid of the picture tube. The fluctuations of voltage on the control grid of the picture tube cause the intensity or brightness of the scanning spot to vary in accordance with the amount of light on that element in the scene which at that particular instant is being scanned by the electron beam of the camera tube.

The receiver contains separate circuits for deflecting the beam of electrons horizontally and vertically so as to accomplish the scanning of the image at the picture tube. In general these circuits are similar to those used to deflect the electron beam at the camera tube. To insure absolute synchronization between the scanning at the picture tube and that at the camera tube, the receiver contains circuits (called sync separator circuits) for separating the synchronizing pulses from the complete television signal. As is noted in the figure, these impulses are applied to the deflection circuits in the receiver and keep the two scanning beams—the one in the camera tube at the transmitting end and the other in the picture tube at the receiving end—in perfect synchronism. In this way the image of the scene is traced out by the moving spot of light on the screen of the picture tube.

In the above description we have omitted a consideration of the sound broadcasting which almost invariably is a part of the television broadcast. For the present, it will be sufficient to understand that the sound is transmitted and received in the same way as a conventional sound broadcast even to the extent that an entirely separate carrier is used to carry the modulation of the sound accompanying the television broadcast.

THE TELEVISION SIGNAL

One of the most important factors delaying the commercial introduction of television in this country was the necessity for establishing definite standards. You can appreciate that standards are of tremendous importance in television—and in this respect television is unlike radio—because of the close relationship which exists between the design of the receiver and conditions at the transmitting end. Thus the manner in which the image is scanned and the manner in which the synchronizing information is conveyed influence both the design and operation of the receiver.

To avoid the danger of establishing transmitting standards which would tend to prevent progress in television, the entire problem in all its aspects was investigated by the television committee of the Radio Manufacturers Association—the RMA. After several years of careful study, the standards were arrived at which are the basis of television in the United States today. It is believed that these standards have been made flexible enough to permit gradual improvements without requiring radical changes in receivers now being distributed and sold. Thus improvements which will be made will probably be improvements in the present basic system rather than radical changes in the system itself. The primary contribution of the present RMA standards is that they have started television out along the path which appears to hold the greatest promise for the future.

The Video Signal

We are now in a position to consider more fully the nature of the signal which is used to transmit the television image. Up to this point we have explained in a general way that this signal contains the electrical image of the scene being televised and in addition contains the information required to synchronize the scanning at the camera tube with that at the picture tube. We will now go into greater detail as to the structure of this signal because of the bearing which it has on the operation and servicing of television receivers.

It will be helpful in understanding the nature of the television signal to review briefly the audio signal used in sound broadcasting and later to compare the two. In Fig. 17a is shown a typical sound or audio signal. As you know, the amplitude of this audio signal represents the intensity (loudness) of the sound, and the number of cycles per second represents the frequency (pitch) of the sound. During periods when the sound intensity is zero, the amplitude of the sound wave is of course zero; on the other hand, during periods when the sound intensity is high, this is represented by a proportionate increase in the amplitude of the signal. An important characteristic which you should note is that in a sound wave, the amplitude of the wave has both positive and negative peaks and extends equally in both directions from the zero axis.

A typical video or picture signal, that is, the electrical signal which represents the variations in brightness over the elements of a scene, is shown in Fig. 17b. The horizontal line in the left-hand portion of the signal shown represents the signal voltage produced by an *unilluminated* or *black* portion of the scene, which is called the "black level." In discussing video signals this black level is used as a reference from which the light values corresponding to all other signal voltages are measured. The reason for this is apparent from inspection of the rest of Fig. 17b, which represents various signal voltages corresponding to parts of the scene reflecting varying degrees of brightness. Note that as the brightness of the scene increases from black, the voltage of the video signal decreases, and that in any case the picture brightness never results in a signal voltage greater than the black level. The black level is therefore a suitable reference, because its voltage is fixed and easily reproduced. "White" would not be a suitable reference because the signal voltage corresponding to "whitest white" depends upon the maximum intensity of illumination available.

A video signal in which the signal voltage decreases (from the black level) as the picture brightness increases toward white is said to have a "negative picture polarity." The signal of Fig. 17b, as we have seen, is of this type. If we call the black-level voltage zero volts in Fig. 17b, all other shades of brightness will produce negative voltages, the whitest part of the scene having the greatest negative voltage. A signal having negative picture polarity is used to modulate the television carrier in present-day American television. Of course it is perfectly possible to have a video signal in which the signal voltage increases as the picture brightness increases; in this case the signal is said to have a "positive picture polarity." In fact we shall see later on, in considering receiver circuits, that the signal undergoes a reversal of polarity in passing through each stage of the video amplifier.

The important difference between the audio signal and the video signal is that the *video signal is always located on only one side of the black reference level,* whereas the audio signal contains variations on both sides of the zero-signal level. The video signal is therefore a pulsating voltage with a d-c component, not an a-c wave like the audio signal.

Let us now consider the video signal in greater detail. Fig. 18a shows the output of the camera tube for two successive lines of the image. At the same time Fig. 18b shows these two lines as they appear on the scanning pattern or raster. Starting at a, the beginning of the field, the beam traces the first line a-c; referring to the signal (Fig. 18a) it can be seen that the image is black at a, changes gradually to a brilliant white at b, and finally changes gradually to black at the end of the line c.

During the retrace time c-d, the signal level is maintained at a uniform black level as shown by c-d on Fig. 18a. This "black" interval during which the retrace is carried out is called the "horizontal blanking period," and the pulse c-d is called the "horizontal blanking pulse," or the "horizontal blanking pedestal."

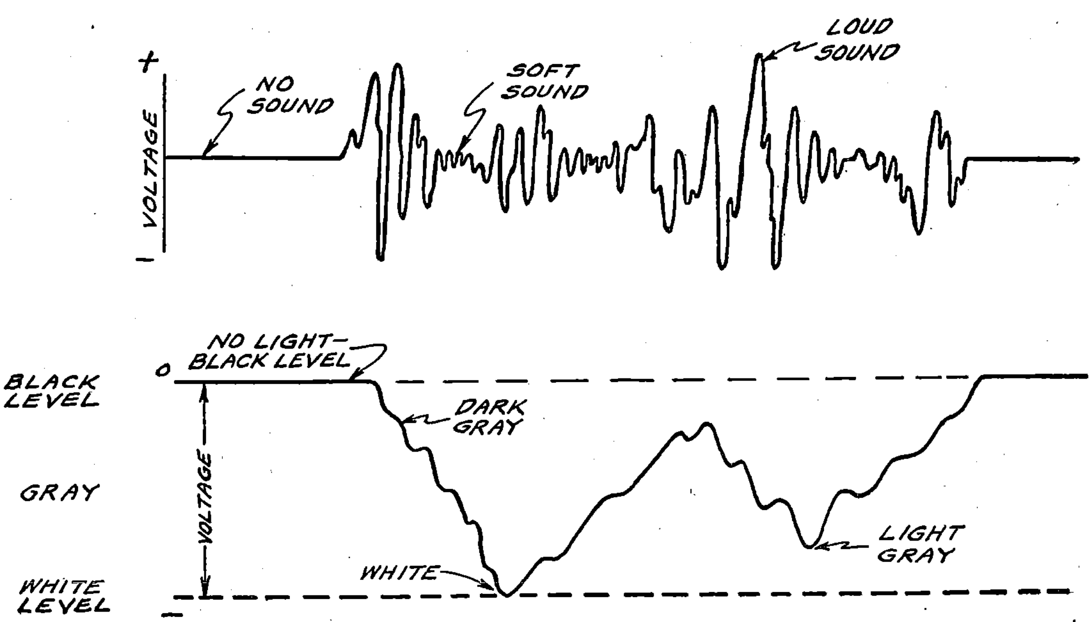


FIG. 17a, 17b.—Comparison between a sound and video signal. In the video signal black is represented by a fixed level, and various shades of brightness by voltages which are displaced proportionately from the black reference level.

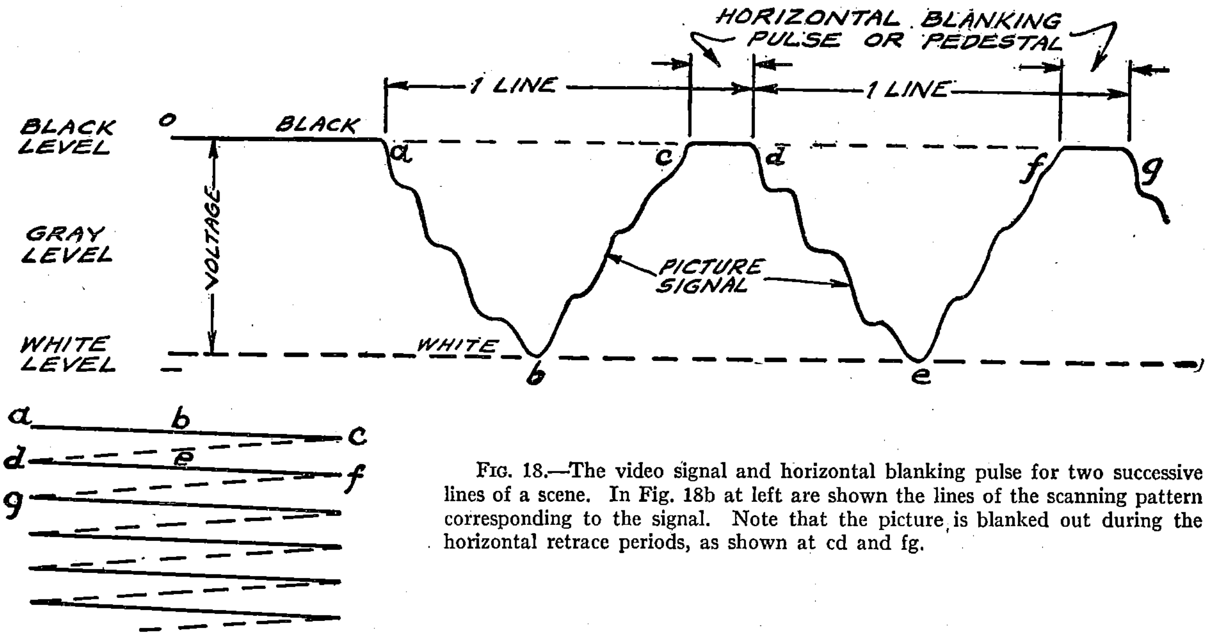


FIG. 18.—The video signal and horizontal blanking pulse for two successive lines of a scene. In Fig. 18b at left are shown the lines of the scanning pattern corresponding to the signal. Note that the picture is blanked out during the horizontal retrace periods, as shown at cd and fg.

As we shall see later in more detail, the pedestal performs two functions: (1) It blacks out the return trace so that it will not appear on the screen of the picture tube and (2) it provides a platform on which the horizontal synchronizing pulse is erected. Note that the second scanning line d-e-f is essentially the same as the first line and again the line is terminated on the signal wave by a blanking pulse f-g. In this way the entire field is scanned and the picture signal corresponding to the light and dark variations of the field is produced.

Signal and Sync Pulses

In the previous section we showed the video signal without discussing the modifications which must be made in the signal in order to provide the necessary synchronization. We shall now describe how this synchronizing information is added to the signal.

Consider the video wave shown in Fig. 19. This shows the wave for the last two lines of the field, just preceding the vertical retrace period during which the beam returns to the upper portion of the field. Starting at the left of the figure, the first thing you will note is the addition of a pulse which is erected on top of the horizontal blanking pulse; this is called the "horizontal sync pulse." As we shall see later in the discussion of receiver sync circuits, this small rectangular pulse provides the means which keeps the horizontal line or scanning oscillator in the receiver in synchronism with the scanning at the camera tube. An important thing to note is that this sync pulse is located in the "blacker-than-black" region so that the screen of the picture tube is kept dark during the period of the horizontal retrace. Thus the portion of the signal more positive than black is used for synchronizing information, whereas the voltage more neg-

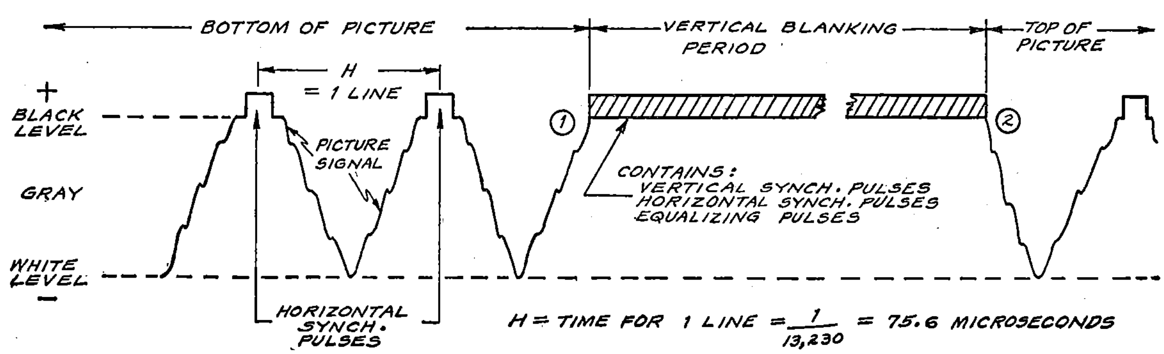


FIG. 19.—The video signal, showing the last two lines of a field followed by a vertical blanking period. Horizontal sync pulses have been erected on the horizontal pedestals and during the vertical blanking period the vertical sync pulse is transmitted.

ative than the black level is used for the picture information. It is also important to observe that this line-synchronizing pulse appears at the end of each line so that constant synchronization of the line oscillator is maintained.

At the end of the last line at the bottom of the field represented by point 1 in Fig. 19, the beam is ready to return to the upper edge of the field. As in the case of horizontal scanning, a sync pulse is required to return the beam to the top at the proper instant. All the information associated with the end of the field, required to return the beam to the top of the field in preparation for the one to follow, is contained in the interval designated as the "vertical blanking period." Essentially the following three functions are performed during the vertical blanking period: (1) A field synchronizing pulse is provided (the exact nature of this pulse is described later) so that the beam will be returned to the start of the frame at the proper instant. (2) The entire signal is blacked out so that the field retrace and lines scanned during this interval will not be apparent to the observer. (Actually, of course, the line-scanning circuits continue to function, but the beam does not exist because of the negative voltage on the control grid of the picture tube during this interval.) (3) The line synchronizing pulses are maintained during the vertical blanking period, which lasts for about 15 lines, so that the horizontal deflecting circuit in the receiver will not slip out of synchronism during this period. In addition to the vertical and horizontal sync pulses, two groups of so-called "equalizing pulses" are transmitted during the vertical blanking period; these are required for reasons which will be explained later.

RMA Standard Television Signal

It is desirable at this point to show the complete signal which has been recommended by the RMA to be used as the standard for this country. To illustrate the makeup of this signal, Fig. 20 shows the signal for two successive fields in the neighborhood of the vertical blanking pulse. Accordingly the left-hand portion of A shows the last four lines of any one field. This is followed by the vertical blanking period which contains equalizing pulses both preceding and following the vertical sync-pulse interval. After the last equalizing pulse the horizontal sync pulses are resumed; by this time the beam has been returned to the upper portion of the screen so that shortly thereafter the normal video signal is resumed. To summarize, the first line, A, shows the complete signal as it exists for any one field both before and after the transmission of the vertical blanking period.

Part B of this figure describes the signal as it exists 1/60 second later for the following field. Since the scanning is interlaced, note that the line-sync pulses in B appear *between* the line-sync pulses in A, thus providing the timing which is essential for interlacing. Again the last line in this field is followed by a vertical blanking period at the end of which the video signal is resumed. Note that for both parts of the figure, the reference point from which time is reckoned is the beginning of the vertical sync pulse, which is designated as taking place at any time represented by $t = t_1$. Using this time reference, it of course follows that the vertical sync pulse for the next field must begin 1/60 second later (since there are 60 fields per second); this is shown by part B of the figure so that the two vertical sync pulses are directly below each other but 1/60 second apart in time.

The description which follows shows in greater detail those parts of the complete video signal which have already been described. The specifications throughout are those of the RMA.

Horizontal Blanking and Synchronization

As shown in Fig. 20, the horizontal sync signal is transmitted at the end of each line and consists of an essentially rectangular pulse erected on the horizontal blanking pedestal. The amount of time allowed for the blanking pedestal is specified as 15% of the total time from the beginning of one line to the beginning of the next line. Since the time for each line (including the retrace) is 75.6 microseconds (1/13230 second), the time devoted to horizontal blanking is about 11 microseconds. This interval of 11 microseconds has been found to be just large enough to allow for the retrace time, to allow the spot to assume normal scanning speed at the left edge of the picture and to maintain reliable synchronization.

The whole of the horizontal blanking interval is not utilized for the synchronizing pulse as can be seen by examining the enlarged view of the wave between C-C (Part A) shown in the detail view, Part C of the figure. Actually only about half the total blanking time is used, and the front or leading edge of the sync signal is placed as close as possible to the beginning of the blanking pulse. The small allowance which is made takes care of some variation in timing and insures that the sync pulse will not run into the video portion of the signal and thus upset the line timing.

Vertical Blanking and Synchronization

The vertical blanking interval follows the last line of each field and consists of the following four parts which will be considered separately.

(1) *Equalizing-Pulse Interval*: Six equalizing pulses one-half line apart precede the sync pulse and accomplish (a) the maintenance of horizontal or line synchronization and (b) the "equalization" of the intervals preceding the vertical sync pulse so that *conditions preceding the vertical sync pulse are identical for alternate fields.* The need for these equalizing pulses arises because of the interlacing of alternate fields. As you can see from Fig. 20, the lines in the second field (B) are interlaced between those of the preceding field (A). If the equalizing pulses were eliminated and the vertical sync pulses were inserted in A at the end of the last line, then the vertical sync pulse would have to appear in the next field B at the middle of the line; the reason for this is that 1/60 second later the beam is in the middle of the line because of the interlacing. Thus *without the equalizing pulses,* the conditions preceding the vertical sync pulse would be different for each of the two fields. This would tend to produce a different type of vertical sync pulse for alternate fields, upset the synchronization and give rise to the distortion known as "pairing of the interlace." In a paired interlace, the even-scanned lines do not lie midway between the odd-scanned lines, because of the difference in timing on alternate fields.

In connection with the maintenance of line synchronization during the vertical blanking interval, note that the leading edges of the equalizing pulses function to maintain synchronization. Not all the pulses are used for each field, however. Thus note that because of the interlacing, the first, third and fifth equalizing pulses are used on the first field (A), and the second, fourth and sixth pulses are used on the succeeding field (B). This explains why six pulses are used, each spaced one-half line apart, rather than three pulses spaced one line apart. It would, of course, be possible to use three different pulses in each field, but if this were done the signal preceding the vertical sync pulse would be different for succeeding fields and there would be a resulting absence of equalization.

(2) *Vertical Sync Pulse*: The vertical sync pulse follows directly after the equalizing pulse interval and consists of six broad pulses in which the edges are serrated or cut at one-half line intervals. The function of the vertical sync pulse is to provide the control signal which tells the vertical oscillator that it is time to begin the retrace and thus to return the beam to the top for the beginning of the next field. The pulses in the vertical sync-pulse interval are considerably broader than the line pulses so that the sync separator circuit will be able to distinguish between the two types of pulses and thus be able to separate the vertical sync pulses from the horizontal sync pulses. At the same time the edges of the serrations at half-line intervals provide the necessary control for maintenance of horizontal synchronization. The serrations are required at half-line intervals because of the interlacing; the reasoning used in connection with the equalizing pulses also applies here.

(3) *Lagging Equalizing Pulses*: It was explained previously that in order to provide identical conditions for the two successive fields preceding the vertical sync pulses, six equalizing pulses were inserted in front of the vertical sync pulse in each field. It is just as necessary to keep the conditions following the vertical sync-pulse interval the same for the two successive fields A and B; for this reason six lagging equalizing pulses appear in both A and B after the vertical sync pulse. If you examine the vertical sync-pulse interval in both A and B you will see that, although the lines in the two fields are displaced by one-half line because of the interlacing, nevertheless the conditions in the neighborhood of the vertical sync-pulse interval are the same for both fields. Note that the lagging equalizing pulses are also one-half line apart so that line synchronization is maintained for both the "odd" and "even" fields.

(4) *Normal Horizontal Sync Pulses*: The lagging equalizing pulse interval is terminated before the end of the vertical blanking period so as to prepare the line oscillator for the normal horizontal sync pulses which are to follow. In practice, the video signal is blanked out for a period of from 7 to 12 lines following the last equalizing pulse so that the line oscillator (which may have been operating at double line frequency during the preceding period) has a chance to settle down to being under control of the normal type of sync signal. At the end of the vertical blanking interval, the blanking is of course removed and the video portion of the signal again controls the intensity of the beam in the picture tube.

Range of Frequencies in Video Signal

Unlike audio signals which contain frequency components ranging from a low value of about 20 cycles per second to a high value of about 12,000 cycles per second, video signals include a range from practically zero frequency (produced over areas where there is little variation in light intensity) to as high as 4 or more megacycles (produced over areas where there is a very rapid variation in light intensity).

It is interesting to examine the manner in which the maximum frequency required in the video signal is related to the amount of detail which is reproduced. This can be arrived at from the following considerations: Let us assume that we wish to transmit a picture in which the same resolution or detail is desired in the horizontal direction as in the vertical direction.

Now in the vertical direction we have a total of 441 lines or 441 elements. Since a horizontal line is 4/3 times as long as a vertical line (the picture is 4/3 times as wide as it is long), it follows that there are 4/3 as many elements in a horizontal line as there are in a vertical line. This makes a total of 441 x 441 x 4/3 or 260,000 elements in the complete picture.

Since we wish to calculate the maximum frequency which is required to reproduce the light and dark variations over each one of these 260,000 elements, let us assume that alternate elements in the picture are black and white so that the image resembles a checkerboard pattern. This type of scene requires the highest possible frequency for faithful reproduction because of the rapid variation in light intensity as the beam goes from one element to the next. The exact opposite of this type of scene would be one which was uniform over its entire area, for in this case it would be necessary for the system to transmit only very low frequencies. For the checkerboard pattern under discussion, the variation from black to white in scanning two adjacent elements requires a certain amount of time. This amount of time represents the duration of one complete cycle and 1 divided by this number represents the highest frequency which must be transmitted.

Let us calculate this time interval required for the beam to scan two adjacent black and white elements. Since there are 260,000 elements in a complete picture and it requires 1/30 second to transmit this picture, the time alloted to the transmission of information on two elements (1 cycle) is equal to

$$\frac{2}{260{,}000} \times \frac{1}{30}\ \frac{\text{second}}{\text{cycle}} = \frac{1}{3{,}900{,}000}\ \frac{\text{second}}{\text{cycle.}}$$

The frequency generated when the scanning beam passes over these two elements is thus equal to 3,900,000 cycles per second, or 3.9 megacycles.

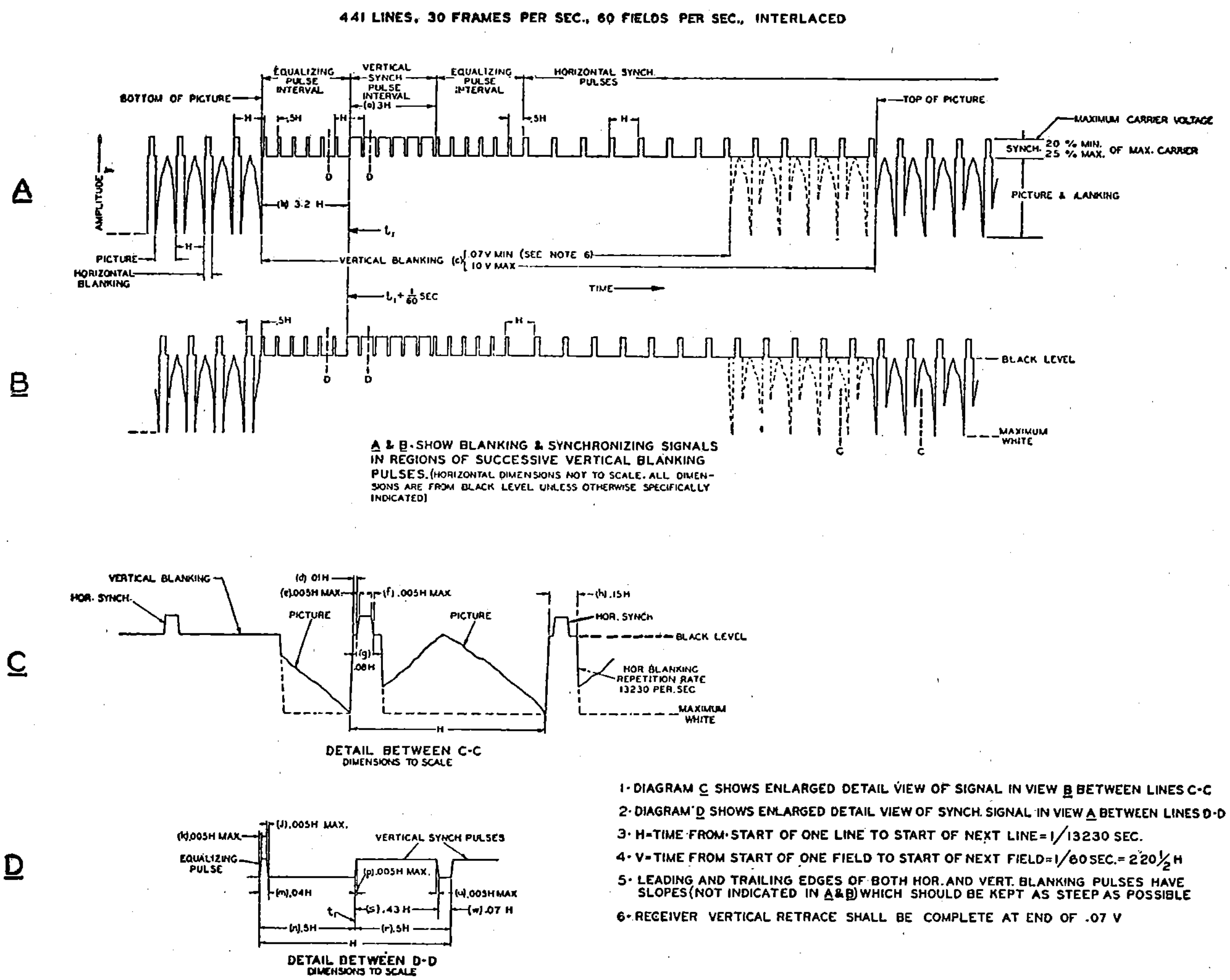


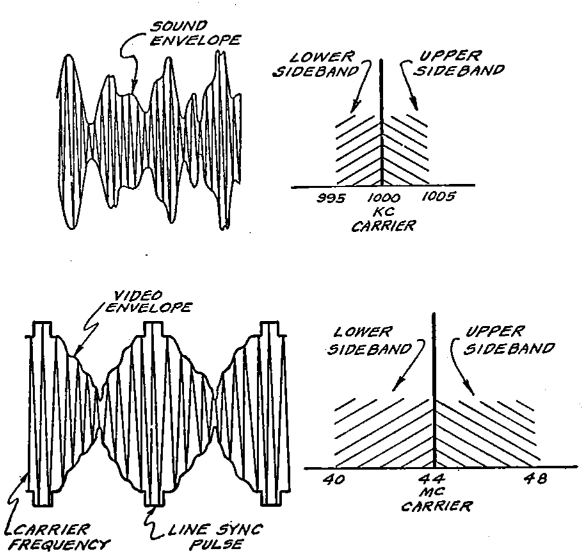
FIG. 20.—The standard RMA television signal. Diagram A shows the signal at the bottom of any one field; diagram B shows the signal at the bottom of the next field, 1/60 second later. Note the interlacing of the lines in the two successive fields shown by A and B.

As we have previously seen, the maximum frequency which is present in the video signal is related directly to the amount of detail required in the image. It has been found that for the smaller picture tubes satisfactory detail is obtained when frequency variations up to 2.5 megacycles are transmitted and that little is gained by transmitting the high frequency components produced in the scanning at the camera tube. However, where a comparatively large picture tube is used, additional detail and a finer image can be produced by transmitting frequency components ranging up to about 4 megacycles.

The Modulated Wave

In previous sections we have described the video wave produced when a scene is scanned and the modifications which are made in this wave in order to provide for both line and field synchronization. We now need to consider the make-up of the modulated wave which is produced when this video wave is arranged to modulate a high-frequency carrier.

First let us review the result of modulating a carrier with a conventional audio signal. As Fig. 21a shows, if we modulate a 1000-kc carrier with an audio signal which contains frequency components ranging up to 5 kc, then the resulting modulated wave contains, in addition to the carrier frequency, new frequencies which extend to the limits of 5 kc below the carrier frequency and 5 kc above it. In other words, the process of modulating the carrier results in the introduction of two sets of *sidebands* which extend outward from the carrier to a value equal to the highest frequency in the modulating wave. The sideband which contains frequencies lower than the carrier frequency is called the "lower sideband," and that which contains the frequencies higher than the carrier is called the "upper sideband."



Figs. 21a, 21b.—The sidebands in a sound signal occupy a bandwidth of only about 10 kc whereas the sidebands in a television signal require a bandwidth of about 8 mc or 8000 kc.

It would be impossible to use a broadcast-band carrier for television work. This can be seen from the fact that unlike sound, the video modulating frequencies would themselves be higher than the carrier frequency. In order to make the modulation process work, it is necessary that the carrier frequency be at least several times the highest frequency of modulation. For this reason the carrier frequency in television must be several times as high as the maximum video frequency, or several times 4 mc. Actually the carrier frequencies which have been chosen for television are at least ten times the highest video frequency since the lowest carrier frequency which is being used for 441-line television is 44 mc.

Some of you may recall that a few years ago, carrier frequencies only a little higher than the broadcast-band were assigned to experimental television. This merely illustrates our point, however, since those early low-definition pictures contained comparatively few elements and consequently had maximum video frequencies far below those found in present-day high-definition work (for example, 100-line picture has a top video frequency only 1/16 as high as that of a 400-line picture).

Returning to the comparison between a broadcast-band carrier modulated by a sound wave and a modulated television carrier, we show in Fig. 21b the wave which results when a 44-mc carrier is modulated with a video signal. As in the case of the 1000-kc carrier, the process of modulation introduces two sets of sidebands, and for the example shown the two sidebands extend to 4 mc below and 4 mc above the 44-mc carrier.

It is interesting to compare the bandwidth required for the transmission of a scene by television with the bandwidth required in sound broadcasting. As Fig. 21 shows, a sound broadcast requires only a 10-kc channel whereas the television channel (arranged for double-sideband modulation) requires 8000 kc or 800 times as much space as the sound channel. Although it is possible to locate approximately 100 sound channels in the broadcast band it would require more than 8 times the space provided by the entire broadcast band for the transmission of a single television channel with double-sideband modulation. The large amount of the radio spectrum required for television is one of the reasons for the choice of the ultra-high frequency range for television.

Positive and Negative Modulation

In discussing video signals we pointed out that the video signal is said to have a positive or negative picture polarity depending upon whether the changes from the black level take place in a positive or a negative direction, respectively. In modulation we run into somewhat similar terms—positive and negative modulation—which are related not to the polarity of the video signal but to the modulated wave itself. A television carrier is said to have positive modulation when an increase in carrier amplitude corresponds to a brighter area in the scene being scanned. Thus for a wave with *positive* modulation, the *lowest* carrier amplitude corresponds to *black* while the maximum carrier amplitude corresponds to the brightest part of the image. On the other hand, for negative modulation, a decrease in carrier amplitude corresponds to an increase in the brightness of the image. Thus for a wave with *negative* modulation, the lowest carrier amplitude corresponds to maximum white in the image and the *highest* carrier amplitude corresponds to *black*.

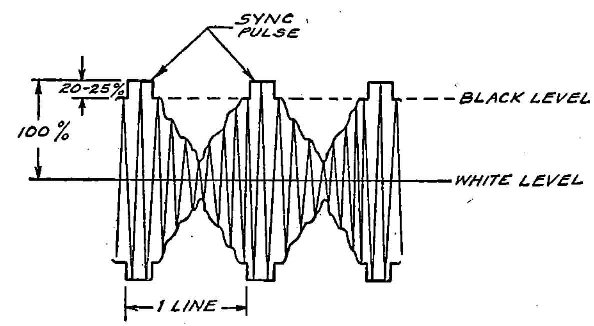


FIG. 22.—A modulated video wave. The sync pulses are located in the blacker-than-black region and occupy from 20 to 25% of the maximum carrier amplitude.

Because negative modulation offers certain advantages in improved performance and simplified receiver design, it has been recommended by the RMA as standard for this country. All television transmissions in this country therefore use negative modulation, although in England positive modulation is being used. As shown in Fig. 22, the maximum amplitude of the carrier is used for the synchronizing pulses and lies in the blacker-than-black region. The term "blacker-than-black" merely means that the sync signals have higher amplitude than black picture signals. It has been found that reliable synchronization can be secured so long as the amplitude of the synchronizing pulses is from 20 to 25 percent of the maximum carrier amplitude; this recommendation is also part of the RMA standards. Actually, then, not more than 80% of the total carrier amplitude is available for transmitting information on the light values in the scene, the rest of the wave being used for synchronization.

Channel Make-up

The standard RMA television channel is laid out so that the complete video signal and its accompanying sound signal can be transmitted as close together as possible, thus making for a compact channel which takes up a minimum amount of space in the radio spectrum. As shown in Fig. 23, the complete channel is 6 mc wide and the video carrier is placed 1.25 mc from the low-frequency end of the channel. The sound is transmitted on a separate carrier which is located 4.5 mc higher than the video carrier or 0.25 mc from the upper end of the band.

In order to use the minimum possible channel width, the major part of the lower sideband is *suppressed* and only the portion shown is transmitted. In this type of transmission, which is known as "vestigial sideband transmission," the transmission is essentially double-sideband for the *low* modulating frequencies (up to approximately 1.25 mc) and then becomes single-sideband for the higher modulating frequencies (above approximately 1.25 mc). This tends of course to overemphasize the *lower* frequencies (since they receive contributions from both the partially suppressed lower sideband and the upper sideband). Such overemphasis is avoided by designing the selectivity of the receiver to attenuate the carrier and the lower (double-sideband) frequencies. The difference between the transmitter selectivity curve and the receiver selectivity curve is shown by the dotted line in Fig. 23.

The advantage of this type of transmission is that it reduces the channel width required for a given maximum amount of detail in the image. We might mention here that earlier RMA proposed standards called for a double-sideband transmission which—although using the same 6-mc channel—made it possible to transmit video frequencies up to only 2.5 mc because both sidebands (occupying a 5-mc total bandwidth) were transmitted.

It is interesting to note the relatively small part of

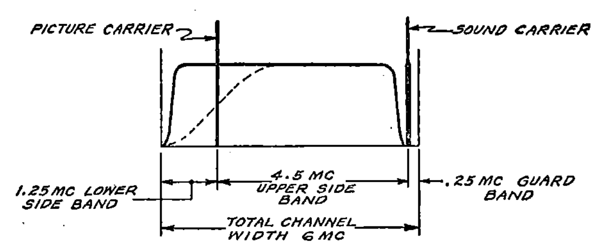


FIG. 23.—Make-up of the standard RMA television channel, showing the position of the picture and sound channels. The dotted line shows the receiver selectivity characteristic.

the total channel width occupied by the sound carrier. Even assuming that radio frequencies up to a maximum of 10 kilocycles are transmitted, this would make the total bandwidth (including both upper and lower sidebands) equal to 20 kc or 0.02 mc. It is thus apparent that the guard band of 0.25 mc is more than enough to prevent the sound modulation from spreading into the next channel. In practice, to take care of oscillator drift, the sound-carrier bandwidth is often about 100 kc.

Frequencies Assigned to Television

The Federal Communications Commission has assigned a total of nineteen channels for television transmissions, each of these channels being 6 mc wide in accordance with the description in the preceding sections. The distribution of these channels is noted in Fig. 24; seven of the channels are located between 44 mc and 108 mc; the remaining 12 lie between 156 and 294 mc. At present, only the lower-frequency channels are in use, but it is expected that the higher-frequency channels will be employed as television services expand.

FIG. 24

Channels Assigned to Television

44–50 MC	156–162 MC	234–240 MC
50–56	162–168	240–246
66–72	180–186	258–264
78–84	186–192	264–270
84–90	204–210	282–288
96–102	210–216	288–294
102–108		

For a number of reasons the ultra-high frequency bands are the most logical choice for television. In the first place, a relatively high-frequency carrier is required to accommodate the wide sidebands. Even if this requirement did not prevent the use of lower frequencies it would still not be feasible to use the lower radio frequencies because these are practically all in use already for other services. The ultra-short waves used for television have the advantage that the waves are not usually reflected by the ionosphere so that multiple signals and fading from this source are eliminated. This is desirable because the time difference in the reception of the direct image and each of the multiple reflected images causes a displaced "ghost" pattern to appear on the screen of the picture tube. The absence of *natural* static is another important feature in making the frequencies above 40 megacycles suitable for television work.

The fact that ultra-short waves travel essentially in straight lines and so do not follow the curvature of the earth limits the effective radius of a television station to a "horizon" which depends upon the height of the transmitting and receiving antennas. In the case of the transmitter atop the Empire State Building in New York City (about 1250 feet above street level) the expected range for reliable reception is about 40-45 miles. Although this is a disadvantage in that the coverage of any one station is limited, there is the slight compensating advantage that the same frequencies can be reassigned in various sections of the country which have a reasonable geographical separation.

RECEIVER CIRCUITS: GENERAL

Having examined the fundamental principles of television, let us now investigate the operation of receiver circuits. These circuits are especially important because primarily the work of servicemen in the field deals with the installation and maintenance of receivers. In order to show the interrelationship between the many components that make up a receiver, we shall first break down the receiver into its major sections and later consider the functioning of these in more detail.

Fig. 25 shows a block diagram of a typical television receiver, this being arranged to show the general character of the signal and the function performed by each section. For convenience we shall assume that the receiver is tuned to the 44-50 mc channel. In accordance with the preceding description, this means that the frequency of the video carrier is 45.25 mc (1.25 mc above the low-frequency end of the channel) whereas the frequency of the audio carrier is 49.75 mc (0.25 mc below the high-frequency end of the channel).

Both these signals, together with their sidebands, are picked up by the antenna and fed through a transmission line to the input of the r-f amplifier. Essentially the function of the r-f amplifier is the same as that of the r-f amplifier in any superheterodyne receiver—to amplify the signal and to reject unwanted signals in adjacent and other channels. In this case, the r-f amplifier is broadly tuned so that both the video and sound carriers, which are separated by 4.5 mc, are amplified equally.

After being amplified in the r-f amplifier, both signals are fed to the *first detector* circuit where the conversion of the signals to the intermediate frequencies takes place. Since there are two radio frequencies, it of course follows that two separate intermediate frequencies are produced.

In accordance with a proposed RMA standard, and general present practice, the oscillator operates at a frequency *12.75 mc above the video carrier frequency.* For the channel being received, the frequency of the oscillator in the receiver is thus equal to 45.25 mc + 12.75 mc, or 58 mc. Since the oscillator frequency is 12.75 mc above the video carrier frequency, it follows at once that the video intermediate frequency produced is equal to 12.75 mc. In the same way, the intermediate frequency of the sound signal is equal to the difference between the oscillator frequency and the sound carrier frequency, 58 mc — 49.75 mc, or 8.25 mc.

Following the first detector, the sound channel is entirely independent of the rest of the receiver and in practically every detail is similar to a conventional broadcast receiver. Thus the 8.25-mc sound i-f signal passes through the sound i-f amplifier (the selectivity of which is broader than usual to minimize the effects of oscillator drift, as mentioned above) and is demodulated at the sound second detector. The avc voltage is supplied in the usual manner to control the gain of the stages in the sound i-f amplifier. The design of the audio amplifier and the reproducer is also conventional so that no further comment is required.

Returning to the video signal, we have seen that a 12.75-mc i-f signal is produced by the first detector and that this signal carries the video modulation. As the diagram shows, this signal is amplified in the *video i-f amplifier,* which usually consists of several stages, and finally reaches the *video second detector* where the signal is demodulated. The video signal recovered at this point is essentially the same as the output of the camera tube so that it contains all the information required to reproduce the picture, and in addition, includes the blanking and sync pulses. The video second detector is followed by the *video amplifier* which in terms of a sound receiver, corresponds to the audio amplifier. The function of the video amplifier is to amplify the video signal so that its amplitude will be great enough to "swing" the modulation grid of the picture tube. For the average picture tube this requires approximately 25 volts, peak-to-peak.

Note in the diagram that the polarity of the video signal is reversed 180 degrees for a single stage of video amplification and that the receiver is arranged so that the signal which reaches the control grid of the picture tube has a positive polarity. As a result the synchronizing impulses appear in the blacker-than-black (highly negative grid-bias) part of the picture-tube characteristic so that the beam is blocked during the retrace part of the line and field sweeps.

In addition to supplying the video signal and the signal which actuates the avc system, the second detector supplies the video signal to the *synchronizing separator.* The purpose of this separator is to remove the picture component from the complete video signal, and then to separate the horizontal sync pulses from the vertical sync pulses. As is shown, the horizontal sync pulses are arranged to control the timing of the horizontal deflection circuit, while the vertical sync pulses are arranged to control the timing of the vertical deflection circuit.

The power supply is not shown in the block diagram. As a general rule, a single low-voltage power supply is used to take care of all voltage requirements throughout the receiver with the exception of the high-

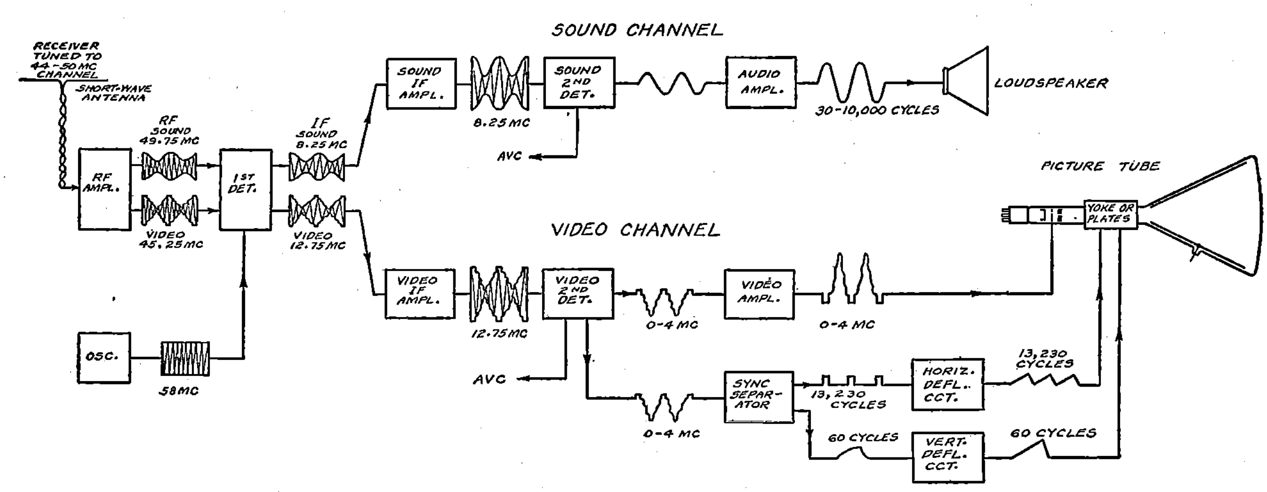


FIG. 25.—A block diagram of a typical television receiver showing the principal sections of which it is composed. Note the changes in the signal as it passes through the receiver.

voltage requirements for the picture tube. The latter, which may include voltages as high as 9000 volts, is supplied by a separate high-voltage power supply which has its own transformer, rectifier and filter.

RECEIVER CIRCUITS: DETAILS

The serviceman who examines a television receiver schematic for the first time is likely to be discouraged. Considering the size of the schematic, the large number of components, and the newness of many of the circuits, this is not at all surprising. Even the man who understands the basic ideas associated with television may find himself unable to understand immediately the operation of some of the circuits. Fortunately, however, the circuits are not actually as complicated as they appear on first sight. What is really required is an explanation of how the basic principles of radio have been applied in television receivers. With this explanation as a guide and with the aid of experience, the serviceman will find that the apparently complex television receiver schematic will begin to look more like an old friend.

We can best explain the circuits being used in television receivers by breaking down the complete receiver circuit into separate sections and considering the function and operation of each section separately. By this means we can for the time being eliminate the complications introduced by the related parts of the circuits and also eliminate unessential detail which tends to obscure the operation of the circuit. Since without exception all television receivers in this country are of the superheterodyne type, the divisions which will be followed are those characteristic of superheterodyne receivers.

R-F Circuits

The action in a receiver circuit can well be considered as beginning at the antenna, for it is at this point that the signal enters the receiver. Since we shall consider antennas in more detail under the head of "Antennas and Installation," for the present it is sufficient to note that the function of the antenna is to provide the maximum signal pickup with a minimum of noise. To do this, the antenna must be located as high and as far away from sources of man-made noise as possible and placed for maximum pickup. The signal is fed from the antenna to the receiver input by means of a transmission line.

Since the complete television signal consists of a band of frequencies extending over a 6-mc channel, it is clear that the antenna and transmission line must be broad enough to pass the 6-mc band. A sharply tuned antenna system is undesirable because it discriminates against the different frequencies present in the signal and as a result produces distortion.

The characteristics of the r-f circuits in television receivers are the same as for ordinary broadcast receivers. As in any superheterodyne receiver, the function of the r-f circuits is to select and amplify the wanted signals and to reject all other signals. As a general rule, most television receivers do not use an r-f stage but rely on the selectivity of the tuned circuit which feeds the signal from the transmission line to the mixer input to provide the required selectivity and image rejection. In some receivers, however, an r-f stage is provided so that additional gain, selectivity and a higher signal-to-noise ratio are obtained.

In most cases you will observe that the r-f tuned circuits as well as tuned circuits in the i-f amplifier are shunted by resistors of comparatively low value. The function of these resistors is to damp the circuits so that sideband cutting will not take place and so that the complete television signal will be passed. Although these resistors lower the gain, this reduction in gain must be tolerated in order to broaden the circuits sufficiently.

Without exception all commercial receivers use push-button or switch-controlled tuning rather than conventional continuous tuning with a large variable condenser. This is feasible because the short-wave channels which have been assigned for television are limited in number and do not require continuous coverage as is the case, for instance, in the broadcast band. At the present time the lower channels are most in use and will probably be the only ones in use for some time.

As a general rule, a small vernier condenser is provided to permit a fine adjustment of the tuning. This condenser is placed across the oscillator tuned circuit and compensates for drift in the trimmers and other effects which tend to change the oscillator frequency. No external tuning adjustments are required for the r-f circuits since these are not critical of adjustment.

Oscillator Circuits

As has been previously pointed out, the oscillator in a television receiver beats with both the sound and video carriers of the signal to form two separate intermediate-frequency signals: the video i.f. and the sound i.f. According to present standards, the oscillator frequency for any given channel is 14 mc above the low-frequency end of the channel, which in turn makes it 12.75 mc above the video carrier and 8.25 mc above the audio carrier. As a result, the frequency of the signals produced by heterodyning with the oscillator signal is 12.75 mc for the video i.f. and 8.25 mc for the sound i.f.

Combination oscillator and mixer tubes are not satisfactory for the comparatively high frequencies at which the oscillator must operate, because of low conversion gain and because these tubes do not oscillate readily at the high frequencies required. For these reasons a separate tube is generally used for the oscillator circuit. The type 6J5 tube is more widely used than any other tube because of its high mutual conductance, low capacitance, and because it oscillates readily at frequencies up to 120 megacycles.

In the design of oscillator circuits much attention is given to the problem of minimizing frequency drift. Because of the high frequencies at which the oscillator operates, a comparatively small percentage change in the oscillator frequency, such as might be caused by drift, has the effect of spoiling the picture and causing the sound i.f. to drift out of the range of the sound i-f channel. Although the effect of oscillator drift is minimized because of the comparatively high intermediate frequencies, the problem of oscillator stability and freedom from drift is an important one. In commercial receivers, drift is minimized through proper circuit design and by the use of coils and condensers which are independent of changes in temperature and humidity.

Mixer

As has previously been pointed out, combination oscillator-mixer tubes such as are satisfactory at lower frequencies are not satisfactory at frequencies above 40 mc. It is general practice to use one of the new high mutual conductance tubes in the mixer circuit, such as the type 1852. The 1852 is especially adapted for frequency conversion and provides high conversion efficiency. For proper mixer operation, it is essential that the output of the separate heterodyning oscillator be coupled to the mixer tube and that the mixer receive approximately the same value of voltage from the oscillator on all bands.

Typical R-F, Oscillator, and Mixer Circuits

Belmont Model X-466

The circuit shown in Fig. 26 is that of the high-frequency section of the Belmont Model X-466 receiver. This receiver does not use an r-f stage but the signal is coupled directly to the grid of the 1851 mixer tube through a double-tuned closely coupled bandpass circuit. This bandpass circuit provides the required selectivity without sacrifice in gain. Five of the assigned television channels are covered, beginning with the 44-50 mc channel, the highest channel being the 84-90 mc channel. The three highest-frequency channels are shunted by resistors having a value between 1000 and 2000 ohms in order to obtain the required pass band. These resistors do not have the loading effect that might be expected offhand, since the loading of the input resistance of the tube is itself of the order of 1000 ohms. In addition to improving the gain and selectivity of the input circuits, the tuned primary windings of the input transformers aid in proper matching of the transmission line and in eliminating reflections. These reflections are undesirable because they tend to produce more than one image on the screen of the picture tube.

The oscillator circuit, which uses a 6J5 tube, is conventional in design, with the tank circuit located in the grid circuit. Note the comparatively small value of grid condenser-25 mmf. The major portion of the total capacitance in the tank circuit of the oscillator is selected by means of the 5-position switch which is of course ganged with the r-f selector switch. A small vernier tuning condenser across the grid coil provides an adjustment which compensates for small variations due to oscillator drift. This control appears on the panel and its designated as the tuning control.

A type 1851 tube is used as the mixer tube. This is a pentode having a high mutual conductance, and is similar to the 1852 but has the grid cap on the top. It is used in preference to a 6J7 because it provides higher gain and a higher signal-to-noise ratio.

There is no direct coupling connection between the oscillator circuit and the mixer; the required coupling is provided inductively by placing the oscillator coil close to the mixer input coil.

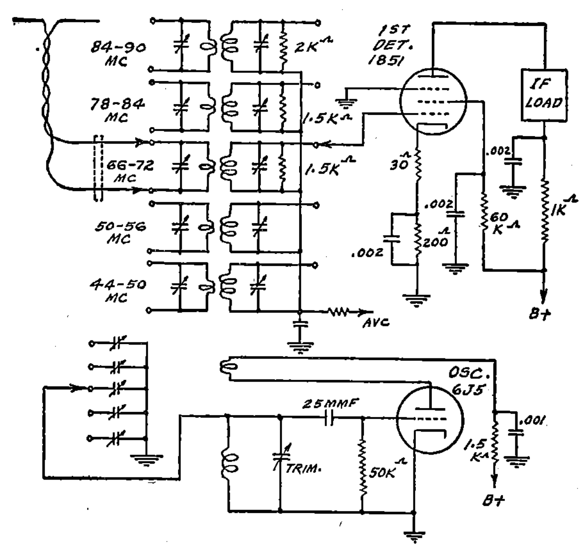


FIG. 26.—The high-frequency section of the Belmont Model X-466 receiver. The signal from the oscillator coil is inductively coupled to the mixer input coil.

DuMont Models 180-183

The DuMont Models 180-183 use a tuned r-f stage preceding the mixer stage, as shown in Fig. 27. In this receiver the transmission line feeds directly into an untuned primary winding which is the same for all four channels. The secondary winding is tuned by one of the four trimmers, depending upon the channel selected. The secondary winding is loaded on all bands by the 3000-ohm shunt resistor which is required to obtain the necessary 6-mc pass band; on one of the bands, an additional shunt resistor of 10,000 ohms is provided.

The signal voltage developed across the secondary tuned circuit is fed to the grid of the 1853 tube used as the r-f tube. Note the small values of capacity—600 mmf—used for the cathode and screen bypasses. These condensers although they seem small in capacitance provide the same relative bypassing action at 50 mc as would be provided by a .06-mf condenser at 500 kc. The tuned circuit used in the grid of the mixer tube is similar to that used in the input circuit of the r-f tube. The r-f tube receives its plate voltage through the 3000-ohm resistor. This resistor, as far as r.f. is concerned, is effectively shunted across the coil in the mixer tube grid circuit, and thus provides the damping necessary to broaden the selectivity. Note that this type of circuit is not used at lower frequencies, such as the broadcast band, because the values of tuned-circuit impedance are much larger at the lower frequencies, and to attempt to use a high value of resistance would introduce a large voltage drop. For this reason, transformers are generally used at the lower radio frequencies rather than the resistive-tuned circuit coupling arrangement shown in Fig. 27.

The oscillator circuit used here is a conventional Hartley oscillator with the feedback obtained by returning the cathode to a tap on the coil. Vernier tuning for each one of the four channels is provided by the small condenser C which appears on the panel as the tuning control. The oscillator coil and the mixer input coil are close to each other so that the oscillator voltage is coupled to the mixer magnetically.

I-F Circuits

As a result of the action in the mixer circuit, we have seen that two intermediate frequencies are produced and that one of these—the video i.f.—carries the picture signal, while the other one—the sound i.f.—carries the sound signal. As in the conventional superheterodyne receiver, it is necessary to amplify both of these i-f signals before they are finally demodulated in the second detectors. These functions are performed by the video i-f and the sound i-f amplifiers. In this section we shall discuss the design of i-f circuits for television receivers and illustrate the principles with circuits taken from typical receivers on the market at the present time.

Signal Output of Mixer

The frequencies which must be handled by the two i-f amplifiers are illustrated in Fig. 28. Let us assume that a signal in the 44-50 mc channel is being received. In this channel, the video carrier is at 45.25 mc and the sound carrier is at 49.75 mc; the local oscillator frequency, which is 14 mc above the low-frequency end of the channel, is therefore at 58 mc (44 + 14). As a result of beating with the oscillator, the video i-f signal at 12.75 mc (58 — 45.25) and the sound i-f signal at 8.25 mc (58 — 49.75) are produced. It is important to note, as the figure shows, that whereas the video r-f carrier is lower in frequency than the sound r-f carrier,

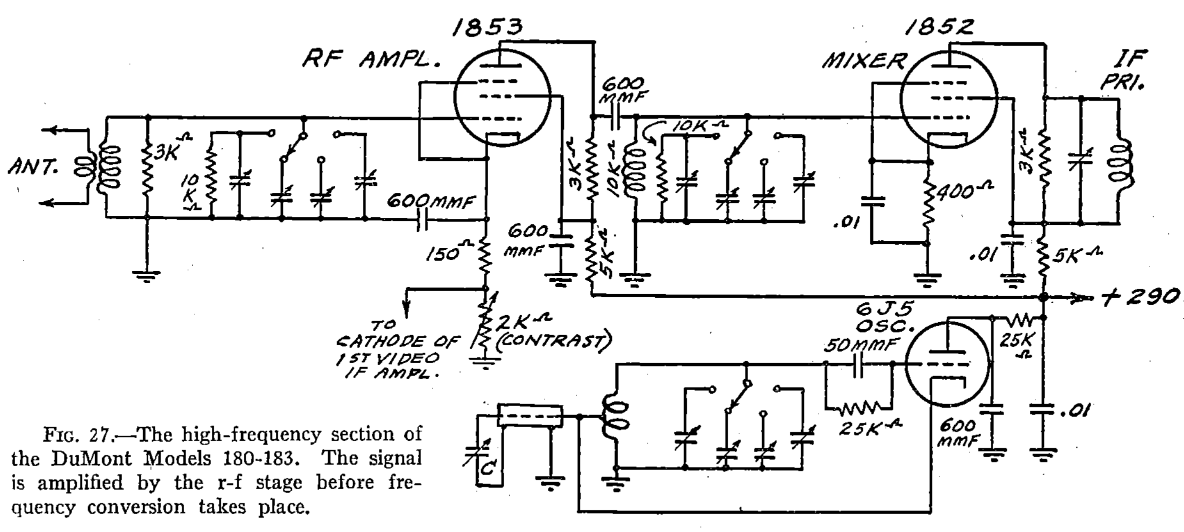


FIG. 27.—The high-frequency section of the DuMont Models 180-183. The signal is amplified by the r-f stage before frequency conversion takes place.

the video i.f. is higher in frequency than the sound i.f. However, the relative placement of the various components of the complete signal is the same in the i-f signal as in the r-f signal. Thus the frequency separation between the two carriers is constant at 4.5 mc in both cases as is also the separation from the two ends of the channel.

The intermediate frequencies used in television receivers have a number of desirable qualities which are the result of careful planning by television engineers.

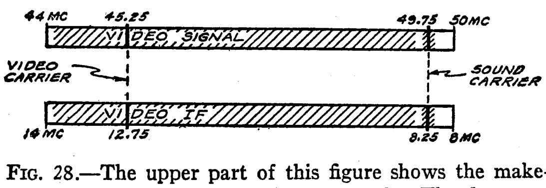


FIG. 28.—The upper part of this figure shows the make-up of a video signal in the 44-50 mc band. The lower part shows that the same frequency separation of the components of the signal is maintained in the i-f signal as in the r-f signal.

Thus the frequencies are high enough to give good image rejection; this is especially important because many receivers do not use an r-f stage. At the same time, the video i.f. is high enough so that there is sufficient space for the sidebands and the sound i.f. is high enough so that the sound selectivity is not too sharp. The effect of too sharp selectivity in the sound i-f amplifier is to make tuning critical, to exaggerate the effect of the slightest drift in the oscillator frequency and to prevent adjustment for the best picture detail without losing the sound signal.

Like any other superheterodyne, television receivers are subject to interference due to pickup by the antenna of frequencies within the range of the i-f amplifier. In the case of broadcast receivers, such interference shows itself in the form of squeals, code signals, and general distortion. Similarly, in the case of television receivers such pickup may distort either the picture, the sound, or both, depending upon the frequency of the interference. The range of intermediate frequencies between 8 and 14 mc has been especially chosen to minimize i-f interference; the fact that the amateur bands lie outside of this range is of considerable assistance in this respect.

Sound I-F Channel

It is the function of the sound i-f amplifier to separate the sound component of the i-f signal from the video component and to amplify this signal before it is demodulated at the sound second detector. Because of the comparatively high frequencies involved, however, the design of a television sound i-f amplifier is somewhat more difficult than that of the conventional i-f amplifier in a radio receiver. Thus there is a greater tendency toward regeneration and more attention must be paid to stray wiring and tube capacitance.

The bandwidth which must be passed is comparatively small and does not present the same problem as does the video i-f amplifier. Actually, of course, a bandwidth of from 10 to 20 kc is sufficient to transmit all the frequencies present in the audio signal. However, in practice, the bandwidth of the sound i-f amplifier is made approximately 100 kc. Primarily this larger bandwidth is necessary to allow for normal drift in the frequency of the oscillator. The significance of this is that if the bandwidth of the sound i-f amplifier were held to 10 kc, then a change of 10 kc in the oscillator frequency would cause the sound signal to drift completely out of the range of the sound i-f amplifier. However, a change of 10 kc, in an oscillator operating at a frequency of the order of 60,000 kc and up, represents a frequency drift in the oscillator of only one part in 6000, whereas in practice it is not possible to design receiver oscillators which will have a reliable frequency stability of better than one part in 1000. Therefore, instead of resorting to voltage regulation and expensive design to prevent oscillator drift, the bandwidth of the sound i-f amplifier is intentionally made about ten times as great as that required for the sound modulation, thus allowing for reasonable drift in the oscillator. Assuming that the receiver is initially tuned to the center of the sound i-f amplifier, a drift in the oscillator frequency as high as 25 kc will not cause any appreciable change in the quality of the audio signal. This is illustrated in Fig. 29, which shows that the effect of a change in the frequency of the oscillator is merely to shift the location of the sound signal within the band passed by the sound i-f amplifier.

Although the bandwidth of approximately 100 kc is sufficiently great to compensate for normal oscillator drift, this bandwidth is still small enough so that the receiver can be tuned by listening to the sound accompanying the picture. At the same time there is enough latitude so that the tuning can be varied slightly in

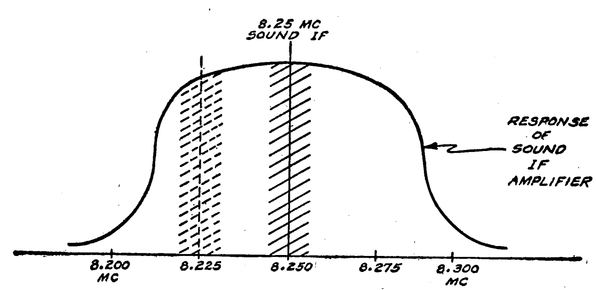


FIG. 29.—The frequency response of a typical sound i-f amplifier. The dotted signal shows that the sound signal can be detuned appreciably without falling outside the pass band of the amplifier.

order to improve the detail of the picture without losing the accompanying sound signal. Although we shall see later that a special type of AVC circuit is required in the video i-f amplifier, the AVC circuits used in the sound i-f amplifier are conventional.

Sound I-F Amplifiers in RCA and Westinghouse Receivers

The circuit of the sound i-f amplifier used in the RCA Models TRK-9 and TRK-12 is shown in Fig. 30; these receivers are also used in the Westinghouse Models WRT-702 and WRT-703. The tuned circuit L18-C19 is part of the load circuit of the mixer tube and is tuned to 8.25 mc so that the sound i-f signal is developed across this tuned circuit. This signal is fed to the grid of the first sound i-f tube, a 6SK7, which is similar to the 6K7 with the exception that the control grid is terminated at one of the base pins so there is no top cap. A double-tuned interstage transformer is used to feed the second sound i-f stage, which employs an 1853 tube. Because the gain obtainable with this tube is approximately twice that which can be obtained with an ordinary r-f pentode, no further amplification is required and the output of the 1853 feeds directly into the 6H6 second detector. The circuit beyond the second detector is not shown but this is a conventional high-quality audio system and requires no comment.

The i-f transformers in this circuit are especially designed so as to provide an overall selectivity of approximately 100 kc. The 68,000-ohm resistor shunting the primary winding of the last i-f transformer loads this circuit so as to aid in obtaining the proper response.

The AVC circuit is similar to one which has been extensively used in other RCA receivers. This circuit has been described in detail in the book "An Hour a Day with Rider on AVC." Briefly, one of the diodes is used as the second detector and AVC tube, while the second diode of the 6H6 provides a delayed AVC action and permits the minimum bias of approximately —2 volts to be fed to the grids through the AVC bus. Both i-f tubes are controlled by the AVC circuit.

Because of the high frequencies being amplified and the low shunt capacitances across the tuned circuits, it is important that there be no change in the effective tube capacitances to cause detuning to take place as the AVC bias changes in accordance with the strength of the incoming signal. This effect, ordinarily not important in broadcast receivers, is avoided in this receiver by using *unbypassed* cathode resistors. The negative feedback introduced by these resistors tends to keep the tube input capacitance constant and independent of the voltage on the control grid.

Video I-F Circuits

The design of the video i-f amplifier is more complicated than that of the sound i-f amplifier because of the wide band of frequencies which the video i-f amplifier must pass. Thus the video i-f amplifier often must handle frequencies extending from approximately 8.7 mc to 14.0 mc, a range of over 5 mc. Not only must the amplifier have an almost flat response over this range, but at the same time it must reject interfering signals close to the edges of the pass band.

The use of the so-called vestigial sideband transmission, in which all of one sideband and a small portion of the other sideband are transmitted, makes it necessary for the selectivity of the i-f amplifier to depart from the uniform selectivity which might at first be expected. To avoid overemphasis of the lower video frequencies, which receive contributions from both the upper and lower sidebands, the selectivity of the i-f

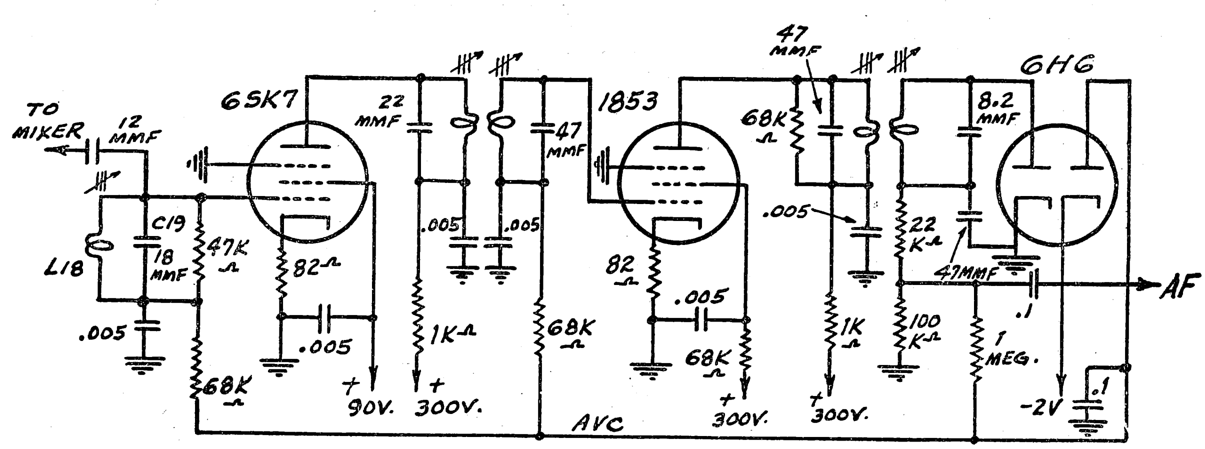


FIG. 30.—The sound i-f amplifier used in the RCA Models TRK-9 and TRK-12. The transformers are designed so that the overall bandwidth of the amplifier is approximately 100 kc.

amplifier is designed to have a sloping characteristic in the neighborhood of the video i-f carrier at 12.75 mc. This is illustrated in Fig. 31 which shows a typical *overall* selectivity curve for a video i-f amplifier.

The amplification which the i-f carrier receives is only 50% of the maximum amplification received by the upper sidebands and the lower sidebands, which are only partially transmitted, also do not receive the full amplification. In this way overemphasis of the lower video frequencies is avoided by shaping the overall selectivity so that the contribution of the lower sideband plus the contribution of the upper sideband is equal to the gain for the higher video frequencies. Since the upper video frequencies receive contributions only from the one sideband, the selectivity, as Fig. 31 shows, is such that the full gain is received by these frequencies.

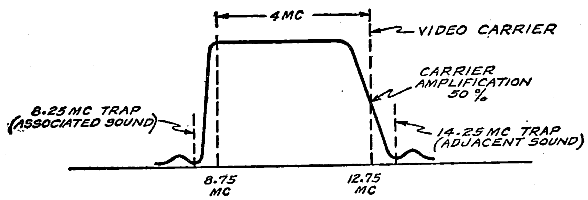


FIG. 31.—The overall frequency response of a typical video i-f amplifier. Note that the carrier receives only 50% of the maximum amplification.

If video frequencies up to a maximum of 4 megacycles are to be received, which is usual for the higher-priced sets using large picture tubes, then the i-f amplifier should cut off at about 8.75 mc (12.75 — 4.0). Since the sound i-f carrier is located close by, at 8.25 mc, it is necessary that this cutoff be sharp in order to prevent the sound carrier and its sidebands from causing interference with the video signal. In practice this rejection of the sound carrier is secured by the use of rejection or trap circuits which generally are part of the video i-f coupling transformers.

In addition to rejecting the sound i-f carrier of the *associated* channel at 8.25 mc, it is desirable that the i-f amplifier have a sharp cutoff at the high-frequency end of the band. This is required in order to prevent the sound signal on the *lower adjacent* television channel from getting through the video amplifier. Because of the reversal of high and low frequencies which takes place in the mixer, the sound carrier of the lower adjacent channel will beat with the oscillator and cause an interfering signal which is located 0.25 mc above the edge of the channel, at 14.25 mc. These frequency relationships just described are shown in Fig. 32. A trap of the same general type as that used to reject the 8.25 mc carrier is used to reject possible interference from the adjacent sound carrier at 14.25 mc.

The maximum gain which can be obtained in a video i-f stage is considerably lower than that in an ordinary broadcast i-f stage because of the wide band of frequencies which must be passed and because of the high carrier frequency. This is true even where high mutual conductance tubes of the 1851 series are used, so that it is not unusual for as many as five separate stages to be used in the video i-f amplifier.

The transformer design is especially complicated in video i-f amplifiers because of the wide pass band of from 2.5 to 4.0 mc which must be obtained. To obtain close coupling so as to increase the pass band, direct coupling of the primary and secondary windings by means of a common inductance is often used. Loading of the tuned circuits with resistors so as to broaden the circuits is very common and will be found in practically all the circuits. Video i-f transformers are further complicated because the rejector circuits for the associated and adjacent sound channels are often an integral part of the interstage coupling transformers. Because of the comparatively high frequencies, the only capacitance used to tune the circuits is often that of the wiring and tube capacitance so that no condenser as such appears on the schematic. Nevertheless this capacitance forms a resonant circuit with the related windings of the transformer and should be taken into consideration. Since the wiring capacitance is an important part of the total circuit capitance, it is important that no changes be made in the wiring when servicing is required.

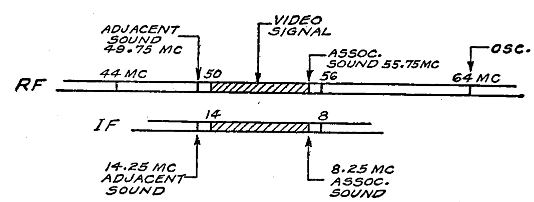


FIG. 32.—The sound signal of the associated channel at 8.25 mc and the sound signal of the adjacent channel at 14.25 mc are both close to the edges of the video band. Traps are provided to prevent interference from these signals.

AVC is often used in video i-f amplifiers, but as will be explained later under "AVC Circuits," the manner in which the AVC voltage is produced differs from that in radio receivers and in the sound i-f amplifier.

Video I-F in Andrea Model 1F5

In the Andrea Model 1F5 receiver, shown in Fig. 33, the video i-f amplifier employs two stages of amplification both of which use type 1852 tubes. In order to separate the sound i-f part of the signal from the video part, a separate secondary circuit L2-C2 is tuned to 8.25 mc so that the sound i-f signal appears across this circuit. The sound i-f signal is fed directly to

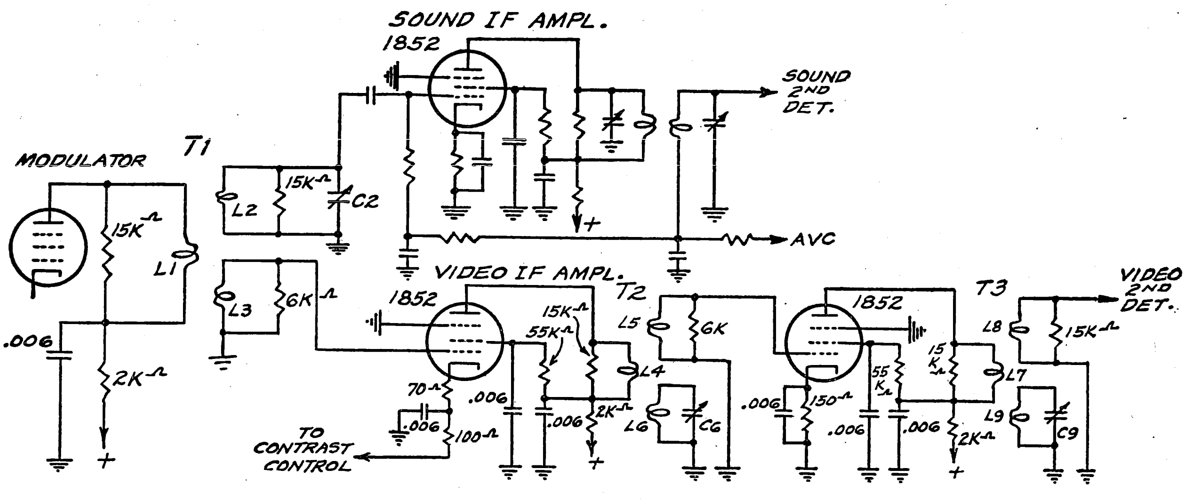


FIG. 33.—The video and sound i-f amplifiers in the Andrea Model 1F5 receiver.

the sound i-f channel which is conventional and requires no further comment.

The video component of the i-f signal is developed across L3. No trimmer condenser is used on this winding and the circuit is heavily loaded by the 6000-ohm resistor in order to pass the required band of frequencies. The video signal is applied directly to the grid of the type 1852 tube used in the first i-f stage. To obtain negative feedback and the increased stability which it makes possible, an unbypassed 70-ohm resistor is placed in the cathode circuit. The other end of this resistor is connected to a variable resistor—the "contrast control"—by means of which the gain of the i-f stage is controlled. Since no AVC is used, the control grid is returned directly to ground. The band of frequencies passed by this amplifier is approximately 2.5 mc; this pass band is generally considered to provide sufficient detail for the small picture tube used with this receiver.

The signal is coupled to the grid of the second i-f tube by means of the transformer T2. The windings L4 and L5 of this transformer function as the primary and secondary windings of the interstage transformer and are loaded by means of the 15,000-ohm resistor across the primary and the 6000-ohm resistor across the secondary. The only capitance used to tune these windings is the tube and circuit capacitance.

The third winding L6 is tuned to 14.25 mc by means of the trimmer C6 and eliminates possible interference from the sound carrier of the lower adjacent television channel, as was previously shown in Fig. 32. This circuit acts as a trap by absorbing all the energy in the neighborhood of 14.25 mc so that it is not passed on to the grid of the following tube.

The second i-f stage feeds directly into the video i-f second detector through the transformer T3 which is similar to T2. The circuit L9-C9 is likewise tuned to 14.25 mc so that it acts as a trap circuit for this frequency.

No AVC is used in the video i-f amplifier in this receiver and accordingly the grids of the two i-f tubes are returned directly to ground. The gain is controlled by means of the "contrast control" which varies the bias of both the first i-f stage and the first detector stage.

Video I-F Amplifier in the RCA Model TRK-12

The partial schematic in Fig. 34 shows the video i-f amplifier used in the RCA Model TRK-12 receiver, which is also used in the Westinghouse Model WRT-703. In contrast to the video i-f amplifier described above, this amplifier is designed so as to obtain a pass band of approximately 4 mc. As a result of the higher modulating frequencies which are passed, the detail in the image is increased correspondingly. A large 12-inch picture tube is used with this receiver; this permits finer detail, so that it utilizes the aditional detail which the wide response of this more elaborate amplifier provides.

Unfortunately it is not possible to increase the pass band of the i-f amplifier without decreasing the gain obtained in each stage. As a consequence of this it is necessary to use a larger number of stages in the i-f amplifier; five stages are used in the receiver being described. In addition to the large number of stages required, the complexity of the coupling transformers is increased both as a consequence of the larger band-width and the fact that the trap circuits must be more effective. Thus the frequencies accepted by the i-f amplifier are very close to the sound carrier so that the rejection must be more nearly perfect than in the case of a video i-f amplifier which passes a smaller band.

The transformers used in this receiver can be broken down into three basic elements which are shown in Fig. 35: the primary winding L1, the coupling winding L3 and the secondary winding L2. Inductive coupling between the primary and secondary is not used, but instead the primary and secondary are coupled directly by means of the inductance L3 which is common to both circuits. The primary circuit is resonated by C1 near one end of the pass band, whereas the secondary circuit is resonated by C2 near the opposite end of the band. R1 and R2 are loading resistors used to broaden the response.

Although the i-f transformers in the RCA TRK-12 use the relatively simple basic design shown above, the circuits are further complicated because of the blocking condenser required to keep the plate voltage off the grid and because of the presence of the trap circuit. The condensers C1 and C2 do not appear as such in the schematic because they are represented by the plate-to-ground and grid-to-ground capacitances, which include the stray wiring capacitances in addition to the tube capacitances.

Referring again to Fig. 34, let us consider the several transformers separately. The first-detector transformer assembly is more complicated than the others because the sound i-f signal is present at this point, and must be separated from the video i-f signal. This separation is accomplished by means of the circuit L18-C19 which is resonated to 8.25 mc, the sound i-f. The sound i-f signal is coupled to this circuit by means of the 12-mmf condenser C24; the resistor R10 is used to broaden the selectivity of the sound i-f channel.

With respect to the video section of this transformer, L17 and L20 are the primary and secondary windings which are tuned by the plate and grid capacitances as explained in connection with Fig. 35. These circuits are coupled to each other by the common coupling condenser C23. A trap circuit is made an integral part of the transformer assembly. This circuit is tuned by L19 to 14.25 mc and prevents frequencies close to this value from getting into the video i-f amplifier. There are thus four adjustments required for proper operation of this transformer which can be

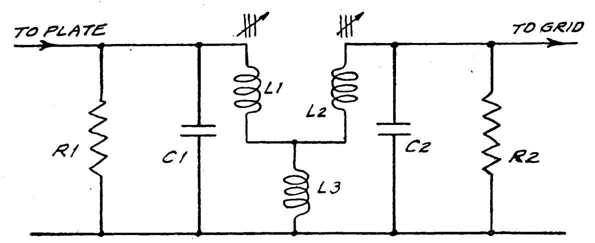


FIG. 35.—A simplified diagram of the video i-f transformers used in RCA television receivers. Direct coupling is provided by the inductance L3 which is common to both primary and secondary circuits.

summarized as follows: L17 and L20 control the primary and secondary tuning and are resonated at opposite ends of the pass band of 4 mc; L18 tunes the sound pickup circuit and is resonated at 8.25 mc; L19 tunes the trap circuit so as to reject interference in the neighborhood of 14.25 mc.

The first and second i-f transformer assemblies are practically identical, and are somewhat similar to the first detector unit. In the first i-f assembly, L21 and L25 are the primary and secondary inductances which are again resonated at opposite ends of the pass band. L24 provides the direct coupling between the primary and secondary as shown in the simplified drawing of Fig. 35. L23 is part of a trap circuit which is tuned to 8.25 mc, so that, in all, two sharply tuned trap circuits are provided at this frequency. These are required because the wide pass band necessitates passing video frequencies which are close to the sound carrier frequency; at the same time this sound carrier and its sidebands must be rejected and this is effected by means of the tuned circuits associated with L23 and L28.

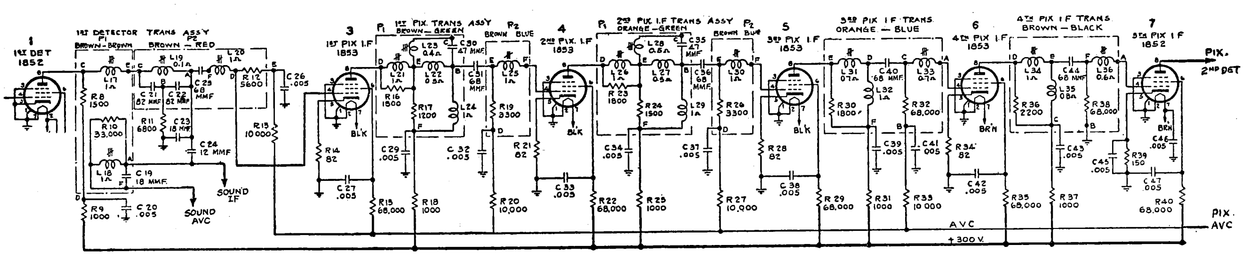


FIG. 34.—The video i-f amplifier in the RCA Model TRK-12. Five i-f stages are used to obtain a pass band of 4 mc. Traps are provided at 8.25 mc and 14.25 mc to prevent interference from the associated and adjacent sound channels.

The third and fourth transformer assemblies do not incorporate any trap circuits and are similar to the transformer shown in Fig. 35. The condensers C40 and C44 are blocking condensers which prevent the plate voltage from being applied to the control grid of the following tube. The plate of the fifth i-f tube feeds through a special coupling transformer to the video second detector; this transformer is not shown in the figure but will be discussed later in connection with video second detector circuits.

As the schematic of Fig. 34 shows, the first, second, third and fourth video i-f tubes are controlled by the video AVC circuit; the grids of these tubes are each returned to the common AVC bus through a filter combination consisting of a 10,000-ohm resistor and a .005-mf condenser. In addition, the gain of the first detector tube is controlled by the same AVC voltage, so that effectively there are five stages under control. This makes for a very effective AVC action which keeps the signal applied to the video second detector and sync separating circuits essentially constant.

Video Second Detector Circuits

In a radio receiver the second detector rectifies the i-f signal and as a result the audio signal corresponding to the variations in the carrier is recovered. In the same way, the video second detector in a television receiver rectifies the video i-f signal and as a result the video signal corresponding to the variations in the amplitude of the carrier is recovered. This video signal is of course that produced by the camera tube and contains in addition the pulses required for synchronization; it is similar to the standard RMA signal shown in Fig. 20.

Generally speaking, video second detectors are similar to the second detectors of the diode rectifier type used in radio receivers. However, because modulating frequencies as high as 4 mc (in the larger receivers) must be passed, a lower value of load resistance is used in order to prevent the attenuation of the higher video frequencies. The value of load resistance generally used is of the order of 2500 ohms; on the other hand, the values used in radio receivers are of the order of 250,000, or approximately 100 times as great. Because of the low value of diode load resistance, receivers are generally designed so that the signal level at the second detector is approximately 5 volts or more. This minimizes distortion due to the curvature of the diode characteristic, which is more pronounced when low values of diode load resistance are used.

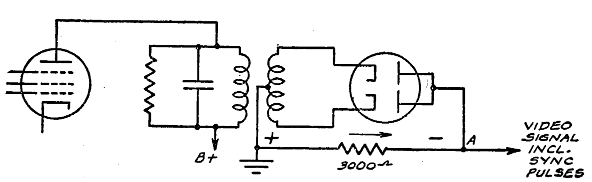


FIG. 36.—The video second detector circuit in the DuMont Models 180-183. A full-wave rectifier circuit is used.

Video Second Detector in DuMont Models 180-183

The video second detector circuit used in the DuMont Models 180-183 receivers is shown in Fig. 36. A full-wave rectifier circuit is used so that both halves of the signal are rectified. Since the cathodes are connected to the ends of the centertapped secondary, each diode will draw current when its cathode is negative with respect to ground (the diode plates both return to ground through the 3000-ohm load resistor). As a result the current flow through the load resistor will be in the direction shown. Thus when a video signal is applied to the primary of the transformer, the plate end of the load resistor will become negative in proportion to the amplitude of the carrier. When the carrier amplitude is greatest, as it is for the sync pulses, the greatest negative voltage will be produced at A. The various shades of white and gray in the signal will produce lesser values of voltage at A, zero voltage of course corresponding to whitest white. In accordance with the definition of signal polarity previously given, the video signal produced at A is said to have *positive polarity*.

It is worth while noting that if the diode plates, instead of the cathodes, had been connected to the ends of the coil, then the polarity of the video signal would have been reversed. As we shall see in the discussion of video amplifiers, whether or not the diodes are connected to give a signal of positive or negative polarity depends upon the number of stages in the video amplifier. The controlling factor is that the amplified signal which is finally applied to the grid of the picture tube must of course have a positive polarity since a more positive voltage on the grid produces a brighter spot on the screen of the tube.

Video Second Detector in RCA Model TRK-12

The video second detector in the RCA Model TRK-12 (also used in the Westinghouse Model WRT-703) is shown in Fig. 37. The signal is coupled through an autotransformer arrangement from the plate of the last video i-f tube into the full-wave diode rectifier circuit. Thus the signal voltage between A and the centertap C is stepped up so that the voltages across each half of the coil L38 are equal. The secondary winding is loaded to broaden the frequency response. By means of the bypassing action of the .005-mf condenser C48, the centertap of L38 is maintained at ground i-f potential; in other words, there is no signal voltage at point C.

Unlike the previous circuit, the video signal produced across the 4000-ohm load resistor R45 has a negative polarity. This can be seen from the fact that a large carrier amplitude, which corresponds to black in the picture, produces a more positive voltage at B. R45 is a potentiometer and serves to regulate the magnitude of the video signal fed into the video amplifier. Since it controls the maximum voltage swing of the video signal on the grid of the picture tube between black and white, it is called the "contrast control."

An important advantage which results from the use of a full-wave rectifier circuit in video second detectors is that the filtering of the i-f components from the video signal is more easily accomplished. Because of the balanced nature of the circuit, the lowest frequency which is present across the output load R45 is the second harmonic of the video i.f. and this is more readily prevented from getting into the video amplifier. On the other hand, in the case of a single-ended circuit using only one diode, the fundamental video i.f. is present across R45 and is more difficult to filter out.

Video AVC Circuits

Although the ultra-high frequencies used for television are not subject to fading of the same type as that found in the high and medium radio frequencies, the signal strength may still vary because of swinging of the antenna or the presence of automobiles and other moving objects. Since these variations will cause a change in the contrast of the picture being received, they are undesirable and can be avoided if the receiver is equipped with AVC. The use of AVC also simplifies the design of both the video gain control circuit and the sync separating circuits because it assures the maintenance of a constant signal voltage at the video second detector.

In the conventional AVC circuits used in radio receivers, the control voltage is produced by rectifying the carrier and as a result the control voltage is proportional to the *average* value of the carrier. Because the average value of the carrier in ordinary broadcasting does not change during modulation, it is a measure of the signal strength and hence can be used to control the gain of the receiver.

In television this same system cannot be used because the average value of the video carrier is dependent upon the average illumination of the scene being televised. Thus if the average background of the scene is white, then the average carrier amplitude will be small; on the other hand, if the average background is dark, then the average carrier amplitude will be large. (The above conditions are of course only true for negative modulation which is standard for this country.) Obviously, then, we cannot use the average amplitude of a video signal to obtain the necessary d-c control voltage, because such a control action would vary the gain of the amplifier in accordance with the average background illumination and as a result produce distortion.

However, although the average value of a video signal does not remain constant, the *peak* value always has the same fixed value regardless of the percentage of modulation or the average illumination of the scene. For this reason the peak value of the carrier serves as a convenient reference to establish the strength of the carrier and is the basis of operation of video AVC circuits. As we have seen, this peak value is transmitted at the end of each line, that is, 13,230 times in every second, and thus it is available at regular intervals which are frequent enough to make possible the production of an automatic control voltage.

It is of interest to note here that one of the important reasons for the use of negative rather than positive modulation is that only in negative modulation is this regular succession of peak pulses available for AVC purposes. The design of AVC circuits where positive modulation is used, is considerably more complicated; for positive modulation the peak values of the signal are not fixed but depend upon the brilliance of the scene being televised.

Satisfactory operation in the smaller and less expensive receivers is often secured without the use of a separate AVC system in the video channel. In these receivers, relatively few video i-f stages are used so that the problem of manual gain control is not so difficult. In addition, the first detector is often controlled by the AVC voltage produced in the sound channel, so that some degree of automatic control is provided. Since the video and sound carriers are close to each other, they undergo approximately the same varia-

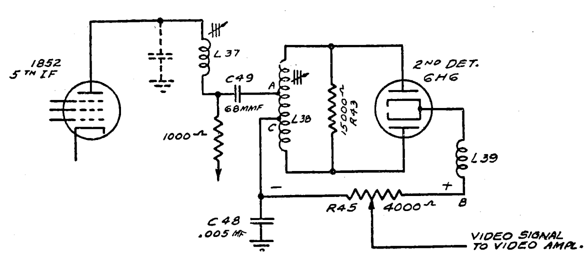


FIG. 37.—The video second detector circuit in the RCA Model TRK-12.

tions in transmission from the transmitting antenna to the receiving antenna, but in general these variations are not sufficiently alike to permit the use of sound AVC voltages on all the video stages.

Video AVC Circuit in the RCA Model TRK-12

The video second detector and AVC circuit used in the RCA Model TRK-12 is shown in Fig. 38. Although the second detector has been described previously, it is shown here because the action of the AVC circuit is connected with the detector. When a signal is being received, full-wave rectification takes place in the 6H6 and as a result the demodulated video signal is produced across the 4000-ohm load R45 in series with the peaking coil L39. The polarity of this signal is indicated by the insert wave which shows that point B of the load is positive with respect to point A; B can be considered as being at a fixed reference voltage since it is tied down to —33 volts through the filter resistor R47.

The circuit used to obtain the AVC voltage from the signal across AB is essentially a peak voltmeter using one section of the 6F8-G tube as a diode. As the circuit shows, the grid is used as the diode plate and is connected directly to B; the cathode is bypassed to ground by a 1-mf condenser C54 and is returned to A through a 470,000-ohm resistor, R46.

During the sync intervals, the grid of the diode is highly positive with respect to its cathode so that a current flow takes place through R46 and a positive change is stored in C54. Because the sync pulses are repeated rapidly, 13,230 times per second, this charge is continually replenished and C54 remains charged to the peak value of the video signal. If, for example, we assume a 10-volt peak signal, then C would charge up to a potential 10 volts greater than that at A or —23 volts (—33 + 10).

Since the voltage produced in this way is proportional to the peak value of the carrier, it is a suitable measure of the signal level at the second detector. However, its polarity must be reversed in order that an increase in signal input will produce a more *negative* rather than a more positive control voltage. This reversal of polarity is effected by means of the second section of the 6F8-G which is used as a d-c amplifier.

This tube receives its plate voltage through a 680,000-ohm load resistor R50 which is 2 volts negative with respect to ground. Since the cathode is returned to —23 volts on the bleeder, the net plate voltage with no input signal is equal to 21 volts (—2 + 23). The grid bias is equal to the voltage at the grid minus that at the cathode or —10 volts (—33 + 23). When no signal is present this value of bias is so great that the cathode current is completely cut off and as a result the voltage at D is equal to —2 volts. This is the minimum bias with no signal and in combination with the drop of 0.7 volt across the 82-ohm cathode resistor of each of the controlled tubes, provides a net bias of 2.7 volts for each of the video i-f tubes.

On the other hand, when a signal is being received, C54 charges up positively to the peak value of the signal and this positive voltage is applied to the grid of the AVC triode amplifier. If the signal is strong enough, the plate current will increase, the voltage drop across R50 will increase, and D will become more

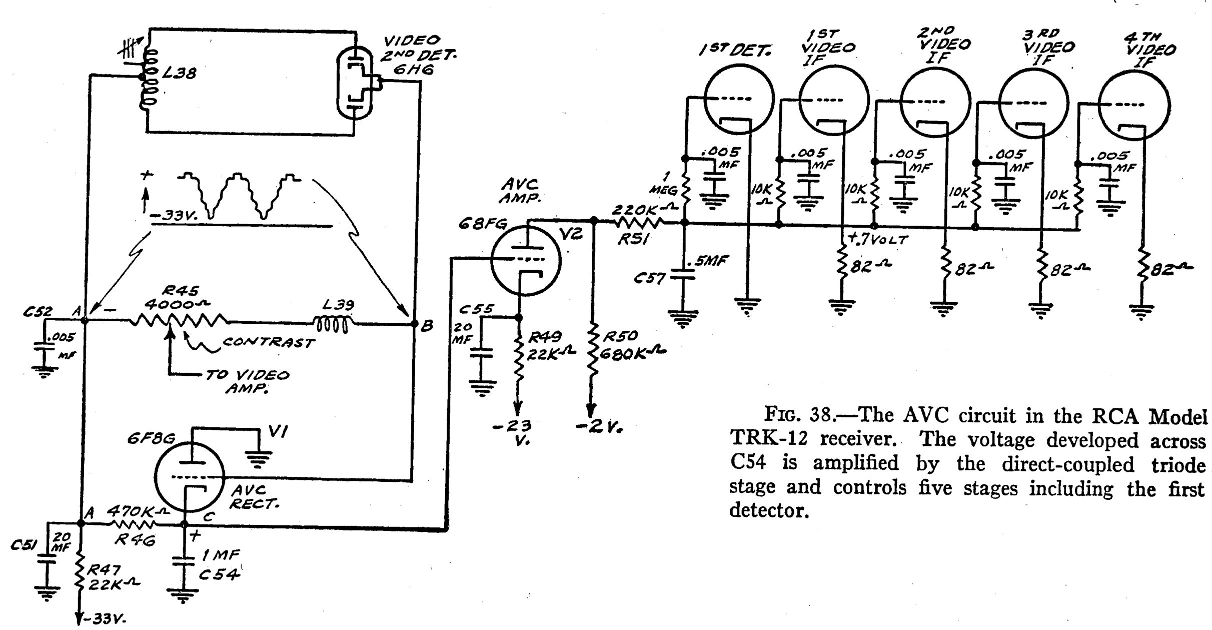


FIG. 38.—The AVC circuit in the RCA Model TRK-12 receiver. The voltage developed across C54 is amplified by the direct-coupled triode stage and controls five stages including the first detector.

negative than —2 volts. The amount of negative voltage produced at D is proportional to the strength of the signal and hence the voltage is available for AVC.

A delayed AVC action is secured because the negative bias of 10 volts, which exists with no signal, drives the grid of the AVC amplifier tube considerably beyond cutoff. Thus the signal level must reach a certain minimum value before the plate current will flow and the AVC voltage be produced.

In addition to the delay action, the fact that five stages are controlled results in a very effective AVC action which maintains the signal level at the second detector essentially constant.

Video Amplifiers

In the same way that the audio signal in a radio receiver requires amplification before it has sufficient power to drive the speaker, so the video signal in a television receiver requires additional amplification following the video second detector before it has sufficient amplitude to swing the grid of the picture tube. This amplification is supplied by the video amplifier which works between the video second detector and the grid of the picture tube.

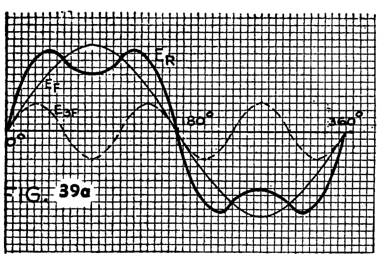


FIG. 39a, on the left, shows the resultant wave (E_R) when a 1000-cycle sine wave (E_F) and a 3000-cycle sine wave (E_{3F}) are added in phase.

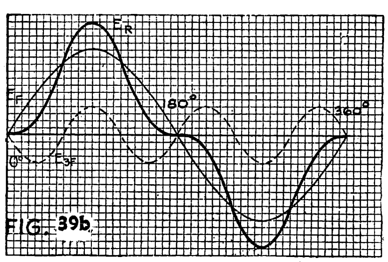


FIG. 39b, on the right, shows how the resultant wave (E_R) is distorted when the 3000-cycle sine wave (E_{3F}) is retarded half a cycle.

The problems associated with the video amplifier, like most television problems, are considerably more difficult than the corresponding problems for a radio receiver. Thus the video amplifier must amplify uniformly frequencies ranging from a few cycles to frequencies as high as 2 to 4 mc. Whereas phase shift is not important in an audio amplifier, in a video amplifier all the frequencies in the signal must take the same time to pass through the amplifier from input to output. This is important because distortion of the waveform and hence of the picture, is produced when the different video frequencies do not all take the same time to pass through the amplifier. This type of distortion is illustrated in Fig. 39 which shows the difference in waveform produced when a 3000-cycle wave is retarded half a cycle in passing through the amplifier. That the uniformity of time delay plays an important part can be seen from the fact that it takes only approximately seven one-millionths of a second for the cathode-ray beam to move one inch across the screen of the picture tube. Thus even a small non-uniformity in time delay can cause serious distortion of the image.

The video amplifiers being used in television receivers now on the market have successfully met the problems outlined above. By using low values of load resistance, the shunting effect of tube and circuit capacitances has been minimized and the upper frequency limit extended. Fig. 40 shows how the use of a low value of plate load resistance, although it lowers the maximum amplification obtainable, makes possible a more uniform gain over a wide range of frequencies. The sacrifice in gain accompanying the use of low values of load resistance has been partially compensated for by the use of the new high mutual conductance tubes which provide approximately three times as much amplification for a given value of load resistance, as was previously possible with the older tubes.

The most common method for obtaining uniform gain is to use so-called "peaking coils" in series with the plate load resistor. These are small inductances of the order of 100 microhenries, which are resonated with the tube and wiring capacitance near the high-frequency limit of the video amplifier. Peaking coils permit higher values of plate load resistor for a given uniformity of amplification, and consequently make possible reasonably high gains per stage.

In most video amplifiers, filter resistors and condensers are used in the plate and screen leads to provide low-frequency compensation for both gain and time-delay. These filter resistors and condensers are

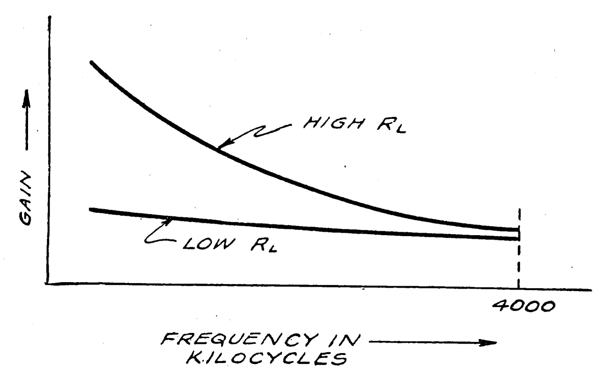


FIG. 40.—The use of a small value of load resistance provides a more uniform gain over a wide range of frequencies, although the maximum gain is decreased.

more critical in value than they are in a radio receiver where the primary purpose is to reduce hum and prevent circuit interaction through the common power supply. For this reason, whenever replacement becomes necessary, the resistors and condensers should be replaced with the correct value. Although a larger plate filter condenser, for example, will cause no harm and may even do some good in reducing hum in a radio receiver, the same procedure followed in a video amplifier may cause serious distortion of the picture.

Average Brightness and D-C Restorer Circuits

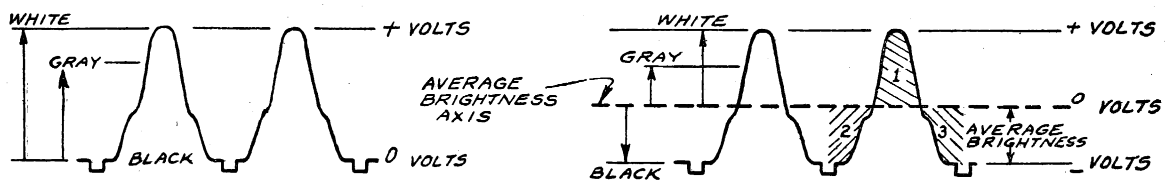
In our previous discussion of the video signal, we looked upon this signal as containing a series of voltage values each of which corresponded to a particular value of light intensity in the televised image. We considered that in the same way that light values can be reckoned from black as a reference level, so a particular voltage value can be assigned to black and then each light value represented electrically by assigning a higher (or lower) voltage to the signal, depending upon the brightness of the light value at the scanned area. This method of looking upon a video signal is shown in Fig. 41 (a), in which it is clear that all light values are with reference to the black level—which is taken as the zero-voltage axis.

Insofar as video amplifier operation is concerned, the important thing about Fig. 41 (a) is that it shows that a video signal is inherently a pulsating d-c voltage. In other words (as in the case of a rectified a-c voltage which is also a pulsating voltage) all the light values are represented by electrical values on one side of the zero-voltage axis. The video signal must therefore contain both a d-c and an a-c component in the same way that a rectified a-c voltage representing the output of a power supply contains a d-c component—the d-c voltage of the power supply, and an a-c component—the hum ripple of the power supply.

Physically what does it mean to say that a video signal contains a d-c as well as an a-c component? Actually it is only another way of looking at the signal, as Fig. 41 (b) clearly shows. In this figure we describe the signal by saying that the light values are represented by fluctuations in both directions from an average level which we can call the "average brightness," or the "picture background." Thus instead of describing the light value at any point in the scene by stating how much brighter it is than black, as in (a), in (b) we accomplish exactly the same thing by stating how much brighter or blacker is the particular light value than the *average brightness.* In (a) we use the black level as the reference level whereas in (b) we use the average brightness as the reference level.

Electrically speaking, the average brightness level represents the average value of the video signal or in other words the d-c component of the signal. On the other hand, the fluctuations in the signal on either side of the average brightness level, which is electrically the a-c axis of the signal, represent the a-c component of the signal. An important characteristic of the average brightness or a-c axis is that the area between the positive part of the cycle and the a-c axis is equal to the area included between the negative part of the cycle and the same a-c axis. This is shown in Fig. 41 (b), where it can be seen that area 1 is equal to area 2 + area 3.

From the preceding it will be clear to you that proper operation of the picture tube requires that both the d-c and a-c components of the video signal be passed by the video amplifier. For if only the a-c component reaches the grid of the picture tube, then the picture tube will have information only on the fluctuations in light values *with reference to the average brightness level* but it will have no information whatsoever on the value of this average brightness level. Thus the picture cannot be reproduced accurately since the same variations (represented by the a-c component) might be superimposed on say either a dark or light background of any shade. The average brightness, or the d-c component of the video signal, must be present before the picture can be reproduced.



FIGS. 41a, 41b.—The light values in a video signal can be reckoned in two ways: In (a) the various light values are described with reference to the black level, whereas in (b) the same light values are described with reference to the average brightness of the signal.

D-C Restorer Circuits

Unfortunately it is not possible to transmit the d-c component of any signal without using a direct-coupled amplifier. However, the use of direct-coupled amplifiers is not practical in television receivers because of their comparative instability and high cost. For this reason, television engineers have developed circuits which make possible the use of conventional a-c amplifiers with condenser coupling and at the same time provide for the restoration or *recreation* of the d-c component after the a-c component has been amplified by itself.

It will be helpful at this time to consider several video signals which have different values of average brightness and to describe the action which takes place when these signals pass through an amplifier which employs a blocking condenser as a coupling element between stages. It is because of the presence of the blocking condenser that only the a-c component is passed and that the d-c component is lost.

In Fig. 42, the picture being scanned is a white triangle on a black background, with the vertex of the triangle near the top. Part (a) shows two lines scanned near the top of the picture; part (b), near the middle of the picture; and part (c), near the bottom. Thus (a), (b) and (c) represent three sections of the picture where the average brightness is low, medium, and high respectively. Fig. 42 can be said to represent the signal as it is at the output of the camera tube or as it is recovered at the video second detector. Of special importance is the fact that all the blacks are lined up so that the d-c component of the signal is represented in all cases. Note that the d-c component, like the average brightness which it represents, is successively larger in (a), (b), and (c).

Now what happens to this signal when it is passed through an a-c amplifier which contains coupling condensers and therefore will not pass the d-c component? This is clearly illustrated in Fig. 43 which shows that the blacks are no longer lined up, but instead the separate average-brightness or a-c axes are all lined up. In other words, when the d-c component is lost, only the fluctuations on either side of the average brightness are transmitted and this axis must of necessity be the zero voltage axis in all instances because no d-c component can get through the amplifier.

Having investigated the video signal both with and without the d-c component, let us now examine the manner in which the picture tube is affected by the presence or absence of the d-c component. In Fig. 42, we see that black in every case corresponds to the same definite voltage value and that is also true for white and every intermediate shade between black and white. Thus when the voltage of Fig. 42 is applied to

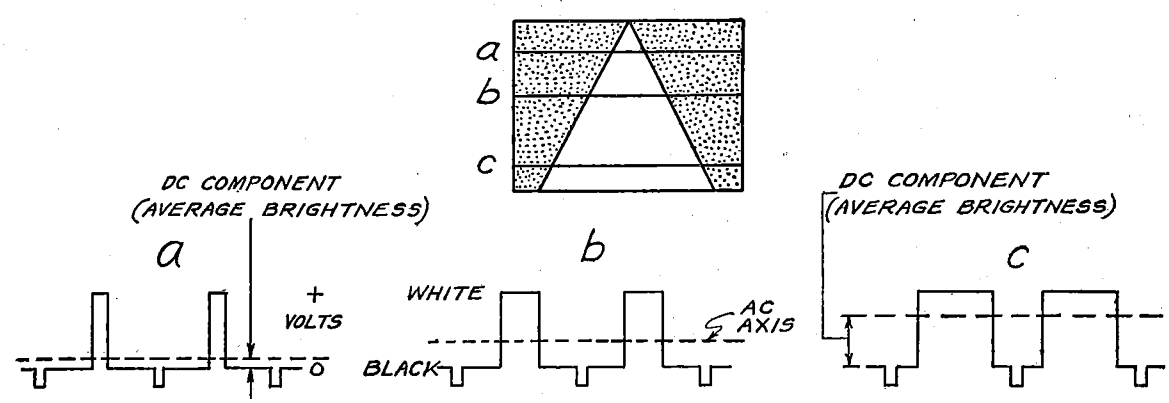


FIG. 42

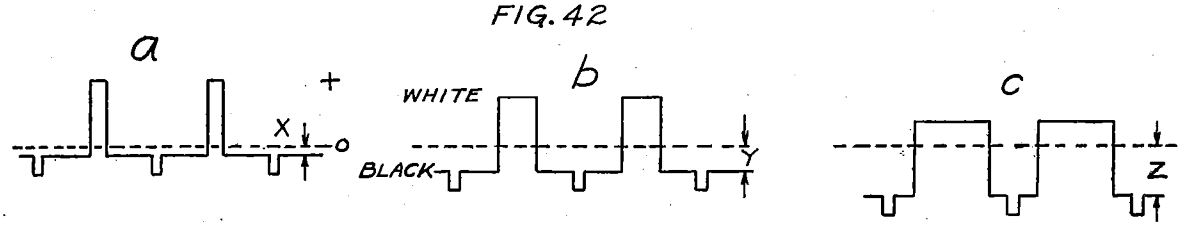


FIG. 43

FIGS. 42, 43.—FIG. 42 shows the video wave produced when two lines are scanned at a, b, and c of the white triangle on a black background. Since the black level is the same for all three cases, this signal contains the d-c component. FIG. 43 shows the same signal after it has passed through an a-c amplifier; note that the d-c component has been lost so that black in the signal no longer corresponds to a fixed voltage level as it does in FIG. 42.

the grid of the picture tube, the picture will be reproduced without any distortion.

This, however, is not true of the signal in Fig. 43, from which the d-c component has been removed. Black no longer corresponds to the same value in all instances, but instead the signal voltage associated with black takes on a value which is entirely dependent upon the average brightness of the strip being scanned. In the same way, this figure shows that white, and in fact every intermediate shade as well, has a different voltage value which is also dependent upon the average brightness of the strip being scanned. A little reflection will show you that this gives rise to serious distortion because the same light value in different parts of the picture does not correspond to the same voltage value in the signal. Thus, for example, the grid of the picture tube receives a *different voltage* for the *same shade* of gray in (a), (b) and (c) of Fig. 43 and as a result this shade is reproduced differently in the three instances.

In order to remove this source of distortion, it is apparent that the average brightness or the d-c component must be restored. At first glance this seems impossible, for how can the d-c component be restored after it has once been lost in the video amplifier? As a matter of fact, it is generally not possible to restore the d-c component of a pulsating wave after the d-c component has been lost in transmission, because no information relative to the d-c component is contained in the a-c component; the two are entirely independent of each other. Fortunately, however, the sync pulse is transmitted at the end of each line, *and the pedestal on which the sync pulse stands corresponds to a definite black reference level.* These facts make it possible to restore the lost d-c component. Thus to restore the d-c component to the signal of Fig. 43 it is only necessary to modify the signal so that all the synchronizing pulses are lined up. When this is done, the signal in Fig. 43 is exactly the same as that in Fig. 42 and the d-c component has been completely restored.

The solution of the problem depends upon finding this varying d-c voltage and adding it to the signal. This is accomplished in a very simple manner by using a diode to rectify the "black" half of the a-c video signal (which contains the sync signal) and in this way the required voltage is produced. Thus in Fig. 43, at (a) this rectification produces the voltage x; at (b) it produces the voltage y; and at (c) it produces the voltage z. In general, the addition of this varying d-c voltage lines up all the pedestals to produce the original signal (Fig. 42) with the d-c component restored.

Basic D-C Restorer Circuit

In Fig 44 we show a straightforward circuit which is used to restore the d-c component in the video signal before the signal is applied to the control grid of the picture tube. The video signal is developed across the 3000-ohm plate resistor R1 and fed to the control grid through a 0.1-mf coupling condenser C1. As the sketch shows, the signal has the required positive polarity both at the plate of the video amplifier and the grid of the picture tube. However, the d-c component is not present at the plate side of C1, whereas the diode circuit shown in heavy outline has restored the d-c component on the grid side.

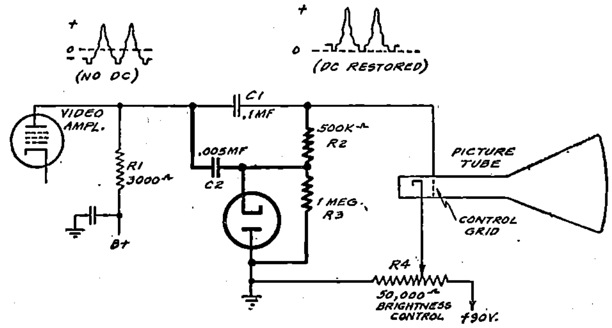


FIG. 44.—The heavy outline shows a typical d-c restorer circuit arranged to restore the d-c component to the video signal before it is applied to the control grid of the picture tube.

Let us see just how the diode circuit restores the d-c component. Considering the series circuit composed of the video voltage across R1, the .005-mf condenser C2, and the diode in shunt with a 1-meg resistor,—we can see that the following takes place: On the positive half of the cycle the cathode of the diode is swung positive with respect to its plate so that no current flows in the diode circuit. On the negative half of the cycle, however, the cathode is swung negative with respect to the diode plate, and current flows in the diode circuit through R3. It is this current flow which charges C2 and makes the cathode end of R3 positive, and as a result provides the d-c restoring bias.

Note that the d-c voltage across R3 satisfies all the conditions required to line up the sync pulses so as to restore the d-c component. Essentially the action in the diode circuit is such that the *negative* part of the video wave is rectified and that the diode current charges C2 positively to a value equal to the amount by which the sync pulses in (a) are depressed below the a-c axis. Since the grid of the picture tube is returned to this d-c voltage through the 50,000-ohm resistor R2, the d-c voltage is added to the video signal at (a) and "raises" the pedestal so that it lies along the zero-voltage axis, as shown at (b).

Now suppose, as in Fig. 43 (c), that the average brightness is higher than that shown at (a) in Fig. 44. This results in the pedestal being more negative with respect to the a-c axis, so that the diode produces a more positive voltage which again raises the pedestal to the same zero-voltage axis as at (b) in Fig. 44. Thus the action is entirely automatic so that all the pedestals are lined up at the grid of the picture tube, *regardless of the value of the average brightness.*

It is important to understand that the voltage produced at the cathode varies constantly throughout the scanning and that its value at any time depends upon the average brightness of the *portion* of the picture being scanned at that particular time. The time constant (RC) of the diode circuit is designed so that C2 will not discharge appreciably during the interval between successive sync impulses. At the same time, the time constant is sufficiently small so that when the average brightness changes, the condenser is able to change its charge rapidly enough to respond to the new conditions.

Insofar as the grid of the picture tube is concerned, it receives the a-c component of the video signal through C1, and *only* the d-c component through R2. Although the a-c component is also present at the cathode of the diode, R2 acts as a filter resistor to prevent that portion of the video signal present at the cathode from reaching the picture-tube grid through R2.

Brightness Control

We have just seen how the d-c restorer circuit automatically lines up all the sync pulses so they are at the same voltage level. For correct operation of the

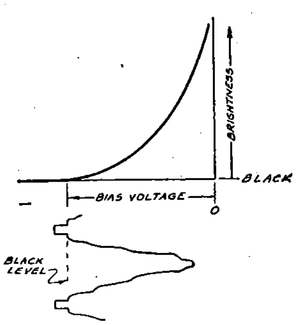


FIG. 45.—The effect of bias voltage on the brightness of the image. The brightness control (see FIG. 44) should be adjusted so that the black level on the signal occurs approximately at the cutoff of the picture tube characteristic.

picture tube, the bias on the picture tube must be so adjusted that these aligned pedestals occur at the cutoff or black level. The sync pulses will then lie in the blacker-than-black region and the various shades of gray and white will be reproduced correctly.

Fig. 45 shows the illumination characteristic of a picture tube and the manner in which the brightness of the scanning spot depends upon the bias voltage on the control grid. Referring again to Fig. 44, it will be observed that the cathode of the picture tube is returned to a potentiometer which makes it possible to vary the bias voltage from 0 to 90 volts.

When the bias is highly negative, the tube is cut off and the spot intensity is zero. As the bias becomes more positive, the intensity of the spot increases. For correct operation, the brightness control should be adjusted manually so that the pedestals occur at the black or cutoff points. Once the brightness control has been set, the d-c restorer circuit automatically keeps the pedestals in alignment so that no further adjustment is required.

Grid Leak—Condenser Restorer

Another type of d-c restorer circuit which is very widely used is shown in Fig. 46. In this circuit the

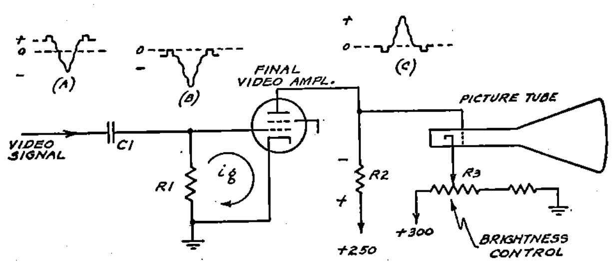


FIG. 46.—A widely used type of d-c restorer circuit in which the video amplifier output tube is operated at zero bias so that the grid-cathode elements function as a diode to reinsert the d-c component.

output video amplifier tube is operated at zero bias and the grid-cathode elements are used as a diode to insert the missing d-c component. To prevent the loss of the newly restored d-c component which would occur if condenser coupling were used in coupling the plate to the picture tube, the plate is coupled *directly* to the picture tube grid.

From the explanation already given of the process of d-c restoration, it is easy to understand how circuits of this type operate. The waveform of the video signal on the left side of C1 is shown at (a); at this point the signal has a negative polarity and of course the d-c component is missing. When this a-c signal is impressed on the grid of the output tube through C1, the positive parts of the video cycle (including the sync pulses) place the grid positive with respect to its cathode so that grid current flows through R1. The direction of this grid-current flow is such that the grid becomes negative with respect to ground.

When the average brightness of the signal is small, the a-c axis of the signal will be near the black level, the positive peaks will be small in amplitude, only a small value of grid current will flow, and consequently the grid will be displaced only slightly negative. On the other hand, when the average brightness is great, the a-c axis is away from the black side, the positive peaks will be large in amplitude, a relatively large flow of grid current will take place, and the grid will be made highly negative. *In each instance, the grid will be made more negative by an amount equal to the height of the sync pulses above the a-c axis of the wave.* As a result of this action all of the pedestals in the signal are depressed by an amount sufficient to align them to the same zero-voltage level at the grid. This is shown by the signal waveform at (b). Essentially the action here is the same as that previously described for the circuit using a separate diode. The condenser C1 performs the same function of storing the grid charge as in the previous method.

At the plate of the output tube, the polarity of the video signal is reversed and as (c) shows, the signal at this point has the required positive polarity. Since no blocking condensers are interposed between the plate and the grid of the picture tube, the sync pulses remain in alignment.

As in the previous circuit, provision must be made for initial adjustment of the bias of the picture tube so that the pedestals of the signal will occur at cutoff (black level) on the picture-tube characteristic. To accomplish this, the cathode of the picture tube is returned to a bleeder-potentiometer which makes it possible to place up to a maximum of +300 volts in the cathode. Since the grid can at most have a potential of +250 volts, this makes a bias of —50 volts available on the grid of the picture tube. Under actual operating conditions, the voltage drop across R2 makes the grid more negative; this is compensated for by making the cathode of the picture tube less positive by adjusting the brightness control R3.

When the receiver is first turned on, there is no voltage drop across the plate-load resistor R2 until the output video tube warms up and draws plate current. The final adjustment of the brightness control therefore should not be attempted until the receiver has been turned on for a few minutes. In particular the brightness control should be all the way to the left (with the rotor at +300) until the receiver has warmed up; this is done to avoid possible damage to the picture tube because of excessive beam current.

The Contrast Control

The "contrast control" is the gain control which determines the magnitude of the video signal applied to the grid of the picture tube. Its counterpart in a sound receiver is the volume control, and in the same way that the sound volume control determines the range of intensities between the loudest sound and the softest sound, so the video contrast control determines the range of light intensities between the highlights and the shadows of the picture. Referring to Fig. 45, the setting of the contrast control determines how much of the picture tube characteristic is used and how bright will be the brightest element of the scene. When the contrast control is not advanced far enough, the picture lacks brilliance and the highlights are comparatively dark; when the contrast control is advanced too far, the picture becomes blurred, there is a loss of detail in the highlights, and in general the intermediate shades are lost.

Synchronizing Circuits

The circuits devoted to synchronization in a television receiver are those which remove the sync information contained in the complete video signal and utilize it to control the timing of the horizontal and vertical deflection oscillators. To perform these functions, the sync part of the signal must first be separated from the picture part of the signal. In addition the vertical sync pulses must be separated from the horizontal sync pulses so that each can be applied to the respective deflection oscillator which it controls.

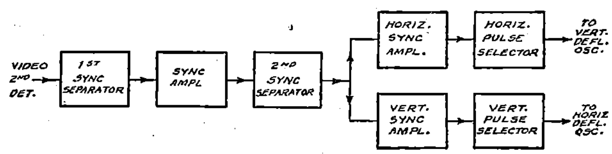


FIG. 47.—Block diagram of the sync circuits used in the RCA Model TRK-12 receiver.

The circuits used to separate the synchronizing pulses from the picture portion of the signal are called "sync separators" or "clippers." These circuits are designed so that they are responsive only to the sync pulses which lie above the pedestals; thus they reject the picture portion of the signal. The clipper or sync separator is generally followed by additional amplification and finally the sync signal is fed to a frequency-selecting circuit which separates the horizontal sync pulses from the vertical sync pulses. This separation is accomplished by circuits which depend for their action upon the difference in the time duration of the two types of pulses.

To illustrate the principles involved in sync circuits, we shall describe the circuits used in the RCA Model TRK-12 receiver. As the block diagram in Fig. 47 shows, the video signal is taken directly from the second detector and passes through the *first sync separator* which removes most of the video signal from the sync signal. The sync signal is then amplified in a *sync amplifier* stage and fed to a *second sync amplifier* stage which completes the separation of the sync signal. The output of the second clipper is fed to two separate stages, the horizontal sync amplifier and the vertical sync amplifier. The output of the horizontal sync amplifier feeds the sync pulses to a circuit—*the horizontal pulse selector*—which selects the vertical sync pulses; the output of the vertical sync amplifier also feeds the sync pulses to the *vertical pulse selector* which selects the vertical pulses.

On the whole, the block diagram presents quite an imposing array of circuits considering that it represents but a small part of all the circuits in the complete receiver. However, synchronization is so important in the operation of the television system that great care must be taken to make the synchronization positive in action.

Sync Separator Circuit

Referring to the partial schematic in Fig. 48, the video signal is fed from the second detector directly into the grid of the first sync separating tube. This stage uses one section of the 6N7 dual triode. The distinguishing features of this stage are that the tube is operated at the very low plate voltage of 15 volts and at zero bias (when no signal is present). When a signal is being received the grid leak-condenser combination R75-C77 provides a bias voltage as a result of the rectified grid current. As the waveform shows, the polarity of the video signal applied to the grid is negative so that the grid bias is supplied by the sync pulse part of the signal. As previously explained in connection with d-c restorer circuits, the bias at the grid varies in accordance with the average brightness and the result is that all the sync pulses are lined up with the zero-voltage axis at the grid of the first sync separator. This is illustrated in Fig. 49 which shows the plate current-grid voltage characteristic of the first sync separator stage.

Because of the low plate voltage of only 15 volts, plate-current cutoff is reached at a low value of negative grid voltage. Consequently the picture part of the signal lies beyond cutoff, and only the sync pulses are effective in causing the plate current to change. Thus the picture part of the signal is removed and so does not appear in the plate circuit of the first sync amplifier tube. An important part of the action in this circuit is the operation with grid leak bias so that all the sync pulses are lined up. As in the d-c restoring circuits, the time constant of the input circuit is sufficiently large so that the bias is maintained during the interval between sync pulses.

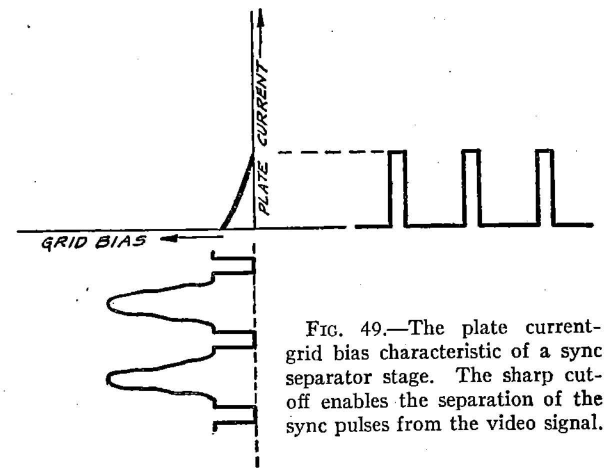


FIG. 49.—The plate current-grid bias characteristic of a sync separator stage. The sharp cut-off enables the separation of the sync pulses from the video signal.

The signal produced in the plate circuit of the first sync separator no longer contains the picture part of the signal but instead the latter has been removed because of the sharp cutoff of this stage. A term often used to describe the action of a circuit similar to the first sync separator is the term "clipper." This term is appropriate because the stage can be thought of as clipping the video portion of the signal and leaving only the sync pulses.

The clipped sync signal is next fed to the grid of the second triode of the 6N7 which is arranged to func-

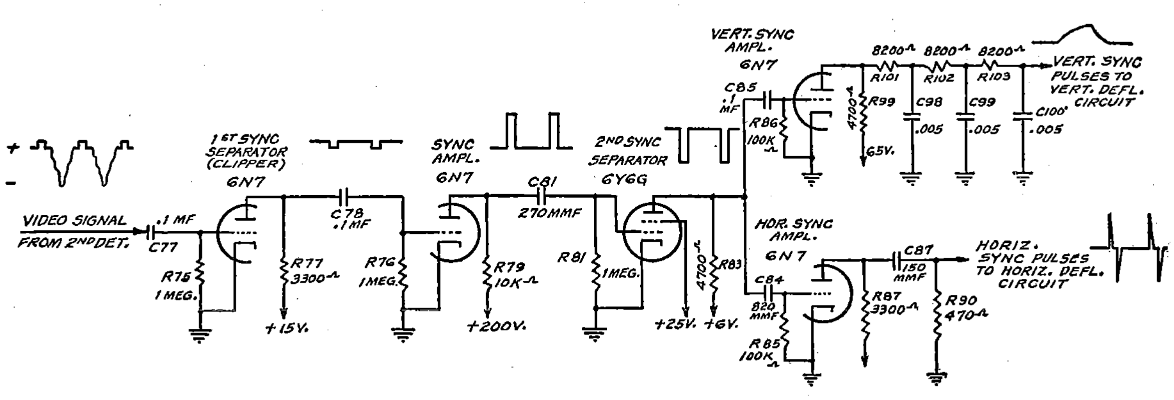


FIG. 48.—Schematic of the sync circuits used in the RCA Model TRK-12 receiver.

tion as an amplifier. For this reason a high value of plate voltage, 200 volts, is used. Note that the sync pulses have been reversed in polarity so that the grid of the amplifier tube goes negative on the peaks of the sync pulses. However, the operating characteristics of the amplifier stage are such that the sync pulse waveform in the plate circuit of the sync amplifier is simply an amplified version of the signal in the grid circuit. The polarity of the signal is of course reversed 180 degrees so that the sync signal in the grid circuit of the following clipper tube is negative in polarity.

The action in the second sync separator is similar to that in the first sync separator. A screen grid tube is used with the screen placed at a higher voltage than the plate and with both these voltages comparatively low. Thus the screen voltage is only 25 volts and the plate voltage about 6 volts. Under these conditions the stage has a very effective clipping action on both the positive and negative peaks of the sync pulse. In this way, if any video signal still remains it is clipped sharply by the plate-current cutoff; at the same time, the positive peaks of the sync pulses are again clipped as in the previous sync separator. As a result of this second clipping of the sync pulses, the waveform is made flat and any noise components that may have been added to the signal are removed. Thus noise is prevented from interfering with the synchronization.

The output of the second sync separator feeds the

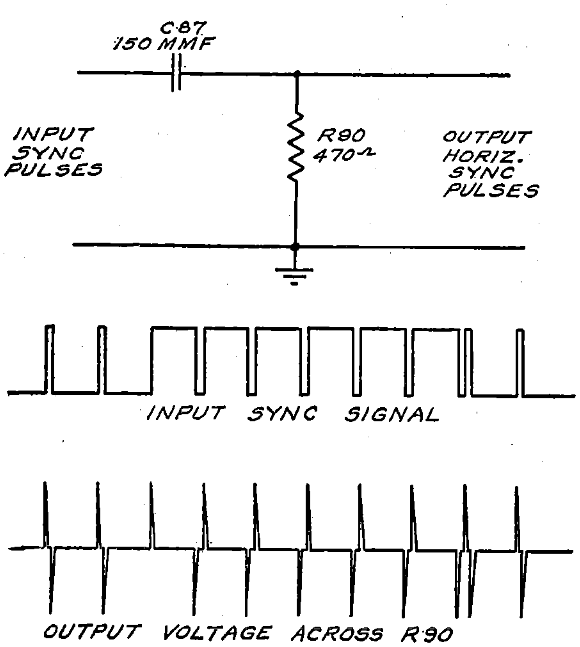


FIG. 50.—Circuit used for separating the horizontal sync pulses from the complete sync signal. The waveform of the sync signal at the input of the circuit and the corresponding waveform at the output are shown below the circuit.

sync pulses to two separate amplifier stages, a vertical sync amplifier and a horizontal sync amplifier. These individual stages provide further amplification of the sync pulses and at the same time act as buffer stages to isolate the vertical sync circuits from the horizontal sync circuits. The circuits used in the output of these stages are frequency-selecting circuits which differentiate between the two types of sync pulses by making use of the fact that the duration of the vertical sync pulses is greater than that of the horizontal sync pulses.

Horizontal Sync Selector

The signal is coupled to the horizontal sync amplifier through the 820-mmf condenser C84. The amplified signal appears across R87 and is fed to the *selector circuit* consisting of C87 (150-mmf) and R90 (470 ohms). This circuit separates the horizontal sync pulses, which appear across R90.

The manner in which this selector circuit operates requires some explanation. Essentially the current which passes through R90 is limited by C87 because of the small value of capacitance and the low value of resistance. As a result the current through R90 is proportional to the rate of change of the sync pulse voltage and in this way sharp voltage pulses are produced across R90. This is clearly iluustrated in Fig. 50 which shows the input sync signal during the interval between successive fields. Note that at each edge of the sync signal where the waveform changes abruptly, this rapid change results in a pulse of current through C87 and R90, which produces the voltage drop across R90 shown in the figure. As explained later, only the positive pulses across R90 are effective in synchronizing the deflection circuit; those below the axis have no effect. As Fig. 50 shows, horizontal sync pulses are also produced during the vertical blanking period because the leading edge of each vertical sync pulse represents a rapid change of voltage and therefore produces a pulse through R90.

Vertical Sync Selector

The complete sync signal is also fed from the second sync separator into the grid of the vertical sync amplifier. The amplified sync signal appears across R99 and is fed to the selector circuit consisting of R101 and C98. Two additional sets of resistor-condenser combinations are used in series in order to increase the effectiveness of the vertical pulse selection.

The action of R101 and C98 in differentiating between the vertical and horizontal sync pulses is a direct result of the longer duration of the vertical pulses. Thus Fig. 51 shows that each one of the sync impulses, including the horizontal impulses, contributes a small amount of charge which is stored in the condenser. The greater the duration of the pulse, the greater the voltage across the condenser. During the

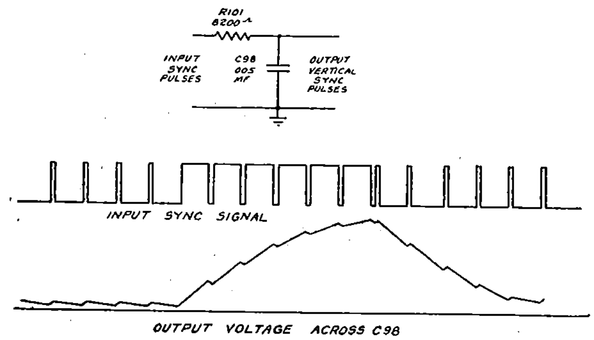


FIG. 51.—Circuit used for obtaining the vertical sync pulses required for field synchronization. The corresponding waveforms at the input and output are shown below the circuit.

transmission of the long vertical sync pulses, the accumulation of charge on the condenser is greater than during the transmission of the short line sync pulses. As a result, the voltage across the condenser C98 builds up to a peak once during each field or 60 times in each second. As the figure shows, the vertical pulse builds up to a maximum at the end of the last vertical sync pulse and then steadies down to an average value of voltage which remains constant until the beginning of the next field pulse.

To increase the circuit effectiveness, two more similar resistor-condenser combinations are used in series as shown in Fig. 48. These circuits accomplish a further selection of the two pulses so that a sharper pulse is produced once during each field. The peak of this pulse is used to synchronize the vertical deflection oscillator.

For exact interlacing it is important that the vertical pulses produced at the output of the vertical selector circuit be the same on alternate fields. The equalizing pulses, previously described, accomplish this by making the conditions exactly the same before and after the transmission of the actual broad vertical sync pulses. As a result, the condenser charges up to the same value of peak voltage on both the odd and even fields so that the vertical oscillator is maintained in perfect timing.

DEFLECTION CIRCUITS

In describing the picture tube we explained how the electron beam can be deflected by sawtooth waves applied to the deflecting elements of the picture tube. The previous sections have explained the necessity for synchronizing these waves and how the sync signals are selected at the receiver. The next problem is to generate the sawtooth waves, control them by the sync signals and to apply them to the deflecting system of the picture tube.

The block diagram of Fig. 52 shows the essential parts of a common type of deflection circuit for television. From the sync separator described in the previous section, horizontal sync pulses are applied to the horizontal deflection circuits and vertical sync pulses to the vertical deflection circuits. Both sets of deflection circuits contain the same type of elements, the principal difference being the operating frequencies.

The sawtooth waves shown in Fig. 15 are formed in the *discharge circuit*. This circuit includes a condenser which is slowly charged from the B supply and then rapidly discharged through a vacuum tube. The voltage across this condenser varies in such a way as to form a sawtooth voltage wave similar to that shown in Fig. 15. The exact moment at which the discharge tube operates is determined by the *blocking oscillator* which provides pulses to the grid of the discharge tube of sufficient amplitude to "trip" it. The frequency of the blocking action is itself synchronized with the incoming signal by pulses from the *sync separator*. The sawtooth voltage wave formed in the discharge circuit

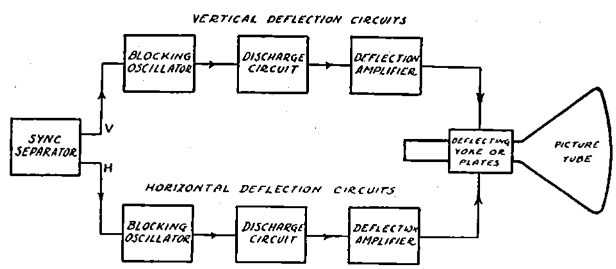


FIG. 52.—Block diagram of the essential parts of a widely-used type of deflection circuit.

is amplified in the *deflection amplifier* and then applied to the deflecting yoke or plates which cause the scanning action of the beam in the *picture tube*.

Circuits for Electromagnetic Deflection

The schematic, Fig. 53, shows the deflection circuits used in the RCA Model TRK-12 and Westinghouse Model WRT-703 receivers. These are examples representative of circuits for use with a picture tube deflected by the electromagnetic method.

To describe the formation of the sawtooth wave, let us assume that the grids of the 6N7 tube (in the horizontal circuit) are biased to cutoff so that the tube is non-conducting. The plate voltage starts to charge the .001-mf condenser C90 through resistors R93, R94 and R95 in series. The voltage across C90 (from D to ground) rises as shown by the line designated "trace" in Fig. 15a. About 65 microseconds later, a positive pulse of voltage is applied to the grids of the 6N7 and the tube "trips" or starts conducting. The triode section, whose plate is connected to D, then acts as a short to ground and discharges C90 in about 11 microseconds. The voltage across C90 falls as shown by the line designated "retrace" in Fig. 15a. The discharge is stopped after 11 microseconds by a sudden blocking of the grids, and the charging cycle starts again. The relatively short time allowed for the charge and discharge of condensers C90 (horizontal) and C103 (vertical) assures that the sawtooth wave will be essentially linear.

Blocking Oscillator

The periodic blocking and tripping of the 6N7, which has just been mentioned, is accomplished by the blocking oscillator. In connection with the latter, the question naturally arises as to why the sync pulses could not be used directly to trip the discharge tube. Actually, the sync pulses could be used directly, but it has been found more satisfactory to use the blocking oscillator circuit being described. The blocking oscillator provides a steep pulse of high amplitude which is more readily adapted to the control of the discharge tube than is the sync pulse itself. The necessary timing of the blocking oscillator is of course obtained from the sync pulses.

As the name implies, the blocking oscillator is a regenerative oscillator in which the feedback is so large that the oscillator is blocked on the first cycle of oscillation. Thus when oscillation starts, the amplitude is so great that the negative charge which accumulates on the grid condenser drives the tube to cutoff. Before the oscillations can start up again, the charge on the grid condenser must leak off. The rate at which this charge leaks off determines the rate at which the steep pulses are produced by the blocking oscillator. Because the circuit constants are such that the natural frequency at which the oscillator attempts to work is higher than the frequency of blocking, the pulse produced when oscillations start has a very steep waveform which is advantageous in controlling the discharge tube.

The rate of blocking, and hence also the rate at which the pulses for the discharge tube are produced, is controlled by R91 and R92. The lower the value of this grid resistance, the more rapidly the charge leaks off so that the oscillations can begin again and produce another pulse. The "free-running" frequency of

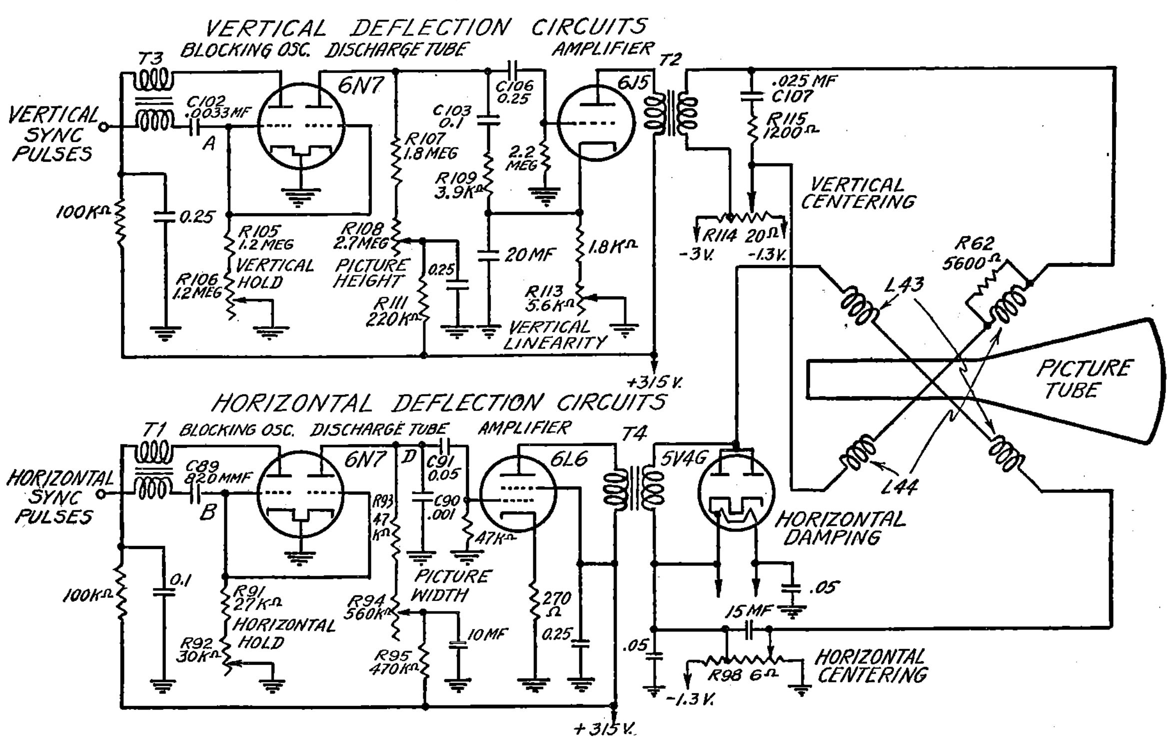


Fig. 53.—Deflection circuits used in the RCA Model TRK-12 receiver. Compare with the block diagram shown in Fig. 52.

the blocking oscillator is thus controlled by the value of C89, which determines the amount of charge stored in the grid circuit, and R91 and R92 which determine the rate at which this charge leaks off.

In practice, the free-running frequency is adjusted by means of the *horizontal hold control* R92 so that it is lower than the line frequency of 13,230 cycles. The application of the horizontal sync pulse to the grid circuit, as shown, will then introduce a positive pulse into the grid circuit and cause the blocking oscillator to start operating slightly before the instant when it would normally resume operation. In this way the sync pulse keeps the blocking oscillator exactly in synchronism with the frequency of the scanning at the camera tube.

The circuit for the vertical deflection operates in the same manner. In this case R106, the *vertical hold control,* is adjusted so that the free-running frequency of the vertical oscillator is slightly less than 60 cycles. The introduction of the vertical sync pulse trips the oscillator just before it would otherwise resume oscillation so that the frequency is kept in synchronism with the vertical sync pulses.

Width and Height Controls

The peak value of the sawtooth voltage which is developed across C90 depends on the setting of R94. Since the peak value of the voltage across C90 determines the magnitude of the horizontal scan and therefore the picture width, R94 is called the *picture width control.* Similarly R108 controls the vertical sawtooth amplitude and therefore is called the *picture height control.*

The *vertical linearity control* R113, which is in series with the vertical wave-forming condenser C103, corrects the waveshape so that a sawtooth wave of current will be obtained through the deflecting coils.

Centering

As a result of the circuits described, accurately timed sawtooth voltages are available at points C and D. These waves are amplified and coupled to the deflecting coils L44 and L43 by transformers T2 and T4 respectively. The picture is centered on the picture-tube screen by sending a small direct current through the deflecting coils. Potentiometers are provided for making the vertical and horizontal centering adjustments.

Damping Tube

The 5V4G diode shunted across the secondary of T4 is provided so as to prevent transient voltages being set up when the scanning current changes abruptly. This diode acts as an automatic switch so that the transformer is loaded only during the trace period, and the load removed during the retrace period. It is not possible to use a permanently-connected resistor load in place of the diode switch because this continuous loading would tend to prolong the retrace period by an excessive amount.

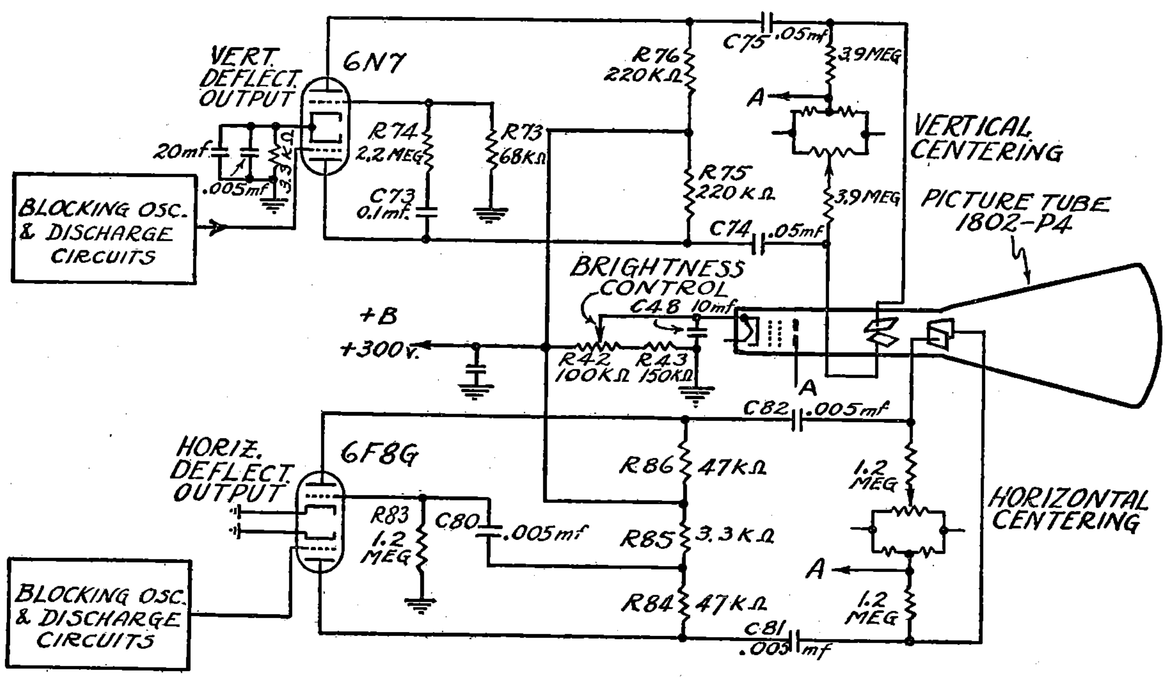


FIG. 54.—Circuits used for electrostatic deflection in the RCA TRK-5 receiver. Note the push-pull output in both the horizontal and vertical channels.

Electrostatic Deflection

In electrostatic deflection systems for television, it is usual to use the same type of sawtooth-wave generator as is used for electromagnetic deflection. The output systems, however, are quite different. To avoid distortion of the raster and defocusing of the spot, the sawtooth waves on each plate of any pair must be alike but 180 degrees out of phase. A balanced amplifier using a phase inverter is used to furnish these deflecting voltages. The force acting on the electron beam is thus due to the difference between the potentials of the two plates, since at any one instant the positive voltage on the one plate attracts the electron beam at the same time that the corresponding negative voltage on the other plate repels the electron beam. Thus, if at any instant the deflecting voltage on one plate is +50 volts, then the voltage on the other plate is —50 volts and the effective deflecting voltage is the sum or 100 volts.

Electrostatic Deflection Circuits

Fig. 54 shows the output circuits of the electrostatic deflection circuits used in the RCA TRK-5 and Westinghouse WRT-701 receivers. The blocking oscillator and discharge circuits are shown in block form because they are similar to those shown in Fig. 53. In the vertical circuit the signal across R75 is fed to one of the vertical deflecting plates through condenser C74. This same signal is also fed to the grid of the phase inverter section of the 6N7 tube through condenser C73 and a voltage divider consisting of R74 and R73. The signal across the phase inverter load R76, which is 180 degrees out of phase with the signal across R75, is fed through condenser C75 to the other vertical deflecting plate. The voltage divider R74, R73 is used to compensate for the gain of the phase inverter section of the 6N7 so that the signal amplitude applied to each deflecting plate is the same except for the phase reversal. In the case of the horizontal deflecting circuit, the action is similar; here the voltage divider consists of R84 and R85.

Centering Control

Fig. 54 also shows the type of centering circuit used with electrostatic deflection. One plate of each pair is returned to the second anode through a high resistance. The second plate is returned through a high resistance to the potentiometer which permits a d-c voltage, either zero, plus or minus with respect to the first plate, to be applied to the second plate in order to center the raster on the screen of the picture tube. These potentiometers, called *centering controls,* are usually adjusted during installation and seldom need readjustment. The details of this type of circuit are shown in Fig. 55 in the following section on power supplies.

POWER SUPPLIES

As a general rule, two separate rectifiers are used to supply the d-c voltages for television receivers. A low-voltage supply provides approximately 300 volts for the tubes associated with the amplifier, deflection, and sync circuits of the receiver. A separate high-voltage power supply provides the high voltages—from approximately 2000 to 10000 volts—required for the picture tube.

Since the low-voltage power supplies are very similar to those used in radio receivers, a separate low-voltage schematic is not shown here. The regulation in a television low-voltage power supply is generally better than that in a radio receiver because of the importance of preventing variations in the numerous circuits from interfering with each other and with the picture. The hum level is also kept down to a lower value because of the large number of circuits and stages, and because hum which would be inaudible in a sound receiver may cause appreciable distortion of the picture.

Unlike the low-voltage power supply, a half-wave rectifier is invariably used in the high-voltage supply. The advantages of the half-wave rectifier are that the transformer does not have to be as large and that the peak voltage is reduced to about one-half the value required for full-wave rectification. Ordinarily the half-wave rectifier is not used in radio receiver power supplies because its output is harder to filter and because it cannot supply as much current to the load as the full-wave rectifier. However, these characteristics are not disadvantages in television receivers because only a very small current is drawn and a resistor-condenser filter can be used.

High-Voltage Power Supply in RCA TRK-5, Westinghouse WRT-701

The high-voltage power supply used in the RCA Model TRK-5 and Westinghouse WRT-701 receivers is shown in Fig. 55. A type 879 high-voltage half-wave rectifier is used, the complete path of the rectified current being from the low-voltage end of the secondary, through the secondary winding, the 879 rectifier tube, the first filter resistor R91, the second filter resistor R92, and the bleeder resistors from R93 to R98, inclusive, and back to the low-voltage side of the secondary.

R91 acts as a filter resistor and also limits the voltage and current through the first filter condenser C86. Good filtering is secured by using a high value of filter resistance; R92 is 470,000 ohms, and in combination with the two .05-mf condensers provides adequate filtering. Note that large values of filter resistance rather than large values of capacitance are used to obtain the required filtering. The advantage of this is the reduced cost and size of the condensers; in addition, the smaller the size of the filter condenser, the less is the danger of fatal shock if one accidently comes in contact with a charged or partly-discharged condenser. Nevertheless, the high-voltage filter condensers should always be discharged before any measurements are made so as to guard against the possibility of an open bleeder circuit.

In the circuit being described the cathode of the picture tube is near ground potential while the second anode is 2000 volts positive with respect to the cathode. The focusing anode is returned to the focusing control which places approximately 500 volts on this electrode. Centering of the beam horizontally and vertically is accomplished by returning one plate of each of the pairs to point M which is at a voltage slightly lower than the maximum output of the power supply. The remaining plates are then returned to the sliding taps on the horizontal and vertical centering potentiometers so that the voltages can be varied either positively or negatively with respect to the other plates. These circuits should not be tested while the power is on since the maximum high voltage is present on all the deflection plates and centering adjustments. The deflecting plates are capacitively coupled to the horizontal and vertical deflection output tubes through .05-mf and .005-mf condensers as shown in Fig. 54; these condensers are of course rated to withstand the full high-voltage output.

The high-voltage supply is not entirely independent of the low-voltage power supply in the sense that the entire high-voltage power supply is returned to ground through the brightness control in the low-voltage power supply. If the connection to the brightness control at R42 were broken, then the entire high-voltage power supply would "float." In actual operation, the potential at the cathode is approximately 200 volts above ground potential, depending upon the setting of the brightness control; as a result the low end of the high-voltage rectifier circuit, including the cathode of the picture tube, is above ground potential by this same amount. The control grid of the picture tube, which is tied to the plate of the 6V6 video output tube, is approximately 175 volts above ground potential so that the proper average brightness can be secured by means of the setting of R42.

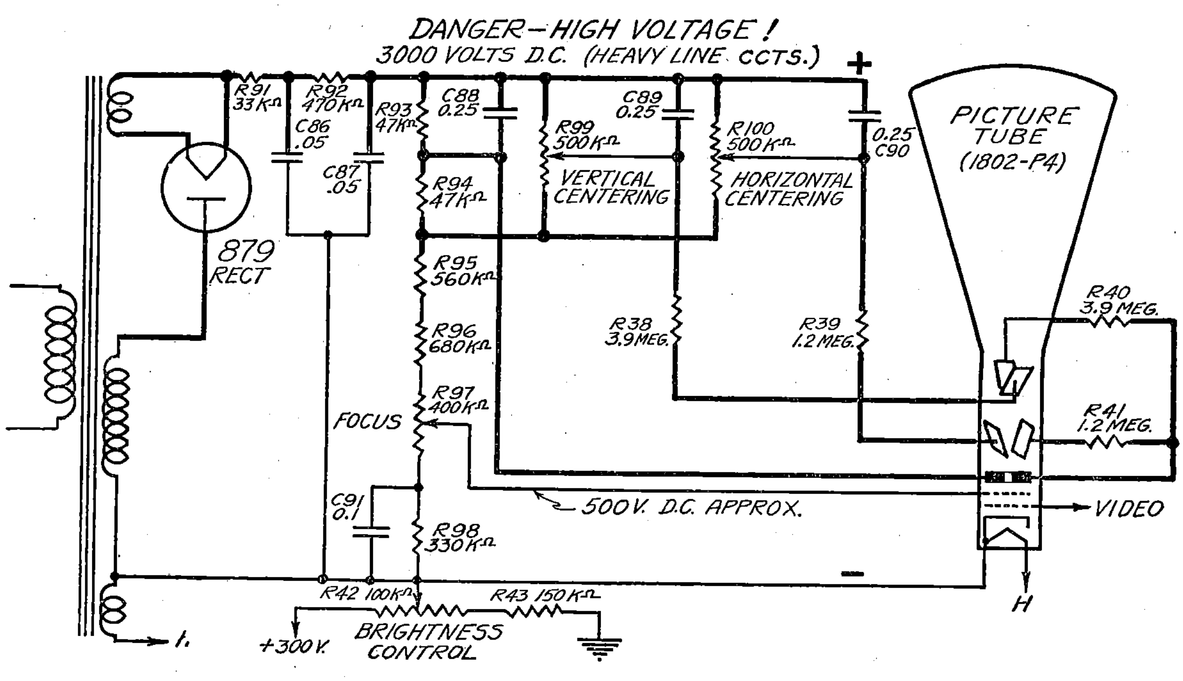


Fig. 55.—High-voltage power supply used in the RCA Model TRK-5 receiver. The heavy black lines represent the high-voltage circuits. Extreme caution should be observed to avoid coming in contact with high-voltage points.

Grounding of High-Voltage Power Supply

The high voltage difference required between the cathode and second anode of the picture tube can be obtained with either the positive or negative side of the high-voltage power supply near ground potential. In receivers using the electromagnetic method of deflection, it is usual for the negative side of the power supply to be grounded since this enables coupling the video output tube to the modulation grid without the use of a high-voltage condenser. This same system is also used in some receivers which use electrostatic deflection, as for example in the RCA Model TRK-5 receiver. Where electrostatic deflection is used, however, high-voltage blocking condensers are required in the circuits which couple the deflection output tubes to the horizontal and vertical deflection plates.

To avoid the use of high-voltage blocking condensers in the deflection plate circuits and at the same time maintain the deflection plates at the same potential as the second anode (which is necessary to avoid distortion in the picture tube), the positive side of the high-voltage power supply is sometimes grounded and the cathode is then several thousand volts negative with respect to ground. The DuMont Models 180-183 are examples of receivers using this type of circuit. Although high-voltage condensers are not required in the deflection circuits, a high-voltage blocking condenser must be used between the plate of the video output tube and the modulation grid.

Regardless of whether the positive or negative side of the power supply is grounded, the usual precautions against electrical shock must be observed.

ANTENNAS AND INSTALLATION

The proper operation of a television receiver depends to a very great extent upon the care with which the installation is made. No matter how well designed the receiver may be, its performance will be poor unless proper attention is given to the type of antenna, its location, and the installation of the receiver itself.

The receiver should be placed where no direct light will fall on the cathode-ray tube viewing screen. Although television pictures can be seen satisfactorily without total darkness, the vicinity of the receiver should be capable of being darkened readily. The location chosen should permit adequate ventilation and be close enough to a power outlet to avoid the use of extensions to the power cord. A good ground connection is also important. If the receiver is of the type intended to be used with a broadcast receiver, it should be placed in such a way that the sound appears to come from the picture, and the connections between the receivers should be as short as possible. The relation between the receiver location and the length of the antenna lead-in should also be considered, since the antenna location itself is usually determined by external conditions which cannot readily be changed.

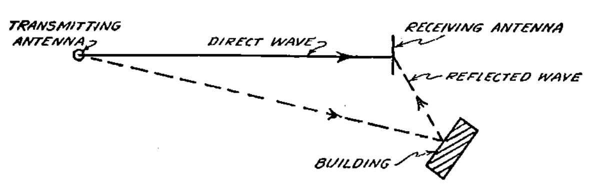


FIG. 56.—The same signal may reach the receiving antenna by two different paths. The dotted line shows the signal being reflected from a building. The example in the text is for a case in which the reflected (dotted) signal travels two miles farther than the direct signal.

The most important problem is the choice and installation of the antenna. The various manufacturers offer different types of antennas, some types being recommended for suburban areas, others for city use. All are of special design suitable for the ultra-short waves used in television, an ordinary broadcast antenna not being suitable for television use.

The necessity for special antennas for television is more apparent when we consider some of the differences between the short waves used in television and the comparatively long waves used in ordinary broadcasting. The shorter the wavelength of a radio wave, the more it behaves like light. For example, we know that light travels in straight lines through space. For this reason we cannot see objects far enough away to be "below the horizon." Clearly a taller object can be seen from a greater distance than one closer to the surface of the earth since it projects above the horizon. In the same way, the "coverage" of a television transmitter depends upon the height of both the transmitting antenna and the receiving antenna. In addition to increasing the range of reception, placing the receiving antenna as high as possible has the important advantage of increasing the signal pickup and decreasing the noise pickup. It is interesting to note that the television transmitter of the National Broadcasting Company in New York, which is located atop the Empire State Building (1250 feet high), covers a radius of about 40 miles or an area of about 5000 square miles.

In ultra-short wave transmissions as in light, buildings, mountains and other opaque objects cast "shadows" which result in no signal or very weak signal within the shadow area. In addition such objects can cause reflections which may result in distorted pictures because of the small but appreciable difference in the time of arrival of the direct wave and reflected wave. Fig. 56 shows how this reflection may occur. The transmitter sends out waves in all directions, one of which may be considered as going directly to the receiver. Another wave reaches the receiver indirectly by going first to a building or other reflector and then to the receiver. The important point here is the difference in the total length of the path which the reflected wave has to travel as compared with the path of the direct wave. Here the difference is 2 miles. Since both waves travel at the same velocity of 186,000 miles per second, the reflected wave will arrive $\frac{2}{186{,}000}$ second, or approximately $\frac{1}{100{,}000}$ second later than the direct wave. The time required for the electron beam to travel 1 inch horizontally across the picture tube is also about $\frac{1}{100{,}000}$ second. Therefore the reflected wave will cause a second image which is displaced about 1 inch horizontally to the right of the image due to the direct wave. Smaller time differences may produce only lack of sharpness in the picture, but in any case, when installing the antenna the serviceman should try to avoid multiple images due to reflections. This effect can often be reduced or eliminated by slight changes in the position of the antenna, or by the use of a special antenna.

In general, since American television transmitting antennas will be mounted horizontally, the receiving antenna should also be approximately horizontal, and placed broadside to the direction of the transmitter. During installation, however, the best procedure is to watch an actual picture on the receiver, comparing different locations and positions of the antenna on the basis of the results obtained at the receiver. An intercommunication set between the man working on the antenna and another observing the received picture is obviously a useful accessory for antenna installation.

Automobile ignition systems and diathermy apparatus emit short-wave signals covering at least part of the television spectrum. Antennas should therefore be erected as far as possible away from these sources of interference.

The antenna should be erected at as high a point as conditions permit, since, other things being equal, the signal strength increases when the elevation of the antenna is increased. A high antenna is also likely to reduce local interference. Both these effects of course, tend to improve the signal-to-noise ratio.

Most television antennas consist of two rods or tubes of conducting material placed in a straight line end to end, but with some separation between them. Each section is about ¼ wavelength (roughly 5 feet) long, making the total length about ½ wavelength. Such an antenna, shown in Fig. 57, is called a simple *half-wave dipole.*

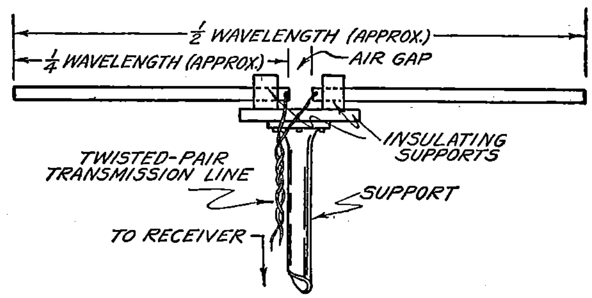


FIG. 57.—A half-wave dipole antenna—a type very widely used for television reception.

The lead-in or transmission line is usually a twisted pair of wires specially insulated against weathering; one wire of the pair is connected to each rod near the air gap. Some manufacturers have different kinds of transmission line for special purposes. The simple dipole is generally satisfactory, but improved performance can often be obtained from two such dipoles connected in parallel. Such double dipoles are mounted one above the other like the cross arms on a telephone pole.

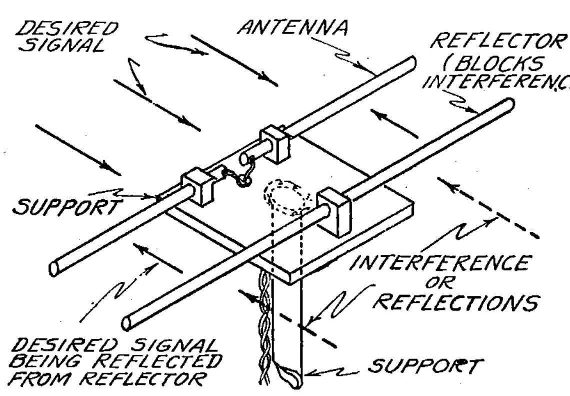


FIG. 58.—A half-wave dipole antenna with a reflector for increasing the signal pickup and reducing interference from reflections.

Where trouble is encountered from reflections or low signal strength, or both, a reflector element may be added to the antenna system. As shown in Fig. 58, the reflector is a continuous rod somewhat longer than the antenna and placed *behind* it; that is, the reflector is at the same elevation as the antenna and is parallel to it, but placed on the side of the antenna *away from* the transmitting station whose signal it is desired to receive. The reflector serves two desirable purposes:

it blocks interference or reflections coming from "behind" the dipole, and it strengthens the desired signal by reflecting it back to the dipole. The spacing between antenna and reflector is determined from the manufacturer's instructions or by experiment. The double dipole described previously may be provided with a double reflector.

No dipole of fixed dimensions can be equally efficient for all the television channels. The reason for this is that maximum efficiency requires that the length of the dipole (and also the reflector, if used) should have a fairly definite relation to the wavelength of the desired signal. We have mentioned, for example, that it should be about ½ wavelength long overall. For the first two television channels (44 to 56 mc) the middle frequency is 50 mc and the corresponding wavelength is 6 meters, or almost 20 feet. A 10-foot half-wave dipole is therefore quite efficient for these two channels. It is not so efficient, however, for the 66-72 mc and 78-90 mc channels, since the mid-channel wavelengths for these are respectively about 14.3 and 11.7 feet. If all these channels are to be received on one antenna, they will not be received with equal efficiency. Depending upon the local conditions, it is possible to choose the antenna length suitable for either (1) the mid-point of the whole band, (2) the mid-point of the most popular station or stations, or (3) to provide an antenna of adjustable length.

FREQUENCY MODULATION

Up to the present time all broadcast stations have used amplitude modulation for program transmission. In this method of transmitter operation the frequency of the carrier is maintained constant, usually by crystal control, while the amplitude of the carrier is varied by the audio modulation impressed upon it. A new system of broadcast transmission by frequency modulation is now being introduced by a few stations in the East. This system was devised by Major E. H. Armstrong and differs from amplitude modulation in that the carrier *frequency* is varied by the impressed audio modulation, while the carrier amplitude is held constant.

Advantages of Frequency Modulation

The principal advantages of frequency modulation over amplitude modulation are an improved signal-to-noise ratio, particularly in poor reception areas where the signal strength of the transmitter is weak, and a reduction in interference when two frequency modulated transmitters are geographically separated but operating on the same frequency. In receiving, better fidelity is usually more easily obtained from frequency-modulated transmissions.

Since the carrier frequency in frequency-modulated broadcasting is varied over a wide band, wide channels are necessary for transmission. Present channels are 200-kc wide and have been allocated in ultra-high frequency bands to avoid interference with other services which would result if channels of such width were assigned within the standard broadcast band. The actual carrier frequency variation is limited to one-half the channel width, as with amplitude modulation, since the frequency of the carrier varies above and below the nominal assigned value when audio modulation is applied. In present frequency-modulated broadcast transmissions, the maximum frequency deviation is held to approximately plus or minus 75 kc during audio modulation.

How Noise is Reduced

The manner in which frequency modulation reduces noise may be understood by remembering that most electrical noises change the amplitude of the signal but not its frequency. Now, in the amplitude modulation method of broadcasting, both noise and audio modulation act to vary the carrier signal voltage so that the two are combined in the signal detected by the receiver. In frequency modulation, however, the audio modulation varies only the frequency of the carrier signal and not its amplitude. Noise, on the other hand, will cause no change in the carrier frequency, though it will affect its amplitude. If, then, the receiver is designed to detect only variations in signal frequency and not variations in amplitude, noise resulting from amplitude modulation is eliminated. Frequency modulation is not perfect, but a very great reduction in noise is secured by this method.

Special Receivers Necessary

Conventional broadcast receivers are designed only for the reception of amplitude-modulated transmissions and therefore are not suitable for receiving frequency-modulated broadcast signals. The principal differences in the latter are in the design of the detector and in the limiter stage which precedes the detector.

A typical stage-by-stage lineup for a frequency modulation receiver is shown in Fig. 1. This shows an r-f amplifier, converter, 3-stage i-f amplifier, limiter, detector and a-f amplifier.

Since the transmitted frequency varies about 75 kc above and below the point to which the receiver is tuned and flat amplification is necessary for high-quality reproduction, the carrier-amplifying stages and the converter must be designed to pass a 150-kc band without frequency discrimination. Ordinary tuned circuits are usually far too sharp for this purpose, particularly in i-f circuits, so we find in the frequency modulation receiver that low-Q circuits are necessarily employed to achieve broad tuning.

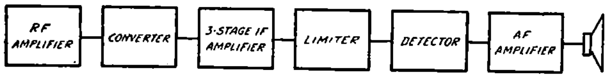


FIG. 1.—Block diagram of a receiver designed for the reception of frequency-modulated signals. With the exception of the limiter stage, the lineup is similar to that of a conventional superheterodyne receiver.

In the i-f stages, broad-band reception is secured by using a high intermediate frequency, usually of the order of 3 megacycles, and by broadening the i-f transformer response by resistance shunted across one or more windings.

What the Limiter Does

The limiter stage requires detailed consideration. Its purpose is to smooth out any variations in carrier amplitude so that it may pass on to the detector circuit a signal which is constant in voltage but varies in frequency. This is done by designing the circuit and operating the tube so that it overloads even when a weak signal is being received. Then any increase in signal voltage will not cause an increase in the carrier signal voltage which appears across the tuned circuit forming the limiter stage plate load. The high gain in the r-f, converter and i-f stages provides sufficient amplification for even weak signals so that the actual signal voltage at the limiter grid during reception will always be several volts. Any applied signal voltage greater than the overload point causes rectification in the grid circuit. A resistor in series with the grid return of the limiter input circuit is installed so that the grid current resulting from rectification in this circuit causes a voltage drop across the resistor which can be utilized to provide AVC action. This AVC voltage is applied, through appropriate filters, to preceding i-f, converter and r-f stages.

Special Detector Used

Since, in frequency modulation, the a-f modulation causes a variation in carrier frequency, we need a type of detector which will convert these frequency variations into the a-f signal voltages which originally produced these carrier frequency variations, and in this way restore the original modulation. Ordinary detector circuits are not suitable, since they give an output voltage which is proportional to the amplitude of the carrier modulation and not to the carrier frequency. Since the voltage output of the discriminator circuits employed in AFC designs varies with the frequency shift of the applied carrier signal, it serves as an ideal device for the detection of frequency-modulated signals.

A typical AFC discriminator circuit is shown in Fig. 2. The primary coil, L1, of the discriminator transformer is connected in the plate circuit of the limiter tube and is closely coupled to the center-tapped secondary L2, L3. When the transformer secondary circuit is tuned to resonance with the alignment frequency of the i-f system, the voltages E2 and E3 are equal but opposite in phase. Since the d-c voltage across the discriminator load resistors, R1 and R2, occurs as the result of rectification of E2 + E1 and E3 + E1, then, at resonance, the d-c voltage from point B to ground is equal to that from point B to A, as both R1 and R2 are similar resistors. However, because of the manner in which the diodes are connected, the resulting d-c voltages will be opposite in polarity. Therefore, the voltage across R1 will cancel that across R2 and a measurement from point A to ground will show zero voltage between these two points when the circuit is tuned to resonance with the alignment frequency. This is the normal condition for perfect alignment of an AFC circuit.

When the signal voltage applied to the discriminator transformer is higher or lower in frequency than that to which it is tuned, the voltages E2 and E3 will remain equal but their phase relationship with respect to E1 will change. As a result, E2 plus E1 will no longer equal E3 plus E1. Since this becomes the case, the resulting d-c voltages across R1 and R2 will no longer be equal and opposite in polarity and a voltage with respect to ground will accordingly appear at Point A. As the frequency of the carrier signal becomes higher or lower than that to which the discriminator is tuned, the voltages developed across R1

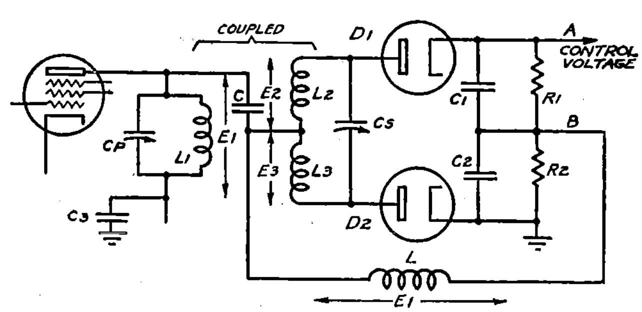


FIG. 2.—The second detector of a receiver for frequency-modulated signals is similar to the discriminator circuit shown.

and R2 add or subtract. Since point A is at zero voltage at resonance, this signal frequency variation causes point A to assume a potential with respect to ground which varies in a positive or negative direction in accordance with these frequency variations. The change in voltage of point A with respect to ground as a result of this shifting frequency is represented in the diagram, Fig. 3.

How the Discriminator Detects

Now let us see how this characteristic of the AFC circuit serves to supply an audio signal to actuate the a-f amplifier of the receiver. We have seen, in frequency-modulated transmissions, that the carrier frequency changes at a rate which is in accordance with the audio modulation impressed upon the carrier. Let us assume that a 400-cycle audio note is being broadcast and the nominal frequency of the transmitter is 42 mc. On the positive half of the 400-cycle modulation, the carrier frequency may be increased while on the negative half it may decrease. If the modulating voltage is sufficient, this may cause a maximum increase of carrier frequency of 75 kc so that the maximum frequency at the peak of the positive half of the wave becomes 42 mc + 75 kc and, at the peak of the negative half of the cycle, to 42 mc — 75 kc. Now, referring again to Fig. 3, we see that a carrier frequency shift in a negative direction will cause the output voltage of the discriminator to become positive whereas an increase in carrier frequency will cause this output voltage to become negative. Since a 400-cycle note is being broadcast, the carrier frequency increases and decreases and the output voltage of the discriminator becomes positive and negative at the

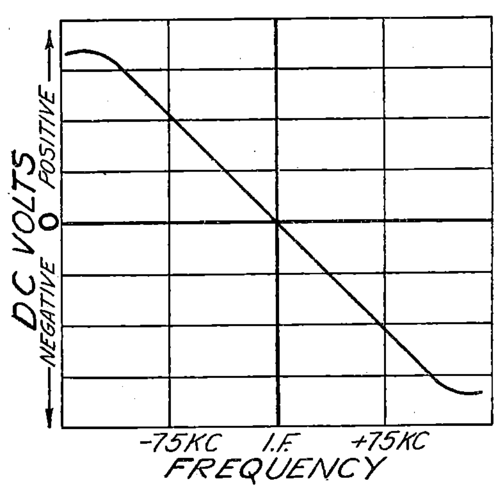


Fig. 3.—The output voltage of the frequency demodulator or second detector varies in accordance with the amount by which the signal frequency differs from the intermediate frequency.

same rate, 400 cycles per second, as that of the original broadcast note. Now, if we apply this rapidly-varying voltage to the grid of an amplifying tube, the voltage across its output load will vary at the same rate. Since this is precisely what occurs when an a-c signal is applied to a grid, we see that in this manner detection of frequency-modulated signals is effected.

Once the frequency-modulated signal is converted into audio frequencies, any type of conventional audio amplifier is suitable. Since the fidelity of reproduction in a carefully-designed receiver is exceptional, high-grade a-f amplifiers and speakers are usually employed.

The G-E Model GM125 Receiver

The schematic (see page 10-35) shows the circuit of the G-E model GM125 receiver, which is designed for frequency-modulation reception. This is a 12-tube, single-band receiver which covers a frequency range of from 37 to 44 megacycles. A single r-f stage feeds the 6K8 converter; four i-f stages are employed, the fourth stage acting as the "limiter." The detector is similar to the AFC discriminator previously described. The triode section of a 6Q7G is employed as the first a-f amplifier and feeds a 6J5G phase inverter which drives the push-pull 6L6G output tubes.

The r-f and converter stages are similar to those which could be employed in conventional designs for the same frequency band, except that no effort has been made to acquire selectivity in the tuned stages since this would be undesirable in a receiver which is required to pass a wide frequency band without frequency discrimination.

The i-f stages are designed to give a band width of 300 kc. This is done by using a high intermediate frequency (3000 kc) and by shunting each i-f transformer primary winding with a 15,000-ohm resistor.

The last i-f stage operates as a limiter. The limiting effect is secured by using a 6SJ7 tube in this stage and operating it with zero control grid bias and only 65 volts on the plate and screen. Under these operating conditions, the tube overloads with a relatively small applied signal. The high overall gain of the stages preceding the limiter tube provides sufficient amplification so that even a weak signal in the antenna circuit is built up to a voltage sufficient to overload the limiter.

When the signal strength is sufficient to overload the limiter stage, grid current flows through the 330,000-ohm resistor, R15, in the grid return circuit of the 6SJ7. The resulting voltage drop across R15 is used to provide AVC action and thus prevent overloading of preceding stages. By incorporating AVC in this stage, there can be no AVC action until the limiter is overloaded, which is its required operating condition. When such is the case, an increase in signal voltage applied to the limiter grid will cause no increase in the output signal voltage across its plate load but the grid current will increase, thereby assuring an increasing AVC voltage.

The discriminator-type detector is similar in action to that reproduced in Fig. 2. It converts the frequency variations of the i-f signal output to a voltage which varies in amplitude at the audio frequency rate. The essential difference between this type of discriminator and one used solely for AFC purposes is that the audio component is not filtered out. This must be done when such circuits are used for AFC applications to avoid modulating the oscillator at the audio frequency. The discriminator load by-pass condensers, C18, C19, are accordingly only 22 mmfd each in this circuit, so there is no by-passing of the higher audio frequencies.

The output of the frequency-demodulator is coupled to a tone control network composed of R11, R20, R40 and the shunt and series condensers C39 and C17. Operation of R40 provides attenuation of either high or low frequencies, as desired. The output of this network connects to the volume control, R21, which returns to ground through an inverse-feedback network composed of R37 shunted by C16 in series with R22. The balance of the audio system is conventional.

Alignment Procedure

To align the i-f amplifier, connect an electronic voltmeter (or any other d-c voltmeter which has a high input resistance) across R15. Feed a 3-mc signal to the grid of the third i-f tube. Temporarily shunt the secondary winding of T7 with a 10,000 or 15,000-ohm resistor and adjust C48 until the voltmeter reading is a maximum. Then remove the secondary shunting resistor and adjust C49 for maximum reading on the voltmeter. Then connect the shunting resistor across T6 secondary, feed the 3-mc signal to the second i-f grid and peak the trimmers of T6 in the same manner. Repeat this process for each of the i-f transformers in turn until all are aligned.

The frequency demodulator circuit may also be aligned with the voltmeter and signal generator. Feed a 3-mc signal to the input of the i-f amplifier and connect the voltmeter from the cathode connection of R18 to ground. A small voltage reading usually will be indicated if the circuit is slightly out of adjustment. If not, adjust C51 until a reading is secured. Then adjust C50 until the voltage reading is a maximum. After this is done, adjust C51 until the voltmeter reads zero. The discriminator alignment is then complete.

The r-f and oscillator stages are aligned by feeding a 42.8 mc signal to the antenna terminals and, with the receiver tuned to this point on the dial scale, adjusting the oscillator trimmer C4 for maximum reading on the voltmeter, which should be connected across R15. Then peak the antenna and r-f trimmers (C2 and C3) in the same manner.

The receiver may also be aligned with a frequency-modulated signal generator as described in the service notes given in Volume X of Rider's Manual.

WIRELESS RECORD PLAYERS

A number of different wireless record players are described in Volume X. These were first announced about the middle of 1938, although phonograph oscillators were available commercially as far back as 1935. Contributing to the present popularity of these record players is that fact that no direct connection is required between the record player and the receiver, as well as the element of mystery which is introduced because of the absence of any wire connection to the radio. Although specific service data are shown in Volume X for the models listed in the index, there are certain general considerations which apply to all wireless record players.

Essentially a wireless record player is a low-powered transmitter which provides a signal much in the same way as an ordinary broadcast transmitter. However, instead of the modulation being obtained from a studio microphone, the phonograph pickup converts the vibrations on the record into an audio signal and this voltage is used to modulate the oscillator contained in the wireless record player. The modulated signal is radiated to the receiver which is tuned to the signal and as a result the record is reproduced by the receiver in the conventional manner. Note that the entire receiver is used rather than just the audio section. Unlike the phonograph oscillators which preceded wireless record players, there is no direct connection to the receiver and hence the name "wireless" record player.

In general, the design of the radiating system in these record players is such that the effective range of pickup is approximately fifty feet. Since excessive radiation will cause interference in other radio receivers, the Federal Communications Commission has limited the amount of radiation to a value which is high enough to permit satisfactory operation of the record player in a typical installation, and which at the same time is not so high as to cause interference in neighboring receivers. In general a long antenna should not be attached to the record player to supplement the built-in antenna, but where the signal input to the receiver is too small the coupling between the record player and the receiver should be increased. This can be accomplished by running the antenna of the record player closer to the antenna lead-in of the receiver.

Most wireless record players use two tubes, one tube as a combination oscillator and modulator, and the other tube as the rectifier tube. The 6A7 and the 25Z5 (or their newer equivalents) are commonly used to perform these functions. In some cases a single combination tube, such as the 12A7, is used both as an oscillator-modulator and as a rectifier.

The power supply design for the most part follows conventional practice and is not unlike the power supplies used in midget receivers. In some cases a small power transformer is used, but in general the d-c voltage for the oscillator-modulator tube is obtained by means of half-wave rectification of the line voltage. In the latter case, the voltage for the heaters and the pilot bulb are obtained through a line cord or ballast tube, although in some instances the heaters are in series with the motor windings so that no ballast resistor is required.

Where the 6A7 tube is used as the oscillator-modulator, the first two grids are not used to form the oscillating circuit, as is the case in the pentagrid converter. Instead, the tuned circuit of the oscillator is connected to the signal grid (the #4 grid) and the feedback circuit is through the plate of the tube, which carries the feedback or tickler winding. Essentially, then, as far as the action of the tube as an oscillator is concerned, the tube may be considered as an ordinary regenerative triode oscillator, in which the signal grid acts as the control grid and in which the feedback is supplied through the plate.

The unmodulated signal produced by this oscillator is modulated by means of the audio signal from the phonograph pickup. The action which takes place here is similar to that which takes place in the pentagrid converter. In the pentagrid converter, the local oscillator signal is produced by the first two grids of the tube, and the incoming signal (applied to #4 grid) is modulated by means of this local oscillator signal so as to produce the intermediate frequency. In wireless record players, however, the signal to be modulated is the oscillator signal (produced as explained above by connecting a tuned circuit to the #4 grid) and the modulation is accomplished by feeding the audio signal to the #1 grid. Both gride #2 and the screen grid (#3 and #5) are connected to B+.

As a general rule a crystal pickup is used in wireless record players and, where the type 6A7 tube is used, the pickup is connected to the #1 grid. The output of these pickups is of the order of 1 volt or more, so that with average circuit conditions the percentage of modulation is fairly low. In order to prevent distortion as a result of non-linearity of the modulation, some designs do not apply the full value of the pickup output to the grid, but use a high value of series resistance to form a voltage divider. Where a volume control is used in the record player, this control appears in the input circuit so that it is possible to control the level of the audio signal which is fed to the modulator grid.

General Service Notes

The servicing of wireless record players is similar to that of radio receivers so that no special instructions are required. However, the following notes will be found helpful in dealing with the specific conditions which are enumerated below and which are peculiar to these record players.

1. *High Noise Level*: A condition wherein the noise level is excessively high can generally be eliminated by coupling the record player more closely to the receiver. As a result of the closer coupling, the signal input from the record player to the receiver is increased, so that the noise level is correspondingly decreased. It is preferable, in coupling more closely to the receiver, to bring the antenna wire of the record player in close proximity to the lead-in of the receiver, rather than to extend the antenna of the record player in a random direction. In places where the noise level is especially high and it is difficult to find a clear channel, it will be found helpful to wind several turns of the antenna wire around the lead-in of the receiver. In no case should a direct connection be made to the antenna post of the receiver.

An alternative method of increasing the signal input to the receiver is to couple a wire to the tuned circuit of the record player through a 20-mmf condenser and to wrap several turns of this wire around the antenna lead in.

In some cases it will be helpful to tune the receiver over the range of the record player as it may turn out that a more quiet channel is clear which can be used advantageously. The record player should be off while this check is made. If a more quiet channel is found, then the record player should be tuned to this frequency.

Hum: Reversing the line cord plug has been found of help in reducing hum and in some instances a further reduction of hum can be effected by using the same receptacle for both the record player and the receiver. Aside from the usual causes of hum such as defective filtering in the power supply, excessive hum may be caused by proximity of the pickup leads (or the leads in the tuned circuit) to the line cord or rectifier leads.

Distortion: Where distorted operation is encountered, a check should be made to determine whether the distortion is being introduced by the record player or by the receiver. It should be remembered that in the last analysis the quality of reproduction can, at best, be equal to that of the receiver when it is operating on ordinary broadcast signals. This follows inasmuch as the entire receiver, and not just the audio section, is used to reproduce the signal.

If the operation of the receiver is good on broadcast signals but the output is distorted when the record player is used, then the distortion is most likely in the record player. A probable cause of distortion is a defective oscillator-modulator tube and this should be replaced to see whether another tube makes any difference. Other possible causes of distortion are a worn needle, defective crystal cartridge, or improper operating conditions. The actual cause of the distortion can be localized by following usual service procedure. It should be noted that in some cases placing the record player too close to the radio may cause microphonic action to take place with resulting distortion. On records which are deeply cut, distortion may sometimes be encountered as a result of amplitude distortion. This can be eliminated by changing to a softer needle or by reducing the setting of the volume control in order to feed a weaker signal to the modulating grid of the record player. The resulting decrease in volume which results can be compensated for by advancing the volume control setting in the radio receiver and, if necessary, by increasing the coupling between the wireless record player and the receiver in the manner previously described. In general, the volume control in the receiver should be adjusted for the highest volume that will be required and the volume control in the record player should only be used for further control of volume. The quality of reproduction will generally be better when the volume control in the record player is not fully advanced.

FACSIMILE RECEIVERS

On Crosley pages 10-41 to 10-44 of Rider's Manual Volume X there are included service notes on the Crosley Models 118, 119 facsimile receivers. Although these service notes are complete in themselves, they assume that the reader understands the theory and operation of the vasic system. For this reason the following description of facsimile as used in the Crosley-Finch system will be of interest.

As the name implies, facsimile transmission is the transmission of an exact copy of original material which may be composed of black and white characters of various shades of gray. This, of course, includes all printed material, line drawings, sketches, or photographs.

It is, therefore, necessary to prepare the copy which you desire to send by facsimile transmission. In the Crosley-Finch system, this represents the printing of copy on a sheet of plain white paper of the same size as is used in the Reado printer. Sketches or drawings are also made directly on this piece of paper, or may be pasted on as half-tone photographs usually are handled. It is essential that all characters of this copy be sharply defined, if best results are to be obtained.

This copy is then fed through the scanning mechanism by means of a paper feed system practically identical to the one used in the Reado Receiver. As the paper is fed through the machine at the rate of 1/100 of an inch per second, it is scanned from left to right by a small, intensely bright point of light 1/100 of an inch in diameter. This light strikes either the characters which are black or some shade of gray, or the white spaces between the characters, and reflects back off the copy on the plate of a photoelectric cell. Optical lenses are used to obtain the small point of light from the 50 candle power 6 volt automobile headlamp, and a lens is also used to gather the reflected light from the copy and focus it on the plate of the photoelectric cell. The photoelectric cell emits electrons when light falls upon its plate, and these electrons form a small current which, as it flows through a very high value resistor, produces a voltage which regulates the amount of signal from a 2000-cycle oscillator that will pass through the 1851 modulator tube. When the tiny point of light falls on black characters, most of the light is absorbed and very little is reflected; but when the light falls on white paper, most of the light is reflected, and in this way the photoelectric cell may differentiate between black and white. Shades of gray reflect light according to their degree of whiteness, and so they are also detected by the photoelectric cell. We, therefore, have obtained from the black and white characters on the paper small pulses of electrical waves

(2000 cycles) which are proportional in intensity to the blackness of the characters and proportional in time duration to the length of the particular black character scanned by the small spot of light on its journey from left to right on its narrow path of 1/100″ across the paper.

Synchronizing

Since even such small type as 6 or 8 point is from .040 to .060″ in height, it is readily apparent that the small light spot from the scanner will have to make from four to six journeys from left to right to complete one line of type. In a like manner in the Reado printer the small stylus which travels from left to right across the recording paper is only 1/100″ in diameter, and therefore must make the same number of journeys from left to right to print the same line of type. It is apparent, therefore, that both the spot of light and the recording stylus must move across the paper in perfect synchronism, if the characters are to be built up as they appear in the original copy.

Various systems of synchronism have been used in facsimile. One of the simplest systems makes use of the fact that two synchronous motors running on the same power line will run exactly at the same speed, and therefore if both are started at the same instant, will remain together. However, if the scanner and printer are on separate power lines, serious distortion occurs since one or the other may be going faster or slower. In the Reado system, the printer is geared to run 2% faster than the scanner. It will, therefore, complete one journey from left to right and back from right to left in a shorter time than will the scanner. The stylus arm is then held over at the left side of the copy by slipping a clutch between the motor and the stylus arm. This clutch is released by a small pulse of 500 cycles which is set up by the scanner just before it starts on the journey from left to right across the copy, thereby insuring that both the small spot of light and the stylus needle start on their journey in perfect synchronism. It is perfectly true since the recording stylus travels 2% faster than the small spot of light, it will arrive at the right side of the copy sooner than the spot of light, but this difference in speed is constant and so slight that no distortion is noticed.

This, of course, means that the Reado printer will receive perfect transmission regardless of its power source and makes possible the transmission of facsimile from a phonograph record, as the records have not only the small electrical impulses represented by the black and white characters but also the small pulse of 500 cycles which releases the clutch in the receiver impressed upon them.

The simplicity of the Crosley Reado printer is due primarily to the ability of the Reado paper to turn black or some shade of gray as the small current emanating from the stylus point passes through this paper. This does away with expensive types of ink, chemically treated paper which must be used in a slightly moist condition, or carbon paper pressure recording systems. This white-coated electro-sensitive paper is a development of the Crosley laboratories. It is capable of reproducing some five or six shades of half-tone as well as sharp definite characters which, of course, is necessary in handling small type size.

The paper feeds through the machine at the rate of 1/100 inch per second, which means that three feet of copy should be received during an hour broadcast from stations using the Finch system of facsimile.

Two small coils are mounted on the left side of the printer which actuate the small pawl to release the clutch, which makes possible the synchronization of the printer and scanner at the beginning of each stroke.

SERVICING BY SIGNAL TRACING

This business of radio servicing has been in existence now for a good many years and the one subject that is of primary importance to every man actively connected with it is how a defective receiver should be tested or inspected in order that the fault may be found accurately, quickly, and easily, because unless the test be conducted so that these conditions are met, the chances are good that the serviceman will not show a reasonable profit on any one particular job.

Ream after ream of paper has been covered describing all manner of test procedures—some good—some fair—and others decidedly not so good. There have been advocates of one system or another and they apparently find one suited to their needs for they have built up a successful business. Yet when each and every one of these systems of testing be analyzed—taken apart to see upon what it is based, it will be found that there are almost as many bases as there are systems. Now to our way of thinking—and we feel sure that you will agree with our premise—there is just one way to test any machine or system—no matter what its variations may be—and that is to decide what is the essential factor that is responsible for the functioning of the system; then when that has been determined, to investigate its behavior as it progresses through the system and performs useful work. All too often this thought of the power itself is sidetracked and because of some reason, a multitude of minor procedures come into practice that check the *parts* of the system but not the fundamental or driving force itself.

For example, when a steam generating plant is tested, upon what are the observations made? The live steam itself—the moving force that performs work. If you were to look in at such a test, you would find the engineers reading gauges and thermometers, watching flow meters—inspecting the condition of the steam as it progresses through the system . . . watching the force itself, as it were. True, you would find men taking the temperature of the fire with a pyrometer—checks being made on the gases going up the flue with a CO_2 analyzer—records made of the amounts of the coal and water being consumed—but these are only to calculate the overall efficiency of the installation—it is the steam itself that is the important factor.

Now apply this same line of reasoning to the testing of a radio receiver—*any* receiver, mind you—old or new or yet to be designed—a-c or d-c operated—trf or superhet. . . . Just what is the one essential factor upon which the functioning of every radio receiver ever built or ever to be built, is based? What is this common denominator of all receiving systems—the fundamental—the elemental? It is the signal itself.

What is it that is superimposed upon the carrier wave? The signal. What is it that every condenser, resistor, transformer, tube or any other part in a receiver works on? The signal. When you are called into a customer's home, you are wanted because the receiver is not functioning as it should and the *signal* has been affected in some way or other. Perhaps it has become distorted—perhaps hum is superimposed upon it—maybe there is a reduction in the sensitivity or a loss of control or maybe no signal at all. . . . Any way you approach it, the signal, and the signal alone, is the all-important factor. And this is what you as a serviceman must restore to its normal state. . . . No matter *how* you do it, it is your job to fix the trouble as easily and as quickly as you can.

Diagnosis All-Important

But before the signal can be brought back to normality, the condition or conditions causing the trouble—and they may be external as well as in the set itself, although the chances are that they will be the latter—must be discovered. And that brings us back to our starting point: the testing of the receiver—the diagnosis of the condition that is affecting the signal. You know as well as we do that it is the ability of a serviceman to diagnose trouble that makes him valuable to his business. . . . The locating of the fault is 90% of the whole job of bringing back the signal and if the time to do this great percentage can be reduced, even a few minutes, then that will automatically make for increased profits.

And that is what we have been striving to do and it is our belief that we have found a way that you can localize the faulty condition in a receiver more quickly and more efficiently than it has been possible to do heretofore.

First of all, if one method of finding out what is causing the signal's abnormality could be equally well applied to *any* type of receiver, matters would be simplified enormously. Furthermore, if this method could be applied to any *new* receiver as well as those now on the market, then it would be unnecessary to clutter up your mind with a thousand and one details. Now taking the premise that in every radio receiver essentially the identical things happen to the signal, a good start towards universality has been made.

In general terms the signal in every receiver is detected, amplified at audio frequencies, and then the electrical energy is delivered to the actuating mechanism of a loud speaker. If the signal be amplified at radio frequencies before detection that still does not spoil the picture . . . it is just an additional step—just as the introduction of avc or afc would be. . . . Also if a locally generated current be mixed with the signal before it is detected that is just one more step that does not detract from the main idea. Think in generalities and you will find nothing complicated. If you will look into the future a bit, you will see that unless the whole system of broadcasting be entirely changed—and there is little chance of that coming to pass—receivers of the future will have exactly the same features as those of today . . . perhaps a few refinements and embellishments, but nothing to affect the main idea. It is just like the automobile industry: new models are introduced annually with knee action, improved brakes, balloon tires and what have you, but still the same old fundamentals are there—you have a motor in which the expanding gases push a piston down and that mechanical energy makes the rear wheels revolve.

Signal Tracing

Granting that all receivers are alike fundamentally in their action on the signal, some way had to be found whereby the signal could be inspected from the instant it enters the receiver at the antenna until it arrives at the output. Moreover if some practical way of doing this existed, it would make possible the locating of the point at which the signal departed from normal . . . where it became distorted . . . where it weakened or where something else happened to it. Yet no matter how desirable such a procedure might prove to be, with the equipment available to the serviceman such a method was out of the question. Therefore, in order to employ this signal-checking procedure, which we consider to be universally practical, it was first necessary to develop some apparatus that would give the information required under actual operating conditions and without influencing the signal in its passage through the receiver. Moreover, theoretical analysis of the problem showed that if such apparatus could be developed, it would not only localize the fault in some particular circuit, but it would also go a long way in tracking down the part that caused the signal to depart from its normal condition.

Accessibility of Parts

We then turned our attention to the physical side of the receivers themselves. Granting the signal-tracing system of testing to be the best, would it be possible to get at the different points in the sets where connections would have to be made and what effect would such connections have not only on the readings but on the operation of the receiver? Schematics of all kinds were examined as well as the chassis of a large number of existing receivers. . . . Design engineers were consulted concerning the electrical and physical trends in the sets to come; what would be the result if the ideas of today were incorporated in the sets of tomorrow? All our findings were encouraging; the further we went, the firmer were our convictions that we were on the right track. As far as we were able to discover the parts in the new receivers were to be as accessible as possible in order to assure simple and economical maintenance. And it goes without saying that if the parts are easily reached, then the paths along which the signal flows will also be accessible. Furthermore, as our method offered no interference with the receiver's operation, the complex interlocked circuits would not offer any problem in respect to its application.

The problem was also considered from the point of view of the servicemen's technical capabilities in relation to the new design of receivers. It was clear that a new attack—a new method of approach was in order so that the trouble in a receiver could be diagnosed systematically, efficiently, and quickly. As our readers will admit, although receiver design has advanced with gigantic strides in the last few years, the serviceman's methods of trouble localization might well be described as belonging to the Stone Age. It has been conceded that some new method must be devised if the service industry is going to survive by mastering the problems presented by the new receivers. We wish that you would think back over the last few months' work and remember the number of conditions that you were unable to check in late receivers or the number of things you had to assume—mainly because it was impossible for one reason or another to check them.

Three Essentials

With all these facts marshalled before us, we arrived at the conclusion that this signal-tracing method of testing required three major items in order to be effective; it must have universal application, positive identification, and speedy operation. In no one of the methods in use up to the present time are these three factors incorporated and you can readily see that they are necessary for rapid and accurate work. Although the signal is really the basis of the system, yet its tracing through the receiver is the primary, but not the only test. It is supplemented by a voltage test which although secondary, plays an important part. The primary test locates the trouble in some certain portion of the receiver—sometimes the exact defective part. The supplementary test identifies the defective part in many cases—but in every case furnishes the required information.

Now what must we be able to do in finding the portion of the receiver that is not functioning correctly and locating the faulty component? First we must be able to trace the passage of a signal entering the receiver through the antenna post throughout the various signal-current-carrying circuits, no matter if it be at radio frequency, intermediate frequency or audio frequency. Then the signal must be traced throughout the receiver without altering the constants of the circuits and as a consequence, impairing the operation of the receiver and so nullifying the observations. Simultaneously, the operation of the receiver oscillator also is checked. The voltage tests must be of such a kind that they will take care of the operating voltages and also the control voltages that are developed by the signal. These voltage measurements can be made simultaneously with the observation of the signal and at points common to both the signal and the voltage. The measurement of the d-c voltages must be made with reasonable accuracy with respect to the true voltage present at the point under test without changing the constants of the circuit.

It is our belief that you will agree that the different points outlined above would go far towards helping servicemen over many difficult spots, if it were possible to perform the signal-tracing tests and make the various voltage measurements. And all this *is* possible.

AUTHOR'S FOREWORD

Volume X is a continuation of the "Perpetual Trouble Shooter's Manual" series. In addition to this Volumes I, II, III, IV, V, VI, VII, VIII and IX have been published.

Inasmuch as owners of preceding volumes are familiar with the Manual and with the nature of its contents, an elaborate description is not required. However, it might be well to state that the information presented in Volume X is condensed as much as possible in accordance with the requests of owners of previous volumes of this publication. You will find that in many cases facts associated with a number of the receivers contained under any one manufacturer's heading have been grouped upon a single page, and references are made to this page in the description of the various models which employ a component, utilize the adjustment, and in general make use of the facts given upon this company's reference page. By arranging the contents in this manner we avoid duplication and make space available for the inclusion of a greater number of schematics. Examples of the foregoing are push-button tuning adjustments, dial cable adjustments, etc.

In a number of instances references are made to "conventional alignment." This term is used in conjunction with simple receivers which do not require elaborate alignment instructions. Such conventional alignment was described in the "How It Works" section of Volume VIII, and we feel that so many men are familiar with simple alignment that it would be a waste of space to include such alignment in conjunction with each of the receivers contained in the Manual.

We feel that reference to a given source of such information makes available additional space so badly needed for the inclusion of the large number of receiver models being manufactured. An example of the successful application of such space conservation is the fact that Volume X contains approximately 2600 models in its 1650 pages; whereas the number of models which hitherto have been incorporated in a Manual with an equivalent number of pages was roughly 1900.

We take this opportunity to request comments and criticism concerning the contents and make-up of Volume X.

JOHN F. RIDER.

HOW TO USE THIS INDEX

This index covers all Rider's Manuals issued thus far. The three columns of pages are used to identify the pages employed in the various series of manuals published up to the present time. The column headed "Revised Pages" covers the ten individual Volumes I, II, III, IV, V, VI, VII, VIII, IX, and X which were arranged with a new type of folio. With respect to earlier editions of Rider's Manuals, the revised folios appear only in Volumes I and II.

Hence any material which appears in Volumes I or II is shown in the columns marked "Revised" and also "Early," establishing the correct page in either of these issues of manuals. Thus if you own the early editions of Volumes I and II and the regular editions of Volumes III, IV, V, VI, VII, VIII, IX, and X you will refer to the "Early" column for material in Volumes I and II and to the "Revised" column for material in subsequent volumes. This work is simplified by the fact that the "Early" column has its equivalent in the "Revised" column only for the material which has been shown in Volumes I and II.

Referring to the folios listed in the "Revised" column and covering all manuals, the number 1, before the page number, establishes the data as being in Volume I. The numeral 2 before the page number establishes the material as being in Volume II. The numeral 3 before the page number establishes the material as being in Volume III and the numeral 4 before the page number establishes the material as being in Volume IV, etc.

Concerning the pages listed in the "Early" column, all page numbers preceded by an asterisk (*) are in Volume I. All numbers which do not have an asterisk are in Volume II. The word "Front" shown in the "Early" column establishes that the material was shown in the front end of Volume II.

An example of the use of this index is as follows:

Electrical Research Laboratories, Inc.

Model	Revised Pages	Early Pages	Radiotron Complete Pages
75, 77 (231)	2-6	252-I	870
81, 82 (245)	1-5	*252-C	871
81-P, 82-P, 30 (248)	3-2		872

The receiver model 75, 77 (231) is on page Erla 2-6 in the revised Volume II; on page 252-I of the early Volume II and on page 870 of the Radiotron Complete Manual. The receiver model 81, 82 (245) is on page Erla 1-5 in the revised Volume I; on page 252-C in the early Volume I and on page 871 in the Complete Manual. The model 81-P, 82-P, 30 (248) is on page Erla 3-2 in Volume III and on page 872 of the Complete Manual.

Volumes III, IV, V, VI, VII, VIII, IX, and X pages require no comment, since their identity is established by the numerals 3, 4, 5, 6, 7, 8, 9, or 10 which precede the page number.

When seeking any page, remember that the manufacturers' names are arranged alphabetically and that the trade names are shown in connection with the folios. Sometimes more than one model using the same chassis is listed upon the same line. Where a chassis is used in more than one model, the extra model numbers appear in their numerical order, referring back to the lowest model number. Chassis numbers are also listed numerically and cross indexed to the lowest model number.

INDEX

AIR KING PRODUCTS CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
27, 28A	Schematic	7-8		
37, 39	Schematic	Misc. 4-1		
40	Schematic	6-1		
41, 42	See model 10			
47, 48, 57, 58	Schematic	7-8		
50	Schematic	6-1		
52-54	Schematic	4-1		
57, 58	See model 47			
66	Schematic	6-2		
70	Schematic	6-2		
72, 73	Schematic, alignment	8-3		
76, 501 Queen, 503 Earl, 505 Castle	Schematic	9-2		
81	See model 21			
209, Prince	Schematic, notes	7-6		
211, 224, 225 Lancer, Spear, Armor	Schematic, notes	7-7		
213, King	Schematic, notes	7-3		
214	Schematic, socket	8-8		
221, 222, 223 Regent, Autocrat, Council	Schematic, notes	7-9		
222	Schematic, socket	9-4		
224, 225	See model 211			
227, 228, 229 Premier, Palace, Pirate	Schematic	7-5		
250	Schematic	8-4		
250-B	Schematic	9-4		
252	Schematic, socket	9-3		
257	Schematic, voltage, socket, trimmers, alignment	10-1		
	Tuner data	10-2		
260	Schematic	8-4		
261	Schematic, alignment	8-5		
501, 503, 505	See model 76			
522	See model 21			
600	Schematic	7-10		
688, 886	Schematic	9-5		
699	Schematic	9-5		
700	Schematic, socket	8-6		
700 LW	Schematic	9-6		
701, 702, 703	Schematic	9-7		
704	Schematic	9-6		
705	Schematic, socket	8-6		
710, 715	Schematic, socket	8-7		
720, 721, 770, 771, 870, 871	Schematic, alignment	9-8		
725	Schematic	9-7		
730, 731, 850 (Early)	Schematic, alignment	8-5		
777	Schematic	9-9		
X-780B	Schematic	9-10		
801	Schematic	9-10		
810	Schematic, alignment	9-11		
815	Schematic	9-12		
822, 822X, 826X, 832	Schematic, alignment	9-13		
823, 833	Schematic, alignment	9-13		
824, 834	Schematic, alignment	9-13		
X-825	Schematic, alignment	9-8		
828, 838	Schematic, alignment	9-11		
X-837	Schematic, alignment	9-15, 16		
X-837S	Schematic, alignment	9-15, 16		
850 (Late)	Schematic	9-14		
870, 871	See model 720			
886	See model 688			
908	Schematic, socket	9-17		
909	Schematic, socket	9-17		
910 Early	Schematic	9-9		
911	Schematic, socket, notes	9-14		
912	Schematic, socket, trimmers, alignment, tuner data	10-1		
1000, 2000	Schematic, socket	8-7		
1001, 2001, Early, Late	Schematic, socket	8-8		
1001B, 2001B	Schematic, socket	9-12		
2206	Schematic, socket	9-12		
3905	Schematic, voltage, alignmatic socket	10-2		
3910	Schematic, socket	10-2		
X-8312	Schematic, alignment	9-18		

AIRLINE

See MONTGOMERY WARD

ALL-AMERICAN MOHAWK CORP.

Also see WURLITZER

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
D	Schematic, socket, voltage	1-14	*26	46
F	See model 60			
H	Schematic, socket, voltage	1-15	*19	47
J	Schematic, socket, data	1-16	*24-A	48
	Voltage, values	1-17	*24-B	49
K	Schematic, socket	1-18	*24-E	50
P	Schematic, socket, data	1-19	*24-BA	51
R	Schematic, socket	3-9		25
DC	Schematic	1-27	*24-BB	81
VA	Schematic, socket	3-1		17
All-Amax Junior	Schematic	3-7		23
All-Amax Senior	Schematic	3-7		23
Cherokee	Schematic, data	3-2		18
Chieftain	Schematic, socket	3-2		18
Forte, 1926	Schematic, socket	1-5	*19	31
Mohawk All-Electric (Kellogg type)	Schematic, socket, cable connections	3-3		19
Mohawk 1926 All-Electric	Schematic	3-5		21
Mohawk Volume Control (2 types)	Schematic, chassis	3-4		20
Navajo	Schematic, chassis	3-1		17
Screen Grid, 110-volt DC	Schematic	3-17		45
Sextette, Duet (Battery)	Schematic, socket	3-9		25
Sextette, All-Electric	Schematic	3-10		26
7-tube, 110-volt DC	Schematic	3-16		32
8-tube, Battery	Schematic	3-15		33
8-tube, 110-volt DC	Schematic	3-20		38
A-1, A-3, A-4 Eliminator	Schematic, color code	3-8		24
C-6 Studio	Schematic, socket	1-20	*24-C	52
S-6	Schematic, socket, data	1-21	*24-F	57
	Voltage, data	1-22	*24-G	58
S-7	Schematic, socket, data	1-23	*24-H	59
	Voltage, data	1-24	*24-I	60
DC-7, 220 volts	Schematic, socket	3-21		55
DC-7, 110 volts	Schematic, socket	3-22		54
A-8 Eliminator	Schematic, color code	3-8		24
S-8	Schematic, socket, data	1-25	*24-J	61
	Voltage, data	1-26	*24-J	62
SW-8	Schematic, socket	3-23		63
A-9 ABC Power Pack	Schematic, chassis wiring, color code	3-11		27
A-10 Eliminator	Schematic, color code	3-6		22
A-10 Power Pack	Schematic, chassis wiring, color code	3-14		30
S-10	Schematic	3-24		64
B 30-31	Schematic, socket	3-19		53
S-40	Schematic	3-25		65
44	Schematic, socket	1-5	*19	31
S-50	Schematic	3-25		65
U-55, AC-DC, 25 or 60 cycles	Schematic, data	3-40		80
60, 61, 62, 65, 66, F, AC	Schematic, socket, voltage	1-6	*15	36
60, 61, 62, 65, 66, F, SPU	Schematic, wiring, plug	1-7	*17	37
S-63	Schematic, socket, voltage, data	3-26		66
DC-65, 110 volts	Schematic, socket, voltage, data	3-28		68
DC-65, 220 volts	Schematic, socket, voltage	3-29		69
SA-65	Schematic, socket, data, voltage	3-27		67
65, 66 AC	See model 60			
70, 73, 75	Schematic, socket, voltage, data	1-8	*20	39
77 (Simplified)	Schematic, data, socket	3-13		29
B-80	Schematic, socket, voltage	3-30		70
S-80	Schematic, socket, voltage, data	3-31		71
SW-80	Schematic, socket, voltage, data	3-32		72
80, 83, 84, 85, 86, 88	Schematic, socket, voltage	1-9	*16	35
90, 25-cycle	Schematic, voltage	1-10	*23	42
90, 60-cycle	Schematic, socket, voltage	1-11	*22	41
90 (25 & 60 cycles) SPU	Chassis, plug connections	1-13	*24	43
SA-90	Schematic, socket, voltage, data	3-33		73
SA-91	Schematic, socket, voltage	3-34		74
	Service notes	3-35		75
96, 60-cycle	Schematic, socket	1-12	*25	44
SA-110	Schematic	3-36		76
115-1926 Battery	Schematic, socket	3-12		28
115-1926 All-Electric	Schematic	3-12		28
SA-130	Schematic, socket, voltage, data	3-37		77
	Service notes	3-38		78
	Service notes concluded, socket	3-39		79
Mohawk 226	Socket layout	3-5		21

ALLIED RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
A9788, A9789, A9852, A9854 Chassis AM7	Schematic, socket, trimmers	9-19		
	Alignment, parts	9-20		
A9802	Schematic	8-8		
A9805	Schematic	8-8		
A9807	Schematic	8-4		
A9809	Schematic	10-4		
A9811	Schematic	10-4		
A9813	See model A9724			
A9820, Chassis B102	Schematic	10-5		
A9825	See model A9740			
A9826, A9828	See model A9760			
A9830, A9831 Chassis 47AE	Schematic, voltage, trimmers	9-21, 22		
	Alignment, parts	9-25		
E-9830 (8-tube Super)	Schematic	3-12		94
E-9831 (10-tube Super)	Schematic	3-13		95
A9833, A9834, A9835, A9836, A9837, A9838 Chassis 66B, 66BE	Schematic, trimmers, voltage, coils	9-23, 24		
	Socket, trimmers, layout	9-27		
	Alignment, parts	9-28		
A9848, A9849, Chassis 68	Schematic	9-29		
	Socket, voltage, trimmers	9-31		
	Alignment	9-32		
A9848, A9849 Chassis 266	Schematic	9-30		
A9848, A9849 Chassis 268	Schematic	9-30		
A9848, A9849, Chassis 266, 268	Trimmers	9-31		
	Alignment	9-32		
A9851, Chassis B2	Schematic, socket, trimmers, alignment	10-6		
A9852, A9854	See model A9788			
A9855, A9856	See model A9785			
A9857, A9857E, Chassis A1	Schematic, socket, trimmers, alignment	10-7		
A9860	See model A9775			
A9861, A9862, A9863, A9864, A9865, A9866, Chassis M5	Schematic, socket, trimmers, alignment	10-8		
A9870, Chassis Z3	Schematic, socket, trimmers, alignment	8-9		
A9880, Chassis U6	Schematic, socket, trimmers, alignment	8-10		
G-9881	See model G-9515			
G-9882	See model G-9517			
A9891, Chassis AM4	Schematic, socket, trimmers, alignment	10-9		
A10500, A10501 Chassis 5Z	Schematic, socket, trimmers, alignment	10-10		
A10502, A10503, Chassis 6Y	Schematic, socket, trimmers, alignment	8-11		
A10505, Chassis 5X	Schematic, socket, trimmers, alignment	8-12		
A10506, Chassis 6W	Schematic, socket, trimmers, alignment	8-12		
A10507, Chassis 7M	Schematic, socket, trimmers, alignment	8-13		
A10508, Chassis 6P	Schematic, socket, trimmers, alignment	8-14		
A10510, A10511, A10512, A10513, Chassis 8K	Schematic	10-11		
	Alignment, socket, trimmers, tuner	10-12		
A10515, A10516, A10517, A10518, Chassis 8T	Schematic	10-11		
	Alignment, socket, trimmers, tuner	10-12		

AMERICAN FOUNDATION FOR BLIND

U	Schematic	7-1		
	Chassis wiring	7-2		
X	Schematic	7-1		
	Chassis wiring	7-2		
80	Schematic	7-1		
	Chassis wiring	7-2		

AMERICAN TRANSFORMER CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Amertran Power Pack	Schematic	1-1	*697	108
25-A Power Amplifier (A unit)	Schematic	1-1	*697	108
25-A Power Amplifier (PA unit)	Schematic	1-1	*697	108
25-A Power Amplifier (P unit)	Schematic	1-1	*697	108
210 Power Amplifier	Schematic	1-1	*697	108
250 Amertran Power Amplifier	Schematic	1-2	*696	104

AMRAD CORPORATION

Also see CROSLEY

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Inductrol	Schematic	1-4	*54	108
AC-5 and Power Pack	Schematic	1-4	*60	108
AC-6, AC-6C	Schematic, socket	1-6	*58	110
DC-6, DC-6C	Schematic, socket	1-6	*58	110
AC-7, AC-7C	Schematic, socket	1-3	*59	107
DC-7, DC-7C	Schematic, socket	1-3	*59	107
70	Schematic, socket, voltage	1-8	*61	112
80, 82, 83	Schematic, socket	1-4	*60	108
81 Bel-Canto	Schematic, socket, data, voltage	3-1		113
	Condenser data	3-2		114
84	Schematic, socket	1-5		109
171 ABC Power Pack	Schematic	1-2	*56	106
F-516	Schematic, parts	7-1		
	Socket, trimmers, voltage, alignment	7-2		
S-522	Schematic	1-1	*55	105
F-546	Schematic, parts	7-3		
	Socket, trimmers, voltage, alignment	7-4		
F-616	Schematic, parts	7-5		
	Socket, trimmers, voltage, alignment	7-6		
F-626	Schematic, parts	7-7		
	Socket, trimmers, voltage, alignment	7-8		
S-733	Schematic, socket	1-5	*54	109
3500-1, Tuner #3475, Amplifier #2634	Schematic	1-1	*55	105
3500-2, Tuner #3730, Amplifier #2634	Schematic	1-1	*55	105
3590	Schematic	1-5	*54	109
7100	Schematic	1-7	*57	111
7191	Schematic	1-7	*57	111

ANDREA RADIO CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
MI Chassis	See model CA5			
PUE-L Chassis	See model 1531			
PUE-S Chassis	See model 1530			
1A5, 5A5, Chassis A5L	Schematic, coils	8-1		
1A7, 3A7, Chassis A7L	Schematic, coils	8-2		
1B6, 3B6, Chassis B6L	Schematic, trimmers, coils, alignment	8-3, 8-4		
1B8, 2B8, Chassis B8L, B8S	Schematic, trimmers, alignment, parts	9-3		
1C5, 2C5; 510, 511 (AC Models) Chassis C5L, C5S, UC5L, UC5S	Schematic, coils, parts	9-1		
	Alignment, trimmers, notes	9-2		
1D7, 3D7, 5D7, 7D7, Chassis D7L	Schematic, trimmers, coils, alignment	8-5		
	Notes, alignment	8-6		
1D8, 3D8, 5D8, 7D8, Chassis D8L, 2D8, 4D8, 6D8, 8D8, Chassis D8S	Schematic, trimmers, alignment, coils, parts	9-4		
1D10, 3D10, 5D10, 7D10, 9D10, Chassis D10L	Schematic, trimmers, coils, data	8-7		
1E6, 2E6, Chassis PE6L	Schematic, trimmers, coils, parts	9-5		
	Alignment, tuner	9-7		
1E6, 2E6, Chassis PE6S	Schematic, trimmers, coils, parts	9-6		
	Alignment, tuner	9-7		
1E8, 3E8, 5E8, 7E8, 9E8, Chassis PE8L 2E8, 4E8, 6E8, 8E8, 10E8, Chassis PE8S	Schematic, coils, trimmers, alignment, tuner, data, parts	9-9, 10		
1F5 Television	Schematic, coils	10-1, 2		

ANDREA RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
1F5 Television	Service chart	10-3		
	Socket, alignment, video block diagram	10-4		
2A5, 6A5, Chassis A5S	Schematic, coils	8-1		
2B6, 4B6, Chassis B6S	Schematic, trimmers, coils, alignment	8-3, 8-4		
2B8	See model 1B8			
2C5	See model 1C5			
2D5, 3D5, 4D5, Chassis D5L	Schematic, coils, trimmers, alignment, parts	9-13		
	Alignment data	9-16		
2D5, 3D5, 4D5, Chassis D5, D5E, D5S	Schematic, coils, parts	9-14		
	Alignment, trimmers	9-16		
2D7, 4D7, 6D7, 8D7, Chassis D7S	Schematic, trimmers, coils, alignment	8-5		
	Notes, alignment	8-6		
2D8	See model 1D8			
2D10, 4D10, 6D10, 8D10, 10D10, Chassis D10S	Schematic, coils, data, trimmers	8-8		
	Alignment	8-9		
2E6	See model 1E6			
2E8	See model 1E8			
3A7	See model 1A7			
3B6	See model 1B6			
3D5	See model 2D5			
3D7	See model 1D7			
3E8	See model 1E8			
3D8	See model 1D8			
3D10	See model 1D10			
3E11, 5E11, 7E11, 9E11, Chassis PE11L, 4E11, 6E11, 8E11, 10E11, Chassis PE11S	Schematic, coils, trimmers, alignment, tuner, parts	9-11, 12		
B4, B4L Chassis	See model 400			
4B6	See model 2B6			
4D5	See model 2D5			
4D7	See model 2D7			
4D8	See model 2D8			
4D10	See model 2D10			
4E8	See model 1E8			
4E11	See model 3E11			
UC4 Chassis	See model 410			
UC4L Chassis	See model 411			
A5L Chassis, 5A5	See model 1A5			
A5S Chassis	See model 2A5			
CA5, Chassis MI	Schematic	8-10		
C5L, C5S, UC5L, UC5S Chassis	See model 1C5			
D5, D5E, D5L, D5S Chassis	See model 2D5			
5D7	See model 1D7			
5D8	See model 1D8			
5D10	See model 1D10			
5E6, Chassis PE6L 6E6, Chassis PE6S	Schematic, phonograph notes	9-8		
5E8	See model 1E8			
5E11	See model 3E11			
PD5, PD5E Chassis	See model 6D5			
PXD5 Chassis	See model 62PX			
UB5 Chassis	See model 500			
UC5L Chassis AC	See model 1C5			
UC5S Chassis AC	See model 1C5			
UC5L Chassis AC-DC	See model 511			
UC5S Chassis AC-DC	See model 510			
UD5L Chassis	See model 521			
UD5S Chassis	See model 520			
XD5 Chassis	See model 62X			
6A5	See model 2A5			
B6L Chassis	See model 1B6			
B6S Chassis	See model 2B6			
CB6, C32B Chassis	See model 610			
D6B Chassis	See model 616			
6D5, 8D5, Chassis PD5, PD5E	Schematic, coils, parts	9-15		
	Alignment, trimmers	9-16		
6D7	See model 2D7			
6D8	See model 2D8			
6D10	See model 2D10			
6E6	See model 5E6			
6E8	See model 1E8			

ANDREA RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
6E11	See model 3E11			
E6B Chassis	See model 626			
PE6L Chassis	See models 1E6 or 5E6			
PE6S Chassis	See models 1E6 or 6E6			
PUE6L Chassis	See models 630 or 635			
PUE6S Chassis	See models 630 or 634			
UB6 Chassis	See model 600			
UD6L Chassis	See model 621			
UD6S Chassis	See model 620			
A7L Chassis	See model 1A7			
D7L Chassis	See model 1D7			
D7S Chassis	See model 2D7			
7D7	See model 1D7			
7D8	See model 1D8			
7D10	See model 1D10			
7E8	See model 1E8			
7E11	See model 3E11			
B8L, B8S Chassis	See model 1B8			
D8L, Chassis	See model 1D8			
D8S Chassis	See model 2D8			
8D5	See model 6D5			
8D7	See model 2D7			
8D10	See model 2D10			
8E8	See model 1E8			
8E11	See model 3E11			
PE8L, PE8S Chassis	See model 1E8			
9D10	See model 1D10			
9E8	See model 1E8			
9E11	See model 3E11			
D10L Chassis	See model 1D10			
D10S Chassis	See model 2D10			
10D10	See model 2D10			
10E8	See model 1E8			
10E11	See model 3E11			
11E6, 12E6, 14E6, Chassis PE66L	Schematic, trimmers, coils, parts	9-17		
	Alignment, notes	9-19		
11E6, 12E6, 14E6, Chassis PE66S	Schematic, trimmers, coils, parts	9-18		
	Alignment, notes	9-19		
PE11L Chassis	See model 3E11			
PE11S Chassis	See model 4E11			
UD14L Chassis	See model 1401			
UD14S Chassis	See model 1402			
C32B Chassis	See model 610			
55 Amplifier	Schematic	8-3, 8-4		
62X, Chassis XD5 62PX, ChassisPXD5	Schematic, trimmers, coils, alignment, parts	9-20		
PE66L, PE66S Chassis	See model 11E6			
400, 401, Chassis B4	Schematic, socket, trimmers, coils, alignment, parts	9-21		
410, Chassis UC4	Schematic	8-10		
411, Chassis UC4L	Schematic	8-10		
500, Chassis UB5	Schematic, coils, alignment, parts	9-22		
510, 511 AC	See model 1C5			
510, Chassis UC5S, AC-DC 511, Chassis UC5L AC-DC	Schematic, coils, alignment, parts	9-23		
520, Chassis UD5S	Schematic, alignment, coils, trimmers	8-11		
521, Chassis UD5L	Schematic, alignment, coils, trimmers	8-11		
600, Chassis UB6	Schematic, alignment, parts	9-24		
610, 611, 612, 613, Chassis C6B	Schematic, coils, parts	9-25		
	Alignment, trimmers	9-27		
610, 611, 612, 613, Chassis C32B	Schematic, coils, parts	9-26		
	Alignment, trimmers	9-27		
616, 617, 618, Chassis D6B	Schematic, coils	8-13		
	Alignment, trimmers	8-14		
620, Chassis UD6S 621, Chassis UD6L	Schematic, coils, alignment, parts	9-28		
626, 627, 628, Chassis E6B	Schematic, trimmers, parts	9-29		
	Socket, trimmers, alignment	9-30		
630, 631, Chassis PUE6L	Schematic, coils, alignment, parts	9-31		
	Alignment data	9-7		

ANDREA RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
630, 631 Chassis PUE6S	Schematic, coils, alignment, parts	9-32		
	Alignment data	9-7		
634, Chassis, PUE6S, 635, Chassis, PUE6L	Schematic, phonograph data	9-33		
1401, 1403, 1405, 1407, 1409, Chassis UD14L	Schematic, trimmers, coils, alignment	8-12		
1402, 1404, 1406, 1408, 1410 Chassis UD14S	Schematic, coils, alignment, parts	9-34		
1530, 1534, 1536, 1538, Chassis PUE-S 1531, 1533, 1535, 1537, Chassis PUE-L	Schematic, coils, trimmers, data, parts	9-35, 36		
	Alignment, notes	9-37		
	Tuner and phonograph data	9-38		

ANSLEY RADIO LABORATORIES

DC Electric Set	Schematic	2-1	(1) 88-A	115
B-1, Early, Late	Schematic	7-1		
D-1, Dynaphone, Type 3	Schematic	7-2		
D-1, Dynaphone, Type 2	Schematic	6-1		
D1, D1A, D16, D20, D26	Schematic	8-1		
MD-1	Schematic, socket, chassis	2-2	(1) 88-B	116
U-1, AC-DC	Schematic	2-3	(1) 88-C	117
U-2, AC-DC	Schematic	2-4	(1) 88-D	118
D-3, D-4, D-6	Schematic	5-1		
U-3	Schematic	5-2		
U-8	Schematic	5-3		
D9, D10, D17, D18, U10, U11	Schematic	8-2		
U-10	Schematic, socket	6-2		
U-10, Revised	Schematic, socket	7-4		
D-12, Dynaphone	Schematic	7-2		
D12	Schematic	8-3		
D-16 (Early)	Schematic	7-3		
D20	See Model D1			
D21, D22	Schematic	Misc. 9-1		
D24, D25, Chassis 7152	Schematic, trimmers, alignment	8-4		
D26	See Model D1			
7152 Chassis	See model D24			

APEX

See U. S. RADIO & TELEVISION

APPEL-HENDERSON

Silver-King DC Combination	Schematic, notes	2-1	(1) 89-A	119
Silver-King AC Combination	Schematic	2-2	(1) 89	120
4-tube AC	Schematic	2-3	(1) 89-B	121
4-tube Portable	Schematic	2-4	(1) 89-C	122
5-tube Battery, midget	Schematic	2-4	(1) 89-C	122
5-tube AC	Schematic	2-3	(1) 89-B	121

ARBORPHONE

45	Schematic	Misc. 3-1		2745

ARCADIA

See WELLS-GARDNER

ARGUS RADIO CORP.

B-125	Schematic	1-1	*89	123
B-195	Schematic	1-1	*89	123
	Chassis	1-2	*90	124

ARIEL RADIO, INC.

101	Schematic	Misc. 6-2		
	Chassis Wiring	Misc. 7-2		

ARKAY

See R-K. RADIO LABORATORIES

ARVIN

See NOBLITT-SPARKS

ATCHISON RADIO MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
5-AC	Schematic	1-1	*123	125
	Chassis layout	1-3	*123	127
5-DC	Schematic	1-1	*123	125
6-AC	Schematic, SPU chassis	1-2	*124	126
	Chassis layout	1-3	*124	127

ATWATER KENT MFG. CO.

Suffixes:	D = DC			
	F = 25 cycles			
	Q = Battery operated			
	Z = 32 volts DC			
Prefixes:	E = European long wave range			
	P = Phonograph conn.			
32-Volt DC Sets	Installation data	7-66		
1934 Sets	Model specifications	5-34		
1935 Sets	Model specifications	5-46		
Doublet Antenna	Data	5-16		
General Notes		7-6		
General Parts List		5-22		
Phonograph pickup	Sketches, adjustments	2-19	114-ZP-1	199
	Schematic, data	2-20	114-ZP-2	200
Test Circuit	Schematic, data	3-28		166
Tubular Resistors	Service notes	3-178		324
Tun-O-Matic	See model 511			
Chassis D-1, D-2, F, L-1, L-2, P, Q	See model 70 Series			
Chassis H-1, H-2	See model 72 Series			
10	Schematic, socket	1-1	*91	129
10-B	Schematic, socket	1-1	*91	129
12	Schematic, socket	1-1	*91	129
19, #4880	Schematic, socket	1-2	*92	130
20, #4640	Schematic	1-2	*92	130
	Condenser and resistor data	3-1		131
20 #7570	Schematic, socket	1-2	*92	130
	Condenser, resistor data	3-1		131
20 #7960	Schematic, socket	1-3	*93	132
	Condenser and resistor data	3-2		133
21 #7780	Schematic, socket	1-3	*93	132
30, 35, 48	Schematic, socket	1-4	*94	134
30, Early, late	Data	3-3		135
32	Schematic, socket	1-4	*94	134
	Data	3-4		136
33, 49	Schematic, socket	3-6, 1-5		143
	Data	3-7		140
35	See model 30			
35 (2 volt aircell)	Schematic	7-1		
36, Early, Late, Power Pack	Schematic	1-6	*95	141
36	Data	3-5		138
36 Power Pack, Model Y, Serial #260,000	Schematic	1-6		141
36 Power Pack, Above serial #260,000	Schematic	1-6		141
36 Early, Below serial #2,610,000	Schematic, socket	3-6, 1-5		143
36 Late, Above serial #2,610,000	Schematic, socket	3-6, 1-5		143
37 Early, Below serial #1,385,000	Data	1-8		144
37 Late, Above serial #1,385,000	Resistor changes	1-8		144
37, 37-F, 37-C	Schematic, socket	1-7	*96	139
37 Power Pack, Early, late	Schematic, data	3-10		144
38	Schematic, socket	1-7	*96	139
	Data	3-8		142
40, 42, 52, 56, 57	Schematic, socket, voltage	1-9	*100	145
40, 42, 52 Power Pack	Schematic	1-9	*100	145
40, 42, 44, 52, Power Pack	Chassis layout	1-10	*101	148
40, 42, 52	Data	3-11		146
	Filter condenser data	3-12		147
40, 45 Power Pack (2nd type)	Chassis layout	1-10	*101	148
41 DC	Schematic, socket	1-11	*102	149
41 Power Pack, 3 types	Schematic, voltage	1-12	*103	150
41, 51	Data	3-13		151
42	See model 40			
43	Schematic test data	3-15		153
Power Pack	Schematic, chassis wiring, data	3-16		152
44 Power Pack	See model 40—Chassis layout			

ATWATER KENT MFG. CO.—(Cont.)

ATWATER KENT MFG. CO.—(Cont.)

ATWATER KENT MFG. CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
89, 3rd type	Voltage	3-83 & 3-126		229 & 272
89, 89-F, 89-P, 3rd type	Schematic	3-107		253
	Chassis layouts, condenser data	3-108		254
	Voltage	3-83 & 3-126		229 & 272
90	Voltage	3-83 & 3-126		
90, 90-F	Schematic	3-109		255
90, 90-F, Early, late	Chassis layouts, condenser data	3-110		256
90 Late	Schematic changes	3-110		256
91, 91-B, 91-C	Schematic, speaker connections	3-111		257
	Chassis layouts	3-112		258
	Voltage	3-126		272
92, Early, late	Schematic	3-113		259
	Chassis layouts	3-114		260
92-F	Schematic	3-115		261
92, 92-F	Chassis layouts	3-116		262
	Voltage	3-83 & 3-126		229 & 272
92, 92-F, Late	Bypass condenser data	3-116		262
93, SW Converter	Schematic	3-117		263
	Chassis layouts	3-118		264
	Voltage	3-83 & 3-126		229 & 272
94	Voltage	3-83 & 3-126		229 & 272
94, 94-F	Schematic	3-119		265
	Chassis layout	3-120		266
94 Late	Schematic changes	3-120		266
96, 1st type, Below serial #7,289,385	Schematic	3-121		267
	Chassis layouts, condenser data	3-122		268
	Voltage	3-83, 3-126		
96, 2nd type, serial numbers #7,289,385 to #7,291,674	Schematic	3-123		269
	Voltage	3-83 & 3-126		
	Chassis layout	3-124		270
96, 3rd type, Above serial #7,291,674	Chassis layout	3-124		270
	Schematic	3-125		271
96, 96-F	Voltage	3-83 & 3-126		229 & 272
96-F	Schematic	3-127		273
	Chassis layouts, condenser data	3-128		274
99, 1st type, Below serial #4,882,380	Schematic	3-129		275
2nd type, from serial #4,882,380 to #4,884,901				
99, 1st type	Chassis layout, condenser data	3-130		276
99, 99-F, 99-P	Socket layout	3-130		276
	Voltage	3-83 & 3-126		229 & 272
99, 2nd and 3rd types	Chassis layouts	3-131		277
99, 3rd type	Schematic	3-132		278
99-F, 99-P	Condenser data	3-133		279
99-F	Filter circuit schematic	3-133		279
99-P	Phonograph switching circuit	3-133		279
112	Alignment	5-28		
	Schematic, voltage, notes	6-1, 6-2		
	Trimmer notes	6-3		
	Alignment, trimmers, socket	6-4		
	Chassis wiring	6-5		
	Parts list	6-6		
126, 136, 416, 446	Schematic	7-3		
	Socket, trimmers, chassis, alignment, parts	7-4		
	Installation data	7-5		
135Z, 215Z	Schematic, voltage	6-7		
	Trimmers, socket, alignment	6-8		
	Chassis layouts	6-10		
	Parts list	6-11		
137	Schematic, socket, trimmers	7-7		
	Chassis	7-8		
	Parts list	7-9		
145, 325, Early and late	Schematic, voltage	5-7		
	Socket, trimmer, chassis	5-8		
	Alignment	5-28		
	Parts List	5-30		

ATWATER KENT MFG. CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
145, 325, Early and late	Chassis (late), changes	Changes 7-13		
E-145, E-145X	Socket, trimmers, chassis, alignment	7-10		
	Schematic	7-11		
	Changes	7-2		
	Parts list	7-9		
155 (1st type) Below serial #7,086,900	Schematic, socket, voltage	3-179		324-A
155 (2nd type) Above serial #7,086,900	Schematic, socket, voltage	3-180		324-B
155 (3rd type) Above serial #7,088,700	Schematic, socket	4-1		
	Parts list	4-3		
155	Changes	7-2		
165	Schematic, socket	4-2		
	Parts list	4-3		
165 (2nd type), 185, 525	Schematic, socket, voltage	5-9		
	Socket, trimmer, parts	5-10		
165-Q, 525-Q	Schematic, voltage	4-23		
	Socket, trimmers, parts	5-1		
168	Schematic	7-13		
	Parts list	7-9		
	Socket, trimmers, chassis	7-14		
184, 184-X	Schematic	7-15		
	Socket, trimmers, chassis	7-8		
	Parts list	7-12		
185-A	Schematic, voltage	5-11		
	Socket, trimmers, parts	5-12		
188, 188-F, (1st type)	Schematic	3-135		281
	Chassis layout, socket	3-136		282
188	Voltage	3-126 & 3-134		272 & 280
188, (2nd type), Above serial #8,074,387	Schematic	3-137		283
188-F, 2nd type, Above serial #5,693,025				
188, 188-F, (2nd types)	Chassis layout, socket	3-138		284
188-F	Voltage	3-126		272
200	Same circuit as Model 317 except that Model 200 has terminals for phono. connection.			
200, 317, 337	Parts list	7-12		
206, 376 (1st type)	Schematic, voltage	5-13		
	Socket, trimmers, parts	5-14		
	Alignment, trimmers	5-29		
206, 376, 559, 825, 944	Parts Lists	5-15		
206D, 376D, Early	Schematic	7-17		
	Socket, trimmers, chassis	7-16		
	Parts list	7-12		
206D, 376D, Late	Schematic	7-18		
	Parts list	7-12		
E206, E206X	Parts list	7-12		
E208, E248	Schematic	7-19		
	Parts list	7-12		
E208X, E248X	Parts list	7-12		
215-Z	See model 135Z			
P216, P216X, P336, P336X	Parts list	7-12		
P216, P336	Socket, trimmers, chassis, alignment	7-22		
	Schematic	7-21		
217, 427, 667	Schematic, voltage	4-4		
	Socket, trimmers, parts	5-3		
	Changes	7-20		
217-D, 427-D, 667-D	Schematic, voltage	4-5		
	Socket, trimmers, parts	5-4		
225	See Model 435			
228, Early, late	Schematic	3-139		285
	Chassis layouts	3-140		286
228-F	Schematic	3-141		287
	Chassis layout, socket	3-142		288
228, 228-F	Socket, bypass condenser data	3-142		288
228-D	Schematic	3-143		289
228-Q	Chassis layouts, data	3-144		290
	Schematic	3-145		291
	Chassis layouts, condenser data	3-146		292
236	Schematic	7-23		
	Socket, trimmers, chassis	7-24		
	Parts list	7-32		

MODEL	ATWATER KENT MFG. CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
237-Q, 467-Q, Early	Schematic, voltage	6-12		
	Trimmers, alignment	6-46		
	Installation notes, dry cell data, speaker adjustments	7-27		
	Parts list	7-28		
246	Schematic, voltages across resistors	3-147		293
	Chassis layouts, voltage, condenser schematic	3-148		
246, 266 (2nd type)	Schematic, voltage	4-6		294
E248	See Model E208			
255	Schematic	7-25		
	Parts list	7-32		
257	Same as model 137 but with a 2A5 instead of a 47			
260, 260-F (1st type), Below serial #8,422,101	Schematic	3-149		295
	Chassis and socket layouts	3-150		296
260, 260-F (2nd type), Above serial #8,422,101	Schematic	3-151		297
	Chassis layout, bypass condenser data	3-152		298
260, 260-F, (3rd type), Above serial #6,188,242	Schematic	3-153		299
	Chassis layout, socket	3-154		300
260	Voltage	3-126 & 3-134		272 & 280
260-F	Voltage	3-126		272
266 (2nd type)	See model 246 2nd type			
273D	Schematic	7-26		
275 (1st type)	Schematic, voltage	4-7		
275	Socket, trimmers, parts	5-5		
285-Q, 415-Q	Schematic, voltage	6-13		
	Trimmers, chassis, alignment	6-14		
	Parts list	7-28		
286, 356	Schematic, voltage	6-15		
	Trimmers, chassis, alignment	6-16		
	Parts list	6-22		
305-Z, 565-Z	Trimmers, socket, alignment	6-8		
	Schematic, voltage, SPU layout	6-9		
	Chassis layouts	6-10		
	Parts list	6-11		
E308	Same as model 318 but with a long wave range instead of police range, and long wave oscillator tracking condenser is 50 MMF.			
310, 510	Schematic, voltage	4-8		
	Socket, trimmers, parts	5-6		
312, E312	Schematic	7-29		
	Parts list	7-32		
317, 337, Early	Schematic, voltage	6-17		
	Trimmers, alignment	6-46		
	Socket, trimmers, chassis	7-31		
	Parts list	7-12		
	Changes	Changes 7-11		
318	Similar to 447			
325	See model 145			
328, Early	Schematic, voltage	6-18		
	Trimmers, alignment	6-47		
	Chassis layout	7-34		
	Parts list	7-30		
328 (110v.), 328X (230v.) 2nd Type, above serial #6438750	Schematic	7-33		
	Chassis layout	7-34		
	Parts list	7-30		
P336, P336X	See model P216, P216X			
337	See model 317			
349	Same as model 649			
356	See model 286			
376	See model 206			
376D	See model 206D			
385-Q, 625-Q	Schematic, voltage	6-19		
	Trimmers, socket, chassis, alignment	6-20		
	Parts list	6-22		
387, 427-Q	Schematic, voltage	4-9		
387, above serial #7,873,966	Schematic, voltage	5-17		
	Socket, trimmers, parts	5-18		

MODEL	ATWATER KENT MFG. CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
P412, E412, P412X, E412X	Schematic, voltage	7-35		
	Socket, trimmers, chassis	7-31		
	Coil data	7-1		
	Parts list	7-30		
415-Q	See model 285Q			
416	See model 126			
424, 534	Socket, chassis, parts list	4-10		
	Schematic, voltage	4-11		
	Changes	7-36		
425, 665	Schematic, voltage	4-24		
	Socket, trimmers, parts	5-2		
427	See model 217			
427-D	See model 217D			
427-Q	Schematic, voltage	4-9		
427-Q, above serial #1,948,501	Schematic, voltage	5-17		
	Socket, trimmers, parts	5-18		
435, Early	Schematic, voltage	6-21		
	Parts list	7-32		
435, 2nd Type	Schematic, voltage	7-37		
	Socket, trimmers, chassis layout	7-38		
	Parts list	7-32		
446	See model 126			
447	Alignment, trimmers	5-29		
	Schematic, voltage	7-39		
	Chassis layout	7-40		
	Parts list	7-30		
448	Schematic, voltage, socket	4-12		
	Parts list, chassis	4-13		
456	Similar to model 856			
465Q, 655Q	Schematic, voltage	6-23		
	Trimmers, socket, chassis	6-24		
	Speaker data, alignment	6-25		
	Parts list	6-26		
467Q	See model 237Q			
469	Voltage	3-126 & 3-134		272 & 280
469, 469-F (1st type)	Schematic	3-155		301
	Chassis layout, socket	3-156		302
469, (2nd type), Above serial #8,498,122; 469-F, (2nd type), Above serial #6,186,242	Schematic	3-157		303
469, 469-F, (2nd types)	Chassis layout, socket	3-158		304
469-D, 558-D	Schematic	3-163		309
	Chassis layout, socket	3-164		310
469-D, 469-Q	Voltage	3-134		280
469-F	Voltage	3-126		272
469-Q, 558-Q	Schematic	3-165		311
	Chassis layout, socket	3-166		312
475, 735	Schematic, voltage	6-27		
	Parts list	6-22		
	Trimmers, socket, chassis, alignment	6-28		
480	Schematic	3-159		305
	Chassis layout, socket	3-160		306
	Frequency-range-switch circuit, early	3-161		307
	Frequency-range-switch circuit, simplified schematic	3-162		308
	Voltage	3-134		280
485Q, 515Q	Schematic, voltage	7-41		
	Socket, trimmers, chassis, alignment	7-42		
	Parts list	7-28		
487	Schematic	7-43, 7-44		
	Chassis layout	7-40		
	Parts list	7-54		
509	Schematic, socket, trimmers	7-45, 7-46		
	Chassis wiring	7-47		
	Parts list	7-54		
510	See model 310			
511, Tun-O-Matic	Schematic, data	5-19		
	Data	5-20		
	Data	5-21		
511	Schematic, voltage	6-29, 6-30		
	Parts list	6-6		
	Tune-O-Matic data, socket, chassis	6-31		

ATWATER

MODEL	ATWATER KENT MFG. CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
511, Late	Chassis wiring	6-32		
	Changes	7-48		
511, Automatic tuning, clock, remote control units	Schematic	6-33		
	Trimmers, socket, alignment data	6-34		
515Q	See model 485Q			
525 (2nd type)	See model 165 2nd type			
525Q	See model 165Q			
534	See model 424			
534 (2nd type)	Schematic, voltage	5-23		
	Socket, speaker, trimmers, parts	5-24		
535	Same as model 435 but the short wave range goes to 18 MC			
535, 725, P725, P725X	Parts list	7-54		
545	Schematic, voltage	6-35		
	Trimmers, socket, chassis, alignment	6-36		
555	Schematic, voltage, chassis, socket	4-14		
555 (2nd Type) above serial #5063260	Schematic, voltage	4-15		
556	Schematic, voltage	7-49		
	Socket, trimmers, chassis, alignment, parts	7-4		
	Installation data	7-5		
558	Schematic	3-169		315
	Chassis layout, socket	3-170		316
558D	See model 469D			
558, 558-D, 558-Q	Voltage	3-134		280
558-Q	See model 469-Q			
559	Schematic, voltage	5-25		
	Chassis wiring	5-26		
	Socket, trimmers, alignment notes (1), balancing gadget	5-27		
	Alignment	5-28		
	Parts list—See model 206			
565Z	See model 305Z			
567, 567-F	Schematic	3-167		313
	Chassis layout, socket, bypass condenser data	3-168		314
	Circuit changes in late type	3-168		314
E608, E648	Schematic, voltage	7-51		
	Socket, trimmers, alignment	7-52		
	Parts list	7-54		
612	Schematic	3-171		317
	Chassis layout, socket	3-172		318
	Voltage	3-134		280
	Change, general phono. connections	7-50		
625Q	See model 385Q			
627	Schematic	3-173		319
	Chassis layout, socket	3-174		320
	Voltage	3-134		280
636	Schematic, socket, voltage	3-181		324-C
	Trimmers, chassis	3-182		324-D
	Parts list	4-16		
637	Same as model 317			
648	Similar to 649 but with glass tubes			
	Parts list	7-54		
E648	See model E608			
649, Early	Schematic, voltage	6-37		
	Trimmers, alignment	6-47		
649, P649	Chassis, parts	7-53		
	Changes	7-2		
655Q	See model 465Q			
657Q, 747Q	Schematic, voltage	7-55		
	Socket, trimmers, chassis, alignment	7-56		
	Parts list	7-28		
665	See model 425			
666	Schematic, voltage	5-31		
	Socket, trimmers, parts layout	5-32		
	Parts list	5-33		
667	See model 217			
667D	See model 217D			
676	See model 856			
708, 808	Schematic, voltage	4-17		

MODEL	ATWATER KENT MFG. CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
708, 808	Socket, R-F. wiring	4-18		
	Parts list	4-19		
	Chassis	4-20		
	Changes	7-20		
710	Schematic	7-65		
	Parts list	7-30		
P710	Speaker data, parts list	7-64		
711	Schematic, voltage	4-21		
	Chassis wiring	5-35		
	Socket, trimmers, parts	5-36		
	R-F. transformers	5-39		
717	See model 317			
725, P725, P725X	See model 535			
725 (110v.), 725X (230v.)	Schematic, voltage	7-57		
	Socket, trimmers	7-58		
735	See model 475			
747Q	See 657Q			
P755, P875	Schematic, voltage	7-59		
	Socket, trimmers, chassis, alignment	7-60		
P755, P755X, P875, P875X	Speaker data, parts list	7-64		
756, 756-B	Schematic, voltage	3-183		324-E
	Chassis layout, trimmers	3-184		324-F
E765	Schematic, voltage	7-61		
	Socket, trimmers, chassis, alignment	7-62		
E765, E765X	Speaker data, parts list	7-64		
768Q, 978Q	Chassis, alignment	6-39		
	Schematic, voltage	6-38		
	Socket, trimmers, battery connections	6-40		
776	Schematic voltage	6-41		
	Socket, trimmers, chassis, changes	6-42		
	Alignment, parts	6-43		
788	Schematic, voltage	5-37		
	Chassis wiring	5-38		
	R-F. Transformers, trimmers	5-39		
	Parts list	5-40		
808	See model 708			
808A	Schematic, voltage	4-22		
	Chassis wiring	5-41		
	R-F. transformers, parts list	5-42		
	Changes	7-20		
810	Schematic, voltage	6-44		
	Trimmers, alignment	6-47		
	Parts list	7-30		
	Coil data	7-1		
	Speaker data, parts list	7-64		
812	Schematic	3-175		321
	Chassis layout, socket	3-176		322
	Voltage	3-134		280
	Schematic, booster amplifier, change	7-63		
	Change, phono. connections	7-50		
816, 926, 986 (1st)	Schematic, voltage	5-43		
	Socket, trimmers, parts, SPU schematic	5-44		
	Parts list	5-45		
825 AC-DC	Schematic, voltage	5-47		
	Socket, trimmers, parts layout	5-48		
825	Parts list—See model 206			
828	See model 328			
856, 976, Early	Schematic, voltage	6-45		
	Trimmers, alignment, socket	6-46		
	Chassis layout	7-58		
	Speaker data, parts list	7-64		
	Changes	Changes 7-11		
E865	Same as E765 but with metal tubes			
P875	See model P755			
926, 986	See model 816			
944	Schematic, voltage	5-49		
	Socket, trimmers, parts layout	5-50		
	Alignment data	5-30		
	Parts list, see model 206			
976 Early	See model 856 Early			
978Q	See model 768Q			

AUDIOLA RADIO CO.

See also FAIRBANKS MORSE HOME APPLIANCES, INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Audiola, Jr.	Schematic, socket	1-7	*120-A-3	333
Intermediate Frequencies	I-F. peaks ......Changes	7-4		
SW Converter	Schematic, socket	3-1		341
4-tube Pentode 31	Schematic, socket	2-2	120-A-1	332
4-tube 32	Schematic	3-1		341
5-tube Pentode 31	Schematic, socket	2-2	120-A-1	332
6-tube Pentode	Schematic, socket	1-7	*120-A-3	333
6-tube Jr. #1	Schematic	2-6	120-A-2	334
	Socket layout ......Changes	7-4		
6-tube Jr. #2	Schematic	2-6	120-A-2	334
	Socket layout ......Changes	7-4		
7-tube Super Pentode 31	Schematic, socket	2-1	120-A-4	335
8-tube Super Pentode 31	Schematic, socket	1-8	*120-B	336
9-tube Super Pentode 31	Schematic	1-9	*120-C	337
9-tube Super (2) Pentode 31, 13-S-9	Schematic	2-4	120-D	338
10-tube Super 31	Schematic	2-3	120-E	339
B-6	See model 346			
6-T (1927)	Schematic	1-2	*116	326
	Socket layout ......Changes	7-4		
8-T (1927)	Schematic	1-2	*116	326
	Socket layout ......Changes	7-4		
9-T-45 Super 31	Schematic	2-3	120-E	339
13-S-6	Schematic ...... Misc.	6-3		
13-S-9, 91031	See model 9-tube Super (2) Pentode 31			
13-T-5	Schematic, socket	5-4		
23-S-7	Schematic	4-1		
23-S-8	Schematic	3-2		342
23-S-8 (Two types)	Schematic	4-2		
23-S-8Q	Schematic	3-3		343
23-S-10	Schematic	3-4		344
	Socket layout ......Changes	7-4		
23-S-10 (Two types)	Schematic	4-3		
23-S-12	Schematic	3-5		345
23-S-12, Revised	Schematic	5-3		
23-T-5	Schematic	3-6		346
	Socket layout ......Changes	7-9		
23-T-5-SW	Schematic	3-6		346
	Socket layout ......Changes	7-9		
30-B, 7330	Schematic, socket	1-4	*117	340
31 Series	Schematic, voltage	1-5	*120	329
	Socket layout ......Changes	7-4		
31 Super	Schematic, voltage	1-6	*120-A	330
	Socket layout ......Changes	7-4		
	Service notes	2-5		331
32-S-11	Schematic ...... Misc.	6-3		
33-S-5	Schematic	4-7		
	Socket layout ......Changes	7-9		
33-S-5, Revised	Schematic	5-4		
33-A-6	Schematic	4-5		
	Socket layout ......Changes	7-9		
33-S-6	Schematic	4-6		
33-S-6B	Schematic, socket	5-6		
33-S-7	Schematic	4-7		
	Socket layout ......Changes	7-9		
33-S-8, 32-volts	Schematic	4-4		
	Socket layout ......Changes	7-9		
33-S-10 SW	Schematic, socket, alignment	5-5		
33-T-4	Schematic	4-7		
	Socket layout ......Changes	7-9		
34-C-5 AC-DC	Schematic	5-6		
34-S-5 AVC	Schematic	5-7		
34-S-5-LW	Schematic	5-8		
346, B-6	Schematic, socket, alignment	5-1		
347	Schematic, socket, alignment	5-2		
527	Schematic	1-1	*115	325
	Socket layout ......Changes	7-4		
627	Schematic	1-1	*115	325
	Socket layout ......Changes	7-4		
889	Schematic	1-10	*119	328
	Socket layout ......Changes	7-4		
7330	See model 30-B			
8430	Schematic, socket, voltage	1-3	*118	327

AUSTIN RADIO MFG. CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
A	Schematic, voltage	6-1		
J	Schematic, voltage	6-1		

AUSTIN RADIO MFG. CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
J	Alignment	6-4		
S	Schematic	6-2		
SP	Schematic	6-3		
	Alignment, voltage	6-4		

AUTOCRAT RADIO CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
4 Jr.	Schematic	4-2		
4 LW	Schematic	4-3		
4-SA	Schematic	5-2		
5	Schematic	5-1		
5M	Schematic, parts ......Misc.	9-2		
5-SA	Schematic	5-1		
6	Schematic	4-3		
6, Revised	Schematic	5-2		
6-D-32	Schematic	5-2		
41 TRF	Schematic	4-1		
56SW, 57SW	Schematic, parts ......Misc.	9-2		
57-C	Schematic	4-4		
80	Schematic	4-4		
90-SL	Schematic	5-3		
406	Schematic, socket	7-2		
505	Schematic, socket	7-1		
518, 618	Schematic, socket	7-2		

AUTOMATIC RADIO MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Junior	Schematic ...... Misc.	6-3		
Tom Thumb, Screen Grid 4 (Battery)	Schematic	1-1	*121	347
Tom Thumb Midget	Schematic	3-1		348
Tom Thumb Steering Post	Schematic	4-1		
	Notes	4-2		
Tom Thumb, 933 Series 2	Schematic	9-1		
C-4	Schematic	7-1		
A-5	Schematic	7-3		
D-5	Schematic, socket	7-2		
R-6	Schematic ......Misc.	10-1		
S-6	Schematic	7-1		
M10, M20	Schematic, parts, alignment	8-1		
P-25	Schematic	3-2		849
B30, Series I	Schematic, parts, alignment	8-2		
B30, Series II	Schematic, parts, alignment	8-3		
P-35, 34	Schematic	2-2		850
B40, Series II	Schematic, parts, alignment	8-4		
44, V-45, V-46, C-45, P-46	Schematic	2-1		851
J-50	Schematic	7-3		
D55	Schematic	9-1		
J-60	Schematic	7-3		
M60	Schematic, parts, alignment, data	8-5		
B70, B80	Schematic, parts, alignment	8-6		
J-80	Schematic, parts, alignment	7-4		
M80	Schematic, parts, alignment	8-7		
845, 960, 963	Schematic, layout	9-2		
850	Schematic, parts, alignment	8-8		
855	Schematic, alignment, tuner	9-3		
878	Schematic, trimmers, alignment	9-4		
892	Schematic, trimmers	9-5		
	Alignment, tuner	9-6		
933 Ser. 2	See Tom Thumb			
933, 935	Schematic, layout	9-2		
950, 955	Schematic, layout	9-2		
960, 963	See model 845			
960-A	Data ......Changes	10-1		

AZTEC RADIO CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Receiver	Schematic, voltage, notes ...... Misc.	3-2		2746

BAIRD

See GENERAL ELECTRONICS CORP.

NATHANIEL BALDWIN & CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
45	Schematic	4-1		
47	Schematic	4-1		
80	Schematic ...... Misc.	1-1	*122	2767

BALKEIT RADIO CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
C	Schematic, socket, voltage, parts list	1-3	*128	368
	Chassis, two views	3-3		369
E	Schematic	3-4		370
F	Schematic, socket, voltage, parts list	1-4	*127	366
	Chassis, two views	3-1		367
KP	Schematic	3-5		371
M	Schematic	4-2		
A-3, A-5, A-7	Schematic, voltage, chassis	1-2	*125	364
D-5	Schematic, socket	4-3		
SG-6	Schematic	4-1		
A-7	See Model A-3			
B-7, B-9	Schematic, chassis, data	1-1	*126	365
L-7	Schematic, socket	3-6		372
L-8	Schematic	4-9		
GT-16A	Schematic	6-1		
G-18A, G-19B	Schematic	6-2		
GT-20, GT-200X	Schematic	6-3		
GT-33	Schematic, alignment	6-4		
38	Schematic	5-1		
41-A	Schematic	6-1		
42-E, 42-G	Schematic, socket	4-5		
45	Schematic	5-2		
48	Schematic	5-2		
52-1	Schematic, socket	4-6		
55	Schematic, socket	4-7		
59	Schematic	5-3		
60, 70	Schematic, parts	5-4		
69	Schematic	5-3		
Windsor 70	Schematic	4-4		
100	Schematic	4-8		
GT-156BA	Schematic, socket, trimmers	6-5		
	Alignment data	6-6		
GT-200X	See Model GT-20			

BALKITE PRODUCTS CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Specifications	Voltages, charging rates, etc.	1-1	*728	353
B Form D	Schematic	1-10	*737	362
B-H	Schematic	1-10	*737	362
B-W	Schematic	1-9	*736	361
B-W Form D	Schematic	1-10	*737	362
B-X	Schematic, wiring	1-8	*735	360
BY	Schematic, wiring	1-7	*734	359
H, J, K, N Chargers	Schematic	1-2	*729	354
K-X	Schematic, wiring	1-11	*738	363
A-6	Schematic	1-8	*735	360
AB-6 Form B	Schematic, wiring	1-6	*733	358
AB-6-135 Form A	Schematic, wiring	1-5	*732	357
AB-6-180, Form A	Schematic, wiring	1-4	*731	356
B-135 Form A	Schematic, wiring	1-9	*736	361
B-180, Form A	Schematic, wiring	1-3	*730	355
B-180, Form B	Schematic, wiring	1-4	*731	356

BARKER BROS.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
L	Schematic, voltage, alignment	6-1		
M	Schematic, voltage, alignment	6-1		
P, 2 types	Schematic, voltage	6-2		
	Alignment	6-1		

BELMONT RADIO CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Series 40, Models 45, 46	Schematic, speaker cable code	3-1		378
Series 40, 41, 42, AC	Schematic, voltage	3-7		379
Series 40-A, 41-A, 42-A, AC	Schematic, voltage	3-7		379
45, 46	See Series 40			
Series 50	Schematic, voltage, speaker cable code	3-2		374
Series 50-A, 110-220-volt, 25 and 60 cycles	Schematic	3-3		375
Series 50-B	Schematic	3-4		376
Series 50-C	Schematic	3-8		380
50-F	Schematic	5-1		
Series 60	Schematic	3-5		377
Series 70	Schematic, voltage, data	3-6		378
70-A	Schematic	5-1		
71-C	Schematic, socket, alignment	5-2		
100	Schematic	5-1		

BELMONT RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Series 110	Schematic	3-9		381
401	Schematic, voltage	6-1		
	Socket, trimmers, alignment, notes	6-2		
401, Series B	Schematic, socket, voltage, alignment, parts list	7-1		
403, Series A	Schematics, voltage, trimmers, socket	10-1		
	Alignment	10-2		
404, Above serial #5D115200A	Schematic, voltage, socket, trimmers	6-3		
	Alignment, parts, battery data	6-4		
408, Series A	Schematic, voltage, socket, trimmers, alignment, parts	9-1		
415, Series A	Schematic, voltage, parts, socket trimmers, alignment	8-1		
415, Series B	Schematic, trimmers, alignment	8-2		
418, Series A	Schematic, socket, trimmers	10-3		
	Alignment, voltage, tuner data	10-2		
420	Schematic, socket	5-3		
	Alignment	5-4		
425	Schematic, socket	4-1		
430	Schematic, socket	5-3		
	Alignment	5-4		
435 Export Chassis	See model 524, Ser. A			
440	Schematic, socket	5-5		
	Alignment	5-6		
444	Schematic, voltage, socket, chassis	6-5		
	Alignment, notes	6-6		
X466 Television	Schematic	10-39, 40		
	Voltage, Notes	10-41		
489, Series A, Above Serial 7J852300; 489, Series B, Above Serial 8C136800	Schematic, socket, trimmers, voltage, parts	9-3		
	Trimmers, alignment	9-4		
501, Series A	Schematic, socket, trimmers, voltage, alignment, parts	9-2		
504, Series A	Schematic, socket, trimmers, voltage, alignment, parts	9-5		
505, Series A, Above Serial 7J851300	Schematic, voltage, socket, trimmers, parts	9-6		
	Alignment, trimmers	9-4		
517, Series A	Schematic, voltage, socket, trimmers, alignment, parts, tuner	9-7		
519	Schematic voltage, alignment	10-4		
	Socket, trimmers, tuner	10-5		
520, Series A	Schematic, socket, trimmers, voltage	10-6		
	Alignment	10-5		
521, Series A	Schematic	10-7		
	Socket, trimmers, voltage, alignment, tuner	10-8		
522	Schematic, voltage, socket, trimmers, alignment, parts	7-2		
523	Schematic, socket, trimmers, voltage, alignment, parts	9-8		
523B	Schematic, socket, trimmers, voltage, alignment, parts	9-9		
524, Series A; Export Chassis 435	Schematic, socket, trimmers, voltage, alignment, parts	9-10		
525 AC-DC	Schematic, socket, servicing data	3-8		380
526	Schematic, socket, trimmers, voltage, tuner, alignment, parts	9-11		
527, Series A	Schematic	10-9		
	Socket, trimmers, voltage, alignment, tuner data	10-10		
529	Schematic	10-11		
	Socket, trimmers, alignment, tuner data	10-12		
530	Schematic, socket, parts list	4-2		
531 Series B, Above Serial 187500	Schematic, voltage, socket, trimmers, alignment, parts	9-12		
540	Schematic, socket, alignment, parts	5-7		

BELMONT RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
541	Schematic, voltage, socket, trimmers	6-7		
	Alignment, parts, notes	6-8		
544, 545	Schematic, voltage, socket, trimmers, parts	6-9		
	Alignment, notes	6-10		
550	Schematic	4-3		
	Notes, socket, parts list	4-4		
551, Series A	Schematic, voltage, socket, trimmers	10-13		
	Alignment	10-14		
553, Series A	Schematic, voltage, socket, trimmers	10-15		
	Alignment, tuner data, notes	10-16		
555	Schematic, voltage, socket, trimmers, parts	6-11		
	Trimmers, alignment, notes	6-12		
556 (Export)	Schematic, socket, trimmers	7-3		
	Alignment, parts	7-4		
566	Schematic, socket, trimmers, parts	7-5		
	Alignment, notes	7-6		
575	Schematic, alignment	5-8		
577 Series A	Schematic, voltage, socket, trimmers, tuner, alignment parts	9-13		
577C Above Serial 203070	Schematic, voltage, notes	10-17		
	Alignment, socket, trimmers, tuner data	10-18		
578, 2 types, Serial 5G133670A to 5K173250A and Above serial 5K173250A	Schematic, voltage, parts	6-13		
878, Series A	Socket, trimmers, alignment	6-14		
580	Schematic, socket, voltage	6-15		
	Changes	Changes 7-2		
580, Revised, Above serial 11501	Schematic, voltage, parts	6-16		
	Installation details, parts	6-17		
	Alignment, installation data	6-18		
582, Series A, Above Serial 7L894500; 582, Series B, Above Serial 8B106200	Schematic, voltage, socket, trimmers, parts	9-15		
	Alignment, tuner, notes	9-16		
583 Export	Schematic, voltage, socket, trimmers, parts	9-14		
	Alignment	9-28		
585, Series A, B, C	Schematics, voltage	6-19		
	Socket layouts, trimmers, parts, change data	6-20		
	Alignment data	6-21		
585, Series D	Schematic, trimmers, parts list	7-7		
	Alignment, parts	7-8		
586, Series A, above serial 6E248475	Schematic, socket, alignment, parts	7-9		
587, Series A	Schematic, socket, trimmers, parts	7-11		
	Alignment	7-12		
588, Series A	Schematic, voltage, socket, trimmers, parts	8-3		
	Alignment, trimmers	8-4		
589	Schematic, socket, trimmers, alignment	8-5		
589 Series A Above Ser. No. 8E-189200	Changes	Changes 9-1		
601, Series A & B	Schematic, socket, parts, alignment, notes	7-10		
602	Schematic, socket, voltage, trimmers, alignment, parts	8-6		
602B, 602C	Schematic, voltage, socket, trimmers, alignment, parts	9-29		
611 Series A	Schematic, socket, trimmers, parts	9-17		
	Voltage, alignment, tuner, notes	9-18		
625	Schematic, socket, parts list	4-5		
632 Series A	Schematic, voltage, parts	9-19		
	Socket, trimmers, alignment, notes	9-20		

BELMONT RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
633, Series A	Schematic, socket, trimmers, voltage	10-19		
	Alignment, tuner, parts	10-20		
634, Series A	Schematic, socket, trimmers, voltage, alignment	10-21		
	Tuner, phono data, parts	10-22		
640	Schematic, socket, trimmers	5-9		
	Alignment	5-10		
650	Schematic	5-11		
	Socket, alignment	5-12		
660	Schematic, socket, parts list, voltage	4-6		
661	Schematic, voltage, socket, trimmers, parts	8-7		
	Alignment, assembly, wiring diagram	8-8		
665, Series A, 765	Schematic, voltage, trimmers, parts	9-21		
	Alignment, tuner, trimmers, notes	9-22		
	Data	Changes 10-3		
666	Schematic, socket, trimmers, parts	7-13		
	Alignment, notes	7-14		
667	Schematic, voltage, socket, trimmers, parts	9-23		
	Alignment, wiring data, notes	9-24		
670	Schematic, socket, trimmers	5-13		
	Alignment, service notes	5-14		
670-A	Schematic, voltage, parts	6-22		
	Socket, trimmers, installation details	6-23		
	Alignment, installation data	6-24		
675	Schematic, socket, trimmers	5-15		
	Alignment	5-16		
677	Schematic, voltage, socket, trimmers, parts	9-25		
	Installation, alignment, tuner	9-26		
677, Issue C, Above Serial 50672	Schematic, socket, trimmers, voltage	10-23		
	Alignment, tuner data, notes	10-24		
	Tuner data	10-18		
	Installation	9-26		
678, Issue A	Schematic, voltage, socket, trimmers	10-25		
	Alignment, notes, tuner, trimmers	10-26		
	Tuner data, notes	10-27		
680	Schematic, voltage, socket, trimmers	6-25		
	Alignment, parts	6-26		
685, Series A	Schematic, socket, trimmers	7-15		
	Alignment, notes	7-16		
686, Series A & B	Schematic, socket, trimmers	7-15		
	Alignment, notes	7-16		
691 Series A	Schematic, voltage, socket, trimmers, parts	9-27		
	Alignment	9-28		
740	Schematic, voltage, socket, trimmers, parts	8-9		
	Alignment, trimmers	8-10		
746, Series A	Schematic, socket, trimmers, voltage	7-17		
	Alignment, parts	7-18		
750	Schematic	4-7		
	Alignment, socket	5-19		
751, Series A	Schematic, voltage	10-29		
	Tuner data	10-28		
	Alignment, socket, trimmers, notes	10-30		
755	Schematic, socket, parts, layout	6-27		
	Trimmers, alignment	6-28		
761 Series A	Schematic, voltage, socket, trimmers, parts	9-30		
	Alignment, tuner	9-36		
767, Series A	Schematic, socket, trimmers	10-31		
	Alignment, trimmers, voltage	10-32		
770, Series A	Notes	7-20		
775	Schematic, socket, trimmers, parts	5-17		

BELMONT RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
775	Alignment	5-18		
777, Series A, B	Schematics, voltage	6-29		
	Trimmers, socket, parts, layouts	6-30		
	Alignment	6-31		
	Socket, trimmers, notes	7-20		
777, Series C	Schematic, voltage, changes, parts	7-19		
	Socket, trimmers, notes	7-20		
	Alignment (same as 777, series B)	6-31		
778, Series A	Schematic, socket, trimmers, parts	7-21		
	Alignment, notes	7-22		
786, Series A	Schematic, socket, trimmers	7-15		
	Alignment, notes	7-16		
787, Series A	Schematic, voltage, socket, trimmers, parts	8-11		
	Alignment	8-12		
804	Schematic, socket, voltage, parts	8-13		
	Alignment, trimmers	8-14		
822	Schematic, socket, trimmers, parts	8-15		
	Alignment	8-16		
823	Schematic, voltage, socket, trimmers, parts	9-31		
	Alignment, trimmers	9-32		
840	Schematic, voltage, socket, parts	8-17		
	Alignment, trimmers	8-18		
842 Series A	Schematic, voltage, socket, trimmers, parts	9-33		
	Alignment, trimmers	9-34		
845, Series A	Schematic, socket, trimmers	7-23		
	Alignment, notes, parts	7-24		
848, 849	Schematic, voltage, socket, parts	8-19		
	Alignment, trimmers	8-20		
856, Series A	Schematic, voltage, socket, trimmers, parts	8-21		
	Alignment	8-22		
860 Series A	Schematic, voltage, socket, trimmers, parts	9-35		
	Alignment, tuner	9-36		
867, Series A	Schematic, voltage, tuner data	10-33		
	Tuner data	10-28		
	Alignment, socket, trimmers....	10-34		
878, Series A	Schematic, voltage, socket, trimmers, parts	8-23		
878, Series B	Schematic, voltage, socket, trimmers, parts	8-24		
878, Series A & B	Alignment	8-25		
879, Series A	Schematic, voltage, parts, socket, trimmers	8-26		
	Alignment	8-12		
880, Series A, B	Schematics, voltage	6-32		
880, Series C	Schematic, voltage, data	6-33		
880, Series A, B, C	Socket, trimmers	6-34		
	Alignment, parts	6-35		
881	Schematic, socket, trimmers, alignment, parts	9-39		
888, 889	Schematic, voltage, socket, trimmers, parts	9-37		
	Alignment, trimmers, notes	9-38		
890, Series A	Schematic, voltage, socket, trimmers, parts	8-27		
	Alignment	8-28		
910 Export	Schematic, parts, phonograph notes	9-41		
	Alignment	9-40		
	Socket, trimmers, voltage, tuner	9-42		
1050	Schematic, voltage	4-8		
	Alignment, socket	5-20		
1070, Series A & B	Schematics, socket, trimmers	7-25		
	Alignment, notes, parts	7-26		
1075, Series A, B	Schematic	10-35		
	Alignment	10-36		

BELMONT RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
1075, Series A, B	Socket, trimmers, voltage, phono, notes	10-37		
	Tuner data, notes, parts	10-38		
1170, 1172	Schematic, voltage, socket, trimmers, parts	8-29		
	Alignment	8-30		
1170B	Schematic, voltage, socket, trimmers, parts	8-31		
	Alignment	8-32		
1170C, Above Serial 7C561750	Schematic, socket, trimmers, parts	9-43		
	Alignment, trimmers	9-44		
1171 Series A	Schematic, voltage, socket, trimmers, parts	9-45		
	Alignment, notes	9-46		
1174	Schematic, voltage, socket, trimmers, parts	8-33		
	Alignment	8-34		
1175 Series A	Schematic, voltage, parts	9-47		
	Alignment	9-40		
	Trimmers, tuner	9-48		

BLACKHAWK

6-U	Schematic	**Misc. 5-3**		

DAVID BOGEN CO., INC.

Mastertone Amplifier	Schematic	8-1		
Supreme Amplifier	Schematic	8-1		
2.5-5-10 Meter Superhet	Schematic, data	8-2		
2SC Communicator	Schematic, data	8-3		
2W Communo-Phone	Schematic, data	8-5		
3A Communo-Phone	Schematic, data	8-6		
5SC Communo-Phone	Schematic	8-3		
	Instructions	8-4		
B-20 Amplifier	Schematic, notes	8-7		
SX50 Amplifier	Schematic, notes	8-8		

BOSCH

See UNITED AMERICAN BOSCH

BRANDES PRODUCTS CORP.

Also see KOLSTER RADIO, INC.

A-1	Schematic	3-2		**388**
B-10	Schematic	1-1	***435**	**388**
	Voltage, socket, data	1-2	***435**	**384**
B-11, B-12	Schematic	3-1		**385**
B-15, B-16	Schematic	1-3	***436**	**386**
	Voltage, socket, data	1-4	***436**	**387**

BREMER-TULLY MFG. CO.

ABC Power Pack	Schematic	3-4		398
B-T 6	Schematic	2-1	*129	389
6-40 Power Converter	Schematic	1-5	*132	395
6-40, 6-41	Schematic, socket, voltage	1-4	*129	390
7-70	Schematic, chassis wiring	3-1		391
7-70 Power Converter	Schematic, socket, voltage	3-2		392
8 Counterphase	Schematic	1-3	*131	393
8-12 Counterphase	Schematic, socket	2-1	132-A	389
8-20, 8-21	Schematic, socket, voltage	1-3	*131	393
80	Schematic, socket	2-2	132-A	394
81-A	Schematic, socket	1-5	132-B	395
81, 82	Schematic, socket, voltage	1-6	133	396
	Resistor, condenser, transformer connections	3-4		398
81, 82 Power Unit	Chassis wiring	3-3		397
S-81, S-82	Schematic, socket	1-7	*134	399
S-81, S-82 RF	Chassis wiring	2-3		400
S-81, S-82 A-F. 60 cycles	Chassis wiring	3-5		401
S-81, S-82 A-F & SPU, 25 cycles	Schematic, choke and condenser connections	3-6		**402**
83-A	Schematic	2-2	**132-A**	**394**

BRENARD MFG. CO.

Heraldyne	Schematic	**Misc. 6-4**		

BULOVA WATCH CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
M-501	Chassis layout, assembly wiring, voltage	2-2	187-B	504
600, 601, 605, 610	Schematic, voltage, socket	5-1		
	Alignment, trimmers	5-2		
M-701, G-781	Schematic, chassis, voltage	2-3	187-C	505
	Test data	2-4	187-D	506
C-751	Schematic, socket	2-5	187-E	507
	Voltage, service data	2-6	187-F	508

BUSH & LANE PIANO CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
10	Schematic	1-1	*189	509
	Voltage, socket, tests	3-1		511
	Chassis layout	3-2		510
12	Schematic, socket, voltage	1-2	*188	512

C. R. C.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
24-27	Schematic	4-1		
24-45	Schematic	4-1		
24-47	Schematic	4-2		
58-47	Schematic	4-2		

CABLE-NELSON

See HOWARD RADIO

CADILLAC DIV.—GENERAL MOTORS

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
5X	Schematic, voltage, socket, trimmers	8-1		
	Alignment, notes	8-2		
6W	Notes on mounting	5-1		
	Notes on mounting, Part 2	5-2		
	Schematic, socket, alignment	5-3		
	Parts list	5-4		
6KB	Schematic, voltage, socket, trimmers	8-3		
	Alignment, notes	8-2		
	Schematic	7-1		
6-Q	Voltage, resistances, socket, trimmers, transformer data	7-2		
	Circuit data, parts, alignment	7-3		
6R	Schematic	8-5		
	Alignment, voltage, socket, trimmers, data	8-6		
6S	Schematic, parts	8-7		
	Alignment, voltage, socket, trimmers, changes, notes	8-8		
6T	Schematic, notes	8-9		
	Alignment, voltage, trimmers, socket, data	8-10		
6U2	Schematic	8-4		
C-8	Schematic, voltage, sensitivity	10-1		
	Socket, trimmers, chassis	10-2		
	Tuner, alignment notes	10-3		
	Tuner, alignment data	10-4		
56V1	Schematic	5-12		
2029, 2029A, 2080	See Delco Radio 3026			
2721 (072)	Schematic	5-5		
	Voltage, socket, assembly	5-6		
	Chassis wiring	5-11		
	Parts, trimmer data	5-8		
	Power pack data	5-7		
2722 (072A)	Trimmer data	5-8		
	Chassis wiring	5-11		
	Power pack data	5-7		
	Trimmer data	5-8		
	Voltage, parts list, special notes	5-9		
	Schematic	5-10		
1425470, 1425471	Schematic	9-1		
	Socket, trimmers, layout, voltage, alignment	9-2		
7232502	Schematic	9-3		
	Socket, trimmers, layout, voltage, alignment	9-4		

CALVERT MOTORS ASSOCIATES

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
A-50-A	Schematic, voltage	6-1		
A-51-A, A-52-A	Schematic, voltage, parts	6-2		

THE CAPEHART, INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
E-1	Tuner schematic, voltage	10-1		
	Amplifier schematic, voltage, alignment	10-2		
	Trimmers, chassis	10-3		
Standard Amplifier	Schematic	5-5		
10, 12-C	Chassis, service notes, Part I	2-1	192-D	525
	Service notes, part 2	2-2	192-D-1	526
	Service notes, part 3	2-3	192-D-2	527
	Service notes, part 4	2-4	192-D-3	528
16-E DeLuxe Record changer	Adjustments, Part 1	10-25		
	Adjustments, Part 2	10-26		
	Adjustments, Part 3	10-27		
	Notes	10-28		
	Complete assembly	10-29		
	Chassis views	10-30		
	Chassis views	10-31		
	Chassis views	10-32		
	Chassis view, parts	10-33		
	Chassis views	10-34		
21	Cabinet wiring	3-1		517
100, 100½, 101, 101½, 130, 130½	Complete wiring	3-2		518
103, 104, Cosmopolitan, Chassis Z	Schematic	5-1		
110 Amperion	Wiring diagram	3-3		519
110-G, Panamuse	Tuner schematic	10-5		
	Trimmers, chassis, alignment	10-4		
	Amplifier schematic	10-6		
111 Amperion	Wiring diagram	3-4		520
130, 130½	See model 100			
150, 151 Amperion	Wiring diagram	3-5		521
152 Amperion	Wiring diagram	3-6		522
170 Amperion	Wiring diagram	3-7		523
180, 180½, 182, 182½ Amperion	Wiring diagram	3-8		524
200-F Tuner	Schematic	8-1		
	Alignment—See 110G			
202	Schematic, voltage	7-1		
203	Amplifier and power pack schematic	7-2		
	Tuner schematic, voltage	7-3		
400, 401, 402	Schematic	1-1	*192-A	513
400 Series, PZ Amplifier	Chassis wiring	1-2	*192-C	514
400 Series, RF	Chassis wiring	1-3	*192-B	515
400, 401, 402	Complete wiring diagram	1-4	*192-D	516
400-A Series Tuner Amplifier	Schematic	4-1		
400-B Tuner	Schematic	4-2		
400-B Amplifier	Schematic	4-3		
400-B, 402-B, 404-B Tuner	Schematic	5-2		
400-B, 402-B, 404-B A-W. Tuner	Schematic	5-3		
400-B, 402-B, 404-B Amplifier	Schematic	5-4		
400-D	Tuner schematic, voltage	7-4		
	Bass Amplifier schematic, voltage	7-5		
	Treble amplifier schematic, voltage	7-6		
400-E, 500-E Series	Schematic, voltage, alignment	10-7, 8		
	Trimmers, layout	10-11		
400-F Tuner	Schematic	8-2		
Bass Amplifier	Schematic	8-3		
Treble Amplifier	Schematic	8-3		
400-G, 500-G Series	Remote control installation	10-9, 10		
	Mixing panel chassis, notes	10-18		
	Mixing panel notes	10-19		
	Trimmers, chassis	10-17		
	Extended control wiring	10-20		
	Extended control, wiring assembly	10-21		
400-G	Tuner schematic, voltage	10-13		
	Assembly wiring	10-12		
	Bass amplifier schematic, voltage	10-14		
	Volume control schematic, data, parts list	10-22		
	Tuning meter adjustments, chassis, assembly	10-16		

CLIMAX RADIO & TELEVISION CO., INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
ASE	Schematic, socket, alignment	9-1		
ATE	Schematic, socket, alignment	9-1		
B	Schematic, parts	8-6		
C, D	Schematic, parts	8-6		
E	Schematic, parts	8-7		
F	Schematic, parts	8-7		
FBT	Schematic	Misc. 10-3		
G	Schematic, parts	8-8		
HE	Schematic, parts	8-9		
JE	Schematic, parts	8-9		
JEBT	Schematic, parts	8-13		
JL	Schematic, parts	8-10		
M	Schematic	7-9		
M, ME Revised	Schematic, parts	8-11		
MEBT	Schematic, parts	8-11		
R	Schematic, parts	8-8		
RBT	Schematic, parts	8-12		
SBT	Schematic, parts	8-13		
T	Schematic, parts	8-12		
U, UE	Schematic, socket, alignment	9-2		
E-02	Schematic, socket, alignment	9-1		
A-4	Schematic	7-6		
KSW-4	Schematic	7-7		
M-4 (Early)	Schematic	7-6		
M4 (Late)	Schematic	Misc. 10-3		
4-Tube AC-DC	Schematic	7-2		
4-Tube Batt.	Schematic	7-1		
5-Tube AC-DC	Schematic	7-2		
SW-5 (Lee)	Schematic	7-7		
6-Tube Batt.	Schematic	7-1		
AD6	Schematic, socket, alignment	9-2		
7	Schematic	7-8		
7-B	Schematic	7-9		
10 to 19 inclusive	Schematic	7-10		
30, 31, 32, 33, 34	Schematic	7-11		
35	Schematic	7-12		
50 to 59 inclusive	Schematic	7-13		
Z-55	Schematic	8-14		
AC60, AC61, AC64, AC64B, AC65	Schematic, parts	8-15		
U60, U61, U64, U64B, U65	Schematic, parts	8-16		
66	Schematic	7-15		
Q-69	Schematic	8-14		
90 to 99 inclusive	Schematic	7-14		
90B to 99B inclusive	Schematic	7-15		
424	Schematic	Misc. 5-4		
457	Schematic	7-16		
557	Schematic	7-16		

CLIPPER

See RADIO PRODUCTS SALES CO.

COAST TO COAST

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
A-14	Schematic	Misc. 3-3		2747
56, 3-46, 83	Schematic	Misc. 3-4		2748
56, 2-59, 2-81	Schematic	Misc. 3-4		2748
525	Schematic	4-1		
D-3008	Schematic	4-2		
D-3031	Schematic	4-3		
4978	Schematic	4-4		

COLONIAL RADIO CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Suffix A:	16" spkr. used instead of 8"			
General Notes	Alignment, image frequency data	5-1		
Intermediate Frequencies	I-F. Peaks	Changes 7-4		
16-5	Schematic	1-2	*194	542
16-6	Schematic	1-1	*193	541
17-5	Schematic	1-2	*194	542
20	Schematic	1-3	*195	543
21	Schematic	1-3	*195	543
25	Schematic, socket	1-4	*196	544
26	Schematic, socket	1-5	*197	545
28 AC, Serial #90,001	Schematic, socket	1-6	*198	546
28 DC, Serial #85,001	Schematic, socket	1-7	*199	547
31 AC	Schematic, socket	1-10	*205	550
31 AC, 31 DC	Voltage	1-9	*205	549
31 DC	Schematic, socket, voltage	1-8	*200	548
	Chassis wiring, data	1-9	*201	549
32 DC, Issue A	Chassis wiring	1-11	*203	553

COLONIAL RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
32 DC, Issue A	Schematic, socket, voltage	1-12	*202	552
32 AC, Issue J	Chassis wiring	1-13	*207	555
	Schematic, socket, voltage	1-14	*206	554
33, 34 DC	Schematic, socket, voltage	1-16	*204	556
33, 34, 35 AC	Schematic	1-15	*208	557
	Chassis layouts	2-1	208-1	559
	Remote Control Notes	2-2	208-3	560
	Parts list	2-3	208-2	558
33, 34, 35 Remote Control	Schematic, wiring, cable	1-17	*209	561
36 DC	Schematic, socket	2-4	208-4	562
36, 114	Schematic	1-19	*208-A	563
	Chassis wiring, parts list	2-6	208-B-1	564
	Data on parts	2-5	208-B-2	565
36-P	Schematic	1-19	*208-A	563
37	Schematic, socket	2-7	208-B-5	567
	Chassis wiring	2-8	208-B-6	568
	Parts coding, voltage	2-9	208-B-7	569
37-P	Schematic	2-10	208-B-8	570
38, 117	Schematic	2-11	208-5	571
39, 125	Schematic	1-18	*208-B	574
	Chassis wiring	2-13	208-B-9	575
	Voltage, parts coding	2-12	208-B-10	576
40, 43	Schematic, socket, data	2-15	208-B-11	581
40, 43 Battery	Chassis wiring	2-14	208-B-12	582
41, 42	Schematic	1-18	*208-B	574
	Parts coding	2-19	208-B-15	579
41	Chassis wiring, voltage	2-17	208-B-13	577
41-P	Schematic	2-16	208-B-16	580
42	Chassis wiring	2-18	208-B-14	578
44 Super	Chassis wiring	2-20	208-D	584
	Schematic, voltage, data	2-21	208-C	583
	Parts coding	2-22	208-E	585
44 Revised	Schematic	Misc. 10-4		
46 Midget	Chassis wiring, parts coding	2-23	208-B-18	587
	Schematic, voltage, data	2-24	208-B-17	586
47	Chassis wiring	2-25	208-G	589
47, 48	Schematic, socket, voltage	2-26	208-F	588
	Parts coding	2-27	208-I	591
47, 48 Revised	Schematic	Misc. 10-4		
48	Chassis wiring	2-28	208-H	590
49 Midget	Chassis wiring, voltage	2-29	208-B-20	593
	Schematic, socket, parts coding	2-30	208-B-19	592
50 AVC	Chassis wiring	2-31	208-K	595
	Schematic, socket	2-32	208-J	594
	Voltage, parts coding	2-33	208-L	596
51	Schematic, socket	3-1		597
	Voltage	3-3		599
	Parts coding	3-4		600
52	Schematic	3-2		598
	Voltage	3-3		599
	Parts coding	3-5		601
55	Schematic, voltage	3-6		602
	Parts coding	3-7		603
56	Schematic, voltage	3-8		604
	Parts coding	3-9		605
62	Schematic, data	3-10		606
	Voltage, socket	3-11		607
	Parts coding	3-12		608
	Coil connections	3-13		609
	Switch connections	3-14		610
65	Schematic, coil connections	3-15		611
	Voltage, chassis layout	3-16		612
69	Schematic, I-F data	3-17		613
	Voltage, parts coding, socket	3-18		614
71	Schematic, transformer notes	3-19		615
	Voltage, chassis layout	3-20		616
	Parts coding	3-21		617
	Service notes	3-22		618
	Simplified schematic	3-22		618
73	Schematic, voltage	3-23		619
	Parts coding	3-24		620
76 #1	Schematic, transformer data	3-25		621
76 #2	Schematic	3-26		622
76	Parts coding	3-27		623
	Voltage, alignment data	3-28		624
	Notes	4-1		
106-B	Notes, cable data, antenna condenser data	4-2		
	Drive cable data	4-3		
	Cable data	4-4		

COLONIAL RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
700, 701, 702	Parts location	4-59		
	Parts list, terminal board data	4-60		
700 AC, 701 AC, 702 AC	Circuit notes, voltage	4-61		
	Schematic	4-62		
	Parts location, speaker terminal data	4-63		
	Socket layout, parts list	4-64		
C-995	Voltage, service notes	3-38		634
	Parts coding	3-39		635
	Supplementary service notes (A)	3-40		636
	Schematic	3-41		637
	Spkr., notes, parts. See model T-345			

COLUMBIA PHONOGRAPH CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
C-1, C-3	Schematic, socket	1-1	*437	639
C-2, C-4	Schematic, socket	1-2	*437	640
C-5 (205)	Schematic, socket, voltage	1-3	*438	641
C-5 (310)	Schematic, socket	1-3	*438	641
C-6, C-7	Schematic, socket	1-4	*439	642
CM-16-A, C-19-A	Dynamic speakers data	3-6		658
C25-31, C25-32, C31, C32 (Chassis C101)	Schematic, socket, voltage	2-2	218-A	650
	Chassis, test data	2-1	218-B	651
33, 34 (Chassis C102)	Chassis layouts	2-3	218-C	653
C-80-A	Schematic	3-2		654
C-80-B	Schematic	3-3		655
	Power transformer data	3-5		657
	Chassis, notes	3-6		658
C-80-A, C-80-B, C-800-A	Voltage	3-5		657
C-80-A, C-800-A	Power transformer data	3-6		658
C-90	Power transformer data	3-5		657
	Schematic	3-7		659
	Silent tuning notes	3-8		660
	Voltage, tuning notes	3-9		661
C-100	Schematic, voltage, socket	3-10		662
C-101 Chassis	See model C-25-31			
C-102 Chassis	See model 33, 34			
120-B	Schematic, alignment data, notes	3-11		663
	Voltage, notes	3-12		664
C-800	Schematic	3-4		656
C-800-A	Voltage, pwr. data. See model C-80-A			
900, 901	Schematic, socket	1-4	*438	642
902	Schematic, socket	1-5	*440	643
920, 990	Schematic	1-6	*440	644
930	Schematic, socket	1-6	*440	644
930-300	Schematic, socket	1-7	*441	645
931	Schematic, socket	1-7	*441	645
940	Schematic, socket	2-4		646
950	Schematic, socket	1-8	*443	647
961	Schematic, socket	1-9	*443	648
980	Schematic, socket	1-10	*442	649
990	See model 920			

COLUMBIA RADIO CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
SG-5 1930	Schematic	3-1		665
SG-8	Chassis wiring, voltage	1-1	*211	667
	Schematic	1-2	*210	666
	Chassis	3-2		668
SG-9 1930	Schematic, socket	3-3		669
SG-10	Schematic	3-4		670

COMMONWEALTH RADIO MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
150	Schematic	Misc. 5-5		

CONSOMELLO

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
8-In-Line	Schematic	Misc. 6-4		

CONTINENTAL RADIO CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Star Raider	See model R-20			
Slagle 9 with '71-A	Schematic, socket, voltage	1-1	*212	671
Slagle 10. A and B with '71-A Power Pack	Schematic, socket	1-2	*215	672
R-20, R-30, R-40, Star Raider	Schematic	1-6	*217	676

CONTINENTAL RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Slagle 29-C with '71-A Power Pack	Schematic, socket	1-3	*214	673
Slagle 29-A and 29-B with '50 Power Pack	Schematic, socket	1-4	*213	674
Slagle 29-C and 29-D with '50 Power Pack	Schematic, socket	1-5	*216	674
R-40	See model R-20			

CONTINENTAL RADIO & TELEVISION CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Touch-O-Matic, Type T-21	Schematic, assembly	8-21		
	Installation, notes, adjustments	8-22		
M-1	Schematic, voltage, socket, trimmers	7-9		
	Alignment, parts	7-10		
L2, ML156, ML266	Schematic	6-2		
Z-2	Schematic, voltage, socket, trimmers	7-13		
	Alignment, parts	7-14		
4A, 4B, Early, Late, 4C	Schematic	10-1		
	Alignment, socket, trimmers	10-2		
4D, Early, Late	Schematic	10-3		
	Alignment, socket, trimmers	10-2		
4D-PH	Schematic	10-3		
4	Alignment, socket, trimmers	10-2		
4H	Schematic	10-3		
	Alignment, socket, trimmers	10-2		
L4, ML4	Schematic, voltage	6-1		
Z-4	Schematic, voltage, socket, trimmers	7-15		
	Alignment, parts	7-16		
5A	Schematic, socket, trimmers, alignment, tuner, parts	9-1		
5AZ	Schematic, socket, trimmers, alignment	9-2		
5B	Schematic	10-5		
	Socket, trimmers, alignment, tuner, voltage, phono data	10-6		
5C	Schematic, socket, trimmers, alignment, parts	9-3		
5CU	Schematic	10-5		
	Socket, trimmers, alignment	10-6		
5D, 5DL	Schematic	10-4		
	Alignment, socket, trimmers	10-2		
5E	Schematic, socket, trimmers, alignment, parts	9-4		
5EA	Schematic	10-4		
	Alignment, socket, trimmers	10-2		
5F	Schematic, socket, trimmers, alignment, parts	9-5		
5G	Schematic, socket, trimmers, alignment	9-6		
5J	Schematic	10-1		
	Alignment, socket, trimmers	10-2		
5L, 5LL	Schematics, voltage	10-7		
	Alignment, socket, trimmers	10-2		
L-5	Schematic, socket, trimmers	7-3		
	Alignment, parts	7-4		
5LL Phono	Schematic, voltage	10-7		
5M Chassis	Schematic, socket, trimmers, alignment	8-1		
5VU	Schematic, socket, trimmers, alignment	9-7		
5X Chassis	See model 160-5X			
5Z Chassis	See model 150-5Z			
6A	Schematic, socket, trimmers, alignment	10-8		
6B	Schematic, socket, trimmers, alignment	10-9		
	Tuner data	10-10		
6C	Schematic, socket, trimmers, alignment	10-11		
	Tuner data	10-10		
6D	Schematic, socket, trimmers, alignment	9-8		
6G	Schematic, socket, trimmers, alignment	10-12		
	Tuner data	10-10		
6H	Schematic, socket, trimmers, alignment	9-9		

CROSLEY CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Merrimac	See model 855			
Olympia	See model 655			
Prestotune Eleven	See model 1137			
Quiktune Fiver	See model 517			
Roamio	See model A158, A267 or A358			
Roamio (Auto)	See models 90, 95 & 96			
Sampler	See model 2C1			
Sixer Roamio	See model A168			
Super Six	See model 637			
Super Eight	See model 817			
Super Eleven	See model 1117			
Trirdyn	Schematic, socket	1-16	*219	678
Tuning Condenser Alignment	Notes, part 1	3-1		695
	Notes, part 2	3-2		696
	Notes, part 3	3-3		697
Two-step A-F. Amplifier	Schematic	2-7		677
Vanity	See model 418			
Viking	See model 725			
2C1, Sampler	Schematic, voltage, socket, parts, data	6-1		
3-B, 3-C	Schematic, chassis wiring	1-1		679
4-29	Schematic, socket	1-2	*228	680
4A1	Schematic, parts list	5-17		
	Alignment, voltage	5-18		
4B1, Battery Forty	Schematic, socket, parts	6-2		
5-38	Schematic, socket	1-16		678
5A1	Schematic, socket, parts list	5-47		
5A3, Battery Fiver	Schematic	6-3		
	Voltage, parts	6-4		
	Additional data	Changes 7-15		
5B3, Battery Fiver	Schematic, socket, parts	6-5		
5C2 Chassis	See model 51			
5H1 Chassis	See model 50			
5M3 Chassis, Fiver Jr.	Voltage, notes, alignment	5-19		
	Schematic, socket, parts list	5-20		
5V1 Chassis, DeLuxe Fiver, L-B Chassis	Voltage, data, parts list	5-21		
	Schematic, alignment, socket	5-22		
5V2, Fiver DeLuxe	Schematic, socket, parts, voltage	6-6		
	Additional data	Changes 7-15		
6B1, Battery Six	Schematic, parts, socket	6-7		
	Chassis, trimmers	6-8		
	Voltage, alignment	6-9		
6H2 Chassis	See model 61			
6H3	Schematic, socket, parts	6-18		
6V2 Chassis	See model Dual Sixty			
6-60, 6-85	Schematic, socket	1-3	*220	681
7	Schematic, socket, data	2-1	1-239	759
7-1	Schematic, socket, data	2-1	1-239	759
	Voltage	2-2	2-239	760
7-2	Schematic socket, data	2-2	2-239	760
AC-7, AC-7C	Schematic, socket	1-18	*238-B	698
AC Power unit for AC-7	Schematic	1-5	*222	683
7H2 and 7H3 Chassis	See model 72			
8B1	Data	Changes 7-16		
8B3, Battery 8 AF	Schematic, parts	6-10		
8H1 Chassis	See model 80AW			
10	Schematic	4-1		
20, 21, 22	Schematic, socket, voltage, data	1-19	*231	699
26	Schematic, socket, voltage, parts list	2-3	232-A	700
27, 28	Schematic, socket, voltage, data	2-4	232-B	701
30S, 31S, 33S, 34S	Schematic, socket, voltage, data	1-20	*232	702
32 DC SIX	See model 645			
38	Schematic	4-1		
40S, 41S, 42S, 82S	Schematic, socket, voltage, data	1-21	*234	703
41, 41-A, 42	Schematic, socket, voltage	1-22	*233	704
48	Schematic, voltage, socket, notes	3-4		705
50, 50 LB, Chassis 5H1	Voltage, data	5-23		
	Alignment, notes	5-24		
	Schematic, trimmers	5-25		
	Parts list	5-26		
51	Schematic, socket	1-16		678
51, Chassis 5C2	Parts list	5-26		

CROSLEY CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
51, Chassis 5C2	Voltage, data	5-27		
	Schematic, alignment	5-28		
53, 54, 57	Schematic, socket, voltage, data	1-24	*234-A	706
55	Schematic, socket, voltage	1-25	*234-P	707
55, 56	Parts list	1-26	*234-C	708
56	Schematic, socket, voltage	1-25	*234-B	707
58	Schematic, socket, parts list	1-27	*236-B	709
59 AC	Voltage, parts list, data	2-5	236-F	711
	Schematic, socket, chassis	2-6	236-E	710
RFL 60, 75	Schematic, socket	1-2		680
60S, 61S, 62S, 63S	Schematic, socket, voltage	1-28	*236	712
Dual Sixty, Chassis 6V2, Dual Sixty-LB	Schematic, parts list	5-31		
	Alignment, trimmers	5-30		
	Voltage, data	5-29		
Sixty One, Chassis 6H2, Sixty One LB	Voltage, notes	5-32		
	Alignment, trimmers	5-33		
	Schematic, socket, parts list	5-34		
72, 72-LB, Chassis 7H2	Voltage, data	5-35		
	Alignment data	5-36		
	Alignment, parts list	5-37		
	Schematic, trimmers, socket	5-38		
72, 72-LB, Chassis 7H3	Voltage, data	5-39		
	Alignment, data	5-40		
	Schematic, trimmers, socket	5-41		
	Parts list	5-42		
75	See model 60			
76	Schematic, socket, voltage, chassis	1-29	*236-A	713
77-1	Schematic, socket, chassis	1-30	*236-C	714
77-A, 77-B, 77-L	Schematic, socket, voltage, data	1-31	*237	715
80AW, 80AW-LB, Chassis 8H1	Voltage, data	5-43		
	Alignment, data	5-44		
	Alignment, trimmers	5-45		
	Schematic, socket, parts list	5-46		
82S	See model 40S			
84-C, 84-D	Schematic, socket, voltage, data	1-32	*238	716
RFL 90	Schematic, socket	1-3	*220	681
90 Roamio Auto Set	Schematic, socket, voltage, chassis	1-33	*239	717
91 Auto Set	Schematic, chassis, voltage	3-5		718
92 Auto Set	Schematic, socket	3-6		720
95 Roamio Auto	Schematic, voltage, chassis	3-6		720
96 Roamio Auto	Schematic, socket, voltage, notes	3-7		721
98	Schematic, voltage	4-2		
99	Schematic, voltage	4-3		
102	Schematic	4-4		
103	Voltage, parts list	5-1		
	Schematic, socket layout	5-2		
104, 105, 106 Power Converter	Schematic	1-7 & 1-6	*224 & 225	685 & 684
104-R, 105-R, Pwr. Conv.	Schematic	1-7	*224	685
117 S.P.U.	Schematic	9-24		
	Layout, connections	9-23		
118, 119 Reado Printers	Schematic, connections, stylus details	10-41		
	Assembly, chassis views	10-42		
	Operating and service data	10-43		
	Trouble chart	10-44		
119	Schematic, socket, parts list	5-5		
120	Schematic, socket, voltage, changes	1-34	*238-A	722
	Notes	3-8		723
121, Series A	Schematic, socket	2-8	238-C	724
121, Series B	Schematic, socket	2-8	238-C	724
122	Schematic, voltage, socket	2-9	238-D	725
122, 123, 124	Condenser notes, data	2-12	238-E	728
123	Schematic, socket, voltage	2-10	238-F	726
124	Schematic, socket, voltage	2-11	238-G	727
124-1	Schematic, socket, voltage	3-9		729
125	Schematic, socket, voltage, data	2-13	238-H-1	730
126	Schematic, socket	2-14	238-H-2	732

CROSLEY CORP.—(Cont.)

MODEL	CROSLEY CORP.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
126-1	Schematic, socket	2-14	238-H-2	732
127	Schematic, socket, voltage, data	2-15	238-I	733
	Parts list, data	2-16	238-J	734
127-1	Schematic, voltage, alignment data	3-11		735
128	Schematic, socket	3-12		736
129	Schematic, voltage, notes	3-13		737
129-1	Schematic, voltage, notes	3-14		738
130	Schematic	4-5		
130-1	Schematic	4-6		
131	Schematic, socket	3-12		736
132-1	Schematic, voltage, notes	3-15		739
133	Schematic, voltage, socket, notes	3-16		740
134	Schematic, voltage, notes	3-17		741
134-1	Schematic, voltage, socket	3-18		742
135	Schematic, voltage, socket, notes	3-19		743
136-1	Schematic, voltage, specifications	3-20		744
137	Schematic, voltage, socket, notes	3-21		745
141	Schematic, voltage, socket, notes	3-22		746
143	Schematic, voltage	4-7		
146	Schematic, voltage, socket, notes	3-23		747
146-1	Schematic, voltage, socket	3-24		748
147	Schematic, voltage, changes, notes	3-25		749
148	Schematic, voltage, notes	3-26		750
150	Schematic, voltage, notes	3-27		751
154	Schematic, voltage, notes	3-34		758
155	Schematic, voltage, notes	3-28		752
156	Schematic, voltage, notes	3-29		753
A-156	Schematic, socket, voltage	7-1		
	Trimmers, chassis, alignment, parts	7-2		
157	Schematic, voltage, notes	3-30		754
A-157, Fiver Roamio	Schematic, voltage, parts	8-1		
	Socket, trimmers, chassis, alignment	8-2		
158	Schematic, voltage, notes	3-31		755
A158, A258 Roamio	Schematic, socket, layout, trimmers, voltage	9-1		
	Alignment, tuner, dial data, parts	9-2		
	Tuner assembly, voltage, parts	9-3		
159	Schematic	4-8		
160	Schematic, voltage, chassis layout	3-32		756
161	Data ... Changes	7-16		
163	Schematic, voltage	3-33		757
	Data ... Changes	9-1		
164	Schematic	4-11		
166	Schematic, voltage	4-12		
A-166	Schematic, voltage	7-3		
	Socket, trimmers, chassis, parts, alignment	7-4		
167	Schematic, parts list	4-9		
167, **Series 2**	Schematic, voltage	4-10		
A-167	Schematic, voltage, socket, trimmers	8-3		
	Chassis, alignment, parts	8-4		
168	Schematic, voltage	4-13		
A168, A268, Sixer Roamio	Schematic, voltage, socket, trimmers, layout	9-5		
	Tuner assembly, parts	9-4		
	Alignment, dial data	9-6		
169	Schematic, voltage	4-14		
169, **Revised**	Voltage, parts list	5-3		
	Schematic, socket layout	5-4		
170	Schematic, voltage	4-15		
171	Schematic, voltage	4-16		
172	Schematic, voltage	4-12		
173, 173-5	Schematic, voltage	4-17		
174	Schematic, voltage	4-18		
175	Schematic, voltage	4-19		
176	Schematic	4-11		

MODEL	CROSLEY CORP.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
A-177	Schematic, voltage, socket, trimmers	8-5		
	Chassis, parts, alignment	8-6		
178	Schematic, voltage, parts, socket	5-6		
179	Voltage, parts	5-7		
	Schematic	5-8		
180	Voltage, parts list	5-9		
	Schematic, socket	5-10		
181	Voltage, parts list	5-11		
	Schematic	5-12		
182	Parts list	5-13		
	Schematic, voltage	5-14		
184	Schematic	5-16		
	Voltage, parts list	5-15		
A258	See model A158			
A-266	Schematic, socket, trimmers, chassis, voltage	7-5		
	Alignment, parts	7-6		
A267, Roamio	Schematic, socket, parts	9-7		
	Socket, trimmers, layout, voltage, alignment	9-8		
A268	See model A168			
A358, Roamio	Schematic, socket, trimmers, voltage, layout	9-9		
	Alignment, dial data, parts	9-10		
A-366	Schematic, socket, parts	7-7		
	Socket, trimmers, voltage, alignment	7-8		
401 Bandbox Jr.	Schematic, socket, chassis	1-4	*221	682
401-A Bandbox Jr.	Schematic, socket	1-4	*221	682
415	Schematic, socket, voltage	7-9		
	Socket, trimmers, chassis, parts, alignment	7-10		
416	Schematic, voltage, socket, alignment	8-7		
	Chassis, parts	8-8		
418, Vanity	Schematic, socket, trimmers, layout	9-11		
	Alignment, tuner, voltage, parts	9-12		
425	Schematic, socket, voltage	7-11		
	Socket, trimmers, chassis, parts, alignment	7-12		
428 Vanity DeLuxe	Schematic, socket, trimmers, layout	9-13		
	Tuner, alignment, voltage, parts	9-14		
435	Schematic, voltage	7-13		
	Socket, trimmers, alignment, parts	7-14		
438, 438M, 486	Schematic, parts	9-15		
	Phono, chassis, voltage, alignment, drive data, phono data, tuner	10-1		
448	Schematic, parts	9-28		
	Combination, socket, trimmers, voltage, alignment, phono data, tuner	10-2		
458, Battery Vanity	Schematic, socket, trimmers, voltage, chassis	10-3		
	Alignment, tuner, notes, parts	10-4		
505, 525	Schematic, parts	6-13		
	Voltage, chassis, trimmers, alignment	6-14		
506, Below Serial #1308741	Schematic, socket, parts	8-9		
	Trimmers, Chassis, alignment, voltage	8-10		
506, Above Serial #1308741	Schematic, socket, voltage, parts	8-11		
	Trimmers, chassis, alignment	8-12		
507	Schematic, voltage, socket	10-5		
	Trimmers, chassis, alignment, parts	10-6		
515, 5515, Fiver	Schematic, socket, parts	6-11		
	Voltage, trimmers, alignment, chassis	6-12		
516, 5516, 6516	Schematic, voltage, socket, parts	7-58		
517 (Early), 547 (Early), Teletune Fiver	Schematic, socket, parts	8-13		

CROSLEY RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
716	Trimmers, chassis, alignment, parts	8-30		
718	Schematic, parts	9-46		
	Socket, trimmers, voltage, chassis, data	10-21		
	Alignment, drive data	10-22		
725, Viking	Schematic, voltage	7-45		
	Socket, trimmers, chassis, parts, alignment	7-46		
726	Schematic, voltage	8-31		
	Socket, trimmers, chassis, alignment, parts	8-32		
736	Schematic, voltage	8-33		
	Socket, trimmers, alignment, chassis, parts	8-34		
758	Schematic, socket, trimmers, chassis	10-23		
804	Schematic, socket, voltage, chassis	1-15	*280	693
814	Schematic, socket, parts	6-25		
815	Data ....Changes	7-13		
815, Battery 8	Schematic	7-47		
	Socket, trimmers, chassis, parts, alignment, voltage	7-48		
816	Schematic, parts	7-49		
	Socket, trimmers, voltage, chassis, alignment	7-50		
817, Super Eight	Schematic, socket	9-43		
	Voltage, socket, trimmers, layout	9-44		
	Alignment, phonograph data, parts	9-45		
818	Schematic	10-25		
	Socket, trimmers, chassis, voltage, phono.	10-24		
	Alignment, notes, parts	10-26		
828	Schematic, phono.	10-27		
	Chassis, parts	10-28		
	Socket, trimmers, voltage, alignment, drive data	10-29		
855, Merrimac	Schematic, voltage, socket	7-51		
	Socket, trimmers, chassis, parts, alignment	7-52		
865	Schematic, voltage	7-53		
	Socket, trimmers, chassis, parts, alignment	7-54		
915, Clipper	Schematic, voltage	7-55		
	Socket, trimmers, chassis, phono.	7-56		
	Alignment, parts	7-57		
916	Schematic, parts	7-59		
	Socket, trimmers, chassis, voltage, alignment	7-60		
926	Schematic, socket, voltage	8-35		
	Trimmers, alignment, parts	8-36		
955	Schematic, parts	7-61		
	Socket, trimmers, chassis, voltage, alignment	7-62		
1014, Centurion	Schematic, socket, parts	6-26		
	Chassis, trimmers, voltage, data	6-27		
	Alignment, data	6-28		
1016	Schematic, socket	7-63		
	Alignment, voltage, parts	7-65		
	Socket, trimmers, chassis, phono	7-64		
1018	Schematic, notes	10-31		
	Voltage, alignment, drive data, notes, tuner	10-30		
	Socket, trimmers, parts	10-32		
1026	Schematic, socket	8-37		
	Parts	8-38		
	Socket, trimmers, voltage, chassis, resonance curves, phono. pick-up	8-39		
	Alignment, notes	8-40		
1055, Constitution	Schematic	7-67		
	Socket, trimmers, chassis, voltage	7-66		
	Alignment, parts	7-68		
1117 (Early) Super Eleven	Schematic, socket	9-47		

CROSLEY RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
1117 (Late) Super Eleven	Schematic, socket	9-48		
1117 Early and late	Alignment, changes, data	9-49		
	Socket, trimmers, layout, voltage, phonograph data, parts	9-50		
1118, 1128	Schematic	10-33		
	Parts list	10-34		
	Alignment, tuner, notes, drive data	10-35		
	Voltage, socket, trimmers, chassis, drive data	10-36		
1126	Schematic, socket, notes	8-41		
	Parts, notes	8-42		
	Socket, trimmers, voltage, resonance curves, phono, pick-up, data	8-43		
	Alignment, notes	8-44		
1127, Dynatrol Eleven	Schematic, socket	9-51		
	Socket, trimmers, voltage, layout	9-52		
	Motor assembly, transformer data, phonograph data	9-53		
	Alignment, data, parts	9-54		
1128	See model 1118			
1137, Prestotune Eleven	Schematic, socket	9-55		
	Socket, trimmers, voltage, layout	9-56		
	Motor assembly, tuner, phonograph data, transformer data	9-57		
	Alignment, tuner, parts	9-58		
1155	Schematic	7-69		
	Socket, trimmers	7-70		
	Voltage, parts, alignment	7-71		
1216	Schematic, socket	8-45		
	Parts	8-46		
	Socket, trimmers, voltage, resonance curves, pick-up data, notes	8-47		
	Alignment, notes	8-48		
1217, 1227	Schematic	10-37		
	Tuner, parts list	10-38		
	Socket, trimmers, chassis, drive data, phono.	10-39		
	Voltage, alignment, notes	10-40		
1316	Schematic	7-73		
	Voltage, trimmers, socket, chassis	7-72		
	Alignment, parts	7-74		
1336	Schematic, socket	8-49		
	Parts	8-50		
	Socket, trimmers, chassis, voltage, resonance curves, phono. pick-up, notes	8-51		
	Alignment, notes	8-52		
1516	Schematic, socket	8-53		
	Parts, notes	8-54		
	Socket, trimmers, chassis, voltage, resonance curves, phono. pick-up, notes	8-55		
	Alignment, notes	8-56		
5515	See model 515			
5516	See model 516			
5517 Fiver Console	See model 517			
5526	See model 526			
5536	See model 536			
5548	See model 548			
5555	See model 555			
5628	See model 628 (Late)			
5656	See model 656			
5666	See model 666			
6516	See model 516			
6615	Schematic, parts	7-75		
	Socket, chassis, trimmers, voltage, alignment	7-76		
6625	Schematic	7-77		
	Socket, chassis, trimmers, parts, alignment, voltage	7-78		

DAY FAN ELECTRIC CO.
See GENERAL MOTORS RADIO CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
DAYRAD				
See RADIO PRODUCTS CO.				
DeFOREST RADIO CORP.				
F-5	Schematic	Misc. 1-8	*240	763
CS-5	Schematic	Misc. 1-8	*240	763
D-10	Schematic	Misc. 1-8	*240	763
D-17	Schematic	Misc. 1-8	*240	763
DELCO APPLIANCE CORP.				
RB-B, RA-B	Schematic	3-1		767
	Voltage, color codes	3-2		768
RB-1, RC-1	Schematic	3-4		770
	Voltage, color codes	3-5		771
RB-3, RA-3	Schematic, voltage, color code, notes	3-3		769
DELCO RADIO CORP.				
See also UNITED MOTORS SERVICE				
8002	Schematic, socket, chassis wiring, voltage	1-1	*842	765
	Chassis layout, control wiring, data	1-2	*842	766
8026	Schematic	4-1		
	Socket layout, cable data	4-4		
	Terminal data	4-5		
	Control drive data	4-6		
	Voltage, resistance, plug data	4-7		
	Values, changes	4-8		
8026 below serial #1400	Chassis layout	4-2		
8026 above serial #1400	Chassis layout	4-3		
DE SOTO				
See PHILCO RADIO & TELEVISION CORP.				
DETROLA RADIO & TELEVISION CORP.				
E = Tuning Eye (Other letters indicate cabinet styles)				
Detrola Jr. Peewee	See model 216, 280			
Peewee	See model 197, 218			
Roadchief	Schematic	5-8		
Roadmaster	Schematic	5-2		
	I-F. peak	Changes 7-8		
Super Peewee	See model 219, 276U, 284			
Warwick	Schematic, socket	6-1		
4-Tube TRF '32	Schematic	5-1		
5-Tube Super. Midget	Schematic	5-3		
4C	Schematic, socket	6-1		
4-D	Schematic, socket	5-1		
4F	Schematic, socket	6-2		
4H	Schematic, socket	6-1		
4J	Schematic, socket	6-2		
4W	Schematic, socket	6-2		
4Y	Schematic, socket	6-2		
5B	Schemtic, voltage, socket, data	6-3		
	Alignment, parts	6-4		
5D	Schematic, voltage, socket, data	6-5		
	Alignment, parts	6-6		
5L	Schematic, socket	6-2		
5W	Schematic, voltage, parts	6-7		
	Alignment	6-9		
5-WG	Schematic	7-9		
5X	Schematic, voltage, parts	6-8		
	Alignment	6-9		
5Y	Schematic, socket	6-1		
6A	Schematic, voltage, alignment	6-10		
6M, 6R	Schematic	6-11		
	Installation data, voltage, parts, alignment	6-12		
6W	Schematic, voltage, parts	6-13		
	Alignment	6-9		
6X	Schematic, voltage, parts	6-14		
	Alignment	6-9		
6ZM	Schematic	7-2		
	Alignment	7-5		
7A	Schematic, voltage	6-15		
	Alignment, parts	6-16		
7ZM	Schematic	7-3		
	Alignment	7-5		

DETROLA RADIO & TELEVISION CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
10ZM	Schematic	7-4		
	Alignment	7-5		
48	Schematic, socket	6-1		
100	Schematic, socket	7-6		
101	Schematic, socket	7-7		
101-A	Schematic, socket	7-7		
102	Schematic, socket	7-8		
103	Schematic, socket	7-9		
104	Schematic, socket	7-1		
106	Schematic, socket	7-6		
106-E	Schematic, socket	7-10		
108	Schematic, socket	7-10		
109	Schematic, socket	7-11		
111	Schematic, socket	8-1		
114	Schematic, socket	7-12		
116	Schematic, socket	7-11		
117B	Schematic, socket, alignment, parts	8-2		
120	Schematic, socket	7-1		
121	Schematic, socket	7-1		
130	Schematic, notes	8-3		
134A, 134AB, 134AZ	Schematic, socket	8-4		
134X	Schematic, socket	8-3		
135, 135E	Schematic, socket	8-4		
136, 149, 149E	Schematic, socket, trimmers, alignment	8-5		
137	Schematic, socket, parts	8-6		
139, 139E	Schematic, socket	8-7		
140	Schematic, socket, parts	8-8		
141A	Schematic, socket	8-3		
144B, 144C	Schematic, socket, alignment, trimmers, parts	8-9		
145B, 145CR	Schematic, socket, trimmers, alignment, parts	8-10		
146	Schematic, socket	8-11		
147, 147E, 147ECR	Schematic, socket, trimmers, alignment, parts	8-12		
147A, 147B, 147CR	Schematic, socket	8-7		
148	Schematic, socket, parts	8-13		
149, 149E	See model 136			
150	Schematic, socket, notes	8-14		
154E	Schematic, socket, trimmers, alignment, parts	8-15		
155X	Schematic, parts	8-16		
	Socket, trimmers, alignment	8-17		
157A	Schematic, socket	8-3		
158A	Schematic, socket	8-11		
159	Schematic, socket	8-19		
162	Schematic, socket	8-11		
162A	Schematic, socket	8-19		
163	Schematic, parts	8-18		
	Socket, trimmers, alignment	8-17		
165	Schematic, trimmers, parts	8-21		
	Alignment, socket	8-22		
166	Schematic, socket, trimmers, alignment, parts	8-20		
167	Schematic, socket, trimmers, alignment, parts	8-23		
168	Schematic, socket	8-19		
169	Schematic, socket, trimmers, alignment, parts	8-24		
172	Schematic, socket	8-19		
175 Series (T1, C1), 190, 193 Series (T2, T3), 195 Series (C4)	Schematic, socket, trimmers, alignment, parts	9-1		
176	Schematic, socket	9-2		
178	Schematic, socket	9-3		
183 Series, 191 Series (C5)	Schematic, socket, trimmers, alignment, parts	9-4		
	Tuner data, s-w alignment	9-5		
184 Series	Schematic, socket, alignment	9-3		
190, 193	See model 175			
192 Series (C3)	Schematic, socket, trimmers, parts	9-6		
	Tuner data, alignment	9-7		
195 Series	See model 175			
197, Peewee	Schematic, socket	9-3		
204	Schematic, socket, trimmers, tuner, parts	9-8		
	Alignment	9-2		
206	Schematic, socket, trimmers	9-9		

DEWALD RADIO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
527	Schematic, socket, chassis, installation, notes	8-5		
528, 528LW	Schematic	8-6		
529, 529LW	Schematic, alignment	8-7		
530, 530LW, 531, 531LW, 534, 534LW	Schematic, alignment	9-2		
531, Phono.	Schematic	10-3		
532, 532LW	Schematic	10-3		
DC-532-3	Schematic	2-5	240-5	777
533, 533LW	Schematic, alignment	9-2		
AC-535-6	Schematic	2-6	240-6	778
537, 537LW, 538, 538L, 538LW, 539, 539LW	Schematic, notes	10-4		
AC-547	Schematic	2-6	240-6	778
AC-547-A	Schematic	2-7	240-7	779
553-4S	Schematic	5-11		
	Socket layout. See model BAH-9			
555	Schematic, socket	5-12		
570	Schematic, socket	5-13		
600	Schematic	5-14		
600-A, 601-A	Socket layout. See model BAH-9			
605	Schematic	6-9		
	Alignment, socket, trimmers, parts	6-10		
606, 617 (Early and Late)	Schematic, parts, notes	7-3		
	Socket, trimmers, alignment	7-4		
607	Schematic, socket, trimmers	6-8		
609	Schematic, data, parts	6-11		
609, Late	Schematic	7-11		
610, 610-LW	Schematic, socket, alignment, parts	6-12		
611, 611-LW	Schematic, socket, trimmers, alignment	6-13		
612, 612-LW, 615, 615-LW	Schematic, socket, alignment, parts	6-14		
616	Schematic, alignment	7-6		
617 (Early and Late)	See model 606			
618, 618LW	Schematic, alignment	7-7		
619	Schematic, alignment	7-6		
620, 620LW	Schematic, alignment	7-7		
621, 621LW	Schematic, alignment, notes	7-8		
629, 629LW, 703, 703LW	Schematic, alignment	8-7		
630	Schematic	5-15		
	Socket layout. See model BAH-9			
DC-632	Schematic, socket	2-8	240-8	780
633, 633LW, 633S	Schematic, alignment	8-8		
635, 635LW	Schematic, alignment	8-8		
636, 636LW, 636S, 636LW-S	Schematic, alignment	9-3		
637, 637LW, 637S, 637LW-S	Schematic, alignment	9-3		
DC-637-8	Schematic	2-7	240-7	779
640	Schematic, socket	5-16		
645, 645LW, 652	Schematic, alignment	9-4		
648, 648LW, 650, 650LW	Schematic, socket, tuner, alignment	9-5		
649, 649 LW, 651, 651LW	Schematic, socket, tuner, alignment	9-9		
652	See model 645			
655, 655LW, 656, 656LW	Schematic, alignment	10-5		
700, 700LW	Schematic, alignment	8-9		
700A, 700A-LW	Schematic, alignment	8-9		
701, 701LW	Schematic, tuner, alignment	9-7		
702	Schematic, socket, trimmers, alignment, parts	8-10		
703, 703LW	See model 629			
AC-724	Schematic	2-9	240-9	781
	Chassis views	2-10	240-10	782
AC-724-1	Schematic	3-1		783
DC-727	Schematic	3-2		784
AC-746-7M	Schematic	3-3		785
	Chassis layout, oscillator coil	3-4		786
802, 803	Schematic	5-17		
804, 805	Schematic, voltage	6-15		
	Socket, trimmers, alignment, data	6-16		
804, 804S, 805A, 805C	Schematic, parts, voltage	7-9		
	Alignment, socket, trimmers, data	7-10		
807	Schematic, alignment	9-8		

DEWALD RADIO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
811-A	Schematic	5-18		
	Socket layout. See model BAH-9			
1002, 1003	Schematic, alignment, parts	9-6		
1004	Data	Changes 10-2		
1100, Early	Schematic	7-11		
1100, Late	Schematic, data	7-12		
1102-3	Schematic, socket, trimmers, alignment	10-6		
1104, 1105	Schematic, socket, trimmers	9-10		
	Alignment, parts	9-1		
1106	Data	Changes 10-1		
1200	Schematic	8-6		
1201	Schematic, alignment	9-8		

DICTOGRAPH PRODUCTS CO., INC.

91134, 91134A	Schematic, parts	8-1		
	Socket, trimmers, alignment	8-2		
91168, 91175	Schematic, parts	8-3		
	Socket, trimmers, alignment	8-2		

DODGE

See PHILCO RADIO & TELEVISION CORP.

ALLEN B. DUMONT LABS., INC.

180, 181, 182, 183 Television, Early	Video and A-F Receivers, schematic	10-3		
	Separator and Sweep, voltage divider, schematics, notes	10-4		
	S.P.U. schematic, voltage, notes	10-5		
	Circuit data, controls, trouble chart	10-1		
	Chassis views	10-2		
	Service data, parts	10-6		
	Antenna data	10-7		

EARL RADIO CORP.

21, 22 AC	Schematic, socket, voltage	1-2	*299	796
	Data	2-1		797
21-DC, 22-DC	Schematic, socket	1-1	*298	795
24-DC, 31-DC, 32-DC	Schematic, socket	1-3	*299	800
31, 32 AC	Schematic, socket, voltage	1-4	*300	798
	Data	2-2		799
33-S AC	Schematic	1-3	*300	800
41, 42 AC	Schematic, socket, voltage	1-5	*301	801
	Data	2-3		802
121	Schematic	1-1	*298	795

ECHOPHONE RADIO MFG. CO.

F	Voltage	2-1	240-L	813
	Schematic, socket, data	2-2	240-K	812
Dynatron	See model S-5			
Echoette	See model 40			
S-3	Schematic, socket	1-1	*240-A	803
	Voltage, data	1-2	*240-B	804
	Chassis views	1-3	*240-C	805
S-3 Revised	Schematic	1-1	*240-A	803
4, 44	Schematic, socket, voltage	3-12		826
S-4	Schematic	1-4	*240-E	806
	Voltage, data	1-5	*240-F	807
	Chassis views	1-6	*240-D	808
5	Schematic, socket, voltage	3-1		815
5, 14	Data	3-2		816
S-5 Dynatron	Schematic, socket, data	1-7	*240-G	809
S-5 Revised	Schematic, socket, data	1-8	*240-H	810
S-5	Voltage, chassis layout	1-9	*240-J	811
10, 15, 20	Schematic, socket, voltage	3-4		818
	Circuit notes	3-6		820
12, 38	Schematic	3-7		821
	Voltage, circuit notes	3-8		822
14	Schematic	3-3		817
	Data—See model 5			
15	See model 10			
16, 17, 18	Voltage	3-4		818
	Schematic	3-5		819
	Circuit notes	3-6		
20	See model 10			
35	Schematic, socket	3-9		823

ECHOPHONE RADIO MFG. CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
35, 36	Voltage	3-9		823
	Circuit notes	3-11		825
36	Schematic	3-10		824
38	See model 12			
40, Echoette	Schematic, socket, data	2-3	240-M	814
	Voltage	2-1	240-L	813
44	See model 4			
50	Schematic, socket	3-13		827
	Voltage, circuit	3-14		828
60	Schematic, socket, data	2-4	240-N	829
	Voltage	2-6	240-O	830
70 DC	Schematic, voltage, socket	3-16		832
	Circuit notes	3-15		833
80	Schematic, socket, data	2-5	240-P	831
	Voltage	2-6	240-O	830
81	Schematic, socket, voltage	3-18		834
90	Schematic, socket, voltage	2-7	240-Q	835
	Voltage, notes	2-8	240-R	836
90 (Revised)	Schematic, voltage	3-17		837
111	Schematic, data	5-1		
119	Schematic, alignment, parts list	5-2		
124	Schematic, alignment	5-3		
126	Schematic, alignment	5-3		
128	Schematic, data	5-1		
139, 139C	Schematic, socket, trimmers	6-1		
	Alignment	6-2		
143	Schematic, alignment, parts	5-4		

THOMAS A. EDISON, INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
"Light-O-Matic"	Cable drive data	4-1	*251	855
	Cable drive data, Part 2	4-2	*250	855
	Cable drive data, Part 3	4-3	*241	839
	Cable drive data, Part 4	4-4	*242	841
Splitdorf Abbey Jr.	Schematic, socket	1-11		
Splitdorf Abbey Battery	Schematic, socket	1-11		
C-1, Chassis SC	Schematic, socket, voltage	1-1		
C-1, Chassis SC, Power Unit	Chassis wiring	1-2		
R1, R2, C2, Chassis Jr. and Jc. 25 cycles	Chassis wiring	1-3	*244	843
	Schematic, socket, voltage	1-4	*243	842
R1, R2, C2, 60 cycles	Schematic, chassis wiring	1-5	*245	844
Splitdorf PAD4	Schematic	Misc. 6-31		
R4, R5, C4 (Unit Type 7R)	Chassis wiring	1-6	*247	846
R4, R5, C4	Schematic, socket, voltage	1-7	*246	845
	Chassis views	2-1		849
	Parts list	1-8	*248	848
R4, R5, C4 (Power unit, type 8P)	Chassis wiring	1-9	*247	847
R4, R5, C4 Power unit	Chassis views	2-2		850
R4, R5, DC	Schematic	3-1		851
R6, R7	Schematic, socket, voltage	1-10	*249	852
	Resistance data	3-2		853
Splitdorf R-100	Schematic, socket	1-12	*252-A	854
Splitdorf E-175	Schematic	1-13	*252	856
Splitdorf R-200	Schematic, socket	1-12	*251	854
Splitdorf RV-695	Schematic, socket	1-12	*252-B	854

EDISON-BELL CO., INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
36	Schematic	5-1		
53	Schematic	5-1		
53-LW	Schematic	5-2		
55 AW	Schematic	5-3		
63	Schematic	5-4		
63 LW	Schematic	5-5		
66 AW	Schematic	5-6		

ELECTRAD, INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Loftin-White '45	Schematic	1-1	*698	859
245 Amplifier	Schematic	Misc. 8-6		
A-250	Schematic	2-1	698-1	857
C-250	Schematic	2-1	698-1	857
D-250	Schematic	2-2	698-2	858
	Schematic	Misc. 6-7		
E-250	Schematic	2-2	698-2	858
D-450	Schematic	Misc. 6-7		
E-450 Amplifier	Schematic	Misc. 7-5		

ELECTRIC AUTOLITE CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
062A, 3622A	Schematic	4-1		
072A, 3722A	Schematic	4-2		
	Assembly wiring	4-3		
	Installation notes	4-4		

ELECTRIC & AUTOMOTIVE PRODUCTS CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
4M	Schematic	6-1		
IL-5	Schematic	6-3		
6-AW, 35-AW	Schematic	6-4		
SW-6	Schematic	6-2		
25-AW	Schematic	6-1		
30-AW	Schematic	6-3		
IL-55	Schematic	6-3		
303	Schematic	6-4		
303-LW	Schematic	6-5		
303-SW	Schematic	6-5		
405	Schematic	6-6		
405-LW	Schematic	6-6		

ELECTRICAL RESEARCH LABORATORIES, INC.

(Also all models listed under SENTINEL RADIO CORP.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
SW Converter	Schematic	5-10		
R-1	Schematic, socket	1-1	*253	861
R-2, RF Unit	Schematic, socket	1-2	252-M	862
A-2, A-F Unit	Schematic, socket	1-2	252-M	862
A-13 Amplifier	Schematic	3-1		877
30, 31, 32, AR-3	Schematic, socket, voltage	2-1	252-N	863
35, 37, 38, 39 (230)	Schematic, socket	2-5	252-H	869
S-61	Schematic, socket	1-1	*253	861
61, 62, 63 (250)	Schematic, socket	3-2		872
74, 76, (210)	Schematic, socket	2-2	252-E	864
75, 77 (231)	Schematic, socket	2-6	252-I	870
81, 82 (245)	Schematic, socket	1-5	*252-C	871
81-P, 82-P, 30 (248)	Schematic, socket	3-2		872
210 Chassis	See model 74			
224 AC	Schematic, socket	1-3	*254	865
	Chassis, voltage	1-4	*255	866
224-B	Schematic, socket	2-3	252-F	867
225	Schematic	2-4	252-G	868
230 Chassis	See model 35			
231 Chassis	See model 75			
245 Chassis	See model 81			
248 Chassis	See model 81-P			
250 Chassis	See model 61			
271-A	Schematic	2-7	252-K	874
335	Schematic, socket	1-6	*252-D	875
336	Schematic	2-8	252-L	876
603	Schematic	5-1		
	Voltage, alignment, parts list	5-2		
5700, 5721	Schematic, voltage, parts list	5-3		
	Alignment data	5-4		
6100	Schematic, power pack (2 types)	5-5		
	Voltage, alignment, parts list	5-6		
6200	Data	Changes 7-7		
6300, 6315, 6317, 6323	Schematic	5-7		
	Alignment, voltage	5-8		
	Parts list, notes	5-9		
7700, 7732, 7741	Schematic, voltage	5-11		
	Alignment, parts list	5-12		
	Changes	Changes 7-7		
9100	Data	Changes 7-7		

ELECTRIC SPECIALTIES EXPORT CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
38	Schematic	5-1		
45	Schematic	5-2		
48	Schematic	5-1		
69	Schematic	5-3		
R-502	Schematic	5-4		

ELECTROACOUSTICAL PRODUCTS

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
A1832 Amplifier	Schematic, voltage	8-1		
	Chassis layout	8-2		
A2023 Amplifier	Schematic, voltage	8-3		
	Chassis layout	8-2		
A2232 Amplifier	Schematic, voltage	8-4		
	Chassis layout	8-5		
A3041 Amplifier	Schematic, voltage	8-6		
	Chassis layout	8-5		

ELECTRONIC LABORATORIES, INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
"Electronic B"	Schematic, notes	4-1		
10, 32-Volt Converter	Schematic	Misc. 6-21		
331, 6-volt Eliminator	Schematic	4-2		
332, 32-volt Eliminator	Schematic	4-2		
338, 339 D-C Converters	Schematic	4-3		

ELKON

See P. R. MALLORY & CO.

EL-REY RADIO MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
4-Tube Midget	Schematic	Misc. 5-14		
7-Tube A-W Superhet.	Schematic	6-2		
10, 15	Schematic	6-1		
20	Schematic	6-1		
644	Schematic	6-3		
845	Schematic	6-4		

EMERSON RADIO & PHONOGRAPH CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Mickey Mouse	See model 409			
A Chassis	See model A130			
AA Chassis	See model AA131			
AB Chassis	See model AB178			
AB Chassis with phonograph	See model AB184			
AC Chassis	See model AC130			
AC Chassis, with phonograph	See model AC202			
AD Chassis	See model AD108			
AE Chassis	See model AE163			
AF Chassis	See model AF171			
AG Chassis	See model AG151			
AH Chassis	See model AH162 or AH166			
AJ Chassis	See model AJ130			
AL Chassis	See model AL130			
AL Chassis (Combination)	See model AL164			
AL Chassis Late	See model AL164 Late			
ALLW Chassis	See model ALLW130			
AM Chassis	See model AM131			
AP Chassis	See model AP165 or AP171			
AR Chassis	See model AR165 or AR171			
AS Chassis	See model AS179			
AT Chassis	See model AT170			
AU Chassis	See model AU190			
AV Chassis	See model AV193			
AW Chassis	See model AW171			
AX Chassis	See model AX221AC			
	See model AX240			
	See model AX211			
AXLW Chassis	See model AXLW211			
AY Chassis	See model AY194			
AZ Chassis	See model AZ196			
B Chassis	See model B131			
BA Chassis	See model BA199			
BB Chassis	See model BB208			
BD Chassis	See model BD197			
BE Chassis	See model BE198			
BF Chassis	See model AM131 Late			
BG Chassis	See model BG138			
BJ Chassis	See model BJ200			
	See model BJ218			
BL Chassis	See model BL200			
	See model BL218			
BM Chassis	See model BM206			
BM Chassis with phonograph	See model BM216			
BN Chassis	See model BN206			
BN Chassis with phonograph	See model BN216			
BQ Chassis	See model BQ223			
	See model BQ225			
BR Chassis	See model BR224			
	See model BR226			
BS Chassis	See model BS227			
BT Chassis	See model BT245			
BU Chassis	See model BU229			
BW Chassis	See model BW231			
BX Chassis	See model BX208			
BY Chassis	See model BY233			
C Chassis	See model C134			

EMERSON RADIO & PHONOGRAPH CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
CA Chassis	See model CA208			
CB Chassis	See model CB243			
CD Chassis	See model CD206			
CE Chassis	See model CE259			
CF Chassis	See model CF255			
CJ Chassis	See model CJ211			
CH Chassis	See model CH243			
CL Chassis	See model CL246			
CLW Chassis	See model CLW134			
CM Chassis	See model CM260			
CR Chassis	See model CR261			
CS	Schematic, socket, voltage	3-4		882
CT Chassis	See model CT275			
D Chassis	See model D134			
DLW Chassis	See model D134LW			
E	See model KS			
E Chassis	See model E128			
F	Schematic, socket, voltage, parts list	1-1	*256-A	886
F Chassis	See model F117			
G Chassis	See model G127			
H Chassis	See model H130			
J Chassis	See model J106			
JS	Schematic, voltage, socket	3-3		881
K Chassis	See model K116			
KS, E	Schematic, socket, voltage	3-3		881
L Chassis	See model L143 or L117			
LLW Chassis	See model 117LW			
M Chassis	See model M134			
P Chassis	See model P117			
Q Chassis	See model Q157			
R Chassis, Early	See model R152 Early			
R Chassis, Late	See R152 Late			
S Chassis	See model S147			
T	Schematic, voltage, socket	3-2		880
TS	Schematic, voltage, socket	3-2		880
U Chassis	See model U154			
V Chassis	See model V155			
X Chassis	See model X146			
X Chassis, Late, with phonograph	See model X175			
Z Chassis	See model Z117			
A4 Chassis	See model 409			
4B Chassis	See model 23			
G4 Chassis	See model 20A			
L-AC-4	Schematic, socket, voltage	3-1		879
L-DC-4	Schematic, voltage, socket	3-2		880
U4A Chassis	See model 109			
U4B Chassis	See model 118			
U4C Chassis	See model 409			
UV4	See model 19			
V4	See model 420			
5A	Schematic	6-1		
	Alignment, voltage	6-2		
B5 Chassis	See model 36			
C5 Chassis	See model 117			
DS-5 Chassis	See model 39			
E5 Chassis	See model 107AC			
F5 Chassis	See model 103			
G5 Chassis	See model 116			
Chassis H-5	See model 30			
Chassis H-5-L	Schematic	4-5		
5J Chassis	See model 28			
K5 Chassis	See model 117LW			
L-AC-5	Schematic, voltage, socket	3-1		879
U5A Chassis	See model 108			
U5B Chassis	See model 108LW			
U5S Chassis	See model 32			
6-A	Schematic, voltage	6-1		
	Alignment	6-2		
6BD Chassis	See model 45			
C6, D6 Chassis	See model 34C			
F6D Chassis	See model 280			
T6 Chassis	See model 35			
U6, U6D Chassis	See model 38			
U6A Chassis	See model 107			
U6A Chassis, Revised	See model 119			
U6B Chassis	See model 106			
U6C Chassis	See model 107LW			
U6D Chassis	See model U6			
U6F Chassis	See model 107			

EMERSON RADIO & PHONOGRAPH CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
AW7 Chassis	See model 71			
F7 Chassis	See model 34F7			
M-AC-7	Schematic, socket, voltage	3-5		883
A8 Chassis	See model 102			
B8 Chassis	See model 102LW			
B-AC-10	Schematic, socket, voltage, notes	3-7		
A-11 Chassis	See model 105			
19, Chassis UV4	Schematic, voltage, parts	6-3		
20-A, 25-A, Chassis G4	Schematic, voltage	3-9		
23 Chassis 4-B	Schematic, voltage, parts list	5-1		
26	Schematic, voltage	4-1		
	Socket layout ... Changes	7-3		
28, Chassis 5-J	Schematic, voltage, parts list	5-2		
30, 250, 300, Chassis H-5	Schematic	3-6		884
	Voltage, socket	4-5		
30 AW, 31 AW, 33 AW, 250 AW, 321 AW, 330 AW, 350 AW	Schematic, voltage, socket	4-2		
30 LW, 33 LW, 250 LW, 321 LW, 350 LW	Schematic, voltage, socket layout	4-5		
32, Chassis U5S	Schematic, voltage, parts	6-4		
34C, 101, Chassis C6, D6	Schematic, voltage	6-5		
	Alignment, parts	6-6		
34F7, 101F7, Chassis F7	Schematic	7-1		
	Alignment, voltage, notes, parts list	7-2		
35 (T-6)	Schematic	4-3		
	Socket layout ... Changes	7-3		
	Voltage ... Changes	8-1		
36, Chassis B5	Schematic, voltage	6-7		
38, 42, 49, Chassis U6	Schematic	6-9		
	Alignment, voltage	6-10		
38, 42, 49, Chassis U-6-D	Schematic, voltage	5-3		
	Alignment, parts list	5-4		
39, 59, Chassis DS-5	Schematic	5-5		
	Alignment, voltage	5-6		
40, 875	Schematic, voltage	4-6		
	Parts list	4-20		
	Socket layout ... Changes	7-3		
45, Chassis 6-BD	Schematic	5-7		
	Alignment, voltage	5-8		
49	See model 38			
50L	See model L755			
50M	See model M755			
S50	See model S755			
AW-55	Schematic, socket, voltage	3-4		882
59	See model 39			
65	Schematic, condenser data	1-2	*256-B	888
	Voltage, data	3-8		889
U68 Chassis	See model 101U			
71, 770, Chassis AW-7	Schematic, voltage, socket	5-9		
77	Schematic, layout, voltage	4-4		
101	See model 34C			
101F7	See model 34F7			
101U, Chassis U68	Schematic	7-3		
	Alignment, voltage, notes, parts list	7-4		
102, 104, 112, Chassis A8, Early, Late	Schematic	7-5		
	Alignment, voltage, changes, parts list	7-6		
102LW, 104LW, Chassis B8	Schematic	7-7		
	Alignment, voltage, notes, parts list	7-8		
103, Chassis F5	Schematic, voltage	6-8		
105, 113, Chassis A-11	Schematic	6-11		
	Alignment, voltage, parts	6-12		
106, Chassis U6B, 2 Types, below serial # 636901, above serial #636901	Schematic	6-13		
	Alignment, parts, voltage	6-14		
J106, Chassis J	Schematic, voltage, alignment, data	7-9		
107, 111, Chassis U6A	Schematic, voltage	6-15		
	Alignment, parts, changes	6-16		
107, 111, Chassis U6F	Schematic, voltage, notes	7-10		
107AC, 114, Chassis E5	Schematic, alignment, voltage, changes, parts	7-11		
107LW, 111LW, Chassis U6C	Schematic	7-13		

EMERSON RADIO & PHONOGRAPH CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
107LW, 111LW, Chassis U6C	Alignment, voltage, notes, parts	7-14		
108, 110, Chassis U5A	Schematic, socket, trimmers	6-17		
	Alignment, voltage, parts	6-18		
	Changes ... Changes	7-10		
AD108, AD110, AD125 Chassis AD	Schematic, voltage	8-1		
	Alignment, notes, parts	8-2		
108LW, 110LW, Chassis U5B	Schematic	7-15		
	Alignment, voltage, notes, parts	7-16		
109, Chassis U4A	Schematic	7-15		
	Alignment, voltage, notes, parts	7-16		
110	See model 108			
AD110	See AD 108			
110LW	See model 108LW			
111	See model 107			
111LW	See model 107LW			
112	See model 102			
113	See model 105			
114	See model 107AC			
116, 121, Chassis G5	Schematic, voltage	7-17		
	Alignment, changes, parts	7-18		
K116, K121, K123, Chassis K	Schematic, voltage	7-19		
	Alignment, parts	7-20		
117, Chassis C5	Schematic	7-21		
	Alignment, voltage, changes, notes, parts	7-22		
	Changes ... Changes	8-1		
117LW, L117LW, L122LW, L133LW, L135LW, L141LW, Chassis K5 & LLW	Schematic	7-23		
	Notes, voltage, parts, alignment	7-24		
F117, F122, F133, F135, F141, Chassis F	Schematic	7-25		
	Alignment, voltage, notes, parts, changes	7-26		
	Changes ... Changes	9-1		
L117, L122, L133, L135, L141, L150, Chassis L	Schematic	7-27		
	Alignment, voltage, notes, parts	7-28		
	Changes ... Changes	8-1		
P117, P135, Chassis P	Schematic, connections	8-3		
	Voltage, alignment, notes, parts	8-4		
Z117, Z122, Z133, Z135 Z141, Z150, Z159, Z160 Chassis Z	Schematic, voltage	8-5		
	Alignment, notes, changes, parts	8-6		
118, 120, 126, Chassis U4B	Schematic, voltage, changes, alignment, parts	7-12		
119, Chassis U6A (Rev.)	Schematic, voltage, alignment	7-29		
121	See model 116			
K121	See model K116			
F122	See model F117			
L122	See model L117			
L122LW	See model 117LW			
Z122	See model Z117			
K123	See model K116			
AD125	See model AD108			
126	See model 118			
G127, Chassis G	Schematic, voltage	8-7		
	Alignment, notes, changes, parts	8-8		
E128, Chassis E	Schematic, voltage, alignment	7-30		
A130, A132, A148, Chassis A, Three Types	Schematic	7-31		
	Voltage, alignment, notes, parts	7-32		
AC130, AC149, AC168 Chassis AC	Schematic, voltage, changes	8-9		
	Alignment, notes, parts	8-10		
	Changes ... Changes	9-1		
AJ130, AJ137, AJ149 Chassis AJ	Schematic, voltage	8-11		
	Alignment, notes	8-12		

EMERSON RADIO & PHONOGRAPH CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
AL130, AL132, AL149, AL168, Chassis AL	Schematic, voltage	8-13		
	Alignment, parts, notes	8-14		
ALLW130, ALLW132, ALLW149, ALLW168, Chassis ALLW	Schematic, voltage	8-13		
	Alignment, parts, notes	8-14		
H130, H137, Chassis H	Schematic, voltage, trimmers	7-39		
	Alignment and Data	Changes 9-1		
AA131, Chassis AA Early, Late	Schematic, voltage	8-15		
	Alignment, notes, parts	8-16		
AM131, AM169, AM187 Chassis AM	Schematic, voltage, changes	8-17		
	Alignment, notes, parts	8-18		
AM131, AM169, AM187 Late, AM153 Chassis AM BF191, Chassis BF	Schematic, voltage	9-1		
B131, Chassis B	Changes, alignment, notes, parts	9-2		
	Schematic	7-33		
	Alignment, notes, voltage, parts, changes	7-34		
A132	See model A130			
AL132	See model AL130			
ALLW132	See model ALLW130			
F133	See model F117			
L133	See model L117			
L133LW	See model 117LW			
Z133, Z135	See model Z117			
C134, C136, C138, C139, C140, C142, Chassis C	Schematic, socket	7-36		
	Alignment, voltage, notes, parts	7-35		
	Changes	Changes 8-1		
	Changes	Changes 9-2		
C134LW, C136LW, C138LW, C139LW, C140LW, and C142LW	Alignment and Changes	Changes 9-2		
CLW134, CLW136, CLW138, CLW139, CLW140, CLW142 Chassis CLW	Similar to Chassis C	Changes 8-1		
D134, D136, D138, D139, D140, D142, D146, Chassis D	Schematic	7-37		
	Alignment, voltage, socket, trimmers, notes	7-38		
	Changes	Changes 9-2		
D134LW, D136LW, D138LW, D139LW, D140LW, D142LW D146LW, Chassis DLW	Schematic, trimmers	8-19		
	Alignment, voltage, notes, changes, parts	8-20		
M134, M136, M138, M139, M140, M142, M146, Chassis M	Schematic, trimmers, phono, notes	8-21		
	Alignment, voltage, changes, notes, parts	8-22		
F135	See model F117			
L135	See model L117			
L135LW	See model 117LW			
P135	See model P117			
Z135	See model Z133			
C136	See model C134			
C136LW	See model C134LW			
CLW136	See model CLW134			
D136	See model D134			
D136LW	See model D134LW			
M136	See model M134			
AJ137	See model AJ130			
H137	See model H130			
BG138, BG140, BG142, BG146, BG178, BG182, BG183, Chassis BG	Schematic, voltage	9-3		
	Changes, alignment, parts	9-4		
C138, C139, C140	See model C134			
C138LW	See model C134LW			
CLW138, CLW139, CLW140	See model CLW134			
D138, D139, D140	See model D134			
D138LW, D139LW, D140LW	See model D134LW			
M138, M139, M140	See model M134			
C139LW	See model C134LW			
BG140	See model BG138			
C140LW	See model C134LW			
F141	See model F117			
L141	See model L117			
L141LW	See model 117LW			
Z141	See model Z117			
BG142	See model BG138			
C142	See model C134			
C142LW	See model C134LW			
CLW142	See model CLW134			
D142	See model D134			
D142LW	See model D134LW			
M142	See model M134			
L143, Chassis L, Early, Late	Schematic	8-23		
	Alignment, voltage, parts, notes, changes	8-24		
BG146	See model BG138			
D146	See model D134			
D146LW	See model D134LW			
M146	See model M134			
X146, X178, X183, Chassis X Early	Schematic, voltage	8-25		
	Alignment, notes, parts	8-26		
X146, X178, X183, Chassis X Late	Schematic, voltage, changes	9-25		
	Alignment, parts	9-26		
S147, S151, Chassis S	Schematic, voltage, changes	8-27		
	Alignment, notes, parts	8-28		
A148	See A130			
AC149	See model AC130			
AJ149	See model AJ130			
AL149	See model AL130			
ALLW149	See model ALLW130			
L150	See L117			
Z150	See model Z117			
AG151, Chassis AG	Schematic, trimmers, phono. data	8-29		
	Alignment, notes, parts	8-30		
S151	See model S147			
R152, R153, R156, R158 Chassis R, Early	Schematic, voltage	8-31		
	Alignment, notes, changes, parts	8-32		
R152, R153, R156, R158, R167, R189 (Phonograph) Chassis R Late	Schematics	9-5		
	Changes, alignment, voltage, parts	9-6		
AM153	See AM131 Late			
U154, Chassis U	Schematic, voltage	8-33		
	Alignment, notes, parts	8-34		
	Changes	Changes 9-2		
V155 Early, Chassis V, Below Serial 951850	Schematic, voltage, notes	9-7		
	Alignment, changes, notes, parts	9-8		
V155 Late, Chassis V, Above Serial 951850	Schematic, voltage	9-9		
	Alignment, notes, parts, changes	9-10		
R156, R158	See model R152			
Q157, Chassis Q	Schematic, changes, voltage, alignment, parts	9-24		
Z159, Z160	See model Z117			
AH162, Chassis AH	Schematic, changes, parts	8-35		
	Voltage, alignment, notes	8-36		
	Changes	9-4		
AE163, Chassis AE	Schematic, parts, changes	8-37		
	Voltage, alignment, notes	8-38		
AL164, Chassis AL (Combination)	Schematic, voltage	8-39		
	Alignment, notes	8-40		
AL164, Chassis AL Late	Schematic	9-11		
	Alignment, voltage, changes, notes, parts	9-12		

EMERSON RADIO & PHONOGRAPH CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
AP165, AP166, AP177, Chassis AP	Schematic	9-13		
	Alignment, changes, voltage, parts	9-14		
AR165, AR166, AR177, Chassis AR Below and above Serial 1326200	Schematics, changes, parts	9-15		
Chassis AR, 2nd Type, Between Serials 1326200 and 1412601	Schematic, voltage, changes, parts	9-18		
Chassis AR, Between Serials 1412601 and 1413601. Above Serial 1416650, 3rd Type	Schematic, voltage	9-16		
Chassis AR, 3rd Type	Parts, changes, alignment	9-17		
AH166, AH171, AH173, AH174, AH176, AH179, AH180, AH185, Chassis AH, Below and above Serial 1711701	Schematics, voltage	9-3		
	Changes, alignment, parts	9-4		
R167	See model R152 Late			
AC168	See model AC130			
AL168	See model AL130			
ALLW168	See model ALLW130			
AM169	See model AM131			
AT170, AT172, AT181 Chassis AT, 1st Type	Schematic, changes, voltage	8-41		
	Automatic dial details	8-42		
	Automatic dial notes	8-43		
	Alignment, notes, parts	8-44		
AT170, AT172, AT181, Chassis AT, 2nd Type, Above Serial 1386551	Schematic, voltage, changes, parts	9-18		
	Alignment	9-17		
AF171, AF173, AF176, AF179, AF180, AF185, Chassis AF	Schematic, voltage	8-45		
	Alignment, notes	8-46		
	Changes	Changes 9-2		
	Data	Changes 10-1		
AH171	See model AH166			
AP171, AP173, AP174, AP176, AP180, AP185, Chassis AP	Schematic, voltage	8-47		
	Alignment, notes, parts	8-48		
AR171, AR173, AR174, AR176, AR180, AR185, Chassis AR, 1st Type	See model AT170			
	Data	Changes 9-2		
Chassis AR, 2nd Type	See model AR165			
AW171, AW173, AW174, AW176, AW180, AW185, Chassis AW	Schematic	9-19		
	Alignment, voltage, parts, notes	9-20		
AT172	See model AT170			
AF173, AF176, AF179, AF180	See model AF171			
AH173	See model AH166			
AP173, AP174, AP176, AP180	See model AP171			
AR173, AR174, AR176, AR180	See model AR171			
AW173, AW174	See model AW171			
AH174	See model AH166			
X175, Chassis X, Late, with phonograph	Schematic, voltage, notes	9-21		
	Changes, parts	9-22		
	Alignment	9-23		
AH176	See model AH166			
AW176	See model AW171			
AP177	See model AP165			
AR177	See model AR165			
AB178, AB182, AB183, Chassis AB	See model X-146 Late			
BG178	See model BG138			
X178	See model X146			
AS179, Chassis AS	Schematic	8-49		
	Alignment, voltage, notes	8-50		
	Changes	Changes 9-1		

EMERSON RADIO & PHONOGRAPH CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
AH179, AH180	See model AH166			
AW180	See model AW171			
AT181	See model AT170			
AB182, AB183	See model AB178			
BG182, BG183	See model BG138			
X183	See model X146			
AB184, Chassis AB with phonograph	See model X175			
AF185	See model AF171			
AH185	See model AH166			
AP185	See model AP171			
AR185	See model AR171			
AW185	See model AW171			
AM187	See model AM131			
R189	See model R152 Late			
AU190, Chassis AU	Schematic	9-27		
	Alignment, voltage, notes, parts	9-28		
BF191	See model AM131 late			
AV193, Chassis AV	Schematic, voltage, tuner	9-29		
	Alignment, notes, parts	9-30		
	Tuner data	9-32		
AY194, AY195, Chassis AY	Schematic	9-33		
	Tuner data	9-32		
	Alignment, voltage, changes, parts	9-34		
AZ196, Chassis AZ	Schematic, voltage	9-35		
	Alignment, changes, notes, parts	9-36		
	Tuner data	9-32		
BD197, Chassis BD	Schematic	9-33		
	Tuner data	9-32		
	Alignment, voltage, changes, notes	9-34		
BE198, Chassis BE	Schematic	9-37		
	Alignment, voltage, changes, parts	9-38		
	Tuner data	9-39		
BA199, BA201, Chassis BA	Schematic, voltage, alignment, parts	9-31		
BJ200, BJ210, BJ214, Chassis BJ	Schematic, voltage, notes	9-41		
	Alignment, parts	9-42		
BL200, BL210, BL214, Chassis BL	Schematic, voltage, notes	9-43		
	Alignment, parts	9-44		
BA201	See model BA199			
AC202, Chassis AC with phonograph	Schematic, voltage, coils	9-45		
	Alignment, changes, notes, parts	9-46		
AL202	See model AL164			
BM206, BM215, BM-247, BM-258 Chassis BM	Schematic, voltage, parts, alignment	9-47		
BN206, BN215, Chassis BN	Schematic, voltage, alignment, parts	9-47		
CD206, CD215, Chassis CD	Schematic, voltage, alignment, parts	10-1		
BB208, BB209, Chassis BB	Schematic, alignment, tuner, voltage, parts	9-40		
BX208, BX209, Chassis BX	Schematic, voltage, alignment	10-2		
CA 208, CA209, CA234, Chassis CA	Schematic, voltage, alignment, notes	10-3		
	Tuner data, parts	10-4		
BJ210	See model BJ200			
BL210	See model BL200			
AX211, AX212, AX217, AX219, AX235, AX237, AX238, AX239, Chassis AX	Schematics, voltage	9-51		
	Alignment, notes, parts	9-52		
AXLW211, AXLW212, AXLW217, AXLW235, AXLW237, AXLW238, AXLW257, Chassis AXLW	Schematic, voltage, alignment, notes	10-5		
CJ211, CJ217, CJ235, CJ257, Chassis CJ	Schematic, voltage, alignment	10-6		
BJ 214	See model BJ200			
BL214	See model BL200			
BM215	See model BM206			

FADA RADIO & ELECTRIC CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
O Electric unit	Schematic, chassis wiring	1-7	*71	905
S, 26-36	Schematic	5-1		
KA Chassis	See model 41			
KB Chassis	See model 81			
KE Chassis	See model 122			
KF Chassis	See model 43			
KG Chassis	See model 761			
KO Chassis	See model 51			
KOO Chassis	See models 53 & 171			
KU Chassis	See model 45			
KW Chassis	See model 48			
KX Chassis	See model 61			
KY Chassis	See model 66			
NA Chassis	See model 141			
NE Chassis	See model 151			
NF	Schematic, socket	5-2		
NK Chassis	See model 126			
RA Chassis	See model 74			
RO Chassis	See model 78			
RE Chassis	See model 73			
RG Chassis	See model 55			
RK Chassis	See model 101			
RL Chassis	See model 103			
RN Chassis	Voltage, data	4-9		
	Schematics	3-17 & 4-8		962
	Socket layout	Changes 7-3		
RP Chassis	See model 102			
RS Chassis	See model 112			
RU Chassis	See model 131			
RV Chassis	See model 104-B			
	Socket layout	Changes 7-3		
RW Chassis	See model 133			
RX	Schematic, socket	4-1		
	Alignment data	4-2 & 4-3		
	Socket layout	Changes 7-3		
RY	See model 108			
Fadalette	See model 103			
Motoset	See model 101 & 166			
Neutrodyne Reflex	See model 160			
Receiver Specifications	Data	3-9		964
Resistors, Condensers	Specifications	4-4		963
5F50	Schematic	10-1		
5F60	Schematic, coils, parts	9-14		
	Alignment, socket, trimmers, voltage	10-2		
6A51	Schematic	10-3		
6A54, 54, 554	Schematic, voltage, alignment, trimmers, socket	10-12		
6A60	Schematic	10-9		
6A61	Schematic	10-3		
6A65	Schematic, voltage, alignment, socket, trimmers	10-4		
6A70	Schematic	10-1		
6A80	Schematic, socket, voltage, trimmer	10-5		
	Alignment	10-6		
10, 11, 30, 31, 10Z, 11Z, 30Z, 31Z	Schematic, socket, parts list	1-10	*74	908
	Service notes	2-1		909
16, 17, 32, 16Z, 32Z	Schematic, socket, voltage	1-11	*75	910
16, 17, 32, 16Z, 32Z	Service notes	2-2		911
18 DC	Schematic, socket	1-12	*76	912
20, 20Z	Schematic, socket, voltage	1-13	*77	913
20, 20A, 20B, 20T (Late)	Schematic, coils, parts	9-1		
	Alignment, voltage, socket, trimmers	10-7		
22 Battery	Schematic, socket	1-14	*78	914
25, 25Z	Schematic, socket, voltage, data	1-15	*79	915
	Additional data	Changes 7-6		
25, 25Z (M-250 and M-250Z units)	Schematic, socket, voltage	1-16	*80	916
25	Sensitivity adjustments	2-8		919
26-36	See model S			
30, 31	See model 10			
30 Late	Schematic	10-8		
31 Late	Schematic	10-8		
32, 32-Z	See model 16			
32 Late	Schematic	10-9		
35, 35Z	Schematic, socket, voltage, data	1-18	*81	918

FADA RADIO & ELECTRIC CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
35-B	Schematic, voltage, data	1-17	*82	917
	Sensitivity adj.	2-3		919
40	Schematic, socket, voltage, data	1-19	*83	920
	Service notes	2-4		921
41, 42, 44, 46, 47 (KA)	Schematic, socket	1-20	*84	922
	Voltage, data	2-5		923
43, 52 (KF); 761, 762, 764, 766 (KG)	Schematic, data	1-21	*84-A	925
	Voltage	3-2		926
	Compensating data	3-1		927
45, 45Z (KU)	Schematic, socket, data	1-22	*88-A	928
	Voltage, test data	3-3		929
45, 48, 49	Service notes	1-24	*88-D	930
SF 45-75	See model 475-A			
46, 47	See model 41			
S46	Schematic, voltage, alignment, trimmers, socket, coils	10-10		
48, 49 (KW)	Schematic, socket, data	1-23	*88-B	931
48, 49, 65 (KW)	Voltage, test data	3-4		932
B49, C49, T49	Schematic	10-11		
P49	Schematic	10-11		
50, 70, 71, 50Z, 70Z	Schematic, socket, voltage	1-25	*85	933
SF 50-80B	See model 480-B			
E-180, E-180Z units for 50, 70, 71, 72	Schematic, chassis wiring, data	1-26	*87	934
E-420, E-420Z units for 50, 70, 71, 72	Schematic, chassis wiring, data	1-27	*86	935
SF 50-80	See model R-80A			
51 (KO), 53, 57 (KOO)	Schematic, socket, data	1-30	*88-C	936
	Voltage, resistance values	3-5		937
54	See model 6A54			
F55	Schematic	10-13		
55 (RG)	Schematic	3-6		938
	Voltage, test data	3-7		939
59	Schematic	10-13		
60	Schematic	10-9		
	Adjustments	3-8		940
R-60 Unit	See model 460A			
61, 66 (KX)	Schematic	2-6	88-G	941
62-R, 66-Q, ABC SPU	Schematic	1-8	*72	906
65	See model 48			
66 (KY) Early	Schematic	3-10		942
66 (KY) Late	Schematic	3-11		943
66 (KY)	Service notes	3-12		944
	Trimmer notes, part 1	3-13		945
	Trimmer notes, part 2	3-14		946
	Trimmer notes, part 3	3-15		947
	Voltage, socket, DC resistance values, data	3-16		948
70, 70Z, 71	See model 50			
73, 85 (RE)	Schematic, data	3-18		950
	Test data, DC resistance values	3-19		951
74, 76, 83, 88, 89 (RA)	Alignment data	3-20		952
	Voltage, DC resistance values, socket	3-21		953
	Schematic, data	3-22		954
75, 77	Schematic, socket, voltage, data	1-29	*88	949
78, 79 (RC)	Schematic, data	3-23		955
	Voltage, socket	3-24		956
78-10, 79-10	See model 133			
R-80-A Unit, 480-A, SF 50-80 A	Schematic, socket	1-3	*67	901
81, 82, 84, 86 DC (KB)	Schematic, socket	2-7	88-E	957
82W, 86W ABC SPU	Schematic	1-9	*73	907
83, 88, 89	See model 74			
85 (RE)	See model 73 (RE)			
97-10	See model 133			
101 (RK) Motoset	Schematic	3-26		958
102 (RP)	Schematic, socket	4-5		
	Alignment notes	4-6		
102 (RP)	Socket layout	Changes 7-3		
103 (RL) Fadalette	Schematic	3-25		959
	Socket layout	Changes 7-3		
104-B (RV) Auto	Schematic	4-7		
	Socket layout	Changes 7-3		
105, 106, 107 (RN)	Schematic	4-8		

FADA RADIO & ELECTRIC CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
105, 106, 107 (RN)	Voltage, point-to-point data	4-9		
	Socket layout ....Changes	7-3		
108, 109, 125 (RY)	Schematic	4-10		
	Socket layout ....Changes	7-3		
112 (RS)	Schematic	4-11		
	Socket layout ....Changes	7-3		
122 (KE)	Schematic, socket	2-8	88-F	960
126, 127, 128, Chassis NK	Schematic	7-8		
131, 132 (RU)	Schematic	4-12		
	Alignment notes	4-13		
133, 134, 135, 78-10, 79-10, 97-10 (RW)	Schematic	4-14		
	Alignment, trimmers, socket	5-3		
141 (NA)	Schematic	4-15		
141, 141-Z (NA)	Alignment, trimmers, voltage, socket	5-4		
150, 2 types	Schematic	6-1		
	Alignment, trimmers, socket, voltage	6-2		
151, 152 (NE)	Schematic	4-16		
	Socket layout ....Changes	7-3		
155	Schematic, socket, trimmers	6-3		
	Alignment, voltage	6-4		
156	Schematic	6-5		
157	Schematic	6-6		
160 Series	Schematic	6-7		
	Socket, trimmers, alignment, voltage	6-8		
160 Neutrodyne Reflex	Schematic	1-28	*63	898
166, Motoset	Schematic	6-9		
	Alignment, socket, trimmers, data	6-10		
167	Schematic, parts list	7-1		
168	Schematic, changes, parts	7-2		
170	Schematic	6-11		
	Socket, trimmers, alignment, voltage	6-12		
171, 173 (KOC) 110-volt DC	Schematic	2-9	88-H	961
E180, E180Z Units	See model 50			
190	Schematic	6-13		
	Socket, trimmers, alignment	6-14		
	Alignment, part 2, voltage	6-15		
192	Schematic	6-17		
	Socket, trimmers, alignment, voltage	6-18		
192-A (192S, 192BS units)	Schematic, chassis wiring, data	1-28	*64	898
211	Schematic, voltage, parts	7-3		
211, Late	Alignment, changes, socket, trimmers	8-1		
211, 220 volts	Schematic, parts	8-2		
211B, 220 volts	Schematic, parts	8-3		
212	Schematic, voltage, parts	8-4		
	Alignment, socket, trimmers	8-8		
216, Early, Late	Schematic, parts	8-5		
	Alignment, socket, trimmers	8-8		
216, 3rd Production	Schematic, parts	8-6		
	Alignment, socket, trimmers	8-8		
216, 220 volts, Early, Late	Schematic, parts	8-7		
	Alignment, socket, trimmers	8-8		
242	Schematic, parts	8-9		
	Alignment, socket, trimmers	8-11		
246	Schematic, parts	8-10		
	Alignment, socket, trimmers	8-11		
M-250, M-250Z Units	See model 25			
250, 2 types, Early, up to Serial 50698, Late, from Serial 50699	Schematic, parts list	7-4		
	Socket, trimmers, voltage, alignment	9-2		
254	Schematic, voltage, socket, trimmers, alignment	8-12		
255	Schematic, parts	8-13		
260	Schematic, parts	7-5		
	Alignment, voltage, socket, trimmers	7-6		
261	Schematic, parts	8-14		
262	Schematic, parts list	7-7		

FADA RADIO & ELECTRIC CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
262	Socket, trimmers, voltage, alignment	9-2		
262UA, 265UA, 262CA, 265CA	Schematic, socket, data	1-5	*69	903
265	Schematic, parts, socket, trimmers, alignment, voltage	8-15		
266	Schematic, parts	8-16		
267 Motoset	Schematic, voltage	8-17		
	Socket, trimmers, alignment, parts	8-18		
270	Schematic, parts list	7-9		
	Alignment, voltage, socket, trimmers	7-10		
271	Schematic, parts list	7-11		
272	Schematic, parts list	7-12		
	Socket, trimmers, voltage, alignment	9-3		
273	Schematic, parts list	7-13		
	Socket, trimmers, voltage, alignment	9-3		
280	Schematic, parts list	7-14		
	Socket, trimmers, voltage, alignment	9-3		
281	Schematic, parts list	7-15		
	Socket, trimmers, voltage, alignment	9-3		
290	Schematic, voltage, parts list	7-16		
291	Schematic, parts list	7-17		
311	Schematic, parts list	7-18		
311 (220 volts), 311B (220 volts)	Schematic, parts	8-19		
312	Schematic, parts	8-20		
316, Early, Late	Schematic, parts	8-21		
316 (220 volts) Early, Late	Schematic, parts	8-22		
350	Schematic, changes, parts	8-23		
351	Schematic, parts	8-24		
352	Schematic, coils, parts	9-4		
354	Schematic, parts	8-25		
360	Schematic, coils, parts	9-5		
365	Schematic, coils, parts	9-6		
	Alignment, voltage, socket, trimmers	10-15		
366, 366PT	Schematic, coils	10-14		
	Alignment, voltage, socket, trimmers	10-15		
	Flash-O-Matic data	10-6		
370	Schematic, coils, parts	9-7		
380	Schematic, coils, parts	9-8		
390	Schematic, coils, parts	9-9		
410	Schematic, socket, trimmers, coils, parts	9-10		
	Alignment, voltage	9-11		
	Alignment table	9-13		
413	Schematic, socket, trimmers, coils, parts	9-12		
	Alignment, voltage	9-11		
	Alignment table	9-13		
E420, E420Z Units	See model 50			
450	Schematic, coils, parts	9-14		
	Alignment, voltage, socket, trimmers	10-7		
451	Schematic, coils, parts	9-15		
	Alignment, voltage, socket, trimmers	10-7		
454, 454T	Schematic, coils, parts	9-16		
	Alignment, voltage, socket, trimmers	10-7		
460	Schematic, coils, parts	9-17		
	Alignment, socket, trimmers, voltage	10-2		
460-A, R-60 Unit	Schematic, socket	1-1	*65	899
461	Schematic, coils, parts	9-18		
	Alignment, socket, trimmers, voltage	10-2		
465	Schematic, voltage, alignment, trimmers, socket	10-16		
470	Schematic, voltage, alignment, trimmers, socket	10-17		
472UA, 475UA, 472CA, 475CA	Schematic, socket, parts list	1-6	*70	904

FAIRBANKS MORSE & CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
90	Circuit and AVC data, tuning indicator and transformer notes	7-18		
	Notes	7-17		
	Alignment, oscillograph notes	7-16		
91C4, 91C5, 91T4, Chassis 91	Schematic, voltage, resistance	8-33		
	Socket, trimmers, alignment, data	8-34		
100	Schematic	6-8		
	Voltage, socket, trimmers, chassis, resistance	7-20		
	Circuit, AVC, tuning indicator notes	7-21		
	Alignment, trap, transformer data	7-22		
110 (Temporary)	Schematic	6-9		
110 (Revised)	Schematic	7-23		
	Voltage, socket, trimmers, resistance	7-24		
	Alignment, trap, transformer data	7-22		
	Circuit, AVC, tuning indicator notes	7-21		
Chassis 120	See model 12C6			
346, B-6	Schematic, voltage, socket	5-12		
347	Schematic, voltage, socket	5-12		
816, 840, 32-Volt	Schematic	5-13		
	Voltage, parts, alignment	5-14		
5106, 5107, 5108, 5109, 5111, 5112, 5141, 5143 (51)	Schematic	5-1		
	Alignment, color code, notes	5-3		
	Voltage	5-4		
	Parts list	5-5		
5212, 5212-A, 5241 (52)	Schematic	5-1		
	Alignment, color code, notes	5-3		
	Voltage	5-4		
	Parts list	5-5		
5312, 5312-A, 5341 (53)	Schematic, coil data	5-2		
	Alignment, color code, notes	5-3		
	Voltage	5-4		
	Parts list	5-5		
6010, 6044, Chassis 60	Schematic, trimmers, socket	6-11		
	Resistance test, voltage, data	6-10		
	Alignment, coil data	6-12		
6210, 6244, Chassis 62	Schematic, parts	6-13		
	Voltage, alignment	6-14		
7014, 7040, 7052 (70)	Schematic, coil data	5-7		
	Alignment, parts	5-8		
	Socket, trimmers, parts view	5-9		
	Voltage data	5-10		
	Voltage data, part 2	5-11		
8110, 8141, Chassis 81	Schematic, parts, trimmers	6-15		
	Alignment, data	6-16		

FANSTEEL

See BALKITE PRODUCTS CO.

FARRAND MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
B Eliminator	Schematic	Misc. 1-5	*740	2750
	Schematic	Misc. 6-8		
7-Tube AC	Schematic	Misc. 6-8		

FEDERAL RADIO CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
A-10, 59, 102	Schematic, socket	1-1	*257	965
A-10	Chassis wiring	1-2	*258	966
B	Schematic	1-3	*259	967
	Chassis wiring	1-4	*260	968
C	Schematic, socket	1-5	*261	969
	Chassis wiring	1-6	*262	970
D, Code 68-070	Schematic, socket	1-7	*263	971
D Battery	Chassis wiring	1-8	*264	972
D, Code 79-070	Schematic, socket, data	1-9	*265	975
D (60 cycles)	Chassis wiring	1-10	*266	974
E, Code 68-060	Schematic, socket	1-11	*267	977
E, DC	Schematic, socket	1-12	*269	978

FEDERAL RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
F, Code 79-080	Chassis wiring	1-13	*275	979
	Schematic, socket	1-14	*274	980
F-10 DC, F-11 DC	Schematic, socket, data	1-15	*278	981
F (25 cycles)	Schematic, socket	1-16	*276	982
G (25 cycles)	Schematic, socket, data	1-17	*279	983
H, Code 71-030	Schematic, socket, voltage	1-18	*280	984
H Receiver	Chassis wiring	1-19	*282	985
H Power Unit	Chassis wiring	1-20	*283	986
K	Schematic, socket	1-21	*284	987
	Voltage data	Changes 7-10		
M	Schematic, socket, voltage	1-22	*286	988

FEDERATED PURCHASER

Also see ACRATEST

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Cathedral Tone	Schematic	3-2		992
Acratone 2	Schematic	2-1	286-A	989
Acratone 5	Schematic	2-2	286-B	990
6-A, 12-A	Schematic	5-2		
7-A, 13-A, 24-A	Schematic, voltage	5-1		
8-A	Schematic, voltage	5-1		
8B, 9B, 11B	Schematic, voltage	7-1		
Royal 9-A	Schematic	6-3		
14-A	Schematic, voltage	5-2		
Acratone 17	Schematic	Misc. 4-3		
24-A	See model 7-A			
29C, 30C, 31C	Schematic, voltage, socket, trimmers	7-3		
	Alignment, parts	7-4		
31-40	Schematic, color code, parts list	3-1		991
32-A, 36-A	Schematic	5-3		
	Alignment, voltage	5-4		
32C, 33C	Schematic, voltage, socket, trimmers	7-5		
	Alignment, parts list	7-6		
35, 40	Data	3-2		992
38-A	Schematic, voltage, alignment	5-5		
39-A, 43-A, 44-A, 86, 87	Schematic, voltage, trimmers, socket	5-6		
	Alignment data	5-7		
40	Schematic	6-4		
49	Schematic	8-1		
52-A	Schematic	5-8		
53, 54, 58, 59	Schematic	5-8		
65, 66	Schematic	6-1		
79, 80	Schematic, voltage, socket	6-2		
	Schematic, voltage, socket	5-9		
	Alignment	5-10		
86, 87	See model 39-A			
88	Schematic	6-3		
92	Schematic, voltage, socket	5-11		
93, 94, 96, 97	Schematic, voltage, socket, trimmers	5-12		
100	Schematic	6-1		
117	Schematic, parts	6-5, 6-6		
	Voltage, alignment	6-7		
121	Schematic, socket	6-8		
215	Schematic, socket	6-8		
228, 229	Schematic	6-4		
248	Schematic, socket, trimmers, alignment	7-2		
1940	Schematic	8-2		

FENWAY

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Superheterodyne, Early, late	Schematic	Misc. 1-5	*788	2750

FERRANTI, INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
250, B-3	Schematic	Misc. 1-6	*699	2751
250-C	Schematic	Misc. 1-6	*699	2751

FIRESTONE TIRE & RUBBER CO.

AIRCHIEF

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
R-1322, Chassis R-132	See Stewart-Warner			
R-1332, Chassis R-133	See Stewart-Warner			
R-1431	See Stewart-Warner			

FIRESTONE TIRE & RUBBER CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
R-1651AS, R-1651WS, Air Chief, Chassis R-165	Schematic, voltage, parts	7-1		
	Circuit data, alignment, trimmers	7-2		
R-1661, Air Chief, Chassis R-166	Schematic, voltage, parts list	7-3		
	Alignment, socket, trimmers, parts	7-4		
R-3051, Chassis R-305	Schematic, socket, voltage, parts	9-1		
	Trimmers, alignment, dial data	9-2		
3061, 3062, 3063, 3064, 3065, 3066, 3067, 3068, 3069 Chassis R-306	Schematic, socket, voltage, parts	9-3		
	Trimmers, alignment, dial data	9-4		
3071, 3072, 3073, 3074, 3075, 3076, 3077, 3078, 3079 Chassis R-307	Schematic, socket, voltage, parts	9-5		
	Trimmers, alignment, parts, dial data	9-6		
Chassis R-307-X	Phonograph schematic	9-5		
3085, Chassis R-308	Schematic, socket, voltage, parts	9-7, 8		
	AFC test, trimmers, tuner, parts	9-9		
	Alignment	9-10		
7405-1	Schematic, socket, notes, parts	8-1		
7406-1	Schematic	8-2		
7407-1	Schematic	8-2		
7407-3, Chassis 536	Schematic, voltage, socket, trimmers, chassis, alignment	10-1		
S7407-5	Schematic, voltage, socket, trimmers, alignment, tuner	10-2		
7422-3	Schematic, socket, notes, parts	8-3		
S7424-3	Schematic, socket, trimmers, alignment	10-3		
S7425-4, S7425-5, S7426-5	Schematic, socket, trimmers, alignment	10-4		
S7426-6	Schematic, socket, trimmers, alignment, voltage	10-5		
S7426-7, Roamer (Jan. 1939)	Schematic, socket, trimmers, alignment	10-6		
S7426-7 (Mar. 1939)	Schematic, socket, trimmers, alignment, voltage	10-7		
S7426-9	Schematic, socket, trimmers, alignment, voltage	10-8		
S7427-5	Schematic, socket, trimmers, alignment, voltage	10-9		
S7427-6	Schematic, socket, trimmers, alignment, voltage	10-5		
S7428-1	Schematic, socket, trimmers, alignment	10-10		
S7428-2	Schematic, socket, trimmers, alignment, voltage	10-7		

FIRST NATIONAL RADIO CORP.

See BALKEIT RADIO CO.

FORD MOTOR CAR CO.

See also PHILCO RADIO & TELEVISION CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
N, Center Control	Schematic, parts	6-2		
	Installation data	6-3		
N, Center Control	Socket, alignment, service notes	6-4		
Ford-Lincoln Auto Set Built by Zenith	Schematic	5-4		
Glove Box (Police Radio) Built by Grigsby Grunow	Schematic	5-1		
Police auto radio, built by Grigsby Grunow	Schematic	6-1		
40-18805, Glove Box Built by Grigsby Grunow	Schematic	5-3		
111	See Majestic 114			
B-18805, Built by Grigsby Grunow	Schematic	5-2		

FORDSON RADIO MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
FP (330001 up)	Schematic, alignment voltage	5-1		
FP Battery (173501 up)	Schematic, alignment voltage	5-1		
FP 32-volt (350001 up)	Schematic, alignment voltage	5-2		
FR (189001 up)	Schematic, alignment voltage	5-2		
FU	Schematic, alignment voltage	5-3		
FV	Schematic, alignment voltage	5-4		
FW	Schematic, alignment voltage	5-5		
Goldentone 6T	Schematic	Misc. 3-5		2752

FRANKLIN RADIO CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
H-33	Schematic	4-2		996B
6-tube Super	Schematic	3-3		995
1	Schematic	4-2		996B
D-32	Schematic	4-1		996A
H-32	Schematic	4-1		996A
English reading Tube Checker	Schematic	4-2		996B
33-A Checker-Analyzer	Schematic	4-3		
33-B Analyzer	Schematic	4-4		
43 AB or C-L	Schematic	4-6		
53	Schematic	4-5		
54-L	Schematic	4-6		
	Socket layout	Changes 7-3		
63-L	Schematic	4-7		
64	Schematic	4-8		
	Socket layout	Changes 7-3		
94	Schematic	4-9		
	Notes	4-10		
	Notes, part 2	4-11		
	Notes, part 3	4-12		
	Voltage, notes	4-13		
100	Schematic, socket	3-1		993
	Service notes	3-2		994
	I-F. Peak	Changes 7-3		
102	Schematic, socket	3-1		993
	I-F. Peak	Changes 7-3		
104	Schematic, socket	3-4		996
105	Schematic	4-14		
	Socket layout	Changes 7-3		
106	Schematic	4-14		
	Socket layout	Changes 7-3		
200	Schematic, installation notes	4-15		
	Installation notes, part 2	4-16		
	Socket layout	Changes 7-3		

FREED MFG. CO., INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
FE 24A	Schematic	9-1		
27-D	Schematic	9-2		
30-D	Schematic	9-2		
FE-30L	Schematic	7-1		
FE-33	Schematic	8-1		
FE-48	Schematic	8-1		
FE-50	Schematic, socket	8-2		
FE-51L, P351L	Schematic, socket	8-2		
FE-52, FE-56, FE-58	Schematic	7-2		
FE-60	Schematic, socket	8-3		
FE-62	Schematic, socket	8-3		
FE-69X	Schematic	8-4		
96	Schematic	9-1		
FE97	Schematic	9-1		
351	Schematic, socket	6-1		
351-L	Schematic, socket	6-1		
351-P	Schematic, socket	6-2		
P351L	See model FE-51L			
357-L	Schematic, socket	6-3		
357-P	Schematic, socket	6-2		
358-L	Schematic, socket	6-3		
369-S	Schematic, socket	6-4		

FREED TELEVISION & RADIO CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Intermediate Frequencies	I-F. Peaks	Changes 7-4		
ABC Power Pack	Schematic	1-5	*306	1001
MB-5	Schematic, socket	3-3		1021
NR-5	Schematic	1-1	*302	997
NR-6	Schematic	1-1	*302	997
NR-7	Schematic, socket	1-2	*303	998
A-7	Schematic	4-1		
MB-7	See model 72			

FREED TELEVISION & RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
NR-8, NR-8A	Schematic, socket	1-2	*303	998
A-9	Schematic	4-1		
MB-9, 90	Schematic	3-5		1023
NR-9, NR-9A	Schematic, socket	1-3	*304	999
NR-10	Schematic, socket	1-3	*304	999
NR-11	Schematic, socket	1-4	*305	1000
NR-11 Power Pack	Schematic	1-5	*306	1001
NR-12	Schematic	1-4	*305	1000
FE-15	Schematic	1-6	*307	1002
FE-18	Schematic	1-6	*307	1002
NR-20	Schematic	1-6	*307	1002
FE-30	Schematic	1-7	*308	1003
40N, 48N	Schematic	1-7	*308	1003
50	Schematic	1-8	*309	1004
51 DC	Schematic, socket	3-1		1020
NR-53	Schematic	1-22	*323	1018
54, 56, 59	Schematic, socket	3-3		1021
NR-55 DC	Schematic, socket	1-9	*310	1005
NR-55, NR-56 AC	Schematic, socket, voltage	1-10	*311	1006
NR-57	Schematic, socket	1-11	*312	1007
	Power Unit	1-11	*312	1007
58 AC	Schematic, socket	3-1		1020
59	See model 54			
NR-60 DC	Schematic	1-12	*313	1008
NR-60 AC	Schematic, socket	1-13	*314	1009
FE-63 DC	Schematic	3-8		1026
NR-66, 66-A	Schematic, socket	1-14	*315	1010
NR-70 AC	Schematic, socket	1-15	*316	1011
72, 74, MB-7	Schematic, socket	3-4		1022
NR-77	Schematic, socket	1-16	*317	1012
NR-78 DC, NR-79 DC	Schematic, socket, voltage	1-17	*318	1013
NR-78 AC, NR-79 AC	Schematic, socket, voltage	1-18	*319	1014
NR-80 DC	Schematic, socket, voltage	1-19	*320	1015
NR-80 AC	Schematic, socket, voltage	1-20	*321	1016
NR-85 AC	Schematic, socket, voltage	1-21	*322	1017
90	See model MB-9			
NR-90-S	Schematic	1-22	*323	1018
91 DC	Schematic, socket	3-6		1024
92 AC	Schematic, socket	3-7		1025
NR-95 AC	Schematic, socket, voltage	1-23	*324	1019
FE-96 DC	Schematic, socket	3-9		1027
FE-98	Schematic, socket	3-10		1028
FE-99 DC	Schematic	3-8		1026
346-4	Schematic, socket, parts list	4-2		
354	Schematic, socket	4-3		
355	Schematic, socket	4-4		
360, 360X	Schematic, socket	4-5		
365, 365X	Schematic, socket	4-6		
NR-457	Power Unit—See NR-57			
NR-460 AC Power Unit	Schematic	1-13	*314	1009
NR-470 AC	Schematic	1-15	*316	1011
800	Schematic	1-16	*317	1012

JESSE FRENCH EXPORT CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
5X, 6X, 7X	Schematic	5-1		
	Socket, voltage, parts list	5-2		

JESSE FRENCH & SONS PIANO CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
8-tube AC	Schematic, socket, voltage, data	1-1	*405	1029
G Junior	Schematic	2-1	406-A	1031
	Voltage, service notes	2-2	406-B	1032
H-1	Schematic	2-4	406-C	1035
	Service notes, voltage	2-6	406-F	1036
U-1	Schematic	2-5	406-E	1037
	Service notes, voltage	2-6	406-D	1036
H-2 Pentode AC	Schematic	2-3	406-F	1033
H-2 Pentode, 110-volt DC	Schematic	2-3	406-F	1033
H-2 Junior	Schematic	3-1		1034
S-2	Schematic	3-2		1038
5-093	Schematic, socket, voltage	1-2	*406	1030

CHARLES FRESHMAN CO., INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
ABC Power Unit	Schematic	1-4	*290	1042
G	Schematic, socket, voltage	1-2	*288	1040
G with G-60-S Power Unit, (2 types)	Schematic, socket, voltage	1-3	*289	1041
H	Schematic, socket, voltage	1-4	*290	1042
K	Schematic, socket, voltage	1-5	*291	1043

CHARLES FRESHMAN CO., INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
L	Schematic, socket	1-7	*294	1045
M	Schematic, socket, voltage	1-6	*293	1044
N	Schematic, socket, voltage	1-7	*294	1045
Equaphase	Schematic	1-1	*287	1039
Masterpiece	Schematic	1-1	*287	1039
2N with 2N-60-S Power Unit	Schematic	1-8	*292	1046
3-Q-15, 3-Q-16	Schematic, socket, voltage	1-10	*296	1048
Q-15, Q-16	Schematic, socket	1-9	*295	1047
QD-16-S	Schematic, socket, voltage	1-11	*297	1049

FROST-MINTON

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
4-PW	Schematic, voltage, socket	4-1		
	Electrical values, transformer notes	4-2		
FM-4	Schematic	4-3		
FM-5	Schematic	4-3		

FULTON RADIO CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Pre	Schematic	6-1		
Z	Schematic	6-1		
13B	Schematic	6-2		
15B	Schematic	6-1		
35B	Schematic	6-2		

GALVIN MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Acoustinator	Notes	8-14		
Golden Voice (1936)	Schematic	7-1		
	Alignment, sensitivity, magic eliminode notes, service data	7-5		
	Changes, chassis	7-6		
	Coil & Transformer connections	7-7		
	Parts list	7-9		
	Additional data ....Changes	7-10		
Golden Voice, 1937 Early	Schematic, alignment, sensitivity, voltage, chassis	8-1		
Golden Voice, 1937 Late	Schematic, voltage, sensitivity, alignment	8-2		
	Coil data	9-12		
Golden Voice (1938)	See Model 8-80			
Magic Eliminode	Notes	8-14		
Motorola	Test data, alignment data	4-16		
	Installation notes	3-16		1068
	Antenna data	4-1		
	General installation data	7-8		
Motorola Airplane Type Control	Notes	4-2		
Motorola Auto Set	Schematic ....Misc.	1-7	*452-C	1051
	Special notes for Buick and Ford "A" ....Misc.	1-8	*452-D	1052
"Pep Boys"	See Model 34			
5-tube, Split Case	Schematic	3-1		1053
Dual "6"	Alignment, notes	5-1		
	Control adjustment	5-2		
	Resistance test data	5-4		
	Schematic	5-6		
	Power pack test data	5-7		
	Parts list	7-10		
Super "6"	See model 66			
Super "8"	See Model 88			
Twin "8"	Alignment, notes	5-1		
	Control adjustment	5-2		
	Resistance test, data	5-3		
	Schematic	5-5		
	Power pack test data	5-7		
	Parts list	7-10		
E5T	See Model 9-49			
	See Model 9-69			
5-T, Chassis 5-1	Schematic, voltage, parts	8-3		
	Socket, trimmers, alignment, sensitivity	8-4		
5T-1, 5T-2, 5Y, Chassis 5-2	Schematic, voltage, parts	8-5		
	Socket, trimmers, alignment, sensitivity	8-4		
5T-71	Schematic	3-2		1054
	Parts list	7-9		
5T-71A	Data ....Changes	9-3		

GAROD RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
60	Schematic, voltage, alignment	7-2		
66	Schematic	6-5		
73, 73LW	Schematic	7-13		
83	Schematic	6-6		
83-LW	Schematic	6-6		
100 Television	Schematic	10-3, 4		
	Chassis wiring, top	10-5, 6		
	Chassis, wiring, bottom	10-7		
	Chassis view, socket, controls	10-8		
	Circuit data, assembly, wiring notes	10-9		
	S.P.U. chassis wiring, voltage	10-10		
	Alignment, operating, antenna notes	10-11		
104 Early & Late, 104M	Schematic, voltage	7-9		
	Alignment, socket, trimmers	7-10		
115	Schematic	8-1, 8-2		
159	Schematic, socket, trimmers	10-2		
205C, 205L, 205-1, 206L, 206C, 206-1, 206P4	Schematic, voltage, alignment	9-3		
237, 337	Schematic	9-4		
250	Schematic, voltage, alignment	9-5		
259, 269	Schematic, socket, trimmers	10-13		
	Alignment	10-14		
307L, 307T, 307-1, 307, 307E	Schematic, socket, trimmers	9-6		
309L, 309T, 309E-1, 309-2, 309-3, 309E-2, 309E-3, 309P-5, 309P-7, 309E-P5, 309E-P7	Schematic	9-7		
	Socket, trimmers, voltage, alignment	9-8		
310	Schematic	8-1, 8-2		
311	Schematic	8-4		
337	See model 237			
369	Schematic	10-12		
	Alignment	10-14		
370, 370C, 370D, 370KC	Schematic	8-5		
371, 371C, 371D, 371KC	Schematic	8-5		
379, 3790	Schematic	10-15		
	Socket, trimmers, tuner data	10-16		
380, 380D, 380KC	Schematic	8-6		
	Alignment, voltage, socket, trimmers	8-7		
381, 381D, 381KC	Schematic	8-6		
	Alignment, voltage, socket, trimmers	8-7		
511-A, 511-G, 511-P	Schematic, voltage	7-11		
	Alignment, socket, trimmers	7-12		
514	Schematic	7-15, 7-16		
	Alignment, voltage	7-14		
514M	Schematic	7-17, 7-18		
520	Schematic	7-19		
	Alignment, voltage, socket, trimmers	7-20		
602C, 602L, 602-1	Schematic, voltage, alignment	9-9		
620	Schematic, alignment	8-8		
629, 729	Schematic	10-17		
	Alignment	10-14		
703EC, 703EL	Schematic	9-10		
731	Schematic, notes	8-9		
789	Schematic, socket, trimmers	10-18		
	Alignment	10-14		
762	Schematic, voltage, alignment, tuner	9-13		
	Tuner data	9-12		
782, 782-1	Schematic, voltage, socket, trimmers	9-11		
	Alignment, tuner	9-12		
803L, 803T, 803-1	Schematic, socket, trimmers	10-19		
830, 830C, 830D, 830KC	Schematic	8-10		
830A	Schematic	8-11		
831, 831C, 831D, 831KC	Schematic	8-10		
831A	Schematic	8-11		
839	Schematic	10-20		
903L, 903T, 903E-T, 903E-L, 903-2, 903-3, 903E-2, 903P-5, 903P-7, 903E-P5, 903E-P7	Schematic	9-15		
	Socket, trimmers, voltage, alignment	9-16		

GAROD RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
930, 930D, 930KC	Schematic	8-12		
930, 930D, 930KC	Alignment, socket, trimmers, voltage	8-13		
930A	Schematic, voltage, socket	8-14		
	Alignment, socket, trimmers	8-13		
931, 931D, 931KC	Schematic	8-12		
	Alignment, socket, voltage, trimmers	8-13		
931A	Schematic, voltage, socket	8-14		
	Alignment, socket, trimmers	8-13		
1203L, 1203T, 1203-3, 1203-P6, 1203-P7, 1204ET, 1204E1, 1204-3, 1204E-P6, 1204E-P7	Schematic	9-17		
	Socket, trimmers, voltage, alignment	9-18		
1240, 1240E, 1240LC	Schematic, voltage	8-15		
	Socket, trimmers, alignment	8-16		
1240A	Schematic, socket, voltage	8-17		
	Alignment	8-16		
1603, 1604-4	Schematic, voltage	9-19		
	Socket, trimmers, alignment	9-20		
	Tuner data	9-14		
1649	Schematic, socket	10-21		
	Alignment, trimmers	10-22		
	Tuner data	10-26		
1650, 1650H, 1650LC	Schematic, voltage	8-18		
	Socket, trimmers, alignment	8-19		
1650A	Schematic, voltage, socket, notes	8-20		
	Alignment	8-19		
3119	Schematic	10-23		
3012L, 3012T, 3012-3, 3012-P6, 3012-P7, 4012ET, 4012EL, 4012E-3, 4012E-P6, 4012E-P7	Schematic	9-21		
	Socket, voltage, trimmers, alignment	9-22		
3016, 4016-4	Schematic, socket, trimmers	9-23		
	Voltage, alignment	9-24		
	Tuner data	9-14		
3790	See Model 379			
4110, 4110E, 4110KC	Schematic, voltage	9-25		
	Socket, trimmers, alignment	9-26		
4159	Schematic	10-25		
	Alignment, tuner	10-26		
	Socket, trimmers	10-16		
5140	Schematic, voltage	9-27		
	Socket, trimmers, alignment	9-28		
5240	Schematic, voltage	8-21, 8-22		
	Socket, trimmers	8-23		
	Alignment	8-24		
7390	Schematic	10-24		
	Alignment	10-14		

GATES RADIO & SUPPLY CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
P-1 SPU	Schematic	Misc. 7-7		
40-B Amplifier	Schematic	Misc. 7-7		
40-C Amplifier	Schematic	Misc. 7-7		
B-100 Amplifier	Schematic	Misc. 7-7		
105-CR	Schematic	6-1		
120-B Amplifier	Schematic	Misc. 7-7		
125-P SPU	Schematic	Misc. 7-7		
A-300	Schematic	6-1		
500-A	Schematic	6-2		
901-A	Schematic	6-2		

GENERAL ELECTRIC CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
BX	See RCA R-17-M			
V-Doublet Antenna	See G.E. model KV-100			
B-1	See RCA Radiola 21			
B-2	See RCA Radiola 22			
FS-5 Remote Station	Schematic, chassis	8-1		
	Circuit data, operation, notes	8-2		
	Voltage, parts	8-3		
GM11, Wireless Record Player	Schematic, operating notes	10-1		
T-12	See RCA R-5			
T-12-E	See RCA R-5-X			
T-12-DC	See RCA R-5 DC			
S-22, S-22-X	See RCA R-7			

MODEL	GENERAL ELECTRIC CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
S-22-A	See RCA R-7-A			
S-22-D	See RCA R-7 DC			
C-30	See RCA 91-B			
H-31	See RCA Radiola 80			
H-32	See RCA R-50			
B-40	See RCA M-34			
	Data	Changes 9-3		
F-40	Schematic, voltage	9-1		
	Circuit data, socket, trimmers, alignment, voltage	9-2		
K-40	See RCA R-27			
K-40 (Revised)	See RCA R-27 (Revised)			
K-40-A	See RCA R-18-W			
M-40	See RCA 102			
C-41	See RCA M-105			
FM-41 Handy Phone	Schematic, chassis	8-1		
	Circuit data, operation, notes	8-2		
	Voltage, parts	8-3		
GD-41, GD-41U	Schematic, voltage, alignment, parts, specifications	9-6		
K-41	See RCA R-17-M			
M-41	See RCA 100, 101			
M-42	See RCA 103			
T-41	See RCA 48			
S-42	See RCA R-9			
S-42-B	See RCA R-48			
S-42-D	See RCA R-9 DC			
SZ-42-P	See RCA R-7 AC, Radiola 86			
K-43	See RCA 100			
GD44A, GD44AU, GD44B, GD44BU	Schematic, voltage, alignment	10-2		
K-48	See RCA 300			
M-49	See RCA 301			
D-50	See RCA M-101			
E-50, E-52	Schematic, socket, trimmers, voltage	8-5		
	Chassis wiring	8-4		
	Alignment, parts	8-6		
G-50, G-55	Schematic, coils	9-3		
	Circuit data, voltage, tuner, specifications	9-4		
	Socket, trimmers, chassis, alignment, parts	9-5		
K-50-P, K-51-P	See RCA R-28-P			
K-50, K-51	See RCA R-28			
L-50, L-51	See RCA R-22			
M-50	See RCA 117			
U-50	Schematic, socket, trimmers, voltage	8-7		
	Alignment, dial drive data	8-8		
D-51	See RCA M-104			
D-51, D-52	Data	Changes 9-3		
E-51	Schematic, socket, voltage, trimmers	8-9		
	Chassis wiring	8-10		
	Circuit data, alignment, voltage, parts	8-11		
F-51	Schematic, socket, trimmers, dial data, chassis wiring	9-7		
	Alignment, parts, voltage, specifications	9-8		
GD51	Schematic, socket, voltage, alignment, trimmers	10-11		
H-51	See RCA 82			
H-51, H-51-R	See RCA Radiola 82, 82-R			
K-51	See K-50			
L-51	See L-50			
M-51	See RCA 118			
M-51-A	See RCA 118 (Revised)			
U-51, U-55	Schematic	8-13		
	Notes, parts	8-12		
	Coils, resistance, vibrator, notes	8-14		
	Socket, trimmers, voltage, dial assembly	8-15		
	Alignment, notes, drive cord data	8-16		
A-52, A-55	Schematic, voltage, socket, trimmers	7-1		
	Chassis wiring data	7-2		
	Circuit data, alignment, parts	7-3		

MODEL	GENERAL ELECTRIC CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
B-52	See RCA M-116			
D-52	See RCA M-108			
	Data	Changes 9-3		
E-52	See model E-50			
FB-52, FB-53, FB-56, FB-57	Schematic, battery connections, power adaptor	8-17		
	Voltage, chassis	8-18		
	Alignment, trimmers	8-19		
	Drive cord data, notes, parts	8-20		
GD52	Schematic, voltage, socket, alignment, trimmers	10-3		
K-52	See RCA 110			
L-52	See RCA 112			
M-52	See RCA 119			
A-53	Schematic	6-4		
	Chassis wiring	6-5		
	Circuit data, alignment	6-6		
	Alignment part 2, voltage, socket	6-7		
	Voltage, parts	6-8		
F-53	Schematic, resistance, voltage, transformer data	8-21		
	Socket, trimmers, alignment, parts	8-22		
FB-53	See model FB-52			
G-53, G-56	Schematic, socket, trimmers, dial data, chassis wiring	9-9		
	Alignment, specifications	9-10		
	Circuit data, voltage, pick-up, parts	9-11		
K-53	See RCA 111			
K-53-M	See RCA 115			
L-53	See RCA 114			
A-54	Schematic, voltage, transformer data	7-5		
	Circuit data, alignment, parts	7-4		
	Chassis wiring, socket, trimmers	7-6		
K-54	See RCA RE-40			
K-54-P	See RCA RE-40-P			
A-55	See model A-52			
G-55	See model G-50			
K-55	See RCA 210			
M-55	See RCA 214			
U-55	See model U-51			
FB-56, FB-57	See model FB-52			
G-56	See model G-53			
M-56	See RCA 211			
G57	Data	Changes 10-1		
K-58	See RCA 310			
A-60	See RCA M-32			
C-60	See RCA M-107			
FA-60, FA-61	Schematic, socket, trimmers, resistance	8-23		
	Chassis and speaker layouts	8-24		
	Voltage, installation	8-25		
	Alignment, installation, parts	8-26		
GD60	Schematic, voltage, socket, trimmers, alignment	10-3		
K-60	See RCA R-37			
K-60-P	See RCA R-37-P			
N-60	Schematic	7-7		
	Circuit data, coils, alignment, socket, trimmers, voltage, resistance data	7-8		
C-61	See RCA M-123			
E-61, E-62, E-68	Schematic, data	7-9		
	Chassis wiring, circuit data, coil data	7-10		
	Socket, trimmers, circuit data, part 2	7-11		
	Voltage, alignment, parts list	7-12		
FA-61	See model FA-60			
G61, G66, G68, G69	Schematic	10-5, 6		
	Socket, trimmers, chassis, dial, phono. connections	10-7		
	Voltage, alignment, coils, parts	10-8		
	Phono. connections, motor data, changer assembly	10-10		

MODEL	GENERAL ELECTRIC CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
G61, G66, G68, G69	Automatic record changer data	10-9		
M-61	See RCA 128			
M-61 (Revised)	See RCA 128 (Revised)			
C-62	See RCA 126-B			
E-62	See model E-61			
FD-62, FD-625	Schematic, coils, voltage, resistance	9-13		
	Socket, trimmers, alignment, parts	9-12		
	Specifications, alignment notes, voltage, circuit data, chassis wiring	9-14		
GA62	Schematic, voltage, socket, alignment, trimmers	10-12		
GD62, GD67	Schematic, voltage, socket, alignment, trimmers	10-13		
K-62	See RCA R-11			
K-62 (Revised)	See RCA R-11 (Revised)			
M-62	See RCA 125			
KZ-62-P	See RCA RE-18, RE-18-A			
A-63, A-65	Schematic, data	6-9		
	Chassis wiring	6-10		
	Circuit data, alignment	6-11		
	Alignment, voltage	6-12		
	Voltage, parts	6-13		
	Additional data	Changes 7-1		
F-63, F-65, F-66	Schematic, resistance, voltage	8-27		
	Socket, trimmers, chassis, alignment	8-28		
GD63	Schematic, socket, voltage, alignment, trimmers	10-14		
K-63	See RCA 120			
M-63	See RCA 124			
A-64, A-66, A-67	Schematic	6-14		
	Chassis wiring	6-15		
	Circuit data, trimmers, alignment, socket	6-16		
	Alignment part 2, voltage, dial data	6-17		
	Parts	6-18		
	Additional data	Changes 7-12		
G64, G65	Schematic, chassis wiring	10-15		
	Alignment, voltage, socket, trimmers, dial data, phono. connections, parts	10-16		
K-64	See RCA 121			
K-64-D	See RCA 127			
F-65	See model F-63			
K-65	See RCA R-38			
K-65-P	See RCA R-38-P			
M-65	See RCA 221			
A-66	See model A-64			
F-66	See model F-63			
G66, G68, G69	See Model G61			
K-66	See RCA 220			
K-66-M	See RCA 222			
M-66	See RCA 226			
A-67	See G.E. model A-64			
C-67	See RCA 223			
M-67	See RCA 224			
GD67	See model GD62			
E-68	See model E-61			
M-68	See RCA Duo 321			
M-69	See RCA 322			
A-70, A-75	Schematic	6-19		
	Chassis wiring	6-20		
	Alignment, trimmers, socket, voltage	6-21		
	Circuit data, dial data	6-22		
	Voltage, parts	6-23		
	Changes	Changes 7-1, 7-16		
C-70, C-75	See RCA 135-B, 235-B			
F-70, F-75	Schematic, resistance	8-29		
	Alignment, socket, trimmers	8-30		
	Chassis, voltage	8-31		
J-70	See RCA R-4			
U-70, U-75	Schematic	8-33		
	Socket, vibrator, dial assembly, data	8-32		

MODEL	GENERAL ELECTRIC CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
U-70, U-75	Trimmers, voltage, resistance, coils	8-34		
	Alignment, drive data	8-35		
	Parts	8-36		
E-71, E-72, E-76	Schematic, data	7-13		
	Chassis wiring, transformer data	7-14		
	Circuit data, alignment, socket, trimmers, voltage	7-15		
	Parts list	7-16		
H-71, H-71-R	See RCA 86, 86-R			
D-72	See RCA M-109			
E-72	See model E-71			
FB-72, FB-73, FB-76, FB-77	Schematic, battery connections, switch assembly, adapter	8-37		
	Socket, trimmers, alignment, notes	8-38		
	Chassis, voltage	8-39		
	Dial assembly, notes, parts	8-40		
H-72	See RCA RAE-59			
J-72	See RCA R-70			
H73, H77, H79 Preliminary	Schematic, socket, alignment, trimmers	10-43		
F-74, F-77	Schematic, resistance, voltage, transformer data	9-15		
	Socket, trimmers, chassis wiring	9-16		
	Alignment, voltage, parts	9-17		
A-75	See G.E. model A-70			
C-75	See RCA 235-B			
F-75	See model F-70			
G75	Schematic, chassis wiring	10-17		
	Alignment, voltage, socket, trimmers, dial and phono. data	10-18		
J-75	See RCA R-6			
U-75	See model U-70			
E-76	See model E-71			
FB-76, FB-77	See model FB-72			
G76	Schematic, socket, trimmers, alignment	10-21		
H77, H79	See Model H73			
G78	Schematic, socket trimmers, chassis wiring, voltage	10-19		
	Alignment, dial and phono. data	10-20		
K-78	See RCA 330			
E-79	Schematic	8-41		
	Chassis wiring	8-42		
	Voltage, socket, trimmers	8-43		
	Circuit data, alignment, dial data	8-44		
	Phono. data	8-45		
	Parts	8-46		
K-79	See RCA 331			
F-80, F-85	Alignment, voltage, parts	9-18		
	Schematic, socket, trimmers, transformer data, voltage, resistance	9-19		
	Specifications, circuit data, chassis wiring	9-20		
FA-80	Schematic, resistance	8-47		
	Socket, trimmers, chassis, voltage	8-48		
	Circuit data, alignment, installation	8-49		
	Parts	8-50		
J-80	See RCA R-8			
K-80, K-80-X	See RCA 140 series			
A-81	See RCA P-31			
B-81	See RCA 142-B			
E-81, E-86	Schematic	7-17		
	Chassis wiring	7-18		
	Circuit data	7-19		
	Alignment, parts, voltage, dial data	7-20		
F-81, F-86	Schematic, resistance	8-51		
	Voltage, chassis	8-52		
	Alignment, trimmers, socket	8-53		
	Dial data, notes	8-54		
	Parts	8-55		

GENERAL ELECTRIC CO.—(Cont.)

GENERAL ELECTRIC CO.—(Cont.)

GENERAL ELECTRIC CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
GM125	Alignment, socket, trimmers	10-36		
J-125	See RCA R-78			
J-125-A	See RCA R-78			
M-125	See RCA 281			
E-126	Schematic, resistance	8-61, 8-62		
	Chassis wiring	8-63, 8-64		
	Sentry Box wiring	8-65		
	Socket, trimmers, voltage	8-66		
	Dial mechanism, alignment oscillograms	8-67		
	Alignment, dial notes	8-68		
	Circuit data	8-69		
	Parts	8-70		
K-126	See RCA 281			
M-128	See RCA 280			
M-128-B	See RCA Duo 880			
E-129	Schematic, resistance	8-71, 8-72		
	Chassis wiring	8-73, 8-74		
	Sentry Box wiring	8-75		
	Dial mechanism, alignment oscillograms	8-76		
	Socket, trimmers, voltage	8-77		
	Alignment	8-78		
	Circuit data	8-79		
	Phonograph data	8-80		
	Parts	8-81		
M-129	See RCA 381			
S-132	See RCA R-10			
F-135	Schematic, resistance	9-49, 50		
	Socket, trimmers, alignment	9-51		
	Voltage, chassis wiring	9-52		
	Specifications, circuit data, dial mechanism	9-53		
	Tuner data, Part 1	9-54		
	Tuner data, Part 2	9-55		
	Parts list	9-56		
E-155	Schematic, resistance	8-83, 8-84		
	Circuit data	8-82		
	Chassis wiring	8-85, 8-86		
	Sentry Box wiring	8-87		
	Dial mechanism, alignment oscillograms	8-88		
	Socket, trimmers, voltage	8-89		
	Alignment	8-90		
	Dial data	8-91		
	Parts	8-92		
E-195	See Model A205E			
A-205	Schematic	9-57, 58		
	Chassis wiring, coil data	9-59		
	Speaker and power unit wiring	9-60		
A-205, A-208	"Sentry Box" wiring	9-65		
	Socket, trimmers, voltage	9-66		
	Parts list, pick-up data	9-72		
	Parts list, concluded	9-73		
	Specifications, circuit data, alignment, Part 1	9-69		
	Alignment, Part 2	9-70		
	"Sentry Box" notes, dial and phonograph data	9-71		
A-205E, A-208E	Specifications, "Colorama" data, voltage	9-74		
	Schematic	9-75, 76		
	Trimmers	9-77		
	Phonograph data, installation notes	9-78		
	Parts list	9-79		
	Parts list, concluded	9-80		
	Automatic record changer adjustments	9-68		
	Circuit data, alignment, Part 1	9-69		
	Alignment, Part 2	9-70		
	"Sentry Box" notes, dial and phonograph data	9-71		
	Pick-up data	9-72		
A-208	Schematic	9-61, 62		
	Chassis wiring, coil data	9-63		
	Speaker and power unit wiring	9-64		
	Assembly wiring	9-67		
	Automatic record changer adjustments	9-68		

GENERAL ELECTRIC CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
GD-400	Schematic, socket, trimmers, alignment	10-37		
H-400 Preliminary	Schematic, socket, trimmers, alignment	10-45		
GD-500	Schematic, socket, trimmers, voltage, alignment	10-38		
H-500, H-500W, H-500-X	Schematic	10-47		
H-510, H-510W, H-510X Preliminary	Alignment, socket, trimmers, parts	10-48		
H-501, H-501W, H-501X, H-511, H-511W, H-511X Preliminary	Schematic	10-47		
	Alignment, socket, trimmers parts	10-48		
GD-520, GD-521	Schematic, socket, trimmers, alignment, voltage	10-39		
H-520, H-520W, H-520X Preliminary	Schematic	10-47		
	Alignment, socket, trimmers, parts	10-48		
H-521, H-521W, H-521X Preliminary	Schematic	10-47		
	Alignment, socket, trimmers, parts	10-48		
GD-600	Schematic	10-41		
	Socket, trimmers, voltage, alignment	10-42		
H-600, H-601, H-610, H-611 Preliminary	Schematic, socket, alignment, trimmers	10-46		
GD-610, GD-620	Schematic, socket, trimmers, voltage, alignment	10-40		
H-620, H-621, H-630, H-631, H-632, H-633 Preliminary	Schematic, socket, trimmers, alignment	10-49		
H-625 Preliminary	Schematic, socket, alignment, trimmers	10-50		
FD-625	See model FD-62			
GD630	Schematic	10-41		
	Alignment, voltage, socket, trimmers	10-42		
M-655	See RCA 225			
JZ-822	See RCA R-24			
JZ-822-A	See RCA R-24-A			
JZ-835	See RCA RO-23			
9500A	Antenna system, data, installation	7-41		
	Installation notes, parts list	7-42		

GENERAL ELECTRONICS CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Baird AW-50	Schematic	Misc. 5-7		

GENERAL HOUSEHOLD UTILITIES CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Suffixes:	W = 115 volts, 50-60 cycles X = 115 volts, 25-50 cycles Z = 110-135-220-250 volts, 50-60 cycles			
2A Chassis	See model 1101			
4A Chassis	See model 450			
4A, Revised Chassis	See model 450			
4B Chassis	See model 460			
4B, 4BX, Revised Chassis	See model 460			
4C Chassis	See model 470			
4C, Revised Chassis	See model 470			
4NB Chassis	See model 410			
5A Chassis	See model 500			
5B Chassis	See model 501 and 550			
5C Chassis	See model 502			
5D, 5DX, 5DZ Chassis	See model 570			
5E Chassis	See model 560			
5G Chassis	See model 580			
5G, Revised Chassis	See model 580			
5H Chassis	See model 532			
5J Chassis	See model 542			
5K Chassis	See model 551			
5L Chassis	See model 555			
5M Chassis	See model 590			
5N Chassis	See model 592			
5NB Chassis	See model 510			
5P Chassis	See model 587			

GENERAL HOUSEHOLD UTILITIES CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
5Q Chassis	See model 573			
5R Chassis	See model 564			
5S Chassis	See model 566			
5T Chassis	See model 576			
5U Chassis	See model 587			
5W Chassis	See model 583			
6A Chassis	See model 650			
6A, Revised Chassis	See model 650			
6B Chassis	See model 622			
6C Chassis	See model 660			
6C, Revised Chassis	See model 660			
6D Chassis	See model 670			
6E Chassis	See model 663			
6F Chassis	See model 690			
6G Chassis	See model 680			
6H Chassis	See model 632			
6HB Chassis	See model 620			
6J Chassis	See model 640			
6K Chassis	See model 623			
6M Chassis	See model 631			
6N Chassis	See model 654			
6Q Chassis	See model 622			
7A Chassis	See model 700			
7B Chassis	See model 750			
7C Chassis	See model 760			
7DB Chassis	See model 720			
7M Chassis	See model 723			
7NB Chassis	See model 711			
7Q Chassis	See model 755			
8A Chassis	See model 801			
8B Chassis	See model 821			
8D Chassis	See model 861			
8E Chassis	See model 871			
8H Chassis	See model 823			
9A Chassis	See model 901			
9B, 9B-2A Chassis	See model 1101			
9C Chassis	See model 921			
9E Chassis	See model 941			
10D Chassis	See model 1067			
10G Chassis	See model 1091			
11A, 11B Chassis	See model 1151			
11C Chassis	See model 1171			
11G Chassis	See model 1191			
11H Chassis	See model 1181			
12A Chassis	See model 1241			
12B Chassis	See model 1291			
12W Chassis	See model 1297			
15W	See model 1541			
410, 411, Chassis 4NB	Schematic, socket, trimmers, alignment, voltage, chassis, parts	8-1		
450 (4A), Temporary	Alignment, parts list	5-1		
	Schematic, trimmers	5-2		
450, 451 Chassis 4A, Revised	Schematic, socket, trimmers, voltage, resistance, parts	7-1		
460 (4B), Temporary	Alignment data	5-3		
	Schematic, trimmers	5-4		
460, 461, 460X, 461X, Chassis 4B, 4BX, Revised	Schematic, socket, trimmers, chassis, voltage, resistance, parts list	7-2		
470, (Chassis 4C)	Schematic, socket, trimmers	6-1		
	Alignment	6-2		
470, Chassis 4C, Revised	Schematic, socket, trimmers, chassis, parts	7-3		
500 (Chassis 5-A)	Schematic, condenser assembly	4-1		
	Parts list	4-2		
501 (Chassis 5-B), Early	Schematic, condenser assembly	4-3		
	Parts list	4-4		
501, 520, 530, 550 (Chassis 5-B), Late	Trimmers, schematic, socket	6-3		
	Alignment	6-4		
	Additional data	7-11		
502, 503 (Chassis 5-C)	Schematic	4-5		
	Parts list	4-6		
510, Chassis 5NB	Schematic, socket, trimmers, parts, voltage, alignment, chassis	8-2		
520, 530	See model 501			
532, Chassis 5H	Schematic, voltage, parts, chassis, socket, trimmers, alignment	8-24		

GENERAL HOUSEHOLD UTILITIES CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
542, Chassis 5J	Schematic, voltage, socket, trimmers, parts, alignment, chassis	8-38		
550 (5B)	See model 501			
550 (5B), Temporary	Alignment, parts list	5-5		
	Schematic, trimmers	5-6		
551, 553, Chassis 5K	Schematic, alignment, voltage, parts	8-3		
	Socket, trimmers, chassis	8-4		
555, 572, Chassis 5L	Schematic, voltage, alignment, parts	8-5		
	Socket, trimmers, chassis	8-6		
560, Chassis 5E	Schematic, voltage, socket, trimmers, parts, chassis layout	6-5		
	Alignment	6-6		
564, Chassis 5R	Schematic, voltage, socket, trimmers, chassis, alignment, parts	8-9		
566, Chassis 5S	Schematic, chassis, socket, trimmers, voltage, parts	8-10		
	Alignment	8-11		
570, 571, Chassis 5D, 570X, 571X, Chassis 5DX, 570Z, 571Z, Chassis 5DZ	Schematic, voltage, socket, trimmers, parts	6-7		
	Alignment	6-8		
572	See model 555			
573, Chassis 5Q	Schematic, voltage, parts	8-13		
	Alignment	8-11		
	Socket, trimmers, chassis	8-12		
576, 578, Chassis 5T	Schematic, parts	9-1		
580, 581, Chassis 5G	Schematic, trimmers	6-9		
	Alignment	6-10		
580, 581, Chassis 5G, Revised	Schematic, voltage, notes	7-5		
	Socket, trimmers, parts list, notes	7-4		
583, 585, 586, 588, Chassis 5W	Schematic, parts	9-2		
587, 589, 599, Chassis 5P, 5U	Schematic, parts	9-3		
590, Chassis 5M	Schematic, voltage, alignment, parts	8-7		
	Socket, trimmers, chassis	8-8		
592, 594, Chassis 5N	Schematic, parts	9-4		
599	See model 587			
614, 618 Auto	Schematic, socket, trimmers, chassis, voltage, parts	8-14		
	Alignment, control unit	8-16		
620, 621, Chassis 6HB	Schematic, voltage	7-7		
	Socket, trimmers, chassis	7-6		
	Alignment, parts	7-8		
622, 624, Chassis 6B, 6Q	Schematic, parts	9-5		
623, 627, Chassis 6K	Schematic, parts	9-6		
625 Auto	Schematic, socket, trimmers, voltage, chassis, parts	8-15		
	Alignment, control unit	8-16		
631, 643, Chassis 6M	Schematic, voltage, parts	8-17		
	Socket, trimmers, chassis	8-18		
	Alignment	8-23		
632, Chassis 6H	Schematic, parts	9-7		
640, 641, Chassis 6J, Temporary	Schematic, trimmers	6-11		
	Alignment	6-12		
640, 641, Chassis 6J, Revised	Schematic, voltage	7-9		
	Socket, trimmers, chassis, notes, parts	7-10		
643	See model 631			
650, 651 (6A), Temporary	Alignment, parts	5-7		
	Schematic trimmers	5-8		
650, 651, Chassis 6A, Revised	Schematic, voltage, resistance	7-11		
	Socket, trimmers, chassis, alignment	7-12		
654, Chassis 6N	Schematic, chassis, voltage	8-19		
	Socket, trimmers, alignment	8-20		
660, 661, 662 (6C), Temporary	Alignment, parts	5-9		
	Schematic, trimmers	5-10		

GENERAL HOUSEHOLD UTILITIES CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
660, 661, 662, Chassis 6C, Revised	Schematic, voltage, resistance, notes	7-13		
	Socket, trimmers, chassis	7-14		
663, Chassis 6E	Schematic, parts	9-8		
670, 671 (6D), Temporary	Alignment data	5-11		
	Schematic	5-12		
670, 671, Revised, Chassis 6D; 690, 691, Chassis 6F	Schematic, voltage	6-13		
680, 681, Chassis 6G	Schematic, trimmers	6-15		
	Alignment, notes	6-16		
680, 681, Chassis 6G, Revised	Schematic, voltage	7-15		
	Socket, trimmers, chassis, alignment, parts list	7-16		
690, 691, Chassis 6F	Alignment, parts	6-14		
700 w/8A1 Spkr. (Chassis 7-A)	Schematic, condenser assembly	4-7		
700, 701 (Chassis 7-A)	Parts list	4-8		
700, 701, 801, 901, 902, Chassis 7A, 8A, 9A	Alignment of I-F.	4-13		
	Alignment	4-14, 4-15		
	Socket layouts	4-16		
701 w/10A2 Spkr. (Chassis 7-A)	Schematic, condenser assembly	4-7		
711, Chassis 7NB	Schematic, voltage, parts	8-25		
	Switch and coil assembly	8-26		
	Socket, trimmers, chassis, vibrator	8-27		
	Alignment	8-28		
720, 721, Chassis 7DB	Schematic, notes	7-17		
	Socket, trimmers, chassis	7-18		
	Alignment, parts	7-19		
723, 731, 733, 735, Chassis 7M	Schematic, voltage, parts	8-21		
	Socket, trimmers, chassis	8-22		
	Alignment	8-23		
750, 751, 752, 753 (7B)	Service notes, socket	5-13		
	Schematic, voltage	5-14		
	Trimmers, coil data	5-15		
	Alignment, parts	5-16		
755, Chassis 7Q	Schematic, voltage, alignment, parts	8-29		
	Socket, trimmers, chassis	8-30		
760, 761, Chassis 7C	Schematic, voltage	7-21		
	Socket, trimmers, chassis, switch & coil assembly	7-20		
	Alignment, parts	7-22		
801, (Chassis 8A)	Alignment—See model 700			
	Schematic, data	4-9		
	Parts list	4-10		
821, (Chassis 8B)	Schematic, trimmers, socket parts	6-17		
	Alignment	6-18		
823, 831, 833, 835, Chassis 8H	Schematic, voltage, parts	8-31		
	Socket, trimmers, chassis	8-32		
	Alignment	8-33		
	Switch and coil assembly	8-34		
861, (Chassis 8D)	Schematic, voltage	6-19		
	Switch and coil assembly, trimmers, chassis layout	6-20		
	Circuit data, socket layout	6-21		
	Alignment, parts	6-22		
871, Chassis 8E	Schematic, voltage	7-23		
	Socket, trimmers, chassis	7-24		
	Alignment, parts list	7-25		
901, 902 (Chassis 9A)	Alignment—See model 700			
	Schematic, data	4-11		
	Parts list	4-12		
901, 902 (9A) Revised	Schematic	5-19		
921, Chassis 9C	Schematic, parts, alignment	7-26		
941, Chassis 9E	Schematic, voltage, parts	8-35		
	Switch and coil assembly	8-34		
	Socket, trimmers, chassis	8-36		
	Alignment, notes	8-37		
1067, Chassis 10D	Schematic, parts	9-9, 10		
1091, Chassis 10G	Schematic, parts	9-11, 12		

GENERAL HOUSEHOLD UTILITIES CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
1101 (Chassis 9-B, 2-A)	Schematic, data	4-17		
	Alignment	4-18		
	Socket layout, alignment	4-19		
	Parts list	4-20		
	Parts list	4-21		
1101 (9B-2A) Revised	Schematic	5-20		
1151, 1152 (11A), Temporary	Schematic	5-17		
	Alignment	5-18		
1151, 1152, Chassis 11A (Final)	Schematic, voltage	6-23		
	Switch and coil assembly, trimmers, chassis layout	6-24		
	Switch data, socket	6-25		
	Alignment, parts	6-26		
	Switch and coil assembly, notes	8-39		
	Socket, trimmers, chassis	8-40		
1151, 1152, 1161, 1162, Chassis 11A (type 2), Chassis 11B	Schematic, voltage, data	6-27		
	Parts list	6-28		
1171, Chassis 11C	Schematic, voltage	7-27		
	Socket, trimmers, chassis, switch & coil assembly	7-28		
	Mechanical alignment, parts details	7-29		
	Alignment, parts	7-30		
1181, 1183, 1185 Chassis 11H	Schematic, parts	9-13, 14		
1191, 1191B, Chassis 11G	Schematic, voltage, parts	8-41		
	Socket, trimmers, chassis	8-42		
	Alignment, notes	8-43		
1241, Chassis 12A	Schematic, voltage	7-31		
	Socket, trimmers, chassis	7-32		
	Alignment, notes, parts list	7-33		
1291, 1297, Chassis 12B, 12W (Preliminary)	Schematic, parts	7-35		
	Socket, trimmers, chassis	7-34		
	Alignment	7-36		
1291, 1297, Chassis 12B, Chassis 12W, Final	Schematic, parts, voltage	8-45		
	Socket, trimmers, chassis	8-44		
	Alignment, Teledial parts	8-46		
1541, Chassis 15W	Schematic	7-37		
	Range & Fidelity switches, schematic, range switch & coil schematic speaker	7-38		
	Socket, trimmers, parts details	7-39		
	Chassis, alignment curves	7-40		
	Alignment, part 1	7-41		
	Alignment, part 2	7-42		

GENERAL MOTORS RADIO CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
B and C SPU	Schematic	1-9	*337	1079
Little General	See model 110			
E-2 Chassis	See model 200			
R-1A Chassis	See model 281			
S-1A, S-1B Chassis	See model 216			
S-2A, S-2B Chassis	See model 251			
S-3A, S-3B Chassis	See model 252			
S-4A, S4-B	See model 292			
Day-Fan 5-AC	Schematic	1-3	*331	1073
	SPU Schematic, data	1-3	*331	1073
Day-Fan 6	Schematic, socket	1-3	*331	1073
Day-Fan 6 Jr.	Schematic, socket	1-4	*332	1074
Day-Fan 6-61 (5050)	Schematic, socket, data	1-4	*332	1074
OEM-7 (4 tube)	Schematic, socket	1-1	*329	1071
OEM-7 Super-Sel.	Schematic, socket	1-1	*329	1071
S-9A, S9-B Chassis	See model 211			
S-10A, S-10B	See model 220			
OEM-11 (3 tube)	Schematic, socket	1-1	*329	1071
Day-Fan 25, 26, 27, 28, 43, 48	Schematic, socket, voltage	1-10	*338	1080
Day-Fan 35	Schematic, socket	1-10	*338	1080
110, 180, 190, Little General	Schematic, socket, data	3-1		1095
	Divider data, notes	3-2		1096
120, 130, 140 Below Serial #29100A-1700B	Schematic, socket, voltage	1-14	*348	1086

GENERAL MOTORS RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
120, 130, 140 Between Serials #29100A-62100A and 1700B-1964B	Schematic, socket, voltage	1-15	*345	1087
120, 130, 140 Above Serial #62100A-1964B	Schematic, socket, voltage	1-16		1088
120, 130, 140	Service notes	2-3	346-1	1089
150, 160 Pick-up	Service notes	2-4	346-3	1090
150, 160 Induction Motor	Service notes, Part 1	2-5	346-4	1091
	Service notes, Part 2	2-6	346-5	1092
170-E	Schematic, socket, voltage	1-17	*346-B	1093
	Chassis wiring, data	1-18	*346-C	1094
180, 190	See model 110			
200, 201 (E-2)	Schematic, socket	3-3		1103
	Voltage, parts values	3-4		1104
211 (S-9A, S-9B)	Schematic, socket, voltage	3-5		1105
	Chassis layout, tracking procedure	3-6		1106
216, 217, 219, 250 (S-1A, S-1B)	Schematic, socket	2-7	346-E	1097
	Voltage, data	2-8	346-F	1098
220 (S-10A, S-10B)	Schematic, socket, voltage	2-13	346-K	1107
	Chassis layout, service data	2-14	346-L	1108
250	See model 216			
251 (S-2A, S-2B)	Schematic, socket	2-9	346-G	1099
	Voltage, data	2-10	346-H	1100
	Changes	Changes 7-5		
252, 253, 254, 255, 256, 257, 258 (S-3A, S-3B)	Schematic, socket	2-11	346-I	1101
	Voltage, data	2-12	346-J	1102
253, 254, 255, 256, 257, 258	Changes	5-2		
281 (R-1A) Converter	Schematic, voltage, service notes	3-7		1109
	Diagrams, data	3-8		1110
292, 293 (S4-A, S4-B)	Schematic, socket	5-1		
	Changes	5-2		
527 (5 tube)	Schematic, socket	1-2	*330	1072
Day-Fan A-5003, A-5010	Schematic, socket	1-12	*340	1082
Day-Fan A-5005, A-5020	Schematic, socket, voltage	2-1	340-A	1083
	Chassis wiring, parts list	2-2	340-B	1084
5044 (5 tube)	Schematic, socket	1-2	*330	1072
5050	See Day-Fan 6-61			
Day-Fan 5050 Battery	Schematic	1-9	*337	1079
Day-Fan 5050-7	Schematic, socket	1-9	*337	1079
Day-Fan 5051 (MG Set)	Schematic, socket, data	1-5	*333	1075
Day-Fan 5052 (110-volt DC)	Schematic, socket	1-8	*336	1078
Day-Fan 5053	Schematic, socket	1-6	*334	1076
Day-Fan 5057	Schematic, data	1-6	*334	1076
Day-Fan 5057 SPU	Schematic	1-6	*334	1076
Day-Fan 5060 (32-volt DC)	Schematic, socket	1-8	*336	1078
Day-Fan 5065 AC	Schematic, socket, data	1-7	*335	1077
Day-Fan 5066	Schematic, data	1-7	*335	1077
Day-Fan 5077	Schematic	1-11	*339	1081
Day-Fan 5080	Schematic, socket, voltage	1-11	*339	1081
Day-Fan 5091	Schematic, socket, voltage	1-13	*341	1085
Day-Fan 5524, 5525 SPU	Schematic	1-7	*335	1077

GENERAL RADIO CO.

210 Amplifier	Schematic	1-1	*700	1111
250 Amplifier	Schematic	1-1	*700	1111
320 Oscillator	Schematic	1-3		1113
360 Oscillator	Schematic	1-3		1113
360-A Oscillator	Schematic	1-3		1113
361-B	Schematic diagrams	1-2		1112
390 Eliminator	Schematic	1-1	*700	1111
403-C	Schematic	1-2		1112

GENERAL TELEVISION, INC.

A, B, C, E	Schematic	Misc. 6-9
G, GSW, M, MSW	Schematic	Misc. 6-9

GENERAL TELEVISION & RADIO CORP.

457	Schematic	Misc. 10-5
510	Schematic	8-1
533	Schematic	8-1

GENERAL TELEVISION & RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
543	Schematic	8-2		
557	Schematic	Misc. 10-5		
745	Schematic	8-2		
PR-4	Schematic, notes	Misc. 9-4		

GILFILLAN BROS.

4T, 30	Schematic, socket, alignment	5-3		
5B8	Schematic, socket, parts	9-1		
5C, 5T, 32, 35, 41	Schematic, socket, alignment	5-3		
5B8, 5B9	Schematic, socket, parts	9-1		
5SJ, 54S	Schematic, socket	10-2		
5S8	Schematic, socket, parts	9-2		
5X, 34, 55A, 55B	Schematic, socket	5-4		
6C, 6T	Schematic, alignment	5-1		
GN-6	Schematic, socket	3-1		1117
6X8	Schematic, socket, parts	9-2		
7A, 700	Schematic, socket	6-7		
7T8	Schematic, socket, trimmers	9-3		
8C, 8T, 47, 50	Alignment data	5-1		
	Schematic	5-2		
	Socket layout	5-4		
8C8, 8T8	Schematic, socket, trimmers	9-4		
8C8E, 8T8E	Schematic, socket, trimmers	9-5		
	Alignment, tuner	9-6		
8X	Schematic, socket	7-1		
13C8E	Schematic, socket, trimmers,	9-7		
	Alignment, tuner	9-6		
30	See model 4T			
32	See model 5C			
33	Schematic, socket	1-1	*348	1115
34	See model 5X			
35	See model 5C			
35, 100, with p.p. 71s	Schematic	6-1		
41	See model 5C			
42A	Schematic, socket	6-2		
43A	Schematic, socket	6-2		
47, 50	See model 8C			
52A, 54A	Schematic, socket	6-5		
54S	See Model 5SJ			
55A, 55B	Schematic	6-3		
	Schematic, socket. See model 5X			
56S	Schematic, socket, voltage	10-1		
	Tuner data	10-2		
60	Schematic, socket	1-2	*347	1116
62B-X	Schematic, socket	6-4		
63B, 63X	Schematic, socket	6-4		
66	Schematic, socket	1-2	*347	1116
66S	Schematic, socket, voltage	10-1		
	Tuner data	10-2		
78 B, 78X	Schematic, socket	6-5	*348	1115
100	Schematic, socket	1-1		
100, with p.p.71s	See model 35			1117
105, 106, 107 Early	Schematic, socket	3-1		
116B, 116X	Schematic, socket, voltage	6-6		
117B, 117X	Schematic, socket, voltage	6-6		
402T	Schematic, socket	7-2		
410	Schematic, socket	6-7		
412T	Schematic, socket	7-2		
501T	Schematic	9-8		
510, 520	Schematic, socket, alignment, data	6-8		
515, 525	Schematic, socket, alignment, data	6-9		
521T-C	Schematic	8-1		
615, 625	Schematic, socket, alignment, data	6-10		
700	See model 7A			
711T	Schematic	8-2		
715, 725	Schematic, socket, alignment, data	6-9		
723T-C	Schematic, socket	7-2		
731T-C	Schematic	8-3		
815, 825	Schematic, socket, alignment, data	6-10		
831T-C	Schematic, socket	7-3		
1131C	Schematic, socket	7-4		
1331C	Schematic	8-4		

GOODYEAR TIRE & RUBBER CO., INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Wings All Weather	See model 101501			
Wings Junior	See model 101500			
404	Schematic, voltage, socket, trimmers, alignment	10-1		
415A Chassis	See Model 010219, Run 1			
415B Chassis	See Model 010219, Run 2			
489 Chassis	See Model 010219, Run 3, 4			
504	Schematic, voltage, socket, trimmers, alignment	10-2		
505 Chassis	See Model 01554			
523 Chassis	See Model 010220			
523B Chassis	See Model 010220, Run 2			
526E Chassis	See Model 01009			
526I Chassis	See Model 01010			
540	**Schematic, voltage, socket, alignment, parts**	**6-1**		
550	Schematic, voltage, socket, trimmers, alignment	10-3		
575	**Schematic, voltage, socket, trimmers, alignment**	**6-2**		
578, Series A	Schematic, voltage, socket, trimmers, alignment	10-4		
580	**Schematic, parts list**	**7-4**		
582 Chassis	See Model 01030			
585	Schematic, voltage, socket, trimmers, alignment	10-5		
585, Run 1	Schematic, voltage	9-1		
585, Run 2	Schematic, voltage	9-1		
585, Run 1, Run 2	Socket, trimmers, alignment	9-2		
587	Schematic, voltage, socket, trimmers, alignment	10-6		
588 Chassis	See Model 010212			
601, Runs 1, 2	Schematic, voltage, socket, trimmers, alignment	10-7		
602	**Schematic, socket, trimmers, alignment, voltage, parts**	**8-2**		
602, Runs 1, 2	Schematic, voltage, socket, trimmers, alignment	10-8		
602E Chassis	See Model 010211			
602I Chassis	See Model 010222			
661 Chassis	See Model 01019			
666, Runs 1, 2	Schematic, voltage, socket, trimmers, changes	10-9		
	Speaker connections, alignment	10-10		
667 Chassis	See Model 010110			
670	**Schematic, voltage, socket, trimmers**	**6-3**		
	Alignment, elimination notes	**6-4**		
675	**Schematic, voltage, socket, trimmers**	**6-5**		
	Alignment	**6-6**		
691	Schematic, voltage, socket, trimmers	10-11		
	Alignment	10-12		
741	**Schematic, voltage, socket, trimmers, parts**	**8-7**		
	Alignment, trimmers	**8-8**		
749	Schematic, voltage, socket, trimmers, tuner	10-20		
777, Run 1	**Schematic, voltage**	**7-1**		
	Trimmers, socket, parts, layout	**7-2**		
	Alignment	**7-3**		
787	Schematic, voltage, socket, trimmers	10-16		
	Alignment	10-12		
804 Chassis	See Model 010221			
860 Chassis	See Model 01029			
880 Chassis	See Model 01018			
881 Chassis	See Model 01020			
888, 889	Schematic, voltage, socket, trimmers, parts	9-3		
01009, Ch. 526E	Schematic, socket, voltage, trimmers, alignment, tuner	10-21		
01010, Ch. 5261	Schematic, socket, voltage, trimmers, alignment, tuner	10-21		
01018, Runs 1, 2 Chassis 880	Schematic, voltage, socket, trimmers, alignment	10-22		
01019 Chassis 661	**Schematic, voltage, socket, trimmers, alignment, parts**	**8-5**		

GOODYEAR TIRE & RUBBER CO., INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
01020, Chassis 881	Schematic, socket, trimmers, alignment	10-23		
01029, Chassis 860	Schematic, voltage, socket, trimmers	10-24		
	Tuner, alignment	10-19		
01030, Runs 1, 2 Ch. 582, Series A.B	Schematic, voltage, socket, trimmers, alignment	10-34		
	Tuner	10-21		
1070, Runs 1, 2	Schematic, socket, trimmers, changes	10-13		
	Alignment, parts	10-14		
1170, 1171	Schematic, socket, trimmers, alignment	10-15		
1173 Chassis	See Model 010217			
1174 Chassis	See Model 010218			
1175	Schematic, voltage	10-17		
	Socket, trimmers, tuner data	10-18		
	Alignment	10-19		
01554, Chassis 505	Schematic, voltage, socket, trimmers	10-25		
010110, Chassis 667	**Schematic, voltage, socket, trimmers, parts**	**8-6**		
010211, Chassis 602E	Schematic, voltage, socket, trimmers, alignment	10-26		
010212, Chassis 588	**Schematic, voltage, socket, trimmers, parts**	**8-3**		
	Alignment, notes	**8-4**		
	Alignment	9-4		
010217, Chassis 1173	Schematic, socket, trimmers, parts	8-9		
	Alignment, notes	8-10		
010218, Chassis 1174	Schematic, voltage, socket, trimmers, parts	9-5		
	Alignment	9-6		
010219, Run 1, Chassis 415-A	Schematic, voltage, socket, trimmers, alignment	10-27		
010219, Run 2, Chassis 415-B	Schematic, voltage, socket, trimmers, alignment	10-28		
010219, Runs 3, 4, Chassis 489, Series A Issues A and B	Schematic, voltage, socket, trimmers	10-29		
	Socket, trimmers, alignment	10-30		
010220, Chassis 523	Schematic, socket, trimmers, alignment, voltage, parts	8-1		
010220, Run 2, Chassis 523B	Schematic, voltage, socket, trimmers, alignment	10-33		
010221, Chassis 804	Schematic, voltage, socket, trimmers	10-31		
	Trimmers, alignment	10-32		
010222, Chassis 6021	Schematic, voltage, socket, trimmers, alignment	10-26		
015040	Schematic, voltage, socket, trimmers, alignment	10-35		
	Tuner data	10-37		
015050	Schematic, voltage, socket, trimmers, alignment	10-36		
	Tuner data	10-37		
015060	Schematic, voltage, socket, trimmers, alignment, tuner	10-37		
015070	Schematic, voltage, socket, trimmers	10-38		
	Tuner data	10-42		
	Alignment	10-41		
015080	Schematic, voltages, socket, trimmers	10-39		
	Tuner data	10-42		
	Alignment	10-41		
015090	Schematic, voltage, socket, trimmers	10-40		
	Tuner data	10-42		
	Alignment	10-43		
015100	Schematic, voltage, socket, trimmers, alignment	10-44		
	Tuner data	10-37		
015110	Schematic, voltage, socket, trimmers, alignment	10-45		
	Tuner data	10-37		
015120	Schematic, voltage	10-46		
	Socket, trimmers	10-43		
	Alignment	10-41		
	Tuner data	10-37		
015130	Schematic, voltage	10-49		

GOODYEAR TIRE & RUBBER CO., INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
015130	Alignment	10-41		
	Tuner data	10-37		
100502, Double Eagle Above Serial 42,000	Schematic, changes, tuner	10-47		
	Early schematic of coils, early, late alignment, socket, trimmers	10-48		
101500, Wings Junior	Schematic, voltage, alignment, tuner, socket, trimmers	9-7		
	Installation, parts	9-8		
	Tuner data	9-10		
101501, Wings All Weather	Schematic, voltage, alignment, socket, trimmers	9-9		
	Installation, tuner, parts	9-10		
101503	Schematic, voltage	9-11		
	Socket, trimmers, chassis, alignment, tuner, coils, parts	9-12		
	Tuner data	9-10		
103533	Schematic, socket, trimmers, voltage, alignment	10-50		

GRAYBAR ELECTRIC CO.

GB-4	See RCA Radiola R-5			
GT-7	See RCA Radiola R-4			
GB-8	See RCA Radiola R-7			
GB-8-A	See RCA Radiola R-7-A			
GT-8	See RCA Radiola R-8			
GT-8-56	See RCA Radiola R-71			
GT-8-69	See RCA Radiola R-72			
GB-9	See RCA Radiola R-11			
GT-10-69	See RCA Radiola R-74			
GT-10-88	See RCA Radiola R-76			
GT-10-99	See RCA Radiola R-77			
GC-13	See RCA R-6			
GC-14	See RCA Radiola R-12			
GG-15	See RCA Radiola R-6			
GB-100	See RCA Radiola R-55			
GB-300	See RCA Radiola 16			
GB-310	See RCA Radiola 18			
811	See RCA Radiola 33			
GB-311	See RCA Radiola 33			
GB-330	See RCA Radiola 60			
340	See RCA Radiola 62			
GB-340	See RCA Radiola 62			
500	See RCA Radiola 44			
GB-500	See RCA Radiola 44			
550	See RCA Radiola 46			
GB-550	See RCA Radiola 46			
600	See RCA Radiola 66			
GB-600	See RCA Radiola 66			
GB-678	See RCA Radiola 48			
GB-700	See RCA Radiola R-80			
GB-770	See RCA Radiola R-82			
GB-900	See RCA Radiola 86			
GB-989	See RCA Radiola R-10			

A. H. GREBE & CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Broadcast Receiver	Schematic	1-6	*355	1124
Synchrophase 1925	Schematic	1-11	*363	1129
RORB	Schematic	1-1	*358	1119
RORD	Schematic	1-1	*359	1119
RORE	Schematic	1-1	*359	1119
RORF	Schematic	1-1	*359	1119
RORG	Schematic	1-2	*359	1120
RORH	Schematic	1-2	*360	1120
RORJ	Schematic	1-2	*360	1120
RORK	Schematic	1-2	*360	1120
RORL	Schematic	1-2	*360	1120
RORN	Schematic	1-3	*356	1121
RORO	Schematic	1-3	*361	1121
RORQ	Schematic	1-3	*361	1121
AH-1	Schematic, socket, voltage	1-20	*372	1140
CR-1	Schematic	1-4	*353	1122
Synchrophase MU-1	Schematic	1-11	*363	1129
	Socket layout	1-12	*364	1130
CR-2	Schematic	1-4	*353	1122
Synchrophase MU-2	Schematic, socket, voltage	1-12	*364	1130
CR-3	Schematic	1-4	*358	1122

A. H. GREBE & CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
HS-3	Schematic	3-1		1141
CR-4	Schematic	1-4	*353	1122
HS-4, 1 Pentode	Schematic, socket, voltage	1-21	*372-D	1143
HS-4 with '45 Pushpull	Schematic, socket, voltage	1-22	*372-B	1142
Synchrophase SK-4, Early	Schematic, socket, voltage	1-19	*370	1137
Synchrophase SK-4, Late	Schematic	3-2		1138
CR-5	Schematic	1-5	*354	1123
HS-5	Schematic, socket, voltage	1-23	*372-F	1144
Synchrophase 5, 671 SPU	Schematic, socket, voltage	1-10	*362	1128
Synchrophase AC-6	Schematic, socket, voltage	1-15	*366	1133
Synchrophase AC-6 SPU	Chassis wiring (2 types)	1-16	*367	1134
CR-6	Schematic	1-5	*354	1123
HS-6	Schematic, socket	3-3		1145
CR-7	Schematic	1-5	*354	1123
HS-7	Schematic, socket	3-4		1146
Synchrophase 7 Battery	Schematic, socket	1-17	*368	1135
Synchrophase 7 AC	Schematic, socket, voltage	1-18	*369	1136
CR-8	Schematic	1-5	*354	1123
HS-8	Schemetic, socket	3-5		1147
CR-9	Schematic	1-7	*356	1125
HS-11	Schematic	4-5		
CR-12	Schematic, socket	1-6	*355	1124
HS-12	Schematic	3-6		1148
CR-13	Schematic	1-8	*357	1126
CR-14	Schematic	1-8	*357	1126
CR-18 (Special)	Schematic, socket	1-7	*358	1125
CR-18 (1 A-F. Stage)	Schematic	1-9		1127
61-R	Schematic	4-2		
	Socket, alignment data, vibrator data	4-3		
89	Schematic	4-4		
111-B	Schematic	4-1		
412 Pushpull Amplifier	Schematic, chassis wiring	1-13	*364-A	1131
428 DeLuxe Console	Schematic	1-14	*365	1132
671 SPU	See model Synchrophase 5			
671-B Power Unit	Schematic	1-17	*368	1135

GRIGSBY-GRUNOW CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
7-P-6, 7-P-3 (2 types)	Schematic	1-2	*374	1150
7-P-6, 7-P-3 (Old wiring)	Chassis wiring	1-3	*375	1151
7-P-6, 7-P-3	Chassis wiring	1-4	*376	1152
7-BP-6, 7-BP-3	Schematic	1-6	*378	1154
	Chassis wiring	1-7	*379	1155
8-P-6, 8-P-3	Schematic, chassis wiring	1-9	*381	1157
9-P-3, 9-P6	Schematic, socket, voltage, data	1-24	*384	1162
10 Chassis, 11, 58, 204, 294	Schematic, voltage	3-14		1206
	Alignment notes	3-15		1207
G-13, G-13-C, PM Speakers	Two views, data	3-9		1201
G-14-F, G-19-B, G-19-C	Notes	3-18		1210
15, 15-B, 150 Chassis, 151, 153, 154, 155, 156	Schematic, data	2-4	386-L	1176
Below Serial #65,149,	Voltage, chassis views	2-5	386-M	1177
15, 15-B, 150 Chassis, Above Serial #65,150	Schematic	2-6	386-N	1178
15-B Chassis	Chassis views	2-7	386-O	1179
G-19-B, G-19-C	See model G-14-F			
20 Chassis, 21, 22, 23	Schematic, socket, voltage, data	1-14	*386-A	1166
	Chassis views	1-15	*386-B	1167
25 Service Notes	See model 120			
25 Chassis, 251, 253, 254	Schematic	2-8	386-P	1180
	Voltage, chassis views	2-9	386-Q	1181
25-B Chassis, 251-B, 253-B, 254-B	Schematic, voltage, data	2-10	386-Q-1	1182
	Chassis views, parts list	2-11	386-Q-2	1183
	Alignment data	2-13	386-Q-5	1185
	Speaker connections	2-15	386-Q-6	1187
30 Chassis, 31	Schematic, socket	1-16	*386-H	1168
	Voltage, data	1-17	*386 I & J	1169
35 Chassis, 351, 353	Schematic, voltage, data	2-12	386-Q-3	1184
	Chassis views	2-14	386-Q-4	1186
	Alignment data, chassis	2-13	386-Q-5	1185
	Speaker connections	2-15	386-Q-6	1187
44, 49, 194 (Chassis 440)	Chassis views, voltage, parts list	4-11		
	Schematic, parts list, point-to-point data, socket	4-12		
50 Chassis, 51, 52	Schematic, socket, voltage	1-18	*387	1170

MODEL	GRIGSBY-GRUNOW CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
50 Chassis, 51, 52	Chassis views	1-19	*386-C	1171
F-50	Schematic	5-1		
55 Chassis, 56, 57, 58	Schematic, color code	3-1		1189
	Chassis views, voltage	3-2		1190
55, 59, 75, 195, 560, 566 (Chassis 500)	Chassis view, alignment, parts list	4-23		
	Schematic, parts list, point-to-point data, coil resistances, sockets	4-24		
56, 57, 58	See chassis 55			
58	See chassis 10			
59 (Chassis 500)	See model 55			
60 Chassis, 61, 62	Schematic, socket	1-20	*386-D	1172
	Voltage, data	1-21	*386-F	1173
	Chassis views	1-22	*386-E	1174
66	Schematic	4-1		
	Chassis view	4-2		
	Point-to-point data	4-3		
	Installation notes	4-4		
	Voltage, installation notes	4-5		
	Parts list	4-6		
70 Chassis, 71, 72	Schematic, socket, voltage	1-1	*378	1149
	Power Pack—See 7-P-6 & 7-P-3			
70-B Chassis, 71, 72	Schematic, socket, voltage	1-5	*377	1153
	Chassis views	2-1	382-1	1159
	Data	1-10		
	Power Pack—See 7-BP-6 & 7-BP-3			
75 (Chassis 500)	See model 55 (500)			
77	See chassis 330			
85, 86, 998 (Chassis 800)	Chassis view, voltage, notes, parts list	4-30		
	Schematic, parts list, socket, point-to-point data	4-31		
90 Chassis, 91, 92	Schematic	1-11	*383	1161
	Chassis	2-3	384-2	1163
	Power Pack—See 9-P-6 & 9-P-3			
90-B Chassis, 90, 91, 98	Schematic, socket, voltage	1-12	*385	1164
95, 105 (Chassis 520)	Notes	4-25		
	Voltage, alignment, coil resistances	4-26		
	Schematic, socket, condenser assembly	4-27		
	Point-to-point data	4-28		
	Parts list	4-29		
100 Chassis, 101	Schematic	1-11	*383	1161
	Power Pack—See 9-P-6 & 9-P-3			
	Chassis	2-3	384-2	1163
100-B Chassis, 102, 103	Schematic	1-12	*385	1164
105	See model 95			
110 Auto Set	Schematic, chassis, data	2-17	386-R	1191
	Chassis view, voltage, parts list	4-7		
114	Schematic, socket, voltage	3-48		1234-F
	Chassis view, voltage, parts list, notes	4-8		
116	Chassis views, alignment data	4-9		
	Data	3-44		1234-B
Duro-Mite for 116	Data	3-43		1234-A
116, Type 1	Schematic, socket, voltage	3-45		1234-C
116, Type 3	Schematic, socket, voltage	3-46		1234-D
116, Type 4	Schematic, socket, voltage	3-47		1234-E
118	Schematic	5-2		
120 Chassis, 121	Schematic, voltage	2-18	386-T	1192
	Chassis (Bottom view)	2-19	386-U	1193
	Chassis (End view), service notes	2-20	386-V & W	1194
120-B Chassis, 123	Schematic, alignment, voltage	Misc. 6-10		
130-A, 130, 131, 132	Schematic, socket, voltage	1-13	*386	1165
150	Schematic	2-21	386-X	1195
151, 153, 154, 156	See chassis 15			
160 Chassis, 163	Schematic, socket	1-23	*386-G	1175
	Voltage, data—See Chassis 60			
180 Chassis, 181	Schematic, socket, voltage	1-8	*380	1156
	Chassis views	2-2	382-2	1160
	Data	1-10		
	Power Pack—See 8-P-6 & 8-P-3			
194	See model 44			
195 (Chassis 500)	See model 55 (500)			

MODEL	GRIGSBY-GRUNOW CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
200 Chassis, 201, 203, 204	Schematic	3-3		1196
	Chassis views, values	3-5		1197
	Voltage, speaker data, color code	3-6		1198
204	See chassis 10 and chassis 200			
210 Chassis, 211, 214, 215	Schematic	3-7		1199
	Chassis views, values	3-8		1200
	Voltage, color code	3-9		1201
220 Chassis, 221, 223	Schematic, transformer data, notes	3-10		1202
	Chassis views, values	3-11		1203
	Chassis view, voltage	3-13		1205
	Speaker data, record changer notes	3-12		1204
230-A, 233	Schematic, socket	1-13	*386	1165
251, 253, 254	See chassis 25			
251-B, 253-B, 254-B	See chassis 25-B			
290 Chassis, 291, 293, 294	Schematic, voltage	3-16		1208
	Silent tuning data	3-17		1209
294	See chassis 10 and chassis 290			
300 Chassis, 303, 304, 307	Schematic, power transformer data	3-18		1210
	Chassis layout, notes	3-19		1211
	Continuity and resistance check	3-20		1212
	Chassis	Changes 7-11		
310-A Chassis, (2 types), 311	Schematic	3-21		1213
310-A	Continuity and resistance check	3-24		1216
310-A, 310-B	Chassis layout	3-23		1215
310-B	Continuity and resistance check, data	3-25		1217
	Data	Changes 9-2		
310-B Chassis, (2 types), 314, 315	Schematic	3-22		1214
320 Chassis, 324	Schematic, data	3-26		1218
	Chassis layout	3-27		1219
	Continuity and resistance check	3-28		1220
330 Chassis, 331, 336, 77	Schematic, voltage, data, notes	3-29		1221
	Chassis layout, test data	3-30		1222
340 Chassis, 344	Schematic, color code	3-31		1223
	Chassis layout, voltage, test data	3-32		1224
351, 353	See chassis 35			
353 Record Changer	Notes	2-16	386-Q-8	1188
360 Chassis, 363	Schematic, voltage, transformer color code, speaker data	3-33		1225
	Chassis layout, test data	3-34		1226
	Resistance tuning indicator notes	3-35		1227
370 Chassis, 371, 373	Schematic, speaker data, alignment data, transformer color code	3-36		1228
	Chassis layout, voltage	3-37		1229
	Continuity and resistance test data	3-38		1230
380 Chassis, 381	Schematic, voltage	3-39		1231
390 Chassis, 393	Schematic, voltage, transformer color code	3-40		1232
	Chassis layout, continuity and test data	3-41		1233
400 Chassis, 411, 413	Schematic, voltage, alignment data	3-42		1234
	Socket layout	Changes 7-1		
	Changes	Changes 7-15		
400-A Chassis, 411-A, 413-A	Schematic, notes	4-10		
Chassis 440	See model 44			
460, 461, 463	Chassis view, voltage, parts list, notes	4-13		
	Schematic, alignment, color codes, notes	4-14		
490, 491, 493	Circuit notes	4-15		
	Vibrator notes, voltage	4-16		
	Coil resistances, vibrator notes	4-17		

THE HALLICRAFTERS INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
SX23, Super Skyrider, Skyrider 23	R-F switching schematic	10-12		
	Socket, trimmers, parts	10-13		
	Alignment, notes	10-14		
SX-24, Skyrider Defiant	Schematic	10-15		
	Antenna notes	10-10		
	Socket, trimmers, alignment, parts	10-16		

HALSON RADIO CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Dual Range	Schematic	3-2		1272
"Roadmaster"	Schematic	4-5		
	Socket layout	Changes 7-9		
Intermediate Frequencies	I-F. Peaks	Changes 7-4		
A-5	Schematic, socket, trimmers, alignment	9-1		
A-5S, S-5	Schematic, socket, alignment, trimmers	Misc. 10-6		
5LE	Schematic, socket	7-1		
MG-5	Schematic, socket	7-1		
AW6	Schematic, socket	7-2		
C-6, 163	Schematic, socket, trimmers, alignment	9-1		
6L6	Schematic, socket	7-3		
10	Schematic, socket, trimmers, alignment, parts	9-2		
20	Schematic, socket, trimmers, alignment, parts	9-3		
20-A	Schematic	4-1		
	Socket layout	Changes 7-9		
20-B	Schematic	4-1		
	Socket layout	Changes 7-9		
20-B European	Schematic	4-2		
25	Schematic, socket, trimmers, alignment, voltage, parts	8-1		
30	Schematic, socket, trimmers, alignment, parts	9-4		
35	Schematic, socket, trimmers, alignment, voltage, parts	8-2		
N.S. 40	Schematic	4-3		
	Socket layout	Changes 7-9		
45	Schematic, socket	6-1		
N.S. 50	Schematic	4-3		
	Socket layout	Changes 7-9		
50S	Schematic, socket	7-4		
50X	Schematic, socket	7-5		
52	Schematic, socket	6-1		
54	Schematic, socket	6-2		
60L	Schematic	7-7		
60M	Schematic	7-6		
MA63	Schematic, socket	7-8		
66-AW	Schematic, socket, notes, parts	6-3		
100, 100M	Schematic, socket	7-9		
102, 103	Schematic, socket, trimmers, alignment, parts	8-3		
104, 106	Schematic, socket, trimmers, alignment, parts	8-4		
161, 162	Schematic, socket, trimmers, alignment, voltage, parts	8-5		
163	See model C-6			
310, 711	Schematic, socket, trimmers, alignment, voltage, parts	8-6		
410	Schematic, socket, parts	5-1		
412	Schematic, socket, trimmers, alignment, parts	9-5		
515 SW	Schematic	3-1		1271
515	Schematic	3-1		1271
	Socket layout	Changes 7-9		
516	Schematic	3-3		1273
520	Schematic, socket, alignment	5-2		
530	Schematic, socket, alignment	5-3		
535	Schematic, socket, parts	6-4		
536	Schematic, socket	7-10		
580	Schematic, socket, parts	6-5		
606	Schematic, socket, trimmers, alignment, parts	9-6		
610 Dual Wave	Schematic, socket, alignment	5-4		
610	Schematic	4-4		
612	Schematic, socket, trimmers, alignment, parts	9-7		

HALSON RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
615	Schematic	3-3		1273
	Socket layout	Changes 7-9		
620	Schematic, socket, alignment	5-5		
630	Schematic, socket, alignment	5-6		
711	See model 310			
770-AW	Schematic, socket	6-6		
770AW Late	Schematic, socket	9-8		
1200	Schematic, parts	9-9, 10		
1900	Schematic, parts	9-9, 10		

HAMMARLUND MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
AC & DC Converters	Schematic	1-1	*786	1284
Comet Pro, Dec., '31	Schematic	3-1		1281
Comet Pro, July, '32	Schematic	3-1		1281
Comet Pro, Sept., '32	Schematic	3-2		1282
Comet Pro, Oct., '32	Schematic	3-2		1282
Comet Pro, Feb., '33	Schematic	2-1		1283
"Comet Pro" AVC	Schematic, voltage	5-1		
	Alignment, socket	5-2		
"Comet Pro" (Crystal)	Schematic	4-5		
	Chassis view	4-6		
	Service notes	4-7		
	Service notes	4-8		
"Comet Pro" (Standard)	Schematic	4-1		
	Chassis view	4-2		
	Chassis view	4-3		
	Service notes	4-4		
DeLuxe	Schematic	1-1	*786	1284
Hawk	Schematic	1-1	*786	1284
Super Pro	Schematic, voltage, trimmers	7-1, 7-2		
	Parts list	7-3, 7-4		
	Alignment, part 1	7-5		
	Alignment, part 2, socket, chassis	7-6		
	Circuit data, operating notes	7-7		
Trans-Oceanic Two	Schematic	1-1	*786	1284
Z-4 Commander	Schematic	1-1	*786	1284
SP110X, SP120X, SPR110X, SPR120X Super Pro Standard Model SP110 Series	Schematic, trimmers, crystal circuit, terminal voltages	9-1, 2		
	Parts list	9-3, 4		
	Tuning data, resonance curves, connections	9-5		
	Chassis, voltage, connections	9-6		
	Alignment	9-7, 8		
HQ-120X, Crystal	Schematic, socket, trimmers, notes.	10-1		
	Circuit data, voltage, alignment	10-2		
	Operating notes, parts	10-3		

HAMMARLUND-ROBERTS, INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
H-R 5-tube	Schematic	1-1	*393	1275
H-R "Hi-Q"	Schematic	1-1	*393	1275
H-R "Hi-Q" 6	Schematic, chassis wiring, data	1-2	*394	1276
H-R "Hi-Q" 29 Jr. (3 types)	Schematic, socket, data	1-3	*395	1277
H-R "Hi-Q" 29 Master (3 types)	Schematic, socket, data	1-4	*396	1278
H-R "Hi-Q" 30 (30-R Battery)	Schematic	1-5	*397	1279
H-R "Hi-Q" 30 AC	Schematic, socket	1-5	*397	1279
H-R "Hi-Q" 30 DC	Schematic, socket, voltage	1-6	*398	1280
H-R "Hi-Q" 31	Schematic	1-6	*398	1280

HARRIS MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
100, "A"	Schematic, socket	Misc. 9-4		
500, 600, 700	Schematic, socket, trimmers, voltage	8-1		
501W, 701W, 900, 1201W	Schematic, socket, trimmers, voltage	8-2		
800	Schematic, socket, trimmers, voltage	8-3		
1000	Schematic, socket, trimmers, voltage	8-4		
1201W	See model 501W			

HATRY & YOUNG

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
H-Y 7	Schematic, parts list	Misc. 1-10	*784	2754
H-Y 7, Battery	Schematic	Misc. 1-10	*784	2754
H-Y 7-B	Schematic	Misc. 1-10	*784	2754

HETRO ELECTRICAL INDUSTRIES

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
A, B Tuners	Installation data	9-5		
	Installation, concluded, adjustments, operating data	9-6		
6-Tube AC	Schematic, voltage, socket, trimmers, alignment	6-11		
6-Tube, AC-DC	Schematic, voltage, socket, trimmers, alignment	6-12		
8-Tube Superhet	Schematic	6-13		
	Voltage, socket, parts, trimmers	6-14		
9-Tube Air-Ace	Schematic, socket, trimmers, voltage	6-15		
	Alignment	6-16		
	Changes	7-4		
F5, F6, F7, F8	Schematic, alignment	Misc. 8-2		
6LB, 6SB	Schematic, socket, trimmers, alignment, battery connections	6-4		
F-9 to F-12 incl. Series FA	Schematic	7-1		
F-13 to F-20 incl. Series FA	Schematic	7-2		
F-21 to F-28 incl. Series FA	Schematic	7-3		
22, 2 types	Schematic, voltage	6-1		
31, 2 types	Schematic, voltage	6-2		
H47, H48	Schematic	9-12		
H61, H62, HP61, HP62	Schematic, voltage, parts, phonograph circuit	9-1		
	Socket, trimmers, alignment, parts	9-2		
H63, H64, HP63, HP64	Schematic, voltage, parts, phonograph circuit	9-3		
	Socket, trimmers, alignment, parts	9-4		
HA67	Schematic, voltage	9-5		
71	Schematic, voltage	6-3		
H85, H93, HP85, HP93	Schematic, voltage, parts, phonograph circuit	9-7		
	Socket, trimmers, alignment, parts	9-8		
H87, HP87	Schematic, voltage, phonograph circuit, parts	9-9		
	Socket, trimmers, alignment, parts	9-10		
207, 257	Schematic, parts	6-5		
209, 259	Schematic, parts	6-6		
251	Schematic	6-7		
293, Series V	Schematic	7-4		
295	Schematic, parts	6-8		
297	Schematic, parts	6-9		
412	Schematic, socket	6-10		
466	Schematic, socket	6-10		
10310, 10410, 10510, 10610, Series B	Schematic	9-11		
14610, 14710, 15010, 15110, 15210	Schematic	9-13		
14810, 14890, 14910, 14990	Schematic	9-14		

HICKOK ELECTRICAL INSTRUMENT CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
48 Volt-Ohmmeter	Schematic	3-1		1285
4600 Tester	Schematic	3-1		1285
4700 Tester	Schematic	3-1		1285
4949 Volt-Ohm-Capacity Meter	Schematic	3-2		1286

HIGH FREQUENCY LABORATORIES

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
A-C Special	Schematic	1-1	*787	1287
Mastertone 1929	Schematic	1-2		1288
Mastertone 1931	Schematic voltage		*399	
4-Tube Pentode	Schematic	Misc. 6-12		
9-in-Line	Schematic	1-1	*787	1287
Isotone 10	Schematic	1-2	*399	1288
117-4	Schematic	3-1		1289
160-6	Schematic	3-2		1290
200	Schematic	3-2		1290
222	Schematic	3-1		1289

CHARLES HOODWIN CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Aero A-F. Amplifier	Schematic	4-7		
Aero Auto Set	Schematic	2-1		1293
Aero 1932 Converter	Schematic	2-1		1293
A (1932), Aero Pentode Auto	Schematic	3-1		1291
B (1932), Aero Pentode Auto	Schematic	3-2		1292
1-Tube SW	Schematic	4-1		
2-Tube SW	Schematic	4-1		
4-Tube SW	Schematic	4-1		
4-Tube DC	Schematic	4-2		
4-Tube TRF	Schematic	4-6		
5-Tube TRF	Schematic	4-6		
5-Tube DC	Schematic	4-7		
5-Tube AC	Schematic	4-7		
6-Tube DC Superhet	Schematic	4-2		
6-Tube Batt. Super.	Schematic	4-3		
6-Tube AC Superhet	Schematic	4-4		
6-Tube 32-volt DC Super	Schematic	4-5		
6-Tube 110-volt DC Super	Schematic	4-5		
"International Aero" 11-Tube All-Wave	Schematic	4-8		

HERBERT H. HORN

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
1934	Schematic	5-2		
4T	Schematic	9-1		
5	Schematic	6-1		
5A	Schematic	7-1		
5MT	Schematic	6-2		
5MTD	Schematic	7-2		
7MT	Schematic	6-3		
9MT, 9MTC	Schematic	6-4		
9MT, 9MTC, Revised	Schematic	7-3		
10MT	Schematic	7-4		
11A	Schematic	9-2		
15	Schematic, voltage, data	3-1		1295
	Service data	3-2		1296
15M	Schematic, voltage, socket, notes	6-5		
16MT	Schematic	8-1		
17MT	Schematic	7-5		
21, 25	Schematic	4-1		
24	Schematic	4-2		
36	Schematic	4-2		
50, 50B	Schematic	9-1		
51	Schematic	7-6		
52	Schematic	7-7		
55	Schematic	6-1		
58	Schematic	4-3		
58, 158	Schematic, socket	5-2		
59, 69, 90	Schematic, socket, voltage	3-3		1297
62	Schematic	7-6		
63	Schematic	7-8		
66	Schematic	6-6		
66MT	Schematic	6-9		
66MT, Revised	Schematic	7-1		
67	Schematic	9-3		
69	See model 59			
70, 71	Schematic	3-4		1298
	Voltage, socket, data	3-5		1299
76	Schematic	7-4		
77	Schematic	6-1		
79, 99, 109	Schematic, voltage, socket	6-7		
	Alignment, changes	6-8		
83	Schematic	7-8		
87	Schematic	9-4		
90	See model 59			
97	Schematic	9-4		
101, 110	Schematic, socket, data	2-1		1303
	Voltage, alignment data	2-2		1304
101-B, 102	Schematic	3-6		1300
	Voltage, socket	3-7		1301
	Condenser adjustments	3-8		1302
109	See model 79			
110	See model 101			
112-A	Schematic	5-1		
156	Schematic	5-2		
	Schematic	4-4		
156AW	Schematic	6-2		

HERBERT H. HORN—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
158	Schematic	4-4		
	Socket, schematic—See model 58			
518	Schematic	9-3		
535	Schematic	7-7		
537, 538	Schematic	8-2		

HOWARD RADIO CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Intermediate Frequencies	I-F. Peaks ......Changes 7-4			
A (SW Converter)	Schematic, socket	3-9		1333
AVH, AVH-P Chassis	See models 45 & 60			
AVO Chassis	See model 35-A			
D,F	Chassis wiring	6-5		
	Alignment	6-6		
EX, Dual Range	Schematic, socket	3-2		1324
F	Schematic, voltage	6-4		
F Pentode	Schematic	2-1		1325
H Chassis (35-40) Pushpull 47s	Chassis views	2-5	404-G	1339
	Schematic, socket	2-3	404-E	1315
	Adjustment data	2-4	404-F	1316
H Chassis, (35, 40) Push-pull '45	Schematic, socket	3-3		1327
	Alignment data	3-4		1328
K Chassis	See model 400			
L Chassis	See model 420			
	Revisions	3-6		1330
M Chassis	Revisions	3-6		1330
M Chassis 1st type	Schematic	3-7		1331
O Chassis	See model 20			
Q	Alignment data	4-2		
	Schematic, voltage	4-3		
	Socket layout ......Changes 7-9			
SG "A" RF Chassis	Schematic	1-6	*403	1312
SG "C" RF Chassis	Schematic	1-6	*403	1312
SG "A" AF Chassis	Schematic	1-7	*404	1313
SG "C" AF Chassis	Schematic	1-7	*404	1313
SG "B" (Miniature)	Schematic, socket	2-14	404-A	1314
SG-T	Schematic, socket	2-10	404-J	1322
	Chassis views, parts list, data	2-11	404-J-1	1323
T Chassis	See model 10			
W, Explorer, (Type 1)	Schematic	5-4		
W, Explorer (Type 2)	Schematic	5-5		
W, Explorer Power Amplifier	Schematic	5-6		
W, Explorer Receiver	Socket layout, trimmers	5-7		
	Socket layout, trimmers	5-8		
	Notes, alignment	5-9		
	I-F. Alignment, R-F., Oscillator alignment	5-10		
	Power amplifier notes, parts list	5-11		
	Parts list	5-12		
	Schematic, voltage	6-13		
	Power pack schematic	6-14		
	Socket layout ......Changes 7-9			
Grand, Series 1	Schematic	6-15		
	Amplifier & SPU schematic	6-16		
Grand, Series 2	Schematic	7-1		
	Socket, trimmers, alignment	7-2		
Green Diamond "8" (Mag. Spkr.)	Schematic, socket, voltage data	1-3	*401	1309
Green Diamond "8" (Dynm. Spkr., '71)	Schematic, socket, voltage data	1-4	*402	1310
Green Diamond "8" (Dynm. Spkr., '45)	Schematic, socket, voltage data	1-5	*402	1311
1, 2, "Perm-A-Matic" Tuner	Adjustments	10-16		
	Changes	10-17		
HA-1	See model 670-A			
HA-2	See model 52			
S-2, S-7	Schematic	4-1		
	Socket layout ......Changes 7-9			
X-2, X-3, Y-3	Alignment data	4-4		
	Schematic, voltage	4-5		
	Socket layout ......Changes 7-9			
HA-8	Schematic, socket, alignment, notes	6-11		

HOWARD RADIO CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
J-3 Compact	Schematic, changes	3-12		1336
4B	Schematic, voltage, notes	10-1		
	Alignment	10-7		
	Socket, trimmers, tuner data, dial	10-8		
4BT	Schematic, voltage, notes	10-2		
	Alignment	10-7		
	Socket, trimmers, tuner data, dial	10-8		
Cable-Nelson D-4	Schematic, socket, voltage	2-12	*806	1326
HA-4	Schematic, socket, alignment	6-12		
Z-4	Alignment data	4-6		
	Schematic, voltage	4-7		
A-5	Schematic, socket	1-1		1305
E5B	Schematic, phonograph and headphone circuits	9-1		
	Alignment, trimmers	9-3		
5B	Schematic	8-1		
	Trimmers	8-2		
	Alignment, notes	8-3		
A-6	Schematic, socket	1-1		1305
HA-6, Early	Schematic, parts list	7-3		
	Alignment, notes, socket, trimmers	7-4		
	Installation data, noise notes	7-5		
	Parts list, notes	7-6		
	Installation data	7-7, 7-8		
HA-6, Late	Schematic, voltage, parts list	7-9		
	Alignment, socket, trimmers, speaker	7-10		
6B	Schematic, parts	9-4		
6B-A	Schematic, alignment, parts	9-5		
HA-7, HA-9	Schematic, voltage, alignment	10-3		
S-7	See model S-2			
SN-7	Schematic, socket	1-2	*401	1308
7BT	Schematic, voltage	9-6		
D-8	Schematic, voltage	6-17		
HA-8	Schematic, voltage, alignment	10-3		
X-8	See model X-2			
HA-9	See Model HA-7			
R-9	Schematic	5-1		
	Parts layout, socket, trimmers	5-2		
	Alignment data	5-3		
10 (T)	Schematic, socket	2-10	404-J	1322
	Chassis views, parts list, data	2-11	404-J-1	1323
A-12	Schematic, socket	6-1		
B-13	Schematic, socket	6-1		
E-14, E-107	Schematic, alignment	6-2		
20, 25, 30, 32 (O)	Schematic, socket	2-8	404-I	1320
	Chassis views	2-13	404-I-1	1337
	Voltage, service data	2-9	404-I-2	1321
CC-23, CC-24	Schematic, socket	6-3		
AA-25	Schematic, socket	6-3		
G-26	Schematic, socket	6-3		
30, 32	See model 20			
35, 40	See chassis H			
35-A (Chassis AVO)	Schematic	3-11		1335
45, 60 (AVH)	Schematic, socket	2-7	404-H	1317
	Alignment data	2-6	404-I-3	1318
	Chassis view	3-10		1334
45, 60 (AVH-P)	Data	3-10		1334
47-A	Schematic, voltage	7-11		
	Alignment, parts	7-12		
50	Schematic, voltage	7-11		
	Alignment, parts	7-12		
50-SW	Schematic, voltage	7-11		
	Alignment, parts	7-12		
52, 502, HA-2	Schematic, socket, trimmers, notes	6-10		
56	Schematic, voltage	8-2		
57-A	Schematic, voltage	7-13		
	Parts list	7-12		
	Notes	7-14		
57-AUS	Schematic, voltage	7-13		
E-57	Schematic, voltage	7-13		
	Alignment, parts	7-12		
58	Schematic, voltage	7-15		
	Alignment, socket, trimmers, parts list	7-16		

MODEL	HOWARD RADIO CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
59	Schematic, voltage	9-26		
60	Schematic, voltage, socket, notes	7-14		
60 (AVH)	See model 45			
	Phonograph data	3-1	574-A	1819
60-SW	Schematic, voltage, socket, notes	7-14		
	Parts list	7-12		
67C, 67T	See model 626			
68	Schematic, voltage	7-17		
	Circuit data, notes, parts	7-18		
68 (Revised)	Schematic, voltage	8-5		
	Socket, trimmers	8-4		
	Alignment	8-6		
77 Long Wave	Schematic, voltage, socket, notes	7-21		
77-C, 77-T	Schematic, voltage, socket, trimmers	7-19		
	Alignment, chassis	7-20		
99 Long Wave	Schematic, voltage, notes, alignment	7-22		
99-C, 99-T	Schematic, voltage, socket, parts	7-23		
	Alignment, chassis	7-24		
E-107	See model E-14			
118, 218	Schematic, voltage	8-7		
	Socket, trimmers	8-8		
	Alignment	8-9		
135 A. C.	See model 395			
135 DC	Schematic, socket, data	2-2		1807
200	Schematic, voltage	9-26		
210, Push-Button Adapter	Schematic, instructions, parts	10-5		
	Instructions, tuner	10-7		
211, Push-Button Converter	Schematic	10-6		
	Instructions, tuner	10-7		
214	Schematic, voltage	8-11		
	Socket, trimmers, alignment, parts	8-12		
218	See model 118			
220, 270	Schematic, voltage, notes	10-9		
	Alignment	10-7		
	Socket, trimmers, tuner data, dial	10-8		
221, 271	Schematic, voltage, notes	10-10		
	Alignment	10-7		
	Socket, trimmers, tuner data, dial	10-8		
225, S225, 250, S250	Schematic, voltage	9-9		
	Socket, trimmers, alignment, Part 1	9-13		
	Trimmers, alignment	9-14		
240-1	Schematic, voltage	9-7		
	Phonograph data, tuner data, parts	9-8		
	Alignment, notes	9-18		
240-2	Schematic, voltage	9-7		
	Phonograph data, tuner data, parts	9-8		
	Alignment, notes	9-18		
250, S250	See model 225			
E256	Schematic, voltage	9-2		
	Phonograph and headphone circuits	9-1		
S-256	Schematic, voltage	8-10		
	Trimmers	8-2		
	Alignment	8-3		
256	Schematic, voltage	8-10		
	Trimmers	8-2		
	Alignment, notes	8-3		
E259	Schematic, voltage	9-2		
	Phonograph and headphone circuits	9-1		
S-259	Schematic, voltage	8-13		
	Trimmers	8-2		
	Alignment	8-3		
259	Schematic, voltage	8-13		
	Trimmers	8-2		
	Alignment	8-3		
260, S260	Schematic, voltage, phonograph data, parts	9-10		
	Trimmers, alignment, Part 1	9-13		

MODEL	HOWARD RADIO CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
260, S260	Trimmers, alignment, Part 2	9-14		
266	Socket, trimmers	8-4		
	Alignment	8-6		
268	Schematic	8-1		
	Socket, trimmers	8-4		
	Alignment	8-6		
270	See model 220			
271	See model 221			
275C, 275T, 280	Schematic, voltage	9-11		
	Socket, trimmers	9-12		
	Alignment, Part 1	9-13		
	Alignment, Part 2	9-14		
X275	Schematic, voltage	10-11		
	Alignment, trimmers, parts	10-12		
285	Schematic, voltage, notes	10-13		
	Alignment, trimmers, part	10-12		
318, 325	Schematic	9-15		
	Parts list	9-16		
	Socket, trimmers, voltage	9-17		
	Alignment, notes	9-18		
318D, 325D, 375	Schematic	10-14		
	Alignment, socket, triimmers	10-15		
	"Perm-A-Matic" tuner adjustments	10-16		
	Phonograph data	10-20		
368	Schematic	9-15		
	Parts list	9-16		
	Socket, trimmers, voltage	9-17		
	Alignment, notes	9-18		
377	Schematic, voltage, socket	10-15		
395, 445, 470, 495 (135 AC)	Schematic, socket	1-8	*400	1806
400	Schematic, voltage	9-19		
	Phonograph data, notes, parts	9-21		
	Antenna data, notes, tuner	9-22		
	Socket, trimmers	9-24		
	Alignment	9-25		
400-A	Schematic, voltage	9-20		
	Phonograph notes, parts	9-21		
	Antenna notes, tuner	9-22		
	Tuner data	9-23		
	Socket, trimmers	9-24		
	Alignment	9-25		
400 (K)	Schematic, socket	3-8		1832
400X	Schematic, voltage	10-4		
418	Schematic, voltage	10-18		
	Socket, trimmers, alignment, phono. data	10-20		
	"Perm-A-Matic" tuner adjustments	10-16		
420 (L) 1st type	Schematic, socket	3-5		1829
425	Schematic, voltage	9-19		
	Phonograph notes, parts	9-21		
	Antenna notes, tuner	9-22		
	Socket, trimmers	9-24		
	Alignment	9-25		
425-A	Schematic, voltage	9-20		
	Phonograph notes, parts	9-21		
	Antenna data, notes, tuner	9-22		
	Tuner data	9-23		
	Socket, trimmers	9-24		
	Alignment	9-25		
430, Series 2	Schematic, voltage	10-21		
	Alignment, socket, trimmers, dial data	10-22		
438	Schematic	10-23		
	Dial data	10-22		
	Alignment, socket, trimmers	10-24		
440, Series 1, 2	Schematic, voltage	10-25		
	Crystal alignment	10-24		
	Alignment, socket, trimmers	10-26		
450	Schematic, voltage	10-27		
	Socket, trimmers, chassis	10-28		
	Antenna data, color code, notes	10-30		
	Alignment	10-31		
450A	Schematic, voltage	10-29		
	Socket, trimmers, chassis	10-28		
	Antenna data, color code, notes	10-30		
	Alignment	10-31		

HOWARD RADIO CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
468	Schematic, voltage	10-19		
	Socket, trimmers, alignment, phono. data	10-20		
	"Perm-A-Matic" tuner adjustments	10-16		
502	See model 52			
525	Schematic, voltage, socket	10-32		
	"Perm-A-Matic" tuner adjustments	10-16		
	Socket, trimmers, alignment, phono. data	10-20		
626, 1626, 67-C, 67-T	Schematic, voltage, parts	8-15		
	Socket, trimmers, chassis	8-14		
	Alignment	8-16		
670-A, HA-1	Schematic, voltage, parts	6-7		
	Alignment, notes	6-8		
	Socket, trimmers, parts details	6-9		
1626	See model 626			

HUDSON MOTOR CAR CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
CB-6	Schematic, socket, trimmers, alignment data	9-1		
	Chassis wiring	9-2		
	Voltage, alignment	9-3		
	Alignment, concluded	9-4		
H-6	See RCA model H-6			
DB-37	Schematic, socket, trimmers, specifications	9-5		
	Alignment, Part 1	9-3		
	Alignment, Part 2	9-4		
	Chassis wiring	9-6		
	Voltage, parts	9-7		
SA-37	Schematic, socket, trimmers, specifications	9-9		
	Voltage, parts	9-8		
	Alignment, Part 1	9-3		
	Alignment, Part 2	9-4		
	Chassis wiring	9-10		
DB-38	Schematic, socket, trimmers, alignment	10-1		
	Chassis wiring, voltage, connections	10-2		
	Alignment procedure	10-4		
SA-38	Schematic, socket, trimmers, alignment	10-1		
	Chassis wiring, voltage, connections	10-3		
	Alignment procedure	10-4		
650HD, 651HE, 660TD, 661TE	See Zenith model 650HD			
680	See Zenith model 680			

HUDSON-ROSS

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Legion	Schematic	Misc. 6-13		
38	Schematic	5-1		
48	Schematic	5-1		
59	Schematic	5-2		
69	Schematic	5-3		
80	Schematic	5-4		

HUPMOBILE

See PHILCO RADIO & TELEVISION CORP.

ICA

See INSULINE CORP. OF AMERICA

IMPERIAL

See TRIANGLE ELECTRIC CO.

INSULINE CORP. OF AMERICA

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Auxiliary Tube Checker	Schematic	4-1		
	Chart	4-2		
"Classic"	Schematic	5-6		
Conqueror SW AC	Schematic	2-6	8-405	1848
Conqueror, SW Batt.	Schematic	2-10	7-405	1852

INSULINE CORP. OF AMERICA.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
DC 110-volt AVC, Super Seven Long Wave-Broadcast	Schematic	4-3		
"Elite"	Schematic	5-5		
Envoy 6 Tube AC	Schematic	2-1	1-405	1341
Envoy Midget	Schematic	2-1	1-405	1341
Envoy Midget DC (Rev) 1st	Schematic	2-2	2-405	1342
Envoy Midget DC (Rev) 2nd	Schematic	2-2	2-405	1342
Envoy Brdcst-LW DC	Schematic	2-3	3-405	1343
Envoy Brdcst-LW AC	Schematic	2-4	4-405	1344
Envoyette	Schematic, socket	Misc. 6-14		
Envoyette, 5-tube AC	Schematic	3-2		1350
Envoyette, 5-tube DC	Schematic	3-2		1350
Envoyette, Long Wave AC	Schematic	3-2		1350
ICA-ette	Schematic	Misc. 6-14		
"Icasix" (2 bands)	Schematic, socket	5-3		
"Icasix" (3 bands)	Schematic, socket	5-4		
Insulette-4 Tube Midget AC	Schematic	2-5	5-405	1345
Insulette Brdcst-LW AC	Schematic	2-5	5-405	1345
Mascot, Brdcst-Long Wave, 4-tube Midget	Schematic	2-5	5-405	1345
Mascot 4 Tube Midget AC	Schematic	2-5	5-405	1345
Super-Conqueror, Short-Long Wave	Schematic	2-7		1849
"Super-Conqueror" AC, 108-250 volts, w/Noise Suppressor	Schematic	4-14		
Super Six AVC, Long Wave	Schematic	4-4		
Super Six AVC, Broadcast	Schematic	4-5		
"Superseven" AC, Long Wave	Schematic	4-16		
"Trans-Atlantic"	Schematic, socket	5-1		
"Trans-Pacific"	Schematic, socket	5-2		
"Una-Radio Nine" AC-DC	Schematic	4-15		
Universal Companion, AC-DC-Batt.	Schematic	2-8		1346
Universal Companion, AC-DC-Batt. (Revised)	Schematic	2-9	6-405	1847
Universal Mascot	Schematic	2-8		1346
5-Tube Unaradio Super AC-DC "Americus"	Schematic	4-6		
5-Tube Unaradio Super AC-DC "Aiglon"	Schematic	4-7		
5-Tube Unaradio Super AC-DC "Atlantic"	Schematic	4-8		
5-Tube Unaradio Super AC-DC "Bijou"	Schematic	4-9		
5-Tube Unaradio Super AC-DC "Latinic"	Schematic	4-10		
5-Tube Unaradio Super AC-DC "Mignon"	Schematic	4-11		
5-Tube Unaradio Super AC-DC "Gnome"	Schematic	4-12		
5-Tube Unaradio Super AC-DC "Pacific"	Schematic	4-13		
6-tube Superhet. AC	Schematic	3-1		1851
7-tube Superhet. 220-v. DC	Schematic	3-1		1851

INTERNATIONAL INDUSTRIES, INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Classic	See model 10			
A, B Kaydette	Schematic, parts list	4-1		
	Alignment data	4-2		
BW, CD	See model A-7			
CB (Battery)	Schematic	5-3		
CM	Schematic, voltage	5-4		
	Alignment data	5-8		
CMS	Schematic	5-3		
CS (SW)	Alignment data	3-3		1855
CS	Schematic, socket, voltage, data	3-4		1856
D, DSP Chassis	See model DA-8			
DAC Chassis	See model A-7			
DAS Chassis	See model A-8			

INTERNATIONAL INDUSTRIES, INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
ES Chassis	See model ES-19			
F Kaydette, Jr. (Four types)	Schematic, parts list	4-3		
F Kaydette, Jr.	Voltage, condensers, notes	4-4		
	Parts list, notes	4-5		
J	Schematic, socket, voltage	3-5		1357
JS (SW)	Alignment data	3-2		1354
	Schematic, socket, voltage	3-1		1353
KS	Schematic, socket, voltage	3-1		1353
L Chassis	See model 10			
M Chassis	See model K-40			
P	Schematic, notes	9-8		
T, TS	Schematic, socket	3-5		1357
Jewel	See model 40			
Kadette	Schematic, chassis views, adjustments	3-2		1354
Regal	See model K-40			
St. Regis	See model K-60			
KRC-2, Tunemaster	Schematic	10-1		
	Alignment	10-2		
K-6 Chassis	See model K-60			
A-7, BW, CD (DAC)	Schematic, voltage	5-5		
	Alignment data	5-8		
A-8, A-9, A-10, AD-11, AD-12 (Chassis DAS)	Schematic, voltage	5-6		
	Alignment data	5-8		
DA-8, DA-9, DA-10, D-11, D-12, D-14 (Chassis D, DSP)	Schematic, voltage	5-7		
	Alignment data	5-8		
10, 11 ,12, 13, 14, 15, 16, Classic, Chassis L	Schematic, voltage	8-1		
10 (1938)	Schematic, socket, alignment, voltage	9-1		
AD-11, AD-12	See model A8			
D-11, D-12, D-14	See model DA8			
ES-19, ES-20, ES-30 (Chassis ES)	Schematic, alignment	5-8		
KR 20, Autime	Schematic, voltage, alignment	10-2		
21, 22, 23	Schematic, voltage	8-1		
25, 56	Schematic	6-3		
25, 26, 27, 28 (1938)	Schematic, socket, alignment, voltage	9-1		
ES-25	Schematic	6-3		
26, 226	Schematic, parts list	6-1		
	Voltage, alignment, data	6-2		
35	Schematic, voltage, alignment	8-2		
36	Schematic, socket, alignment, voltage	8-3		
40, Jewel (Early)	Schematic	6-4		
40, 41, 43, 44, 45, 46, 47, 48 Jewel	Schematic, parts	7-1		
K-40 Regal (M)	Schematic, voltage, data	3-6		1358
41, 43 (1938)	Schematic, voltage, socket, alignment	9-2		
50	Schematic	6-4		
52	Schematic, parts	6-5		
	Voltage, alignment	6-6		
53, 553, Early and late	Alignment	6-7		
	Schematic	6-8		
53, 553	Trimmers, parts, voltage	6-9		
	Changes	Changes 7-7		
55	Schematic	6-10		
AW-55	Schematic, socket, voltage	3-4		1356
56	See model 25			
56X, 86X	Schematic, voltage	8-4		
60	Schematic	6-10		
K-60, St. Regis (Chassis K-6)	Schematic	5-1		
	Voltage, alignment	5-2		
61, 661	Schematic, parts	6-11		
	Voltage, trimmers, alignment	6-12		
65	Schematic	6-13		
66X, 86, 96	Schematic, parts	7-2		
	Socket, voltage, alignment	7-1		
70	Schematic	6-13		
71	Schematic	6-14		
71C	Schematic	6-14		
72	Schematic, alignment	6-15		
	Parts list	6-16		

INTERNATIONAL INDUSTRIES, INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
76X, 676X	Schematic, voltage	8-4		
77, 777, 778, 779	Schematic, voltage, changes	7-3		
	Alignment, parts	7-4		
85	Schematic	6-17		
	Alignment, voltage, parts	6-18		
86	See model 66X			
86X	See model 56X			
87	Schematic	7-5		
	Voltage, socket, alignment, parts	7-6		
90	Schematic	6-19		
	Alignment, voltage, parts	6-20		
96	See model 66X			
105, EL-105, 1050	Schematic	6-21		
105, 1050	Alignment, voltage, trimmers, parts	6-22		
120, 1200, 2200	Schematic, trimmers, voltage	6-23		
	Alignment, parts	6-24		
150, 151	Schematic, socket, voltage, alignment	8-5		
210 Converter	Schematic, notes	9-8		
226	See model 26			
400	Schematic, socket	7-7		
	Alignment, parts	7-8		
500	Schematic, parts	7-9		
	Alignment, socket, battery connections	7-10		
553	See model 53			
617	Schematic, voltage, socket alignment	9-2		
630	Schematic, socket	9-3		
	Alignment, voltage	9-4		
634, 635, 3734	Schematic, socket	9-3		
	Alignment, voltage	9-4		
661	See model 61			
676X	See model 76X			
735	Schematic	9-3		
	Alignment, voltage	9-4		
739	Schematic, socket	9-5		
	Voltage, alignment	9-6		
777, 778, 779	See model 77			
845	Schematic	10-1		
950	Schematic, socket	9-5		
	Voltage, alignment	9-6		
1019, 1024	Schematic, socket, trimmers, voltage, alignment	8-6		
1030, 1035	Schematic, socket	9-9		
1050	See model 105			
1129, 1149	Schematic, socket	9-7		
	Voltage, alignment	9-6		
	Alignment, voltage	9-10		
1140	Schematic, socket	9-9		
	Alignment, voltage	9-10		
1159	Schematic, socket	9-7		
	Voltage, alignment	9-6		
1200, 2200	See model 120			
3734	See model 634			

INTEROCEAN RADIO CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
202	Schematic, voltage, socket, alignment, trimmers	10-1		
204	Schematic, socket, trimmers, voltage, alignment	10-2		
500, 515, 516, Chassis 2037	Schematic, socket	7-1		
	Voltage, alignment, parts list	7-2		
505	Schematic, alignment	10-2		
	Socket, trimmers	10-4		
508, 522, 525, 525A	Schematic, voltage, trimmers	10-3		
Chassis 508	Alignment, socket	10-4		
511, 524, 527, 527A	Schematic, voltage, trimmers	10-3		
Chassis 511	Alignment, socket	10-4		
520, 521 (Chassis 2035)	Schematic	5-1		
	Voltage, socket, parts list	5-2		
530, 531, 533 (Chassis 2038)	Schematic	5-3		
	Voltage, socket, alignment	5-4		

JACKSON-BELL CO., LTD.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
4	Schematic	7-1		
5-A	Schematic	5-1		
24	Schematic	3-1		1359
25	Schematic, data	3-2		1360
25-A, 25-U	Schematic	3-3		1361
26	Schematic, alignment data	3-4		1362
26-SBL	Schematic	3-6		1364
27, 1st type	Schematic, alignment data	3-5		1363
27, 2nd type	Schematic	3-6		1364
28	Schematic, service notes	3-7		1365
	Alignment data	3-8		1366
29	Schematic	3-9		1367
	Alignment data	3-10		1368
33	Schematic, data	2-1		1369
Junior 50	Schematic, voltage	7-2		
59	Schematic	7-3		
60	Schematic	7-3		
	Alignment, voltage	7-5		
62, 63, 64, (Early) Under Serial #120,000	Schematic	3-3		1361
62, 2nd & 3rd Series	Schematic, socket	7-4		
	Alignment, voltage	7-5		
68	Schematic, voltage, socket, trimmers	7-6		
	Alignment, voltage	7-5		
84	Schematic, voltage, alignment	6-1		
86	Schematic	5-2		
87	Schematic, socket, voltage, alignment	6-2		
88	Schematic, voltage, alignment	6-3		
89	Schematic	4-1		
89-A	Schematic, socket, voltage, alignment	6-4		
96	Schematic	5-2		
99	Schematic	5-1		
205 Auto Set	Schematic, data	3-1		1359
845S	Schematic	7-1		

JACKSON RADIO & TELEVISION CO.

J-104, 401-A, 447	Schematic	Misc. 5-8		
J-105, 504-B, SF-547	Schematic	Misc. 4-4		

JACKSON RESEARCH LABORATORY

NJ-8	Schematic	Misc. 6-15		

J. E. JENKINS & S. E. ADAIR

A (2 types)	Schematic	1-2	*702	1372
Level Indicator	Schematic	1-2	*702	1372
Monitor Amplifier	Schematic	1-2	*702	1372
Pushpull Amplifier	Schematic	1-2	*702	1372
3B Mixing Panel	Schematic	1-1	*701	1371
3C Mixing Panel	Schematic	1-1	*701	1371

KADETTE

See INTERNATIONAL INDUSTRIES, INC.

KARADIO CORP.

56	Schematic, socket	Misc. 5-9		

KELLER-FULLER

F	Schematic	3-1		1373
M	Schematic	3-1		1373
Radiette F-12	Schematic	3-2		1374
Radiette F-14	Schematic	3-2		1374
Radiette F-14-A	Schematic	3-3		1375
Radiette F-14-B	Schematic	3-3		1375
Radiette 30	Schematic	3-4		1376
Radiette 40	Schematic	3-5		1377
Radiette 50	Schematic	3-5		1377
Radiette 60	Schematic	3-6		1378
Radiette 70	Schematic	3-6		1378

KELLOG SWITCHBOARD AND SUPPLY CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Chassis B	Schematic, voltage	1-2	*408	1380
Wave Master	Schematic	1-1	*407	1379
6-tube Battery	Schematic	1-1	*407	1379
7-tube Cascade	Schematic	1-1	*407	1379
AC-7-tube	Schematic, voltage	1-2	*408	1380
523, 524, 525, 526, 527, 528 RF	Schematic	1-3	*409	1381
523, 526 Power Unit	Schematic, socket, voltage	1-4	*410	1382
524, 525, 527, 528 Power Unit	Schematic, socket, voltage	1-5	*411	1383
533, 534, 535, 536, RF Chassis	Schematic, socket	1-6	*410-A	1384
RFL 701	Schematic	1-2	*407	1380

COLIN B. KENNEDY CORP.

Coronet	See model 42 & 7 DC			
Globe Trotter	See model 54			
Royal	Schematic	1-5	*416	1389
5	Schematic	1-2	*413	1386
6, Type 420	Schematic	1-2	*413	1386
6, Type 421	Schematic	1-2	*413	1386
7-Coronet DC	Schematic, socket	1-3	*414	1387
10	Schematic, socket, voltage	1-4	*415	1388
15, 16 (Type 430-43)	Schematic	1-1	*412	1385
20, Type 440	Schematic	1-3	*414	1387
20	Schematic, socket, voltage	1-4	*415	1388
22, 36, 38, 40 DC	Chassis layouts	2-1	416-2	1391
	Schematic, parts list, data	2-2	416-1	1390
24	Schematic, voltage, chassis, data	2-3	416-3, 4	1392
26	Schematic, chassis, notes	1-6	*416-C	1394
30, Type 485	Schematic, voltage	1-3	*414	1387
30, 32	Schematic chassis	1-7	*416-A	1393
34	Schematic, voltage	1-8	*416-F	1396
	Chassis wiring	1-9	*416-B	1397
	Changes, data	1-10	*416-H	1398
Coronet 42	Schematic, chassis, voltage	1-11	*416-E	1395
42-B	Schematic	4-1		
44	Schematic	2-4	416-I	1399
48	Schematic	2-5	416-J	1400
50	Schematic, chassis, alignment data	2-6	416-K	1401
52	Schematic, socket, voltage, data	2-7	416-L	1402
53-SW, 54-SW	Parts list, data	2-8	416-L-2	1404
	Schematic, chassis calibration scales	2-9	416-L-1	1403
54 "Globe Trotter"	Schematic, chassis, data	2-10	416-M	1406
54-A	Schematic, chassis, data	2-11	416-L-3	1405
55	Voltage, socket, data, schematic	4-2		1407
56	Schematic, socket, voltage, parts list	2-12	416-N	1408
Royal 60	Schematic, socket	1-5	*416	1389
62	Schematic, voltage, parts list	2-13	416-O	1409
	Chassis, alignment data	2-14	416-P	1410
62-A	Schematic, data	3-1		1411
	Chassis views, alignment data	3-2		1412
62-D Chassis	See model 882-62-D			
63, 63-A Chassis	See model 563-A			
64	Schematic, socket, alignment	Misc. 8-4		
64-B Chassis	See model 164-B			
66, 66-A	Schematic, data	3-11		1423
	Chassis views, alignment data	3-12		1424
66-B Chassis	See model 266-B			
Royal 80	Schematic, socket	1-12		1427
164-B (Chassis 64-B)	Schematic, data	3-7		1419
	Chassis layout, alignment data	3-8		1420
175 to 25,000 Meters	Schematic	1-1	*412	1385
220	Schematic	1-1	*412	1385
266-B, 366-B (Chassis 66-B)	Schematic, data	3-13		1425
	Chassis layout, alignment data	3-14		1426
281	Schematic	1-1	*412	1385
420, 421 Type	See model 6			

COLIN B. KENNEDY CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
430-43 Type	See model 15			
435 Type	See model 30			
440 Type	See model 20			
563-A (Chassis 63, 63-A)	Schematic, data	3-5		1415
	Chassis layout, alignment data	3-6		1416
826-B	Schematic	1-12	*417	1427
882-62-D (Chassis 62-D)	Schematic	3-3		1413
	Alignment data, socket	3-4		1414
882-64-C	Schematic	3-9		1421
	Alignment data	3-10		1422
1000	Schematic	Misc. 7-1		

KING MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Imperial	See model 98			
Monarch	See model 101			
Royal	See model 97			
E	Schematic, socket	1-2	*420	1431
F	Schematic, socket	1-2	*420	1431
FF	Schematic, socket	3-1		1432
G	Schematic, socket	1-3	*421	1433
H	Schematic, socket	1-3	*421	1433
J	Schematic, socket	1-4	*422	1434
10 Kl, 10-SK	Schematic, socket	1-1	*418	1429
25	Schematic, socket	1-1	*418	1429
30	Schematic, socket	1-1	*418	1429
61	Schematic, socket	1-8	*419	1430
62, 63	Schematic, socket	1-8	*419	1430
71	Schematic, socket	1-8	*419	1430
80	Schematic, socket	1-4	*422	1434
81	Schematic, socket	1-5	*423	1435
82	Schematic, socket	1-5	*423	1435
Royal (97)	Schematic, socket	1-6	*424	1436
	Voltage	1-7	*425	1437
Imperial (98)	Schematic, socket	1-6	*424	1436
Monarch (101)	Schematic, socket, voltage	1-7	*425	1437
218	Schematic, socket, voltage	3-2		1438

KINGSTON PRODUCTS CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
"Gypsy"	Schematic	5-1		
55	Schematic	5-1		
500, 500-A	Schematic	5-2		
600-A, 600-B, 610-B	Schematic	5-3		
700, 700-A, 700-B	Schematic	5-4		

KNIGHT

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
A-31	Schematic	Misc. 5-10		

KNIGHT RADIO

See ALLIED RADIO CORP.

KODEL RADIO CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Improved Gold-Seal Home-charger	Schematic	Misc. 6-16		
15, A & B Supply	Schematic	7-1		
61, B Transifier	Schematic	7-1		
101, Radiola Transifier	Schematic	7-2		
103, A Transifier	Schematic	7-2		
106, A & B Transifier	Schematic	7-2		
108 ABC Transifier	Schematic	Misc. 6-16		
110B Transifier	Schematic	Misc. 6-16		
161, B Transifier	Schematic	7-1		

KOLSTER RADIO, INC.

Also see BRANDES PRODUCTS CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Power Amplifier	Schematic	Misc. 6-18		
SW Converter	Schematic	3-12		1474
6D, 6E, 6G, 6H, (1927)	Schematic, socket	1-1	*426	1439
6-F, 6-J, 6-K, 6-L, 6-M, 6-R	Schematic, socket, voltage	1-2	*427	1441
7-A, 7-B (1926)	Schematic, socket	1-1	*426	1439
8-A, 8-B, 8-C (1926)	Schematic, socket	1-1	*427	1439
K-20, K-22, K-27	Schematic, socket, voltage	1-3	*428	1442
K-21, K-23, K-28	Schematic, socket, voltage	1-4	*429	1443
K-23 Rectifier	Schematic	1-2	*430	1441

KOLSTER RADIO, INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
K-24 (250)	Schematic, socket, voltage	1-5	*430	1444
K-24 (210)	Schematic, voltage	4-1		1445
K-25	Schematic	1-5	*430	1444
K-30, K-32	Schematic, socket	1-6	*431	1446
K-38	Schematic, socket	4-2		1447
K-42	Schematic, socket, voltage	1-7	*431	1448
K-43, K-43-A (1929)	Schematic, socket, voltage	1-8	*432	1449
K-44 (1929)	Schematic, socket, voltage	1-9	*433	1450
K-45	Schematic, socket	1-10	*434	1452
	Voltage, alignment data	2-1		1453
K-48	Schematic	Misc. 6-17		
K-60, K-62	Schematic	1-11	*434-A	1454
	Voltage, test data	2-4	*434-B	1455
	Additional data	Changes 7-16		
K-60, K-62, K-70, K-72, K-80, K-82, K-90, K-92	Condenser adjustments, data	2-3	434-I	1461
	Condenser and resistor data	2-2	434-J	1462
K-63, K-66, K-73, K-103	Schematic, socket	3-1		1463
K-70, K-72	Schematic	1-12	*434-C	1456
	Voltage, test data	2-5		1457
K-80, K-82	Schematic	1-13	*434-E	1458
	Voltage, test data	2-6		1459
K-83, K-93	Schematic, socket	3-2		1464
K-90, K-92	Schematic	1-14	*434-G	1460
K-110, K-120, K-122	Schematic	3-3		1465
	Chassis layout, voltage, data	3-4		1466
K-113, K-123	Schematic	3-9		1471
K-114	Schematic	3-6		1468
K-130, K-132	Schematic	3-7		1469
	Chassis layout, voltage, adjustments	3-8		1470
K-133, K-143	Schematic	3-5		1467
K-140, K-142	Schematic	3-10		1472
210 & 250 Chassis	Chassis layout, voltage, data	3-11		1478
	See model K-24			

KRAKAUER BROS.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Electone Piano Amplifiers	Schematics, pick-up connections	8-1		
	Service notes	8-2		
PR3-PO3, Super Electone Piano	Wiring assembly, delay switches details, polarizing switch and power stage circuits	9-1, 2		
	Pre-amplifier and amplifier circuits, radio tuner circuit	9-3		
	Phasing tone and volume control circuits	9-4		
	Service notes	9-5		

KROHLER MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
93-B, Viking	Schematic, voltage, chassis	Misc. 6-19		

KYLECTRON

See UNITED REPRODUCERS CORP.

L & L ELECTRIC CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
E-33	Schematic	Misc. 8-6		2756

R. E. LACAULT

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
L-2 Ultradyne	Schematic	Misc. 1-11	*789	2755
LR-4	Schematic	Misc. 1-11	*789	2755
All-Wave Electric 9	Schematic, parts list	Misc. 1-11	*789	2755

LAFAYETTE RADIO MFG. CO.

See also WHOLESALE RADIO SERVICE, INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Fireside #1	Schematic	8-1		
Fireside #2, 2Y2280	Schematic	8-1		
First Minstrel	See model 2A5			
Midget Minstrel	See model M-31			
Mighty Atom	Schematic	9-2		
Minstrel (1932)	See model 2001			
Orthotone	Schematic	6-1		
Pigmy	See model M-99			
Thriller	Schematic	9-8		

LAFAYETTE RADIO MFG. CO.—(Cont.)

LANG RADIO CO.

MODEL	LANG RADIO CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
MD-7	Schematic, socket	2-3	446-A	1482
SA-7	Schematic	2-4	446-B	1480
MA-8	Schematic, socket	3-1		1481
MD-8	Schematic, socket	3-1		1481
R-8	Schematic, socket	1-3	*446	1479
SA-8	Schematic, socket	2-4	446-B	1480
F-9	Schematic, socket	1-2	*445	1478
40-UL	Schematic, alignment	6-1		
50-AS	Schematic, alignment	6-2		
50-UP, 60-UP	Schematic, alignment	6-2		
50-US	Schematic, alignment	6-1		
60-AA	Schematic	6-3		
80-UA	Schematic	6-4		
502-US	Schematic, alignment, parts list	5-2		
503-US	Schematic, alignment	5-1		
503-AS	Schematic, alignment, parts	5-3		
503-UT, 528-UT	Schematic, alignment	6-5		
703-US	Schematic, alignment, parts	5-4		

LARKIN CO., INC.

84	Schematic	Misc. 6-20		
88	Schematic	5-1		
90	Schematic, socket	5-1		
91	Schematic	5-2		

LA SALLE

See CADILLAC MOTOR CAR CO.

LAUREHK MFG. CO.

L4B "Laurette"	Misc.	10-7		
L-44-T	Schematic	Misc. 7-8		
L-55-T	Schematic	Misc. 7-8		
L-69 Musique	Schematic, alignment	Misc. 8-5		
L600 Musique	Schematic, alignment	Misc. 8-5		

LEAR-WUERFUL CO.

Suprex Six	Schematic	Misc. 5-11		

C. R. LEUTZ, INC.

C	Schematic	1-1	*788	1483
Seven Seas	Schematic	1-2	*447	1484
Silver Ghost	Schematic	1-1	*788	1483
Trans-Oceanic	Schematic	1-2	*447	1484
C-10 Navy Model	Schematic	1-1	*783	1483

LEWOL MFG. CORP.

LW-4	Schematic, voltage	5-1		
LW-4-DW	Schematic, voltage	5-1		
60-MS	Schematic, socket	5-2		
63	Schematic	5-3		
	Alignment, voltage	5-4		
64	Schematic, socket	5-2		

LINCOLN RADIO CORP.

DC SW-8	Schematic	4-1		
Hollister AC 8	Schematic, chassis wiring	4-4		
Hollister DC 8	Schematic	4-4		
8-80	Schematic	1-1	*448	1485
R-9	Schematic	4-1		
DeLuxe 10	Schematic	3-1		1486
31	Schematic	1-1	*448	1485
SW-32	Schematic	3-1		1486
DeLuxe SW 38	Schematic, socket, coil assembly	4-2		
	Bottom view, terminal connections	4-3		

LOFTIN-WHITE

See ELECTRAD, INC.

MODEL	LYRIC	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE

See ALL AMERICAN MOHAWK CORP.

R. H. MACY & CO.

MB-5	Schematic, socket	3-1		1487
MB-56, MB-58	Schematic	3-1		1487
MB-92	Schematic	3-8		1489
410 AC-DC	Schematic, trimmers, alignment	7-1		
706-70623	Schematic, alignment	7-2		
MB-710	Schematic	3-2		1488

MADISON-MOORE

One-Spot Super	Schematic	Misc. 1-12	*790	2757
Superheterodyne	Schematic	Misc. 1-12	*790	2757

THE MAGNAVOX CO.

A	Schematic	Misc. 1-13	*449	1491
D	Schematic	Misc. 1-13	*449	1491
One Dial	Schematic	Misc. 1-13	*449	1491

THE MAGNOVOX CO., INC.

Model numbers in which the figure 30 appears are housed in the Playfellow cabinet
Model numbers in which the figure 31 appears are housed in the Concerto cabinet
Model numbers in which the figure 32 appears are housed in the Chairside cabinet
Model numbers in which the figure 33 appears are housed in the Duette cabinet
Model numbers in which the figure 34 appears are housed in the Berkeley cabinet
Model numbers in which the figure 35 appears are housed in the Regent cabinet
Model numbers in which the figure 36 appears are housed in the Windsor cabinet
Model numbers in which the figure 38 appears are housed in the Hepplewhite cabinet
Model numbers in which the figure 40 appears are housed in the Swedish Console

CR101 Chassis Model 37, Style RTR308 CR101M Chassis Model 35, Style CPAR301 Model 35A, Style CPAR312 Model 36, Style CPAR302	Schematic, voltage Socket, trimmers, chassis, dial Alignment, dial data Changes, notes	10-1 10-2 10-3 10-4		
CR102 Chassis Model 31, Style TPR307 CR103 Chassis Model 32, Style EPR306 CR104 Chassis Model 31, Style TPR309 CR105 Chassis Model 32, Style EPR 310	Schematic Socket, voltage, chassis, trimmers Alignment	10-5 10-6 10-16		
CR106 Chassis Model 31, Style TPR316 CR109 Chassis Model 32, Style EPR313 Model 33, Style CPR305				

THE MAGNAVOX CO., INC.—(Cont.)

MAJESTIC

See GRIGSBY-GRUNOW CO.

MAJESTIC RADIO & TELEVISION CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Charlie McCarthy 1, 2	Schematic, socket, trimmers, parts	9-1		
1A59, 1A59B, P1A59, 1B59, P1B59	Schematic, socket, trimmers, alignment	10-1		
3PW Record Player	Schematic, socket	10-2		
42	Schematic, socket, trimmers, parts	9-1		
50	Schematic, socket, trimmers, voltage, alignment, parts	8-1		
51B, 51P, 51W, Chassis 151	Schematic, voltage, socket, trimmers	10-3		
52	Schematic, socket, trimmers, parts	9-1		
55B, 55P, 55W, Chassis 155	Schematic, socket, trimmers, alignment	10-4		
56, Chassis 156	Schematic, voltage, socket, alignment, trimmers	10-5		
60	Schematic, voltage, parts	8-2		
	Socket, trimmers, alignment	8-3		
62A	Schematic, socket, tuner, parts	9-2		
65, 66, 650	Schematic, parts list	7-1		
	Trimmers, voltage, alignment	8-5		
	Socket, layout	8-6		
67, 68, 670, 671, 672, 673 Chassis 167 and 1673	Schematic, voltage, socket, trimmers, alignment	10-6		
75, 76, 750	Schematic, parts list	7-2		
	Trimmers, voltage, alignment	8-5		
	Socket, layout	8-6		
85, 86, 850	Schematic, parts list	7-3		
	Trimmers, voltage, alignment	8-5		
	Socket, layout	8-6		
149I, 149N, 149W	Schematic, socket, trimmers, alignment	10-1		
151 Chassis	See model 51B			
155 Chassis	See model 55B			
156 Chassis	See model 56			
167 Chassis	See model 67			
511, 511A, 519P	Schematic, socket, trimmers, parts	9-3		
551	Schematic, socket, trimmers, parts	9-3		
620	Schematic, voltage, parts	8-4		
	Socket, trimmers, alignment	8-3		
639, 639B	Schematic, socket, trimmers, tuner, parts	9-4		
650	See model 65			
651	Schematic, socket, trimmers, alignment	10-2		
651-EB	Schematic, tuner	10-7		
670, 671, 672, 673	See model 67			
739	Schematic, socket, trimmers, voltage, parts	9-5		
	Tuner data	9-4		
	Alignment, phonograph data	9-6		
750	See model 75			
800	Schematic, voltage	8-7		
	Socket, trimmers, alignment, parts	8-8		
850	See model 85			
870, 875, Chassis 1870	Schematic, socket trimmers, voltage, alignment	10-8		
939	Schematic, socket, trimmers, tuner, parts	9-7		
	Alignment, phonograph data	9-6		
1050	Schematic, parts list	7-4		
	Socket, trimmers, voltage, alignment	8-6		
1250	Schematic, parts	8-9		
	Socket, trimmers, voltage, alignment	8-10		
1056X, 1058X	Schematic, voltage	10-9		
	Socket, trimmers, alignment, notes, parts	10-10		
	Phono. and tuner data	10-13		
1356X, Chassis 11356X	Schematic	10-11		
	Socket, trimmers, alignment, phono., tuner data	10-13		
	Parts list	10-14		
1656X, Chassis 11656X	Schematic	10-12		

MAJESTIC RADIO & TELEVISION CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
1656X, Chassis 11656X	Socket, trimmers, alignment, phono., tuner data	10-13		
	Parts list	10-14		
1673 Chassis	See model 67			
1870 Chassis	See model 870			
11056, 11057, 11058	Schematic, voltage	9-9		
	Tuner data	9-8		
	Socket, trimmers, alignment, parts	9-10		
	Alignment	Changes 10-2		
11356	Schematic, voltage	9-11		
	Tuner data	9-8		
	Socket, trimmers, alignment, parts	9-12		
	Tuner data,	Changes 10-2		
11356X Chassis	See model 1356X			
11656	Schematic, voltage	9-13		
	Socket, trimmers, alignment, parts	9-14		
	Tuner data	9-8		
11656X Chassis	See model 1656X			

MAJOR LABORATORIES

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
12	Schematic	Misc. 1-14	*703	2758
ML-210 Amplifier	Schematic	Misc. 1-14	*703	2758
250 Amplifier	Schematic	Misc. 1-14	*703	2758
250 Amplifier Power Unit	Schematic	Misc. 1-14	*703	2758

P. R. MALLORY & CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Elkon Auto "B" Eliminator	Power Connections	4-4		
Elkon Standard Type, Auto "B" Eliminator	Schematic	4-1		
Elkon Type "C" Eliminator	Schematic	4-2		
	Notes	4-3		
Elkonode	Notes	5-5		
50 Series Elkonodes	Repairs	5-7		
60, 70, 80 Series Elkonodes	Repairs	5-6		
60, 70, 80 Series Elkonodes	Repairs, Part 2	5-8		
B-Eliminator Types				
1932 Type	Single-reed Elkonodes Data	5-1		
1933-34 Type	Dual-reed Elkonodes Data	5-2		
1933-34 Type Dual-reed Elkonodes	Dismantling, repairs	5-3		
	Dismantling, adjustments	5-4		

MARCONIPHONE INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
D, DE (1937)	Schematic	10-2		
Vanity 1937	Schematic	10-1		
Vanity 1938	Schematic	10-1		
D8, 1938	Schematic	10-3		
D10, 1938	Schematic	10-4		

MARTI RADIO

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
"T"	Schematic	Misc. 4-10		
2R-10	Schematic	Misc. 4-10		

MASTER RADIO & MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
50, 70 "Mighty Midget"	Schematic, voltage	Misc. 8-9		1498

McMILLAN RADIO CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
8 (2 types) AC	Schematic, socket, voltage	1-1	*450	1495
Series 900	Schematic, socket, voltage	1-2	*451	1496

McMURDO SILVER, INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
World-Wide Nine	Schematic, socket	Misc. 5-12		

MID-WEST RADIO CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Imperial	See 18(1935) Imperial			
Regal (1936)	Schematic, voltage	8-65, 8-66		
	Alignment, trimmers	8-67		
	Socket, chassis	8-68		

MODEL	MID-WEST RADIO CORP.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Regal-87 AFC	Schematic, parts	9-19		
	Socket, trimmers, voltage	9-20		
	Alignment, trimmers	9-18		
Royale	Schematic	7-1		
	Alignment	7-4		
6-Tube Battery	Schematic	8-5		
Miraco Pentode 11-tube Super.	Schematic	3-4		1500
Miraco 1SG-226	Schematic	4-1		1497
C-4 1932 Converter	Schematic	9-1		
5-36 Auto	Schematic, socket, trimmers	9-3		
	Alignment	9-5		
SW5-36 AC-DC	Schematic, alignment, voltage	8-1		
6-33	Schematic, socket, voltage, alignment	8-2		
6-34 (A-E)	Schematic, voltage	8-3		
	Socket, trimmers, alignment	8-4		
6-34 (A-L)	Schematic, voltage	8-3		
	Socket, trimmers, alignment	8-4		
6-37 Auto	Schematic, voltage, socket, trimmers, alignment	8-6		
6-37 AC-DC	Schematic, voltage	8-7		
	Socket, trimmers, alignment	8-8		
6-38 AC-DC (Export)	Schematic, socket	8-18		
	Trimmers	8-36		
	Voltage	9-6		
	Alignment	9-7		
Miraco Ultra 7	Schematic	3-1		1499
7-36, Early, Late	Schematic, socket	7-2		
	Alignment	7-4		
	Voltage data	Changes 9-3		
7-36 AC-DC	Schematic, voltage	8-9		
	Socket, trimmers, alignment	8-10		
7-36 Battery	Schematic, voltage	8-11		
	Socket, trimmers, alignment	8-12		
7-37 AC	Schematic, voltage	8-13		
	Socket, trimmers	8-14		
7-37 AC-DC	Schematic, voltage	8-15		
	Socket, trimmers	8-16		
	Alignment	8-17		
7-37 Battery	Schematic, voltage	8-19		
	Socket, trimmers, alignment	8-20		
7-38 AC-DC	Schematic, socket	8-21		
	Trimmers	8-36		
	Voltage	9-6		
	Alignment	9-7		
7-38 AC-DC (Export)	Schematic, socket	8-22		
	Trimmers	8-36		
	Alignment	9-7		
7-38 Batt. (Export)	Schematic, socket	8-23		
	Trimmers	8-36		
	Voltage	9-6		
	Alignment	9-7		
8 AC-DC '39	Schematic, socket, voltage	10-1		
Miraco Unitone 8	Schematic	3-1		1499
8-31 Batt.	Schematic	8-24		
	Socket, trimmers	9-4		
8-33 Early	Schematic, voltage	8-25		
	Socket, trimmers, alignment	8-26		
8-33 (2 Gang, 4 Band)	Schematic, trimmers	8-27		
	Alignment	8-28		
8-33 (2 Gang, 5 Band)	Schematic, trimmers	8-27		
	Alignment	8-28		
8-38 AC-DC	Schematic, socket	8-29		
	Trimmers	8-36		
	Voltage	9-5		
	Alignment	9-7		
8-38 AC-DC (Export)	Schematic, socket	8-30		
	Trimmers	8-36		
	Voltage	9-5		
	Alignment	9-7		
8-38 Batt.	Schematic, socket	8-31		
	Trimmers	8-36		
	Voltage	9-5		
	Alignment	9-7		
8-39	Schematic, socket, voltage, parts	9-8		
Miraco AC-9	Schematic	3-4		1500
Miraco AC-9-4SG	Schematic	3-2		1498
RT-9, G-9, F-9, H-9 (9-34)	Schematic	4-2		
9-31 (3SG)	Schematic	8-24		
9-31 (4SG)	Schematic, voltage	8-32		
	Socket, trimmers	9-9		
9-32	Schematic, voltage, alignment	8-33		
	Socket, trimmers	9-9		
9-34	Schematic, voltage, socket, alignment	6-1		
9-38 AC-DC	Schematic, socket	8-34		
	Trimmers	8-36		
	Alignment, voltage	9-7		
9-38 AC-DC (Export)	Schematic, socket	8-35		
	Trimmers	8-36		
	Alignment, voltage	9-7		
10-A-33-34	Schematic, socket	6-5		
10-34	Schematic, voltage, socket	6-3		
	Trimmers, alignment, voltage	6-4		
10-35	Trimmers, alignment	6-12		
	Schematic, voltage	6-13		
10-37 AC-DC	Schematic, voltage	8-37		
	Socket, trimmers, alignment	8-38		
10-38 AC-DC	Schematic, socket	8-39		
	Trimmers	8-36		
	Alignment	9-7		
	Voltage	9-6		
11-31	Schematic, voltage, alignment	8-40		
11-36	Schematic, socket	7-3		
	Alignment	7-4		
11-37	Schematic, voltage	8-41		
	Socket, trimmers	8-43		
	Alignment	8-44		
11-37 AC-DC	Schematic, voltage	8-42		
	Trimmers	8-43		
	Alignment	8-44		
12-33	Schematic, voltage	8-45		
	Socket, trimmers, alignment	8-46		
12-38 AC	Schematic	8-47		
	Socket, trimmers	8-49		
	Alignment	9-7		
	Voltage	9-12		
12-38 Batt.	Schematic	8-48		
	Socket	8-49		
	Trimmers	8-36		
12-39	Schematic, socket, voltage, parts	9-10		
14-Z-9	Schematic, voltage, socket	10-3		
14-37	Schematic, voltage	8-50		
	Trimmers, alignment	8-53		
	Socket	8-54		
14-37 (Intermediate)	Schematic, voltage	8-51		
	Trimmers, alignment	8-53		
	Socket	8-54		
14-37A	Schematic, voltage	8-52		
	Trimmers, alignment	8-53		
	Socket	8-54		
J-16, L-16, M-16, S-16, EP-16	Schematic	5-1		
RT-16, A-16, B-16, D-16, PR-16, RM-16, (16-34)	Schematic	4-3		
16-33	Schematic	3-3		1501
	Voltage, socket, trimmers, alignment	6-2		
16-34	Schematic, socket	6-7, 6-8		
	Trimmers, voltage	6-11		
	Alignment data	Changes 7-5		
16-35	Schematic, socket	6-9, 6-10		
	Alignment, trimmers	6-14		
16-37 AC	Schematic, voltage	8-55		
	Socket, trimmers	8-56		
16-37 AFC, Type 1	Schematic, parts	9-13		
	AFC-2nd Detector schematic	9-12		
16-38 AC	Schematic	8-57		
	Socket, trimmers	8-36		
	Alignment	9-11		
	Voltage	9-12		
17-39	Schematic, socket, voltage	10-2		
18 (1935) Imperial	Schematic, voltage, alignment	8-61, 8-62		
	Socket, trimmers	8-63		
18-36	Schematic, socket, trimmers	7-5		
	Alignment	7-4		
18-36A (Intermediate)	Schematic, voltage	8-59		

MID-WEST RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
18-36A (Intermediate)	Socket, trimmers, alignment	8-60		
18-37	Schematic	7-6		
	Socket, trimmers	9-14		
	Alignment, voltage	9-15		
18-37 AFC	Schematic, parts	9-16		
	Socket, trimmers, voltage	9-17		
	Alignment, trimmers	9-18		
18-38 AC	Schematic	8-64		
	Trimmers	8-36		
	Socket	8-70		
	Alignment, voltage	9-11		
20-38 AC	Schematic	8-69		
	Socket	8-70		
	Trimmers	8-36		
	Alignment, voltage	9-11		
35 SW	Socket, trimmers, voltage, alignment, notes	8-58		
35-5-SW	Schematic	6-6		

MIRACO

See MID-WEST RADIO CORP.

MISSION BELL RADIO MFG. CO., INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Phonograph Oscillator	See model 399			
4-A	Schematic	3-1		1503
6-A	Schematic	3-2		1504
10-A	Schematic	4-1		
10, 19-A	Schematic	4-2		
10-A, 19, 19-A	Vibrator data	4-3		
11	Schematic	5-1		
14	Schematic	5-2		
16	Schematic	6-1		
16 Auto	Schematic	7-1		
17, 18	Schematic, notes	7-2		
25-A	Schematic	5-3		
35	Schematic	6-1		
40	Schematic	5-3		
40 All Wave	Schematic	5-4		
41 AW	Schematic	6-2		
41, Skip Band	Schematic	6-2		
384, 384 Special	Schematic	10-1		
386, Above and below Serial 40461	Schematic	10-1		
386 AW	Schematic	10-2		
392	Schematic	10-3		
395	Schematic	10-2		
399 Phonograph Oscillator	Schematic	10-4		
400	Schematic	10-4		
401, 402	Schematic	10-3		
500	Schematic	10-5		
501	Schematic	10-5		
638A, 3817A	Schematic	10-6		
3710	Schematic	10-7		
3716	Schematic	10-8		
3817A	See model 638A			
3849, 3859	Schematic	10-10		
3869, 3891	Schematic	10-7		
3871	Schematic	10-9		
3871A	See model 638A			

MOHAWK

See ALL-AMERICAN MOHAWK CORP.

MONARCH

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
A-81	Schematic	Misc. 5-18		
1000	Schematic, socket	Misc. 7-9		

MONARCH MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
All Wave Signal Generator	Schematic	Misc. 6-21		

MONTGOMERY-WARD & CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Movie Dial Drive	Assembly, chassis	8-1		
	Lamp and Take-up assemblies, Drive cord diagram	8-2		
	Adjustments, notes	8-3		
	Replacing parts	8-4		

MONTGOMERY-WARD & CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Auto Radio	Schematic, voltage, assembly wiring	3-11		1541
	Installation notes	3-12		1542
Balboa	See model 2822			
Cavalier, Commander	See model 14000			
Challenger	See model 11000			
Challenger, Jr.	See model 62-060			
Collegian	See model 1500			
Commodore	See model 62-040			
DeSoto	See model 2822			
Dictator	See model 500			
Fantasy	See model 1111			
Minstrel	See model 1355			
Princess	See model 62-070			
Radiola	See model 839			
Serenader	See model 500			
Solo	See model 1111			
Sovereign	See model 62-040			
Troubadour	See model 62-030			
Washington	See model 62-34 or 62-36			
AE-10	See model 2655			
11-12	See model 62-29			
13, 15, 16, 16X, 17, 18, 18X	Schematic	4-1		1516
17	Schematic, socket	3-13		1543
21, 22	See model 839			
27W	See model 1500			
49	See model 62-055			
51 Chassis	See model 62-020			
62-010	Schematic, socket, voltage	3-8		1536
62-020 (51)	Schematic, socket, voltage	3-7		1535
62-030, 62-232, Troubadour	Schematic, socket, voltage, notes	2-1	452-B-10	1505
62-040, Commodore, 62-181, Sovereign	Schematic, socket, voltage, chassis, data	2-2	452-B-17	1506
62-055, 49, 1522, 1922, 1562	Schematic, socket, voltage, chassis, data	1-1	452-B-1	1507
	Chassis wiring	2-3	452-B-2	1508
62-060, Challenger, Jr. (1800), 62-070, Princess	Schematic, socket, voltage, notes	2-7	452-B-5	1531
62-1, 62-2	Schematic, voltage, notes	3-14		1544
62-7, 62-8	Schematic, socket, voltage	3-15		1545
62-9	Schematic, socket, voltage	3-15		1545
62-11, 62-12, 62-14, 62-27, 62-19 (1st type)	Schematic, voltage, notes	2-4	452-B-19	1509
	Chassis, layout, servicing data	2-5	452-B-20	1511
62-11, 62-14, 62-19, 62-27 (2nd type)	Schematic, notes	2-6		1510
62-16	Schematic, voltage, parts	6-8		
62-20, 62-26 (62-25)	Chassis layout, servicing data	2-23	452-B-12	1513
	Schematic, voltage	2-24	452-B-11	1512
62-22, 62-30 (62-21)	Schematic, chassis layout, voltage, data	3-2		1514
	Alignment notes, assembly data	3-1		1515
62-27	See model 62-11			
62-29 (11-12) 1st type	Schematic	3-4		1532
	Socket, voltage, alignment data	3-5		1533
62-29 (11-12) 2nd type	Schematic, socket	3-6		1534
62-34, Washington	Schematic, voltage, socket, trimmers	9-1		
62-36, Washington	See model 62-40			
62-38, 62-40, 62-50, 62-54, 62-58	Schematic, chassis layout, speaker data	3-9		1539
	Voltage, alignment data	3-10		1540
62PC43	Schematic, voltage, parts	6-18		
62PC55	Schematic, voltage, alignment	6-22		
62PC64	Schematic, voltage, parts	6-38		
62PC68	Schematic, voltage, alignment	6-30		
62-70, 62-70X, 62-72, 62-72X	Schematic, parts	7-1		
	Socket, circuit data, voltage, alignment	7-2		
62-89	Schematic, socket, values	4-2		

MONTGOMERY-WARD & CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
62-89	Voltage, alignment data	4-3		
62-91	Schematic, socket	4-4		
	Voltage, alignment	4-13		
62-93	Schematic, voltage, socket	4-5		
	Noise elimination	4-6		
62-96	Schematic, socket, voltage	4-7		
62-97, 62-99, 62-97X, 62-99X	Schematic, socket	4-10		
	Voltage, alignment	4-11		
62-98	Schematic, hum notes	4-8		
	Voltage, alignment, socket	4-9		
62-101, 62-101X	Schematic, socket	4-12		
62-101	Voltage, alignment	4-13		
62-103, 62-105	Schematic, socket, changes	4-14		
	Voltage, alignment	4-15		
62-104	Schematic, socket, voltage	4-16		
62-106, 62-107, 62-121	Schematic, voltage	4-17		
62-114, 62-116	Schematic, socket, parts	6-1		
	Voltage, resistance test, alignment data	6-2		
	Wiring changes, schematic	6-3		
	Chassis view of changes, data	6-4		
62-118	Schematic, voltage, socket, parts	5-1		
	Alignment, data	5-2		
62-120, 62-122, 62-126, 62-128	Schematic, socket, parts	5-3		
	Alignment, voltage	5-4		
62-121	See model 62-106			
62-123, 62-131, 62-133, 62-142, 62-144, 62-152, 62-158	Schematic, socket, trimmers, alignment, Part 1	10-1		
	Alignment, Part 2, voltage, drive data, changes, parts	10-2		
62-124, 62-129	Schematic, parts, coil resistance	5-5		
	Alignment	5-6		
	Voltage, socket, drive-cord data	5-7		
62-126, 62-128	See model 62-120			
62-130	Schematic, voltage, socket, trimmers, parts	8-14		
62-131	See model 62-123			
62-132, 62-137	Schematic, parts	5-8		
	Alignment, voltage	5-9		
	Socket, trimmers, drive-cord data	5-10		
62-133	See model 62-123			
62-134, 62-134X, 62-139, 62-139X, 62-167	Schematic, parts	6-5		
	Resistance test, socket, trimmers, voltage	6-6		
	Alignment, data	6-7		
62-135, 62-135X, 62-150, 62-150X, 62-154, 62-154X	Schematic, voltage, parts	6-9		
	Socket, trimmers, alignment	6-10		
62-136, 62-138, 62-151, 62-157	Schematic, parts	6-11		
	Voltage, socket, data, alignment	6-12		
62-137	See model 62-132			
62-139	See model 62-134			
62-140, 62-140X, 62-148, 62-148X	Schematic, socket	5-11		
	Alignment, parts list	5-12		
62-142, 62-144	See model 62-123			
62-147, 62-147X, 62-156, 62-156X, 62-164, 62-164X, Series A	Schematic, voltage, alignment, trimmers, socket	6-13		
	Alignment	6-14		
62-147, 62-147X, 62-156, 62-156X, 62-164, 62-164X, Series B & C	Schematic, voltage, socket, trimmers	6-15		
	Alignment, notes	6-16		
62-147, 62-147X, 62-156, 62-156X, 62-164, 62-164X, Series A, B & C	Parts list	6-17		
62-148, 62-148X	See model 62-140			
62-149	Data	Changes 7-2		
62-150, 62-150X	See model 62-135			
62-151	See model 62-136			

MONTGOMERY-WARD & CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
62-152	See model 62-123			
62-153	Data	Changes 7-2		
62-154, 62-154X	See model 62-135			
62-155	Data	Changes 7-2		
62-156, 62-156X, 62-164, 62-164X	See model 62-147			
62-157	See model 62-136			
62-158	See model 62-123			
62-160	Data	Changes 7-2		
62-162	Data	Changes 7-2		
62-165	Data	Changes 7-3		
62-166	Schematic	6-19		
	Alignment, voltage, socket, trimmers, resistance test	6-20		
	Parts list	6-21		
	Changes	Changes 7-15		
62-167	See model 62-134			
62-169, 62-171	Schematic, socket, trimmers, voltage, alignment	7-12		
62-173, 62-175, 62-176, 62-177, 62-188, 62-193	Schematic	6-23		
	Voltage, trimmers, socket, color coding, resistance data	6-24		
	Resistance test, parts	6-25		
	Alignment, data	6-26		
62-178, 62-181, 62-189, 62-211	Schematic	6-27		
	Alignment, data	6-28		
	Voltage, socket, trimmers resistance test, parts	6-29		
62-179, 62-194, 62-206, 62-216, 62-218	Schematic	6-31		
	Alignment, changes, data	6-32		
	Voltage, trimmers, socket, data	6-33		
	Resistance test, parts	6-34		
62-181	See model 62-040, 62-178			
62-185, 62-187, 62-190, 62-196. Three types	Schematic, trimmers	6-35		
	Voltage, socket, color code	6-36		
	Alignment, changes, data	6-37		
	Changes	Changes 7-15		
62-188, 62-193	See model 62-173			
62-189	See model 62-178			
62-192, 62-195	Schematic	7-3		
	Socket, trimmers, voltage, phono., changes	7-4		
	Coil data, resistance	7-5		
	Alignment, parts	7-6		
62-194	See model 62-179			
62-197	Schematic	7-7, 7-8		
	Trimmers, voltage, socket, chassis views	7-9		
	Alignment, phono., changes	7-10		
	Resistance, coil data	7-11		
62-199	Schematic, voltage, trimmers, socket, parts	6-39		
	Alignment, service notes	6-40		
62-202	Schematic, alignment	7-13		
	Voltage, resistance, socket, trimmers, coil data	7-14		
62-203, 62-205, 62-208, 62-212, 62-217, 62-219	Schematic, trimmers	6-41		
	Voltage, socket, data	6-42		
	Alignment, drive cord, changes, data	6-43		
	Resistance test, color coding, data	6-44		
62-206	See model 62-179			
62-207, 62-209, 62-221	Schematic	7-15		
	Voltage, socket, trimmers, battery data	7-16		
	Coil data, resistance	7-17		
	Alignment, parts	7-18		
62-208	See model 62-203			
62-209	See model 62-207			
62-211	See model 62-178			
62-212	See model 62-203			
62-215	Schematic	7-19		
	Voltage, socket, trimmers, battery data	7-20		

MONTGOMERY-WARD & CO.—(Cont.)

MONTGOMERY-WARD & CO.—(Cont.)

MONTGOMERY-WARD & CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
62-334	Schematic, socket, trimmers, alignment, coils, specifications	9-37		
	Antenna, mounting data, tuner, notes	9-38		
62-336	See model 62-326			
62-337	See model 62-327			
62-338	See model 62-251			
62-345	Schematic, voltage, socket, trimmers, parts, alignment	9-39		
62-346	Schematic, voltage, socket, trimmers, parts, alignment	9-40		
62-350, 62-351, 62-352	Schematic, voltage, parts, socket, trimmers, alignment	9-41		
	Tuner data	9-11		
62-353	See model 62-323			
62-357	See model 62-297			
62-361, Issue A	Schematic, socket, trimmers, voltage, parts	9-42		
	Alignment, notes	9-44		
	Tuner data	9-11		
62-361, Issue B	Schematic, socket, parts, trimmers, voltage	9-43		
	Alignment, notes	9-44		
	Tuner data	9-11		
62-362	Schematic, voltage, socket, trimmers, parts	9-45		
	Alignment	9-46		
	Tuner data	9-47		
62-363, 62-463, 62-650	Schematic, voltage, socket	9-48		
	Trimmers, alignment	9-46		
62-364	Schematic, voltage, socket, trimmers, alignment	10-11		
62-367	See model 62-297			
62-369	Schematic, socket, trimmers, alignment	10-12		
62-370, 62-470, 62-700	Schematic, voltage, socket, coils, phono. data	10-13		
	Alignment, trimmers	10-14		
	Tuner data	10-15		
62-372	Schematic, socket, voltage, parts	9-49		
	Tuner data	9-47		
	Alignment, trimmers	9-50		
62-373, 62-374	See model 62-292			
62-377, 62-387, 62-477, 62-487, 62-607, 62-617	Schematic, specifications	9-51		
	Socket, trimmers, alignment, coils, voltage, dial drive data	9-52		
62-380, Series A Above serial 9C618200	Schematic, voltage, socket	10-16		
	Alignment, trimmers	10-8		
62-381 S.P.U.	Schematic	10-61		
	Chassis	10-62		
62-385	See model 62-305			
62-386, 62-636, 62-646	Schematic, voltage, alignment, resistances	10-17		
62-387	See model 62-377			
62-390, 62-490, 62-900	Schematic, socket, trimmers, voltage, parts	9-53		
	Alignment	9-54		
	Remote control installation data	9-18		
	Tuner data	9-47		
62-401, 62-1100	Schematic, coils, socket, specifications, phonograph data, tuner data	9-55		
	Remote control installation data	9-19		
	Trimmers, alignment	9-54		
62-402, 62-1101	Schematic, voltage, socket, phonograph data	9-56		
	Trimmers, coils, alignment, notes	9-34		
62-403	Schematic, voltage, socket, alignment notes	9-59, 60		
	Remote control installation data	9-19		
	Trimmers, alignment	9-61		
62-404	See model 62-304			
62-405	See model 62-305			
62-406	See model 62-306			

MONTGOMERY-WARD & CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
62-407	See model 62-307			
62-408	See model 62-226			
62-410	See model 62-310			
62-411	See model 62-261			
62-414	See model 62-305			
62-415	See model 62-315			
62-416	See model 62-316			
62-418	See model 62-226			
62-422	See model 62-322			
62-425	Schematic, voltage, alignment, parts	9-57		
62-426, 62-436	See model 62-326			
62-428	See model 62-251			
62-434, 62-435	Schematic, voltage, parts, socket, trimmers	9-58		
	Alignment, tuner	9-50		
62-441	See model 62-331			
62-442	See model 62-302			
62-445, 62-455, 62-475	Schematic, socket, voltage, trimmers, parts, alignment	9-63		
62-452	See model 62-302			
62-453, Series A Above serial 489500	Schematic, voltage, socket, trimmers, alignment	10-18		
	Tuner data	10-4		
62-455	See model 62-445			
62-457	See model 62-297			
62-459, Series A	Schematic, voltage, socket, trimmers	10-21		
	Tuner data	10-4		
	Alignment	10-18		
62-463	See model 62-363			
62-465	Schematic, voltage, socket, trimmers, notes, parts	9-64		
	Alignment	9-50		
62-467	See model 62-297			
62-470	See model 62-370			
62-471, 62-472	Schematic	10-19		
	Socket, trimmers, alignment, voltage, drive cord data	10-20		
62-473, 62-701, Early	Schematic, voltage, socket, coils, parts	9-65		
	Alignment, trimmers	9-67		
62-473, 62-701, Late	Schematic, voltage, socket, coils, parts	9-66		
	Alignment, trimmers	9-67		
62-475	See model 62-445			
62-476, 62-606, 62-616	Schematic, socket, trimmers, alignment, voltage, parts	9-68		
62-477	See model 62-377			
62-479	Schematic, voltage, socket	9-69		
	Trimmers, coils, alignment, specifications	9-70		
62-487	See model 62-377			
62-490	See model 62-390			
62-495	See model 62-305			
62-497	See model 62-297			
62-500	Schematic, socket, parts	9-71		
	Alignment, trimmers	9-72		
62-501, 62-502, Series A Above serial 286700	Schematic, voltage, socket, trimmers, alignment	10-22		
	Tuner data	10-4		
62-504, 62-505, Series A Issues A, B Above serial 623100	Schematic, voltage, socket, trimmers, alignment, changes	10-23		
	Tuner data	10-4		
62-506, 62-516	Schematic, trimmers, socket, voltage, parts	9-62		
	Alignment, trimmers	9-72		
62-550, 62-1550, 62-2550 Series A, Above serial 8J312900	Schematic, voltage, socket, trimmers	10-25		
	Alignment	10-26		
62-551, 62-1551, 62-2551 Series A, Above serial 8L475800	Schematic, voltage, socket, trimmers, alignment	10-24		
62-552, Series A	Schematic, voltage, socket, trimmers	10-27		
	Tuner data	10-4		
	Alignment	10-18		
62-553	Schematic, voltage, socket, trimmers	10-28		
	Tuner data	10-4		
	Alignment	10-18		

MODEL	MONTGOMERY-WARD & CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
62-554	Schematic, socket, trimmers, voltage, alignment	10-29		
	Tuner data	10-30		
62-555, 62-557, 62-2555, 62-2557	Schematic, voltage, socket, alignment, trimmers	10-31		
62-558, 62-1558, 62-2558 Series A, Issue A, Above serial 591000	Schematic, voltage, socket, trimmers	10-32		
	Tuner data	10-4		
	Alignment	10-26		
62-601, Series A, Above serial 545900	Schematic, voltage, socket, trimmers	10-33		
	Tuner data	10-4		
	Alignment	10-18		
62-606	See model 62-476			
62-607	See model 62-377			
62-616	See model 62-476			
62-617	See model 62-377			
62-636, 62-646	See model 62-386			
62-650	See model 62-363			
62-651, 62-652, Series A Above serial 8M498700	Schematic, socket, trimmers	10-35		
	Tuner data	10-34		
62-653	Voltage, alignment, trimmers	10-36		
	Schematic, socket, voltage, trimmers	10-37		
	Tuner data	10-30		
	Alignment, trimmers	10-26		
62-654, 62-655, 62-1654, 62-1655, 62-2654, 62-2655, Series A, Above serial 509200	Schematic, socket, trimmers	10-38		
	Voltage, alignment, trimmers	10-36		
	Tuner data	10-34		
62-656, 62-1656, 62-2656, Series A, Above serial 509200	Schematic, voltage, socket, trimmers	10-39		
	Alignment	10-40		
	Tuner data	10-34		
62-700	See model 62-370			
62-701, Early or Late	See model 62-473 Early or Late			
62-702, 62-703, Series A, Issue B, Above serial 8H262200	Schematic, voltage, socket, trimmers	10-41		
	Alignment	10-42		
62-704, 62-705, 62-706, 62-707, 62-708, 62-709, 62-710, 62-711, 62-712	Schematic, voltage	10-43		
	Tuner data	10-15		
	Socket, trimmers, alignment	10-46		
	Drive data	10-49		
62-750, 62-751, Series A, Above serial 8M499800	Schematic, voltage, socket, trimmers	10-44		
	Alignment, trimmers	10-36		
	Tuner data	10-34		
62-752, 62-753	Schematic, voltage, socket, trimmers, notes	10-45		
	Alignment, drive data	10-46		
62-900	See model 62-390			
62-901, Issues A, B	Schematic, voltage, socket, changes	10-47		
	Alignment, trimmers, dial, phono. data	10-42		
62-902	Schematic, voltage, phono., notes	10-48		
	Alignment, trimmers, dial data	10-49		
	Tuner data	10-15		
62-905	Schematic, socket, voltage, coils	10-50		
	Tuner data	10-15		
	Alignment, trimmers	10-49		
62-1100	See model 62-401			
62-1101	See model 62-402			
62-1550	See model 62-550			
62-1551	See model 62-551			
62-1558	See model 62-558			
62-1611, 62-1711	See model 1111			
62-1654, 62-1655	See model 62-654			
62-1656	See model 62-656			
62-1838	See model 1238			

MODEL	MONTGOMERY-WARD & CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
62-1955	See model 1355			
62-2550	See model 62-550			
62-2551	See model 62-551			
62-2555, 62-2557	See model 62-555			
62-2654, 62-2655	See model 62-654			
62-2656	See model 62-656			
62-2558	See model 62-558			
77, 95	Schematic, voltage, socket	4-18		
	Alignment data	4-6		
87	Schematic, voltage, socket	4-19		
	Alignment, wiring	4-20		
	Antenna, mounting notes	4-21		
	Mounting notes	4-22		
	Control unit	4-23		
	Flexible drive notes	4-24		
	Parts list	4-25		
93BR454A, 93BR1455A, Series A	Schematic, voltage, socket, trimmers	10-51		
	Alignment	10-40		
93BR460A, 93BR1460A	Schematic, voltage, socket, trimmers	10-52		
	Alignment, battery data	10-56		
93BR508A, 93BR509A	Schematic, voltage, socket, trimmers	10-53		
	Alignment	10-54		
	Tuner data	10-4		
93BR560A	Schematic, voltage, socket, trimmers	10-55		
	Alignment	10-56		
	Tuner data	10-15		
93WG562	Schematic, socket, alignment, trimmers	10-57		
	Tuner data	10-30		
93BR564A	Schematic, voltage, socket, trimmers	10-58		
	Tuner data	10-4		
	Alignment	10-54		
93WG602, 93WG603	Schematic, voltage, socket, trimmers	10-59		
	Alignment	10-26		
	Tuner data	10-30		
93BR657A	Schematic, voltage, socket, trimmers	10-61		
	Alignment	10-62		
	Tuner data	10-15		
93BR713A	Schematic, voltage, socket, trimmers	10-60		
	Alignment	10-40		
	Tuner data	10-15		
93BR1455A	See 93BR454A			
93BR1460A	See 93BR460A			
500, Dictator, 10,000 Serenader	Chassis wiring	2-8	452-B-8	1518
	Schematic, socket, voltage, notes	2-9	452-B-7	1517
811	See model 1111			
839, 921, 923, 924 (Radiola 21, 22)	Schematic, socket, notes	2-11	452-B-3	1519
839, 921, 923, 924 (Radiola 21, 22)	Conversion data, battery wiring	2-10		1520
1111 (62-1611) Fantasy, 811 (62-1711) Solo	Voltage, socket, parts list notes	2-12	452-B-14	1522
	Schematic, chassis wiring	2-13	452-B-13	1521
1238 (62-1838)	Schematic, chassis layout, voltage, data	2-14	452-B-18	1523
1355 (62-1955) Minstrel	Schematic, voltage, notes	2-15	452-B-21	1525
	Chassis layout, servicing notes	2-16	452-B-22	1524
1500 (27-W, 15,000) Collegian	Schematic, servicing data	2-17	452-B-6	1526
1522, 1562, 1922	See model 62-055			
1800 Chassis	See model 62-060			
2655, AE-10	Voltage, socket, data	2-18		1538
2655, AE-10 (1st and 2nd types)	Schematic, socket	2-19		1537
2822, 2827, Balboa, 2895, 2897 DeSoto	Schematic, socket, voltage, data	2-20	452-B-9	1527
2955-X, 2957-X, 25 cycles	Schematic, voltage	3-16		1547
10,000	See model 500			
11,000 Challenger (2 types)	Schematic, socket, voltage	2-21	452-B-15	1529

MODEL	NOBLITT SPARKS INDUSTRIES—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Arvin 27	Schematic, voltage, resistances, parts	6-11		
	Chassis layouts	6-12		
	Changes—See model 17			
RE27 Chassis	See model 89			
Arvin 28	Schematic, voltage, resistance, changes	7-3		
	Alignment	7-2		
	Socket, trimmers, chassis	7-4		
29	Schematic, voltage, resistance, parts	8-3		
	Socket, trimmers, chassis, alignment	8-4		
RE29 Chassis	See model 58			
Arvin 30-A, Type 1	Schematic	4-6		
Arvin 30-A, Type 2	Schematic	4-7		
Arvin 30-A	Resistance data, voltage	4-8		
	Condenser data, control data	4-9		
Arvin 30-A (3rd Type)	Schematic	5-9		
	Voltage, test data, coil resistance	5-10		
	Alignment data	5-14		
	Notes—See model 20-A			
32	Schematic, parts, voltage, alignment	9-7		
	Socket, trimmers, layout, specifications	9-8		
Arvin 33	Schematic, voltage, resistance, coils, parts	7-5		
	Alignment	7-2		
	Changes	7-3		
	Socket, trimmers, chassis	7-6		
Arvin 35 below serial #E31577H	Schematic, parts list	5-11		
Arvin 35, above serial E31577H	Voltage, resistances	6-10		
	Schematic, parts list	5-12		
Arvin 85	Voltage, test data, coil resistance	5-13		
	Alignment data, notes	5-18		
Arvin 87	Schematic, voltage, resistances, parts	6-13		
	Chassis layouts	6-14		
	Changes	6-15		
	Alignment—See model 17			
RE37 Chassis	See model 78			
39	Schematic, voltage, resistance, parts	8-5		
	Socket, trimmers, chassis, alignment	8-6		
Arvin 41	Schematic, parts	6-16		
	Voltage, resistance, socket, trimmers, alignment, coil	7-7		
42	Schematic, parts, voltage	9-9		
	Socket, trimmers, layout, specifications	9-10		
	Alignment	9-7		
44C, Chassis RE46	Schematic, voltage	10-1		
	Alignment, socket, trimmers, sensitivity	10-2		
	Antenna data	10-3		
RE44 Chassis	See model 7A			
Arvin 45 below serial #E40356L	Schematic, parts list	5-15		
Arvin 45, above serial E40356L	Voltage, resistances	6-17		
	Schematic, parts list	5-16		
Arvin 45	Voltage, test data, coil resistance	5-17		
	Alignment, notes	5-18		
RE45 Chassis	See model 8A			
RE46 Chassis	See model 44C			
Arvin 51	Schematic, parts	6-18		
	Voltage, resistance, socket, trimmers, alignment, coil	7-7		
Arvin 51-B	Schematic, socket, trimmers, voltage, resistance, coils, alignment, parts	7-8		

MODEL	NOBLITT SPARKS INDUSTRIES—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
58, 58A, 88, Chassis RE29, RE35	Schematic, parts, voltage, alignment, specifications	9-11		
	Socket, trimmers, layout	9-12		
Arvin 61, 62	Schematic, parts	6-19		
	Voltage, resistance, alignment, coils	7-9		
	Socket, trimmers, chassis	7-10		
Arvin 61-B, 62-B	Schematic, voltage, alignment, resistance, coils, parts	7-11		
	Socket, trimmers, chassis	7-12		
Arvin, 61M, 62M	Schematic, parts	6-20		
	Voltage, resistance, alignment, coils	7-9		
	Socket, trimmers, chassis	7-13		
68, Chassis RE26	Schematic, voltage, parts, alignment, specifications	9-13		
	Socket, trimmers, layout	9-14		
	Tuner data	9-19		
78, Chassis RE37	Schematic, voltage, trimmers, alignment, parts	9-15		
	Socket, layout	9-16		
Arvin 81	Schematic, parts	6-21		
	Voltage, resistance, alignment, coils	7-9		
	Socket, trimmers, chassis	7-14		
	Voltage, resistance, coil data	7-16		
Arvin 81M	Schematic, parts	6-22		
	Voltage, resistance, alignment, coils	7-9		
	Socket, trimmers, chassis	7-15		
	Voltage, resistance, coil data	7-16		
89, 91, Chassis RE27	Schematic, voltage, alignment, trimmers, sensitivity	10-7		
92, Chassis RE31	Schematic, alignment, trimmers, sensitivity	10-8		
Arvin 417, 467	Schematic, voltage, resistance, coils, parts list	7-17		
	Socket, trimmers, chassis, alignment	7-18		
508 AC-DC	Schematic, voltage, resistance, parts	8-7		
	Socket, trimmers, alignment	8-8		
Arvin 517, 527	Schematic, voltage, resistance, coils, parts	7-19		
	Socket, trimmers, chassis, alignment	7-20		
Arvin 517-B, 527-B	Schematic, voltage, resistance, coils, parts	7-21		
	Socket, trimmers, chassis, alignment	7-22		
518, 518A, 518DW, 528CS, 568, 568A, 568DW	Schematic, parts	8-10		
	Socket, trimmers, chassis	8-12		
	Voltage, resistance, alignment, sensitivity	8-13		
	Data	Changes 9-3		
518B	Schematic, parts	8-11		
578B	Schematic, parts	8-10		
	Socket, trimmers, chassis	10-10		
	Alignment, voltage, data	10-5		
608	Schematic, parts	8-14		
	Voltage, alignment, resistance, specifications	9-17		
	Socket, trimmers, layout	9-18		
Arvin 617, 627	Schematic, voltage, resistance, coils, parts	7-23		
	Socket, trimmers, chassis	7-24		
	Alignment	7-32		
Arvin 617-B, 627-B	Schematic, voltage, resistance, coils, parts	7-25		
	Socket, trimmers, chassis	7-26		
	Alignment	7-32		
618, 618A, 628, 628CS, 638, 638CS	Schematic, parts	8-10		
	Voltage, resistance, alignment, sensitivity	8-15		
	Socket, trimmers, chassis	8-16		
	Data	Changes 10-1		
618B, 628B	Schematic, voltage, alignment, parts	8-17		

PACENT REPRODUCER CORP.—(Cont.)

PACIFIC RADIO EXCHANGE

PACIFIC RADIO CORP.

PACIFIC RADIO CORP.—(Cont.)

PACKARD BELL CO.

PACKARD MOTOR CAR CO.

See PHILCO RADIO & TELEVISION CORP.

PACKARD RADIO CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
4-Tube Superhet	Schematic	3-1		1587
6-Tube Auto	Schematic	4-2		
5 Auto Set	Schematic, data	3-1		1587
4, 24, 24-C	Schematic	4-1		
8 AC	Schematic, parts	Misc. 6-26		
11, 13	Schematic	4-1		
85	Schematic	4-2		

PARAMOUNT RADIO CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Laurel Tone	Schematic	Misc. 5-14		

PATTERSON RADIO CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Pre-Selector	Schematic, data	5-1		
PR-10	Schematic, socket	5-2		
PR-16, Series A	Schematic	6-1		
PR-16, Series C	Schematic, notes	7-1		
	Socket, trimmers, notes	7-2		
	Alignment, voltage	7-3		
60 Series	Schematic	5-1		
70-AW, 107-AW, 207-AW, 210-AW	Schematic, data	3-1		1589
70-AW, 74-AW, 507-AW	Schematic, alignment, test data	4-1		
75-AW, 175-AW, 275-AW, 375-AW	Schematic, alignment	8-1		
75-AW-A, 175-AW-A, 275-AW-A, 375-AW-A	Schematic	8-3		
	Trimmers, alignment	8-4		
78B, 79B, 80B, Chassis 77B, 77BA	Schematic, socket, trimmers phono., notes	9-1		
80-AW, 84-AW, 508-AW	Schematic, alignment, test data	4-2		
85-AW, 185-AW, 285-AW, 385-AW	Schematic	8-5		
	Trimmers, alignment	8-6		
85-AW-A, 185-AW-A, 285-AW-A, 385-AW-A	Schematic	8-3		
	Trimmers, alignment	8-4		
86-AW, 186-AW, 286-AW, 386-AW	Schematic	6-3		
	Trimmers, alignment, part 1	6-2		
	Voltages, alignment, part 2, parts	6-4		
87, 87-A	Schematic	8-7		
	Socket, trimmers, voltage, alignment	8-8		
88, 89; Chassis 87	See model 87			
90; Chassis 87A	See model 87A			
104-AW, 510-AW with #46 power tubes	Schematic	4-3		
104-AW, 510-AW with #59 power tubes	Schematic, data	4-4		
105-AW, 1105-AW, 2105-AW, 3105-AW	Schematic, socket	8-2		
	Alignment, trimmers	8-6		
106-AW, 1106-AW, 2106-AW, 3106-AW	Schematic	6-3		
	Trimmers, alignment, part 1	6-2		
	Voltages, alignment, part 2, parts	6-4		
107, 107-A	Schematic	8-7		
	Socket, trimmers, voltage, alignment	8-8		
107-AW	See model 70-AW			
108, 109; Chassis 107	See model 107			
110; Chassis 107A	See model 107A			
111	See model 87			
126-AW, 1126-AW, 2126 AW, 3126-AW	Schematic	6-3		
	Trimmers, alignment, part 1	6-2		
	Voltages, alignment, part 2, parts	6-4		
127, 127-A	Schematic	8-7		
	Socket, trimmers, voltage, alignment	8-8		
128; Chassis 127	See model 127			
128; Chassis 228, 428	Schematic, voltage, trimmers	9-2		
	Alignment, part 1	9-5		
	Alignment, part 2, voltage	9-6		

PATTERSON RADIO CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
129; Chassis 127A	See model 127A			
130	See model 87			
168, 268	Schematic, socket, trimmers, voltage	9-3		
	Alignment, part 1	9-5		
	Alignment, part 2, voltage	9-6		
175-AW	See model 75-AW			
175-AW-A	See model 75-AW-A			
185-AW	See model 85-AW			
185-AW-A	See model 85-AW-A			
186-AW	See model 86-AW			
198, 298	Schematic, socket, trimmers, voltage	9-3		
	Alignment, part 1	9-5		
	Alignment, part 2, voltage	9-6		
207-AW, 210-AW	See model 70-AW			
208, 308, 408 212, 312, 412	Schematic, notes	9-4		
	Alignment, part 1	9-5		
	Alignment, part 2, voltage	9-6		
228 Chassis	See model 128			
268	See model 168			
275-AW	See model 75-AW			
275-AW-A	See model 75-AW-A			
285-AW	See model 85-AW			
285-AW-A	See model 85-AW-A			
286-AW, 386-AW	See model 186-AW			
298	See model 198			
308	See model 208			
312	See model 212			
375-AW	See model 75-AW			
375-AW-A	See model 75-AW-A			
385-AW	See model 85-AW			
385-AW-A	See model 85-AW-A			
386-AW	See model 186-AW			
408	See model 208			
412	See model 212			
428 Chassis	See model 128			
507-AW	See model 70-AW			
508-AW	See model 80-AW			
510-AW	See model 104 AW			
1105-AW	See model 105-AW			
1106-AW	See model 106-AW			
1126-AW	See model 126-AW			
2105-AW	See model 105-AW			
2106-AW	See model 1106-AW			
2126-AW	See model 1126-AW			
3105-AW	See model 105-AW			
3106-AW	See model 1106-AW			
3126-AW	See model 1126-AW			

PEERLESS

See UNITED REPRODUCERS

PERFECTONE, INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
4-Tube Receiver	Schematic	Misc. 5-15		

PETER PAN

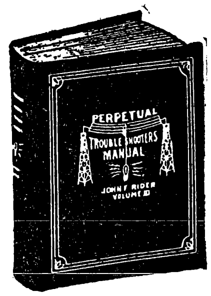
Also see JACKSON-BELL CO., LTD.

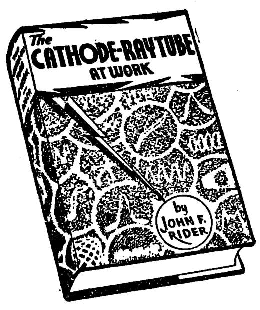
MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
B	Schematic	7-2		
4, 4-S	Schematic	7-1		
4 (w. Tone Cont.)	Schematic	7-2		
25AV, 25UV	Schematic	7-2		
34	Schematic	7-1		
45	Schematic	7-1		
56	Schematic	7-1		
84	Schematic	Misc. 8-3		

PHILCO RADIO & TELEVISION CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Suffixes:	B = Baby Grand Cabinet			
	C = Compact			
	A (batt. sets) = all dry battery models			
	A (A. C. sets) = 25-cycle chassis			
	X = Sloping baffle type of cabinet			
Automatic Tuning	Notes, parts	8-1		
	Assembly, notes	8-2		
Coils, compensating condensers	Coding, values	2-6		

RIDER Publications





THE CATHODE-RAY TUBE AT WORK

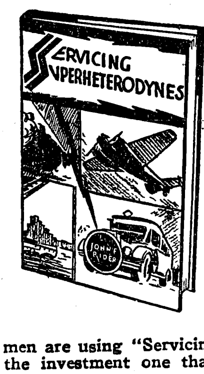
A new era in the servicing of radio receivers, public-address systems, transmitters, etc., is in the offing. It is the use of the cathode-ray tube and the progressive serviceman will prepare himself now for the change that is coming.

The theory underlying the functioning of the cathode-ray tube and the circuits that accompany it receives full consideration in this book. The second half of the volume is devoted to specific and practical applications of commercial oscilloscopes to servicing and adjustment problems. Order your copy today!

CONTENTS

I—The Theory of the Tube. A complete explanation of the different types of cathode-ray tubes. How the spot is focussed and how the beam of electrons is deflected. **II—Sweep Circuits.** How and why the spot moves across the screen and forms the image. **III—A-C. Voltages on Both Sets of Plates.** An explanation of the patterns formed on the cathode-ray tube screen when a.c. voltages are applied. **IV—Commercial Cathode-Ray Oscillographs.** A detailed description of the various cathode-ray oscillographs that are on the market. **V—Practical Application of the Cathode-Ray Oscillograph.** General directions for adjusting the cathode-ray oscillograph for all tests. **VI—Alignment of Tuned Circuits.** Understandable explanation of the theory of the frequency modulated oscillator and how it is used in testing with the cathode-ray oscillograph. **VII—The A-F. Frequency Modulator.** How overall a-f. response curves of audio units are developed and what they mean. **VIII—Auto Radio Vibrator Testing.** The connections for testing vibrators with the cathode-ray tube oscillograph. **IX—Transmitter Adjustment.** How the modulation of a wave is measured and the trapezoidal pattern is developed on the screen. **X—Other Applications of the Cathode-Ray Oscillograph.** Beat patterns, c-w. reception and detection.

338 Pages . . Profusely Illustrated . . Net Price $4.00



SERVICING SUPERHETERODYNES

No other circuit in the radio field has undergone all the changes that have been incorporated in the superheterodyne. In order to service these receivers with profitable speed, you must be able to analyze the different portions of the circuit quickly and this is just what Rider tells you how to do in this book. Not only is the theory of all types of Superhets thoroughly covered, but actual servicing details are most complete. Many thousands of Service-men are using "Servicing Superheterodynes" daily and are finding the investment one that paid dividends in increased profits.

CONTENTS

I—The Principles Underlying the Operation of the Superheterodyne Receiver. II—The Generation of and the Relation Between Harmonics. III—Explanation of the Different Types of Superheterodyne Circuits. IV—Function and Characteristics of Individual Parts of the Superheterodyne Receiver. V—Special Circuits and Tube Applications. VI—Troubles and Symptoms Encountered in Superheterodynes. VII—Application of Test Oscillators. VIII—Vibrator Units. Appendix—Intermediate Peak Frequencies of Commercial Receivers with Model Numbers.

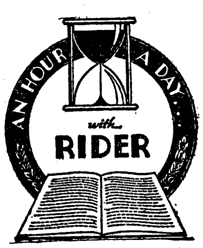
288 Pages . . Profusely Illustrated . . Net Price $2.00

Alternating Currents in Radio Receivers

Are you familiar with the different forms of alternating currents which are present in a radio receiver? When once you understand the basic facts relating to the cycle—frequency—sine waves—harmonics—complex waves—modulated waves—phase relations—you will have no trouble in understanding the servicing problems which involve these factors.

D.C. Voltage Distribution

Only a casual glance at the schematics of some of the 1939 multi-tube sets will convince you that the distribution of the D.C. voltage to the tube elements is complicated. The many different forms these systems take should be recognized at a glance and understood. You should know thoroughly how the value of resistance and wattage rating of each resistor is calculated and why.



96 Pages Each
Net Price $1.25 Each

Resonance and Alignment

Do you know what happens when you tune a circuit to resonance? In order to align a receiver, oscillator, or transformer properly, so that maximum efficiency is attained, you must be familiar with more than just the mechanical operation. Are you familiar with I.F., oscillator, R.F. and detector alignment for all types of circuits—single, double and triple tuned systems?

Automatic Volume Control

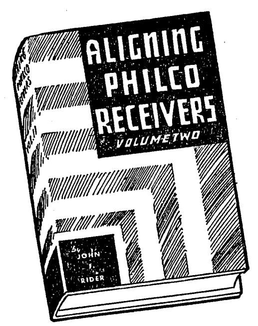
Automatic volume control has now become a standard feature of every well made receiver. Are you familiar with every type in use and can you recognize one system from another by examining the schematic? Do you know how various types of tubes are used in each circuit? Noise suppression systems, time delay circuits—audio-frequency volume expander systems and other such networks have greatly increased servicing problems.

HARD COVERS . . . . TYPE SET . . . . PROFUSELY ILLUSTRATED . . . . HANDY POCKET SIZE

SERVICING RECEIVERS BY MEANS OF RESISTANCE MEASUREMENT

Take the guesswork out of servicing by using an ohmmeter in your trouble shooting. This book tells you how to make and correctly interpret point to point resistance measurements. It will simplify your servicing problems and enable you to use the resistance data furnished in RIDER MANUALS to the best advantage. Now that more and more manufacturers are supplying resistance data, you need this book to speed up your servicing with greater accuracy. Let Rider show you how to use a modern servicing procedure on the complicated receivers—you will find in this book the usual Rider clarity of explanation of how theory is applied to practice.

203 Pages .... Net Price $2.00



ALIGNING PHILCO RECEIVERS

Two Volumes

Everything you need for aligning Philco receivers . . . I.F. peaks — adjustment frequencies—trimmer and padder locations—complete and detailed information for aligning every Philco model from 1929 to 1941. These two volumes, prepared with the co-operation of the engineering staff of the Philco Radio & Television Corp., are the authentic source of alignment information and the data are presented in a brand new way that makes alignment easier and quicker. You will find all the necessary data arranged so that every step in the alignment procedure is carried out in a definite systematic time-saving manner. The necessity for referring back and forth is eliminated completely in this radically new style of presenting alignment data.

Vol. I — 1929 to 1936 — 176 pages — $2.00
Vol. II — 1937 to 1941 — 200 pages — $2.00

AUTOMATIC FREQUENCY CONTROL SYSTEMS

From the simplest type of A.F.C. circuit to the most complicated push pull control circuit . . . you will find them all clearly explained in Rider's book. The first part of the book is devoted to a review of the combination of D.C. voltages, the phase relations in inductive, capacitive, and transformer circuits, with particular reference to the manner in which these principles appear in A.F.C. circuits. The remaining chapters cover the operation of all types of discriminator circuits, the operation of the various types of control tube circuits, including the push-pull type, the reflected reactance type, and the mutual inductance type. Let Rider tell you all about A.F.C. in this up-to-the-minute book that combines theory and practice.

144 Pages ....Net Price $1.75

PHILCO RADIO & TELEVISION CORP.—(Cont.) MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
32	Noise notes	5-17		
	Alignment, layouts, voltage	5-18		
	Schematic	5-19		
	Layouts, parts list	5-20		
	Changes	5-24		
	Changes	7-14		
34, 34-A	Schematic, layouts	5-21		
	Alignment, voltage, socket	5-22		
	Chassis layout, parts list	5-23		
34	Changes	5-24		
	Changes	Changes 7-8		
35, 35-B, 36	Schematic, voltage, data	1-8	*464-A	1613
	Alignment, trimmers	8-10		
35, 35-B	Chassis, data	1-9	*464-B	1614
	Test data	2-7	Front	1615
37	Chassis layout, socket, data	3-19		1635
	Schematic, notes	3-20		1634
	Changes	4-36		
	Changes—See model 14-LZX			
	Alignment, trimmers	8-10		
37-9 (121)	Schematic, parts	8-11		
	Alignment, voltage, chassis, trimmers	8-12		
	Changes	Changes 9-3		
37-10, 37-11	Schematic	8-13		
	Alignment, trimmers	8-14		
	Voltage, speaker data, notes	8-15		
	Chassis views, parts	8-16		
37-33	Schematic, trimmers, parts	7-15		
	Socket, chassis, alignment, voltage	7-16		
	Changes	Changes 8-2		
	Changes	Changes 9-3		
37-34	Schematic, parts	8-17		
	Alignment, trimmers, chassis, voltage	8-18		
	Changes	Changes 9-3		
37-38	Schematic, parts, coils	7-17		
	Socket, trimmers, voltage, alignment	7-18		
	Changes	Changes 8-3		
	Changes	Changes 9-3		
37-60	Schematic, coils	7-19		
	Voltage, socket, circuit data, transformer data	7-20		
	Trimmers, alignment	7-21		
	Chassis, parts	7-22		
	Changes	Changes 8-3		
37-61	Schematic, coil data	7-23		
	Trimmers, alignment	7-24		
	Chassis, voltage, transformer data, notes, parts	7-25		
	Changes	Changes 8-3		
37-62	Schematic, parts	8-19		
	Alignment, trimmers, voltage, chassis	8-20		
37-84 (Code 122)	Schematic, parts list	7-27		
	Socket, trimmers, voltage, alignment	7-28		
37-89	Schematic, coils, parts	7-29		
	Socket, trimmers, voltage, alignment	7-30		
37-93	Schematic, parts	8-21		
	Alignment, trimmers, voltage, chassis	8-22		
37-116 (Codes 121, 122)	Schematic	7-31, 7-32		
	Coils, voltage, trimmers, notes	7-33		
	Chassis views	7-34		
	Alignment	7-35		
	Parts list	7-36		
	Changes	Changes 8-3		
37-600	Schematic, socket, trimmers, parts list	7-37		
	Voltage, chassis, alignment, transformer data	7-38		
	Changes	Changes 8-3		
37-602	Schematic, parts	7-39		
	Voltage, socket, trimmers, chassis, alignment	7-40		
37-604	Schematic	7-41		
	Alignment, notes	7-42		

PHILCO RADIO & TELEVISION CORP.—(Cont.) MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
37-604	Socket, trimmers, voltage, chassis	7-43		
	Circuit data, parts list	7-44		
37-610 (Codes 121, 122)	Schematic, coil data	7-45		
	Circuit data, voltage, transformer data	7-46		
	Trimmers, alignment	7-47		
	Chassis, parts list	7-48		
37-611	Schematic, parts	7-49		
	Voltage, socket, trimmers, alignment	7-50		
37-620	Schematic, coil data	7-51		
	Circuit data, voltage, transformer data	7-52		
	Trimmers, alignment	7-53		
	Chassis, speaker data, parts list	7-54		
37-623	Schematic, parts, coils	7-55		
	Chassis, voltage, socket, trimmers, alignment	7-56		
	Changes	Changes 9-3		
37-624	Schematic, parts	8-23		
	Alignment, trimmers, voltage, chassis	8-24		
	Changes	Changes 9-3		
37-630	Schematic, coils, change	7-57		
	Trimmers, alignment	7-58		
	Circuit data, voltage, socket, transformer data	7-59		
	Chassis, parts list	7-60		
37-640	Schematic, coil data	7-61		
	Trimmers, alignment	7-62		
	Voltage, socket, transformer data, notes	7-63		
	Chassis, parts list	7-64		
37-641	Schematic, voltage, chassis	8-25		
	Alignment, trimmers, parts	8-26		
37-643	Schematic	8-27		
	Alignment, trimmers, notes	8-28		
	Chassis, parts	8-29		
37-650	Schematic, coil data	7-65		
	Trimmers, alignment	7-66		
	Voltage, socket, transformer data, notes	7-67		
	Chassis, parts list	7-68		
37-660	Schematic, coil data	7-69		
	Trimmers, alignment	7-70		
	Voltage, socket, notes	7-71		
	Chassis views, parts list	7-72		
37-665	Schematic	8-31		
	Voltage, notes, speaker wiring	8-30		
	Alignment, trimmers	8-32		
	Chassis, parts	8-33		
37-670	Schematic, coil data	7-73		
	Trimmers, alignment, speaker data	7-74		
	Trimmers, voltage, socket, data	7-75		
	Chassis views, parts list	7-76		
37-675 (Codes 121, 122)	Schematic, coil and switch data	7-137, 138		
	Trimmers, alignment	7-139		
	Chassis views	7-140		
	Voltage, speaker, adjustments	7-141		
	Parts list	7-142		
37-690	Schematic	8-35, 8-36		
	Chassis views	8-34		
	Trimmers, SPU chassis	8-37		
	Alignment	8-38		
	Voltage, notes	8-39		
	Coil & switch connections, speaker wiring, notes	8-40		
	Parts	8-41		
37-2620	Schematic, parts	8-43		
	Alignment, trimmers, voltage, chassis	8-42		
37-2650	Schematic	8-45		
	Chassis, parts	8-44		
	Alignment, trimmers	8-46		
	Voltage, notes, speaker wiring	8-47		
37-2670	Schematic	8-49		
	Voltage, notes, speaker wiring	8-48		

PHILCO RADIO & TELEVISION CORP.—(Cont.) MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
40-120, 40-125	Schematic, voltage, parts	10-28		
	Alignment, trimmers	10-16		
40-150, 40-155	Schematic, socket, trimmers	10-29		
	Alignment	10-30		
	Socket, trimmers, chassis, parts	10-31		
	Tuner data	10-16		
40-160	Schematic, socket, trimmers, chassis, voltage, parts	10-33		
	Tuner data	10-16		
	Alignment	10-34		
40-180, 40-185, 40-190	Schematic, socket, trimmers	10-29		
	Alignment	10-30		
	Socket, trimmers, chassis, parts	10-31		
	Tuner data	10-16		
40-195, 40-200	Schematic, voltage, socket, trimmers	10-35		
	Tuner data	10-16		
	Chassis, tuner chassis, parts	10-36		
	Alignment	10-37		
41 DC, 42 DC	Schematic, socket, voltage, data	1-11	*465	1617
	Chassis, data	2-8		1618
43 AC, 25 AC	Voltage, socket, data, notes	3-13		1619
	Schematic, changes	3-14		1620
	Chassis layout, single and twin speaker connections	3-15		1621
	Alignment data	3-16		1622
43-121	Changes	4-36		
44	Voltage, trimmers, socket	4-23		
	Schematic, condensers	4-24		
	Chassis view, adjustment data	4-25		
	Parts list	4-26		
45	Alignment, voltage, layouts	5-25		
	Changes	5-15		
	Changes	5-24		
	Schematic, parts, socket	5-26		
46, 46-E DC	Chassis, voltage, parts list	1-12	466-B	1624
	Schematic, voltage, data	1-13	466-A	1623
47 DC (121-221)	Schematic, voltage, resistor data	3-47		1687
	Chassis layout, speaker connections	3-48		1688
	Alignment, trimmers	8-87		
48 DC	Socket, resistor data, voltage, notes	3-21		1637
	Schematic, chassis layout	3-22		1636
	Alignment, trimmers	8-87		
49	Alignment, parts list	5-27		
	Schematic, voltage, layouts	5-28		
	Changes	5-33		
50, 50-A	Schematic, chassis, data	1-14	466-B-2	1626
	Voltage, values	1-15	466-B-1	1625
	Adjustments, parts list	2-9	466-B-7	1627
	Test data	2-10	Front	1628
51, 51-A, 52, 24, 551	Schematic, socket, data	2-11	466-B-8	1629
	Voltage, data	2-12	466-B-9	1630
	Chassis, adjustment, parts list, notes	2-13	466-B-10	1631
53 AC-DC	Schematic, alignment	3-17		1633
	Chassis layout, voltage for AC and DC	3-18		1632
54	Voltage, data	3-57		1628-A
	Schematic	3-58		1628-B
	Changes	4-36		
	Changes	7-147		
	Alignment, trimmers	8-6		
57	Voltage, parts view	4-27		
	Schematic, parts list	4-28		
	Trimmers, alignment	4-29		
58	Similar to model 57			
59	Alignment, voltage, parts list	5-29		
	Schematic, chassis, parts list	5-30		
	Changes ... Changes 8-2			
60	Changes	5-40		
	Changes	4-30		
	Voltage, parts view, adjustment	4-31		
	Schematic, parts list	4-32		
	Changes	7-147		

PHILCO RADIO & TELEVISION CORP.—(Cont.) MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
65	Schematic, socket, voltage	1-16	*459	1638
	Changes ... Changes 8-2			
66	Alignment, voltage, parts	5-31		
	Schematic, layouts	5-32		
	Changes	5-33		
70, 70-A (Below #B-22,000)	Schematic, socket, voltage, data	1-17	*466-C	1651
	Chassis, parts values	1-18	*466-D	1652
	Parts list, data	2-15		1653
	Alignment, trimmers	8-88		
70, 70-A (Above #B-22,000)	Voltage, values	3-32		1654
	Chassis layout	2-16		1656
	Alignment	2-17		
	Schematic, wiring changes	3-31		1655
71 Series, 22	Voltage, socket, twin speaker connections	3-23		1639
	Schematic, notes	3-24		1640
	Alignment, trimmers	8-10		
	Shadow tuning data	4-35		
	Changes	4-43		
76	Schematic, socket, voltage, data	2-19	*460	1659
77, 77-A	Schematic, socket, alignment	1-20	*460	1661
	Voltage, values	4-60		
80	Socket, voltage, electrical data	3-25		1643
	Schematic, chassis layout, notes	3-26		1644
	Alignment, trimmers	8-88		
81	Chassis layout, voltage, data	3-27		1645
	Schematic, parts list	3-28		1646
	Alignment, trimmers	8-88		
82, 86	Schematic, socket, voltage	1-21	*462	1663
84	Adjustment, voltage, parts view	4-33		
	Schematic, parts list	4-34		
87	Schematic, socket	1-22	*461	1647
	Voltage, data	2-20		1648
89	Notes	5-16		
	Changes	5-40		
89, 19 (121-2-3)	Schematic, alignment data, changes	3-33		1665
	Chassis layout, socket, voltage, data	3-34		1666
89 (Code 123)	Schematic, socket, trimmers	7-77		
	Voltage, trimmers, alignment	7-78		
	Chassis, parts list	7-79		
89 (126-126B)	Changes	4-43		
90, 90-A (with two '45s)	Chassis layout, parts values, data	2-22	466-D-2	1668
	Schematic, socket, voltage	2-23	466-D-1	1667
	Parts list, data	2-24		1669
	Alignment data with Jewell 560 Oscillator	2-30	466-D-5	1674
90, 90-A (with one '47)	Schematic, socket, voltage	2-26	466-D-3	1670
	Chassis layout, parts values, data	2-27	466-D-4	1671
	Socket, test data	2-28	Front	1672
	Parts list	2-29		1673
	Alignment, trimmers	8-87		
90, 90-A (with two '47s)	Schematic, changes, data	3-35		1675
	Voltage data	3-36		1676
	Chassis, parts list	3-37		1677
91, 14, 91-122	Changes	4-43		
91	Changes—See model 14-LZX			
91 (121-221)	Schematic, data	3-39		1679
	Voltage, socket, speaker connections	3-40		1680
	Chassis layout, adjustment notes	3-41		1681
	Parts list	3-42		1682
91 (126-226)	See model 14			
91-A (121)	Changes	4-43		
95	Schematic, socket, voltage, data	1-23	*462	1689
	Alignment, trimmers	8-89		
96, 96-A	Schematic socket	1-24	*463	1691
	Chassis	2-31		1693
	Alignment, trimmers	8-89		
97	Schematic, voltage, socket, data	6-7		

PHILCO RADIO & TELEVISION CORP.—(Cont.) MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
97	Alignment, trimmers, data	6-8		
	Chassis, parts	6-9		
98	Schematic	8-91		
	Chassis, parts	8-90		
	Alignment, voltage, trimmers	8-92		
101	Schematic, socket, trimmers, alignment, parts	10-32		
105	Schematic, voltage, socket, trimmers, chassis, alignment, parts	10-38		
108 (Code 121)	Schematic, voltage, parts	10-39		
	Tuner data	10-16		
	Socket, trimmers, chassis, tuner unit chassis, alignment	10-34		
111, 111-A	Voltage, values, data	2-32	466-2	1696
	Schematic, socket, data	2-33	466-1	1695
	Chassis layout	2-34	466-3	1697
	Parts list, changes	2-32	466-2	1698
	Alignment, trimmers	8-10		
112, 112-A (Below #174,001)	Voltage, parts values	1-25	466-G	1703
	Schematic, socket	1-26	*466-E	1701
	Parts list	2-35		1705
	Alignment notes	2-37		1707
112, 112-A (Both types)	Chassis layouts	2-36	*466-F, I	1702
112, 112-A (Above #174,001)	Parts values, voltage	2-38	466-J	1704
	Schematic, socket, parts list	2-39	466-H	1706
	Alignment, trimmers	8-10		
112-X	Changes	4-58		
116	Changes	Changes 9-3		
116-B (Code 121)	Chassis, socket, voltage, trimmers, data	6-10		
	Schematic	6-11		
	Alignment, parts	6-12		
	Changes	7-147		
116-X (Code **122**)	Schematic	6-13		
	Voltage, chassis, socket, parts, data	6-14		
	Alignment	6-12		
	Changes	7-147		
	Changes	Changes 9-3		
118	**Changes of layout, changes**	5-34		
	Parts list	5-35		
	Schematic, socket	5-36		
	Chassis layout, trimmer locations	5-37		
	Alignment, voltage	5-38		
118 (Code 128-RX)	Changes	5-34		
144	Changes	5-40		
	Schematic, transformer voltages	5-41		
	Alignment data	5-42		
	Parts list	5-43		
	Voltage, chassis and socket layouts	5-44		
	Changes	Changes 7-8, 7-13		
180-B Power Unit	Schematic	1-2	*745	1592
200, 200-X	Schematic	5-45		
	Alignment data	5-46		
201 (Code 121)	Schematic, parts	6-15		
	Voltage, socket, data	6-16		
	Alignment, trimmers	6-17		
211, 212, 220, 270, 296	Pickup data	4-59		
211, 211-A	Schematic, socket, data	1-27	*466	1699
	Parts list, changes	2-32		1698
	Alignment, trimmers	8-10		
212, 212-A, Radio-Phonograph	Schematic	1-26	*466-E	1701
	Alignment, trimmers	8-10		
220, 220-A	Schematic, socket, notes	3-51		1709
220, 270	Pickup data—See model 211			
233-G, 233-AG	Schematic, chassis, parts	8-93		
	Alignment, trimmers	8-94		
245	Schematic, parts, chassis	8-95		
	Trimmers, socket, voltage, alignment, transformer data	8-96		
P-350 Power Unit	Schematic, data	1-1	*748	1591

PHILCO RADIO & TELEVISION CORP.—(Cont.) MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
261	Schematic, parts	8-97		
	Voltage, socket, trimmers, chassis, alignment	8-98		
263-E	Schematic, chassis, trimmers, parts	8-99		
	Socket, voltage, alignment	8-100		
264, 265	Schematic, chassis, parts	8-101		
	Voltage, alignment, trimmers	8-94		
267-E	Schematic, chassis, parts, trimmers	8-103		
	Socket, voltage, alignment	8-104		
270	Pickup data—See model 211			
270, 270-A	Schematic, data	1-28	*466-C	1657
	Alignment, trimmers	8-10 & 8-88		
	Data	Changes 9-3		
296	Pickup data—See model 211			
296, 296-A	Schematic, socket, data	1-30	*498	1694
	Alignment, trimmers	8-89		
370	Alignment, trimmers	8-10		
AB-423, AB-463, AB-623, AB-663	Schematic similar to model 70 Early Schematics and layouts of power units	1-3	*744	1593
AB-463, AB-623, AB-663, DB	Specifications	1-4	*744	1594
470, 470-A	Schematic, socket, chassis	2-40	466-D-6	1712
	Voltage, parts values	2-41	466-D-7	1711
	Parts list	2-42	466-D-7	1713
	Alignment—See model 4 & model 70			
490	Schematic, socket, voltage	2-43	466-D-8	1715
	Chassis layouts, data	2-44	466-D-11	1716
	Parts list	2-45	466-D-10	1717
	Alignment—See model 4 & model 90			
500 **Series**	Schematic, chassis wiring	1-29	*459	1719
503	Schematic, data	4-37		
	Parts list	4-38		
	Alignment, trimmers	8-89		
504	Schematic	4-39		
	Parts list	4-40		
	Alignment, trimmers	8-89		
505	Schematic	4-41		
	Parts list, data	4-42		
	Alignment, trimmers	8-89		
506	Schematic	8-105		
	Notes, parts	8-106		
507	Schematic, notes	5-39		
	Alignment, trimmers	8-102		
509-X	Schematic, data	6-18		
	Alignment, trimmers	8-102		
511	Schematic, chassis, parts	8-107		
	Data	Changes 9-4		
521	Data	Changes 9-4		
551	See model 51			
570 Grandfather Clock	See model 70 (Below B-22000)			
600	Schematic, socket, trimmers, parts list	7-81		
	Voltage, socket, chassis, alignment	7-80		
602	Schematic, parts list	7-83		
	Voltage, socket, trimmers, chassis, alignment	7-82		
	Changes	Changes 9-3		
B-608 Power Unit	Schematic, data	1-1	*748	1591
604	Schematic	7-85		
	Voltage, socket, chassis, parts	7-84		
	Trimmers, coils, alignment	7-86		
610	Schematic, voltage, data	6-19		
	Socket, trimmers, alignment, data	6-20		
	Chassis, parts	6-21		
	Changes	7-147		
	Changes	Changes 9-3		
610, 610PF, 2nd Type	Schematic	7-87		
	Alignment	6-20		
	Changes, parts	7-88		
610B	Changes	7-148		
610F	Changes	7-148		
611	Parts, alignment	6-22		
	Schematic	6-23		
	Alignment, part 2, chassis, socket, trimmers	6-24		
611 (Code 121)	Changes	7-148		

PHILCO RADIO & TELEVISION CORP.—(Cont.)

DODGE-PHILCO

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
R-CRD	See Chrysler R-CRD			
T2-CT2	See Chrysler T2-CT2			
T11-CT11	See Chrysler T11-CT11			

FORD-PHILCO

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
N-FND (V8, 1934)	Schematic, chassis, parts, changes	8-5		
	Alignment, trimmers	8-4		
T6-FT6	Schematic, chassis, parts, socket	6-59		
	Trimmers, alignment	6-58		
	Changes, parts numbering system	7-26		
T9-FT9, FT9X	Schematic, chassis, parts	6-61		
	Alignment, data, chassis, trimmers	6-60		
F-1440	Schematic, chassis, parts, changes	8-144		
	Socket, trimmers, alignment	8-133		
F-1442	Schematic, chassis, parts, changes	8-145		
	Socket, trimmers, alignment	8-133		
F1540	Schematic, parts, chassis	9-49		
	Socket, trimmers, alignment	9-52		
	Control details, antenna	9-50		
F-1640	Schematic, chassis, parts	10-59		
	Alignment, socket, trimmers	10-60		

GRAHAM-PHILCO

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
G-1418	Schematic, chassis, parts	8-131		
	Socket, trimmers, alignment	8-129		
G-1436	Schematic, chassis, parts	8-142		
	Socket, trimmers, alignment	8-137		
G1528	Schematic, parts, chassis	9-43		
	Socket, trimmers, alignment, control, parts	9-44		

HUPMOBILE-PHILCO

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
G(121)-CGD	See Chrysler G(121)-CGD			
G(122)-CGD, Hupmobile for J, T & W Cars	Schematic, chassis, parts..6-72,	6-73		
	Installation data	6-76		
	Alignment, trimmers	8-4		
H-HHD, Hupmobile for J, T & W Cars	Schematic, chassis, parts	6-75		
	Changes	Changes 7-2		
	Installation data	6-76		
	Alignment, trimmers	8-3		
H(122)-HHD, Hupmobile for J, T & W Cars	Schematic, chassis, parts	6-74		
	Installation data	6-76		
	Changes	Changes 7-2		
	Alignment, trimmers	8-3		
R-HRD, Hupmobile for J, T & W Cars	Schematic, chassis, parts	6-77		
	Installation data	6-76		
	Alignment, trimmers	8-4		
R(122)-HRD	See model 11(122)			
T2-HT2	See Chrysler T2-CT2			
HT11X	Schematic, chassis, parts, changes	8-9		
	Alignment, trimmers	8-8		

LINCOLN-PHILCO

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
LT14X3 Lincoln	Schematic, chassis, parts list	7-9		
	Socket, trimmers, alignment	7-10		
L-1420, L-1424, L-1425	Schematic, chassis, parts	8-132		
	Socket, trimmers, alignment	8-133		
L-1427, L-1429, L-1460	Schematic, chassis, parts	8-135		
	Socket, trimmers, alignment	8-133		
L1560 (Lincoln Zephyr)	Schematic, parts, chassis	9-51		
	Controls details, parts	9-48		
	Socket, trimmers, alignment	9-52		
L-1660 Lincoln Zephyr	Schematic, chassis, parts	10-61		
	Alignment, socket, trimmers	10-62		

NASH-PHILCO

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
C-NCD; D-NDD, Nash (AC-989)	Schematic, parts	6-79		
	Installation data	6-80		
	Alignment, trimmers	8-3		

PHILCO RADIO & TELEVISION CORP.—(Cont.)

NASH-PHILCO

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
D(122)-NDD, Nash (AC-989)	Schematic, parts	6-78		
	Installation data	6-80		
	Alignment, trimmers	8-3		
J-NJD, Nash (AC-1189) Lafayette 110 Series	Schematic, parts	6-84		
	Installation data	6-83		
	Alignment, trimmers	8-4		
J-NJD, Nash (AC-1289)	Schematic, parts	6-84		
	Alignment, trimmers	8-4		
J-NJD(122)	See model 11 (122)			
Q-NQD, Nash (AC-1089) for Lafayette 110 Series	Schematic, parts	6-85		
	Installation data	6-86		
	Alignment, trimmers	8-4		
T7-NT7; T8-NT8	See model 806			
T12-NT12X, NT12X2, Lafayette	Schematic, chassis, parts	7-5		
	Socket, trimmers, alignment	7-6		
T15-NT15, NT15X, Nash, Lafayette	Schematic, chassis, parts	7-11		
	Socket, trimmers, alignment	7-12		
N-1418	Schematic, chassis, parts	8-131		
	Socket, trimmers, alignment	8-129		
	Control parts	8-130		
N-1433H	Schematic, chassis, parts, changes	8-140		
	Socket, trimmers, alignment	8-137		
	Control parts	8-130		
N-1434H (Two-units)	Schematic, chassis, parts	8-141		
	Socket, trimmers, alignment	8-137		
N1514	Schematic, parts, chassis	9-34		
	Socket, trimmers, alignment	9-40		
	Controls details	10-45		
N1524	Schematic, parts, chassis	9-39		
	Socket, trimmers, alignment	9-40		
	Controls details	10-45		

PACKARD-PHILCO

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
A-PAD, A-PAL	Schematic, chassis, parts	6-87		
	Installation data	6-88		
	Alignment, trimmers	8-3		
B-PBD	Schematic, chassis, parts, socket	6-89		
	Installation data	6-90		
	Alignment, trimmers	8-3		
H(122)-PHD	Schematic, chassis, socket, parts	6-91		
	Installation data	6-92		
	Changes, parts numbering system	7-26		
	Alignment, trimmers	8-3		
PHXD	Schematic, chassis, parts	6-93		
	Socket, trimmers, alignment	6-94		
T5-PT5, Packard 120 Cars	Schematic, socket, chassis, parts	6-95		
	Installation data	6-96		
	Changes	Changes 7-11		
	Alignment, trimmers	8-6		
T14-PT14	Schematic, chassis, parts	6-97		
	Alignment, socket, trimmers	6-98		
P-1417	Schematic, chassis, parts changes	8-127		
	Control parts	8-128		
	Socket, trimmers, alignment	8-129		
P-1421	Schematic, chassis, parts list	7-143		
	Socket, trimmers, alignment	7-144		
P-1422, P-1439	Socket, alignment, trimmers	8-133		
P-1426	Schematic, chassis, parts, changes	8-134		
	Socket, alignment, trimmers	8-133		
P-1430	Schematic, chassis, parts	8-138		
	Socket, trimmers, alignment	8-137		
	Control parts	8-128		
P-1432H	Schematic, chassis, parts, changes	8-139		
	Socket, trimmers, alignment	8-137		
P-1439	See model P-1422			

PHILCO RADIO & TELEVISION CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
PACKARD-PHILCO				
P1517	Schematic, parts, chassis	9-37		
	Socket, trimmers, alignment	9-38		
	Controls details	10-46		
P1530	Schematic, parts, chassis	9-46		
	Socket, trimmers, alignment	9-38		
P1535	Schematic, parts, chassis	9-47		
	Socket, trimmers, alignment	9-48		
	Controls details	10-47		
P-1617	Schematic, chassis, parts	10-53		
	Socket, trimmers, alignment	10-54		
P-1630	Schematic, chassis, parts	10-56		
	Alignment, socket, trimmers	10-54		
P-1635	Schematic, chassis, parts	10-57		
	Alignment, socket, trimmers	10-58		
PIERCE-ARROW-PHILCO				
E-MED, Pierce-Arrow	Schematic, parts	6-79		
	Installation data	6-82		
	Alignment	5-5		
E(122)-MED	See model 10 (122)			
T3-MT3, Pierce-Arrow DeLuxe	Schematic, socket, chassis, parts	6-99		
	Installation data, service notes	6-102		
	Changes	Changes 7-12		
	Alignment, trimmers	8-6		
T14-MT14X4	See Packard T14-PT14			
PLYMOUTH-PHILCO				
G(121)-CGD, Plymouth Codes PE & PF	Schematic, chassis, parts	5-4		
	Installation data	5-1		
	Installation data, notes	5-2		
	Alignment, adjustment, socket	5-3		
G(122)-CGD, Plymouth Codes PE & PF	Schematic, chassis, parts	6-62		
	Installation data	5-1		
	Installation data, notes	5-2		
	Alignment, trimmers	8-4		
Plymouth, Code PJ	Schematic, chassis, parts	6-68		
	Installation data	6-67		
	Similar to T2-CT2			
	Alignment, trimmers	8-6		
R-CRD	See Chrysler R-CRD			
T2-CT2	See Chrysler T2-CT2			
REO-PHILCO				
T3-RT3, Reo DeLuxe, (Part No. 5485)	Schematic, socket, chassis, parts	6-99		
	Installation data, parts	6-101		
	Changes	Changes 7-12		
	Alignment, trimmers	8-6		
T11-CT11	See Chrysler T11-CT11			
T14-RT14X	See Packard T14-PT14			
R-1415	Schematic, chassis, parts	8-125		
	Socket, trimmers, alignment	8-126		
STUDEBAKER-PHILCO				
C(122)-SCD	See model 10(122)			
C-SCD	See Nash C-NCD			
D-SDD	See Nash model D-NDD			
J-SJD (121)	Schematic, chassis, parts	6-103		
	Installation data	6-104		
	Alignment, trimmers	8-4		
J(122)-SJD	See model 11 (122)			
Q-SQD	See Nash Q-NQD			
T3-ST3	See Pierce-Arrow T3-MT3			
	Changes, parts numbering system	7-26		
T7-ST7	See model 806			
T12-ST12, Studebaker	Schematic, alignment	7-7		
	Socket, trimmers, chassis, parts, alignment, part 2	7-8		
T15-ST15, Studebaker	Schematic, chassis, parts list	7-13		
	Socket, trimmers, alignment	7-14		
AC-206, Studebaker	Schematic, parts	6-79		
	Installation data	6-81		
	Alignment, similar to AC-206, Code 122			

PHILCO RADIO & TELEVISION CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
STUDEBAKER-PHILCO				
AC-206 (Code 122), Studebaker DeLuxe	Schematic, chassis, parts	5-6		
	Alignment, socket	5-5		
	Similar to model 10 (122)			
AC-236, Studebaker Junior	Schematic, parts	6-84		
	Installation data	6-81		
	Similar to J-NJD			
AC-266, Studebaker	Schematic, socket, parts	6-99		
	Installation data	6-100		
	Similar to T3-ST3			
S-1431, Studebaker	Schematic, chassis, parts list	7-145		
	Socket, trimmers, alignment	7-146		
S-1437 (Two units)	Schematic, chassis, parts	8-143		
	Socket, trimmers, alignment	8-137		
S1516	Schematic, parts, chassis	9-35		
	Socket, trimmers, controls, alignment, parts	9-36		
S1526	Schematic, parts, chassis	9-41		
	Socket, trimmers, controls, alignment, parts	9-42		
S-1616	Schematic, chassis, parts	10-48		
	Socket, trimmers, alignment	10-52		
S-1622	Schematic, chassis, parts	10-55		
	Alignment, socket, trimmers	10-15		
WILLYS-OVERLAND				
W-1419	Schematic, chassis, parts	8-125		
	Socket, trimmers, alignment	8-126		

PIERCE-AIRO, INC.

See DE WALD RADIO

PIERSON—DELANE CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
PR15C, PR15M, PR15R, PR15UH, PR15X	Schematic, data	9-1		
	Trimmers, socket	9-2		
	Alignment, filter data, oscillograms	9-3		
	Noise-suppressor notes	9-4		

PILGRIM ELECTRIC CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
D, DE	Schematic, voltage	10-1		
DA, DAE	Schematic	9-1		
DB, DF	Schematic	9-1		
G, GE	Schematic, voltage	10-2		
GB, GBE, GF, GFE	Schematic, voltage	10-2		
GH, GHE	Schematic, voltage	10-1		
NT, NTE	Schematic, voltage	8-1		
NTH, NTHE	Schematic, voltage	8-1		
RJ, RJE	Schematic, voltage	8-2		
RJH, RJHE	Schematic, voltage	8-2		
200	Schematic	10-3		
210	Schematic	9-1		
313, 314	Schematic	9-2		
623, 624, 643, 644	Schematic	10-3		
713, 714, 753, 754	Schematic	9-2		
860	Schematic	10-4		
930 Wireless Record Player	Schematic	10-1		

PILOT RADIO & TUBE CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
4-Tube DC Superhet	Schematic	4-3		
Air Hound (All Electric)	Schematic	1-3	*467	1723
Air Scout (All Electric)	Schematic	1-3	*467	1723
Captain Kidd Chest	See model 55			
Country Special	See model K-121			
Dragon 8 tube	See model L-8			
Dragon AC Super	See model 10			
Dragon AW	See model 1010			
Dragon AW Super	See model 8			
Dragon DC	See model 11, 41 series			
Dual-Wave Midget, (200-2,000 Meters)	Schematic	2-1		1729
Jumbo ABC	Schematic	1-2	*747	1722
Jumbo Power Pack	Schematic	1-2	*747	1722
Pilotone (Electric)	Schematic	1-3	*467	1723
Pilotone B Pack	Schematic	1-2	*747	1722
Public-Address System	Schematic	1-1	*705	1721
Rainbow	See model 31-81, 81			

MODEL	PILOT RADIO & TUBE CORP.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
S-W Converter	Schematic	1-6	*471	1733
Super Wasp AC	See model K-115			
Super Wasp Battery	See model K-110			
Twin Screen Grid 8	See model K-117			
Universal Wasp AC	See model K-136			
Wasp	See model 3-SW			
2	Schematic	4-1		
B-2 Standard	Schematic	3-8		1738
D-3	Schematic	4-1		
D-3, AC-DC Late	Schematic	3-9		1739
3-SW, Wasp	Schematic	7-14		
SP-5 ABC Pack	Schematic	1-2	*747	1722
PE-6 SG	See model K-122			
7, 8, 81, 84 (Dragon A-W. Super)	Schematic	5-2		
	Alignment data	5-3		
	Socket, voltage, trimmers	5-4		
L-8 (8-Tube Dragon)	Schematic	5-1		
10 AC, Dragon Superhet	Schematic	4-2		
11 Dragon DC	Schematic, voltage, socket, alignment data	3-7		1737
H-11	Schematic, socket, trimmers, alignment	10-1		
12 AC Superhet	Schematic	4-4		
H-12	Schematic, socket, trimmers, alignment	10-2		
F-14 DC Superhet	Schematic	4-3		
20	Schematic	4-4		
23, P23, 25, P25	Schematic, parts	8-1		
	Alignment	8-3		
28	Schematic	4-5		
28 Revised	Schematic	5-5		
31-81 Rainbow Superhet	Schematic	4-6		
39 Series	Schematic, voltage, socket, alignment data	3-2		1724
41	Schematic, voltage, alignment, socket, trimmers	6-1		
41 Series, DC Dragon	Schematic, voltage, socket	3-1		
41 DC Superhet	Schematic	4-7		1725
X-41, Y-41	Schematic, voltage, socket, trimmers, alignment	7-1		
43	Schematic	4-8		
43, X43, 45, X45, Y48, Y45	Schematic, voltage, alignment	6-2		
	Additional data .... Changes	7-11		
G-44, G-45	Schematic, parts, battery connections	8-2		
	Alignment	8-3		
X-48, X-49	Schematic, socket, trimmers, parts	8-4		
	Voltage, alignment	8-6		
53	Schematic, socket	5-6		
	Alignment data	5-7		
55	Schematic	4-6		
	Schematic	5-8		
	Alignment data	5-7		
55, Captain Kidd Chest	Schematic	5-10		1740
G-56, G-57	Schematic, socket, trimmers, parts	8-5		
	Alignment	8-6		
63	Schematic, voltage	6-3		
	Socket, trimmers, alignment	6-4		
X-63, X-65	Schematic, socket, trimmers	6-5		
	Voltage, parts, alignment	6-6		
H-64, Chassis H60	Schematic, voltage, socket, trimmers, alignment	10-3		
68	Schematic	5-9		
X-68, X-69	Schematic, socket, trimmers	6-7		
	Voltage, parts, alignment	6-8		
73, 75	Schematic	6-9		
X-73, X-75	Schematic, socket, trimmers	6-11		
	Voltage, parts, alignment	6-12		
81 Rainbow, 2nd Edition	Schematic	3-9		1739
81, 84	See model 8			
93	Schematic	5-10		
	Additional data .... Changes	7-2		
103, 105	Schematic, voltage	6-13		
	Socket, trimmers, alignment	6-14		
X-105	Schematic, socket, trimmers, parts	8-7		
	Voltage, alignment	8-8		

MODEL	PILOT RADIO & TUBE CORP.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
108, 109	Schematic	6-10		
	Socket, trimmers, voltage, alignment	7-2		
K-110, Super Wasp, Battery	Schematic, socket	1-4	*469	1727
K-111 ABC Pack	Schematic	1-2	*747	1722
114, 115	Alignment, socket, trimmers	6-16		
	Schematic, voltage	6-15		
	I-F. Peak .... Changes	7-3		
X114, X115	Similar to 114, 115			
	Data .... Changes	10-1		
K-115, AC Super Wasp	Schematic, socket	1-4	*469	1727
K-117, Twin Screen Grid 8	Schematic	1-4	*469	1727
K-121, K-121X, Country Special	Schematic, socket	1-5	*470	1728
K-122, K-123, K-124, PE-6 SG	Schematic, socket	1-5	*470	1728
123	Schematic	6-17		
	Voltage, parts, alignment	6-18		
125	Schematic, parts	7-3		
	Socket, trimmers, voltage, alignment	7-4		
K-126, K-128	Schematic, socket	1-5	*470	1728
H134, H135, Chassis H130	Schematic	10-13		
	Voltage, socket, trimmers, alignment	10-14		
	Alignment procedure	10-15		
K-136 AC Universal Wasp	Chassis layout, chassis wiring	2-2	468-A-1	1726
K-139 Power Pack	Schematic	2-1		1729
140 Auto Set	Schematic, socket, wiring, data	1-6	*471	1733
H141	Schematic, socket, voltage, alignment, trimmers	10-4		
S-141	Schematic	2-1		1729
S-148, C-162, S-164, C-165	Schematic, socket	3-5		1732
TH150, H151, Chassis H150	Schematic, voltage, socket, alignment, trimmers	10-9		
153, 155	Schematic, socket, trimmers, voltage, alignment, parts	7-5		
C-153, C-154 (with two '45s)	Schematic, socket	2-3		1735
C-153, C-154 (with two '47s)	Schematic, socket	2-4		1736
S-155, S-155A, S-155-B, S-155-F, C-157, C-157-A, C-157-B, C-157-F, AC Midget, (2 types)	Schematic, socket	3-3		1731
S-156, S-158 DC Midget	Schematic, socket, notes	3-4		1730
C-162, S-164, C-165	See model S-148			
G-162, G-163	Schematic, socket, trimmers, parts	8-9		
	Alignment	8-12		
G-162-A, G-162-B, G-163-A, G-163-B	Schematic, socket, trimmers, parts	8-10		
	Alignment	8-12		
S-164, C-165	See model C-162			
171 Power Amplifier	Schematic	1-1	*705	1721
183, 185	Schematic, socket, trimmers	6-19		
	Voltage, parts, alignment	6-20		
G-184, G-185	Schematic, parts	8-11		
	Alignment	8-12		
V-191	Schematic, socket	2-4		1736
193, 195, Early	Schematic, socket, trimmers, parts	7-7		
	Voltage, alignment	7-8		
193, 195 Revised	Schematic, socket, trimmers, alignment, parts	8-13		
X-201	Schematic, socket, trimmers, chassis, parts	9-1		
	Voltage, alignment	9-2		
203, 205	Schematic, voltage, socket, trimmers, alignment, parts	7-6		
213, 215	Schematic, socket, trimmers	6-21		
	Voltage, alignment	7-2		
223	Schematic, voltage	8-14		
H224, Chassis H220	Schematic, voltage, socket, alignment, trimmers	10-5		
	Alignment procedure	10-6		
243, C-243, 245, C-245	Similar to 213, 215			
	Additional data ....Changes	7-11		

FREQUENCY MODULATION

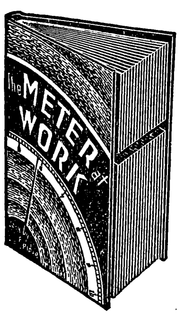
The latest development in radio —FREQUENCY MODULATION—is on the air. More and more stations all over the country are making provision for "staticless" broadcasting and the number of F-M receivers on the market is increasing. . . . Here is your chance to get in at the start— Rider's newest book explains the transmission and reception of frequency-modulated signals with especial attention given to the different types of f-m receivers now available—their adjustments and maintenance. . . . This is a "must" for every serviceman who has an eye on the future. . . . It is an investment that will pay real dividends!

CONTENTS

Chapter I. Frequency Modulation.—An introduction to the subject with comparisons drawn between the frequency-modulation and amplitude-modulation forms of transmission and reception. **Chapter II. What Happens at the Transmitter.**—A non-mathematical explanation of how frequency-modulated signals are broadcast, including a discussion of phase modulation. **Chapter III. What Happens in the Receiver.**—How the f-m signal progresses through the receiver and how it is affected by the limiter discriminate tubes. **Chapter IV. Wave Propagation and Service Areas.**—How the ultra-high frequency waves are used for f-m transmission and the area covered. **Chapter V. F-M Receiving Antennas.**—Explanations and data concerning the best types of antennas for the reception of f-m signals. **Chapter VI. Servicing F-M Receivers.**—Valuable instructions for the adjusting and maintenance of the receiver including numerous oscillograms that will guide you in your servicing problems.

136 PAGES . . . . TYPE SET . . . . FLEXIBLE CLOTH . . . . PROFUSELY ILLUSTRATED . . . . NET PRICE $2.00

THE METER AT WORK



Here is a practical book for all who employ electric meters in radio and the allied electronic arts.

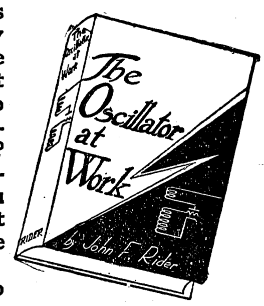
It is only through knowledge of the principles underlying the functioning of any piece of apparatus that a man can get the utmost use from it. To that end, it will be found that the subject matter of this book is treated from an entirely new angle, the theory upon which each meter is based is separate and distinct from any other type and complete in itself. Inasmuch as some types of meters can do several jobs, the practical aspects of the meter are confined to the latter portion of the book. Thus, you can cover whichever phase of the subject you are interested in, and with the new construction of the book —the separation of text and illustrations—you will be able to obtain the information quickly and with the minimum of effort.

CONTENTS

I—General Considerations. II—Moving-Iron Meters. III—Moving-Coil Meters. IV—Electrodynamometer Meters. V—The Electrostatic Meter. VI—Thermal Meters. VII—Components of Meters. VIII—Characteristics of Meters. IX—Rectifiers and Thermocouples. X—Practical Applications of Meters.

152 Pages . . . 138 Illustrations . . . $2.00

THE OSCILLATOR AT WORK



Do you get your money's worth out of your present-day oscillator? Do you derive maximum utility from that unit? Do you know how to test your oscillator and establish if it is working properly? Would you know how to repair it if it went bad? Do you know how many different types of oscillators can be used in the servicing field?

Here is your opportunity to get the true facts about oscillators! Rider's "The Oscillator at Work" is worth many times the price asked because it helps protect the investment you have made in oscillator equipment.

CONTENTS

I—How an oscillator works. II—Alternating Currents. III—Triode Oscillators. IV—Electron-Coupled Oscillators. V—Ultra-High Frequency Oscillators. VI—Negative-Resistance Oscillators. VII—Electro-Mechanical Oscillators. VIII—Relaxation Oscillators. IX—Superheterodyne Oscillators. X—R-F Signal Generators. XI—Audio-Frequency Oscillators. XII—Modulation of Oscillators. XIII—Wobbulators. XIV—Adjustment of Transmitters. Bibliography.

256 Pages . . . 167 Illustrations . . . $2.50

A.C. CALCULATION CHARTS

146 charts 7" x 11" printed in two colors, covering all alternating current calculations from 10 cycles to 1000 megacycles. A tremendous time saver for all engineers and others who work on power, audio, supersonic, high frequency and ultra high frequency problems.

160 PAGES . . . . . . 9½ x 12 INCHES . . . . CLOTH BINDING $7.50

RCA MFG. CO., INC.—(Cont.)

MODEL	RCA MFG. CO., INC.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
7T, 7K, 8T, 8K	Schematic, socket, trimmers, phono.	7-56		
	Chassis wiring	7-57		
	Voltage, socket, trimmers, resistance, loudspeaker	7-58		
	Circuit data, alignment, part 1	7-59		
	Alignment, part 2, parts list	7-60		
	Victrola attachment data	10-101		
7T1	See model 6K3			
	Victrola attachment data	10-101		
7U	Schematic, chassis wiring	7-61		
	Resistance, voltage, socket, trimmers, speaker, transformer	7-62		
	Motor board adjustments	7-63		
	Assembly wiring, pickup details	7-64		
	Circuit data, alignment, pickup data, part 1	7-65		
	Pickup data, part 2, socket, parts list	7-66		
7U2	Schematic, socket, trimmers	8-29		
	Phono. data, notes	8-28		
	Chassis wiring	8-30		
	Parts	8-31		
7X	Schematic, voltage, socket, trimmers, alignment, resistance	8-33		
	Alignment, parts	8-32		
	Chassis wiring	8-34		
	Victrola attachment data	10-101		
7X1	Changes	Changes 9-6		
	Victrola attachment data	10-101		
Victor 7-1	See Victor Alhambra I			
Victor 7-2	See Victor Alhambra II			
Victor 7-3, 7-30, R-20	Schematic, socket	1-62	*512	1978
T7-5	Schematic, socket, trimmers	7-67		
	Chassis wiring	7-68		
	Voltage, socket, trimmers, transformer, loudspeaker	7-69		
	Circuit data, parts, alignment, data	7-70		
	Speaker data	7-82		
	Victrola attachment data	10-101		
C7-6	Schematic, socket, trimmers	7-67		
	Chassis wiring	7-68		
	Voltage, socket, trimmers, transformer, loudspeaker	7-69		
	Circuit data, parts, alignment, data	7-70		
	Victrola attachment data	10-101		
D7-7	Schematic, socket, trimmers	7-71		
	Chassis wiring, pickup	7-72		
	Assembly wiring, voltage, speaker, transformer, circuit, alignment, part 1	7-73		
	Alignment, part 2, parts list	7-74		
	Additional data	Changes 7-6		
BT7-8, BC7-9	Schematic, socket, trimmer, data	6-95		
	Chassis wiring	6-96		
	Parts, circuit data, alignment data	6-97		
	Alignment part 2, voltage, trimmers	6-98		
KK-7, S.P.U. Chassis	See model TRK-12			
KK-7A S.P.U. Chassis	See model TRK-9			
T7-12, C7-14	Schematic, chassis wiring	7-75		
	Data, parts list	7-76		
	Victrola attachment data	10-101		
Victor 7-10	Schematic, socket	1-59	*511	1975
Victor 7-11	Schematic, socket, voltage	1-59	*511	1975
Victor 7-25	Schematic, socket	1-59	*511	1975
Victor 7-26	Schematic, socket	1-62	*512	1978
Victor 7-30	See Victor 7-3			
8BT, 8BK, 8BT6, 8BK6	Schematic, socket, trimmers, phono. data, speaker wiring	8-35		
	Resistance, voltage	8-37		
	Alignment	8-38		
	Notes, parts	8-39		
8BT, 8BK	Battery cable, chassis wiring	8-36		
8BT6, 8BK6	Power unit and chassis wiring	8-36		

MODEL	RCA MFG. CO., INC.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
C8-15	Schematic, socket, trimmers, speaker	7-77		
	Chassis wiring	7-78		
	Voltage, transformer, visual alignment, data	7-79		
	Circuit data, alignment	7-80		
	Parts list	7-81		
	Victrola attachment data	10-101		
C8-17	Schematic, socket, trimmers	7-83		
	Chassis wiring	7-84		
	Voltage, trimmers, transformer, visual alignment	7-85		
	Alignment, parts	7-86		
CV-8, "Pak-O-Powr"	Schematic, chassis wiring, parts	8-52		
D8-28	Schematic, socket, trimmers	7-89		
	Chassis wiring pickup	7-90		
	Voltage, assembly, wiring, phono. adjustments, data	7-91		
	Alignment, parts, loudspeaker, transformer	7-92		
HF-8, U134	Schematic	9-21, 22		
	Automatic record changer	9-9		
	Motor, gear mechanism	9-18		
	Chassis wiring, voltage	9-24		
	Socket, trimmers	9-25		
	Specifications, circuit data, tuner notes	9-26		
	Tuner mechanism, transformer data, tuner data	9-27		
	Fidelity control data, alignment, lead dress	9-28		
	Parts list	9-29		
8K1	Changes	Changes 9-6		
	Victrola attachment data	10-101		
8K, 8T	See model 7T			
8M	Schematic, socket, voltage, trimmers, chassis wiring	9-31		
	Alignment, specifications, data, parts	9-32		
8M1	Schematic, socket, trimmers, voltage	9-33		
	R-f chassis wiring, parts layout	9-35		
	Alignment, parts, specifications, data	9-36		
8M2	Schematic, changes, power unit changes	9-34		
	Socket, trimmers, voltage	9-33		
	R-f chassis wiring, power unit and parts layouts	9-35		
	Alignment, parts, specifications, data	9-36		
8M3, 8M4	Schematics, socket, trimmers, specifications	9-37		
	Parts layouts, R-F chassis wiring	9-38		
	Alignment, trimmers, voltage, data	9-39		
	Parts list	9-40		
	Data	Changes 10-1		
R-8, R-12 AC	Schematic, socket, voltage	2-13	504-D-5	1777
	Chassis wiring, parts list	2-14	504-D-6	1778
	Resistance data, socket, voltage	2-15	Front	1779
8T2, 8T11, 8K11	Schematic, socket, phono. data	8-41		
	Parts	8-40		
	Chassis wiring	8-42		
	Voltage, resistance, trimmers	8-43		
	Circuit data, alignment, transformer wiring	8-44		
	Data	Changes 10-4		
	Victrola attachment data	10-101		
8T10	Data	Changes 8-4		
	Data	Changes 9-6		
	Victrola attachment data	10-101		
T8-14	Schematic, socket, trimmers, speaker	7-77		
	Chassis wiring	7-78		
	Voltage, transformer, visual alignment, data	7-79		

RCA MFG. CO., INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
TRK-9; TRK-12 Television S.P.U. Chassis RS-83E	Schematic	10-23		
9TX1, 9TX2, 9TX3, 9TX4, 9TX5, "Little Nipper 2nd"	Schematic, voltage, socket, alignment, trimmers	10-40		
	Parts	10-38		
9TX21, 9TX22, Chassis RC403, 9TX23, Chassis RC-403A	Schematic, voltage, socket, trimmers, data, alignment	10-41		
	Parts	10-42		
9TX31, Chassis RC-405, 9TX32, Chassis RC-405A, 9TX33, Chassis RC-405B	Schematic, voltage, socket, trimmers, alignment, data	10-43		
	Parts	10-42		
9TX50, Chassis RC435	Schematic, voltage, socket, trimmers, alignment, data, parts	10-44		
9U, 9U2	Schematic	8-67		
	"Magic Brain" wiring	8-69		
	Assembly wiring, dial data	8-71		
	Socket, trimmers, voltage, resistance	8-72		
	Automatic record changer, details, notes	8-73		
	Alignment, page 1	8-74		
	Alignment, page 2, notes, page 1	8-75		
	Notes, page 2, parts, page 1	8-76		
	Parts, page 2	8-77		
	Parts, page 3, circuit data	8-78		
9U	Chassis wiring	8-68		
9U2	Chassis wiring	8-70		
Victor 9-1	See Victor Florenza			
Victor 9-2	See Victor Borgia, II			
Victor 9-3	See Victor Borgia, I			
Victor 9-15	Schematic, socket	1-63	*513	1979
Victor 9-18	Schematic, socket	1-64	*514	1980
Victor 9-25	Schematic, socket	1-65	*515	1981
Victor 9-40 Borgia	Schematic	1-65	*515	1981
Victor 9-54	Schematic, socket, voltage	1-66	*516	1982
Victor 9-55	Schematic, socket	1-67	*517	1983
9X, 9X1, 9X2, 9X3, 9X4	Schematic, socket, voltage, specifications, lead dress, notes, chassis wiring	9-30		
10K, 10T	Schematic	7-130		
	Chassis wiring	7-131		
	"Magic Brain" chassis wiring	7-132		
	Socket, trimmers, dial mechanism, loudspeaker data	7-133		
	Resistance, voltage, transformer	7-134		
	Circuit data, alignment, part 1	7-135		
	Alignment, part 2, parts list	7-136		
	Victrola attachment data	10-101		
10K1, 10T (2nd Production)	Schematic	8-79		
	Chassis wiring	8-80		
	Socket, voltage, trimmers, notes	8-81		
	Parts	8-82		
	Victrola attachment data	10-101		
10K11, 10T11	Data	Changes 8-4		
R-10 AC	Schematic, chassis wiring, voltage, data	2-16	504-F-1	1780
	Resistance data, socket, voltage	2-17	Front	1781
	Data	Changes 10-2		
PLF-10 Filter Coupling unit	See model 5X5I			
R-10 DC	Data	Changes 7-15		
SW Adaptor SW-10	Schematic, chassis wiring	1-53	*504-E	1949
	Voltage, chassis views, data	1-54	*504-F	1950
10T Early	See model 10K			
T10-1	Trimmers, socket, voltage, speaker data, transformer data	6-104		
	Schematic	6-105		
	Chassis wiring	6-106		
	Alignment, parts list	6-107		
	Alignment, part 2	6-108		

RCA MFG. CO., INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
T10-1	Speaker data	7-82		
	Victrola attachment data	10-101		
T10-8	Schematic	6-109		
	Chassis wiring	6-110		
	Socket, trimmers, speaker data, voltage	6-111		
	Circuit data, alignment	6-112		
	Alignment, part 2	6-113		
	Parts list	6-114		
	Speaker data	7-82		
Victor 10-51-A	Schematic, socket	1-67	*517	1983
Victor 10-69	Schematic, socket, chassis wiring	1-68	*518	1984
Victor 10-70	Schematic, socket	1-69	*519	1985
Victor 10-70-A	Schematic, socket	1-69	*519	1985
C11-1	Schematic	6-115		
	Chassis wiring	6-116		
	Trimmers, voltage, speaker data, alignment	6-117		
	Circuit data, alignment, socket	6-118		
	Alignment, part 2	6-119		
	Alignment, part 3; parts list	6-120		
	Victrola attachment data	10-101		
C11-8	Similar to C11-1			
	Data	7-156		
	Victrola attachment data	10-101		
D11-2	Schematic	7-137		
	Chassis wiring	7-138		
	Voltage, socket, trimmers, pickup, transformer, speaker, dial mechanism	7-139		
	Assembly wiring, record changer	7-140		
	Circuit data, notes	7-141		
	Alignment	7-142		
	Parts list	7-143		
	Changes	Changes 8-4		
R-11 AC, Early	Schematic, socket, voltage	2-18	504-G	1782
	Chassis wiring, data	2-19	504-H	1783
R-11 AC, Late	Chassis wiring	2-20	504-I	1784
R-11 AC	Parts list, notes	2-21	504-J	1785
	Resistance data, socket, voltage	2-22	Front	1786
T11-8	Schematic, phono., pickup	7-144		
	Chassis wiring	7-145		
	Socket, trimmers, voltage, speaker, transformer	7-146		
	Circuit data, alignment, part 1	7-147		
	Alignment, part 2, parts list	7-148		
	Changes	Changes 8-4		
R-12 AC	See model R-8			
Victor 12-1	See Victor Cromwell			
Victor 12-2	See Victor Tuscany			
Victor 12-15	Schematic, socket	1-61	*520	1977
Victor 12-15-C	Schematic, socket	1-61	*520	1977
Victor 12-25	Schematic, socket	1-69	*519	1985
C13-2	Schematic	6-121		
	Chassis wiring	6-122		
	Trimmers, voltage, circuit data	6-123		
	Circuit data, part 2; alignment, socket	6-124		
	Alignment, part 2	6-125		
	Alignment, part 3; dial data, transformer data	6-126		
	Parts list	6-127		
	Victrola attachment data	10-101		
C13-8	Similar to C13-2			
	Data	7-156		
	Victrola attachment data	10-101		
13K	Schematic, speaker wiring, transformer wiring	8-83		
	Chassis wiring	8-84		
	"Magic Brain" chassis wiring	8-85		
	Resistance, voltage, socket, trimmers	8-86		
	Dial change mechanism, notes, socket, trimmers	8-87		

MODEL	RCA MFG. CO., INC.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
13K	Alignment, page 1, oscillograms	8-88		
	Alignment, page 2	8-89		
	Alignment, page 3, notes, parts	8-90		
	Victrola attachment data	10-101		
R-14	See Radiola 42			
15-1	See Victor Hyperion			
C15-3	Schematic	6-129		
	Parts list	6-128		
	Chassis wiring	6-130		
	Trimmers, voltage, speaker data, transformer data	6-131		
	Circuit data, alignment	6-132		
	Alignment part 2; cathode-ray, oscillograph alignment	6-133		
	Alignment, part 3; phonograph, dial, transformer notes	6-134		
	Victrola attachment data	10-101		
C15-4	Similar to C15-3			
	Victrola attachment data	10-101		
15K	Data	7-156		
	Schematic, pickup	7-149		
	Chassis wiring	7-150		
	"Magic Brain" chassis wiring	7-151		
	Resistance, voltage	7-152		
	Socket, trimmers, transformer, speaker, visual alignment, dial mechanism	7-153		
	Circuit data, alignment, part 1	7-154		
	Alignment, part 2, parts list	7-155		
	Victrola attachment data	10-101		
PK 15 B1 Speaker Field Supply	Schematic, parts list	4-131		
	Assembly wiring	4-132		
PT-15 Turntable	Schematic	3-59		1962
R-15	Schematic, socket, voltage, data	1-14	*521	1787
15U	Schematic, socket, trimmers	8-91, 8-92		
	Chassis wiring	8-93		
	"Magic Brain" chassis wiring	8-94		
	Power amplifier wiring, pick-up, speaker wiring	8-95		
	Specifications, notes	8-96		
	Resistance	8-97		
	Voltage, socket, trimmers	8-98		
	Automatic record changer, details, notes	8-99		
	Alignment, page 1	8-100		
	Alignment, page 2	8-101		
	Alignment, page 3, notes, oscillograms	8-102		
	Parts, page 1	8-103		
	Parts, page 2, dial change mechanism	8-104		
PT-16-A1, PT-16-A2	Schematic, assembly wiring	5-219		
	Parts list	5-220		
	Pickup data	5-221		
Radiola 16	Schematic, socket, data	1-15	*477	1789
RE-16	Data ... Changes	7-15		
RE-16-A	Schematic, notes	4-19		
	Assembly wiring	4-20		
PT-17-A1, PT-17-A2	Schematic, parts list	5-222		
	Pickup data	5-221		
	Schematic	5-223		
	Pickup data, parts list	5-224		
Radiola 17	Schematic, socket, voltage data	1-15	*477	1789
RE-17	Combination R-15 and RE-57			
R-17-M	Notes	4-21		
	Schematic, chassis, voltage, parts list	4-22		
Radiola 18 AC	Schematic, socket	1-16	*478	1790
Radiola 18 DC	Schematic, socket, voltage	1-16	*478	1790
RE-18	Schematic, socket, data	2-23	504-F-3	1791
	Assembly wiring	2-24	504-F-4	1792
	Resistance data, socket, voltage	2-25	Front	1798

MODEL	RCA MFG. CO., INC.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
RE-18-A	Parts list, specifications	2-26	504-J-1	1794
	Parts list, concluded	2-27	504-J-2	1795
R-18-W	Notes	4-23		
	Schematic, chassis, voltage, parts list	4-24		
RE-19 AC (AVC)	Schematic, socket, chassis wiring, data	2-28	504-J-3	1796
	Assembly wiring, parts list	2-29	504-J-4	1797
R-20	See Victor 7-3			
Radiola 20	Schematic, socket data	1-17	*479	1798
RE-20 Electrola	Chassis wiring, parts list	2-30	504-J-6	1800
	Schematic, socket, data	2-31	504-J-5	1799
	Assembly wiring, parts list	2-32	504-J-8	1802
RE-20 Electrola SPU	Chassis, wiring, parts list	2-33	504-J-7	1801
PK 21 A1 Speaker Field Supply	Panel wiring, schematic	4-133		
Radiola 21, 22	Schematic, socket, voltage	1-18	*480	1803
R-21	Schematic, changes, parts list	2-34	504-J-9	1804
	Chassis wiring, parts list	2-35	504-J-10	1805
	Resistance data, socket, voltage	2-36	Front	1806
R-22	Schematic, voltage, parts list	4-25		
	Chassis wiring, alignment	4-26		
D22-1	Schematic	6-135, 6-136		
	Chassis wiring	6-137		
	Power amplifier, chassis wiring	6-138		
	Voltage, socket	6-139		
	Dynamic amplifier wiring, pickup details, transformer, dial mechanism details	6-140		
	General description, circuit data	6-141		
	Circuit data, part 2; alignment, socket	6-142		
	Alignment, part 2; cathode-ray oscillograph alignment images	6-143		
	Alignment, part 3; output meter alignment, speaker wiring	6-144		
	Alignment, part 4; automatic record changer, notes	6-145		
	Phonograph data, assembly wiring, cable connectors	6-146		
	Phonograph data, part 2; change-over switch wiring, parts list	6-147		
	Parts list, part 2	6-148		
	Parts list, part 3	6-149		
	Changes ... Changes	9-6		
	Revised voltage	10-46		
D22-1A	Schematic changes, parts	10-45		
	Voltage	10-46		
PB 23 H1 Amp.	Schematic, voltage, parts list	4-121		
	Chassis wiring	4-122		
PB-23-M1	Voltage, data, parts list	5-225		
	Schematic	5-226		
	Chassis wiring	5-227		
PK 23 A1 Amp.	Schematic, parts	4-125		
	Chassis wiring	4-126		
RO-23	Schematic, socket	2-37	504-J-11	1807
	Chassis wiring, data	2-38	504-J-12	1808
	Converter chassis wiring, data	2-39	504-J-13	1809
	Alignment notes	2-40	504-J-14	1810
	Assembly wiring, voltage notes	2-41	504-J-15	1811
	Parts list	2-42	504-J-16	1812
PB 24 C2 Amp.	Schematic, voltage, parts list	4-127		
	Chassis wiring	4-128		
R-24, R-24-A, R-24-B with SW-3	See model SW-3			
Radiola 24	Schematic, socket	1-19	*481	1813
RK-24	Schematic, parts, chassis wiring assembly	6-150		
25 DC	Schematic, chassis wiring, voltage	5-56		
Photophone PK-25	Schematic, chassis wiring	2-107		2001
Radiola 25	Schematic, socket, wiring	1-20	*482	1814
Radiola 25 (104 Power Pack)	Schematic, voltage	1-21	*483	1815

RCA MFG. CO., INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Radiola 26	Schematic, socket	1-19	*481	1813
RAE-26	Schematic, socket, data	2-44	504-K	1816
	Assembly wiring	2-43	504-L	1817
	Resistance data, socket, voltage	2-45	Front	1818
R-27 AC-DC	Schematic, speaker types	3-1		1819
	Chassis wiring, two types	3-2		1820
	Parts list, voltage	3-3		1821
R-27, Revised	Schematic, chassis wiring	5-1		
	Voltage, parts list	5-2		
R-28	Schematic, chassis wiring	3-4		1822
	Parts list, voltage, data	3-5		1823
Radiola 28 AC (104 SPU)	Schematic, socket	1-23	*485	1825
Radiola 28, Battery	Schematic, wiring	1-22	*484	1824
R-28-BW	Schematic, chassis wiring	5-3		
	Voltage, parts list	5-4		
R-28-BWC	Schematic, chassis wiring	5-5		
	Voltage, parts list	5-6		
R-28-P	Schematic, chassis wiring	4-29		
	Voltage, parts list, alignment	4-30		
CE-29	Schematic, socket	3-55		1955
	Chassis wiring	3-56		1956
	Specifications, notes, voltage	3-57		1957
	Assembly wiring diagram	3-58		1958
Photophone PG-29	Schematic, voltage, notes	3-68		1986
	Notes	3-69		1987
M-30 Auto Set	Schematic, socket	2-46	504-Y	1830
	Chassis wiring	2-47	504-Y-1	1831
	Notes, part 1	2-48	504-Y-2	1832
	Notes, part 2	2-49	504-Y-3	1883
	Notes, part 3	2-50	504-Y-4	1834
	Notes, part 4	2-51	504-Y-5	1835
	Notes, part 5	2-52	504-Y-6	1836
	Notes, part 6	2-53	504-Y-7	1837
	Notes, part 7	2-54	504-Y-8	1838
	Notes, part 8, voltage	2-55	504-Y-9	1839
	Installation wiring, notes, part 9	2-56	504-Y-10	1840
	Parts list	2-57	504-Y-11	1841
	Resistance data, voltage, socket	2-58	Front	1842
Radiola 30 AC (104 SPU)	Schematic, wiring, data	1-24	*486	1826
Photophone PG-30 (1st type)	Schematic	3-70		1988
PG-30, PG-31 Remote Volume Control	Chassis wiring	3-72		1990
Photophone PG-30, PG-31	Power amplifier, chassis wiring	3-72		1990
	Voltage amplifier, chassis wiring	3-73		1991
	Voltage, socket, speaker connections	3-74		1992
Photophone PG-30 High Fidelity	Schematic, voltage	3-75		1993
Radiola 30-A	Schematic, socket, voltage	1-25	*487	1827
Radiola 30-A Power Pack	Schematic	1-25	*487	1827
Radiola 30-A DC SPU	Schematic, socket	3-6		1828
	General service notes, voltages	3-7		1829
U30, Chassis RC-335KR, U129, Chassis RC-335K	Schematic, data	10-47		
	Calibration scale	10-28		
	Voltage, chassis wiring, transformer, notes	10-48		
	Alignment, socket, trimmers, tuner and antenna data	10-49		
	Tuning mechanism, data, Armchair control unit	10-50		
	Automatic record changer data, adjustments	10-51		
	Record changer assembly, details	10-52		
	Parts	10-53		
Photophone PG-31 (1st type)	Schematic	3-71		1989
	See Photophone PG-30			
Photophone PG-31 High Fidelity	Schematic, socket	3-76		1994
	See Photophone PG-30			

RCA MFG. CO., INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
P-31 Portable	Schematic, chassis, socket, voltage	2-59	504-Y-12	1843
	Chassis wiring, data	2-60	504-Y-13	1844
M-32 Auto Set	Notes, part 1	2-61		
	Notes, part 2	2-62		
	Notes, part 3	2-63		
	Notes, part 4	2-64		
	Service data, voltage	2-66		
	Chassis wiring	2-67		
	Schematic, control box wiring	2-68		
	Parts list	2-69		
M-32 Battery Operated	Terminal data	2-65		
Photophone PG-32	Schematic	2-101		1995
	Change-over panel wiring	2-102		1996
	Voltage, exciter-lamp chassis wiring	2-103		1997
Photophone PG-32, Voltage Amplifier	Panel wiring	2-104		1998
Radiola 32 AC	Schematic, socket, data	1-27	*488	1845
Radiola 32 DC SPU	Schematic, socket	3-6		1828
	General service notes, voltage	3-7		1829
Victor R-32, RE-45, R-52, RE-75	Schematic, socket, voltage, data	1-26	*522	1846
	Alignment data	3-8		1847
Radiola 33 AC & DC	Schematic, socket, voltage	1-28	*489	1848
M-34 Auto Set	Assembly wiring, notes	3-9		1849
	Notes, part 1	3-10		1850
	Notes, part 2	3-11		1851
	Notes, part 3, voltage	3-12		1852
	Vibrator notes	3-13		1853
	Schematic, wiring	3-14		1854
R-34	Similar to R-35			
Victor E-35	Cable wiring	1-61	*520	1977
Victor R-35, R-39, RE-57	A-F. Chassis wiring, socket, voltage, data	1-29	*523	1857
	Schematic, data	1-30	*524	1856
R-37, R-38	Schematic, chassis wiring	3-15		1859
	Voltage, adjustment data	3-16		1860
R-37-P, R-38-P	Alignment, voltage	4-31		
	Schematic, chassis	4-32		
Photophone PG-38	Schematic	2-105		1999
	Chassis wiring, voltage	2-106		2000
R-39	See model R-35			
BT40, Chassis RC-408	Schematic, voltage, socket, trimmers, alignment, parts	10-54		
RE-40	Schematic, chassis wiring	3-17		1861
	Voltage, service data	3-18		1862
RE-40-P	Schematic, chassis	4-33		
	Alignment, voltage, pickup data	4-34		
	Assembly wiring	4-35		
	Parts list	4-36		
Radiola 41 DC, AF and SPU	Chassis wiring, voltage	1-31	*491	1865
Radiola 41 AC, RF	Schematic, socket, data	1-32	*490	1864
	Receptor SPU wiring	1-32	*490	1864
	Sterling SPU wiring	1-32	*490	1864
Radiola 42, R14	Schematic, notes	3-19		1866
R-43	Schematic, socket, voltage, chassis wiring	1-33	*504-6	1867
	Service notes	3-19		1866
Radiola 44 AC	Terminal voltage	1-35	*493	1869
44, RF Chassis	Schematic, socket, voltage	1-36	*492	1868
44, Early SPU	Schematic	1-36	*492	1868
44, Late SPU	Schematic	1-36	*492	1868
PB 45 A1 Amp.	Parts list, data	4-129		
	Chassis wiring	4-130		
RE-45	See Victor R-32			
Radiola 46 DC	Schematic	1-35	*493	1869
Radiola 46 AC, RF Chassis	Schematic, socket, voltage	1-36	*492	1868
	Terminal voltage	1-35	*493	1869
46, SPU	Schematic	1-36	*492	1868
Radiola 47	Schematic, socket, voltage	1-37	*494	1870
Radiola 48	Schematic, socket, voltage, data	1-38	*495	1871
	Resistance data, voltage, chassis	2-70	Front	1872
M60, Chassis RC-357J	Schematic, voltage, data	10-55		

RCA MFG. CO., INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
M50, Chassis RC-357J	Chassis wiring, socket, trimmers	10-56		
	Alignment	10-57		
	Tuner and antenna data	10-58		
	Drive data, parts	10-59		
R-50, R-55	Schematic, chassis wiring	2-71	504-8	1873
	Chassis layouts, voltage, socket notes	2-72	504-9	1874
U50, Chassis RC-414C	Schematic, voltage, R-F chassis wiring	10-61		
	Speaker connections, switch mechanism, parts	10-60		
	Socket, trimmers, dial data, alignment, phono. data	10-62		
R-51-B, R-53-B	Schematic, chassis	4-37		
	Voltage, alignment, parts list	4-38		
R-52	See Victor R-32			
R-55	See model R-50			
RE-57	See Victor R-35			
PG-59	Units specifications	5-228		
	Chassis wiring	5-229		
	Schematic	5-230		
RAE-59	Schematic, socket, data	2-73	504-M	1875
	Assembly wiring	2-74	504-N	1876
M60, Chassis RC-357K	Schematic	10-63		
	Chassis wiring, socket, trimmers, voltage	10-64		
	Alignment	10-57		
	Tuner and antenna data	10-58		
	Drive data, parts	10-59		
Radiola 60	Schematic, socket, voltage, data	1-39	*496	1877
PG 62	Assembly wiring	4-134		
	Chassis views	4-135		
	Notes	4-136		
	Notes	4-137		
	Loud speaker wiring	4-138		
	Microphone notes	4-139		
	Multiple operation of amplifiers	4-140		
	Schematic	4-141		
	Chassis wiring	4-142		
	Voltage, notes, phasing speakers	4-145		
	Replacement parts	4-146		
PG-62, P-A. System	Schematic	3-60		
	Chassis wiring	3-61		
	Voltage, notes	3-62		
PG-62-C	Installation data	5-233		
	Operating notes	5-234		
	Operating notes, chassis views, speaker data	5-235		
	Voltage, parts list	5-236		
	Schematic	5-237		
	Chassis wiring	5-238		
PG 62 Universal Amp.	Schematic	4-143		
	Chassis wiring	4-144		
PG-62-C, Universal Amplifier	Schematic	5-239		
	Chassis wiring	5-240		
Photophone SPU 62	Schematic, chassis	1-71	*710	2002
Radiola 62	Schematic, socket, voltage, data	1-40	*497	1878
	Additional data .... Changes 7-14			
PG 63	Notes	4-147		
	View	4-148		
	Chassis view	4-149		
	Notes	4-150		
	Schematic	4-151		
	Notes	4-152		
	Voltage, parts list	4-156		
PG 63 Amp.	Chassis wiring	4-154		
PG 63 (PB 100 B1) Universal Amplifier	Schematic	4-153		
	Chassis wiring	4-155		
Photophone SPU 63	Schematic	1-71	*710	2002
Radiola 64	Schematic, socket, voltage, data	1-41	*498	1879
	Alignment data	3-21		1880
	Trimmer data	3-22		1881
	SPU Chassis, AVC data	3-23		1882

RCA MFG. CO., INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
PG-65	Panel wiring	5-243		
	Units specifications	5-241		
	Rack assembly wiring	5-242		
Radiola 66	Schematic, socket, voltage, data	1-42	*499	1888
67M	Schematic, socket, trimmers, speaker and transformer connections	9-47		
	Chassis wiring	9-48		
	Voltage, alignment	9-51		
	Parts list	9-52		
67M1, 67M2, 67M3	Schematic, socket, trimmers, speaker	9-49		
	Chassis wiring, transformers and vibrator connections	9-50		
	Voltage, alignment, trimmers	9-51		
	Parts list	9-52		
	Changes .... Changes 7-3			
Radiola 67	Schematic, data	1-43	*500	1884
	Voltage, socket, condenser connections	3-24		1885
RAE-68	Data .... Changes 7-14			
M70, Chassis RC-394	Schematic	10-65		
	Voltage, chassis wiring, tuner	10-66		
	Alignment, socket, trimmers, tuner adjustments, antenna and drive cord data	10-67		
R-70	Data, parts list	4-39		
	Schematic, voltage, chassis wiring	4-40		
R-71, R-72	Voltage, data	3-25		1887
	Schematic	3-26		1888
	Chassis wiring	3-27		1889
	Parts list	3-28		1890
R-71-B	Voltage, data	3-29		1891
	Schematic	3-30		1892
	Chassis wiring	3-31		1893
	Parts list	3-32		1894
R-73	Schematic, chassis wiring	5-7		
	Alignment, voltage	5-8		
	Parts list	5-9		
R-73-A	Alignment, voltage, speaker data	4-41		
	Schematic, chassis wiring	4-42		
	Parts list	4-43		
RE-73	Schematic—Similar to R-35			
	Assembly wiring, data	2-75	504-O	1895
	Parts list	2-76	504-P	1896
	Record changer, part 1	2-79	504-Q	1897
	Record changer, part 2	2-80	504-R	1898
	Record changer, part 3	2-81	504-S	1899
	Record changer, part 4	2-82	504-T	1900
	Locations of parts	2-77	504-U	1901
R-74	Chassis wiring	3-34		1904
R-74, R-76, R-77	Schematic, socket	3-33		1903
	Voltage, speaker wiring	3-35		1905
R-75 (47's Output)	Parts list	5-10		
	Schematic, chassis wiring	5-11		
	Alignment, voltage	5-12		
R-75 (2A5's Output)	Parts list	5-10		
	Schematic, chassis wiring	5-13		
	Alignment, voltage	5-14		
RE-75	See Victor R-32			
R-76, R-77	Schematic, socket	3-33		1903
	Chassis wiring	3-36		1906
RS77 Chassis	See model R98			
R-78	Specifications, notes	3-37		1909
	Schematic, socket	3-38		1910
	Socket, wiring changes, service data	3-39		1911
	Chassis wiring	3-40		1912
	Alignment data	3-41		1913
R-78 (Noise Suppression)	Schematic, voltage, alignment, notes	7-166		
R-78 (AF Chassis Attachments)	Schematic	3-42		1914
R-78 (AF Chassis)	Chassis wiring	3-42		1914
R-78, RE-81, RAE-84 with SW-3	See model SW-3			

RCA MFG. CO., INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
RAE-79	Schematic, socket, data	2-83	504-9-A	1915
	Receiver chassis wiring, data	2-84	504-9-B	1916
	Assembly wiring	2-85	504-9-C	1917
	Remote control notes	2-86	504-9-E	1918
	Motor adjustments	2-87	504-9-F	1919
RAE-79, SPU-1, SPU-2	Chassis wiring diagrams	2-88	504-9-D	1920
Radiola 80	Schematic, socket, voltage	1-44	*501	1921
	Trimmers, chassis wiring of SPU	2-89	502-B	1923
	Assembly wiring	2-90	502-A	1922
	Resistance data	2-91	Front	1924
RE-80	Alignment, voltage, speaker data, notes	4-44		
	Schematic, chassis wiring	4-45		
	Assembly wiring	4-46		
	Pickup data	4-47		
	Parts list	4-48		
RE-81	Specifications	3-43		1925
	Schematic, values	3-44		1926
	Chassis wiring	3-45		1927
	Assembly wiring, diagram	3-46		1928
Radiola 82	Schematic, socket	1-45	*502	1929
	Chassis wiring	2-92	502-C	1930
	Resistance data, socket, voltage	2-94	Front	1932
Radiola 82 SPU	Chassis wiring	2-93	502-D	1931
Radiola 82 (Remote Control)	Schematic, notes	1-47	*504-1	1933
Radiola 82 and 86 (Remote Control)	Assembly wiring	1-46	*504-2	1934
	Receiver chassis wiring	1-48	*504-4	1936
	SPU Chassis wiring	1-49	*504-3	1935
	Remote control units, data	1-50	*504-5	1937
RS-83E S.P.U. Chassis	See models TRK-9, TRK-12			
84BT	Schematic, socket, trimmers, chassis wiring	9-53		
	Voltage, alignment, lead dress, notes	9-55		
	Specifications, parts	9-56		
84BT6	Schematic, socket, trimmers, chassis wiring	9-54		
	Voltage, alignment, lead dress, notes	9-55		
	Specifications, parts	9-56		
RAE-84	Schematic	3-47		1941
	Receiver chassis wiring	3-48		1942
	Service notes	3-49		1943
	Service notes	3-50		1944
	AF Chassis wiring	3-51		1945
	Assembly wiring diagram	3-51		1945
	Parts list	3-52		1946
85BK, 85BT	Schematic	8-105		
	Chassis wiring, socket, trimmers	8-106		
	Alignment, voltage	8-107		
	Notes, parts	8-108		
85BT6	Schematic, socket, trimmers, specifications	9-57		
	R-F chassis wiring	9-58		
	Lead dress, notes, trimmers, voltage	9-59		
	Alignment, parts	9-60		
85E, U102E	Schematic, chassis wiring, transformers	9-61		
	Socket, trimmers, voltage, specifications, pick-up and motor details	9-62		
	Lead dress, alignment, pick-up and motor notes, parts	9-63		
85K	Data	Changes 9-6		
85T	Schematic, chassis wiring	8-109		
	Alignment, voltage, socket, trimmers	8-110		
	Notes, parts	8-111		
85T1	Schematic, chassis wiring	8-113		
	Notes, parts	8-112		
	Alignment, socket, trimmers, voltage	8-114		
	Changes	Changes 9-6		

RCA MFG. CO., INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
85T5	Schematic, chassis wiring	8-115		
	Alignment, socket, trimmers	8-116		
	Voltage, parts	8-117		
	Victrola attachment data	10-101		
86BK, 86BT	Schematic, socket, trimmers	8-119		
	Notes, parts	8-118		
	Chassis wiring	8-120		
	Voltage, alignment	8-121		
86E, 86K, 86K7, 86T, 86T1, 87K, 87T	Schematic	8-123		
	Voltage, socket, trimmers	8-127		
	Socket, trimmers, alignment	8-128		
	Notes, parts	8-122		
	Victrola attachment data	10-101		
86E	Chassis wiring	8-124		
86K, 86K7, 87K	Chassis wiring	8-125		
Radiola 86	A-F Circuit schematics	1-51	*504	1939
	Schematic, data	1-52	*503	1938
	Assembly wiring	2-95	502-F	1940
Radiola 86 (Remote Control)	See model 82 (Remote Control)			
RAE-86	See Radiola 82 Remote Control			
86T, 86T1, 87T	Chassis wiring	8-126		
86T3, 86T2, 87T1	Alignment, parts	9-64		
	Schematic, socket, trimmers, notes	9-65		
	Chassis wiring, voltage, trimmers	9-66		
	Victrola attachment data	10-101		
86T4, 86T44	Schematic, specifications	9-67		
	Chassis wiring, coils	9-68		
	Socket, trimmers, lead dress, voltage, notes	9-69		
	Alignment, parts	9-70		
	Victrola attachment data	10-101		
86T6	Schematic, socket, trimmers, specifications, transformer data	9-71		
	Chassis wiring, lead dress, phonograph	9-72		
	Voltage, trimmers, tuner	9-73		
	Alignment, parts	9-74		
	Victrola attachment data	10-101		
86X	Schematic, socket, chassis, wiring, trimmers	8-129		
	Alignment, voltage	8-130		
	Notes, parts	8-131		
86X4	Schematic, socket, trimmers, specifications	9-75		
	Chassis wiring	9-76		
	Alignment, phonograph data, lead dress	9-77		
	Voltage, trimmers, parts	9-78		
	Victrola attachment data	10-101		
87EY, 87X, 87Y	Schematic	9-79		
	Chassis wiring, coils	9-80		
	Socket, trimmers, voltage, alignment, lead dress	9-81		
	Specifications, phonograph data, parts	9-82		
	Victrola attachment data	10-101		
87K1	Schematic	9-83		
	Chassis wiring, lead dress, phonograph data	9-84		
	Socket, voltage, trimmers, tuner	9-85		
	Alignment, parts	9-86		
	Victrola attachment data	10-101		
87K1, 87K2, 87T2	Data	Changes 10-4		
87T1	See model 86T3			
87X, 87Y	See model 87EY			
88K	Schematic	8-133		
	Alignment, parts	8-132		
	Chassis wiring	8-134		
	Voltage, socket, trimmers, notes	8-135		
	Victrola attachment data	10-101		
R89	Specifications, installation data	9-87		
	Schematic, voltage, chassis wiring, notes, parts	9-88		
RS-89A chassis	See model TRK-5			

RCA MFG. CO., INC.—(Cont.)

MODEL	RCA MFG. CO., INC.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
97X	Schematic, specifications, lead dress, notes	9-105		
	Socket, trimmers, alignment, tuner	9-106		
	Voltage, chassis wiring, parts	9-107		
97Y, Chassis RC352A, 98EY, 98X, 98YG, Chassis RC 352	Schematic, lead dress	9-109		
	Voltage, chassis wiring, drive cord data, notes, specifications	9-110		
	Socket, trimmers, parts, alignment, tuner	9-111		
98K	Schematic, socket, trimmers, specifications	9-113		
	Voltage, lead dress, chassis wiring, notes, transformers	9-114		
	Electric tuning notes, mechanism, adjustments	9-115		
	Alignment, antenna data, parts	9-116		
R98, Chassis RS-77	Schematic, voltage, socket, speaker connections	10-95		
	Motor data, switch assembly, parts	10-96		
98T, 98K2, Chassis RC-386A	Schematic, socket, trimmers, transformer, speaker data	10-97		
	Voltage, chassis wiring, alignment, drive data	10-98		
	Dial calibration	10-8		
	Tuner adjustments, parts	10-99		
99K, 99T	Schematic, socket, trimmers, transformers	9-117		
	Voltage, chassis wiring, tuner	9-118		
	Lead dress, alignment, electric tuning data, specifications	9-119		
	Drive data, parts, notes	9-120		
R-99	Schematic, loudspeaker	7-161		
	Chassis wiring, pickup, socket	7-162		
	Resistance, voltage	7-163		
	Motor adjustments, assembly wiring	7-164		
	Circuit data, adjustments, parts	7-165		
R-100 Victrola attachment	Motor data, tone compensation, parts	10-100		
	Motor, pick-up details, receiver connections	10-101		
RCA-100, 101	Alignment, speaker, schematic, voltage	4-53		
	Chassis wiring, parts list	4-54		
100-A, 100-B, 103, 104 AC, Loudspeakers	Schematic, socket, data	1-55	*506	1958
PB 100 B1	See Model Univ. Amp. PG 63			
M-101	Schematic, transformer data	6-1		
	Alignment, voltage, socket, trimmers	6-2		
	Chassis wiring, service notes	6-3		
	Parts	6-4		
U-101, U-108	Schematic	8-147		
	Alignment, socket, trimmers	8-148		
	Voltage	8-149		
	Parts	8-152		
U-101	Chassis wiring	8-147		
	Motor details	8-149		
	Changes	Changes 9-6		
102	Schematic, chassis wiring	5-25		
	Voltage, parts list	5-26		
U102E	See model 85E			
103	Schematic, voltage	6-5		
	Chassis wiring	6-6		
	Circuit data, socket, trimmers, voltage, alignment, parts	6-7		
103, 104 AC Speakers	See 100-A Speaker			
PA-103-A1	Schematic, voltage, parts list	5-231		
	Panel wiring	5-232		
U-108	Chassis wiring	8-148		
	Automatic record changer, adjustments, details	8-150		
	Motor details, notes	8-151		
	Changes	Changes 9-6		

MODEL	RCA MFG. CO., INC.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
104 DC Speaker	Schematic, socket, notes	3-6		1828
	General service notes, voltage	3-7		1829
104 Power Pack	See Radiola 25, 28, 30			
M-104, M-108	Circuit notes	6-8		
	Schematic, speaker wiring	6-9		
	Chassis wiring, notes	6-10		
	Alignment, voltage, socket, trimmers, notes	6-11		
	Parts list	6-12		
U-104, Chassis RC-345H	Schematic, voltage, chassis wiring, alignment procedure	10-102		
	Chassis wiring, lead dress, pick-up, phono.	10-103		
	Parts	10-86		
105, 106 Speakers	Schematic, socket, wiring	1-56	*507	1954
M-105	Alignment data, voltage, service data	5-27		
	Installation data	5-28		
	Schematic, installation details	5-29		
	Installation details	5-30		
	Chassis wiring	5-31		
	Parts list	5-32		
U105	Chassis wiring	9-123		
	Automatic record changer details, adjustments and details	9-124		
U105, U107	Schematic	9-121		
	Circuit data, lead dress, pick-up data, specifications	9-122		
	Socket, trimmers, voltage, pick-up data, phonograph motor data	9-126		
	Alignment	9-127		
	Parts list	9-128		
U106	Schematic, specifications	9-129		
	Chassis wiring	9-130		
	Socket, trimmers, circuit data, notes	9-131		
	Automatic record changer adjustments, views, tuner	9-132		
	Alignment, transformer data, parts	9-133		
M-107	Schematic, service details	5-33		
	Chassis wiring	5-34		
	Alignment data	5-35		
	Vibrator data, trimmer locations, socket	5-36		
	Voltage, chassis wiring	5-37		
	Parts list	5-38		
U107	Chassis wiring, coils	9-125		
	Automatic record changer adjustments, views, tuner	9-132		
M-108	See Model M-104			
M-109	Schematic	6-13		
	Chassis wiring	6-14		
	Alignment, notes	6-15		
	Socket, trimmers, circuit notes, power unit wiring	6-16		
	Parts list	6-17		
U109	Circuit data	9-134		
	Schematic	9-135		
	R-F Chassis wiring, coils, specifications	9-136		
	Power amplifier, chassis and tuner wiring	9-137		
	Voltage, socket, trimmers	9-138		
	Socket, trimmers, current readings	9-139		
	Lead dress, amplifier adjustments	9-140		
	Tuner mechanism, principles, adjustments	9-141		
	Tuner adjustments, Part 2	9-142		
	Alignment	9-143		
	Assembly wiring, compensator connections	9-144		
	Automatic record changer, views	9-145		
	Automatic record changer adjustments, data, pick-up data	9-146		

RCA MFG. CO., INC.—(Cont.)

RCA MFG. CO., INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
300	Assembly wiring	4-101		
	Phonograph motor data	4-102		
301	Schematic, chassis wiring	5-119		
	Voltage, alignment, pickup data	5-120		
	Assembly wiring, phonograph data	5-121		
	Parts list	5-122		
310	Alignment, pickup data	4-103		
	Schematic, chassis wiring	4-104		
	Assembly wiring	4-105		
	Voltage, parts list	4-106		
Duo 320	Alignment data, voltage	5-123		
	Schematic	5-124		
	Chassis wiring	5-125		
	Assembly wiring	5-126		
	Pickup data	5-127		
	Parts list	5-128		
Duo 321	Alignment data, voltage	5-129		
	Schematic	5-130		
	Chassis wiring	5-131		
	Assembly wiring	5-132		
	Pickup data	5-133		
	Parts list	5-134		
Duo 322	Parts list	6-60		
	Schematic	6-61		
	Chassis wiring	6-62		
	Assembly wiring, transformer data	6-63		
	Alignment, trimmers	6-64		
	Pickup data, voltage, socket	6-65		
Duo 322-E	Parts list	6-66		
	Schematic, speaker data	6-67		
	Chassis wiring	6-68		
	Assembly wiring, transformer data	6-69		
	Trimmers, alignment	6-70		
	Pickup data, voltage, socket	6-71		
327	Schematic	5-135		
	Chassis wiring	5-136		
	Voltage, alignment, assembly wiring	5-137		
	Pickup data, trimmer and socket layouts	5-138		
	Pickup data	5-139		
	Parts list	5-140		
330	Alignment, voltage, trimmer location	4-107		
	Schematic, voltage	4-108		
	Chassis wiring	4-109		
	Assembly wiring	4-110		
	Pickup data	4-111		
	Parts list	4-112		
331	Schematic	4-114		
	Chassis wiring	4-115		
	Assembly wiring	4-116		
	Voltage, alignment, trimmer location	4-113		
	Record changer data	4-117		
	Parts list	4-118		
RC-333B Chassis	See model 94BK1			
RC-335K, RC-335KR	See model U30			
"All Wave Duo" 340, 340-E	Schematic	5-141		
	Chassis wiring	5-142		
	Coils' wiring diagram	5-143		
	Assembly wiring, alignment, voltage	5-144		
	Alignment data	5-145		
	Controls data, transformer data	5-146		
	Pickup data	5-147		
	Parts list	5-148		
340, 340-E	Schematic	5-149		
	Chassis wiring	5-150		
	Coils' wiring diagram	5-151		
	Assembly wiring, voltage, circuit data	5-152		
	Alignment data	5-153		
	Transformer data	5-154		
	Pickup data	5-155		
	Parts list	5-156		

RCA MFG. CO., INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
341	Schematic	5-157		
	Chassis wiring	5-158		
	Socket and trimmer layouts	5-159		
	Assembly wiring, circuit data	5-160		
	Alignment data	5-161		
	Alignment and pickup data	5-162		
	Pickup data, record changer data	5-163		
	Voltage, parts list	5-164		
342	Data	Changes 8-4		
RC-345H chassis	See model U-104			
RC-348E, RC-348E "M," RC-348E "MOD" chassis	See model U-115			
RC-348H chassis	See model U-123 (Single Band)			
RC-348J chassis	See model U-121			
RC-348L chassis	See model U-127E			
RC-351F, RC-351F "M," RC-351F "R" chassis	See model 97K			
RC-351K chassis	See model 97K2			
RC-351L chassis	See model 96E2			
RC-357J chassis	See model M 50			
RC-357K chassis	See model M 60			
Duo 380	Alignment data, voltage	5-171		
	Phonograph data	5-172		
	Schematic	5-173		
	Pickup data	5-174		
	Chassis wiring	5-175		
	Assembly wiring, record changer data	5-176		
	Parts list	5-177		
	Parts list, part 2	5-178		
Duo 380-HR	Alignment data	5-179		
	Schematic	5-180		
	Chassis wiring	5-181		
	A-F. circuits	5-182		
	Assembly wiring	5-183		
	Pickup data	5-184		
	Phonograph data	5-185		
	Phonograph data, voltage	5-186		
	Neon lamp and switching data, record changer data	5-187		
	Parts list	5-188		
Duo 381	Schematic	5-189		
	R-F. assembly wiring	5-190		
	Chassis wiring	5-191		
	A-F. circuits	5-192		
	Assembly wiring	5-193		
	Circuit data, record changer data	5-194		
	Circuit data	5-195		
	Alignment data	5-196		
	Alignment data, part 2	5-197		
	Neon lamp test, voltage	5-198		
	Pickup data, socket layout	5-199		
	Pickup data, part 2	5-200		
	Parts list	5-201		
	Parts list, part 2	5-202		
RC-386 chassis	See model U-125			
RC-386A chassis	See model 98T			
RC-390 chassis	See model 94BK2			
RC-392 chassis	See model 96BK6			
RC-394 chassis	See model M70			
RC-396 chassis	See model 5Q5A			
RC-399 chassis	See model 96T4			
RC-399A chassis	See model 96T6			
RC-400 chassis	See model 96X1			
RC-400A chassis	See model 96X11			
RC-403, RC-403A chassis	See model 9TX21			
RC-404A chassis	See model U8M			
RC-405, 405A, 405B chassis	See model 9TX31			
RC-406 chassis	See model 5X5I			
RC-407 chassis	See model 94BP61			
Chassis RC-408	See model BT40			
RC-410 chassis	See model 94BP4			
RC-414A chassis	See model 5Q5A			
RC-414C chassis	See model U-50			
RC-421 chassis	See model U-123 (2 Bands)			
RC-427 chassis	See model TRK-12			
RC-427A chassis	See model TRK-9			

RCA MFG. CO., INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
RC-429 chassis	See model TRK-5			
RC-435 chassis	See model 9TX50			
690	Data	Changes 8-4		
AP-736	Schematic	1-1	*707	1749
AP-736-B	Schematic, chassis wiring	1-1	*707	1749
AP-777-C	Schematic	1-2	*708	1750
AR-800	See Radiola II			
810K, 810K1, 810T	Schematic, notes	9-175		
	Chassis wiring, coils	9-176		
	Voltage, trimmers, specifications	9-177		
	Alignment, socket, phonograph notes	9-178		
	Lead dress, parts	9-179		
	Victrola attachment data	10-101		
810T4	Schematic, socket, trimmers, specifications	9-181		
	Parts list	9-180		
	Chassis wiring, coils	9-182		
	Lead dress, voltage, notes, trimmers	9-183		
	Alignment	9-184		
	Victrola attachment data	10-101		
811K	Schematic, notes	8-153		
	Chassis wiring	8-154		
	Socket, trimmers, voltage	8-155		
	Specifications, "Electric Eye" wiring	8-156		
	"Electric Tuning" adjustments, assembly	8-157		
	"Electric Tuning" notes, alignment	8-158		
	Notes, parts	8-159		
	Victrola attachment data	10-101		
812K	Schematic	8-161		
	Parts, notes	8-160		
	Chassis wiring	8-162		
	Socket, trimmers, voltage	8-163		
	"Electric Tuning" assembly, details, adjustments	8-164		
	"Electric Tuning" wiring, alignment	8-165		
	Circuit data, adjustment notes	8-166		
	Victrola attachment data	10-101		
813K	Schematic	9-185		
	Chassis wiring, transformer data	9-186		
	Voltage, trimmers, socket, data	9-187		
	Socket, trimmers, tuner wiring	9-188		
	Alignment	9-189		
	Circuit data, adjustments, lead dress	9-190		
	Tuner data, specifications	9-191		
	Tuner mechanism, adjustments	9-192		
	Parts list	9-193		
	Victrola attachment data	10-101		
816K	Tuner mechanism, adjustments	9-192		
	Parts list	9-194		
	Schematic	9-195		
	Chassis wiring, transformer data	9-196		
	Socket, trimmers, voltage	9-197		
	Electric tuning wiring, specifications	9-198		
	Alignment	9-199		
	Tuner notes, lead dress, phonograph data	9-200		
	Victrola attachment data	10-101		
AR-885	See Radiola V			
AR-895	See Radiola VI			
910KG, U126, U128	Schematic, socket, trimmers, drive data	9-201		
	Chassis wiring, voltage, transformer data, specifications	9-202		
	Circuit data, antenna, lead dress, tuning dial	9-203		

RCA MFG. CO., INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
910KG, U126, U128	Alignment, turntable data	9-204		
	Tuner mechanism data	9-205		
	Automatic record changer	9-9		
	Parts list	9-206		
911K	Schematic, lead dress	9-207		
	Chassis wiring, transformer data, voltage, specifications	9-208		
	Tuner mechanism, data	9-209		
	Alignment, socket, trimmers, parts	9-210		
AP-935	Schematic	1-3	*748	1751
AP-937	Schematic	1-3	*748	1751
AP-947	Schematic	1-2	*708	1750
AP-951	Schematic	1-2	*708	1750
AP-951-A, 974-A, AP-997-A	Schematic	1-2	*708	1750
AP-995	Schematic	1-4	*709	1752
AP-997, AP-952	Schematic	1-4	*709	1752
AP-997-C	Schematic	1-4	*709	1752
AP-1080	Schematic	1-3	*748	1751
ER-1240-A2	Schematic	3-63		1967
	Socket, reproducer distribution table, notes	3-64		1968
	AF Amplifier Chassis wiring	3-65		1969
	Receiver Chassis wiring	3-66		1970
	Voltage	3-67		1971
AR-4229	Schematic, chassis details	5-203		
	Chassis wiring	5-204		
	Alignment data, voltage	5-205		
	Parts list	5-206		
	Changes	Changes 8-4		
28590-2	Schematic, voltage	5-207		
	Alignment data, parts list	5-208		
	Chassis wiring	5-209		

R K RADIO LABORATORIES, INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
4-Tube Receiver	Schematic	5-1		
RKC-4	Schematic	Misc. 7-11		
RKP-4	Schematic	5-4		
RK-S-5 Radiokeg	Schematic	Misc. 4-9		
RK-60-G	Schematic	5-2		
RK-60-L	Schematic	5-3		
421, 422, 423, 424	Schematic, voltage	6-1		
425, 426, 427, 428	Schematic, voltage	6-1		
521, 522	Schematic, voltage	6-1		
534	Schematic, voltage	6-2		
631, 633	Schematic, voltage	6-2		

RADIART LABORATORIES

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Magnaformer 9-8	Schematic	Misc. 1-4	*790	2749

RADIETTE

See KELLER FULLER

RADIO CHASSIS, INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Auto Receiver	Schematic	4-1		
A-5-D	Schematic	4-2		
L-5-D	Schematic	4-4		
A-6-D	Schematic	4-3		
L-6-D	Schematic	4-5		
L-6-W	Schematic	4-6		
SMA-24	Schematic	3-1		1745
AC-25, SMA-25	Schematic, socket	3-2		1746
AC-35, QAC-35	Schematic	3-4		1748
AC-36, QAC-36, LSA-36	Schematic	3-4		1748
SDC-36	Schematic	3-3		1747
LSA-37	Schematic	3-2		1746
HOAR-48	Schematic	3-1		1745

RADIO CIRCULAR CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
V	Schematic, voltage, alignment	7-1		
W	Schematic, voltage, alignment	7-2		
5-Tube Dual Battery A-W Superhet	Schematic, alignment	6-1		
5-Tube Dual A-C. A-W. Superhet	Schematic, alignment	6-1		
5-Tube AC-DC Dual A-W Superhet	Schematic, alignment	6-2		
817	Schematic, alignment	6-2		

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
RADIO ELECTRIC SERVICE CO.				
Resco 8	Schematic	Misc. 4-7		
Resco SW-5 AC	Schematic	Misc. 4-7		
RADIO MFG. ENGINEERS, INC.				
RME LS-1 Noise Suppressor	Schematic	10-1		
RME LS-2 Noise Suppressor	Schematic	10-1		
RME DB-20 Amplifier	Schematic	10-1		
RME-69	Schematic	Misc. 7-10		
	Socket, trimmers, controls	10-2		
	Chassis, trimmers, panel	10-3		
	Alignment, Part 1	10-4		
	Alignment, Part 2	10-5		
	Alignment, Part 3	10-6		
RME 69-A, AC or Battery	Schematic	8-1		
	Parts	8-2		
RME 69-B Battery	Schematic	8-1		
	Parts	8-2		
RADIO PRODUCTS CO.				
Dayrad HR	Schematic	3-1		2005
Dayrad 8-80	Schematic	1-1	*780-A	2003
11-A Tester	Schematic	4-3		
Dayrad 21 Output Meter	Schematic	1-2	*780-B	2004
31 Oscillator	Schematic	4-3		
51 (3001-W) Tester	Schematic	4-2		
Dayrad 180	Schematic	3-1		2005
Dayrad 309 Volt-Ohm-meter	Schematic	3-2		2006
330-Mmf. Oscillator	Schematic	1-2	*780-B	2004
Dayrad 400-W Output-meter	Schematic	3-2		2006
Dayrad 870	Schematic	3-1		2005
Dayrad 875	Schematic	3-1		2005
3151 Tester	Schematic	4-1		
RADIO PRODUCTS CORP.				
5-Tube AC Super, Chassis A-1	Schematic, voltage, socket, trimmers	7-1		
	Alignment, parts list	7-2		
6-Tube AC-DC Super, Chassis B-2	Schematic, socket, trimmers	7-3		
	Alignment, parts list	7-4		
6-Tube AC Super, Chassis L-2	Schematic	7-5		
6-Tube AC-AW Super, Chassis Z-3	Schematic, voltage, socket, trimmers	7-7		
	Alignment, parts list	7-8		
6-Tube Batt. Super, Chassis Z-5	Schematic, socket, trimmers	7-9		
	Alignment, parts	7-10		
7-Tube AC Super, Chassis L-4	Schematic	7-6		
A-1 Chassis	See model 5-Tube AC Super			
M-1 Chassis	Schematic, socket, trimmers, alignment, voltage	8-3		
B-2 Chassis	See model 6-Tube AC-DC Super			
L-2 Chassis	See model 6-Tube AC Super			
Z-2 Chassis	Schematic, socket, trimmers, alignment, voltage	8-4		
Z-3 Chassis	See model 6-Tube AC-AW Super			
A3	Schematic, trimmers, socket, alignment	10-1		
4A	Schematic, socket, trimmers, alignment	9-1		
4H	Schematic, trimmers, socket, alignment	10-2		
L-4 Chassis	See model 7-Tube AC Super			
Z4 Chassis	Schematic, socket, trimmers, alignment	9-2		
5A	Schematic, socket, trimmers, alignment, tuner	9-3		
5C	Schematic, socket, trimmers, alignment	9-4		
5CPH	Schematic, socket, trimmers, alignment	9-4		
5E	Schematic, socket, trimmers	9-5		
	Alignment	9-1		
5F	Schematic	10-3		
	Alignment	9-1		
	Socket, trimmers	10-4		

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
RADIO PRODUCTS CORP.—(Cont.)				
5G	Schematic	10-3		
	Socket, trimmers, alignment	10-4		
L5 Chassis	Schematic, socket, trimmers, alignment	9-6		
Z-5 Chassis	See model 6-Tube Batt. Super			
6D	Schematic, socket, trimmers, alignment	9-7		
L-6 Chassis	Schematic, socket, trimmers, alignment, voltage	8-1		
7A	Schematic, socket, trimmers	9-8		
	Alignment	9-7		
7G	Schematic, socket, trimmers, alignment, tuner data	9-9		
L-7 Chassis	Schematic, socket, trimmers, alignment, voltage	8-2		
X8	Schematic, voltage, socket, trimmers, alignment	10-5		
55 Auto	Schematic, socket, trimmers, tuner	9-10		
	Alignment	9-1		
69 Auto	Schematic, socket, trimmers, alignment	10-6		
RADIO PRODUCTS SALES CO.				
140, 170 Clipper	Schematic, voltage, alignment	Misc. 8-7		
178 Clipper	Schematic, voltage, alignment	Misc. 8-7		
RADIO RECEPTOR CO.				
PMA-1	Schematic	2-1		2009
PMA-2	Schematic	3-1		2007
RR-6	Schematic	3-2		2008
AK, R-20	Schematic	Misc. 6-28		
R 25-28	Schematic	Misc. 6-28		
P-50-W	Schematic	2-1		2009
PX-245	Schematic	3-2		2008
PXP-245	Schematic	3-1		2007
PYP-245	Schematic	3-1		2007
PYP-250	Schematic	3-1		2007
RADIO VISION CORP.				
AX96	Schematic	Misc. 8-10		
RADIOBAR CO. OF AMERICA				
505	Schematic	4-1		
508, 528, 210-B	Schematic	4-1		
510 w/'46s	Schematic	4-2		
510 w/'59s	Schematic	4-2		
510	Service notes	4-3		
RADIOTROPE				
G Console	Schematic, socket	3-2		2032
R Console	Schematic, wiring diagram	3-2		2032
S-2 (2 types)	Schematic, socket, voltage	3-1		2031
27-R, Early and late	Schematic, socket, voltage	1-2	*638-B	2036
62, 64	Schematic, socket, voltage	3-3		2033
70-R	See U. S. Radio & Television Series 10			
71-R, 72-R, 73-R	See U. S. Radio & Television Series 8			
74-R (1st type)	Schematic, socket, voltage	3-4		2034
74-R (2nd type)	Schematic, socket, voltage	1-1	*638-A-1	2035
RADOLEK				
Little Leader	Schematic	3-4		2014
Little Master	Schematic	3-4		2014
Monroe-Marvelo Tritone	Schematic	3-1		2011
Marvelo-Tri-Dynamic	Schematic	3-2		2012
Octomatic	Schematic	6-1		
3-Watt A-C. Amplifier	Schematic	6-2		
15-Watt A-C. Amplifier	Schematic	6-1		
15-Watt D-C. Amplifier	Schematic	6-1		
30-Watt A-C. Amplifier	Schematic	6-2		
5-tube DeLuxe	Schematic	3-3		2013
5-tube Super	Schematic	2-1		2015
5-tube Super Compact	Schematic	3-3		2013

REMLER CO., LTD.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
63, Beginning Serial #69116	Schematic, voltage, data	7-7		
64, Beginning Serial #73914	Schematic, voltage, data	7-7		
65, Above Serial 109217	Schematic, voltage, alignment	9-4		
M-70 Communication System	Master unit and S-50 secondary unit wiring	8-7		
	Installation, operation	8-8		
71, Beginning Serial #75639	Schematic, voltage, data	7-2		
72, Above Serial 104459	Schematic, voltage, alignment, data	9-5		
73	Schematic, voltage, tuner, alignment	10-3		
88	Schematic, data	7-8		
89, 89C, Above Serial 92582	Schematic, voltage, alignment, phonograph	9-6		
91, Beginning Serial #72759	Schematic, data	7-8		
140, 170 Norco	Schematic, voltage, alignment	Misc. 8-8		
171	See model 49			
178 Norco	Schematic, voltage, alignment	Misc. 8-8		
179, Above Serial 113701	Schematic, alignment	10-4		

REO

See PHILCO RADIO & TELEVISION CORP.

REPUBLIC INDUSTRIES

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
MS & Jr.	Schematic, notes	Misc. 3-7		2761
Sky Hawk Patrician	Schematic	Misc. 6-12		
BP-5E	Schematic, voltage, socket	5-1		
TR-5B	Schematic, voltage, socket	5-4		
"Skyhawk" RC-5, RC-6	Schematic	4-1		
"Skyhawk" SL-5-D	Schematic	4-2		
CS-6	Schematic, voltage, socket	5-2		
"Skyhawk" SL-6	Schematic	4-3		
"Skyhawk" SL-6-D	Schematic	4-4		
TL-6C	Schematic, voltage, socket	5-3		
42	Schematic, socket, voltage, parts	7-1		
51	Schematic, socket, voltage, parts	7-2		

ROCKE INTERNATIONAL ELECTRIC CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Arlab 51	Schematic	Misc. 4-8		

ROOT'S AUTO RADIO MFG. CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
55 Auto	Schematic, data	Misc. 5-16		

ROYAL

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
9-A	Schematic	Misc. 5-17		

SAMSON ELECTRIC CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Amplifier	Schematic	1-1	*713	2048
MIK-1	Schematic	2-12	712-L	2054
MIK-1D	Schematic	2-12	712-L	2054
PAM-1	Schematic	2-1	712-A	2041
HA-2	Schematic	2-12	712-L	2054
PABC-2	Schematic	2-2	*711	2042
PABC-3	Schematic	2-2	*711	2042
PAM-3	Schematic	2-2	712-B	2042
PABC-4	Schematic	1-3	*712	2043
PABC-5	Schematic	1-3	*712	2043
PAM-5	Schematic	2-3	712-C	2044
PAM-5-D	Schematic	2-3	712-C	2044
PAM-8, 18	Schematic	2-4	712-D	2045
PAM-9	Schematic	2-4	712-D	2045
PAM-11, 12, 13, 14	Schematic	2-5	712-E	2046
PAM-16, 17	Schematic	2-6	712-F	2047
PAM-16-N, 17-N	Schematic	2-6	712-F	2047
PAM-19	Schematic	1-1	*713	2048
PAM-19-N	Schematic	2-7	712-G	2049
PAM-19-Q	Schematic	2-7	712-G	2049
PAM-22	Schematic	2-8	712-H	2050
PAM-23	Schematic	2-9	712-I	2051
PAM-24	Schematic	2-9	712-I	2051
PAM-25	Schematic	2-9	712-I	2051
PAM-25-D	Schematic	2-9	712-I	2051
PAM-29	Schematic	2-10	712-J	2052
PAM-39	Schematic	2-10	712-J	2052
PAM-45	Schematic	2-11	712-K	2053
PAM-48	Schematic	2-11	712-K	2053
PAM-59	Schematic	2-12	712-L	2054
MIK-80	Schematic	2-13		2055
PAM-80	Schematic	2-13		2055
S-100	Schematic	1-1	*713	2048

E. M. SARGENT CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
10	Schematic, notes	Misc. 7-9		

SAVIL RADIO ENGINEERING CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
557	Schematic	4-1		
589	Schematic	4-1		
715	Schematic	4-2		

SCOTT TRANSFORMER CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
All-Wave Super, Receiver	Schematic	2-3	*794-A	2059
	Chassis wiring	2-2	*794-B	2060
Scott's Symphony AC	Schematic	3-1		2058
1933 DeLuxe AVC Super	Schematic, power supply, recording mechanism and schematic	3-2		2062
Shield Grid 9	Schematic	2-1		2057
World Record 10	Schematic	2-1		2057
World Record, Shield-Grid 10 AC	Schematic	3-1		2058
All-Wave Super, 145 Power Pack	Schematic, chassis wiring	2-4	*794-C	2061
All-Wave Super, 150 Power Pack	Chassis views, schematic, control box	1-5	*794-D	2063

SEARS-ROEBUCK & CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
General Notes	Alignment data	5-2		
Loud Speakers	Repair notes	5-14		
	Cone replacement data	5-54		
Wave Trap	Data	Changes 8-5, 8-6		
9-Tube Superhet-AVC	See Sentinel 114			
Silvertone E	Schematic, socket	3-14		2100
Silvertone F	Schematic, socket	3-14		2100
Silvertone FF	Schematic, socket	3-15		2101
Silvertone G	Schematic	3-16		2102
Silvertone J	Schematic	3-16		2102
A1	Schematic, voltage, socket, trimmers, alignment	9-1		
36	Schematic, socket	10-14		
36-P	Schematic, socket	10-14		
44, 45, 90	Schematic, voltage	7-3		
46-47, 91	Schematic, voltage	5-1		
49-50, 92	Schematic, voltage	5-1		
51, 93	Schematic, voltage	7-3		
52, 95	Schematic, voltage	6-1		
	Socket, trimmers, chassis views	9-2		
53, 54, 94, 99	Schematic, voltage	6-1		
56, 100	Schematic, voltage	6-2		
90	See model 44			
91	See model 46			
92	See model 49-50			
93	See model 51			
94	See model 53			
95	See model 52			
96	Note	7-3		
99	See model 53			
100	See model 56			
Silvertone 105, F	Schematic, socket	3-14		2100
106	Schematic, voltage	6-3		
107	Schematic, voltage	6-3		
108	Schematic, voltage	6-2		
Silvertone, 109, 218	Schematic, socket, voltage	2-17		2103
110	Schematic, voltage	6-3		
111	Schematic, voltage	6-4		
112	Schematic, voltage	6-4		

MODEL	SEARS-ROEBUCK & CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
1750	Schematic, voltage	4-31		
	Socket, trimmers, chassis changes	4-32		
1760 (Type 1)	Schematic	5-26		
	Voltage	5-27		
1760 (Type 2)	Schematic, voltage	5-27		
1760	Socket layout, chassis, parts	5-28		
1800	Schematic, notes, parts	5-29		
1801, 1801A	Schematic, alignment, parts	5-30		
1802, 1803	Schematic, voltage	5-3		
	Socket layout, alignment	5-4		
1802-A, 1803-A, 1807	Schematic	5-31		
	Voltage, alignment, socket	5-32		
1804, 1805, 1808, 1820, 1826	Schematic, circuit changes	5-33		
	Wavetrap data, voltage, alignment, socket, parts	5-34		
1805A, 1808A, 1826A, 1841	Alignment	6-20		
	Schematic, voltage	6-21		
1806, 1823, 1829	Schematic	5-35		
	Alignment, voltage, socket	5-36		
1809, 1811, 1833, 1845	Alignment, socket, trimmers, voltage	6-22		
	Schematic	6-23		
1820	See model 1804			
1821, 1827	Schematic	5-37		
	Alignment, voltage, socket, parts	5-38		
1822, 1831, 7164	Socket, trimmers, transformer data	6-24		
	Schematic	6-25		
	Alignment, parts	6-26		
	Additional data	Changes 7-1, 7-6		
1824, 1830	Schematic	6-27		
	Alignment, parts	6-28		
	Socket, trimmers, transformer data	6-29		
	Additional data	Changes 7-1		
1825, 1828	Schematic	5-39		
	Voltage, alignment, socket, parts	5-40		
1825-A	Alignment, voltage, socket, trimmers	6-30		
	Schematic	6-31		
1826	See model 1804			
1826-A	See model 1805-A			
1827	See model 1821			
1828	See model 1825			
1829	See model 1806			
1830	See model 1824			
1831	See model 1822			
1832	Socket, trimmers, clock unit tests, drive unit test	6-32		
	Schematic	6-33		
	Alignment, pre-selector data	6-34		
1832-A	Schematic	6-35		
	Alignment, socket, trimmers, voltage	6-36		
1833	See model 1809			
1835	Schematic, voltage	7-5		
	Socket, trimmers, alignment	7-6		
1840, 1842	Schematic	6-37		
	Wave trap data, alignment, voltage	6-38		
	Socket, trimmers	6-39		
	Additional data	Changes 7-15		
1841	See model 1805-A			
1845	See model 1809			
1850, 1851, 1862, 1868, 1870	Schematic	5-41		
	Voltage, alignment, socket, parts	5-42		
1852, 1853	See model 1711-A			
1854	Schematic	5-43		
	Alignment, voltage, socket	5-44		
1854A	Schematic, voltage	7-7		
	Socket, trimmers, chassis, alignment, parts	7-8		
1855	Schematic	5-45		

MODEL	SEARS-ROEBUCK & CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
1855	Voltage, alignment, socket, parts	5-46		
	Changes	Changes 7-6		
1857	Schematic, socket	5-47		
	Alignment, voltage, parts	5-48		
	Additional data	Changes 7-8		
1857-A, 1867	Socket, trimmers, alignment, voltage	6-40		
	Schematic	6-41		
1858	Schematic	5-49		
	Alignment, voltage, socket, parts	5-50		
1859-A	See model 7117			
1860	See Sentinel model 5600			
1862, 1868, 1870	See model 1850			
1863	Schematic, socket, trimmers, alignment	7-9		
	Generator data, parts	7-10		
1864	Schematic	6-42		
	Alignment, socket, trimmers	6-43		
1867	See model 1857-A			
1868, 1870	See model 1850			
1869X, 7157	Schematic, alignment	7-4		
1870	See model 1850			
1900	Notes, change	7-67		
1900, 1910	Schematic, socket, trimmers, alignment	10-28		
1903, 1953, Early, Late	Schematic, socket, trimmers, alignment	7-11		
1904, 1904-A, 1906, 1908, 1911, 1914, 1938, 1954, 1964, 1964-A, 1984	Alignment, chassis layout	6-44		
	Schematic	6-45		
	Changes	Changes 7-14		
1905, 1915, 1955, 1965, Early and Late	Schematic, voltage, notes	7-13		
	Alignment, chassis, trimmers	7-14		
	Dual Ratio Drive Data	7-12		
1908	See model 1904			
1909	Schematic, voltage, note	7-15		
	Alignment	7-16		
1910	Notes, change	7-67		
	See model 1900			
1911	See model 1904			
1912	See model 1909			
1914	See model 1904			
1915	See model 1905			
1917, 1967, 1967A	Schematic, changes	7-17		
	Chassis, trimmers, notes	7-18		
	Alignment, note	7-19		
	Dual ratio drive data	7-12		
1918, 1968	Schematic, voltage	7-20		
	Trimmers, chassis, notes	7-21		
	Alignment	7-22		
	Dual ratio drive data	7-12		
1918A, 1968A	Schematic, voltage	7-23		
	Chassis, trimmers, note	7-24		
	Alignment	7-25		
	Dual ratio drive data	7-12		
1919, 1929, 1982A, (Late), 1999, Chassis 345X	Schematic, voltage	8-5		
	Chassis, alignment, data, sensitivity	8-6		
1920, 1926, 1980	Schematic	6-46		
	Alignment, chassis, parts	6-47		
1922, 1932, 1982, 1992	Similar to Colonial model 659			
	Notes, changes	7-69		
1922-A, 1932-A, 1982-A, Early, 1992-A	Alignment, socket, trimmers, chassis	6-48		
	Schematic	6-49		
1923, 1933, 1983, 1993, Chassis 334, 334X	Schematic, changes	7-26		
	Chassis, alignment, parts, notes	7-27		
1924	See Sentinel model 31B			
1925, 1935, 1985, 1995, Early, Late	Schematic, voltage	7-28		
	Chassis, alignment, notes	7-29		
1926, 1928, 1978, 1980A, Early and Late	Schematic, voltage	7-30		
1927X, 1937X	Schematic, voltage, trimmers	7-31		

SEARS-ROEBUCK & CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
1927X, 1937X	Alignment	7-44		
1929	See model 1919			
1930, 1940, 1956, 1970A	Schematic	7-32		
1932	See model 1922			
1932-A	See model 1922-A			
1933	See model 1923			
1933A, 1983A	Schematic, voltage	7-33		
	Chassis, alignment, sensitivity	7-34		
1934	See Sentinel model 31B			
1935	See model 1925			
1936, 1996, Chassis 359, Early Chassis 359X, Late	Schematic, voltage	7-35		
	Chassis, alignment, changes	7-36		
	Dual ratio drive data	7-12		
1937X	See model 1927X			
1938	See model 1904			
1940	See model 1930			
1941	See model 1981			
1942, Early	See model 1909			
1942, 1972, 1994, Late, Chassis 391Y	Schematic, voltage	8-4		
	Chassis, alignment, sensitivity	9-14		
1944	See model 1909			
1945	Schematic, socket, voltage	7-37		
	Trimmers, chassis, data, alignment, sensitivity	7-38		
	Dual ratio drive data	7-12		
	Changes	Changes 8-5		
1946, Early Chassis 388, Late, Chassis 388X	Schematic, socket, voltage, changes	7-39		
	Chassis, trimmers, alignment, sensitivity	7-40		
	Dual ratio drive data	7-12		
1947, 1948	Schematic, voltage	8-7		
	Chassis, trimmers, alignment, sensitivity	8-8		
1949 Auto	Schematic, socket	8-9		
1949A Auto	Schematic, parts	8-10		
1953	See model 1903			
1954	See model 1904			
1954X	Schematic, trimmers	7-41		
	Alignment, parts	7-42		
1955	See model 1905			
1956	See model 1930			
1962	See model 1909			
1964, 1964A	See model 1904			
1965	See model 1905			
1967, 1967A	See model 1917			
1968	See model 1918			
1968A	See model 1918A			
1970	Schematic	8-11		
	Alignment, socket, trimmers, voltage	8-12		
1970A	See model 1930			
1972, Early	See model 1909			
1972, Late	See model 1942 Late			
1978	See model 1926			
1980	See model 1920			
1980A	See model 1926			
1981, 1981C, 1941	Schematic	7-43		
1982	See model 1922			
1982-A, Early	See model 1922-A			
1982A, Late	See model 1919 Late			
1983	See model 1923			
1983A	See model 1933A			
1984	See model 1904			
1985	See model 1925			
1986, 1987, 4403, 4463, 4484, 4563, 4564, 4570, 4571, 4572, 4584, Three Types, (Colonial)	Schematic, voltage	7-45		
	Socket, chassis, alignment, changes	7-46		
1986, 1987, 4403, 4463, 4464, 4484, 4563, 4564, 4584, Chassis 100150	Schematic, socket, voltage	8-13		
	Socket, trimmers, chassis, alignment	8-14		
1988, 4401, 4402, 4461, 4462	Schematic, alignment, voltage, data	7-47		

SEARS-ROEBUCK & CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
1988, 4401, 4402, 4461, 4462	Socket, trimmers, notes, chassis	7-48		
1989, 4408, 4420, 4520	Schematic, voltage, alignment, sensitivity	7-49		
	Trimmers, chassis, data	7-50		
1992	See model 1922			
1992-A	See model 1922-A			
1992X	Schematic, voltage, trimmers	7-51		
	Alignment	7-44		
1993	See model 1923			
1993X	Schematic, voltage, trimmers	7-52		
	Alignment	7-44		
1994 (Late)	See model 1942 Late			
1995	See model 1925			
1996	See model 1936			
1998, Early, Late	Schematic, voltage	7-53		
	Alignment, chassis, sensitivity, changes	7-54		
1999	See model 1919 Late			
3972, Chassis 113.972	Schematic, voltage, chassis, color code	10-1		
	Alignment, socket, trimmers	10-2		
4400	See Howard model HA6 (Early)			
4400-A	See Howard model HA6 (Late)			
4401, 4402	See model 1988			
4403	See model 1986			
4404, 4406, 4424, 4444, 4524, 4544, 3-Volt Models	Schematic, voltage, data, sensitivity	7-55		
	Socket, trimmers, chassis, alignment	7-56		
4405, 4407, 4428, 4448, 4548, Two Types	Schematic, voltage, data	7-57		
	Chassis, socket, trimmers, alignment	7-58		
4405A, 4428A, 4433, 4448A, 4453, 4528A, 4548A	Schematic, socket, trimmers, chassis view, voltage	9-7		
	Alignment, specifications, data	9-8		
4406	See model 4404			
4407	See model 4405			
4408	See model 1989			
4409, 4413, 4442, 4443, 4522, 4523, 4542, 4543	Schematic, voltage, alignment, notes	7-59		
	Chassis, socket, trimmers, sensitivity	7-60		
4410, 4411, 4425, 4445, 2-Volt models	Schematic, voltage, data, sensitivity	7-55		
	Socket, trimmers, chassis, alignment	7-56		
4413	See model 4409			
4414, 4415, 4500, 4505, 4506, 4509, 4510, 4511, Chassis 101.393	Schematic, socket, chassis, alignment	8-15		
	Data	Changes 10-5		
4416	Schematic, voltage, specifications, alignment	9-9		
	Socket, chassis, transformer data, parts	9-10		
4418, 4430	Schematic, voltage	8-16		
4419, 4459, 4519, 4559	Schematic, speaker wiring, interference data	8-17		
	Socket, trimmers, chassis, alignment, sensitivity	8-18		
4420	See model 1989			
4421, 4434, 4521	Schematic, socket	8-19		
	Alignment, voltage	8-20		
	Socket, trimmers, chassis	8-21		
4422, 4423, 4524A, 4532, 4542A	Schematic, voltage, data	8-23		
	Socket, trimmers, chassis	8-22		
	Alignment, sensitivity, interference data	8-24		
4424	See model 4404			
4425	See model 4410			
4426, 4427, 4446, 4447, 4526, 4546	Schematic, voltage	8-25		
	Alignment, sensitivity, interference data	8-26		
	Socket, trimmers, chassis	8-27		
4426A, 4526A, 4546A	Schematic, voltage	8-25		

MODEL	SEARS-ROEBUCK & CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
4426A, 4526A, 4546A	Alignment, sensitivity, interference data	8-26		
	Socket, trimmers, chassis	8-27		
4428	See model **4405**			
4428A, **4448A**, **4528A**, **4548A**	Schematic voltage	7-61		
	Alignment, data, transformer	**7-62**		
	Socket, trimmers, chassis	Changes **8-5**		
	Changes	Changes 9-4		
4428A (Late)	See model 4405A			
4429, **4449**, **4529**, **4549**	Schematic, voltage, specifications speaker connections	9-11		
	Socket, trimmers, chassis	9-12		
	Alignment, notes	9-13		
4430	See model 4418			
4431, 4432, 4435, 4436, 4531	Schematic, voltage, specifications	9-15		
	Alignment, sensitivity, socket, trimmers, chassis	9-16		
	Notes, parts	9-17		
4433	See model 4405A			
4434	See model 4421			
4437, 4438, 4477, 4478, 4537, 4577	Socket, trimmers, chassis, parts	9-18		
	Schematic, voltage, notes	9-19		
	Alignment, sensitivity, notes	9-20		
4439, 4440, 4455, 4456, 4539	Schematic, voltage, data	8-28		
	Socket, trimmers, chassis, alignment, sensitivity	8-29		
4441, 4451	Schematic, voltage, alignment, sensitivity, interference data	8-31		
	Socket, trimmers, chassis, notes	8-30		
4442, **4443**	See model 4409			
4444	See model 4404			
4445	See model 4410			
4446, **4447**	See model 4426			
4448	See model 4405			
4448A	See model 4428A			
4448A (Late)	See model 4405A			
4449	See model 4429			
4450, 4550	Schematic, voltage, data	8-33		
	Socket, trimmers, chassis, sensitivity notes, data	8-32		
	Alignment, sensitivity, whistle elimination	8-34		
4451	See model 4441			
4453	See model 4405A			
4455, 4456	See model 4439			
4459	See model 4419			
4461, 4462	See model 1988			
4463	See model 1986			
4464 (Chassis 100150)	See model 1986 (Chassis 100150)			
4465, 4485, 4565, 4585 Chassis 100.151	Schematic, socket, voltage, specifications, speaker connections	9-21		
	Socket, trimmers, chassis, alignment, sensitivity	9-22		
4465, 4485, 4565, 4585 Chassis 101.410	Schematic, voltage, notes	8-35		
	Distortion elimination, sensitivity, data	8-36		
	Alignment, socket, trimmers, chassis	8-37		
	Phono. jack connections, interference data, notes	8-38		
4466, 4467, 4469, 4567	Schematic, specifications	9-23		
	Alignment, sensitivity, voltage	9-24		
	Socket, trimmers, chassis	9-25		
4468, 4470, 4490	Schematic, voltage, data	8-39		
	Alignment, sensitivity, notes	8-40		
	Socket, trimmers, chassis	8-41		
4469	See model 4466			
4472, **4473**, **4533**	Schematic, voltage, specifications, socket, trimmers, chassis	9-27		
	Alignment, sensitivity, notes, parts	**9-28**		

MODEL	SEARS-ROEBUCK & CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
4477, 4478	See model 4437			
4484	See model 1986			
4485	See model 4465			
4486, 4586, 4586A	Schematic, voltage, phono. pick-up data, interference data	8-43		
	Whistle elimination, data	8-42		
	Socket, trimmers, chassis, alignment, sensitivity	8-44		
4487	Schematic, changes	9-29		
	Changes, notes	9-30		
	Data	Changes 10-5		
4488, 4588	Schematic, voltage	8-45		
	Socket, trimmers, chassis, color code	8-46		
	Alignment, sensitivity, dial drive parts	8-48		
	AFC notes, page 1	8-49		
	AFC notes, page 2, dial lamp data	8-50		
	Interference elimination, phono. pick-up jack data	8-51		
	Changes notes	8-52		
	Changes schematics	8-53		
	Changes	8-56		
	Revised alignment, AFC adjustment	8-57		
4488A, **4588A**	Schematic, voltage	8-45		
	Color code	8-46		
	Socket, trimmers, chassis	8-47		
	Alignment, sensitivity, dial drive parts	8-48		
	AFC notes, page 1	8-49		
	AFC notes, page 2, dial drive data	8-50		
	Interference elimination, phono. pick-up jack data	8-51		
	Changes notes	8-52		
	Changes schematics	8-53		
	Changes	8-56		
	Revised alignment, AFC adjustment	8-57		
4488B, 4588B	Schematic, voltage	8-55		
	Socket, trimmers, chassis	8-54		
	Changes	8-56		
	Alignment, AFC adjustment	8-57		
4490	See model 4468			
4498, 4499, 4598	Schematic, voltage, notes	8-59		
	Socket, trimmers, notes, alignment, sensitivity	8-60		
4500	See model 4414			
4501, 4503, 4507	Schematic, voltage, notes	8-61		
	Socket, trimmers, parts, alignment, notes	8-62		
4502, 4502A, 4504, 4508, 4512, 4513, 4514, Chassis 101.427	Schematic, voltage, notes	8-58		
	Socket, trimmers, chassis, alignment, parts	9-26		
	Data	Changes 10-5		
4505, 4506	See model 4414			
4507	See model 4501			
4508	See model 4502			
4519	See model 4419			
4520	See model 1989			
4521	See model 4421			
4522, 4523	See model 4409			
4524	See model 4404			
4524A	See model 4422			
4526	See model 4426			
4526A	See model 4426A			
4528A	See model 4428A			
4528A (Late)	See model 4405A			
4529	See model 4429			
4531	See model 4431			
4532	See model 4422			
4533	See model 4472			
4537	See model 4437			
4539	See model 4439			
4542, **4543**	**See model 4409**			
4542A	See model 4422			

MODEL	SEARS-ROEBUCK & CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
4681, 4781, Chassis 101.499	Phone and phono. jacks installation, schematic	10-18		
	Chassis, antenna, wave-trap data	10-19		
	Socket, trimmers, alignment, chassis	10-20		
4684, Chassis, 101.502	Schematic, voltage, phonograph installation	9-59		
	Socket, trimmers, chassis, alignment, notes sensitivity	9-60		
4688, 4788, 4799 Chassis 100.159	Schematic	9-61		
	Socket, trimmers, speaker connections	9-62		
	Alignment, sensitivity	9-63		
	Moto-Matic Tuner adjustments, operation	9-64		
	Moto-Matic Tuner adjustments, operations, concluded	9-65		
	Voltage, tuner motor data	9-66		
	Drive data	9-67		
	Switch data	9-68		
	Dial mechanism	9-69		
	Tuner faults and remedies, Part 1	9-70		
	Tuner faults and remedies, Part 2	9-71		
	Tuner faults and remedies, Part 3	9-72		
	Parts list	9-73		
	Parts list, concluded	9-74		
4700, Chassis 104.235	Schematic, adjustments, alignment	9-80		
	Alignment procedure, notes	10-4		
4720, 4780	See model 4602-3			
4722	See model 4622			
4723	See model 4613			
4724	See model 4604-5			
4726	See model 4606-7			
4728A	See model 4608A			
4740	See model 4640			
4746	See model 4606-7			
4748A	See model 4608A			
4750	See model 4640			
4761, 4771, Chassis 101.490	Schematic, voltage, socket, specifications, notes	9-75		
	Socket, trimmers, chassis, alignment, sensitivity, transformer data	9-76		
4764	See model 4664			
4767, 4777	See model 4667			
4769	See model 4610			
4771	See model 4761			
4776, Chassis 126.200	Schematic, socket, voltage, specifications	9-77		
	Phonograph data	9-78		
	Socket, trimmers, alignment, chassis, sensitivity	9-79		
4781	See model 4681			
4784	See model 4664			
4786, Chassis 100.196	Schematic, voltage, wave-trap data, socket	10-21, 22		
	Alignment, socket, trimmers, chassis	10-23		
	Jacks installation, color code, wave trap	10-24		
	Automatic tuner data, Part 1	10-25		
	Automatic tuner data, Part 2	10-26		
	Automatic tuner data, Part 3	10-27		
4788	See model 4688			
4789	See model 4610			
4790	See model 4680			
4796, Chassis 126.201	Schematic, voltage	10-29		
	Alignment, data	10-30		
	Socket, trimmers, chassis	10-31		
	Phono. wiring, details	10-32		
4799	See model 4688			
5656A	Schematic, voltage	10-33		
5731, Moto-Matic Tuner for Models 6000, 6001, 6100, 6101, Part 128.15600	Schematics, details, data	10-34		

MODEL	SEARS-ROEBUCK & CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
5731, Moto-Matic Tuner for Models 6000, 6001, 6100, 6101, Part 128.15600	Adjustments, Part 1	10-35		
	Adjustments, Part 2, parts	10-36		
6002, 6021, 6031, 6121, 6131 Chassis 100.195	Schematic, voltage	10-37		
	Socket, trimmers, chassis, alignment	10-38		
	Tuner data	10-88		
	Parts	10-39		
6003, 6004, 6024, 6034, 6124, 6134, Chassis 101.510	Schematic, voltage, drive data	10-41		
	Tuner data	10-58		
	Alignment, jacks installation schematic	10-40		
	Socket, trimmers, chassis	10-42		
6005, 6071, 6076, 6171, 6176, Chassis 101.507	Schematic, voltage, socket	10-43		
	Alignment, notes	10-6		
	Socket, trimmers, chassis	10-42		
6008, 6009, 6018, 6019, 6048, 6049, 6068, 6069, 6148, 6168, Chassis 101.524	Schematic, socket, trimmers, drive data, notes	10-45		
	Tuner data	10-58		
	Alignment	10-44		
	Chassis, data	10-46		
6010, 6040, Chassis 101.519	Schematic, voltage, socket, trimmers, changes	10-51		
	Socket, trimmers, chassis, notes	10-46		
	Alignment	10-10		
6014, 6015	See model 4632A			
6016, 6017, 6046, 6047, 6146, Chassis 101.512	Schematic, voltage, drive data	10-47		
	Alignment, notes	10-6		
	Socket, trimmers, chassis	10-48		
	Tuner data	10-58		
6018, 6019	See model 6008			
6021	See model 6002			
6022, 6122, 6132, Chassis 101.509	Schematic, voltage, drive data	10-49		
	Alignment	10-6		
	Socket, trimmers, chassis	10-50		
	Tuner data	10-58		
6023, 6123, Chassis 101.506	Schematic, voltage, notes	10-52		
	Socket, trimmers, chassis	10-50		
	Alignment, notes	10-6		
6024	See model 6003			
6028, Chassis 126.204	Schematic, voltage, speaker wiring, motor, pick-up wiring, alignment	10-53		
	Motor details, trimmers, chassis wiring, socket	10-54		
	Socket, trimmers, chassis	10-55		
6031	See model 6002			
6034	See model 6003			
6036, 6136, Chassis 101.511	Schematic, voltage, color code, data	10-56		
	Phone and phono. jacks, drive data, notes	10-57		
	Alignment	10-44		
	Socket, trimmers, chassis, tuner data	10-58		
6038, 6138, Chassis 101.517	Schematic, voltage, socket, drive data, color code	10-59, 60		
	Alignment, motor data	10-55		
	Alignment	10-44		
	Tuner data	10-58		
6040	See model 6010			
6044, 6045	See model 4632A			
6046, 6047	See model 6016			
6048, 6049	See model 6008			
6052, 6053, Chassis 101.525	Schematic, voltage, socket, data	10-61		
	Alignment	10-10		
	Socket, trimmers, chassis	10-62		
6054, 6055, Chassis 101.532	Schematic, voltage, socket, trimmers, chassis	10-65		
	Alignment	10-10		

SEARS-ROEBUCK & CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
7143	Schematic, voltage, socket, trimmers, alignment	8-79		
7144	Schematic, socket, alignment	7-65		
7150	Schematic, socket, alignment	7-66		
7152	Notes, change	7-67		
	Schematic, socket, voltage	10-92		
7153	Schematic, socket, trimmers, alignment	7-9		
7154	Schematic, socket	7-66		
7155	Schematic, socket, alignment	7-67		
7157	See model 1869X			
7158	Schematic, trimmers, socket, alignment	7-68		
7164	See model 1822			
7165, 7165X	Schematic, socket	7-65		
7166, 7166X	Schematic, socket	7-63		
7166A	Schematic, socket voltage	7-69		
7167	Schematic, voltage, alignment, parts	7-70		
7168	Schematic, voltage, data	7-69		
7170, 7170A	Schematic, socket	10-93		
7171	Schematic, voltage, socket, trimmers	10-95		
	Chassis wiring	10-94		
	Alignment	10-96		
7172	Schematic, socket, alignment	10-97		
7172X	Schematic, alignment	8-80		
7173, 7183	Schematic, voltage, socket, alignment	9-81		
7176	Schematic, socket, trimmers, alignment	10-98		
7177	Schematic	10-99		
7181, 7182	Socket, trimmers	9-82		
	Schematic, voltage	9-83		
	Alignment	9-84		
7211, Chassis 110.7211 7212, 7212A, Chassis 110.7212	Schematic, socket, trimmers, alignment	10-100		
7213, Chassis 110.7213	Schematic, socket, trimmers	10-101		
7214, Chassis 110.7214	Schematic	10-101		
	Socket, trimmers, alignment	10-102		
7215, Chassis 110.7215	Schematic, socket, trimmers, tuner	10-110		
	Alignment, tuner data	10-102		
7220, Chassis 110.7220	Schematic, notes	10-103		
	Socket, trimmers, alignment	10-104		
7221, Chassis 126.202	Schematic, voltage, drive data, specifications	10-105, 106		
	Socket, trimmers, alignment, phono. data	10-107		
	Chassis wiring	10-108		
	Record changer assembly	10-109		
7225, Chassis 110.255	Schematic, socket, trimmers, voltage, alignment	10-111		
	Tuner data	10-81		
	Alignment	10-64		
7226, Chassis 110.880	Schematic, voltage, alignment	10-112		
	Socket, trimmers, alignment, Part 2	10-104		
100.150 Chassis	See model 1986			
100.151 Chassis	See model 4465			
100.157 Chassis	See model 4613			
100.159 Chassis	See model 4688			
100.179 Chassis	See model 4622			
100.189 Chassis	See model 6070			
100.195 Chassis	See model 6002			
100.196 Chassis	See model 4786			
100.198 Chassis	See model 6157			
101.410 Chassis	See model 4465			
101.458 Chassis	See model 4600			
101.472A Chassis	See model 4608A			
101.473 Chassis	See model 4606-7			
101.476 Chassis	See model 4640			
101.478 Chassis	See model 4619			
101.479 Chassis	See model 4680			
101.480 Chassis	See model 4664			
101.482 Chassis	See model 4610			
101.487 Chassis	See model 4611			

SEARS-ROEBUCK & CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
101.490 Chassis	See model 4761			
101.495 Chassis	See model 6100			
101.496 Chassis	See model 6101			
101.497 Chassis	See model 4614			
101.498 Chassis	See model 4667			
101.499 Chassis	See model 4681			
101.502 Chassis	See model 4684			
101.504 Chassis	See model 4644A			
101.505, 101.505X Chassis	See model 4632A			
101.506	See model 6023			
101.507	See model 6005			
101.508 Chassis	See model 6110			
101.509 Chassis	See model 6022			
101.510 Chassis	See model 6003			
101.511 Chassis	See model 6036			
101.512 Chassis	See model 6016			
101.513 Chassis	See model 6072			
101.515 Chassis	See model 6074			
101.517 Chassis	See model 6038			
101.519 Chassis	See model 6010			
101.521 Chassis	See model 6112			
101.522 Chassis	See model 6114			
101.524 Chassis	See model 6008			
101.525 Chassis	See model 6052			
101.526, 101.526-1 Chassis	See model 6102			
101.527 Chassis	See model 6125			
101.528 Chassis	See model 6073			
101.532 Chassis	See model 6054			
101.533 Chassis	See model 4612A			
101.534 Chassis	See model 6140			
101.537 Chassis	See model 6152			
103.AR166 Chassis	See model 4668			
104.235 Chassis	See model 4700			
109.216 Chassis	See model 6195			
110.255 Chassis	See model 7225			
110.880 Chassis	See model 7226			
110.7211 Chassis	See model 7211			
110.7212 Chassis	See model 7212			
110.7213 Chassis	See model 7213			
110.7214 Chassis	See model 7214			
110.7215 Chassis	See model 7215			
110.7220 Chassis	See model 7220			
113.972 Chassis	See model 3972			
126.200 Chassis	See model 4776			
126.201 Chassis	See model 4796			
126.202 Chassis	See model 7221			
126.203 Chassis	See model 6104			
126.204 Chassis	See model 6028			
134.802, 134.802-1 Chassis	See model 6226			

SENTINEL RADIO CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
"Automatic Tune" Wheel Dial	Assembly, details, notes	10-1		
	Installation, details, parts	10-2		
Push-Button Dial	Assembly, instructions, parts	10-12		
6A	Schematic, voltage, trimmers, alignment, parts	8-1, 8-2		
8, 9	Schematic, socket voltage	3-1		2105
10M	Schematic, voltage, alignment, parts	8-5		
10MF	Schematic, voltage, alignment, parts	8-3, 8-4		
11, 12, 14, 16 (104)	Schematic, socket, voltage	1-1	*624	2106
11M	Schematic, voltage, alignment, parts	8-6		
14A	Schematic, parts, trimmers	9-1, 2		
	Alignment, socket, voltage	9-5		
19A	Schematic, voltage, alignment, trimmers, parts	8-7		
20A	Schematic, voltage, trimmers, alignment	7-1		
30A	Schematic, alignment, voltage, parts	8-8		
31, 33	Schematic	2-8		2116
31B	Schematic, voltage, trimmers	6-1		
	Alignment, parts	6-2		
32B	Schematic, alignment, parts	8-9		
33B	Schematic, alignment, trimmers, parts	8-10		

SENTINEL RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
5500	Schematic	5-25		
	Voltage, alignment, parts	5-26		
	Socket layout	Changes 7-7		
5600	Schematic, voltage, alignment, socket	6-7		
5700-B	Schematic, socket, voltage, alignment	6-12		
5700, 5721	Schematic, voltage	5-27		
	Alignment, parts list	5-28		
5800	Schematic, voltage, trimmers, alignment	7-11, 7-12		
6101, 6102	Schematic	5-29		
	Service notes, voltage, alignment	5-30		
	Parts list	5-31		
6200, 6234, 6241	Schematic	5-34		
6315, 6317, 6321	Schematic	5-32		
	Voltage, alignment	5-33		
	Parts list	5-31		
6700	Schematic, voltage, trimmers, alignment	7-7		
6800	Schematic, voltage, trimmers, alignment	7-8		
6900	Schematic, voltage, trimmers, alignment, parts	8-29, 8-30		
7100	Schematic, voltage, trimmers	7-9		
	Alignment	7-10		
7100B	Schematic, voltage, trimmers	7-13, 7-14		
	Alignment	7-15		
7200	Schematic, voltage, trimmers, alignment, parts	8-32		
7200-B	Schematic, socket	6-9, 6-10		
	Alignment, voltage	6-11		
7700, 7732, 7741	Schematic	5-35		
	Voltage, alignment, parts	5-36		
	Socket layout	Changes 7-7		
8100B	Schematic, voltage	7-17, 7-18		
	Alignment, trimmers	7-16		
8200-B	Schematic	6-13, 6-14		
	Alignment	6-15		
	Voltage, parts, trimmers	6-16		
9100	Schematic, voltage, trimmers, battery data	7-19, 7-20		
	Alignment	7-21		

SETCHELL-CARLSON, INC.

PA 13 Amplifier	Schematic	8-1
PA 25 Amplifier	Schematic	8-1
55 Portable	Schematic, socket, trimmers	Misc. 10-8
PA 115 Amplifier	Schematic	8-2
332	Schematic	9-1
600	Schematic	9-2
602	Schematic	9-2
620	Schematic	9-2
622	Schematic	9-1

SHAMROCK RADIO

Shamrock "28-29"	Schematic	Misc. 4-10

SHELLY RADIO CO.

5 Kompak	Schematic	7-1
25	Schematic	Misc. 9-3
35-C	Schematic, socket	8-1
35C-AW, 37-C	Schematic, socket, alignment	8-2
48	Schematic, socket	7-1
48-A	Schematic, socket	8-1
65	Schematic, socket	7-2
67	Schematic, socket	7-2
75 Auto	Schematic, socket, alignment	8-2

SILVER KING

See APPEL & HENDERSON

SILVER-MARSHALL, INC.

Bearcat	See model 737
Bearcat Midget	See model 37
Broadcast-Long Wave	See model 773

SILVER-MARSHALL, INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Little Red Rooster	Schematic	Misc. 8-9		
Long-Wave Receiver	Schematic	1-28		2152
Sargent Raymond 7	See model 710			
SW Converter	See model 738			
SW Superhet Converter	See model 739			
Time Signal Amplifier	See model 440			
A	Schematic, socket	1-30	*542-C	2163
B	Schematic, socket, data	2-6	542-E	2164
C	Schematic, socket	2-7	542-K	2165
	Parts list	2-8	542-L	2166
C w/AVC	Schematic, parts list	4-3		
D, E	Schematic, socket, voltage	1-31	*542-D	2167
F	Schematic, socket	1-30	*542-C	2163
G	Schematic, socket	2-9	542-F	2168
J	Schematic, socket	2-10	542-G	2169
Q DeLuxe	Parts list	2-11	542-P	2173
	Schematic, socket	2-12	542-O	2172
"Q" Type 1	Schematic, socket, parts list	4-4		
"Q" Type 3	Schematic, socket, parts list	4-5		
R	Parts list	2-13	542-R	2175
	Schematic, socket	2-14	542-Q	2174
V	Schematic, socket	3-4		2176
	Parts list	3-5		2177
Triple Speaker "V," "X," "Q"	Schematic	4-1		
Y	Schematic	Misc. 6-29		
"Z" DeLuxe	Schematic, parts list	4-6		
Z-10	Schematic, parts list	4-7		
Z-13	Schematic, parts list	4-8		
KB21	Schematic, parts	Misc. 9-5		
30	Schematic, socket, voltage	1-1	*537	2127
30, Circuit B	Schematic, data	1-3	*538	2129
30, Circuit C	Schematic, data	1-3	*538	2129
30, Circuit D	Schematic, data	1-4	*539	2130
30, Circuit E	Schematic, data	1-4	*539	2130
30-B, 60-B, 75-B, 90-B	Schematic, socket, voltage	1-2	*540	2128
A-31	Schematic	Misc. 8-9		
33-A, Power Supply, 25 & 60 cycles	Schematic, socket, voltage	1-5	*541	2131
34-A	Schematic, socket	1-6	*542	2132
35-A	Schematic, socket	1-6	*542	2132
36-A	Schematic, socket, voltage	1-7	*543	2133
37, 38, 39, 782 Midget, Bearcat Midget	Schematic, voltage	1-8	*542-A	2134
60-B, 75-B, 90-B	See model 30-B			
440, Time Signal Amplifier	Schematic	1-1	*537	2127
620 S-C	Schematic	1-32	*526	2178
635 Kit	Schematic	1-32	*527	2178
642 AC Tuner	Schematic	1-32	*527	2178
SM-650-B	Schematic	1-10	*749	2136
SM-651 Power Pack	Schematic	1-9	*714	2135
SM-652	Schematic	1-10	*749	2136
SM-660 Unipack	Schematic	1-9	*714	2135
SM-660-B (Without push-pull)	Schematic	1-9	*714	2135
SM-669	Schematic, chassis wiring	1-10	*749	2136
670-ABC	Schematic, chassis wiring	1-11	*750	2137
670-B	Schematic, chassis wiring	1-11	*750	2137
675	Schematic, chassis wiring, parts list	1-12	*751	2138
677, 25 & 60 Cycles	Schematics, chassis wiring	1-13	*716	2140
677-B	Schematic, voltage	1-17	*529	2145
678-PD	Schematic, chassis wiring	1-14	*717	2141
679	Schematic	1-14	*717	2141
683	Schematic, socket, data	2-2	542-F-1	2147
684	Schematic	2-1	718-A	2142
685	Schematic	1-15	*718	2143
690	Schematic	1-15	*718	2143
692	Schematic	1-15	*718	2143
710, Sargent Raymond 7	Schematic, chassis view, data	1-16	*528	2144
712	Schematic, socket, chassis view	1-17	*529	2145
714	Schematic, socket, voltage, chassis views	1-18	*530	2146
716	Schematic, socket data	2-2	542-F-1	2147
720 AC	Schematic	1-19	*531	2148
720 Battery	Schematic, chassis view	1-19	*531	2148
722 AC	Schematic, socket, voltage, data	1-20	*532	2149
722 DC	Schematic, chassis wiring	1-21	*533	2150

SILVER-MARSHALL, INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
724 AC	Schematic, socket, voltage, chassis view	1-22	*534	2151
724 DC	Schematic, socket	1-23	*542-B	2152
726	Schematic, socket, voltage, parts list	1-24	*542-E	2153
727 SW-All-Wave	Parts list	2-3	542-N	2155
	Schematic, socket, data	2-4	542-M	2154
728 SW	Schematic, speaker connections	3-1		2156
729 SW	Schematic, parts list	4-2		
730, 731	Schematic	1-25	*796	2157
735 AC	Schematic	1-25	*796	2157
735 DC	Schematic	1-25	*796	2157
737 AC Bearcat	Schematic, socket	1-26	*797	2158
738 AC, SW Converter	Schematic, socket	1-26	*797	2158
739 SW Superhet Converter	Schematic, data	1-27	*542-F	2159
740 DC	Schematic, chassis	1-28	*535	2160
740 AC	Schematic	1-28	*535	2160
770 Auto Set	Schematic, socket, chassis view	1-29	*536	2161
778, Broadcast-Long Wave	Schematic, data	2-5	542-F-2	2162
782 Midget	See model 37			
4801, 4802	Schematic, voltage, parts	5-1		

SILVERTONE

See SEARS-ROEBUCK CO.

SIMPLEX RADIO CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
AA	Schematic, voltage	7-2		
B AC above serial #162500	Schematic	4-1		
D	Schematic, socket	1-1	*524-A	2179
D, DE	Schematic, voltage	7-1		
F	Schematic	1-2	*524-B	2180
G	Schematic	1-1	*524-A	2179
G, GE	Schematic, voltage	7-2		
GB, GBE	Schematic, voltage	7-2		
GH, GHE	Schematic, voltage	7-2		
H (AC)	Schematic	3-1		2181
J	Schematic, notes	3-2		2182
K	Schematic, socket, notes	3-1		2181
K D-C	Schematic	Misc. 10-7		
KL	Schematic, voltage	7-1		
L	Schematic, notes	3-2		2182
N (AC)	Schematic, alignment, voltage	8-1		
N (DC)	Schematic, socket	2-1		2183
OP	Schematic, voltage	7-1		
P 32-volt above #350001	Schematic	4-2		
P (AC)	Schematic, socket	2-2		2184
P (AC), Serial #161001 and up	Schematic, alignment, voltage	8-1		
P (AC), Serial #165200 and up	Schematic, alignment, voltage	8-1		
P (AC), above serial #330301	Schematic	4-2		
P Battery	Schematic, socket	2-2 & 4-1		2184
P Batt. above #173501	Schematic	4-4		
P (DC), Serial #160051 and up	Schematic, alignment, voltage	8-2		
P 1931	Schematic	4-3		2185
P, Dual Band, Above Serial 600001	Schematic, voltage, alignment	6-1		
Q	Schematic, voltage	7-2		
Q 1931	Schematic, socket	4-3		2185
R (AC)	Schematic, socket	2-1		2188
R (AC), Serial #175001 and up	Schematic, alignment, voltage	8-2		
R (AC) above #320001	Schematic	4-4		
R (DC), Serial #150804 and up	Schematic, alignment, voltage	8-2		
RK, RKE, RKS	Schematic, voltage	7-1		
T	Schematic, data	4-5		
U	Schematic	4-6		
U, AC-DC, Above Serial 640001	Schematic, voltage, alignment	6-2		
U-E, AC-DC, Above Serial 215001	Schematic, voltage, alignment	6-2		

SIMPLEX RADIO CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
V	Schematic	4-6		
W All Wave	Schematic, voltage, alignment	5-1		
X	Schematic, voltage	5-1		
Z, ZE	Schematic, voltage	7-1		

SKY RANGER

500	See United Motors model 630 Delco			

SKY-ROVER RADIO

Sky-Rover	Schematic	Misc. 4-11		

M. B. SLEEPER

RX-1	Schematic	Misc. 1-18	*795	2768

SOBOL BROS.

601 Auto	Schematic, socket, trimmers, speaker data	8-1		
	Alignment, data, panel mounting kits	8-2		

SOLAR

062	Schematic, voltage, connections	Misc. 5-18		

SONORA ELECTRIC PHONOGRAPH CO.

Playette	Schematic	8-2		
D	Schematic	Misc. 6-30		
2-M Automatic Stop	Schematic, parts details	1-11	*557	2197
2-RP, 25 Cycles	Schematic	1-12	*544	2198
3R, 4R	Schematic	1-1	*545	2187
5R	Schematic	1-2	*546	2188
7P	Schematic	1-3	*547	2189
A-30, A-32	Schematic	1-4	*548	2190
	Socket, voltage, chassis wiring	1-5	*549	2191
B-31, 25 Cycles	Schematic, socket	1-6	*550	2192
A-36, A-46	Schematic, socket, voltage	1-7	*551	2193
A-40	Schematic	1-8	*552	2194
	Chassis wiring, socket, voltage	1-9	*553	2195
DeLuxe 44	Schematic, voltage	1-10	*554	2196
64	Schematic, voltage, chassis layout	3-1		2199
70	Schematic, notes	3-3		2201
	Chassis layout, voltage, data	3-4		2202
71, 72, 78	Schematic	2-1		2203
74	Schematic, voltage, chassis layout	3-2		2200
84, 85	Voltage, chassis layout, data	2-2		2206
	Schematic, data	2-3		2205
86, 87	Voltage, data	2-4		2208
	Schematic, chassis, data	2-5		2207
P-101 Amplifier	Schematic	8-2		
PR-101, PR-202	Schematic	8-1		
PR-101 AC-DC	Schematic	8-1		
P-300 Amplifier	Schematic	8-2		
PR-300 AC-DC	Schematic	8-1		
PR-400 AC-DC	Schematic	8-1		

SPARKS WITHINGTON CO.

Amplifier and Connector Units	Chassis views	2-58	568-R	2296
Antenna Trimmer	Service notes	2-42	568-X	2274
Carbon Resistors	Values, color coding	2-28		2292
Carbon, Wire-wound Resistors	Values, types, color coding, etc.	2-29		2293
Intermediate Frequencies	I-F. Peaks	Changes 7-10		
Power Converters	Chassis views	2-56	568-S	2294
	Chassis views	2-59	568-T	2297
Resistors	Standard color coding	2-51	568-A	2225
Selector Unit	Chassis views	2-57	568-Q	2295
Tubes	Characteristics and data	2-60		2276
Vacuum Tubes	Chart and data	5-6		
5, 9	Schematic, chassis layout, voltage, data	2-1	568-W	2210
5-15, 5-26	Schematic	1-3	*558	2283

MODEL	SPARKS WITHINGTON CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
6-15, 6-26	Schematic	1-3	*558	2283
AC-7, AC-62, AC-63	Schematic, socket, voltage	1-5	*560	2209
9	See model 5			
9-A, 600-A, 610-A, 620-A	Schematic, socket, voltage	2-2	568-X-1	2211
9X, 13, 14, 14-A, 15X, 620X	Schematic	2-7		2215
	Voltage, chassis, data	2-6		2216
	Alignment data	4-1		
10	Chassis, voltage, data	2-3	568-W	2213
	Schematic	2-4	568-V	2212
12	Schematic, chassis, voltage	2-5	568-X-3	2214
14, 14A	See model 9X			
15	Chassis, voltage, data	2-8	568-Z	2218
	Schematic	2-9	568-Y	2217
15X	See model 9X			
16, 16-AW (BC Rec.)	Schematic, voltage	2-11	568-X-4	2219
16-AW, 26-AW (SW Rec.)	Schematic, voltage	2-10	568-X-7	2220
	Additional data	Changes 7-4		
17, 18, 28X, 111X, 750-A, 750X, 870-A, 870X	Schematic	4-2		2221
	Voltage, chassis, trimmers	4-3		2222
	Alignment data	4-1		
AR-19, 19-A	Schematic	1-1	*568-B	2223
	Chassis view	2-12	568-C	2224
25, 26	Schematic	2-14	568-Z-1	2226
	Chassis, voltage	2-15	568-Z-2	2227
26 AW (SW Rec.)	Schematic—See model 16-AW (SW Rec.)			
26-AW, Revised #2	Schematic	2-16	568-X-6	2228
27	Chassis, voltage	3-1		2231
	Schematic	3-2		2230
27, 27-A, 28	Alignment data	4-1		
27-A	Schematic	4-4		2232
	Voltage, socket, trimmers	4-5		2233
27X	Data	Changes 7-13		
28	Schematic	4-6		
	Additional data	Changes 7-4		
28X	See model 17			
30, 30A, 30B,	Chassis, voltage	2-17	568-Z-4	2235
	Schematic	2-18	568-Z-3	2234
	Service notes, part 1	2-19	568-Z-4B	2236
	Service, notes, part 2	2-20	568-Z-4C	2237
	Parts list	2-21	568-Z-4A	2239
	Chassis views	2-22	568-Z-4D	2238
30-A	Alignment data	4-1		
31, 32	Schematic	1-4	*559	2240
	Chassis views	2-23		2241
33	Schematic	4-7		
	Voltage, notes, socket	4-8		
33-A, 33-B	Schematic, voltage, resistance	7-1		
	Trimmers, alignment	7-2		
34	Schematic	3-3		2243
	Voltage, battery and assembly connections, notes	3-4		2242
	Alignment data	4-1		
35	Service data	2-24	568-Z-4E	2246
	Service data, continued	2-25	568-Z-4F	2247
	Service data, concluded	2-26	568-Z-4G	2248
	Chassis views	2-27	568-Z-4H	2249
	Schematic	3-5		2245
	Chassis layout, voltage	3-6		2244
	I-F. Peak	Changes 7-8		
36	Schematic, voltage, resistance data	4-9		
	Changes	Changes 7-8		
	Trimmers, alignment	7-2		
39	Schematic	1-4	*559	2240
40, 40-A	Schematic, voltage, socket	2-30	568-Z-5	2250
	Alignment, trimmers	7-3		
41	Schematic, socket, voltage	2-31	568-Z-1	2251
	Alignment, trimmers	7-3		
41-A, 42	Alignment data	4-1		
	Trimmers, additional alignment	7-3		
41A	Schematic, voltage	8-8		
42	Schematic, voltage	8-8		
43	Voltage	4-8		
	Schematic, changes	4-10		
	Alignment, trimmers	7-3		
45	Schematic	2-32	568-Z-11	2252
	Chassis, voltage, data	2-33	568-Z-12	2253

MODEL	SPARKS WITHINGTON CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
46P	Schematic, parts, voltage, resistance, trimmers, alignment	9-1		
49	Schematic	1-5	*560	2209
AR-50, AR-50-A	Schematic	1-1	*568-B	2223
	Chassis	2-12	568-C	2224
51, 52	Schematic, socket, voltage	2-34	568-Z-6, 9	2254
	Service data	2-35	568-Z-7, 10	2255
53 AC-DC	Schematic	5-1		
	Voltage, chassis view	5-2		
	Alignment data	5-3		
54	Voltage, chassis layout	3-8		2256
	Schematic	3-7		2257
	Alignment data	4-1		
55 AC (Police Desk)	Schematic	2-36	568-D	2258
	Alignment, trimmers	7-3		
56	Schematic	2-37	568-Z-13	2261
	Voltage, chassis, data	2-38	568-Z-14	2260
57, 57-A, 57-B, AC-DC	Schematic	5-4		
	Alignment data	5-3		
	Voltage, chassis view	5-5		
	Additional data	Changes 7-14		
58	Schematic, parts	6-1		
	Voltage, socket, trimmers	6-2		
60 (SW Converter)	Schematic, socket, voltage	2-39	568-X-8	2259
	Additional data	Changes 7-4		
61, 61-A, 61-B, 62	Schematic, voltage	4-11		
	Changes	Changes 7-15		
AC-62, AC-63	See model AC-7			
65, 66	Schematic	5-7		
	Voltage, chassis view	5-8		
	Alignment data	5-9		
	Additional data	Changes 7-8		
65-T, 66-T	Note	5-7		
	Alignment data	5-9		
67, 68, 68-XS, 685, 691	Schematic	5-11		
	Alignment data	5-10		
	Voltage, chassis view	5-12		
67-X	Data	Changes 7-13		
69, 79, 79-A, 89	Schematic, voltage	1-7	*561	2262
70, 77, 775	Schematic, parts	6-3		
	Voltage, socket, trimmers	6-4		
71, 71-B	Schematic, voltage, resistance data	4-12		
	Trimmers, alignment	7-2		
72	Schematic, voltage, resistance data	4-13		
	Trimmers, alignment	7-2		
73	Schematic, trimmers	7-4		
	Voltage, alignment	7-6		
73-AX, 73-BX	Schematic, trimmers, parts	7-5		
	Voltage, socket, trimmers, alignment	7-6		
73-X	Data	Changes 7-13		
74	Schematic, voltage, resistance data	4-14		
75-A, 475-A, 478-A	Schematic	5-13		
	Voltage, notes	5-14		
	Alignment	8-2		
75-AX, 475-AX, 478-AX	Schematic, voltage, socket, trimmers, changes, parts	8-1		
	Alignment	8-2		
76	Schematic	7-7		
	Voltage, resistance, socket, trimmers, speaker wiring	7-8		
77	See model 70			
78, 478	Schematic, voltage, resistance data	4-15		
79, 79-A	See model 69			
80, 83, 84, 85-XS, 86X, 835	Schematic	5-15		
	Voltage, chassis view, notes	5-16		
	Alignment data	5-17		
	Trimmer locations, frequency tables	5-18		
	Additional data	Changes 7-4		
80X	Data	Changes 7-13		
81	Schematic, voltage, resistance data	4-16		
81-A	Schematic, socket, voltage, resistance	7-18		

SPARKS WITHINGTON CO.—(Cont.)

MODEL	SPARKS WITHINGTON CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
81-A	Additional data ....Changes	7-14		
81X	Data ....Changes	7-13		
82	Schematic, voltage, resistance data	4-17		
82X	Data ....Changes	7-13		
83, 84	See model 80			
85X	Schematic	5-15		
	Voltage, chassis view, notes	5-16		
	Alignment data	5-17		
	Trimmer locations, frequency tables	5-18		
	Phonograph data, part 1	7-9		
	Phonograph data, part 2	7-10		
85-XS, 86X	See model 80			
89	See model 69			
89-A	Schematic, voltage	1-7	*561	2262
99	Ensemble wiring	1-10	*568	2264
	Schematic	1-11	*567	2263
101	Voltage, assembly wiring	4-18		2266
	Schematic	4-19		2265
103, 578	Assembly wiring, voltage, chassis	2-40	568-J	2268
	Schematic	2-41	568-I	2267
104, 135	Schematic	5-19		
	Voltage, chassis view, notes	5-20		
	Alignment	5-17		
105	Additional data ....Changes	7-14		
105X, 105-XS	Schematic	5-19		
	Voltage, chassis view, notes	5-20		
	Alignment	5-17		
	Phonograph data, part 1	7-9		
	Phonograph data, part 2	7-10		
109 DeLuxe	Schematic	1-12	*562	2269
110, 111, AC (2 types)	Schematic	1-13	*563	2271
111-A, 574, 870	Schematic	2-43	568-P	2273
111X	See model 17			
	Alignment data	4-1		
134. 136	Schematic, parts	6-5		
	Voltage, socket, trimmers	6-6		
135	See model 104			
219-P, 219-PD, Wireless Phonograph	Schematic, voltage, adjustments, changes	10-1		
235	Schematic	2-44	568-Z-8	2275
301 AC	Schematic, voltage	1-14	*564	2277
301 DC	Schematic, voltage	2-45		2278
333	Schematic, voltage, resistance data	4-20		
409-GL	Schematic, voltage, socket, trimmers, alignment	10-2		
410, 420 AC	Chassis layout	2-46	568-F	2280
	Schematic	2-47	568-E	2279
410, 420 DC	Chassis layout	2-48	568-H	2282
	Schematic	2-49	568-G	2281
417X	Schematic, parts, voltage, resistance, socket, trimmers	9-9		
427X, 437X, 457X	Schematic, resistance, voltage, trimmers, parts	8-3		
	Socket, trimmers, alignment	8-4		
475-A, 478-A	See model 75-A			
475-AX, 478-AX	See model 75-A			
478	See model 78			
500DG, 500DR, 500W, 500BV, 500BW	Schematic, voltage, socket, trimmers, alignment	10-3		
506, 566, 594	Schematic, parts	6-7		
	Voltage, socket, trimmers	6-8		
510DG, 510DR, 510W, 510BV, 510BW	Schematic, voltage, socket, trimmers, alignment	10-4		
516, 516X, 546X	Schematic, parts, transformer	7-11		
	Voltage, alignment, socket, trimmers, resistance	7-12		
517, 517B, 517W, 517X, 557, 567	Schematic, trimmers, resistance, voltage, parts	8-5		
	Socket, trimmers, alignment	8-6		
518, 518X, 558B, 558BX, 558C, 558CX, 568, 568X, 578 (1938) 578X	Schematic, parts, voltage	9-2		
	Alignment, socket, trimmers	9-3		
527-2, 587-2	Schematic, voltage, socket, trimmers	10-5		
	Alignment	10-10		

MODEL	SPARKS WITHINGTON CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
528-2, 588-2	Socket, trimmers, alignment	9-3		
	Schematic, parts, voltage	9-4		
536, 536X	Schematic, socket, voltage, resistance	7-13		
	Alignment, trimmers	7-14		
537, 577	Schematic, socket, trimmers, voltage, resistance, parts	8-7		
	Alignment	8-6		
538, 538X, 628, 628X, 668, 668X, 678, 678X, 678A (Selectronne)	Schematic, parts	9-5		
	Voltage, alignment, socket, trimmers	9-6		
	Selectronne data	9-22		
546X	See model 516			
547X	Schematic, voltage, socket, trimmers, resistance, parts	8-11		
	Alignment	8-14		
548X	Schematic, parts	9-7		
	Voltage, alignment, socket, trimmers	9-8		
549-1	Schematic, voltage	10-7		
	Alignment, socket, trimmers	10-8		
557	See model 517			
558	See model 518			
564, 570, 740, 750 AC	Schematic, voltage	2-50	568-L	2284
564, 570, 600, 610, 620, 737, 740, 750 DC	Schematic	2-53	568-O	2287
566	See model 506			
567	See model 517			
568	See model 518			
570	See model 564			
574	See model 111-A			
577	See model 537			
578	See model 103 or 518			
587-2	See model 527-2			
588-2	See model 528-2			
589 AC	Schematic, voltage	1-19	*564	2285
591, 593 AC	Schematic	2-52	568-K	2286
594	See model 506			
600, 610, 620 DC	Schematic, see model 564 DC			
600, 610, 620, 737 AC Below #6502	Schematic, voltage	1-20	568-M	2288
600-A, 610-A	See model 9-A			
608, 608B, 608G, 608W, 608R, 608K, 608V	Schematic, parts, voltage	9-10		
	Socket, trimmers, alignment	9-11		
616, 616-X, 666, 666-X	Schematic, parts	6-9		
	Voltage, socket, trimmers	6-10		
	Alignment, trimmers	7-16		
616-M, 616-MX, 666-M, 666-MX	Schematic, parts	7-15		
	Alignment, trimmers	7-16		
	Socket, voltage, resistance	7-17		
617, 617-X, 667, 667-X	Schematic, socket, voltage, trimmers, parts	8-9		
	Alignment	8-10		
620	See model 564			
620-A	See model 9-A			
620 AC, Below #6502	See model 600 AC			
620 DC	See model 564 DC			
620X	See model 9X			
	Alignment data	4-1		
628	See model 538			
636-MX	Schematic, parts	7-19		
	Voltage, resistance, socket, trimmers, alignment	7-20		
637-6, 687-6	Schematic, voltage	10-9		
	Alignment, socket, trimmers	10-10		
638-6, 688-6	Socket, trimmers, voltage, alignment	9-11		
	Schematic, parts	9-12		
649-6L, 649-6S	Schematic	10-11		
	Voltage, socket, chassis	10-12		
	Alignment, trimmers	10-13		
655	Schematic, parts	6-11		
	Voltage, socket	6-12		
666, 666X	See model 616			
666-M, 666-MX	See model 616-M			
667, 667X	See model 617			
668	See model 538			

MODEL	SPARKS WITHINGTON CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
676, (Late) 686, D686, H686	Schematic, parts, socket, trimmers, voltage, alignment, resistance	9-30		
678	See model 538			
685, 691	See model 67			
686	See model 676			
687-6	See model 637-6			
688-6	See model 638-6			
699	Schematic, speaker connections	10-6		
	Voltage, alignment	10-8		
716X, 766	Schematic, parts	6-13		
	Voltage, socket, trimmers, phonograph data	6-14		
	Alignment, trimmers	7-21		
727X, 727XD, 877X	Schematic, voltage, socket, trimmers, parts	8-12		
	Alignment	8-14		
728X	Schematic, voltage	10-15		
	Alignment, trimmers, socket, chassis	10-16		
737 AC, Below #6502	See model 600 AC, Below #6502			
737 AC (Above #6502)	Schematic	2-55	568-N	2289
737, 740, 750 DC	See model 564 DC			
738 (Selectime)	Schematic, parts, socket, trimmers, voltage	9-13		
	Alignment, "Selectime" data	9-14		
740, 750 AC	See model 564			
748X	Schematic, parts, voltage	9-15		
	Socket, trimmers, alignment	9-16		
750-A, 750X	See model 17			
	Alignment data	4-1		
766	See model 716X			
766X	Schematic, parts	6-13		
	Voltage, socket, trimmers, phonograph data	6-14		
	Alignment, trimmers	7-21		
766-XP, 766-XS	Schematic, parts	6-13		
	Voltage, socket, trimmers, phonograph data	6-14		
	Alignment, trimmers	7-21		
	Phonograph data, part 1	7-9		
	Phonograph data, part 2	7-10		
768, 768X, 778, 778X	Socket, trimmers, alignment	9-16		
	Schematic, parts, voltage	9-17		
775	See model 70			
778	See model 768			
827X, 827XD, 997X	Schematic, socket, trimmers, voltage, parts	8-17		
	Alignment	8-14		
835	See model 80			
867	Schematic, voltage, socket, trimmers, parts	8-13		
	Alignment	8-14		
870	See model 111-A			
870-A, 870X	See model 17			
877X	See model 727X			
928X	Schematic, parts, voltage	9-21		
	Socket, trimmers, alignment	9-22		
930 AC	Schematic, voltage	1-21	*565	2290
931 AC	Schematic, voltage	1-22	*566	2291
931 DC	Schematic, voltage	1-22	*566	2291
966, 966X	Schematic, parts	7-22		
	Alignment, trimmers	7-21		
	Socket, voltage, resistance	7-17		
968, 968X	Schematic, parts, socket, trimmers	9-18		
	Voltage, alignment	9-19		
977	Schematic, parts, socket, trimmers	9-23		
	Voltage, resistance, alignment	9-24		
987	Schematic, socket, trimmers, voltage, parts	8-18		
	Alignment	8-14		
997X	See model 827X			
1068, 1068X, 1078, 1078X	Socket, trimmers, alignment	9-19		
	Schematic, parts, voltage	9-20		
	Selectronne tuner, trimmers, adjustments	10-14		
1078	See model 1068			

MODEL	SPARKS WITHINGTON CO.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
1089	Schematic	10-17		
	Socket, trimmers, chassis	10-16		
	Voltage, alignment, trimmers	10-18		
	Selectronne tuner, trimmer adjustments	10-14		
1116X, 1166, 1166X, 1176, 1186, 1196	Schematic, parts	7-23		
	Voltage, resistance, socket, trimmers	7-24		
	Alignment, phonograph, data	7-25		
1116X, 1166-XP, 1166-XS, 1176-XP, 1176-XS	Schematic, parts	7-23		
	Voltage, resistance, socket, trimmers	7-24		
	Alignment, phonograph, data	7-25		
	Phonograph, data, part 1	7-9		
	Phonograph data, part 2	7-10		
1167	Schematic, voltage, parts	8-15, 8-16		
	Alignment	8-14		
1176, 1186, 1196	See model 1116X			
1176-XP, 1176-XS	See model 1116X			
1268, 1288P	Schematic, parts, voltage	9-25		
	Socket, trimmers, alignment	9-26		
	Selectronne tuner, trimmers, adjustments	10-14		
1288	See model 1268			
1288LXP	Schematic	10-19		
	Selectronne tuner trimmers, adjustments	10-14		
	Alignment, trimmers	10-20		
1466, 1476	Schematic, parts	7-26		
	Alignment, phonograph data	7-25		
	Voltage, resistance, socket, trimmers	7-24		
1567	Schematic, parts, voltage	9-27, 28		
	Socket, chassis	9-29		
1568	Schematic	10-21		
	Alignment, voltage, socket, trimmers, chassis	10-22		
	Selectronne tuner trimmers, adjustments	10-14		
1867, Below Serial 000751 Early, Late Productions	Schematic, changes, voltage	10-25		
	Alignment, trimmers	10-26		
	Socket layout	10-20		
1867, Above Serial 000751	Schematic, changes	10-23, 24		
	Alignment, trimmers	10-26		
	Socket layout	10-20		
5008	Schematic, voltage, alignment, trimmers, socket	10-27		
5018	Schematic, voltage, alignment, chassis	10-28		
5028	Schematic, voltage, trimmers, socket, alignment	10-33		
5218	Schematic, voltage, trimmers	10-29		
	Alignment, tuner	10-30		
	Chassis	10-34		
5518, 5518A, 5518AX	Schematic, voltage	10-31		
	Alignment, chassis, trimmers	10-32		
	Tuner data	10-32		
6218, 7618	Schematic, trimmers, socket, chassis	10-34		
	Voltage, alignment, tuner	10-30		
8618	Schematic, voltage	10-35		
	Alignment, socket, trimmers, chassis	10-35		
	Selectronne tuner, trimmers, adjustments	10-14		

SPARTON

See SPARKS WITHINGTON CO.

SPENCER

See TRUEVALUE

SPIEGEL, INC.

AIR CASTLE

B-1 Chassis	See model 6510			
H1 Chassis	See model 169			
X1	Data	Changes 10-2		

SPIEGEL, INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
AM 3 Chassis	See model 6506			
Z4 Chassis	See model 102			
L-5 Chassis	See model 120			
M5 Chassis	See model 178			
Z-5 Chassis	See model 167			
6A60 Chassis	See model 4505			
AM 6 Chassis	See model 6508			
L-6 Chassis	See model 130			
6-P Chassis	See model 4404			
6-Q Chassis	See model 2154			
6-W Chassis	See model 2000			
X6 Chassis	See model 1901			
7AC Chassis	See model 6502			
AM 7 Chassis	See model 5054			
7-J Chassis	See model 4400			
L-7 Chassis	See model 144			
X-8 Chassis	See model 100			
11-S Chassis	See model 2058			
11X Chassis	See model 4010			
12AC Chassis	See model 4006			
14A Chassis	See model 1903			
14-112S Chassis	See model 6805			
14-127ES Chassis	See model 2080			
14-129 Chassis (1936)	See model 2212			
14-136EA, 14-152ES Chassis	See model 6525			
14-142ES Chassis	See model 6512			
16R Chassis	See model 2060			
20C5 Chassis	See model 4508			
22B7 Chassis	See model 4509			
23E Chassis	See model 2204			
X23 Chassis	See model 2200			
25Y Chassis	See model 9930			
27D Chassis	See model 9904			
29B Chassis	See model 9916			
37B Chassis	See model 150			
39B Chassis	See model 1906			
40 Chassis	See model 2000			
BA41 Chassis	See model 1901			
43 Chassis	See model 2066			
46A Chassis	See model 134			
58 Chassis	See model 132			
65B Chassis	See model 5106			
66-660 Chassis	See model 4210			
73 B Chassis	See model 2222			
78-780 Chassis	See model 2302			
88-880 Chassis	See model 4212			
90B Chassis	See model 2112			
100, Chassis X-8	Schematic, socket, voltage, trimmers	9-1		
	Alignment, parts	9-2		
102, 104, 112, 114, 124, 172, 6750, 6752 Chassis Z4	Schematic, socket, trimmers, alignment	10-5		
109B Chassis	See model 2100			
120, 140, Chassis L-5	Schematic, voltage, socket, trimmers	9-3		
	Alignment, parts	9-4		
124	See model 102			
130, 134, 146, 190, Chassis L-6	Schematic, voltage, socket, trimmers	9-5		
	Alignment	9-4		
132, Chassis 58	Schematic, voltage	9-7		
	Alignment, socket, trimmers, parts	9-8		
134, Chassis 46A	Schematic, trimmers	10-1		
	Alignment, voltage, socket, tuning eye notes	10-2		
144, 152, 178, Chassis L-7	Schematic, voltage, socket, trimmers	9-6		
	Alignment	9-4		
145E Chassis (1938)	See model 2212			
146	See model 130			
147 Chassis (1938)	See model 2080			
150, 188, 1910, Chassis 37-B	Schematic, alignment, parts	9-11		
152	See model 144			
160, 180, 184, 6500, 6504, 6518, 6546, 6550, 6562, 6564, Chassis 603 (1936)	Schematic	10-3		
	Alignment, socket, trimmers	10-4		

SPIEGEL, INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
167, 182, 183, Chassis Z-5	Schematic, socket, trimmers	9-9		
	Alignment	9-4		
169, Chassis H1	Schematic, voltage, alignment	10-6		
172	See model 102			
178	See model 144			
178, 6708, 6754, Chassis M5 (1936)	Schematic, voltage, socket, trimmers	10-7		
	Alignment	10-4		
180, 184	See model 160			
182, 183	See model 167			
188	See model 150			
190	See model 130			
202 Chassis	See model 1100			
211 Chassis	See model 1108			
212 Chassis	See model 1150			
216 Chassis	See model 1010			
218 Chassis	See model 1052			
219 Chassis	See model 1002			
220 Chassis	See model 1104			
601 Chassis	See model 6504			
603 Chassis	See model 160			
603 (1934) Chassis	See model 4519 Auto			
613 Chassis	See model 5058			
633 Chassis	See model 6590			
651 Chassis	See model 5200			
700 Chassis	See model 5256			
745 (1937) Chassis	See model 2064			
871 Chassis	See model 4004			
885 Chassis	See model 4068			
1002, 1003, Chassis 219	Schematic, socket, trimmers, alignment	10-8		
1010, 1011, Chassis 216	Schematic, socket, trimmers, alignment	10-9		
1052, 1053, Chassis 218	Schematic, socket, trimmers, alignment	10-10		
1060B Chassis	See model 6600			
1070B Chassis	See model 5102			
1072AE Chassis	See model 4002			
1090B Chassis	See model 2108			
1100, 1101, 1102, 1103, Chassis 202	Schematic, alignment	10-11		
1104, 1105, 1106, 1107, Chassis 220	Schematic, socket, trimmers	10-12		
	Alignment	10-10		
1105 Chassis	See model 2070			
1108, 1109, 1110, 1111, Chassis 211	Schematic, socket, trimmers, alignment	10-13		
1150, 1151, 1152, 1153, Chassis 212	Schematic, alignment	10-11		
1154, 1155, 1156, 1157, Chassis 220	Schematic, socket, trimmers	10-12		
	Alignment	10-10		
1901, 1907, 1911, 1921, 1932, 1955, 1957, 1961, 1981, Chassis X6, BA41	Schematic, socket, trimmers, alignment	10-14		
1903, 1960, Chassis 14A	Schematic, trimmers	10-15		
	Alignment, voltage	10-16		
1906, 1954, Chassis 39B	Schematic, trimmers, alignment	10-22		
1910	See model 150			
1911	See model 1901			
1921, 1932	See model 1901			
1954	See model 1906			
1955, 1957	See model 1901			
1960	See model 1903			
1961, 1981	See model 1901			
2000, 2001, 2008, 2009, 2018, 2019, 2050, 2051, Chassis 40	Schematic, socket, trimmers, alignment	10-17		
	Tuner data	10-18		
2000, 2001, 2050, 2051, 2072, 2073, Chassis 6-W	Schematic, socket, trimmers, alignment, parts	9-12		
2058, 2059 (1938), 4054 (1937) Chassis 11-S	Schematic, socket, parts, trimmers	9-13		
	Alignment, notes	9-14		
	Electric tuning data	9-15		

SPIEGEL, INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
2060, 2061, 4056, 4074, Chassis 16R	Schematic	10-19, 20		
	Socket, trimmers, tuner data, alignment	10-21		
2064, 2065, 4014, 4064, 4066, Chassis 745 (1937)	Schematic, voltage, socket, trimmers, alignment	10-23		
	Tuner data	10-18		
2066, 2067, 2068, Chassis 43	Schematic, alignment	10-10		
	Socket, trimmers	10-12		
2070, 2071, 4076, Chassis 1105	Schematic, voltage, socket	10-24		
	Tuner data	10-18		
	Alignment	10-28		
2080, 2081, Chassis 147 (1938) Also chassis 14-127ES	Schematic, socket, trimmers, alignment, parts	9-16		
2100, 2101, 2102, 2103, Chassis 109B	Schematic, voltage, socket	10-25		
	Alignment, trimmers, chassis	10-26		
2108, 2109, 2110, 2111, Chassis 1090B	Schematic, voltage, socket	10-27		
	Socket, trimmers, chassis	10-28		
2112, 2113, 2120, 2121, Chassis 90B	Schematic, voltage, socket	10-27		
	Socket, trimmers, chassis	10-28		
2150, 2151, 2152, 2153, Chassis 109B	Schematic, voltage, socket	10-25		
	Alignment, trimmers, chassis	10-26		
2154, 2155 (1938), 4500, 4502, 4504, 4550, 4512, 4514 (1936) Chassis 6-Q	Schematic, socket, trimmers, alignment	9-17		
2200, 2201, 2202, 2203, 2220, 2221, 2230, 2231, 2232, 2233, Chassis X23	Schematic, alignment, notes	10-31		
	Alignment procedure	10-36		
2204, 2205, 2206, 2207, Chassis 23E	Schematic, alignment, notes	10-31		
	Alignment procedure	10-36		
2212, 2213, 2214, 2215, 2254, 2255, 2256, 2257, 2280, 2281, Chassis 145E (1938) Also chassis 14-129 (1936)	Schematic, socket, trimmers, alignment, parts	9-18		
2220, 2221	See model 2200			
2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229 Chassis 73B	Schematic, voltage	10-29		
	Socket, trimmers, chassis, alignment	10-30		
2230, 2231, 2232, 2233	See model 2200			
2302, 2303, Chassis 78-780	Schematic, socket, trimmers, alignment	10-32		
4002, 4050, 5020, Chassis 1072AE	Schematic, voltage	10-33		
	Socket, trimmers, chassis, alignment	10-34		
4004, 4052, Chassis 871	Schematic, socket, trimmers, voltage, alignment	10-35		
	Alignment procedure	10-28		
4006, 4070, Chassis 12AC	Schematic, alignment, trimmers	10-36		
4010, Chassis 11X	Schematic, alignment	10-37		
4014	See model 2064			
4050	See model 4002			
4052	See model 4004			
4054 (1937) Chassis 11-S	See model 2058			
4056	See model 2060			
4064, 4066	See model 2064			
4068, Chassis 885	Schematic, voltage, socket	10-38		
	Alignment	10-28		
4070	See model 4006			
4074	See model 2060			
4076	See model 2070			
4210, Chassis 66-660	Schematic, socket, trimmers, alignment, connections	10-39		
4212, Chassis 88-880	Schematic, socket, trimmers, alignment, connections	10-40		
4400, 4420, Chassis 7-J	Schematic, socket, trimmers, alignment, parts	9-19		

SPIEGEL, INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
4404, 4452, Chassis 6-P	Schematic, alignment	9-21		
	Socket, trimmers, notes, parts	9-22		
4500 (1935), Chassis 4536	Schematic, socket, voltage, alignment	9-20		
4500, 4502, 4504 (1936), Chassis 6-Q	See model 2154			
4505, Chassis 6A60	Schematic, alignment, trimmers, voltage	10-41, 42		
4508, 9905, 9911, Chassis 20C5	Schematic, parts	9-23		
	Socket, voltage, resistance, alignment, drive cord data	9-24		
4509, 9912, Chassis 22B7	Schematic, socket, trimmers, parts	9-25		
	Voltage, alignment, resistance, sensitivity	9-26		
4510, 4516, 4533, 9923 Chassis 6246	Schematic, voltage, alignment	9-32		
4512, 9914, 9915, 9932, 9933 (1935) Chassis 7700	Schematic, voltage, parts	9-27		
	Alignment, parts	9-28		
4512, 4514 (1936) Chassis 6-Q	See model 2154			
4514, Chassis 9148	Schematic, voltage, trimmers, battery data	9-29, 30		
	Alignment	9-31		
4519 Auto, Chassis 603 (1934)	Schematic	10-43		
	Alignment, voltage	10-44		
4533, Chassis 6246	See model 4510			
4536 Chassis	See model 4500			
4550 (1936) Chassis 6-Q	See model 2154			
5006, 5052, 6544, 6568, Chassis 14-127ES	See model 2080			
5020	See model 4002			
5054, 5062, 6570, 6580, 6582, 6590, Chassis AM 7	Schematic, socket, alignment, trimmers	10-49		
5058, 5060, Chassis 613	Schematic, socket, voltage, trimmers, parts, alignment	9-35		
5062	See model 5054			
5102, Chassis 1070B	Schematic, voltage, socket	9-33		
	Alignment, parts, battery connections	9-34		
5106, 5110, Chassis 65B	Schematic, voltage, socket, trimmers, alignment	10-45		
5200, 5210, 5214, 5216 Chassis 651	Schematic, voltage	9-36		
5218, 6712, 6716, 6766, 6772, Chassis 14-129 (1936)	See model 2212			
5256, 5260, 6760, 6770, 6776, Chassis 700	Schematic, socket, alignment	10-50		
5258 Chassis	See model 9907			
5700B Chassis	See model 9902			
6246 Chassis	See model 4510			
6500	See model 160			
6502, 6552, Chassis 7AC	Schematic, socket, trimmers, alignment	10-46		
6504, Chassis 601	Schematic, voltage, socket, trimmers, alignment, parts	9-35		
6504, Chassis 603	See model 160			
6506, 6554, Chassis AM 3	Schematic, socket, trimmers, alignment	10-47		
6508, 6556, Chassis AM 6	Schematic, socket, trimmers, alignment	10-48		
6510, 6514, 6520, Chassis B-1	Schematic, socket, trimmers, alignment	9-37		
6512, 6542, 6566, Chassis 14-142ES	Schematic, socket, trimmers, alignment	10-51		
6518	See model 160			
6525, 6532, 6540, 6560, Chassis 14-136EA, 14-152ES	Schematic, socket, trimmers, alignment	9-41		
6542	See model 6512			
6544, 6568, Chassis 14-127ES	See model 2080			
6546, 6550	See model 160			
6552	See model 6502			
6554	See model 6506			

SPIEGEL, INC.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
6556	See model 6508			
6562, 6564	See model 160			
6566	See model 6512			
6570, 6580, 6582	See model 5054			
6590, Chassis AM 7	See model 5054			
6590, Chassis 633	Schematic, voltage	9-36		
6600, Chassis 1060B	Schematic, voltage, alignment, parts, socket	9-38		
6708	See model 178			
6712, 6716, 6766, 6772	See model 2212			
6750, 6752	See model 102			
6754	See model 178			
6760, 6770, 6776	See model 5256			
6805, 6806, 6807, 6808, 6815, 6816, 6817, 6818, 6836 Chassis 14-112S	Schematic, socket, trimmers, alignment	10-51		
6946 Chassis	Schematic, voltage, trimmers, alignment, parts	9-39, 9-40		
7700 Chassis	See model 4512			
9148 Chassis	See model 4514			
9902, 9908, Chassis 5700B	Schematic, socket, voltage, alignment	9-42		
9904, 9910, 9926, 9928, Chassis 27D	Schematic, socket, trimmers, alignment	9-43		
	Voltage, circuit changes, parts, drive cord data	9-44		
9905, 9911, Chassis 20C5	See model 4508			
9907, Chassis 5258	Schematic, voltage, alignment	10-52		
9912, Chassis 22B7	See model 4509			
9914, 9915, Chassis 7700	See model 4512			
9916, 9917, Chassis 29B	Schematic, socket, trimmers, parts	9-45		
	Voltage, resistance, alignment	9-46		
9923, Chassis 6246	See model 4510			
9930, Chassis 25Y	Schematic, socket, trimmers, voltage, parts	9-47		
	Alignment, resistance, drive cord data	9-48		
9932, 9933 Chassis 7700	See model 4512			

SPLITDORF ELECTRIC MFG. CO.

See THOMAS A. EDISON, INC.

STANDARD RADIO CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Standardyne 29 AC	Schematic, socket	Misc. 1-19	*570	2299

STAR

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
6-U	Schematic	5-2		
062	Schematic, voltage, assembly wiring	5-1		

STAR RAIDER

See CONTINENTAL RADIO CORP.

STEINITE RADIO CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
8-Tube Pentode	Schematic	Misc. 6-32		
10 Chassis	See model 70			
15, 17 Chassis	See model 420			
21 Chassis	See model 421			
22 Chassis	See model 203			
23 Chassis	See model 423			
26 Chassis	See model 642-B			
28 Chassis	See model 700			
40, 40-A, 50, 50-A, 102, 102-A	Schematic	1-1	*571	2301
40-C, 60-C, 102-C	Schematic, socket, voltage	1-2	*572	2302
40, 45, 40-A, 45-A, 50-A, 102 SPU	Schematic, socket, voltage	1-2	*573	2302
70, 80, 95 (Chassis #10)	Schematic, socket, chassis wiring	1-3	*574	2314
102 Series	See model 40 Series			
203, 600, 605, 630, 635, 642, 643 (Chassis #22)	Schematic	2-1	576-E	2303
261, 262, 263, 264, 265	Schematic, socket, voltage	1-4	*575	2304
420, 450 (Chassis #15)	Schematic, socket	2-3	576-A	2305
420, 450 (Chassis #17)	Schematic, socket	2-2	576-B	2306

STEINITE RADIO CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
421, 425 (Chassis #21)	Chassis layout, data	2-4	576-D	2308
	Schematic	2-5	576-C	2307
423 (Chassis #23)	Schematic	2-6	576-F	2309
600, 605, 630, 635, 642, 643	See model 203			
642-B, 700, 705, 706, 725, (Chassis #26)	Schematic	2-7	576-G	2311
	Voltage, data	2-8	576-H	2312
700, 701 (Chassis #28)	Schematic, data, voltage	2-9	576-I	2310
990, 991, 992, 993	Schematic, socket, voltage	1-5	*576	2313

STENODE RADIOSTAT

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Stenode Radiostat	Schematic	Misc. 1-18		2763

STERLING MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
A (DC)	Schematic	3-1		2319
C	Schematic	3-3		2323
F	Schematic	1-5	*579	2320
M-N	Schematic	3-2		2321
P-Q	Schematic	3-2		2321
VA	Schematic	3-1		2319
Miniature	Schematic, voltage	1-3	*578-A	2317
	Chassis views, data	1-4	*578-B	2318
8-tube Receiver	Schematic	1-5	*579	2320
3-A	Schematic	1-1	*577	2315
B-3	Schematic	3-3		2323
4	Schematic	1-2	*578	2316
B-4	Schematic	3-3		2323
RT-41, R-81, R-96-M, R-96, R-97, R-98, R-100, R-100-M	Schematic	3-4		2324
R-100 MV	Schematic	2-1		2325
R-402	Schematic	2-1		2325
R-403	Schematic	2-1		2325
R-404	Schematic	2-1		2325
R-406	Schematic	2-1		2325
R-407	Schematic	2-1		2325
R-409	Schematic	2-3		2327
R-410	Schematic	2-3		2327
R-411	Schematic	2-3		2327
R-412	Schematic	2-3		2327
R-509	Schematic	2-3		2327
R-510	Schematic	2-3		2327
R-511	Schematic	1-6	*781	2322
R-522	Schematic	1-6	*781	2322
R-807-A	Schematic	2-2		2326
R-810 (1st type)	Schematic	2-2		2326
R-810 (2nd type)	Schematic	2-2		2326
R-880	Schematic	2-2		2326

STEWART-WARNER CORP.

NOTE: The second figure of the new system model numbers in Volume X indicates the voltage rating of the receiver as follows:

1—117 volts, 50-60 cycles
2—2-volt battery
3—117 volts, AC-DC Underwriters Approved
7—117 volts, AC-DC
8—117 volts, 25 cycles
10—100-240 volts, 50-133 cycles

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
AC-DC Sets	Data	Changes 10-6		
A-F Transformers	Data	1-15	*580-A	2356
Air Pal	See model A6			
Firestone	See models R-1322, R-1332			
Resistors	Variable and fixed, part 1	1-13	*580-C	2357
	Fixed, part 2	1-14	*580-D	2358
Wave Trap	Installation data	5-4		
1937 Models	Speaker cone replacements	10-14		
01-521, 01-522, 01-523, 01-524, 01-525, 01-526, 01-527, 01-528, 01-529, Chassis 01-52	Schematic, voltage, sockets, coils, tuner switch	10-55		
	Alignment, trimmers, tuner	10-56		
01-531, 01-532, 01-533, 01-534, 01-535, 01-536, 01-537, 01-538, 01-539, Chassis 01-53, 01-531S, 01-532S, 01-533S, 01-534S, 01-535S, 01-536S, 01-537S, 01-538S, 01-539S, Chassis 01-53S	Schematic, voltage, socket, tuner switch, coils	10-57		
	Alignment, trimmers	10-56		

STEWART-WARNER CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
01-541, 01-542, 01-543, 01-544, 01-545, 01-546, 01-547, 01-548, 01-549, Chassis 01-54; 01-541S, 01-542S, 01-543S, 01-544S, 01-545S, 01-546S, 01-547S, 01-548S, 01-549S, Chassis 01-54S, 01-541WT, 01-542WT, 01-543WT, 01-544WT, 01-545WT, 01-546WT, 01-547WT, 01-548WT, 01-549WT, Chassis 01-54WT	Schematic, voltage, socket	10-58		
	Alignment, trimmers, tuner, drive cord data	10-59		
01-611, 01-612, 01-613, 01-614, 01-615, 01-616, 01-617, 01-618, 01-619, Chassis 01-61; 01-611S, 01-612S, 01-613S, 01-614S, 01-615S, 01-616S, 01-617S, 01-618S, 01-619S, Chassis 01-61S	Schematic, voltage, socket, coils	10-60		
	Alignment, trimmers	10-59		
01-811, 01-812, 01-813, 01-814, 01-815, 01-816, 01,817, 01-818, 01-819, Chassis 01-81	Schematic, voltage, socket, coils	10-61, 62		
	Alignment, trimmers	10-63		
	Tuner, drive cord data	10-64		
02-411, 02-412, 02-413, 02-414, 02-415, 02-416, 02-417, 02-418, 02-419, Chassis 02-41	Schematic, voltage, socket notes	10-65		
	Alignment, trimmers, loop, battery data	10-66		
A6, Air Pal, Chassis 07-31	Schematic, voltage, socket	10-1		
	Alignment, trimmers, antenna notes, change	10-2		
07-511, 07-512, 07-513, 07-514, 07-515, 07-516, 07-517, 07-518, 07-519, Chassis 07-51,	Schematic, voltage, socket, coils, changes	10-67		
	Alignment, trimmers, antenna notes	10-68		
07-511S, 07-512S, 07-513S, 07-514S, 07-515S, 07-516S, 07-517S, 07-518S, 07-519S, Chassis 07-51S	Schematic, voltage, socket, coils, changes	10-67		
	Alignment, trimmers, antenna notes	10-68		
07-511H, 07-512H, 07-513H, 07-514H, 07-515H, 07-516H, 07-517H, 07-518H, 07-519H, Chassis 07-51H	Schematic, voltage, socket, notes	10-69		
	Alignment, trimmers, antenna data	10-70		
07-551, 07-552, 07-553, 07-554, 07-555, 07-556, 07-557, 07-558, 07-559, Chassis 07-55	Schematic, voltage, socket, notes	10-69		
	Alignment, trimmers, antenna data	10-70		
07-631, 07-632, 07-633, 07-634, 07-635, 07-636, 07-637, 07-638, 07-639, Chassis 07-63	Schematic, voltage, socket	10-71		
	Alignment, trimmers, drive cord data	10-72		
08-521, 08-522, 08-523, 08-524, 08-525, 08-526, 08-527, 08-528, 08-529, Chassis 08-52	Schematic, voltage, socket, tuner switch, coils	10-55		
	Alignment, trimmers, tuner	10-56		
08-541, 08-542, 08-543, 08-544, 08-545, 08-546, 08-547, 08-548, 08-549, Chassis 08-54	Schematic, voltage, socket	10-58		
	Alignment, trimmers	10-59		

STEWART-WARNER CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
08-811, 08-812, 08-813, 08-814, 08-815, 08-816, 08-817, 08-818, 08-819, Chassis 08-81	Schematic, voltage, socket, tuner switch, coils	10-61, 62		
	Alignment, trimmers	10-63		
	Tuner, drive cord, data	10-64		
10 to 20 inc.	**See models 108, 108-X (Chassis)**			
010-521, 010-522, 010-523, 010-524, 010-525, 010-526, 010-527, 010-528, 010-529, Chassis 010-52	Schematic, voltage, socket, tuner switch, coils	10-55		
	Alignment, trimmers, tuner	10-56		
010-531, 010-532, 010-533, 010-534, 010-535, 010-536, 010-537, 010-538, 010-539, Chassis 010-53, 010-531S, 010-532S, 010-533S, 010-534S, 010-535S, 010-536S, 010-537S, 010-538S, 010-539S, Chassis 010-53S	Schematic, voltage, socket, tuner switch, coils	10-57		
	Alignment, trimmers	10-56		
010-541, 010-542, 010-543, 010-544, 010-545, 010-546, 010-547, 010-548, 010-549, Chassis 010-54, 010-541S, 010-542S, 010-543S, 010-544S, 010-545S, 010-546S, 010-547S, 010-548S, 010-549S, Chassis 010-54S	Schematic, voltage, socket	10-58		
	Alignment, trimmers	10-59		
010-611, 010-612, 010-613, 010-614, 010-615, 010-616, 010-617, 010-618, 010-619, Chassis 010-61, 010-611S, 010-612S, 010-613S, 010-614S, 010-615S, 010-616S, 010-617S, 010-618S, 010-619S, Chassis 010-61S	Schematic, voltage, socket, coils	10-60		
	Alignment, trimmers	10-59		
010-811, 010-812, 010-813, 010-814, 010-815, 010-816, 010-817, 010-818, 010-819, Chassis 010-81	Schematic, voltage, socket, tuner switch, coils	10-61, 62		
	Alignment, trimmers	10-63		
	Tuner, drive cord data	10-64		
50 to 59 inc.	**See model 105 Series (Chassis)**			
56	**Data**	**Changes 7-11**		
91-511, 91-512, 91-513, 91-514, 91-515, 91-516, 91-517, 91-518, 91-519, Chassis 91-51* (*Any of these numbers followed by WT indicates a wave trap)	Schematic, trimmers, alignment	10-9		
	Voltage, socket, tuner, drive cord	10-10		
91-531, 91-532, 91-533, 91-534, 91-535, 91-536, 91-537, 91-538, 91-539, Chassis 91-53	Schematic, voltage, socket, tuner switch, coils	10-11		
	Alignment, trimmers	10-12		
	Tuner data, parts	10-13		
91-611, 91-612, 91-613, 91-614, 91-615, 91-616, 91-617, 91-618, 91-619, Chassis 91-61	Schematic, voltage, socket, coils	10-15, 16		
	Alignment, trimmers, tuner	10-17		
91-621, 91-622, 91-623, 91-624, 91-625, 91-626, 91-627, 91-628, 91-629, Chassis 91-62	Schematic, voltage, socket, tuner switch, coils	10-19		
	Alignment, trimmers, parts	10-20		
	Tuner data	10-17		
91-641, 91-642, 91-643, 91-644, 91-645, 91-646, 91-647, 91-648, 91-649, Chassis 91-64	Schematic, voltage, socket, coils, notes	10-21		
	Alignment, trimmers, phono. data, tuner	10-22		

STEWART-WARNER CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
91-648, Chassis 91-64 (With "S" stamped on chassis)	Schematic, voltage, socket	10-23		
	Alignment, trimmers, tuner, phono. connections	10-24		
91-711, 91-712, 91-713, 91-714, 91-715, 91-716, 91-717, 91-718, 91-719, Chassis 91-71	Schematic, voltage, coils, tuner switch, notes	10-25		
	Alignment, trimmers	10-26		
	Tuner data, drive cord data, parts	10-27		
91-811, 91-812, 91-813, 91-814, 91-815, 91-816, 91-817, 91-818, 91-819, Chassis 91-81	Schematic, voltage, socket, tuner switch, coils	10-29		
	Tuner data, drive cord data	10-28		
	Alignment, trimmers, parts	10-30		
91-821, 91-822, 91-823, 91-824, 91-825, 91-826, 91-827, 91-828, 91-829, Chassis 91-82	Schematic, voltage, socket, tuner switch	10-31, 32		
	Alignment, trimmers, antenna data	10-33		
	Tuner data, phono. notes	10-34		
91-1111, 91-1112, 91-1113, 91-1114, 91-1115, 91-1116, 91-1117, 91-1118, 91-1119, Chassis 91-111	Schematic, voltage	10-5, 6		
	Tuner, drive cord data, notes, parts	10-7		
	Alignment, trimmers, coils	10-8		
97-521, 97-522, 97-523, 97-524, 97-525, 97-526, 97-527, 97-528, 97-529, Chassis 97-52	Schematic, voltage, socket	10-35		
	Alignment, trimmers	10-36		
	Tuner, drive cord data	10-10		
97-561, 97-562, 97-563, 97-564, 97-565, 97-566, 97-567, 97-568, 97-569, Chassis 97-56; 97-561S, 97-562S, 97-563S, 97-564S, 97-565S, 97-566S, 97-567S, 97-568S, 97-569S, Chassis 97-56S	Schematic, voltage, socket	10-37		
	Alignment, tuner data	10-38		
	Alignment, trimmers	10-39		
	Parts	10-40		
97-571, 97-572, 97-573, 97-574, 97-575, 97-576, 97-577, 97-578, 97-579, Chassis 97-57	Schematic, voltage, socket, changes	10-41		
	Tuner data	10-38		
	Alignment, trimmers, parts, antenna notes	10-42		
98-511, 98-512, 98-513, 98-514, 98-515, 98-516, 98-517, 98-518, 98-519, Chassis 98-51	Schematic, trimmers, alignment	10-9		
	Voltage, socket, tuner, drive cord data	10-10		
98-531, 98-532, 98-533, 98-534, 98-535, 98-536, 98-537, 98-538, 98-539, Chassis 98-53	Schematic, voltage, socket, tuner switch, coils	10-11		
	Alignment, trimmers	10-12		
	Tuner data, parts	10-13		
98-611, 98-612, 98-613, 98-614, 98-615, 98-616, 98-617, 98-618, 98-619, Chassis 98-61	Schematic, socket, voltage, coils	10-15, 16		
	Alignment, trimmers, tuner	10-17		
98-621, 98-622, 98-623, 98-624, 98-625, 98-626, 98-627, 98-628, 98-629, Chassis 98-62	Schematic, voltage, socket, tuner switch, coils	10-19		
	Tuner data	10-17		
	Alignment, trimmers, parts	10-20		

STEWART-WARNER CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
98-641, 98-642, 98-643, 98-644, 98-645, 98-646, 98-647, 98-648, 98-649, Chassis 98-64	Schematic, voltage, socket, coils, notes	10-21		
	Alignment, trimmers, phono. data, tuner	10-22		
98-711, 98-712, 98-713, 98-714, 98-715, 98-716, 98-717, 98-718, 98-719, Chassis 98-71	Schematic, voltage, coils, tuner switch, notes	10-25		
	Alignment, trimmers	10-26		
	Tuner and drive cord data, parts	10-27		
98-811, 98-812, 98-813, 98-814, 98-815, 98-816, 98-817, 98-818, 98-819, Chassis 98-81	Schematic, voltage, socket, tuner switch, coils	10-29		
	Tuner and drive cord data	10-28		
	Alignment, trimmers, parts	10-30		
98-821, 98-822, 98-823, 98-824, 98-825, 98-826, 98-827, 98-828, 98-829, Chassis 98-82	Schematic, voltage, socket, tuner switch	10-31, 32		
	Alignment, trimmers, antenna data	10-33		
	Tuner and phono. data	10-34		
98-1111, 98-1112, 98-1113, 98-1114, 98-1115, 98-1116, 98-1117, 98-1118, 98-1119, Chassis 98-111	Schematic, voltage	10-5, 6		
	Tuner and drive cord data, notes, parts	10-7		
	Alignment, trimmers, coils	10-8		
R-100-A, B, E AC	Schematic	1-10	*588-B	2338
	Chassis wiring, voltage	1-10	*588-B	2338
R-100-A	Continuity tests	1-11	*588-C	2339
R-100-C DC	Schematic, socket, voltage	1-12	*588-D	2340
R-101-A, R-101-B	Schematic, socket, voltage	2-1	588-F	2341
R-101, R-102	Chassis layout, servicing notes	2-2	588-H	2342
	Servicing notes, concluded	2-3	588-I	2343
102-D (7 Tubes)	Schematic	10-3		
102-D (8 Tubes)	Schematic	10-4		
R-102-A, B, E (1st type)	Schematic, socket, voltage	2-4	588-G	2344
R-102-A, B, E (Revised)	Schematic, socket, voltage	2-5	588-I-1	2345
R-104-A, B, E	Schematic, socket, voltage	3-1		2347
104 Chassis	Service data, parts list	3-2		2348
105 Series	Schematic, socket, voltage, parts list	3-3		2349
	Service data, part 1	3-4		2350
	Service data, part 2	3-5		2351
R-106	Schematic, voltage, parts list, socket	4-1		
	Alignment	4-2		
R-108, 108-X (10 to 20 incl.)	Schematic, socket, voltage, parts list	3-6		2352
R-109 Chassis	See model 1090			
R-110	Schematic, voltage, parts list, socket	4-3		
	Alignment	4-4		
R-111, R-115	Schematic, voltage, socket, parts list	4-5		
	Alignment	4-6		
R-112 Chassis	Schematic, voltage, socket	4-7		
	Alignment, notes	4-8		
R-113, R-114	Schematic, voltage	4-9		
R-116	Schematic, voltage, socket, parts list	4-10		
	Alignment	4-11		
R-117 Chassis	See model 1171			
R-118 Chassis	See model 1181			
R-119	Schematic, voltage, socket, parts list	4-12		
	Alignment	4-13		
R-120 (1201, 1209)	Schematic, socket, voltage	4-14		
	Alignment	4-15		
	Alignment	4-16		
R-123, R-123A Chassis	See model 1231			
R-125 Series	See model 1251			
R-126 Series	See model 1261			

MODEL	STEWART-WARNER CORP.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
1231, 1232, 1233, 1234, 1235, 1236, 1237, 1238, 1239. Chassis R-123, R-123A	Schematic, socket, voltage, parts	6-1		
1251, 1252, 1253, 1254, 1255, 1256, 1257, 1258, 1259 Chassis R-125 Series, Chassis R-125A and 125X	Circuit data, alignment, trimmers, parts	6-2		
	Schematic, parts list, circuit changes	5-5		
1251, 1252, 1253, 1254, 1255, 1256, 1257, 1258, 1259, Chassis R-125, Late	Alignment data, part 1	5-6		
	Alignment data, part 2, trimmer locations	5-7		
	Alignment data, part 3	5-8		
	Schematic, socket, voltage, parts	6-3		
1261, 1262, 1263, 1264, 1265, 1266, 1267, 1268, 1269. Chassis R-126 Series, Chassis R-126A, R-126P, R-126X	Alignment, trimmers	6-4		
	Schematic, socket, changes, parts	5-9		
1261, 1262, 1263, 1264, 1265, 1266, 1267, 1268, 1269. Chassis R-126 Late	Alignment data, part 1	5-10		
	Alignment data, part 2	5-11		
	Alignment data, part 3	5-12		
	Alignment data, part 4	5-13		
	Schematic, socket, voltage, parts	6-5		
1271, 1272, 1273, 1274, 1275, 1276, 1277, 1278, 1279. Chassis R-127	Circuit data, trimmers, alignment	6-6		
	Alignment part 2, parts list	6-7		
	Schematic, socket, voltage, parts	6-8		
1271, 1272, 1273, 1274, 1275, 1276, 1277, 1278, 1279. Chassis R-127 Series, Chassis R-127-X	Circuit data, trimmers, alignment	6-9		
	Alignment part 2, parts	6-10		
	Schematic, socket, circuit changes, parts	5-15		
1281D, 1282D, 1283D, 1284D, 1285D, 1286D, 1287D, 1288D, 1289D. Chassis R-128D	Alignment data, part 1	5-14		
	Alignment data, part 2	5-16		
	Alignment data, part 3	5-17		
	Alignment data, part 4	5-18		
	Schematic, socket, parts	7-1		
1301, 1302, 1303, 1304, 1305, 1306, 1307, 1308, 1309. Chassis R-130	Trimmers, alignment	7-2		
	Schematic, voltage, socket, parts	6-12		
1311, 1312, 1313, 1314, 1315, 1316, 1317, 1318, 1319. Chassis R-131	Alignment, trimmers, parts	8-6		
	Schematic, voltage, socket, parts	6-13		
Firestone R-1322. Chassis R-132	Circuit data, parts, alignment	6-14		
	Schematic, socket, voltage, parts	6-15		
Firestone R-1332. Chassis R-133	Schematic, socket, voltage, parts	6-16		
	Alignment	Changes 10-6		
1341, 1342, 1343, 1344, 1345, 1346, 1347, 1348, 1349. Chassis R-134 (Temporary)	Schematic, voltage, socket, trimmers, parts	6-17		
1341, 1342, 1343, 1344, 1345, 1346, 1347, 1348, 1349, Chassis R-134 (Final)	Final schematic note, trimmers, alignment	7-8		
1361, 1362, 1363, 1364, 1365, 1366, 1367, 1368, 1369. Chassis R-136 (Temporary)	Schematic, socket, trimmers parts	6-18		

MODEL	STEWART-WARNER CORP.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
1361, 1362, 1363, 1364, 1365, 1366, 1367, 1368, 1369, Chassis R-136 (Final)	Final schematic note, alignment, changes	7-4		
1361, 1362, 1363, 1364, 1365, 1366, 1367, 1368, 1369, Chassis R-136-P, R-136X	Phonograph circuits	7-4		
1371, 1372, 1373, 1374, 1375, 1376, 1377, 1378, 1379. Chassis R-137 (Temporary)	Schematic, socket, parts, trimmers	6-19		
1371, 1372, 1373, 1374, 1375, 1376, 1377, 1378, 1379, Chassis R-137 (Final)	Final schematic note, alignment	7-5		
1371, 1372, 1373, 1374, 1375, 1376, 1377, 1378, 1379, Chassis R-137P, R-137X	Phonograph circuits	7-5		
1381, 1382, 1383, 1384, 1385, 1386, 1387, 1388, 1389. Chassis R-138 (Temporary)	Schematic, socket, parts, trimmers	6-20		
1381. 1382, 1383, 1384, 1385, 1386, 1387, 1388, 1389, Chassis R-138 (Final)	Final schematic note, alignment	7-6		
1381, 1382, 1383, 1384, 1385, 1386, 1387, 1388, 1389, Chassis R-138P, R-138X	Phonograph circuits	7-6		
1391D, 1392D, 1393D, 1394D, 1395D, 1396D, 1397D, 1398D, 1399D. Chassis R-139D	Schematic, socket, data, alignment, parts	7-7		
1401, 1402, 1403, 1404, 1405, 1406, 1407, 1408, 1409, Chassis R-140	Schematic, voltage, socket, trimmers	7-9		
1421, 1422, 1423, 1424, 1425, 1426, 1427, 1428, 1429, Chassis R-142A, R-142AS	Alignment, parts	7-10		
	Schematic, voltage, parts	7-11		
R-1431 Firestone Auto	Circuit data, alignment, trimmers, parts	7-12		
	Schematic, voltage, parts	8-15		
	Alignment, parts	8-16		
1441, 1442, 1443, 1444, 1445, 1446, 1447, 1448, 1449, Chassis R-144AS	Schematic, voltage, parts	7-13		
1451, 1452, 1453, 1454, 1455, 1456, 1457, 1458, 1459, Chassis R-145	Trimmers, alignment, circuit data, parts	7-14		
	Schematic, voltage, parts	7-15		
1451, 1452, 1453, 1454, 1455, 1456, 1457, 1458, 1459, Chassis R-145X	Socket, trimmers, alignment, parts	7-16		
	Phonograph circuit	7-15		
1461, 1462, 1463, 1464, 1465, 1466, 1467, 1468, 1469, Chassis R-146	Schematic, voltage, parts	7-17		
1471, 1472, 1473, 1474, 1475, 1476, 1477, 1478, 1479, Chassis R-147	Trimmers, alignment, parts	7-18		
	Schematic, socket, trimmers, voltage, change	8-1		
1481, 1482, 1483, 1484, 1485, 1486, 1487, 1488, 1489, Chassis R-148	Alignment, parts	8-2		
	Hum elimination	10-14		
	Schematic, socket, voltage, trimmers, change	8-3, 8-4		
1491, 1492, 1493, 1494, 1495, 1496, 1497, 1498, 1499, Chassis R-149	Alignment, parts	8-5		
	Hum elimination	10-14		
	Schematic, voltage, parts	7-19, 7-20		
	Socket, trimmers, alignment, notes, parts	7-21. 7-22		

STROMBERG-CARLSON TEL. MFG. CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
638 DC	Schematic, socket	1-7	*603	2367
641, 642, 652, 654	Schematic, socket, voltage	1-8	*605	2369
641	Resistance data	2-21	Front	2370
642	Chassis wiring	1-9	*607	2371
645 DC	Schematic	3-1		
	Chassis wiring	2-22		2374
652, 654	Schematic, socket, voltage	1-8	*605	2369
	Chassis wiring	1-10	*608	2372
734	Schematic, socket	1-11	*609	2375
744	Schematic, socket	1-11	*609	2375
646 AC	Schematic, socket, voltage	1-12	*612	2376
	Internal wiring	1-13	*618	2378
	Chassis, voltage, test data	2-23		2377

STUDEBAKER

See PHILCO RADIO AND TELEVISION CORP.

STUDEBAKER LABORATORIES

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
81	Schematic	Misc. 8-8		2762

SUPERTONE

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
A-81	Schematic	Misc. 5-20		

SUPERTONE PRODUCTS CO., INC.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Superba	Schematic, color code	Misc. 5-21		

SUPREME INSTRUMENTS CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
"Master" Diagnometer	Schematic	4-1		
Output Meter	Schematic	1-2	*773	2422
AAA-1 (8-14-31) Diagnometer	Schematic	2-2	778-B	2428
19 Revised Tube Checker	Schematic	1-1	*771	2417
33 Ohmmeter	Schematic	3-2		2418
35	Schematic	5-1		
40 Tube Checker	Schematic	3-1		2419
44 Volt-Ohmmeter	Schematic	3-2		2418
55	Schematic	5-2		
56 Analyzer (Weston Metered)	Schematic	2-3		2421
60 Oscillator	Schematic	3-2		2418
61	Schematic	6-1		
62 Tube Tester	Schematic	3-2		
70 Oscillator	Schematic	1-6	*772	2426
75 AC-DC Volt-Ohm-Mil Meter	Schematic	3-2		2418
85	Schematic	5-3		
85-PL	Schematic	6-1		
89-C Tube Tester	Schematic	7-1		
89-D Tube Tester	Schematic	7-2		
90 Analyzer	Schematic	1-2	*778	2422
90 Analyzer (Weston Metered 6-J)	Schematic	2-3		2421
91	Schematic	5-4		
99-A Analyzer	Schematic	1-3	*774	2423
111	Schematic	5-2		
145	Schematic	5-5		
180	Schematic	6-2		
189 Signal Generator	Schematic	7-3		
222	Schematic	5-6		
"333" Free Reference Point Tester	Schematic	4-2		
333 Revised	Schematic	5-7		
333 DeLuxe	Schematic	6-2		
339-D DeLuxe Analyzer	Schematic	7-4		
400-A Diagnometer	Schematic	1-4	*775	2424
400-B (No. 4 Series) Diagnometer	Schematic	2-1	778-A	2425
444	Schematic	5-8		

SUPREME RADIO

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Supreme 1931	Schematic	Misc. 4-12		

SYNCHROPHASE

See A. H. GREBE AND CO.

L. TATRO PRODUCTS CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
A, B	Socket, voltage, resistance data	4-1		
	Schematic	4-2		
EN6-4	Schematic, socket, alignment, parts	7-1		
IN-25	Schematic, socket, alignment, parts	7-2		
EQ-39, FQ-39	Schematic	10-1		
	Alignment, socket, trimmers	10-3		
HQ-39	Schematic	10-2		
	Alignment, socket, trimmers	10-3		
NH-44, K-54, M-54	Schematic	4-2		
AK-54, AM-54 (Mayor and Senator)	Schematic	5-1		
P-54 (Recorder)	Schematic, voltage	5-4		
L-54, N-54	Schematic	4-3		
NO-65, OO-65	Schematic, socket, trimmers, alignment	10-4		
SP-67, TP-67	Schematic	10-5		
	Alignment, socket, trimmers	10-3		
AQ-69, BQ-69	Schematic	10-6		
	Alignment, socket, trimmers	10-3		
CQ-69, DQ-69	Schematic, data	9-1		
	Alignment, socket, voltage	9-2		
L-74, N-74 (Lieut. Governor and Governor)	Schematic	5-2		
084	Schematic	4-3		
094 (President)	Schematic, voltage	5-3		
H-465, I-465	Schematic, voltage, parts, data	6-1		
A-525, B-525	Schematic, voltage, parts, data	6-2		
L-525	Schematic, voltage, parts, data	6-3		
C-625, D-625	Schematic, voltage, parts, data	6-4		
J-665, K-665	Schematic, voltage, parts, data	6-5		
F-725	Schematic, voltage, parts, data	6-6		
F-913	Schematic, notes	4-4		
M-4616	Schemaitc, voltage, alignment	8-1		
O-4626, P-4626	Schematic, parts	7-3		
	Alignment	7-6		
U-5226, V-5226	Schematic, voltage	8-2		
Q-5636, R-5636, S-5636	Schematic, parts	7-4		
	Alignment	7-6		
T-6216	Schematic, voltage	8-2		
W-6236, X-6236, Y-6236	Schematic, parts	7-5		
	Alignment	7-6		

TEMPLE CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
8-60, 8-80, 8-90	Schematic, socket, voltage	1-1	*619	2431
8-61, 8-81, 8-91	Schematic, socket, voltage	1-2	*618	2432

THORDARSON ELEC. MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Eliminator	Schematic	1-3		2435
R-171	Schematic, chassis, wiring	1-1	*719	2433
PP-171	Schematic, chassis, wiring	1-1	*719	2433
210 Power Amplifier	Schematic, chassis, wiring	1-2	*721	2434
R-210	Schematic, chassis, wiring	1-3	*720	2435
213	Schematic	1-3		2435
250 Power Amplifier	Schematic, chassis wiring	1-4	*722	2436

TIFFANY TONE

See HERBERT H. HORN

TODD ELECTRIC CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
"A" Unit	Schematic	Misc. 1-18	*758	2768

TRANSFORMER CORP. OF AMERICA

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
TC1, TC2	Schematic, data	9-1		
	Alignment, voltage, notes, parts	9-2		
TC-6	Schematic, socket	8-1		
	Alignment	8-3		
C-10	Schematic, voltage	7-1		

TRANSFORMER CORP. OF AMERICA—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
C-16	Schematic, voltage	7-2		
C-17	Schematic, voltage	7-2		
TC-20, TC-21	Schematic, voltage	5-7		
	Alignment data, parts list	5-8		
C-21	Schematic, voltage	7-3		
TC22, TC23	Schematic	9-3		
25-60	See AC 60			
25-61	See AC 61			
25-94	See AC 94			
25-160	See model AC 160			
25-220	See model AC 220			
25-260	See model 260			
25-280	See model AC 280			
C-27	Schematic, voltage	7-3		
TC-28, TC-29	Schematic, socket, trimmers	8-2		
	Alignment	8-3		
TC-30	Schematic, parts list	5-6		
TC-31	Schematic, alignment	10-1		
C-33	Schematic, voltage	7-4		
TC-35A, TC-35LW Early	Schematic	10-2		
TC-35LW Late	Schematic	10-3		
TC-36	Schematic	10-4		
TC36A, TC36LW	Schematic	9-4		
TC37	Schematic	9-5		
TC-37A, TC-37LW	Schematic	10-5		
TC38	Schematic	9-6		
TC-39	Schematic	8-7		
	Voltage, alignment, parts	8-8		
TC39A, TC39LW	Schematic	9-7		
40	Schematic, socket, voltage, chassis	1-1	*622-G	2437
	Chassis data	1-2	*622-H	2438
TC-40	Schematic	5-9		
TC-42, TC-43, TC-44	Schematic, socket	8-5		
	Alignment	8-4		
TC-50	Schematic, voltage, alignment	5-10		
51, 53, 55 AC	Schematic, socket, voltage	1-3	*621	2439
	Power pack chassis, receiver breakdown	1-4	*622	2440
TC-52	Schematic, parts list	5-9		
TC53A	Schematic	9-8		
AC 60, 25-60	Schematic, socket, voltage, data	1-5	*622-I	2441
	Chassis test data	1-6	*622-J	2442
TC-60	Schematic	5-11		
	Alignment, parts list	5-12		
AC 61, 25-61	Schematic, socket data	1-7	*622-A	2443
AC 61	Chassis layout	1-8	*622-B	2444
	Voltage data	1-9	*622-C	2445
TC-65	Schematic, socket	8-6		
	Voltage, alignment	8-4		
TC-66	Schematic	10-6		
AC 70	Schematic, voltage data	1-7	*622-A	2443
	Chassis layout	1-8	*622-B	2444
	Voltage data	1-9	*622-C	2445
TC-75, TC-76	Schematic	10-6		
AC 80, 81	Schematic, socket	1-10	*622-D	2446
	Chassis layout	1-11	*622-E	2447
	Voltage, breakdown analysis	1-12	*622-F	2448
AC 84, 85	Schematic, voltage	2-1	622-K	2449
	Chassis layout, speaker	2-2	622-K-1	2450
	Alignment data	2-3	622-K-3	2451
	Parts list	2-4		2452
AC 90, 90A, 91	Schematic, socket	1-10	*622-D	2446
	Chassis layouts	1-11	*622-E	2447
	Voltage breakdown analysis	1-12	*622-F	2448
AC 94, 95	Speaker	2-2	622-K-1	2450
	Alignment data	2-3	622-K-3	2451
AC 94, 25-94	Schematic, voltage	2-5	622-L	2453
	Chassis layouts, socket, test data	2-6	622-L-1	2454
AC 100 Series	Schematic, socket, voltage	2-7	622-M	2455
	Chassis layouts, speaker, test data	2-8	622-M-1	2456
	Trimmer notes	2-9	622-M-2	2457
	Parts list, test data	2-10	622-M-3	2458
100-AR	Schematic, voltage, parts list	5-1		
120-139	Schematic, chassis layout data	2-11		2459
AC 160, 25-160	Chassis layouts	3-1		2461
	Schematic, socket, voltage, data	3-2		2460

TRANSFORMER CORP. OF AMERICA—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
200 Series (SW Converter)	Chassis layouts, notes	3-3		2463
	Schematic, socket, voltage, notes	3-4		2462
AC 220, 25-220	Chassis layouts, socket, voltage	3-5		2465
	Resistance table, notes	3-5		2465
	Schematic, chassis layout, socket	3-6		2464
	Breakdown analysis, trimmer notes	3-7		2466
AC 240	Schematic, chassis layout, breakdown	2-12		2467
	Voltage, resistance, trimmer data	4-1		
241	Schematic, socket, alignment, point-to-point data	5-2		
AC-260, 25-260	Schematic, socket, chassis view	4-3		2469
	Voltage, chassis view, resistance data	4-2		2470
AC 280, 25-280	Chassis layout, voltage, breakdown	3-8		2472
	Schematic, socket, chassis layout	3-9		2471
AC-300	Schematic, voltage, resistance	4-4		2473
AC-320	Schematic, voltage, resistance, chassis	4-5		2474
AC-340	Schematic, voltage, chassis, resistance	4-6		2475
360	Schematic, point-to-point data, parts	5-3		
AC 420	Schematic	3-10		2476
422, 423	Schematic, voltage, parts list	4-7		
425	Schematic, voltage, parts list	4-8		
440	Schematic, voltage, parts list	4-9		
450	Schematic, voltage, parts list	4-10		
470, 472	Schematic, voltage, parts list	4-11		
480	Schematic, voltage, parts list	4-12		
490	Schematic, voltage, parts	5-4		
500	Schematic, battery data, parts	5-5		

TRANSITONE

See PHILCO RADIO & TELEVISION CORP.

TRAV-LER RADIO AND TELEVISION CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Air Chief	See model 42			
C, SG-DX	Schematic	1-2		2480
K	Schematic	1-2		2480
SG-DC	Schematic	3-2		2478
Trav-Lette	Schematic	1-2		2480
5-tube AC-DC Superhet	Schematic, alignment	10-1		
	Socket, trimmers	10-3		
5-tube Battery	Schematic, socket	8-2		
5-tube, 6-volt Battery	Schematic, socket	10-2		
6-tube Auto	Schematic	10-3		
	Voltage, socket, trimmers, alignment	10-12		
6-tube Battery or A-C	Schematic, socket, trimmers	10-4		
	Alignment, tuner	10-12		
6 Tube TRF	Schematic	3-1		2479
6, 7	Schematic, socket	1-1	*620	2477
6, 7 AC Power Pack	Schematic, data	1-1	*620	2477
6, 7 DC Power Pack	Schematic	1-1	*620	2477
S-8	Schematic	3-1		2479
8-tube Battery or A-C	Schematic, socket, trimmers	10-4		
	Alignment, tuner	10-12		
S-9	Schematic	3-2		2478
11-tube A-C Superhet	Schematic, alignment	10-1		
	Socket, trimmers	10-3		
41, 46R, 50-A, 442	Schematic, socket	6-1		
42, Air Chief	Schematic, socket	9-2		
46R	See model 41			
50-A	See model 41			
51, 511	Schematic, socket	6-1		
53	Schematic, socket	6-2		
54	Schematic, socket	6-2		
56	Schematic, socket	6-3		
60-A	Schematic, socket	6-3		
63-A	Schematic, socket	6-4		
76	Schematic, socket	6-4		

TRAV-LER RADIO AND TELEVISION CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
131	Schematic, socket, trimmers, parts	9-1		
163	See model 633			
173, 733	Schematic	7-2		
400	Schematic, socket	10-2		
415	Schematic, alignment	10-5		
	Socket, trimmers	10-6		
420A, 420S	Schematic, alignment	10-7		
	Socket, trimmers	10-8		
425	Schematic, alignment	10-5		
	Socket, trimmers	10-6		
	Tuner	10-12		
426	Schematic, alignment	10-5		
	Socket, trimmers	10-6		
	Tuner	10-12		
431, 431SW	Schematic, socket	9-2		
436M	Schematic	10-7		
	Socket, trimmers	10-8		
	Alignment, tuner	10-12		
437M	Schematic	10-7		
	Socket, trimmers	10-6		
	Alignment, tuner	10-12		
442	See model 41			
455L	Schematic, alignment	10-7		
	Socket, trimmers	10-8		
465M	Schematic	10-9		
	Socket, trimmers	10-2		
	Alignment, tuner	10-12		
466M	Schematic	10-9		
	Socket, trimmers	10-8		
	Alignment, tuner	10-12		
501	Schematic	10-10		
	Socket, trimmers	10-8		
A502	Schematic	10-9		
	Socket, trimmers	10-8		
511	See model 51			
512	Schematic	7-1		
521	Schematic, socket	8-1		
522	Schematic, socket	8-1		
525, 6-Volt DC	Schematic	7-1		
536M	Schematic	10-11		
	Socket, trimmers	10-6		
	Alignment	10-12		
539M	Schematic	10-11		
	Socket, trimmers	10-6		
	Alignment	10-12		
542	Schematic	7-2		
552B	Schematic, alignment	10-11		
	Socket, trimmers	10-6		
560	Schematic, alignment	10-5		
	Socket, trimmers	10-6		
622, 623	Schematic	7-3		
633, 634, 163	Schematic	7-3		
635M	Schematic, socket	8-2		
642	Schematic, notes	7-4		
645E	Schematic, socket, trimmers	10-10		
	Alignment	10-12		
733	See model 173			

TRIANGLE ELECTRIC COMPANY

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
6P, Imperial	Schematic, parts list	7-1		
	Alignment, notes, socket, trimmers	7-2		

TRIPLETT ELECTRICAL INSTRUMENT CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
1125	Schematic	4-1		
1150	Schematic	4-1		
1151 Oscillator	Schematic	5-1		
1166	Schematic	4-2		
1166A, 1220A	Schematic	7-1		
1200 Tester	Schematic	5-2		
1210, Above Serial 100,000	Schematic	Misc. 6-33		
1210, Below Serial 100,000	Schematic	Misc. 6-33		
1210A Tube Tester	Schematic	7-2		
1220A	See model 1166A			
1231 Signal Generator	Schematic	7-1		
1502 Tester	Schematic	7-3		
1503 Tester	Schematic	7-4		

TROPIC-AIRE

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
06-W	Schematic, voltage, socket	Misc. 5-22		

TROY RADIO MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
2A3 Amplifier	Schematic	7-1		
2A5 Amplifier	Schematic	7-1		
4-Tube TRF	Schematic	5-4		
4, 14, 40	Schematic, socket	6-1		
TR4, TR4OH	Schematic, socket	7-2		
5L5, 5U5, 15, 15-5	Schematic, socket	6-1		
42	Schematic, socket	5-1		
46	Schematic, socket	5-2		
51B5	Schematic, socket	7-3		
52	Schematic, socket	5-1		
TR53, TR53C, TR53CH	Schematic, socket	7-4		
54	Schematic	5-3		
	Socket layout	5-4		
55	Schematic, socket	8-1		
56	Schematic, socket	5-2		
57	Schematic, socket	8-1		
62BC, 62BU	Schematic, socket	6-2		
62C, 62PC, 62L, 62U	Schematic, socket	6-2		
67	Schematic, socket	8-2		
67SW	Schematic, socket	8-3		
TR68 Auto	Schematic, socket	7-2		
75, 75C, 75CH, 75PH AC	Schematic, socket	7-4		
75, 75C, 175 AC-DC	Schematic, socket	7-2		
75, 75B, 75C Batt.	Schematic, socket	7-3		
77, 77C	Schematic, socket	7-3		
79	Schematic, socket	8-3		
79 (1938)	Schematic, socket	9-1		
84	Schematic	5-3		
	Socket layout	5-4		
84C, 84PC, 84U	Schematic, socket	6-3		
TR-86	Schematic, socket	6-3		
95	Schematic, socket	8-2		
100	Schematic, socket	8-4		
151-5	Schematic, socket	6-4		
153C, TR153 AC-DC	Schematic, socket	7-4		
162C, 162U	Schematic, socket	6-4		
170	Schematic, socket	9-2		
175 AC-DC	See model 75 AC-DC			
179	Schematic, socket	8-4		
825	Schematic, socket	9-1		

TRUETONE

See WESTERN AUTO SUPPLY CO.

TRUEVALUE

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
6-U	Schematic	Misc. 5-28		

TURNER CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Crystal Microphone Amplifier	Schematic	5-2		
G	Schematic	Misc. 7-1		
PDQ, B-5-Series A	Schematic, cable connections, data	8-1		
3S5, 3S9 Automatic Central	Schematic, connections, installation data	8-3		
	Station cable and switch connections, color code	8-4		
B-5-Series A	See model PDQ			
M-8	Schematic	Misc. 6-34		
PR-15, PR-19	Schematic, stations connections	8-2		
MC-16	Schematic	5-1		
M-16	Schematic	Misc. 6-34		
FS-1000	Schematic	5-1		
5780	Schematic	5-2		

TYRMAN ELECTRIC CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Shield Grid-7	Schematic	Misc. 1-20	*799	2764
Tyrman 10	Schematic	Misc. 1-20	*799	2764
Imperial 80	Schematic	Misc. 1-20	*799	2764

ULTRAMAR MFG. CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
306, 316	Schematic, socket, trimmers, alignment	10-4		
307, 317	Schematic, socket, trimmers, alignment	9-1		
309, 319	Schematic, socket, trimmers, alignment	9-2		
456	Schematic	10-1		
	Sockets, trimmers	10-2		
	Alignment, tuner	10-4		
465	Schematic, alignment	10-1		
	Socket, trimmers	10-2		
	Tuner data	10-4		
477	Schematic	10-1		
	Socket, trimmers	10-2		
	Alignment, tuner	10-4		
487	Schematic, socket, trimmers	10-3		
	Alignment	10-4		
801, 802	Schematic, voltage, parts	8-1		
	Socket, trimmers, alignment	8-2		
856	Schematic	10-1		
	Socket, trimmers	10-2		
	Alignment, tuner	10-4		
877	Schematic	10-3		
	Socket, trimmers	10-2		
	Alignment, tuner	10-4		
889	Schematic	10-3		
	Socket, trimmers	10-2		
	Alignment, tuner	10-4		

UNITED AIR CLEANERS

See SENTINEL RADIO CORP.

UNITED AMERICAN BOSCH CORP.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
BAN Power Units	Schematic, values	1-1	*58	2481
BDN Power Units	Schematic, values	1-1	*58	2481
Amborada	See model 16 & 27			
Cruisers	See model 35			
Essex	See model 4 & 10			
Police Auto	See model 108			
Police Motorcycle	See model 119			
MU-6 (Edition 1 Mag-Motor)	Schematic, data	8-2		2482
	Applications	8-8		2483
04	Schematic, voltage, parts	6-8		
4 Essex	Schematic, voltage	3-5		2489
05	Schematic, voltage, parts	6-20		
5 AC	Schematic, socket, voltage	1-2	*52-A	2486
	Parts, values	1-3	*52-B	2487
5-A	See model 205			
7 DC	Schematic	8-4		2488
7-C DC	Schematic	8-4		2488
9-20	See model 100			
10 Essex	Schematic, voltage, data	3-6		2490
	Data	Changes 9-6		
16 Amborada	Schematic, socket, voltage	1-4	*28	2484
20-J, 20-K, 20-L	Schematic, socket, voltage	2-1	52-C	2491
	Chassis, values, data	2-2	52-D	2492
27 Amborada	Schematic, socket, voltage	1-4	*28	2484
28 AC (2 Types)	Schematic, socket, voltage	1-5	*35	2493
28 AC Power Pack	Chassis, parts, values	1-6	*38	2494
29 AC	Schematic, voltage	1-5	*35	2493
29 AC, 825 Power Pack	Schematic, chassis, voltage	1-7	*36	2495
31, 32 AC	Schematic, socket, chassis data	2-3	52-E	2497
	Voltage, parts list	2-4	52-F	2498
35 Cruisers	Schematic, socket, voltage	1-4	*29	2484
36, 37 AC	Schematic, socket, data	3-7		2499
	Alignment data, voltage, values	3-8		2500
40, 41 AC	Schematic, chassis	4-1		
	Electrical values, voltage	4-2		
45-A, 45-C	Schematic, color code	5-1		
	Alignment data	5-2		
	Test data, parts list	5-3		
	Chassis view, data	5-4		
	Voltage, resistance chart	5-5		
46	Schematic, socket, voltage	1-4	*28	2484
46 AC, 126, 146, 166, 176	Schematic, socket, voltage	1-8	*34	2496
48, 49 AC	Schematic, socket, voltage data	1-9	*39	2503
	Chassis wiring views	1-10	*40, 41	2504

UNITED AMERICAN BOSCH CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
54 DC	Schematic, socket, voltage data	1-11	*42	2505
	Chassis wiring views	1-12	*43, 44	2506
56 Bat.	Schematic, socket, parts list	1-13	*44-A	2507
	Chassis wiring views	1-14	*44-B	2508
57, 87	Schematic, socket, voltage	1-15	*29	2485
58 AC	Schematic, socket, parts list	1-17	*46	2509
60, 60-B, 60-E, 61	Schematic, socket, parts list	1-16	*47	2510
62 DC	Voltage, parts list	1-18	*49	2512
	Schematic, socket	1-19	*45	2511
63 DC	Voltage, parts list	1-20	*49, 51	2514
	Schematic	1-21	*45	2513
66, 76, 76-L	Schematic, socket, voltage	1-15	*30	2485
66 AC, 96, 116, 136 AC	Schematic, socket, voltage	1-15	*31, 2, 3	2485
73, 74, 133, 135	Parts list, voltage, data	1-22	*800-B, C	2516
	Schematic, socket, chassis wiring	1-23	*800-A, C	2515
79-C	Chassis view	5-6		
	Schematic, notes	5-7		
	Voltage, resistance chart	5-8		
	Alignment data, socket	5-9		
	Parts list	5-10		
80	Schematic, socket, voltage, parts list	1-24	*52	2517
	Installation notes	2-5		2518
87	See model 57			
91, 92	Voltage, parts list	2-6		2520
	Schematic, socket, chassis, data	2-7		2519
96 AC	See model 66 AC			
96 DC, 156 DC	Schematic, socket, voltage	1-8	*80	2496
100 (Adv. 9-20) Auto	Installation data	2-8	52-2	2522
	Schematic, socket, voltage	2-9	52-1	2521
107 AC	Schematic, socket, voltage	1-15	*32	2485
108 Police Auto	Adjustment, parts list	2-10	52-4	2524
	Schematic, assembly wiring	2-11	52-3	2523
116	See model 66 AC			
119, 129, Police Motorcycle Radio	Schematic, voltage	5-11		
	Installation data	5-12		
	Tuning notes, suppression notes	5-13		
126	See model 46 AC			
133, 135	See model 73			
136	See model 66 AC			
139, 149, 169	Schematic, voltage	5-15		
	Testing data	5-16		
	Alignment data	5-17		
	Tuning data	5-18		
	Resistance data	5-19		
	Magmotor notes	5-20		
	Installation data	5-14		
140-A	Schematic, values	4-3		
146	See model 46 AC			
150, Type 1	Schematic, socket	4-4		
150, Type 2	Schematic, socket	4-5		
156 DC	See model 96			
160	Schematic	4-6		
166, 176	See model 46 AC			
169	See model 139			
200, 201 AC	Schematic, socket	3-9		2525
	Voltage, chassis layout	3-10		2526
205, 205-A, 206, 5A	Schematic, socket, parts list	2-13		2527
	Voltage, chassis, socket, data	2-12		2528
207A, Ed. 5	Schematic, changes	7-39, 7-40		
224	Schematic	2-14		2529
	Socket, trimmers, voltage, alignment	9-1		
226	Schematic	2-15		2530
	Socket, trimmers, voltage, alignment	9-1		
236, 237, 239 AC	Schematic, socket, voltage, data	3-11		2531
239	Data	Changes 7-13		
242, 243 AC	Schematic, socket, voltage	3-12		2532
	Socket, alignment	7-1		
250, 251	Schematic, voltage, socket, parts	4-7		
	Socket, alignment	7-1		
260, 261	Schematic, voltage, socket, parts	4-8		
	Alignment data	5-21		

UNITED AMERICAN BOSCH CORP.—(Cont.) MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
260, 261	Alignment data, socket, trimmers	5-22		
305 Ed. 1, 305-A	Schematic, resistor color code	3-13		2535
	Voltage, alignment, data	3-14		2536
	Socket, chassis, trimmers	7-2		
305 Ed. 2, 405	Schematic, parts, voltage	7-3		
	Socket, trimmers, alignment	7-4		
306	Schematic, voltage, resistance	8-1, 8-2		
	Circuit data, socket, trimmers, chassis	8-3		
	Alignment, parts	8-4		
307	Schematic	5-23		
	Socket, trimmers, voltage, alignment	7-7		
310, 310A	Schematic	5-25		
	Socket, voltage, parts	5-26		
	Socket, trimmers, alignment	7-7		
312, 318 (AC)	Schematic, socket, voltage	3-1		2537
	Adjustments	2-16		2538
350	Schematic, voltage, socket, parts	4-9		
	Socket, trimmers, voltage, alignment	7-22		
352	Schematic, socket, voltage	5-27		
	Alignment, parts	5-28		
355	Schematic, voltage, parts list	4-10		
	Socket, trimmers, voltage, alignment	7-22		
357	Schematic	5-24		
	Socket, trimmers, voltage, alignment	7-22		
360	Alignment data, part 1	5-29		
	Alignment data, part 2	5-30		
	Schematic, socket, voltage, parts	4-11		
360 Late, 361, 364	Schematic, data	7-5		
	Socket, trimmers, alignment, parts, voltage	7-6		
370	Schematic, voltage, socket, parts	4-12		
	Alignment data, part 1	5-31		
	Alignment data, part 2	5-32		
376	Schematic	5-33		
376BT, 376F, 376S	Schematic, parts	6-1		
	Socket, trimmers, alignment, voltage	6-2		
	Data	Changes 10-6		
385	Schematic, voltage, parts	6-3		
	Socket, trimmers, alignment	6-4		
386	Schematic, voltage	6-5		
	Socket, trimmers, alignment	6-6		
	Speaker data, trimmers, parts	6-7		
402, Ed. 1, 2, 3	Schematic, socket, trimmers	6-9		
	Alignment, voltage, parts, data	6-10		
402	Schematic	5-34		
405	See model 305, Ed. 2			
420	Schematic	5-35		
420, 421	Schematic, parts, socket, trimmers	6-11		
	Trimmers, voltage, alignment, parts	6-12		
430, 430J, 430T 431, 431J, 431T 434, 434J, 434T	Schematic, resistors	6-13		
	Trimmers, socket, parts, alignment	6-14		
440C, 440T, 441C, 441T, 444C, 444T	Schematic, voltage	6-15		
	Socket, trimmers, parts, alignment	6-16		
450L, 450H, 451L, 451H, 454L, 454H	Schematic, voltage	6-17		
	Socket, trimmers, resistance data	6-18		
	Alignment, parts	6-19		
460	Schematic	5-36		
460 A, B, R; 461 A, B, R; 464 A, B, R Ed. 1	Circuit data, schematic	6-21		

UNITED AMERICAN BOSCH CORP.—(Cont.) MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
460 A, B, R; 461 A, B, R; 464 A, B, R Ed. 1	Socket, trimmers, alignment, voltage, parts	6-22		
460 A, B, R, Ed. 2	Schematic, resistances	6-23		
	Socket, trimmers, alignment, parts	6-24		
462A, 462Y	Schematic, voltage	7-8		
	Socket, trimmers, chassis	7-9		
	Alignment, parts	7-10		
470 G, U; 471 G, U; 474 G, U	Schematic, voltage, resistor data	6-27		
480, Ed. 1; 480, Ed. 2; 481, 484	Schematic	6-25, 6-26		
	Socket, trimmers, alignment, parts	6-28		
	Chassis wiring	7-2		
480, Ed. 3	Schematic	5-45		
	Socket, chassis, trimmers	7-2		
500	Schematic, socket	5-37		
	Voltage, alignment data	5-38		
501, 502, AC-DC	Schematic, socket	5-39		
	Voltage, parts	5-40		
	Socket, trimmers, alignment	7-2		
502	Schematic, socket	5-41		
	Voltage, parts	5-42		
	Socket, trimmers, alignment	7-2		
503	Schematic, socket	5-43		
	Voltage, notes	5-44		
505	Schematic, voltage	6-29		
	Socket, trimmers, alignment, parts	6-30		
510, 510E	Schematic, voltage, socket	6-31		
	Trimmers, alignment	6-32		
515	Schematic, voltage	8-5		
	Socket, trimmers, chassis, alignment, notes, parts	8-6		
524A, Ed. 1, 2, 2D, 2G	Service data, parts, alignment	6-34		
	Schematic, voltage, socket, trimmers, resistance data	6-33		
536	Schematic, parts list	7-11		
	Socket, trimmers, chassis, alignment, vibrator data, notes	7-12		
565K, 565W	Schematic, voltage, parts list	7-13		
	Socket, trimmers, chassis, alignment	7-14		
575F, 575Q	Schematic, voltage, coil data	7-15, 7-16		
	Socket, trimmers, alignment	7-17		
	Parts list	7-18		
585 (Preliminary)	Schematic, voltage, resistor data	6-35, 6-36		
585Y, 585Z	Schematic, voltage, resistor data	6-37, 6-38		
	Centr-O-Matic data, alignment, trimmers	6-39		
	Socket, trimmers, parts list	6-40		
595M, 595P	Schematic, voltage, resistor data	6-41, 6-42		
	Centr-O-Matic data, socket trimmers, alignment	6-43		
	Trimmers, parts	6-44		
600 (Preliminary)	Schematic, voltage, parts	7-19		
600 (Final)	Socket, trimmers, alignment, chassis, notes	9-2		
601 (Preliminary)	Schematic, voltage, parts	7-20		
	Socket, trimmers, chassis, alignment, change	Changes 8-6		
602 (Preliminary)	Schematic, voltage, parts	7-21		
602C, 602T (Final)	Socket, trimmers, chassis, alignment, notes	9-3		
604 (Preliminary) (Final)	Schematic, voltage	7-23		
	Socket, trimmers, chassis, parts, alignment	7-24		
604B	Schematic, voltage	8-7		
	Socket, trimmers, chassis, alignment, parts	8-8		
605, 605C (Preliminary)	Schematic, voltage	7-25		
	Socket, trimmers, parts list	7-26		

MODEL	UNITED MOTORS SERVICE—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
R-6015 Delco	Schematic, chassis, notes	9-55		
	Socket, trimmers, voltage, alignment	9-56		
364441 Chevrolet	Schematic, voltage, service, notes	6-21		
	Alignment, parts	6-20		
	Socket, trimmers, chassis	6-22		
393884 Oldsmobile	Alignment, circuit notes, parts	6-26		
	Parts layouts, changes	6-25		
393884 Oldsmobile, Below Serial 1748809	Schematic, voltage	6-23		
393884 Oldsmobile, Above Serial 1748809	Schematic, changes	6-24		
393885 Olds, 544246 Buick-Pontiac, 1291344 Buick	Schematic, voltage, note	8-15		
	Socket, trimmers, alignment, changes	8-16		
405045 Oldsmobile 544289 Late	Schematic	7-42		
	Socket, trimmers, chassis	7-43		
	Alignment, voltage	7-44		
405046 Olds, Above Serial #1791092 544267, Above Serial #1750000, 544289 Pontiac, 601586 Chevrolet	Schematic, voltage	8-23		
	Socket, trimmers, chassis, alignment, changes	8-24		
405057, 405062, Olds Early and Late 544290, 544291, 544297, 544298 Pontiac	Schematics	8-25		
	Socket, trimmers, voltage, chassis, alignment	8-26		
405063, Early, Late Oldsmobile	Schematic, socket, chassis, trimmers, voltage, changes	9-57		
	Alignment, parts	9-58		
544245 Buick-Pontiac 1291345 Buick	Parts layouts, changes	6-25		
	Alignment, circuit notes, parts	6-26		
544245 Buick-Pontiac, Below Serial 1748809 1291345 Buick	Schematic, voltage	6-23		
544245 Buick-Pontiac, Above Serial 1748809 1291345 Buick	Schematic, changes	6-24		
544246 Buick-Pontiac	See model 393885 Olds			
544267 (Above Serial #1750000	See model 405046 Olds			
544268 Pontiac	Schematic	7-42		
	Socket, trimmers, chassis	7-43		
	Alignment, voltage	7-44		
544289 Pontiac (Early)	See model 405046 Olds			
544289 Pontiac (Late)	See model 405045			
544290, 544291 Pontiac Serials with prefix "A"	Schematic, socket, chassis, trimmers, voltage	9-59		
	Alignment, data, parts	9-60		
544290, 544291 Pontiac Serials with prefix "O"	See model 405057 Olds			
544297, 544298 Pontiac	See model 405057 Olds			
600153 Chevrolet	Schematic	7-45		
	Alignment, voltage	7-46		
600249	Same as 4038			
600565, Chevrolet	Schematic	9-61		
	Voltage, alignment, trimmers	9-62		
600566 Chevrolet	Schematic, voltage	6-27		
	Alignment, notes	6-28		
601038 Chevrolet	Schematic, voltage	6-29		
	Parts locations, data	6-30		
	Alignment, test data	6-31		
	Socket, test data, parts	6-32		
601176, 601525 Chevrolet	Schematic, voltage	8-27		
	Socket, trimmers, chassis, alignment, changes	8-28		
601177 Chevrolet Below Serial 1748809	Schematic, voltage	9-63		
	Socket, trimmers, chassis, changes	9-65		
	Alignment	9-66		

MODEL	UNITED MOTORS SERVICE—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
601177 Chevrolet, Late Above Serial 1748809	Schematic, voltage	9-64		
	Socket, trimmers, chassis, changes	9-65		
	Alignment	9-66		
601574 Chevrolet	Schematic, voltage	6-33		
	Parts layout	6-34		
	Circuit data	6-35		
	Alignment, parts	6-36		
	Changes	Changes 9-6		
601586 Chevrolet	See model 405046 Olds			
601662 Chevrolet	Schematic	7-1		
	Socket, trimmers, chassis	7-2		
	Alignment, voltage	7-3		
601814 Chevrolet	Schematic, voltage, socket, trimmers, alignment	8-22		
958200 Chevrolet	Schematic	8-29		
	Alignment, voltage, parts	8-30		
980393 B-O-P	Schematic, voltage, alignment	8-31		
	Data	Changes 9-6		
980441	Similar to 4037			
980455 B-O-P	Schematic, voltage	6-37		
	Alignment, service notes, parts	6-38		
980459 B-O-P	Schematic	6-39		
	Alignment, voltage, parts	6-40		
980507, 980508 Buick	Schematic, voltage, alignment	9-67		
980509, Buick	Schematic, voltage	9-68		
	Alignment	9-67		
980525, 980529, Buick	Schematic, voltage	9-69		
	Socket, trimmers, chassis, alignment	9-70		
980526, Buick	Schematic, voltage	9-71		
	Alignment	9-70		
	Socket, trimmers, chassis	9-72		
980534, 980535, Buick	Schematic, voltage	9-73		
	Socket, trimmers, chassis	9-72		
	Chassis wiring	9-74		
	Alignment	9-75		
982006 Olds	Schematic, voltage	8-33		
	Alignment, change	8-32		
	Socket, trimmers, chassis, note	8-34		
982007, 982008 Olds	Schematic, voltage	8-35		
	Alignment, change	8-36		
	Socket, trimmers, chassis	8-37		
983506 Pontiac	Schematic, voltage, alignment	8-38		
	Socket, trimmers, chassis	9-54		
983507 Pontiac	Schematic, voltage, alignment	8-39		
	Socket, trimmers, chassis	9-54		
983526 Pontiac	Schematic, voltage	9-77		
	Socket, trimmers, chassis, alignment	9-78		
983527, Pontiac	Schematic, voltage, socket, trimmers, chassis	9-79		
	Alignment	9-80		
983534, Pontiac	Schematic	9-81		
	Socket, trimmers, chassis, voltage, alignment	9-82		
983569, Pontiac	Schematic, vibrator, condenser data	9-83		
	Socket, trimmers, chassis	9-84		
985100 Chevrolet	Schematic, voltage	8-41		
	Alignment	8-40		
	Socket, trimmers, chassis, notes	8-42		
985252, 985286, Chevrolet	Schematic, socket, trimmers, chassis	9-85		
	Alignment, voltage	9-86		
985253, Chevrolet	Schematic, voltage, socket, trimmers, chassis	9-87		
	Alignment	9-88		
985255, Chevrolet	Schematic, voltage, socket, trimmers, chassis	9-89		
	Alignment, notes	9-90		
985283, Chevrolet	Schematic	9-91		
	Socket, trimmers, chassis, voltage, tuner assembly	9-92		
985284, Chevrolet	Schematic, socket, chassis, trimmers, voltage	9-93		
985285, Chevrolet	Schematic, socket, chassis, trimmers, condenser data	9-94		
985286	See model 985252			
985300 Chevrolet	Schematic, voltage	8-43		
	Alignment	8-40		

WALGREEN CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
41, 42	Schematic	10-2		
41A, 42A	Schematic	10-2		
55-RS	Schematic, socket, trimmers, alignment, parts	8-2		
57-RS	Schematic, socket, trimmers, alignment, parts	8-3		
166 RIS	Schematic, socket, trimmers, alignment, voltage	10-6		
255	Schematic, socket, notes, parts	9-1		
308, Chassis 801, 802	Schematic, socket, trimmers, alignment, voltage	10-7		
360, Chassis HE	Schematic	10-3		
370	Schematic, socket, trimmers, alignment, parts	8-4		
400	Schematic, socket	10-8		
401	Schematic, voltage, alignment	10-9		
500 (2 and 3 Bands)	Schematic, voltage, alignment	10-10		
540	Schematic, socket, alignment, trimmers	10-11		
550 Auto	Schematic, alignment	10-11		
550 A-C	Schematic, socket, trimmers, alignment	10-12		
575	Schematic, socket, alignment, trimmers, voltage	10-13		
585, Series A	Schematic, socket, alignment, trimmers, voltage	10-14		
630, 635, 652	Schematic	9-1		
651	Schematic, voltage, alignment, trimmers	10-15		
660 Auto	Schematic, voltage, socket, trimmers	10-8		
675	Schematic, voltage, socket, trimmers, alignment	10-16		
700	Schematic, alignment	9-2		
800	See model M-8			
801, 802 chassis	See model 308			
1050	Schematic, socket, alignment, voltage	10-17		
4154	Schematic, voltage, socket, alignment	10-18		

GEO. W. WALKER CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Victoreen "Standard"	Chassis wiring	Misc. 1-23	*800	2605
Victoreen "Universal"	Chassis wiring	Misc. 1-23	*800	2605

WALTHAM

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Waltham '32	Schematic	3-1		2607

WARE MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
T	Schematic	2-1	639-A	2609
SB-A	Schematic	2-4	639-E	2612
SBB	Schematic, notes	3-1		2613
SB-F	Schematic	2-5	639-F	2614
4 Tube Music Master	Schematic	2-1	639-A	2609
7 Tube Music Master	Schematic	2-1	639-A	2609
B-1, B-2 Bantam	Schematic	2-2	639-B	2610
S-1	Schematic	2-5	639-C	2614
SB-7	Schematic	3-3		2615
SB-8	Schematic	3-2		2616
SB-45	Schematic	2-3	639-D	2611

WARNER ENGINEERING CORP., LTD.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Qualiphone R-34	Schematic	Misc. 3-10		2617

WARWICK MFG. CO.

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
6-407	Schematic, socket, trimmers, alignment, voltage, battery data	10-1		
4-Tube AC	Schematic, socket	7-4		
5-Tube A-C Superheterodyne	Schematic, socket, trimmers, alignment	9-1		
5-Tube Auto	Schematic, alignment	7-1		
6-Tube A-C Superheterodyne	Schematic, socket, trimmers, alignment	9-1		
6-Tube Auto	Schematic, alignment	7-2		
7-Tube Batt.	Schematic, socket	7-3		
9-23 Wireless Record Player	Schematic, data	10-2		
9-43, 9-45	Schematic, voltage, socket, trimmers, alignment	10-3		

WARWICK MFG. CO.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
9-46	Schematic, voltage, socket, trimmers, chassis, tuner assembly	10-4		
	Tuner data	10-30		
	Alignment, wave-trap notes, tuner data	10-5		
9-53	Schematic, voltage, socket, alignment, trimmers	10-7		
9-58	Schematic, voltage, socket, trimmers, chassis	10-6		
	Alignment, tuner data	10-5		
9-59 Auto	Schematic, socket, trimmers, alignment	10-8		
9-66	Schematic, voltage, socket, trimmers, alignment	10-9		
9-220, 9-221, 9-222, 9-223, 9-224, 9-225, 9-226, 9-227, 9-228, 9-229	Schematic, socket, trimmers	10-10		
9-480, 9-481, 9-482, 9-483, 9-484, 9-485, 9-486, 9-487, 9-488, 9-489	Schematic, voltage, socket, trimmers, alignment	10-11		
9-550, 9-551, 9-552, 9-553, 9-954, 9-955, 9-556, 9-557, 9-558, 9-559	Schematic, voltage, socket, alignment, trimmers	10-12		
9-670, 9-671, 9-672, 9-673, 9-674, 9-675, 9-676, 9-677, 9-678, 9-679	Schematic, socket, trimmers, voltage, alignment	10-12		
9-680, 9-681, 9-682, 9-683, 9-684, 9-685, 9-686, 9-687, 9-688, 9-689	Schematic, voltage, socket, trimmers, alignment	10-11		
400	Schematic, socket, trimmers, alignment	9-2		
401	Schematic, socket, alignment, trimmers	10-13		
401 LW	Schematic, socket, alignment, trimmers	10-13		
404	Schematic, socket, alignment, trimmers	10-14		
419, 420	Schematic, socket	7-3		
453, 553	Schematic, voltage, socket, trimmers, alignment	10-15		
501	Schematic, socket, trimmers, alignment	8-1		
510-C	Schematic, socket, alignment, trimmers	10-14		
518	Schematic, voltage, socket, trimmers, alignment, parts	8-2		
520	Schematic, socket	7-3		
525	Schematic, socket, trimmers, alignment	9-3		
530	Schematic, socket	7-4		
536	Schematic, voltage, socket, trimmers, alignment, parts	8-2		
542	Schematic, socket	7-4		
542, Late	Schematic, socket, trimmers	10-10		
	Tuner data	10-30		
550-C	Schematic, socket, alignment, trimmers	10-13		
551	Schematic, socket, trimmers, alignment	8-1		
553	See model 453			
559, 579 (with 150-cycle vibrator)	Schematic, voltage, socket, alignment, trimmers	10-16		
	Tuner data	10-30		
600	Schematic, socket, trimmers, alignment	9-4		
601	Schematic, voltage, socket, trimmers, alignment, parts	8-3		
604, 606, 653	Schematic, socket	10-7		
610	Schematic, voltage, socket, alignment, trimmers	10-17		
613	Schematic, voltage, socket, trimmers, alignment, parts	8-3		
629	Schematic, voltage, socket, alignment, trimmers	10-18		
633	Schematic, voltage, socket, trimmers, alignment, parts	8-4		
646 Auto	Schematic, socket, trimmers, alignment	8-1		
648, 648B, 655B	Schematic, voltage, socket, alignment, trimmers	10-19		
	Tuner data	10-30		

WESTINGHOUSE ELECTRIC SUPPLY CO., INC.—(Cont.)

WESTINGHOUSE ELECTRIC SUPPLY CO., INC.—(Cont.)

WESTINGHOUSE INTERNATIONAL

WILCOX-GAY CORP.—(Cont.)

WILLARD STORAGE BATTERY CO.

WINGS

See GOODYEAR SERVICE

WORKRITE MFG. CO.

See U. S. ELECTRIC CORP.

THE RUDOLPH WURLITZER CO.

Also see ALL-AMERICAN MOHAWK CORP.

THE RUDOLPH WURLITZER CO.—(Cont.)

ZANEY-GILL CORP.

ZENITH RADIO CORP.

MODEL	ZENITH RADIO CORP.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
4-F-133, Chassis 5407	Schematic, voltage, socket, trimmers, alignment, parts, battery connections	8-2		
4-F-227, Chassis 5408	Schematic, socket, trimmers, voltage, alignment, parts	8-3		
	Phono. circuit	8-6		
4K310, 4K331, 4K355, Chassis 5412	Schematic, voltage, alignment, socket, trimmers	10-5		
4K329, Chassis 5413	Schematic, voltage, alignment, socket, trimmers	10-6		
4P26, 4T26, 4P51, 4T51 Chassis 5401	Schematic, parts	6-17		
	Voltage, socket, trimmers, alignment, parts	6-18		
4T26, 4T51, Chassis 5403 Early	Schematic	10-7		
	Alignment, voltage, socket, trimmers	10-8		
4T26, 4T51, Chassis 5403 Late with Improved Short Wave	Schematic, changes	10-7		
	Alignment, voltage, socket, trimmers	10-8		
4V31, 4V59 Chassis 5405	Schematic, parts	6-19		
	Voltage, socket, trimmers, alignment, parts	6-20		
ZE-4	Schematic	2-1	656-B	2685
5A119, 5A126, 5A127, 5A151, Chassis 5517A	Schematic	10-15		
	Voltage	10-39		
	Alignment, socket, trimmers	10-28		
5A318, 5A325, Chassis 5532A	Schematic	10-13		
	Voltage, tuner, socket	10-12		
	Alignment, socket, trimmers	10-14		
5-F-134, 5-F-166, Chassis 5518	Schematic, voltage, socket, trimmers, alignment, parts, battery connections	8-4		
5-F-233, 5-F-251, Chassis 5522	Schematic, voltage, socket, trimmers, alignment, parts	8-5		
	Phono. circuit	8-6		
	Data ....Changes	9-5		
5-J-217, 5-J-247, 5-J-255, Chassis 5524	Schematic, parts	8-7		
	Phono. circuit	8-6		
	Voltage, socket, trimmers, alignment	8-8		
5J217T, Chassis 5524T	Schematic, parts	9-5		
	Socket, trimmers, voltage, alignment	9-6		
5L228, 5L237, Chassis 5525A	Schematic	10-15		
	Alignment, socket, trimmers	10-30		
	Voltage	10-39		
5-M-90, Chassis 5510	Schematic, parts	7-3		
	Voltage, socket, trimmers, alignment	7-4		
5-M-191, Chassis 5520	Schematic, voltage, changes, parts	8-9		
	Socket, trimmers, chassis, drive data	8-10		
	Alignment, notes	8-11		
	Parts	8-12		
5M291, Chassis 5527	Schematic	10-9		
	Socket, trimmers, voltage, alignment	10-10		
5M294, Chassis 5530	Schematic, voltage	10-11		
	Alignment, tuner data	10-10		
5-R-123, 5-R-135, 5-R-165, Chassis 5519	Schematic, socket, voltage, trimmers, alignment, parts	8-13		
5-R-216, 5-R-226, 5-R-236, Chassis 5526	Schematic, voltage, parts, socket, trimmers, parts	8-14		
	Phono. circuit	8-6		
5R303, 5R312, 5R316, 5R317, 5R337, Chassis 5528	Schematic, parts	9-7		
	Socket, trimmers, voltage, alignment	9-8		
	Circuit changes for phono. pickup	10-40		

MODEL	ZENITH RADIO CORP.—(Cont.)	REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
5-S-29, 5-S-56, Chassis 5513, 5513A	Schematic, socket, trimmers, parts	7-5		
	Voltage, alignment	7-6		
5-S-119, 5-S126, 5-S-127, 5-S-150, 5-S-151, 5-S-161, Chassis 5516	Schematic, parts	7-7		
	Voltage, socket, trimmers	7-2		
	Alignment ....Changes	10-3		
5-S-201, 5-S-218, 5-S-220, 5-S-228, 5-S-237, 5-S-250, 5-S-252, Chassis 5521	Schematic, socket, trimmers, alignment, voltage, parts	8-22		
	Phono. circuit	8-6		
5S218AT, 5S228AT, 5S237AT, Chassis 5521AT	Schematic, parts	9-9		
	Socket, trimmers, voltage, alignment	9-10		
5S313B, Chassis 5535BT	Schematic	10-13		
	Socket, voltage	10-12		
	Alignment, trimmers, socket	10-14		
5S319, 5S327, 5S330, 5S338, 5S339, Chassis 5529	Schematic, parts	9-11		
	Socket, trimmers, voltage, alignment	9-12		
	Circuit changes for phono. pickup	10-40		
5X230, 5X248, 5X274, Chassis 5523	Schematic, alignment, socket, trimmers	10-16		
	Voltage	10-10		
ZE-5	Schematic	1-4	*656	2690
6A203, 6A223, 6A229, 6A239, 6A241, Chassis 5640AT	Schematic	10-19		
	Voltage	10-39		
	Alignment, socket, trimmers	10-18		
6-B-107, 6-B-129, 6-B-164, Chassis 5635	Schematic, parts	7-8		
	Voltage, socket, trimmers	7-9		
	Alignment	8-36		
6B321, Chassis 5653	Schematic, parts, voltage	9-18		
	Socket, trimmers, alignment	9-17		
	Circuit changes for phono. pickup	10-40		
6-D-116, 6-D-117, 6-D-118, Chassis 5633	Schematic, parts	7-10		
	Voltage, socket, trimmers	7-11		
6-D-202, 6-D-219, 6-D-221, 6-D-238, Chassis 5639	Schematic, parts	8-15		
	Phono. circuit	8-6		
	Voltage, alignment, socket, trimmers	8-16		
6D302, 6D311, 6D326, 6D336, 6D360, Chassis 5646	Schematic, parts, voltage, socket, trimmers, alignment	9-4		
	Circuit changes for phono. pickup	10-40		
6D312, 6D316, 6D317, 6D337, Chassis 5647	Schematic, socket, trimmers, parts	9-13		
	Voltage, alignment	9-15		
	Circuit changes for phono. pickup	10-40		
6D315, Chassis 5657	Schematic, voltage, socket, alignment, trimmers	10-17		
6DL120, 6DL121, 6DL122, Chassis 5636 AC-DC	Schematic	10-19		
	Voltage	10-39		
	Alignment, socket, trimmers	10-20		
6-J-230, 6-J-257, Chassis 5642	Schematic, parts	8-17		
	Phono. circuit	8-6		
	Voltage, alignment, socket, trimmers	8-18		
6J322, 6J357, Chassis 5654	Schematic, parts	9-19		
	Voltage, socket, trimmers, alignment	9-20		
	Circuit changes for phono. pickup	10-40		
6-M-90S, 6-M-90D, Chassis 5680	Schematic, parts list	7-12		
	Socket, trimmers, voltage	7-13		
	Alignment	7-4		

ZENITH RADIO CORP.—(Cont.)

ZENITH RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
9-S-30, 9-S-54, 9-S-55 Chassis 5903	Schematic, socket, trimmers, parts	6-27		
	Voltage, alignment, parts	6-28		
9-S-203, 9-S-232, 9-S-242, 9-S-244, 9-S-262, 9-S-263, 9-S-264, Chassis 5905	Schematic, parts	8-35		
	Phono. circuit	8-6		
	Voltage, alignment, socket, trimmers	8-42		
9S204AT, 9S232AT, 9S244AT, 9S262AT, 9S264AT, Chassis 5905AT	Schematic, parts	9-33		
	Voltage, socket, trimmers, alignment	9-34		
9S307, 9S324, 9S344, 9S367, 9S369, Chassis 5907	Schematic, parts	9-35		
	Voltage, socket, trimmers, alignment	9-36		
	Circuit changes for phono. pickup	10-40		
9S307, Automatic Record Changer Model 169-31	Installation, operation	10-1		
	Adjustments, notes	10-2		
	Chassis, details	10-3		
	Details, notes	10-4		
9S365, Chassis 5906	Schematic, parts	9-37		
	Voltage, socket, trimmers, alignment	9-38		
	Circuit changes for phono. pickup	10-40		
ZE-9	Schematic, data	2-2	654-A, B	2688
10, 11, 12, 102, 112, 122	Schematic, voltage, parts list	2-9	674-Q	2715
	Balancing notes, SPU notes and schematic	2-10	674-R	2716
10-S-130, 10-S-147, 10-S-153, 10-S-155, 10-S-156, 10-S-157, 10-S-160, Chassis 1004	Schematic, voltage, socket, trimmers, phono. data, parts	8-37, 8-38		
	Alignment	8-36		
ZE-10	Schematic	1-5, 1-8	658, 9	2691
11, 12	See model 10			
11, 12, 14 (1st type)	Schematic, socket	1-2	*653	2686
	Power Pack—See ZE-9			
11-E, 14-E	Schematic, socket	1-3	*654	2687
ZE-11	Schematic	1-7	*661, 8	2693
	Schematic	1-10	*663	2696
12 (2nd type)	Schematic, socket	1-2	*653	2686
12-A-57, 12-A-58, 12-L-57, 12-L-58, Chassis 1202 & 1202A	**Schematic, parts**	7-23, 7-24		
	Voltage, alignment, socket, trimmers	7-25		
12-S-205, 12-S-232, 12-S-245, 12-S-265, 12-S-266, 12-S-267, 12-S-268, Chassis 1204	Schematic, parts	8-41		
	Phono. circuit	8-6		
	Voltage, alignment, socket, trimmers	8-42		
12S345, 12S370, 12S371, Chassis 1206	Schematic, parts	9-39		
	Voltage, socket, trimmers, alignment	9-40		
12-U-158, 12-U-159, Chassis 1208	Schematic, voltage, socket, trimmers, parts, phono. data	8-39, 8-40		
	Alignment	8-36		
ZE-12	Schematic	1-12	*665	2698
	Notes	7-22		
ZE-13	Schematic	1-5, 1-8	*658, 9	2694
14	See model 11			
14-E	See model 11-3			
ZE-14	Schematic	1-7	*661	2693
	Schematic	1-10	*663	2696
15, 16	**Schematic, socket**	7-26	*655	2689
15-E, 15-EP, 16-E, 16-EP	Schematic, socket	7-26	*655	2689
15S308, 15S346, 15S372, 15S373, Chassis 1502	Schematic, parts	9-41		
	Voltage, socket, trimmers, alignment	9-42		

ZENITH RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
15S308, 15S346, 15S372, 15S373, Chassis 1502	Circuit changes for phono. pickup	10-40		
15S308, Automatic Record Changer Model 169-31	Installation, operation	10-1		
	Adjustments, notes	10-2		
	Chassis, details	10-3		
	Details, notes	10-4		
15-U-246, 15-U-269, 15-U-270, 15-U-271, 15-U-272, 15-U-273, Chassis 1501	**Schematic, parts**	8-43		
	Phono. circuit	8-6		
	Voltage, alignment, socket, trimmers	8-44		
ZE-15	Schematic	1-12	*665	2698
16	**See model 15**			
16-A-61, 16-A-63 Stratosphere, Chassis 1601-C, 1601-P	**Schematic, parts**	7-27, 7-28		
	Voltage, socket, trimmers, alignment	7-29		
16-E, 16-EP	See model 15-E			
ZE-16	Filter, schematic	1-12	*665	2698
17	Schematic, socket	1-4	*656	2690
ZE-17	Schematic	1-29		2743
18-E	Data	Changes 8-8		
ZE-18	Schematic	1-9	*662	2695
27 Super-Zenith	Schematic	1-30	656-A	2744
27 Super-Zenith (**Series** Filament)	Schematic, socket	1-6	*657	2692
31, 32 Battery	Schematic, socket	1-6	*657	2692
33, 34, 35, 35-A, **342, 352,** 352-A, 362	Schematic, socket, voltage	1-8	*658	2694
33, 33X, 34, 35, 35A	Power Pack—See ZE-10			
33-X, 362-X	Schematic, socket, voltage	1-5	*659	2691
34-P, 342-P	Schematic, socket, voltage	1-7	*661	2693
34-P, 35-P, 35-AP	Power Pack—See ZE-11			
35-P, 35-AP, 352-P, 352-AP	Schematic, socket, voltage	1-10	*663	2696
35-PX, 35-APX, 352-PX, 352-APX	Schematic, socket, voltage	1-9	*662	2695
35-PX, 35-APX	Power Pack—See ZE-18			
37-A	Schematic	1-9	*662	2695
	Power Pack—See ZE-11 & ZE-18			
39, 39-A, 392, 392-A	Schematic, voltage	1-11	*664	2697
39, 39-A	Power Pack—See model ZE-12			
40-A	Schematic, socket	1-11	*664	2697
	Power Pack—See ZE-12			
41, 42	Schematic, socket, voltage	1-13	*666	2699
50	See model 60			
ZE-50	Schematic	1-15	*668	2701
P51 Chassis	See model M-601			
52, 53	Schematic, socket	1-14	*667	2700
52, 53, 54, 55	Voltage data	1-15	*668	2701
54	Schematic, socket	1-14	*667	2700
60, 61, 62, 64, 67, 602, 612, 613, 622, 642, 672, 50 (1929 Chassis)	Schematic, socket, voltage	1-16	*670	2702
ZE-60	Schematic	1-17	*671	2703
ZE-70	Schematic	1-17	*671	2703
70, 71, 72, 73, 77, 712, 722, 732, 772	Schematic, socket, voltage	1-18	*672	2704
70	Tone control installation	1-19	*674-L	2705
80 Hypermetron	Schematic, socket	1-20	*674-K	2706
	Parts list	1-22	*674-I	2708
ZE-80	Schematic, parts list	1-21	*674-J	2707
090, 90, V-8, Chassis 2012-4J	Data	7-22		
91, 92 (1st type)	Schematic, socket, data	2-3	674-M	2709
91, 92 (2nd type)	Schematic	2-4	674-P-1	2710
91, 92 (3rd type)	Schematic	2-5	674-P-2	2711
91, 92	Circuit data	2-6	674-P-3	2712
	Balancing notes	2-7	674-O	2713
	Chassis view, voltage, parts list	2-8	674-N	2714
	Notes	7-22		
102	See model 10			
103 (2017) Serials #450,001-#450,450	Schematic, notes	2-16	674-P-4	2724
103 (2017) Above Serial #450,451	Schematic	2-15	674-P-8	2725
103 (2017) Above Serial #451,260	Schematic, socket	2-18	674-P-9	2726

ZENITH RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
103	Chassis view, parts list	2-17	674-P-5	2727
	Chassis layout, voltage	2-19	674-P-6	2728
112, 122	See model 10			
169-31 Automatic Record Changer	See models 6S306, 9S307, 15S308			
200	Schematic	10-33		
210, 211, 220, 221, 270, 291, 292, Chassis 2022 A & B	Schematic, socket	3-2		2730
	Socket, trimmers, voltage	Changes 8-8		
210-5, 211-5, 270-5	Schematic, socket	3-1		2729
215, 216, 217, 225, 263, 470, Chassis 2044	Schematic	7-30		
215, 216, 225, Chassis 2044	Schematic	7-30		
	Socket, trimmers, voltage	7-13		
220, 221	See model 210			
225	See model 215			
230, 240, 241, 244, 245, 271, Chassis 2036	Schematic, socket	3-3		2731
	Voltage, parts list	3-4		2732
250, 251, 252, 259, 260, 261, 262, 269, 272, 299, 472, 516, 517, 518, Chassis 2031	Schematic, data	2-20		2733
	Alignment, voltage, socket, trimmers	7-32		
250, 260, 272, Standard and SW	Schematic	3-6		2734
258, 268, 278, 280, 281, 288, 289, 478, 558, 568, 578, 589, 590 Early, Chassis 2051 Early	Schematic, voltage, socket, trimmers, alignment	8-45		
	Parts	8-47		
258, 268, 278, 280, 281, 288, 289, 478, 558, 568, 578, 589, 590 Revised, Chassis 2051 Late	Schematic, voltage, socket, trimmers, alignment	8-46		
	Parts	8-47		
261, 262	See model 250			
263	See model 215			
268	See model 258			
269, 272	See model 250			
270	See model 210			
270-5	See model 210-5			
271	See model 230			
273, 410, 411, 412, 414, 420, 443, 473, Chassis 2030-2043	Schematic, socket	3-5		2735
	Voltage, electrical values	3-8		2736
277, 281, 288, 293, 478, 577, 588, 593, Chassis 2056	Schematic, socket, voltage, alignment	4-15		
278, 280, 281	See model 258			
281	See model 277			
288, 289	See model 258			
288, 293	See model 277			
291, 292	See model 210			
299	See model 250			
333, 353-A DC	Schematic, socket	1-29		2748
342, 352, 352-A	See model 33 & ZE-13			
342-P	See model 34-P & ZE-14			
352-P, 352-AP	See model 35-P & ZE-14			
352-PX, 352-APX	See model 35-PX			
353-A	See model 333			
362	See model 33 & ZE-13			
362-X	See model 33-X & ZE-13			
392, 392-A	See model 39, ZE-15 & ZE-16			
410, 411, 412, 414, 420	See model 273			
422	Schematic, socket, voltage	1-18	*666	2699
430, 440, 441, 442, 444, 619, Chassis 2033	Schematic, socket	3-7		2737
	Voltage	7-32		
443	See model 273			
460, Chassis 2047	Schematic, voltage	4-1		
	Layout, trimmers, alignment	4-2		
462, 650, Chassis 2057	Schematic	4-3		
	Voltage, socket, alignment data	4-4		

ZENITH RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
462	Changes	Changes 9-6		
470	See model 215			
472	See model 250			
473	See model 273			
474, 585, 715, 755, 756, 785, Chassis 2053	Schematic, socket, voltage	4-8		
475, 757, 760, 765, 767, Chassis 2054	Schematic, socket, voltage	4-11		
476, 476-A, 770, 775, 780, Chassis 2032	Schematic, socket, voltage	4-12		
476-B, 479, 770-B, 775-B, 777, 788, Chassis 2059 (1933)	Schematic	4-13		
	Voltage, socket	4-14		
478, Chassis 2051	See model 258			
478, Chassis 2056	See model 277			
500, 501, 503, 514, 515, 516, 600, 604, 606, 610, 616, 618, (2037)	Parts list, voltage	2-21		2739
	Schematic, socket	2-22		2738
516, 517, 518	See model 250			
520, 521, 602, 605, 608, 611, 615, Chassis 2035	Schematic, socket, voltage, trimmers, alignment	8-48		
	Parts	8-50		
530, 531, 532, 533, 603, 612, 617, 620, 623, Chassis 2038	Schematic, socket, voltage, trimmers, alignment	8-49		
	Parts	8-50		
558, 568	See model 258			
563 DC	Schematic, socket	1-28	*669	2740
577	See model 277			
578	See model 258			
585	See model 474			
588, 593	See model 277			
589, 590	See model 258			
600	See model 500			
M-601 (P51) (Export Only)	Schematic	5-1		
	Parts list	5-2		
602	See model 60			
602, 605, 608	See model 520			
603	See model 530			
604, 606, 610	See model 500			
611, 615	See model 520			
612, 613, Chassis 1929	See model 60			
612, 617, 620, 623	See model 530			
616, 618	See model 500			
619	See model 430			
622, 642	See model 60			
650	See model 462			
650-HD, 651-HE, 660-TD, 661-TE Terraplane Hudson	Schematic	4-5		
	Voltage, socket, alignment	4-6		
660, 666, Chassis 5615, 668, Chassis 5626	Schematic, alignment	6-1		
	Voltage, socket, trimmers, parts	6-2		
663, 664	Schematic, socket, trimmers, parts	7-31		
	Voltage, alignment	7-6		
668	Data	Changes 9-6		
672	See model 60			
680 Hudson	Schematic, alignment	6-3		
	Voltage, socket, trimmers, parts	6-4		
701	Schematic, socket, alignment	5-4		
701 AC-DC	Schematic, chassis, notes	3-9		2741
702	Schematic, socket, alignment	5-4		
705, 706, 707, 711, 712, 750, Chassis 2052 A, B & C	Schematic, socket	4-7		
712, 722, 732	See model 70			
715	See model 474			
730, 735	Schematic, socket, alignment, voltage	4-9		
740	Schematic, socket, voltage, alignment	4-10		
750	See model 705			
755, 756	See model 474			

ZENITH RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
757, 760, 765, 767	See model 475			
770, 775	See model 476			
770-B, 775-B	See model 476-B			
772	See model 70 Series			
777, 788	See model 476-B			
780	See model 476			
785	See model 474			
801	Schematic, socket, alignment	5-5		
804	Schematic, alignment, socket, trimmers	10-34		
805, 845, Chassis 5502	Schematic, socket, voltage, alignment	5-6		
806, 807, S847, 850 Chassis 5504, 5505	Schematic	5-7		
	Voltage, socket, alignment	5-8		
808, 809, 860, 861 Chassis 5605, 5607	Schematic	5-9		
	Voltage, socket, alignment	5-10		
810, 811, 862, 865, 866, 963, 1115, 1162, Chassis 5609	Schematic, voltage, socket, parts	6-5		
	Alignment, socket	7-22		
812, 816, 817, 819, 962, 1112, 1116, Chassis 5608	Schematic	5-11		
	Voltage, socket, alignment	5-12		
814, 815, 864, 1161 Chassis 5611, 5612	Schematic, socket, parts	6-6		
825, 827, 829, 870 Chassis 5701-2-3	Schematic	5-13		
	Voltage, socket, alignment	5-14		
S-827, S-829, S-870, S-871, 1170, Chassis 5701-R, 5702-R, 5703-R	Schematic, parts	6-23		
	Voltage, socket, trimmers, alignment	6-24		
834, 1102, 1106, Chassis 1002	Schematic	10-38		
	Alignment, notes	10-33		
835, 880, 881, 885, 978, 983, 1101, 1105, Chassis 1001, 1001-A	Schematic	5-15		
	Voltage, socket, alignment, notes	5-16		
845	See model 805			
S847, 850	See model 806			
860, 861	See model 808			
862, 865, 866	See model 810			
864	See model 814			
870	See model 825			
S-870, S-871	See model S-827			
880	See model 835			
908, 909, 960, 961, 1117 Chassis 5614	Schematic, parts	6-15		
	Voltage, socket, trimmers, parts	6-16		
S-908, S-909, S-961, 1167 Chassis 5618	Schematic, parts	6-25		
	Voltage, socket, trimmers, alignment, parts	6-26		
945, 950 Chassis 5508, 5509	Schematic	6-7		
	Voltage, alignment, socket, trimmers, parts	6-8		
960, 961	See model 908			
S-961	See model S-908			
962	See model 812			
963	See model 810			
970, 975 Chassis 5902	Schematic	6-9		
	Voltage, alignment, socket, trimmers	6-10		
978, 983	See model 835			
980, 985, 990 Chassis 1201, 1201-A	Schematic, parts	6-11, 6-12		
	Voltage, socket, trimmers	6-13		
	Alignment, service notes	6-14		
Stratosphere 1000Z Chassis 2501-C, 2501-P	Schematic, parts	6-29, 6-30		

ZENITH RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
Stratosphere 1000Z Chassis 2501-C, 2501-P	Service data, socket, trimmers	6-31		
	Circuit data, voltage, alignment	6-32		
1000Z Revised, Chassis 2501C, 2501P	Schematic	10-35, 36		
	Alignment, trimmers, voltage, resistances	10-37		
1001, 1001-A, Chassis	See model 835			
1002 Chassis	See model 834			
1004 Chassis	See model 10-S-130			
1101, 1105	See model 835			
1102, 1106	See model 834			
1112, 1116	See model 812			
1115	See model 810			
1117	See model 908			
1161	See model 814			
1162	See model 810			
1167	See model S-908			
1170	See model S-827			
1201, 1201-A	See model 980			
1202, 1202A, Chassis	See model 12-L-57			
1203 Chassis	See model 12-U-158			
1204 Chassis	See model 12-S-205			
1206 Chassis	See model 12-S-345			
1501 Chassis	See model 15-U-246			
1502 Chassis	See model 15-S-308			
1601-C, 1601-P Chassis	See model 16-A-61			
2004 Series Chassis	See 6 tube Zenette			
2009-C Series Chassis	See 5 tube Zenette			
2009-C-P Chassis	See model L-P			
2012 Chassis	See model AH			
2012-4-J Chassis	See model 090			
2017 Chassis	See model 103			
2021 Chassis	See model BH			
2022 Chassis	See model LH			
2022 A & B	See model 210			
2030-2043 Chassis	See model 273			
2031 Chassis	See model 250			
2032 Chassis	See model 476			
2033 Chassis	See model 430			
2035 Chassis	See model 520			
2036 Chassis	See model 230			
2037 Chassis	See model 500			
2038 Chassis	See model 530			
2044 Chassis	See model 215			
2047 Chassis	See model 460			
2051 Chassis	See model 258			
2052 A B & C Chassis	See model 705			
2053 Chassis	See model 474			
2054 Chassis	See model 475			
2056, 2056-I, Chassis	See model 277			
2057 Chassis	See model 462			
2059 Chassis	See model 476-B			
2501C, 2501P Chassis	See model 1000Z			
5401	See model 4P26			
5403 Chassis	See model 4T26			
5405 Chassis	See model 4V31			
5406 Chassis	See model 4-B-106			
5407 Chassis	See model 4-F-133			
5408 Chassis	See model 4-F-227			
5409 Chassis	See model 4-B-231			
5410 Chassis	See model 4-B-313			
5411 Chassis	See model 4-B-314			
5412 Chassis	See model 4K310			
5413 Chassis	See model 4K329			
5502 Chassis	See model 805			
5504, 5505 Chassis	See model 806			
5508, 5509 Chassis	See model 945			
5510 Chassis	See model 5-M-90			
5513, 5513A Chassis	See model 5-S-29			
5516 Chassis	See model 5-S-119			
5517A Chassis	See model 5A119			
5518 Chassis	See model 5-F-134			
5519 Chassis	See model 5-R-123			
5520 Chassis	See model 5-M-191			
5521 Chassis	See model 5-S-201			
5521AT Chassis	See model 55218AT			
5522 Chassis	See model 5-F-233			

ZENITH RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
5523 Chassis	See model 5X230			
5524 Chassis	See model 5-J-217			
5524T Chassis	See model 5J217T			
5525A Chassis	See model 5L228			
5526 Chassis	See model 5-R-216			
5527 Chassis	See model 5M291			
5528 Chassis	See model 5R303			
5529 Chassis	See model 5S319			
5530 Chassis	See model 5M294			
5532A Chassis	See model 5A318			
5535BT Chassis	See model 5S313B			
5605, 5607 Chassis	**See model 808**			
5608 Chassis	**See model 812**			
5609, 5610 Chassis	**See model 810**			
5611, 5612 Chassis	**See model 814**			
5614 Chassis	**See model 908**			
5616 Chassis	**See model 666**			
5618 Chassis	**See model S-908**			
5619 Chassis	**See model 6-S-27**			
5621	**See model 6V27**			
5626	See model 660			
5629 Chassis	See model 6VA27			
5630 Chassis	**See model 6-M-90S**			
5631 Chassis	**See model 6-M-91D**			
5632 Chassis	**See model 6-M-92**			
5633 Chassis	**See model 6-D-116**			
5634 Chassis	**See model 6-S-128**			
5635 Chassis	**See model 6-B-107**			
5636AC-DC Chassis	See model 6DL120			
5637 Chassis	**See model 6-M-192, 6-M-198**			
5638 Chassis	**See model 6-S-203**			
5639 Chassis	**See model 6-D-202**			
5640AT Chassis	See model 6A203			
5642 Chassis	**See model 6-J-230**			
5644 Chassis	**See model 6-S-254**			
5644AT Chassis	See model 6S254AT			
5645 Chassis	See model 6M292			
5646 Chassis	See model 6D311			
5647 Chassis	See model 6D312			
5648 Chassis	See model 6S330			
5649 Chassis	See model 6S341			
5650 Chassis	See model 6M295			
5651 Chassis	See model 6S301			
5653 Chassis	See model 6B321			
5654 Chassis	See model 6J322			
5657 Chassis	See model 6D315			
5701-2-3-Chassis	**See model 825**			
5701R, 5702R, 5703R Chassis	**See model S-827**			
5704 Chassis	**See model 7-S-28**			
5706 Chassis	**See model 7-M-91D**			
5707 Chassis	**See model 7-D-119**			
5708E Chassis	See model 7DA119			
5709 Chassis	See model 7-S-204			
5709AT Chassis	See model 7S232AT			
5710 Chassis	See model 7-D-203			
5711 Chassis	See model 7-J-232			
5711T Chassis	See model 7J232T			
5714 Chassis	See model 7S323			
5715 Chassis	See model 7J323			

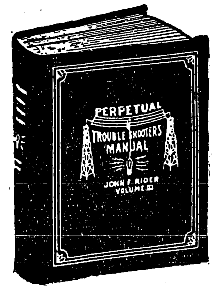
ZENITH RADIO CORP.—(Cont.)

MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
5801 Chassis	**See model 8-S-129**			
5802A Chassis	**See model 8A129**			
5803 Chassis	**See model 8-M-195**			
5804AT Chassis	**See model 8A232**			
5807 Chassis	**See model 8S359**			
5902 Chassis	**See model 970**			
5903	**See model 9-S-30**			
5905 Chassis	**See model 9-S-203**			
5905AT Chassis	**See model 9S204AT**			
5906 Chassis	**See model 9S365**			
5907 Chassis	**See model 9S307**			

ZEPHYR RADIO CO.

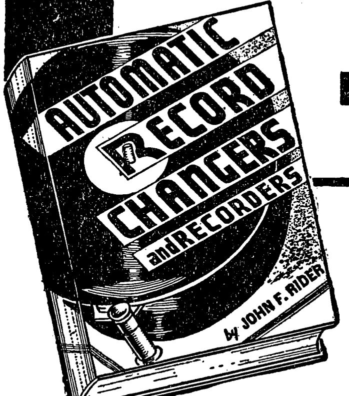
MODEL		REVISED PAGE	EARLY PAGE	RADIOTRON COMPLETE PAGE
C	Schematic	9-1		
DA	Schematic	9-1		
DB, DF. Above serial 775001	Schematic, voltage	10-1		
GB, Above serial 779001	Schematic, voltage	10-1		
NT	Schematic, voltage	7-1		
P	Schematic, Voltage	7-2		
RKD. Above serial 760001	Schematic, voltage	10-1		
RKSD	Schematic, voltage	10-1		
TA	Schematic	9-2		
Y	Schematic, Voltage	7-2		
2M7, B102	Schematic	10-2		
3M7	Schematic	10-3		
3M8	Schematic	10-3		
5DK	Schematic	9-2		
8J	Schematic, voltage	7-1		
20-A-6, 21-A-6, 22-A-6	Schematic, voltage	8-1		
20-B-6, 21-B-6, 22-B-6, 20-P-6, 21-P-6, 22-P-6	Schematic, voltage	8-1		
20-X-7, 21-X-7, 22-X-7	**Schematic, voltage**	8-2		
25X7	Schematic	10-4		
25-Y-11	**Schematic, voltage**	8-2		
30B7	Schematic	10-4		
30X5	Schematic, socket	10-5		
30Y9	Schematic, socket	10-5		
32Y5	Schematic	10-6		
33B6	Schematic, socket	10-5		
33X5, 34X5, 42X5	Schematic	10-7		
35Y12	Schematic, alignment	10-11		
39X4	Schematic	10-8		
	Socket, trimmers	10-9		
39Y6	Schematic	10-8		
	Tuner	10-9		
39YP5	Schematic	10-10		
	Socket, trimmers	10-9		
40Y8, 40Y8C	Schematic	10-10		
	Alignment, tuner, socket, trimmers	10-9		
41X5	Schematic	10-7		
41X6	Schematic, alignment	10-12		
42X5	See model 33X5			
61X6	Schematic	10-7		
B102	See model 2M7			
TSA105	Schematic, socket, trimmers, alignment	10-2		

RIDER *Publications*



Just what the Servicing Industry ordered!—

RIDER'S "Automatic Record Changers and Recorders"



800,000 record changers are providing an important source of profit for the wide-awake service shops of the country and creating a need for adequate and ready reference data to speed up trouble shooting and repair. Rider anticipated this need and has prepared—just when you need it—a sturdily bound volume containing everything you need know on any automatic record changer or recorder coming to your shop.

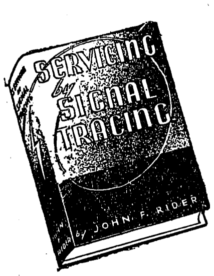
Heretofore, the serviceman's prime interest has revolved around the invisible defects which accompany the operation of electrical devices. Mechanics in radio receivers was limited to a lesser degree. However, with the introduction of the automatic record changer, some knowledge of the development of motion by means of gears, levers and cams has become necessary. Hence the birth of Automatic Record Changers and Recorders. Printed on 8½ x 11 paper, the same size as Rider Manuals, the book covers, by means of explanatory text, mechanical and electrical diagrams, all the information you must have to service these high cost instruments quickly and profitably.

CONTENTS

Chapter I—MOTORS AND DRIVES. D-C Motors. A-C Motors. Universal Motors. Maintenance of Motors. Commonplace Troubles. SPEED REGULATORS and REDUCTION DRIVES. Chapter II—RECORDERS AND PHONOGRAPHS. The Cutting Head. The Groove. Recording Needles. Pick-ups. Phonograph Needles. Chapter III—AUTOMATIC RECORD CHANGERS. Mechanisms. Troubles. Chapter IV—ANALYSIS OF RCA MODEL RP-152-C RECORD CHANGER. MANUFACTURERS' SERVICE DATA.

744 PAGES . . . . . BOUND IN BUCKRAM $7.50

SERVICING BY SIGNAL TRACING



Signal Tracing is destined to become the universally adopted method of locating defects in communication systems, no matter what the nature of the system—if it is a home broadcast receiver, auto-radio receiver, police receiver, commercial, marine, navy or army receiver. Every public address system, every centralized radio system comes within the capabilities of signal tracing. . . . Television receivers, facsimile receivers and other systems intended for special application can be serviced with equal ease. . . . Signal Tracing, founded upon the signal itself, is the most basic, most fundamental method of trouble shooting ever devised. . . . It is free of every limitation which in the past has hindered speedy service operations. . . .

You can't afford to be without this book. . . . We mean every word of this statement. . . . It is vital to your immediate welfare—to your future. . . . Get your copy today—NOW!

CONTENTS

Chapter I—Introduction to Signal Tracing. Chapter II—Amplifier Operation and The Signal. Chapter III—Diode Detector Tube Systems. Chapter IV—Multi-Element Detector Systems. Chapter V—Oscillator Tube Systems. Chapter VI—Mixer Tube Systems. Chapter VII—Control Circuits and Voltages. Chapter VIII—Coupling Devices. Chapter IX—The T-R-F Receiver. Chapter X—The Superheterodyne Receiver. Chapter XI—Television and Facsimile Receivers. Chapter XII—Public Address Systems. Chapter XIII—Localizing Defects by Signal Tracing. Chapter XIV—Signal Tracing in Receiver Design.

360 PAGES . . 188 ILLUSTRATIONS . . $4.00

SPANISH EDITION . . . $4.00

VACUUM TUBE VOLTMETERS

The vacuum-tube voltmeter has been rapidly forging to the front as a favorite tool of engineers, research workers and servicemen. By its proper use, dynamic measurements can be made under any and all conditions with a minimum of effort and time. Here is a book that is a perfect mine of information for everybody who wants to know all about these important instruments. Not only is the theory explained upon which the functioning of the different types of v-t voltmeters is based, but the practical applications of these instruments are completely described. Like nearly all types of voltmeters, multipliers and shunts are employed with vacuum-tube voltmeters to extend their ranges. These and their uses are explained, as is the calibration of the different types.

For those men who are interested in the construction of v-t voltmeters, adequate information will be found for v-t voltmeters were built in the author's laboratory, and constants are given for the components of many types, as well as a wealth of other useful data.

CONTENTS

Chapter I. Fundamentals of Vacuum-Tube Voltmeter. Chapter II. Diode Vacuum-Tube Voltmeters. Chapter III. Triode Vacuum-Tube Voltmeters. Chapter IV. Slide-Back Vacuum-Tube Voltmeters. Chapter V. Rectifier-Amplifier Vacuum-Tube Voltmeters. Chapter VI. Tuned Vacuum-Tube Voltmeters. Chapter VII. Audio-Frequency and Logarithmic Vacuum-Tube Voltmeters. Chapter VIII. Vacuum-Tube Voltmeters for D-C Voltage, Current, and Resistance Measurements. Chapter IX. Design and Construction of Vacuum-Tube Voltmeters. Chapter X. Calibration and Testing of V-T Voltmeters. Chapter XI. Applications of V-T Voltmeters. Bibliography.

180 PAGES . . 111 ILLUSTRATIONS . . $2.50

ADV Plans, LLC