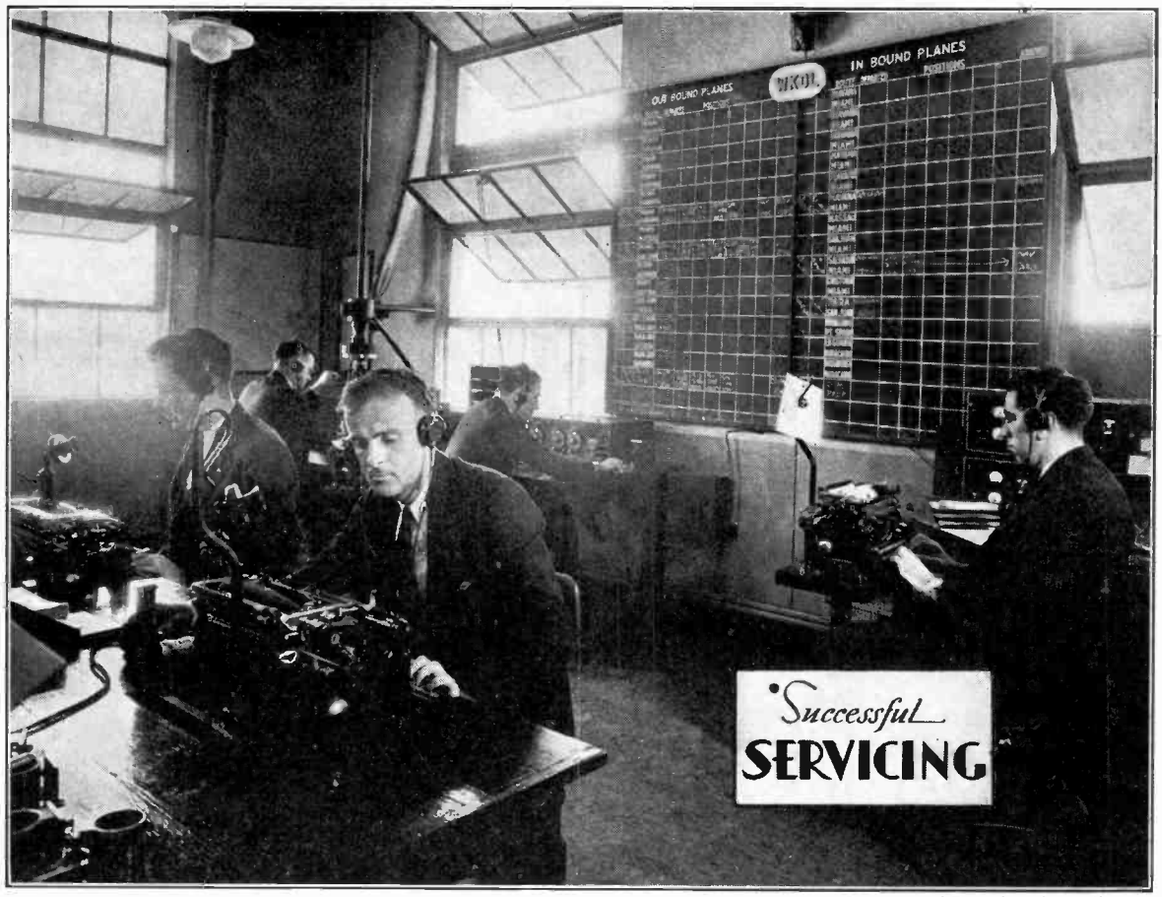


Courtesy of Pan American Airways

FEBRUARY-MARCH-APRIL, 1940

LIMITER ACTION IN F-M RECEIVERS

How This Tube Flattens Peaks in the I-F Amplifier

By JOHN F. RIDER

IN frequency-modulation receivers, one of the principal functions of the limiter is to prevent variations in the strength of the received signal from affecting the operation of the detector, which follows it. When this function is properly performed, only the frequency variations of the incoming signal act upon the detector. Since noise pulses affect the amplitude of the signal at the limiter input, most discussions of limiter action emphasize its efficiency in noise reduction by leveling off these noise peaks so that quiet reception is obtained.

It is not generally realized that the limiter also serves to flatten out peaks in the amplifying stages which precede it. As a result, it is not necessary that the i-f and r-f stages be designed to pass uniformly a broad band of frequencies and we find, in testing a representative f-m receiver, that the characteristics of these stages do not differ greatly from those of ordinary broadcast receivers. Just how the limiter functions to produce this flattening effect has not been given the consideration it deserves to the best of our knowledge, so in this article we want to tell you what actual measurements have shown us regarding this effect. Such information has a direct bearing on the alignment and testing operations of f-m receivers and therefore aids in the servicing of such instruments.

Before discussing these tests, let us first review briefly the mode of operation of f-m receivers. We know that when the transmitter is on the air and is sending out an unmodulated signal, this signal will have a constant frequency, usually in the neighborhood of 42 mc. During modulation this frequency is caused to vary above and below its unmodulated value, at a rate corresponding to the frequency of the audio modulating frequency. The strength of the audio modulation determines the amount of frequency deviation which occurs in the transmitted signal. Thus a weak modulating tone, corresponding to a soft passage in a musical program, may cause a frequency deviation of only 20 kc above and below the unmodulated value, while a very loud note may cause a frequency deviation of 75 kc each side of the mid-frequency point. The latter value is the maximum frequency deviation which is now in use. In actual transmissions, the frequency deviation is limited to somewhat less than this amount to avoid over-modulation on unexpectedly strong notes.

The frequency modulation receiver must be designed to provide a signal at the detector which is substantially uniform—a band width of about twice 75 kc or 150 kc. Since tuned circuits

(*Please turn to page 3*)

Wells Gardner Tuning Indicators

It may happen in some 1938 and 1939 receivers in which is incorporated either a 6U5 or 6AB5 tuning indicator tube that distortion or overloading will result when strong signals are tuned in. Such troubles may be caused by grid current in the tuning indicator tube. An example of such receivers are those whose schematics appear on *page 10-13 and 10-27 of Rider's Volume X*.

It will be noted that the control grid of the triode section of the 6U5 and 6AB5 tubes is connected to the avc circuit and consequently any grid current that flows will affect the avc voltage. It is suggested by the manufacturer that if such troubles occur, that one or more new tubes be tried and the results checked.

•

RCA 9TX-31, -32, -33

In cases where repeated failure of the 24-ohm, dial lamp resistor, and the lamp itself have occurred, the following revisions are suggested:

Remove all the connections from terminals Nos. 2 and 4 of the terminal board—see Fig. 1—and from terminals Nos. 2, 5 and 6 of the 35Z4GT tube socket.

Resolder the pilot lamp lead, which was removed from the No. 4 terminal of the terminal board, and the power lead that was removed from No. 6 terminal of the tube socket, to the No. 2 terminal of the rectifier socket. See Fig. 2.

Resolder the pilot lamp lead that was removed from the No. 6 terminal of the socket, to the No. 3 terminal. Add a jumper between the Nos. 3 and 5 terminals of this same socket.

Resolder the 0.05-mf condenser lead that was removed from the No. 6 terminal to the No. 5 terminal of the same socket. The other side of this condenser remains connected to the No. 1 terminal of the terminal board.

Insert an 86-ohm resistor in the lead between the No. 7 terminal of the rectifier tube socket and the No. 2 terminal of the 35L6GT output tube socket.

Replace the 35Z4GT rectifier tube with a 35Z5GT and the No. 47 pilot lamp with a No. 51.

The schematic of this receiver will be found on *page 10-43 of Rider's Volume X*.

•

Silvertone 6109, 6110, 6111

A later production run of these models, which is identified by the chassis No. 101.508-1, has had a new model number assigned, 6109. Please add that to your index and on *page 10-78 of Rider's Volume X*.

The condenser, C9, in the cathode circuit of the detector, has been changed in this new chassis from 0.25 mf to 10 mf. This is a 10-volt electrolytic condenser, the part number being 10120944.

If trouble should be experienced from hum in the original chassis, 101.508, it can be corrected by connecting a 10-mf condenser across the 0.25-mf condenser, C9, mentioned above. The positive lead of the condenser should be connected to the cathode of the 6J7 detector tube and the negative lead to the chassis.

•

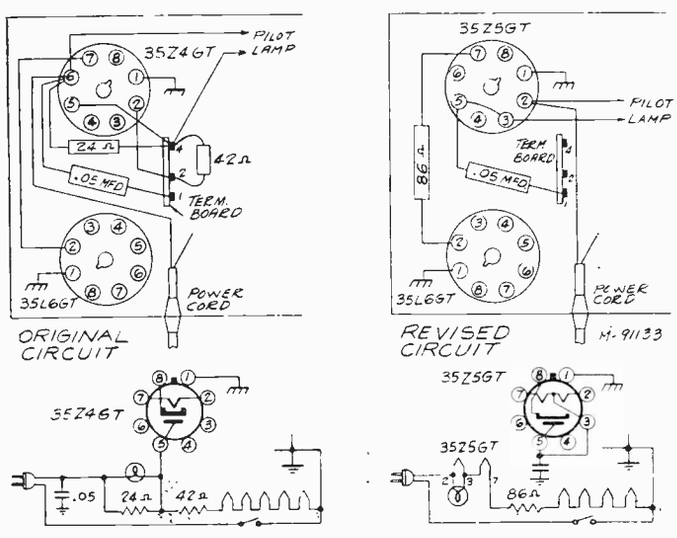


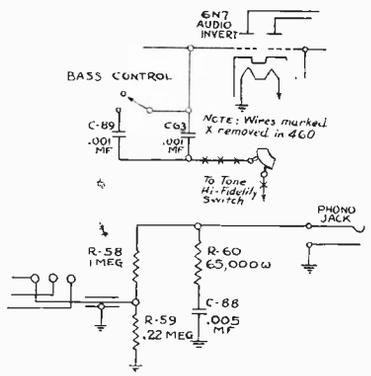
Fig. 1, left, shows the rectifier circuit of the RCA 9TX-31 series before changes were made and Fig. 2, right, the revised rectifier circuit.

•

Stromberg-Carlson 460-PF

The servicing data for the model 360 which appeared on *pages 10-35 to 10-39 inclusive in Rider's Volume X*, apply to this new model with the following exceptions:

A volume-control motor is installed in these receivers and a remote control unit that is identified as P-31860 may be easily connected if so desired. This unit permits the operation of the receiver from a remote point.



Additional phonograph compensation is incorporated in the Stromberg-Carlson Model 460-PF as shown in the above partial schematics.

An automatic record changer is used in this receiver, which will automatically play up to eight records, 10 or 12 inch, in any order. Additional phonograph compensation has been added, as shown in the accompanying diagrams.

•

Halson 40A1X

The same schematic applies to this model as applied to models 104, 106 which was published on *Halson page 8-4 in Rider's Volume VIII*, with the exception that a 6K8G replaces the 6A7 first detector-oscillator tube.

The socket layout, which appears on the same page as the schematic, can be also applied to this new model if the following exceptions are taken into consideration: The positions of the 80 and 41 tubes are interchanged, i.e., the 80 is now immediately beside the power transformer. The 76 and 6F5 tubes are interchanged, i.e., the 76 is now at the rear of the chassis. The wave-trap trimmer is now reached from the back of the chassis—between the 6D6 tube socket and the first i-f transformer—instead of the right side and the broadcast oscillator series trimmer is now located just to the left of the gang condenser on the top of the chassis, instead of the front.

•

F-M Limiter Action

(*Continued from page 1*)

are used in the r-f and i-f stages, it is natural to expect that the signal at the resonant frequency will be amplified to a greater degree than one at a frequency to which the receiver is not tuned. This is the case in actual operation and we shall see that the action of the limiter is to bring down the stage amplification to a constant level over a wide frequency range, provided that the input signal strength at the extremes of the frequency range is sufficiently great as to cause the limiter to function.

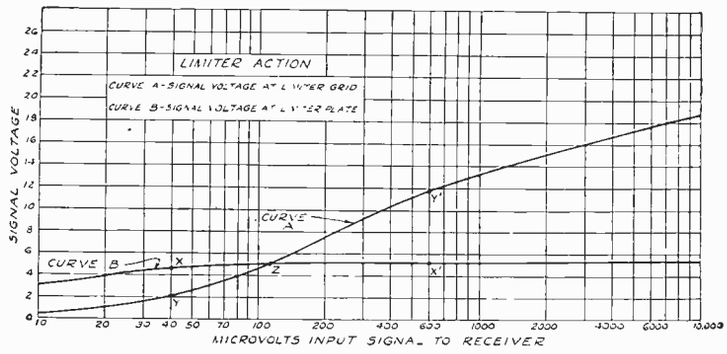


Fig. 1, above. Curve A shows signal voltage at limiter grid and Curve B, signal voltage at limiter plate for different values of the input signal to the receiver.

The strength of the signal required to produce limiting action can be determined from Fig. 1. Curve *A* shows the signal level at the limiter grid for various input signal strengths at the receiver antenna and ground terminals. Curve *B* shows the corresponding signal voltage which is developed at the limiter plate. Note that when a 40-microvolt signal reaches the receiver, the amplified signal at the limiter grid is 2.2 volts, as shown at point *Y*. At the limiter plate, this signal is amplified slightly to 5 volts, as shown in Curve *B*. Now, if we apply double the input voltage to 80 microvolts, and no limiting action took place, we should expect that the output signal should also double. However, we find that an 80-microvolt signal actually produces very slightly more than 5 volts at the limiter plate. Thus any increase in signal voltage at the limiter grid over and above 2.2 volts produces no appreciable increase in the output of the limiter. This is shown in Curve *B*, which is substantially flat over the entire range above the limiting point.

Now let us examine the selectivity curve, Fig. 2, which represents that of a typical i-f amplifier used in an f-m receiver. This curve shows how much stronger the signal input to the i-f amplifier must be at frequencies which differ from the resonant frequency to produce the same signal voltage at the limiter grid as results when a signal at the resonant frequency is applied to the i-f amplifier. In this particular receiver, the i-f resonant frequency is 2.1 mc. Therefore, the kilocycle calibration points on the curve represent frequencies above and below 2.1 mc.

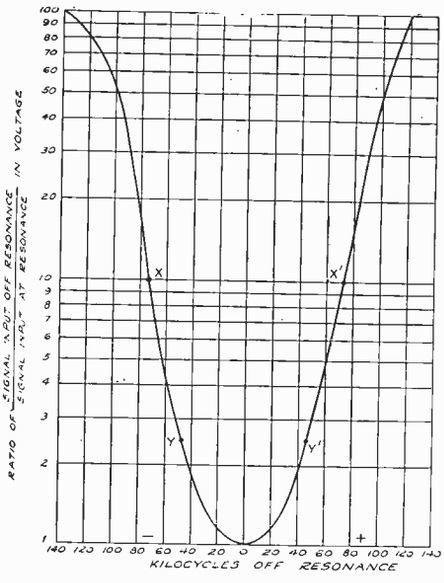


Fig. 2, above. Selectivity curve of an i-f amplifier in an f-m receiver. Fig. 3, below. The limiting action depends on the input signal strength and the three band-pass curves here shown illustrate this effect.

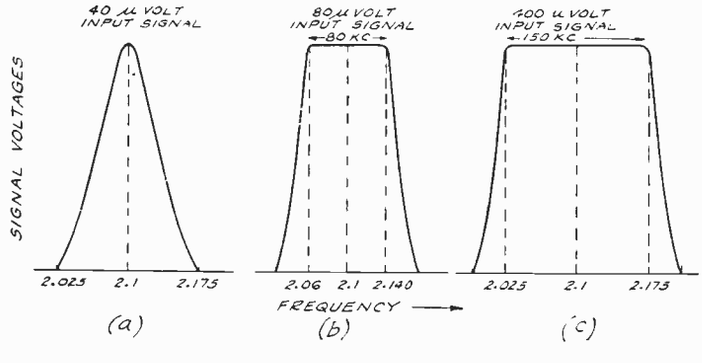
If we refer back to Fig. 1, we find that 40 microvolts input signal will produce 2.2 volts at the limiter grid. This is at the resonant frequency of 2.1 mc, and we note also that limiting action takes place at this signal level. But since a frequency-modulated signal may vary 75 kc above or below the resonant frequency of 2.1 mc, we have to consider the signal level required to produce the same limiting action at points 75 kc higher and lower than 2.1 mc. Our curve, Fig. 2, shows that we require 10 times as strong a signal at 75 kc off resonance to produce 2.2 volts at the limiter grid as is required at the resonant frequency of 2.1 mc. Therefore, if we apply 10 times 40 microvolts, or 400 microvolts, to the receiver input we shall still obtain 2.2 volts at the limiter grid, even though the signal frequency is 75 kc off resonance.

For signal frequencies which are less than 75 kc off resonance, the signal level at the limiter grid will of course increase. But we can see by Curve *B* in Fig. 1, that the output signal at the limiter plate remains substantially constant. Even at resonance, the 400-microvolt signal does not give appreciably more output at the limiter plate than the 40-microvolt signal. In fact, increasing the input signal to 50,000 microvolts still does not increase the output at the limiter plate.

If the received signal strength is less than 400 microvolts then, for an amplifier of these characteristics, the amplified signal reaching the limiter grid will not be strong enough to produce limiting action over a 150-kc band, though a narrower band will be accommodated satisfactorily.

Just how this flat-top band-pass effect is obtained, is shown graphically in Figs. 3(a), 3(b) and 3(c). In Fig. 3(a), the signal arriving at the limiter is weak so that limiting action takes place over a very narrow frequency range. In Fig. 3(b), the lim-

(*Please turn to page 4*)



F-M Limiter Action

(*Continued from page 3*)

iting effect on a somewhat stronger signal is shown and in Fig. 3(c), the maximum desired band width is obtained because the received signal is sufficiently strong to cause the limiter to act over the entire desired frequency range.

There are other considerations which also affect the limiting action so the curves as drawn in these three figures are only illustrative. The limiter output circuit is tuned, though broadly, so a slightly stronger input signal is required to produce perfect limiting than can be predicted from the data and figures which we show. Also, avc action tends to affect these figures slightly.

In general, we shall find that the maximum band width of 150 kc will seldom be used. A certain amount of reserve is necessary, as with amplitude modulation, to prevent over-modulation on unexpectedly strong modulation peaks. In view of this consideration, it will be found that a flat band pass of 120 kc to 140 kc will be sufficient for all practical requirements of high-fidelity operation.

Signal At Limiter Plate

The results are surprising in that they do not conform with the theoretical discussion associated with Fig. 3, wherein a flat-topped response curve is developed by establishing the output signal voltage at one frequency and assuming that the output will be maintained constant. The practical findings given herein have been verified by others and the reason behind the condition is associated with the varying impedance of the tuned plate winding in the limiter plate circuit over the complete frequency deviation range and because of interaction between the primary and secondary windings of the discriminator transformer.

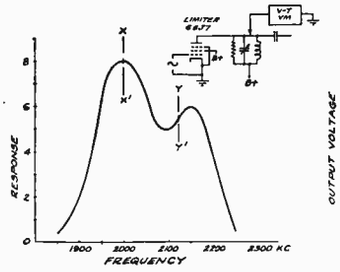


Fig. 4. Response curve obtained across the tuned plate winding of the limiter

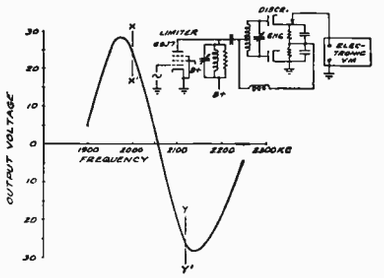


Fig. 5. Discriminator characteristic for the signal conditions of Fig. 4

In contrast to the flat-topped response curve shown in Fig. 3-c, the general shape of the response curve across the tuned plate winding in the limiter plate circuit is like that shown in Fig. 4. Yes, it is a double peaked curve.

Lest you might be inclined to doubt the possibility of securing the proper discriminator characteristic with such signal vs frequency response in the limiter plate circuit, Fig. 5 is the discriminator characteristic for the signal conditions shown in Fig. 4. Both were plotted at the same time. Referring again to Fig. 4, it is customary for the hollow of this double-humped curve to be about 2 to 3 db down from the peak or the voltage at the highest peak to be about 1.3 to 1.5 times the voltage at the bottom of the hollow.

You might wonder at the broad response of both curves. That taken at the limiter plate was made over the full range to which the circuit would respond, although in actual practice, the frequency deviation range of the signals transmitted is much less. In fact the receiver used to make these curves is a standard f-m receiver rated at a bandwidth of approximately 65 kc each side of the i-f peak. This is evident in Fig. 5, where the linear portion of the curve extends for about 65 kc each side of the peak of 2.06 mc. The useful portion of the response curve in Fig. 4, which corresponds with the useful portion of Fig. 5, is between the lines XX′ and YY′.

In case you might have occasion to plot the signal voltage vs frequency at the limiter plate, you might secure a curve which has a different proportion between the two peaks, but in general the shape of the curve will resemble that shown in Fig. 4.

•

RCA R-98

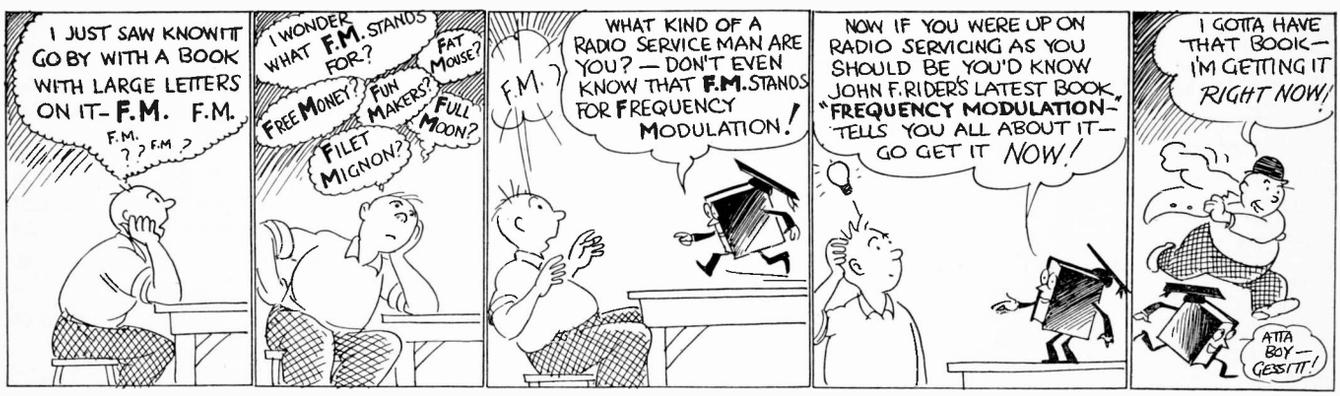
If a complaint is received of excessive hum in this model, the schematic of which will be found on *page 10-95 of Rider's Volume X*, the dress of the lead to the pilot light should be checked. This lead should be placed towards the rear of the chassis base, well away from the audio circuits.

•

The Cover

The busy room shown on page 1 is located in Miami, Florida, is the radio control room at the airport of *Pan American Airways,* through whose courtesy this photograph is reproduced. Progress of planes to and from Cuban and Central American ports are noted on the blackboard between the windows. In the corner is the radio compass equipment for the guidance of incoming planes.

Gessitt Finally Moves



Successful
SERVICING

Reg. U. S. Pat. Off.

Dedicated to financial and technical advancement of the radio service man.

Published by

John F. Rider, Publisher
404 Fourth Ave. New York City

John F. Rider.....Editor
G. C. B. Rowe.....Assoc. Editor

This publication is the house organ of the publisher and if due credit line is given, permission is hereby granted editors to reproduce material contained herein.

Vol. 6 Feb.-March-April, 1940 No. 4

NO STAGNATION

ONE of the greatest evils that any industry has to guard against is stagnation. This is really a state of mind on the part of an industry's leaders — a self-satisfied, smug idea that their individual companies are showing a nice profit on the products they are marketing, so why spend money on research for some new item or some improvement on their old one? Such inertia seeps down from the top men and before long things with that industry are in an unhealthy state.

Happily, such stagnation has never hit the radio industry—and from what can be read from the signs of the times it will be a long while before it does. Even those of you who have been in the servicing business a relatively short time have seen vast improvements made in receivers and you who are old-timers have seen a vast industry grow from scratch — an industry now involving millions of dollars annually.

"Well, all that may be true," you might say, "but how does all this fine expansion you talk about affect the serviceman? Certainly, great improvements have been made in receivers, but for the most part I still get the clucks in my shop. The rest of the industry may not be stagnant, but I don't see where or how it affects me."

Let us consider just two or three facts that have come up not so long ago and see how the service personnel of the industry will be affected.

First, the North American Regional Broadcast Agreement now has been ratified by Canada, Cuba, Haiti, Mexico and the United States. This treaty, in substance, provides for the allocation of broadcast facilities from 550 to 1600 kc between the countries involved. At the present time, no channels have been made available specifically for Mexican and Cuban stations and the operation of high-powered transmitters in those countries has been a source of interference to stations in this country. Now in order that this interference be reduced to the minimum, a large number of United States broadcast stations may have to change the frequency of their carriers, especially those stations now operating above 720 kc.

If these frequency changes are effected by the F.C.C.—and the signs seem to point that they will—think what they will mean to you. How many pushbutton tuners did you adjust in the past year or so? How many owners of such receivers do you think are capable of making the several adjustments necessitated by this proposed reallocation so that their favorite stations can be picked up? We venture to say—a comparatively small percentage. And so that means a perfectly legitimate excuse for you to call on your customers for the readjustment of their tuners and it seems to us that the chances are good that if you do have such an entrée, you will find in many instances that some work on the receiver has been deferred and as long as you are there, you might as well do the whole job, etc., etc.

Again—the attention of set owners is being directed more and more towards frequency modulation. Here is a development of radio that, unless we miss our guess by a wide margin, will take hold of the listening public's fancy in short order. Already four New York f-m stations are on the air.

Now you know without our telling you that these stations would not go to all that expense of f-m broadcasting if they were not sure that plenty of people had f-m receivers with which they could pick up the programs and, further, manufacturers would not make such receivers if they had not been assured that programs would be provided.

And what bearing has all this on the service industry? First and foremost, there is the antenna. For efficient reception of the high-frequency carriers—in the neighborhood of 40 to 44 mc—a good antenna installation especially designed for this type of work is a necessity. This means, of course, a job for the serviceman. . . . And then there are the f-m receivers themselves that will eventually require the attentions of a serviceman. Maybe manufacturers will make f-m converters which will be installed by servicemen. . . .

And television. . . . Perhaps the fact that the radio industry has been making haste slowly has been a disappointment to many of you, but we assure you that it will be better for everybody in the long run. No matter how long it may take for television to reach a commercial level, one thing is definite: television has proved itself as being a practical development. No longer can we say television is a thing of the future—what is in the future as far as television is concerned is the establishment of standards. Today there are some divergent opinions concerning such standards, but they will be ironed out and *not* in the far distant future. In the meantime, television development continues.

And facsimile. . . . Some time ago there was quite a flurry in this phase of radio transmission. Agitation has died down, but this does not mean that all activity has ceased. A number of stations are still transmitting facsimile pictures and we say without fear of contradiction that in time to come facsimile will find its niche in the scheme of things.

Sound on film for home movies uses audio amplifiers, similar in design to those used in radio receivers, so that the serviceman who calls in the home to repair a radio receiver will some day be called in to repair the sound amplifier. Mayhap the sound-on-film home movie will be tied in with an oscillator and the signal fed into the regular receiver, or mayhap the "pec" amplifier will feed into the audio amplifier in the home receiver.

And speaking of maintenance, give thought for a moment to the vast improvements in testing equipment that have been made within the past few years. How much easier it is for you to find the trouble in a receiver today if your shop is equipped with modern apparatus and if you use up-to-date testing methods! Again, consider the increased cooperation that the receiver manufacturers are extending to the service field today over what was given say eight or nine years ago.

No, sir—there is no stagnation in the radio industry!

—JOHN F. RIDER

FREQUENCY MODULATION

ONE of the goals towards which the research engineers of the radio industry have been driving is perfect reproduction of the music or speech that is transmitted over the air. That a great deal has been accomplished in this line of work is evidenced by the broadcasts that are now commonplace and available to anyone who has a few dollars to spend for a receiver, but even the most elaborate receivers still have not filled the bill completely. They approach the ultimate in fidelity of reproduction—approach it to a marvelous degree—but there is still room for improvement.

For more than fifteen years engineers have been investigating the problems of transmission of signals. As you know, the use of the amplitude-modulation type of transmission is universally used in broadcasting as this was found to be more satisfactory than any other form. This point of view was accepted by the radio industry after the publication of findings of Carson, Roder, Andrews and others who seemed to be agreed that amplitude modulation was the best for all-around purposes. However, Major Edwin H. Armstrong continued his experimental studies on other methods of modulation and found that frequency modulation had great possibilities and that its problems were not unsurmountable, as had been the general impression. Within the past few years other experimenters worked on the problem and today frequency-modulated signals are being broadcast by stations holding experimental licenses and their number is increasing all the time in all sections of the country.

Receiver manufacturers, realizing the trend of the experiments, have done some intensive work on the reception of these f-m signals. Today two companies have put several f-m models on the market and others have announced that they will go into production in the near future. And this throws it right into the lap of the serviceman! While it is true that frequency-modulation receivers employ the superheterodyne principle of operation, yet there are a couple of major differences between amplitude-modulation and frequency-modulation receivers that have to be understood if intelligent service work is to be performed on them.

With this in view Rider has prepared a book especially for servicemen, the title being the name of this new form of transmission—*Frequency Modulation.* A broad view of the differences between the two types of transmission and reception—amplitude modulation and frequency modulation—are first presented so that you can gain a picture of the whole subject and then specific differences are discussed.

The second chapter deals with the f-m signals as they are sent out from the transmitter, but this phase of the subject goes only into that amount of detail that is considered necessary for a general idea of why these signals behave as they do. The primary idea of servicemen is the maintenance of receivers—in the main, they are not interested in the transmitter except in a general way—and so extensive transmitter schematics and data have no place in this book.

The third chapter deals with the receiver. As was mentioned above, this superheterodyne type of circuit is similar to those which come into your shop daily with just a few exceptions. Yet it is these differences that play the important role in the reception of f-m signals and these are the items with which you must be familiar. These are all explained in the greatest detail and, as usual in all Rider books, along with the explanation of the functioning of a certain portion of the circuit go certain notations that will enable you to tell when it is not performing as it should.

Then the subjects of service areas and antennas are treated. Inasmuch as f-m signals are broadcast with carriers between 40 and 44 mc, these are important considerations for a serviceman and are covered in the necessary detail.

The whole subject matter of "Frequency Modulation" leads up to the final chapter—the servicing of the f-m receivers. These are the most important pages in the book. Before a word of this chapter was set down on paper, extensive experiments were performed in the author's "SUCCESSFUL SERVICING Laboratory". Here manufacturers' servicing instructions were followed on receivers and the results checked and re-checked. Hundreds of oscillograms were made during different stages in the process of alignment—during the locating of troubles that had been deliberately introduced in the circuit. Here it was that signal tracing was found to be as efficient for trouble shooting in f-m receivers as it is in a-m receivers. Then this mass of data and findings was studied and written up so that you will be able to do a real servicing job when f-m receivers start coming into your shop. Everything has been included—test hook-ups, oscillograms, notations, instructions of all kinds—that will in any way help you to do a real job.

Space does not permit a detailed description of this newest book on radio's newest development. . . . Moreover, the book can speak for itself! By the time you read these lines, your jobber will have had copies of "Frequency Modulation" delivered to him, so at your earliest opportunity stop in your jobber's and see for yourself how good the book is. We're betting you'll say, "Rider has done it again!"

In Connection with F.M.
Read Rider's
"Automatic Frequency Control"
"An Hour A Day with Rider on Alternating Currents in Radio Receivers"

Rolling REPORTER

SOURCES

Seems as to how books are sources of information and the latest source from the typewriter of J.F.R. is about other sources—sources of signals (*oscillators, to you till you read the book*). Of course, lots and lotsa books have been batted out that tell about oscillators but *this is the first time the subject has been covered especially for servicemen.* As usual, the Boss tells about how the different types of oscillators perk and then comes the dope you'll like—**how the oscillators most of you use every day should work and *what to do if they don't.*** The chapter on the use of an oscillator in testing is another one that will give anybody an idea or two or three. When you've read it, let's know how you like this latest source about sources **"THE OSCILLATOR AT WORK."**

NEW XMITTER FREQS???

A plan's in the offing whereby the F.C.C. may change the freqs. of a lotta broadcasters before you tear many more months offen the calendar. The idea in back of this reshuffle of kilocycles is to reduce the interference between stations in Cuba, Canada, Haiti, Mexico and the U. S. Seems as to how no channels were ever given out just for Mexican and Cuban stations and so intereference is sometimes pul-lenty, especially along the borders. NOW—*if and when* some U. S. stations do get dealt new carriers, will that deal out a dividend or two to youse guys???? *How about all those push-button tuners you've set up in the last coupla years???* There are millions of them in use! We'll give you the low-down just as soon as we get it ourselves . . .

SPEED

'Tweren't so long ago, the Boss was tellin' us about when he was makin' one of his airplane jumps on his last trip, how an Army plane appeared wa-a-ay behind his ship and in less than nothin' had zoomed past him as though his ship was anchored to a cloud *instead of makin' about 200 miles per* . . . All of which reminds us of the way F.M. has been spreadin' over these here United States . . . Of course, we slipped you the high spots on F.M. in the Vol. X "How It Works," but figgerin' youse guys wanted more'n that, J.F.R. went to it and batted out "F.M." after a series of sessions next door in the lab. *Look for the big white letters F.M. on the front of the book!!!!*

"'STOO EASY!"

That was the comment we ran up against t'other day during one of our rounds by a serviceman when he was discussing **signal tracing.** He let out a bleat that he had spent *years* perfecting his cat-ray oscillograph technique and here the Boss lets loose on the world *something as easy as signal tracing* . . . Gee whizey—it's a tough world, ain't it?????

RIDER TALKS AND FISHES

Finishing up his series of country-wide talks, J.F.R. talked to crowded houses in **Jacksonville** on Feb. 6th; **Orlando,** Feb. 7th; **Tampa** on the 8th and **Miami** on the 9th. From all indications you servicemen in Florida liked what the Boss had to offer just as much as Lady Luck, for when he went fishing down there he yanked out a 56½ lb. sailfish that was 7′ 2″ and a 4′ 6″ wahoo, which we are told is also a fish, being a cousin or sumpin to a mackerel *and not an Indian saying* . . .

N.A.M. GIVES

At a dinner held here in N. Y. at the Waldorf-Astoria on Feb. 27th, the *National Assoc. of Manufacturers* put itself on record as recognizing the fact that industry does owe something to inventors . . . In the radio and communications field, among other inventors honored were Drs. Goldsmith, Coolidge, Langmuir, deForest, and Major Armstrong, the latter being responsible for a great amount of work on the fundamentals of *frequency modulation* . . .

VOL. XI

Well, the pile of dummy pages is getting bigger and *BIGGER* and any day now the gang in the Ed. Dept. will assume that wild-eyed look that means that the printer is *houndin'* 'em for **MORE PAGES.** As is our wont, we did a little snoopin' round and about tryin' to find out what is going to be the BIG feature of **Vol. XI** and to our surprise and chagrin were told to go fly a kite. However, we sicced Aloysius W. on to the Ed.'s young minion and A. came back looking like the proverbial pussy that was outside the canary. He'd found out alright, but, heel that he is, he would only say this new feature was NEW+ and that *it was sumpin every serviceman would want to own and could use plenty.* (*Aside to our readers:* Do any of you know any good, old-fashioned tortures we could apply to that young g+)?!)?(8nl!?)& of a twirp? A well-laid-on rubber hose or the hot foot have no effect a-tall! All suggestions —*and the more lurid the better*—will be welcomed by

THE ROLLING REPORTER

•

Opportunity

A manufacturer of sound-slide film projector equipment is desirous of expanding their service facilities to the cities mentioned below. They would like to contact reliable servicemen in these cities who would carry a stock of parts furnished by the company and who would be supplied with all the necessary technical information for servicing the company's products. Each service station would cover an area of approximately 150 to 200 miles around its locality and its name would be listed in the company's operating instruction booklet that goes out with each unit so that the owner would know the location of the nearest service station in case of trouble.

The cities in which this company is interested are: Seattle, Wash., Los Angeles, Cal., St. Louis, Mo., Atlanta, Ga., Boston, Mass., Washington, D. C., and Dallas, Texas. If your business is located in or near one of these cities and if you want to branch out, write your qualifications in a letter addressed to Mr. F. Jones in care of the office of the publisher, 404 Fourth Avenue, New York City, and it will be forwarded unopened to the company.

YOU may think the gent in the above picture is acting snooty because he's wearing a new spring bonnet and a Klassy-Kut topcoat, but 't ain't that a-tall. He's just won an argument with three other servicemen over how to test an automatic volume expansion circuit and he won the battle hands down when he backed up his statements with the dope in Rider's "SERVICING BY SIGNAL TRACING" . . .

Yes, sir, you gotta have *facts* in an argument if you're going to come out the winner, just the same as you have to be able to apply those facts when you have an ailing set on your bench. And the best place to get the real, honest-to-goodness information you need every day is from Rider's books.

For instance, take "Servicing by Signal Tracing." There's a book of 360 pages and if there aren't enough well-illustrated brain-throbs packed in between those two covers to save you plenty time and money, well, we never saw any. Not only can you find out *how* and *why* a signal gallops through a receiver, but *what to do it it doesn't and do it the easy way!* It's $2.00 at your jobber's.

Then there's "THE OSCILLATOR AT WORK." You've been using oscillators of one kind or another for a long time, but are you getting the most out of them? Do you know what to do if your signal source goes sour when you are right in the middle of a rush job? You'll find the answers in Rider's *"The Oscillator at Work"* and it's only $1.50.

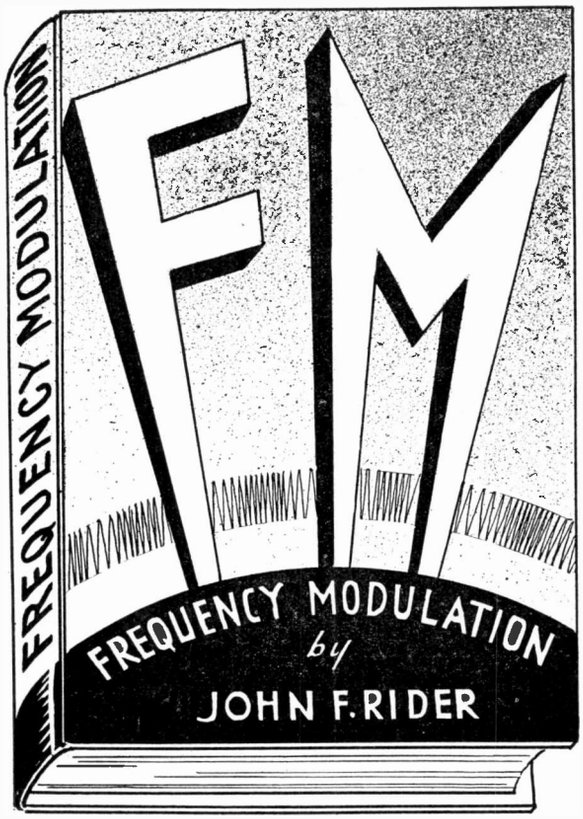
And when you get a job on your bench that you've never seen before, what's the first thing you do? Right—reach for a Rider Manual Index to see which volume the service data is in! And if you haven't all 10 volumes, then what??? Right, again—you develop a headache, if you're missing the one volume you need ot the moment. Save yourself from the serviceman's blues and have all 10 Rider Manuals on hand when you need them.

Vol. X	1664 pages	$10.00
Vol. IX	1672 pages	10.00
Vol. VIII	1650 pages	10.00
Vol. VII	1600 pages	10.00
Vol. VI	1240 pages	7.50
Vol. V	1200 pages	7.50
Vol. IV	1060 pages	7.50
Vol. III	1070 pages	7.50
Vol. II	800 pages	7.50
Vol. I	1000 pages	7.50

YOU NEED ALL 10 RIDER MANUALS

FREQUENCY MODULATION

NEW-HOT



Ready APRIL 18th

•

Flexible Cloth Cover

•

Illustrated

•

136 Pages

•

Price $1.00

RIDER IS FIRST AGAIN!

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 created, including a discussion of phase modulation.

Chapter III
WHAT HAPPENS IN THE RECEIVER
How the f-m signal progresses through the receiver and how a frequency-modulated signal is converted into an amplitude-modulated signal to operate the audio system.

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.

Get "F-M" at Your Jobber's TODAY!

Courtesy of Pan American Airways

MAY-JUNE, 1940

DON'T TAKE IT FOR GRANTED!

By JOHN F. RIDER

THE radio serviceman of 1940 can take nothing for granted, technically speaking. As far as his work is concerned, his mind must be a question mark: if he is going to turn out receivers that function as they should, he must check his work at every point.

Altogether too many servicemen assume too much. Just because a receiver on the bench today carries the same model number as one that was in the shop last week—or even yesterday, as far as that goes—does that mean that the two are alike in all respects? Decidedly it does not! Do not forget that this radio business is one of constant development—it moves ever forward and that thousands of engineers are working with one idea in mind: to improve their company's products. And that results in something new all the time—something new which servicemen should know about before working on a receiver.

Let us first consider this matter of improvements in existing models. Before a receiver is handed over to the production department of a manufacturer, it undergoes a series of tests to see how it performs under different conditions. Then for the sake of argument let us assume that the production department makes certain changes in the chassis for one reason or another, which, after being checked by the engineers, are incorporated in the set. Now suppose that when the receiver is out in the field certain unforeseen conditions arise that call for certain changes in the receiver. In the meantime, these sets have been sold widely.

The manufacturer puts it up to his engineers to see what can be done to produce the desired results in future production runs. They find that a resistor added here and the value of a condenser changed there will take care of the trouble and so the changes are incorporated in future receivers of that model.

Now suppose that one of the "early" models come into a shop for repair. If the serviceman, taking nothing for granted, looks up all the available servicing data pertaining to that receiver, he will find that certain changes have been made in the chassis, which may or may not be incorporated in the particular receiver now on his bench. If this one be of the "early" production, then he will know why there is a lack of conformity between the data and the receiver; if the set be of the "late" production, he will know why the changes were made. In the former instance, it is up to the serviceman to incorporate the changes in the early chassis so

(*Please turn to page 3*)

RCA 8QB, 8QBK

Please make a note in your Vol. XI Index that the Victrola Attachment for those models is the same as that used with Model 10Q1, which will be found on *page 11-40 in Rider's Volume XI.*

•

Belmont 507, Series B

The Series B of this model, starting with serial number 324400, has a trimmer condenser shunted across the antenna section of the gang condenser. This trimmer, C16, is in the same unit as the electrolytic condensers, C8, C10, C13. With this exception, the Series B is the same electrically as the schematic shown on *page 11-5 of Rider's Volume XI.* The arrangement of the ac-dc line cord and the A-battery cord has been changed, these being brought around to the right side of the chassis.

•

Silvertone 6038, 6138, 6193

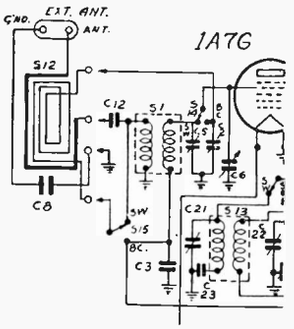
Chassis identified as 101.517-1 have had circuit changes made to stabilize the spread bands. Also the model number 6193 has been added to the two model numbers in which the original chassis, 101.517, were used. The intermediate frequency has been changed from 465 kc that was used in the original chassis to 455 in the later chassis.

Silver mica condensers, C57, C58, and C59 have been added and a triple trimmer condenser has replaced the trimmers C26, C27, and C28. These are shown in the partial schematic and in the chassis layout shown herewith. The later chassis use different knobs, escutcheons and push-buttons. The original schematic will be found on *page 10-59, 60 in Rider's Volume X.*

•

Pilot T-1452

Several changes have been made in the receiver, the schematic of which is shown on *page 10-26 of Rider's Volume X.* The resistor R-14 in the battery circuit has been changed from 1200 ohms to 800. The output tube has been changed from a 1C5G to 1Q5G. The loud speaker was formerly a 5-inch permanent-magnet type; this is



The loop circuit of the Pilot T-1452 has been modified, as shown in the above schematic.

now a 5¼-inch speaker of the same type, the part number being 40877.

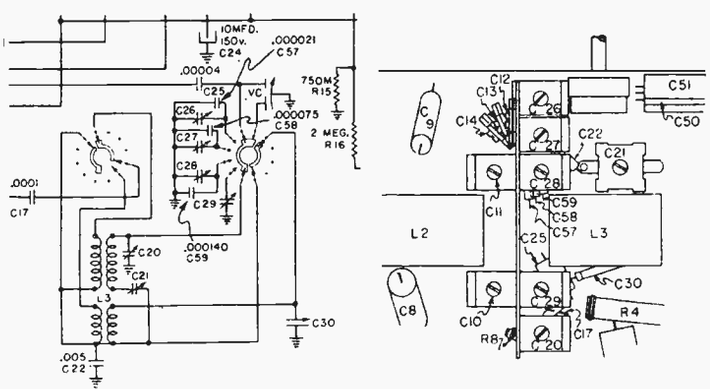
The loop antenna circuit has been modified, as shown in the accompanying partial schematic. Provision is now made for external antenna and ground connections and an additional condenser, C8, has been added. The value of this is 0.01 mf, 600 volt, paper.

•

G.E. J-65, Golden Tone

The chassis used in this model is the same as that used in model HJ624, the data for which will be found on *pages 11-62 to 11-66 inclusive in Rider's Volume XI.* The new model uses a 12-inch magnet dynamic speaker instead of the 6½-inch speaker formerly employed. Please add this new model number to your Volume XI Index.

•



The new condensers are shown in the partial schematic and layout of the Sears-Roebuck chassis 101.517-1.

Goodyear 601—Run 3

The values of three resistors and a condenser have been changed in Run 3, but the schematic on *page 10-7 in Rider's Volume X* applies to this run as well as to the first two. C7 has been changed from 0.0005 mf to 0.0001 mf. The volume control, R4, has been changed from 1 megohm to 0.5 megohm. Both R7 and R9 now are each 500,000 ohms; previously they were 100,000 ohms and 2 megohms, respectively.

•

DeWald 406-R Late

The volume control and a condenser have been changed in the late production of this model. The value of the volume control remains 25,000 ohms, but a 300-ohm stop has been incorporated at the cathode end. The value of the 100-mmf condenser between the plate and cathode of the 12F5GT detector has been changed to 250 mmf. The rest of the components are the same as those shown in the schematic on *page 10-1 of Rider's Volume X.*

•

DeWald 660

The schematic of this model is the same as that appearing on *page 9-9 of Rider's Volume IX,* the only change being in the wave bands covered. The coverage now is: 540-1760 kc; 2.7-8.8 mc; and 8.57-24.0 mc.

SPEED UP YOUR WORK—SPEND

AN HOUR A DAY WITH RIDER ON

RESONANCE AND ALIGNMENT

A clear, easily understood explanation of what happens when a circuit is tuned to resonance and what alignment really means. 96 pp. 48 figures.....60c

AUTOMATIC VOLUME CONTROL

In Rider's personalized style. Information that will make your AVC work easier and more profitable. 96 pp. 65 illustrations.....60c

D-C VOLTAGE DISTRIBUTION IN RADIO RECEIVERS

The theory and practice of d-c voltages — how they are led through various types of networks to the tube elements, calculation of resistances, etc. 96 pp. 69 illustrations.....60c

ALTERNATING CURRENTS IN RADIO RECEIVERS

An explanation of how radio-frequency and other currents behave in receivers. 96 pp. 71 figures.....60c

Don't Take It for Granted

(*Continued from page* 1)

that when the receiver leaves his hands it will function as perfectly as it is within his power to make it.

As you can see, this is all based on the assumption that the serviceman takes nothing for granted—that he consults all the available servicing information before he starts work on the receiver. If he has not acquired this habit and assumes that today's model is the same as yesterday's without checking himself, then it is probable that he will run into a snag. Furthermore, if an early model does come his way and he does not make the changes specified by the manufacturer, he is not giving his customer a really first-class job.

Now when it comes to receivers with which the serviceman is totally unfamiliar, it might be thought first off that the natural thing to do is to consult the schematic of the set at least—to get an idea of the type of circuit used and a general picture of the job. Unfortunately—and we mean just that—too many servicemen take it for granted that the receivers made by one manufacturer follow along certain lines and that they are all more or less alike. That may be true enough, but it does not necessarily follow. The one and only safe procedure to follow is to start with the assumption: here is a new receiver about which nothing is known; before a thing is done to it, find out as much as possible about it. When you get right down to cases, how is it possible to do an intelligent job any other way?

Don't take our word for it—prove it to yourself. Look over the schematic diagram of this season's receivers. On first glance, you might classify them as a conventional superheterodyne in many cases, but on further examination, the chances are mighty good that certain refinements—little circuit changes—have been instituted that are enough to make a big difference when the receiver is undergoing examination or test.

During a recent visit to the research laboratory of a large manufacturer, we noticed that the men who were working on instruments developed in that very laboratory had a schematic and other data pertaining to that instrument spread out on the table. And what is more—they were consulting them constantly. Now here was a group of men who were working on familiar ground; doubtless some of them had worked on the development of these particular instruments, yet they were not trusting their memories—they were not taking a thing for granted—they were checking every point as they went along.

Just think for a minute what this means. Here were men who knew their instruments from all angles and they were employing every means at their command to check every move they made. Then take the case of those servicemen who consider the time wasted that they spend studying the service data even pertaining to receivers with which they are unfamiliar. Servicemen can not pick and choose those receivers that come into their shop—they have to take on all comers, new or old; they have to work on the thousands of different models made by hundreds of different manufacturers—variations of circuits and mechanical details galore!

This may seem like "old stuff" to many of you, but if you think it over you will see that it really is an important phase of your work. Manufacturers realize the importance of such information to the serviceman and spend thousands of dollars annually preparing it. As far as we are concerned, we urge you to use this servicing material, whether it be in Rider's Manuals or in any other form. Don't take a single thing for granted—check everything you do. You will find it will pay in the long run in many ways.

•

The F.C.C. and Television

New rules and regulations announced by the Federal Communications Commission on June 18th opened up television broadcast channels to an increased number of stations in leading cities from coast to coast on an experimental basis. The Commission tentatively approved 23 applications for television stations and announced that it will consider 19 other applications in the near future.

Cities in which television stations are expected to be licensed are New York, Chicago, Los Angeles, Washington, D. C., San Francisco, Philadelphia, Cincinnati, Albany, Fort Wayne, West Lafayette, Ind., Passaic, N. J., and Iowa City.

Most of these stations will be permitted to transmit television programs to the public. Every licensee will undertake to carry on research and experimentation on different engineering problems and to assist in the development of television for widespread public service.

•

Halson 40A5

The same schematic applies to this model as applied to model A5S, which appears on *Miscellaneous page 10-6 in Rider's Volume X* with the exception that in the model 40A5 a 6A8GT tube replaces the 6K8GT first detector-oscillator.

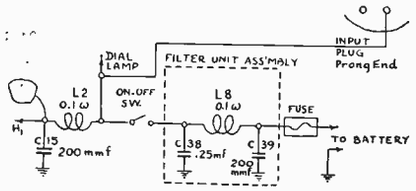
GUESSITT OFFERS—AND TAKES—HELP

Wells Gardner 6C9

The following changes in this chassis apply to the No. 1 issue and issue "B". The schematic for this two-unit auto radio will be found on *page 10-23 of Rider's Volume X.*

Condensers C6 and C7, the oscillator and interstage trimmers respectively, were originally two separate units. These are now incorporated in one unit, Part No. 17A109, but the value remains the same, i.e., 2-35 mmf. A few power cable assemblies employed a 200-mmf condenser, C37, which is now eliminated.

The following changes were made in the issue "B" receivers in order to provide better motor noise elimination, the changes being made in accordance with the accompanying partial schematic of the "A" line filter



The new filter circuit in the Wells Gardner 6C9.

circuit. The issue "B" receivers can be easily identified by the small filter unit attached to the tuning unit case.

The "A" line reactor, L6, and condenser C16 are no longer used. A new filter-unit assembly is composed of the line reactor, L8, and the condensers C38, 0.25 mf, and C39, 200 mmf.

The following changes were made in the issue "C" receivers, which may be identified by the chassis number 6C9-2C. Condensers C19 (0.04 mf), C22 (0.02 mf) and C30 (0.1 mf) now each have the same value, 0.02 mf, being a 360-volt, tubular condenser. C31 has been changed from 0.1 mf to 0.01 mf. C33 has been changed from 0.25 mf to 0.04 mf. The following resistors have been changed in value: R15 from 10,000 ohms to 50,000 ohms; R16 from 80,000 to 150,000 ohms; and R17 from 250,000 to 1 megohm. Each of these three resistors are rated at 0.2 watt as formerly.

The following parts have been removed from the "C" issue models and are not replaced: C17, a part of the tuning unit assembly, and C27, a part of the speaker unit assembly.

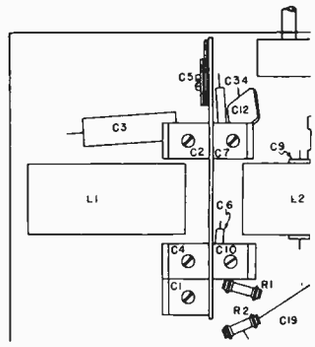
The dual tubular condenser C29A—C29B, 0.5 mf, which was located within the filter-unit shield, has been removed. One section of this condenser, C29A, has been replaced by a mica condenser, C26, 210 mmf. This C26 was formerly located outside this assembly, although it was electrically connected at the same point. Its former part number was 47X114 and it is no longer used on issue "C" models.

The other section of this dual condenser, C29B, has been replaced with a new tubular condenser, C29, 0.5 mf, Part No. 46X272. A new mica condenser, C40, 200 mmf, has been added. It is connected from the B+ side of the 40 mf condenser, C28, to ground.

•

Silvertone 6074, 6079

Changes have been made in chassis 101.515 in order to stabilize the band spread. A silver mica condenser, C34, having a value of 0.0001355 mf, has been placed in shunt with the trimmer C7. See schematic on *page 10-71 of Rider's Volume X.* Chassis in which this change has been made are now numbered 101.515-1. Also the intermediate frequency has been changed from 465 kc to 455 kc. The addition of this condenser necessitated a rearrangement of the parts, the partial layout being shown in the accompanying



The Sears-Roebuck chassis 101.515-1 layout showing new positions of the condensers.

illustration, which can be compared with that on *page 10-84 in Rider's Volume X.*

Chassis identified by 101.516-2 are the same as those above mentioned except for a change in the design of the push-button escutcheon and also additional speakers are used.

•

RCA U-50

The over-all amplification of this model, the schematic of which will be found on *page 10-61 of Rider's Volume X,* when used as a Victrola, is limited by the voltage divider circuit comprised of a resistor in series with the pickup circuit and a condenser across this circuit. If complaints are received that there is insufficient gain, this can be increased by lowering the value of the condenser C-32 to some value between 25 to 50% of the original 0.015 mf.

This value of 0.015 mf was established after the consideration of several factors: 1, the average available voltage output from the pickup under average climatic conditions; 2, the degree of "rumble" likely with a given amplification; 3, the danger of microphonic howl with a high amplification, and 4, a possible reaction on the part of the owner to overload occurring at a low volume-control setting with heavily cut records. All these points should be kept in mind, if the value of C32 is to be changed.

•

BANISH BEWILDERMENT—INCREASE PROFITS

THE CATHODE-RAY TUBE AT WORK
The most complete and practical book ever written on the oscillograph. Prepared especially for servicemen. 336 pages—Over 450 illustrations.....$2.50

AUTOMATIC FREQUENCY CONTROL SYSTEMS
Everything from the simplest type of AFC circuit to the most complicated push-pull control circuit is explained. 144 pages—Illustrated $1.00

SERVICING SUPERHETERODYNES
Many changes have been introduced into superhets in the last few years. Be able to analyze troubles quickly. 288 pages—Illustrated $1.00

THE OSCILLATOR AT WORK
Learn the theory of your oscillator and how to get the most out of it. 256 pages. Illustrated $1.50

SERVICING BY SIGNAL TRACING
Each of the 40,000,000 receivers in the United States comes within the capabilities of signal tracing as a means to locate troubles with speed and accuracy. You can't afford to be without this book! 360 pages. 188 illustrations..... Price $2.00

Read Rider Books!

Successful
SERVICING

Reg. U. S. Pat. Off.

Dedicated to financial and technical advancement of the radio service man.

Published by

John F. Rider, Publisher
404 Fourth Ave. New York City

John F. Rider.....Editor
G. C. B. Rowe.....Assoc. Editor

This publication is the house organ of the publisher and if due credit line is given, permission is hereby granted editors to reproduce material contained herein.

Vol. 6 May-June, 1940 No. 5

SELLING SERVICE

WITH the pages and pages of technical writing that come to the average serviceman every month in various magazines and journals and the stress given to this phase of servicing, the importance of sales efforts has been too much neglected. We hasten to add that we are not inferring that too much stress is being laid on technical matters but too little on the business side.

Radio servicing necessarily requires a high degree of technical knowledge and skill on the part of the men engaged in the business, but what does all that avail if no receivers are in the shop for repair? Just as much effort has to be expended on getting sets *into* the shop as getting them out in good working order. . . . In other words, you must not only be a serviceman, you must be a salesman as well.

Naturally the size of your community and the size of your business have a distinct bearing on the extent to which you can advertise, but advertise you must if you are going to get anywhere. Of course, the best and cheapest form of advertising ever known is the so-called "word of mouth," where Mr. Brown asks Mr. Smith (your customer) to whom he sends his receiver when it needs a serviceman's attention, and Mr. Smith says, "Call up Joe Jones. He did a good job on my radio." That's all well and good, but first you have to get Mr. Smith as a customer and that means an outlay of cash.

Just how large this outlay can be must be determined by you to fit your individual case, but a fair average for a going service business is about 1% or 2% of the total sales. At the start, it might be necessary to spend more than this—perhaps as much as 5%—but with an established business, the figures mentioned are adequate. Of course, these percentages are open to revision since they are based on a total sales in the neighborhood of $2000 or $3000, but no matter what figure you finally decide upon, advertising expenses are as essential as rent.

What form is this advertising to take? There again, everything depends on local conditions. It may be that posters displayed in store windows will be your answer or perhaps handbills distributed from house to house. On the other hand, direct-by-mail advertising is effective if the advertising matter is well planned, sufficiently so that the prospective customer will keep it so that if his receiver goes bad, he will call on you.

One thing to bear in mind at this particular time when planning your advertising matter is that people are depending more and more on their radio receivers for news and this is true no matter what the size of the community. With the two major political parties' conventions just upon us and the weeks of campaign speeches ahead, not to mention the war news from Europe, the listening public should be advised to see that their receivers are in first-rate condition.

But we want to bring another advertising fact to your attention: many sales promotion efforts cost you nothing except an expenditure of time. First of all, see that the receiver you repair for Mr. Smith is repaired in every sense of the word. . . . Spend a few minutes thoroughly checking your work. If the finish on the cabinet is a bit dull or has been scratched, polish it up or take out the scratch. . . . In other words, give your customers a little more than they bought—everybody likes a bargain.

Have you ever thought of giving talks on radio before some of your local organizations? Certainly the layman of today is interested in the new developments of the science and material for your talks can be easily found in daily papers or the magazines devoted to radio. Such talks would bring you in contact with prospective customers and would prove effective advertising. Another similar idea would be to get in touch with the local counsel of the Boy Scouts and offer your services as a radio counsellor for those Scouts who are earning their Radio Merit Badge. The boys could come to your shop for instruction in the evenings and it is obvious that you would be killing two birds with the one stone, giving the boys some worthwhile knowledge and through them becoming acquainted with customers of the future, their parents.

So far we have been considering only the sales promotion for radio maintenance, but the sale of radio accessories should not be overlooked. We have pointed out, on numerous occasions that the radio serviceman is in an ideal position to do a real selling job. He has the entrée into the homes of prospects who are electrically minded and if he uses his eyes and commonsense, he can do a good job of selling with very little effort. The results of such sales talks might not be immediate, but seed so sown is sure to yield fruit in the long run.

Page after page could be filled with sales suggestions, but after all is said and done, it is impossible to state that such and such a method will show results in all cases. What might be a successful sales campaign in one town would show no results in another, so we can deal only in generalities. However, we can say without fear of contradiction that every service shop, large or small, has to concentrate on sales promotion of some kind. That is something no business can do without if it is going to prosper and the sooner that fact is realized by everyone in the service industry, the better it will be for all concerned.

—JOHN F. RIDER.

o

The Cover

The photograph on page 1, which was reproduced through the courtesy of *Pan American Airways,* shows two of the ground crew sealing the joints of the fuselage with tape preparatory to the fumigation of the plane with cyanide gas. After each flight to a foreign port, every plane is fumigated with this deadly gas to eliminate any insects or harmful germs that might have made the trip back to this country.

And Now RIDER'S VOLUME XI

ONCE more the time has rolled around to tell you that a new Rider's Manual is off the press. . . . It's Volume XI and we are sure you will like it even more than you have the other ten volumes. . . .

Each year before starting to make up the next volume, we hold an editorial conference at which suggestions and plans are made for improving the book on which we are going to work. Last fall it was decided to include in Volume XI as much servicing data on the smaller receivers as we could. It was felt that these were the jobs that would come most frequently into your hands for repair inasmuch as manufacturers advised us that the sale of the four-, five- and six-tube sets were far in excess of those having more tubes. This policy has been followed, but, we hasten to add, not to the exclusion of all the eight-, ten- or twelve-tube receivers. . . . You will find them in Volume XI, but not perhaps in the same proportion as in former Manuals. Another reason for this is that the manufacturers seem to have been concentrating their efforts on the portables and sets having a smaller number of tubes.

We have also included in the 1652-page Volume XI the data on as many f-m receivers as have been released to the time of our going to press. This was a "must," for with the recent ruling of the F.C.C. that f-m broadcasting now has the go-ahead signal, such receivers will soon be coming into your shops.

A few more manufacturers are now supplying gain data along with their regular servicing material. For instance in the General Electric service notes, such data will be found under the heading of "Special Service Information" and in the latest RCA service bulletins, you will find the gain for each stage indicated on the schematic just above the tubes.

In Volume XI you will find thirty double-spread pages placed in the binder before the Manual proper. Please place these sheets in their respective positions as indicated by the folio number on each page. Also banded with the double-spread pages are RCA pages 11-123 to 11-174. The data on these pages were received at the last moment and it was impossible to place them in their proper position in the Manual.

An innovation with Rider's Volume XI is the new Index. This is in a new typographical dress, which you will find is easier to follow than the Index to Rider's Volumes I to X. Inasmuch as two columns of page numbers could be omitted—references to the pages in the early editions of Rider's Volumes I and II and in the Rider Combination Manual—more page space was available. With the new make-up it has been possible to get more references on a page and in a much more readable style.

The new Index for Rider's Volume XI is not accumulative—it is for Volume XI only. It was decided to start a new accumulative Index for Volume XI and succeeding Manuals inasmuch as that for Volumes I to X was much too bulky as well as becoming very uneconomical to produce. However, it was necessary to refer some of the listings in the new Index back to the former Volume X Index and those items are designated with an asterisk (*) in front of the model number. Therefore, when you find such a designation in the new Index, be sure to consult your Volume X Index and so know where the data already published is to be found.

Bound in with the Index to Rider's Volume XI is the new "How It Works." The editorial staff went through all the new servicing data and collected the circuits or features which would be of interest to you and about which you should know. The latest uses of loop antennas are explained—uses of voltage developed across the oscillator grid leak for bias control—power-supply filter systems—new negative feedback circuits—phase inverter circuits—a new f-m tuning indicator circuit—all these and more are simply explained in this special section of Rider's Volume XI.

Without doubt you have become acquainted with the fact that the F.C.C. is considering making a change in the frequencies of a large number of the broadcast stations, as was mentioned in the last issue of SUCCESSFUL SERVICING. If this change is effected, it will mean that a great number of push-button receivers will require the attention of a serviceman to readjust the push buttons to the new frequencies. As you are aware, in many cases, one or two push buttons on a receiver have a definite frequency range, say from 530 to 900 kc, while the next button or buttons will cover a range from say 650 to 1000 kc. It is necessary that these buttons be used for tuning in a station within their specific frequency range, which in most instances are not designated on the chassis or cabinet. The question then arises—what frequency ranges are covered by the different buttons on any given model receiver?

In order to facilitate your work in this connection, a complete listing of the frequency ranges of each push button in receivers wherein push-button tuning is accomplished by electrical means, has been compiled and published in the Vest Pocket Manual, which will accompany Rider's Volume XI. The receivers are grouped alphabetically by manufacturers and listed in the numerical order of their model numbers in the same way as they are in the Rider's Manual Index.

Other features in the Vest-Pocket Manual which will assist you many times every day are tube socket connection charts; color coding of resistors, condensers, and transformers; a decibel conversion chart; current carrying capacity of different size copper wire; etc. A table which, while not electrical in nature, will nevertheless prove handy, is that for computing "markups"—in other words, you can tell at a glance what percentage of the cost of an item you have to add to make a certain percent profit on your selling price. Incidentally, the Vest-Pocket Manual has 56 pages and a durable, flexible binding.

By the time you read these lines, your jobber will have Rider's Volume XI. Make a point of going there and seeing for yourself all the new features of this latest addition to the Rider Manual series—Volume XI, the new Index and the Vest-Pocket Manual, will speak more eloquently for themselves than we can here! Go today—*now*—and we know that you'll say, "Yes, sir, Rider has done it again!"

•

Rolling REPORTER

CAST:

The Rolling Reporter—*a colyumist*
Aloysius Winenwiski—*an officeboy*

SCENE:

A large, sun-shiney office with windows overlooking the East River, Brooklyn and points east. A haze over the points east and an electric fan buzzing 'round indicates that the weather is very hot. The Rolling Reporter is discovered seated at a desk piled high with proofs, books, publicity releases and other editorial mess and at the end of the desk fidgets Aloysius Winenwiski. As the curtain rises, the Rolling Reporter is speaking . . .

Rolling Reporter:—and remember another thing, if I hear of your grandmother dying again while I'm away so that you can see the Dodgers try to play ball, I'm going to put more dents in your hide than you have freckles on your nose. Do you get that through your thick skull?

Aloysius: They don't play home till the 17th anyhow.

R.R.: Well, maybe you can get some work done then. Now don't forget to let me know while I'm in Chicago all the things I've told you about. Have you got that list I gave you?

A.W.: Yes, sir, it's right here.

R.R. (*Suspiciously*): Where? Let's see it.

A.W. (*Business of hunting through pockets*): I had it here a second ago. Mebbe it's in this one—no—here 'tis—gosh, that's the grocery order I forgot to leave for Mom—hey, lemme at your phone so I don't catch——

R.R. (*Boiling over*): Never mind the food—where's the list?

A.W. (*Further business of hunting through pockets and dumping a collection of junk on the desk . . . Produces a dirty piece of paper in triumph*): Here 'tis. I told you it was right here! See, I don't never forget nothin'—

R.R. (*Interrupting*): Much! Now, get over to the station and pick up those tickets and on your way back stop in at—

(*Slow curtain shutting off the flow of instructions. The curtain remains down to indicate the passage of five days and upon its rise Aloysius is discovered at the Rolling Reporter's typewriter pecking out a letter muttering aloud in an exasperating way as he hunts around for the proper keys.*)

Aloysius: . . . and thank you for your letter of recent date. I am sorry that you could not find the new portable receiver that you told me to take to the train. How was I to know that guy in a uniform was talking about another train instead of a berth when he asked me what section you was taking??? I ain't no mind-reader. It's just as well you didn't have the set anyhow 'cause then you wouldn't-a won six bucks in that craps game. Say how about splitting with me? If you hada had the radio you wouldn't-a got in that crap game. You oughta thank me instead of bawling me out. (*Aside—Fat chance I got of gettin' anything outa that guy. Guess I'll start a new paragraph. Wonder how the Dodgers are makin' out?*)

You sure are lucky. Here you go ridin' on a nice air-conditioned train, huntin' snake eyes or box cars or whatever it is you yell for when you're shootin' craps, and me here sweatin' helpin' get Vol. XI's to the jobbers. I'll bet that new Vest-Pocket Manual that goes with Vol. XI makes a BIG hit with the gang. It's sure got the dope packed in—the kinda dope they need every day. It was too bad, wasn't it, that you couldn't spring the news of the little Manual on your readers in your last column? You ain't such a hot reporter, are yo—— (*Aside: Guess I better hadn't rub that in. He might get mad all over again, the big stiff. I'll X that out.*) (*Business of X-ing out something he has just written.*) By the way one servicer that came in the office spotted the proofs of the new Vol. XI Index that was laying on your desk and he said that the new make-up was one of the swellest he ever laid eye to. Betcha a lot more guys think the same. (*Aside: That ought to make him feel good—it was his idea. Wonder how I can get off to see the Dodger's first home game?*)

How did the gang like the A-M and F-M set-up in the booth at the Show? I saw the boys in the lab. playing with it and it looked like good stuff to me. Betcha it was the first time a lot of guys ever saw a real live f-m wave, wasn't it?

We got a letter from Harry Lehner out in Chi. He says that he wants to keep his ten Rider Manuals up to date with S.S. and did he miss an issue. Why don't you drop in and tell him he's got 'em all and thank him for being so proud of owning his set of Manuals? . . . Horace Perry up in Portland, Maine says in a letter that he took yesterday off and entered the changes in S.S. on his index card file. Guess he finds those changes valuable if he goes to all that trouble, hey what? Are you coming home by way of Quebec? If you are, go to Maniwaki and see Paul-Emile Dubrule. He sure likes our books. If anyone ever said the nice things about anything I did the way Dubrule talks about the Boss's books, I wouldn't get the blush off for a week. (*Aside: Wonder if that's a police plane flying over there?*) (*Business of gazing out window.*) You got a lot more mail to answer when you get back, so don't hang around out there too long. Say, are you goin' to get one of these new receivers for your chariot? It might keep you awake as you travel. And don't try to take up every drink that's offered you. You ain't that good and don't forget how you felt after the last Show you were at. Hoping you're the same and with 73 to all,

Yours truly,
Aloysius Winenwiski,
Columnist's Assistant.
(*Curtain*)

WANTED

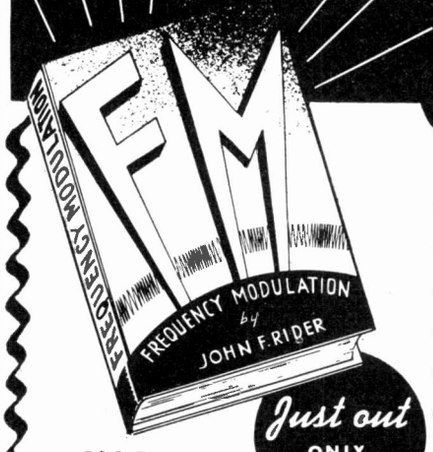
Last summer we ran a notice requesting anyone who wished to dispose of certain back copies of *Television* magazine and *Television and Short-Wave World* to communicate with us as we wanted to complete our files of these English magazines. Through the kind cooperation of several of our readers we were able to obtain several missing copies, but we still need a few more. If you have any of the issues listed below and want to sell them, will you please write us.

Television: March, May, 1928; April, 1929; October, 1931; April, 1932; October, November, 1933; March, April, 1934. *Television and Short-Wave World:* March, June, 1935.

G.E. JA-64

The model JA-64 automobile receiver uses the same chassis as the GA-62, the servicing data for which will be found on *page 10-12 in Rider's Volume X*. The tube complement differs only in the use of GT-tubes in the rectifier and the audio output, but the G-type tubes may be used.

5000 SOLD THE FIRST MONTH

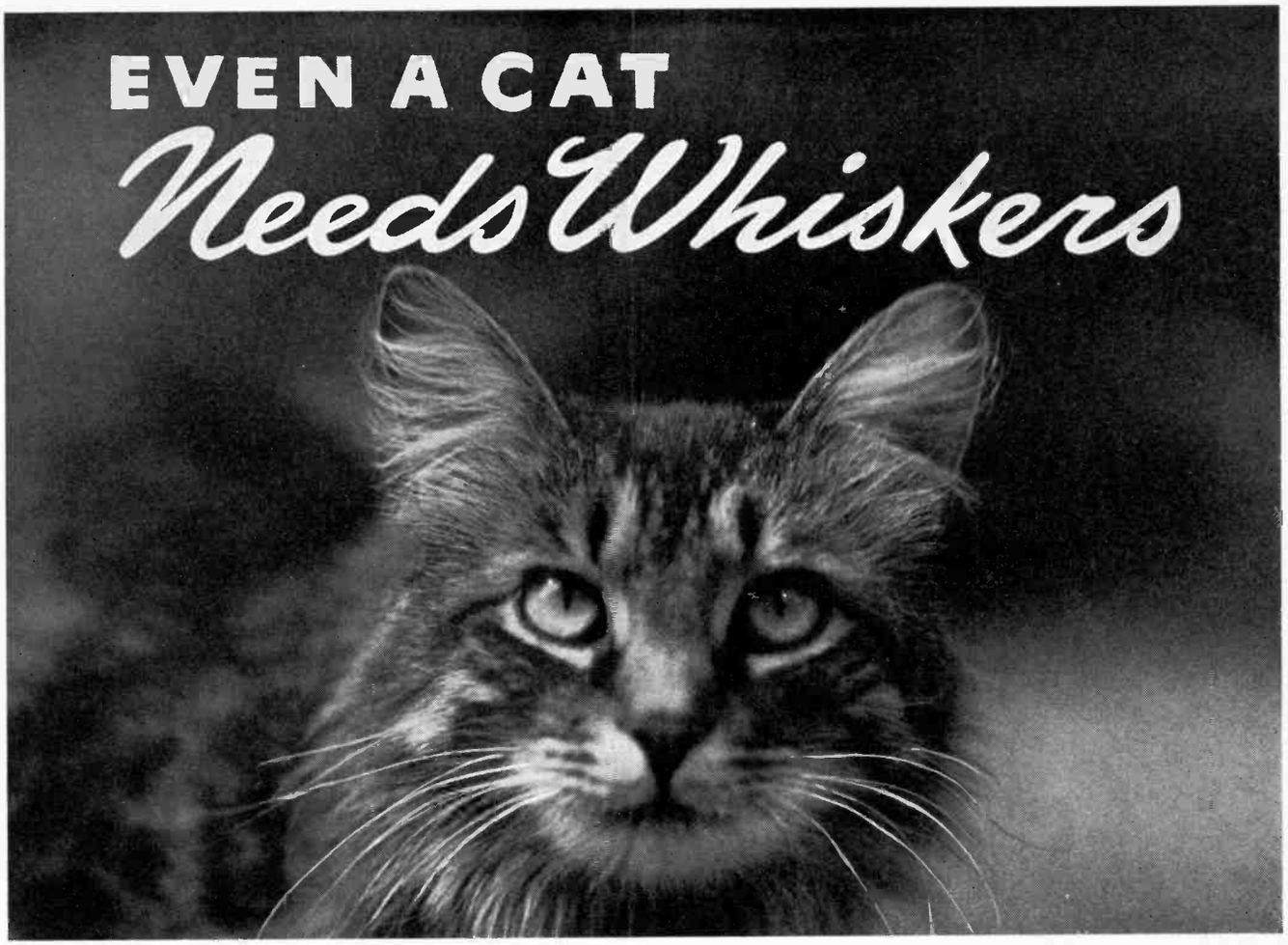


136 Pages
72 Illustrations

Just out
ONLY
$1.00

Now is the time to get into F. M. . . . the greatest development in radio since the beginning! FCC has authorized commercial transmission. This means more and more F. M. stations will be broadcasting . . . more and more receivers will be put into use. Already, thousands of servicemen are preparing themselves to cash-in on the service that will soon be required, by studying this brand new Rider Book, the first authoritative description and analysis of the fundamentals of F. M. and how to service the new F. M. receivers. Don't wait . . . get *your* copy of this important new book right now to be sure that you are ready to reap the profits of this new opportunity!

Read RIDER BOOKS



EVERYBODY knows that a cat can see in the dark . . . yet it needs its whiskers to feel its way through the *tight spots.*

There are *some* servicemen who could repair almost any radio in the dark . . . yet *most* of them depend on Rider Manuals for the tough jobs. In fact, the smarter the serviceman the more likely he is to use Rider Manuals on *every* job, because he knows how foolish it is to rely on his memory or intuition when complete service data are so readily accessible for only 3c a day!

There isn't a serviceman in the country who can't do better work and more of it with the aid of Rider Manuals. They provide, in the most convenient form, complete data on every set he may be called upon to service. They give him data on alignment, I-F peaks, operating voltages, parts lists and values, voltage ratings of condensers, wattage ratings of resistors, coil resistance data, etc.

Why make it tough for yourself by trying to get along without this vital auxiliary equipment? It's like a man working in the dark when he can have light for only 3c a day.

And remember this, you need *all* Rider Manuals. So if you don't have the entire set, order them from your jobber . . . *now,* before you grope in the dark for troubles that could be located promptly and easily with the aid of Rider Manuals. You'll find, as have thousands of servicemen, that Rider Manuals are an investment that will repay you many times their cost.

JOHN F. RIDER Publisher, Inc.

404 FOURTH AVENUE, NEW YORK CITY

Export Division: Rocke-International Elec. Corp.,
100 Varick St., N. Y. C. Cable ARLAB

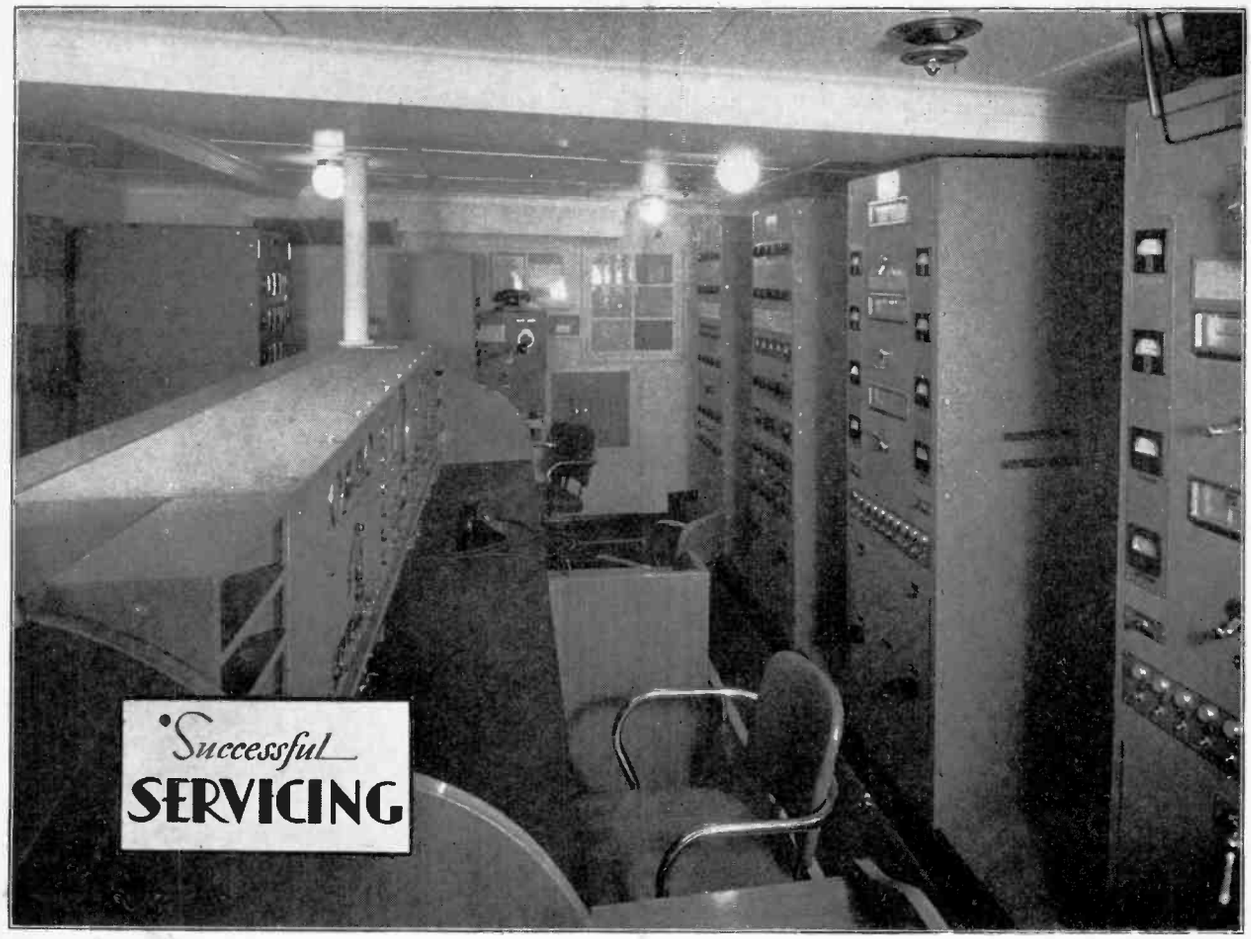
DO YOU HAVE ALL ELEVEN RIDER MANUALS?

Check This List!

Volume	Price	Covering	Volume	Price	Covering
XI	$10.00	Up to June, 1940	V	$7.50	1934-35
X	10.00	1939-40	IV	7.50	1933-34
IX	10.00	1938-39	III	7.50	1932-33
VIII	10.00	1937-38	II	7.50	1931-32
VII	10.00	1936-37	I	7.50	1920-31
VI	7.50	1935-36			

Just Out!
VOLUME XI
RIDER MANUAL

You NEED RIDER MANUALS



Courtesy of United States Lines

JULY-AUGUST, 1940

CLIPPING ACTION IN LIMITER CIRCUITS

Further Notes on Limiter Action in F-M Receivers

THE function of the limiter in f-m receivers, insofar as it serves to flatten peaks in amplifying stages preceding it, was discussed in detail in a previous issue of SUCCESSFUL SERVICING.* When the limiter is performing properly, the signal fed to the discriminator detector is made substantially uniform in amplitude so that only the frequency variations in the modulated wave serve to actuate the detector.

Such a signal characteristic is essential for the high-fidelity reproduction for which f-m receivers are noted. Limiter action also serves to reduce amplitude variations of the signal due to noise modulation, though when the phase relations between the carrier and the noise pulse are such as to result in frequency variations in the signal, the noise is not eliminated. So we see that the primary function of the limiter is to remove amplitude variations in the signal resulting from non-uniform amplification in the receiver, which would cause distortion if they reached the detector.

During the course of an investigation of limiter action in our SUCCESSFUL SERVICING *Laboratory,* many facts concerning its operation were discovered which, so far as we know, have not previously been discussed. Since a knowledge of just how the limiter works will be of aid in trouble-shooting in f-m receivers, we know you will be interested in these findings.

The manner in which the limiter functions is more complex than is generally realized, particularly with respect to the way flattening of peaks is obtained and the change in the operating grid bias when a signal is being received.

In the small insert diagram, Fig. 1A, a typical limiter circuit is shown. The tube employed is the 6SJ7 sharp cutoff pentode and the plate and screen are operated at a relatively low d-c voltage, 90 volts, so that the tube easily overloads. The circuit used is standard with one manufacturer; in other f-m receivers, even lower plate and screen voltages are employed, usually in the neighborhood of 60 volts. In all receivers with which we are familiar, sharp cutoff pentodes are employed.

In the control-grid circuit you will note the grid resistor R and the blocking condenser C. In other makes of receivers, R and C are in parallel and are connected in the grid return circuit. Regardless of the method of connecting these components, their functions are substantially the same as that in the circuit shown.

The plate current-grid voltage curve shown in Fig. 1 was plotted directly, using the 6SJ7 tube in the circuit shown in Fig. 1A with 90 volts d-c on the screen and plate. Note that the plate current becomes zero when a bias of approximately 8 volts negative is applied to the grid. This means

(*Please turn to page* 3)

*February—March—April, 1940.

Emerson DB, DL, DW, DB1, DL1 Chassis

Please make a note in your Index to Rider's Volume XI that several new model numbers have been assigned to the chassis whose data appear on *page 11-22 in Rider's Volume XI.* These new numbers are: DB-315 and DB-327. Also note that the DW chassis is similar to the DB and DL chassis and the model numbers are DW-330A, DW-330B and DW-358.

On *page 11-30 of Rider's Volume XI* will be found the servicing data for model DL1-330. Make a note in your Index that these notes also apply to model DB1-301, chassis DB1, a new addition.

In the DB and DB1 chassis having serial numbers below 2,817,946 the resistor R2, having a value of 15 megohms, is not used.

•

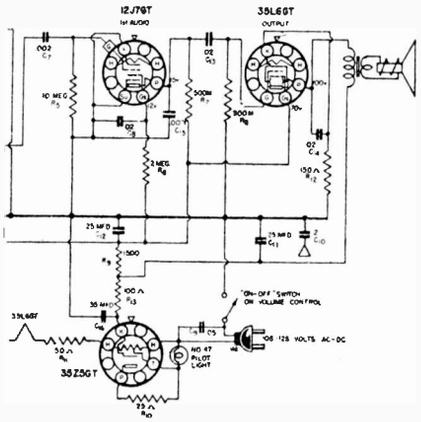
Belmont 601—Series C

The values of several components have been changed in this series, and the schematic of Series A and B, see *page 7-10 in Rider's Volume VII,* applies also to the series C. R4, the volume control, has been changed from 1 megohm to 500,000 ohms; R7 which was 100,000 ohms, now is 500,000 ohms; and R9, which was 2 megohms, now is 500,000 ohms. The value of C7 has been changed from 0.0005 mf to 0.0001 mf. It is suggested that you notice the differences between the series A and B chassis, as noted on the above-mentioned Manual page.

•

Silvertone Chassis 110.989-1A

The addition of -1A to the chassis number 110.989 indicates that a change has been made in the filter circuit of the circuit shown on *page 11-76 of Rider's Volume XI.* A partial schematic



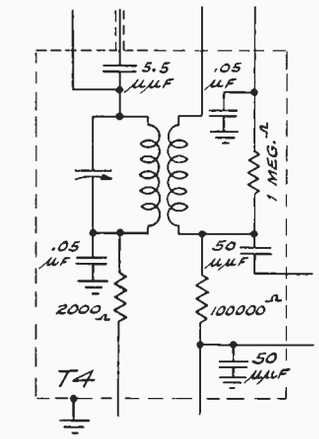
New filter circuit of the Sears-Roebuck chassis 110.989—1A

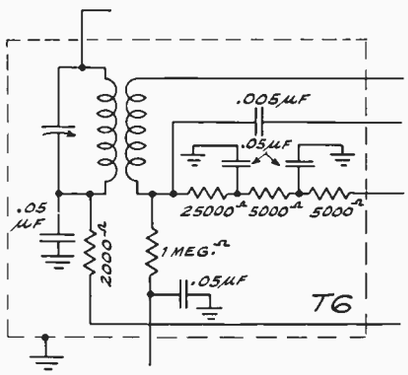
of this receiver, incorporating the changes, is shown herewith. A new model number has also been given to this new chassis; it is R-1021.

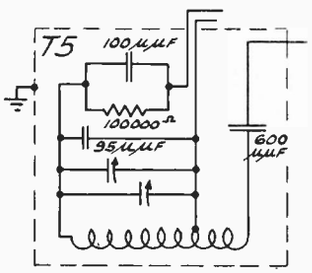
Note the changes made in the filter condensers. C11 and C12 are now 25 mf instead of 40 and a third condenser, C16, 35 mf, has been added. Resistor R9 has been changed from 2500 ohms to 1500; R11 from 25 ohms to 50, and R13, 100 ohms, has been added.

The other servicing data for Chassis 110.989 apply to this changed chassis.

•







Parts values for coil assemblies in Hammarlund 200 series chassis.

Hammarlund 200 Series

A request for the values of the components with the plate coil, beat oscillator coil, and ave plate coil assemblies, T4, T5, and T6 respectively, was recently received. The values, which had been omitted from the manufacturer's schematic and parts list, shown on *pages 11-1, 2 and 11-6 of Rider's Volume XI,* are indicated in the accompanying drawing of the three assemblies. These are numbered to correspond with the assembly numbers on the schematic.

WANTED

In our last issue we ran a notice requesting any of our readers who wished to dispose of certain copies of the English magazine "Television" to advise us of the fact. You will find below a list of certain issues of several other publications which are needed to complete our files, which we plan to have bound for our library. If you have any of these copies in good condition and would like to dispose of them, will you please list them and the price and let us hear from you soon, as we are anxious to get our library completed. Thank you.

RADIO NEWS—1922, Jan. to Oct. inclusive; 1923, Jan.-Feb.-Apr.-June-July-Aug.-Sept.-Dec.; 1924, Aug.-Nov.-Dec.; 1925, Jan.-Feb.-Mar.-May-July; 1926, Aug.-Sept.-Dec.; 1927, Aug.-Sept.-Nov.-Dec.; 1928, Nov.; 1929, Feb.-Mar.-June-Oct.; 1930, Feb.; 1931, Dec.; 1932, Jan.; 1933, May; 1935, June-Oct.; 1936, Jan.-Feb.-Aug.-Dec.; 1937, Jan.

POPULAR RADIO—1923, Mar.-May-June-July-Aug.; 1924, Feb.-Mar.-Apr.-May-June-July-Aug.-Dec.; 1925, Jan.-Mar.-Apr.-May-June - Aug.-Oct. - Nov.; 1926, Jan.-Feb.-Mar.-May-June-Dec.; 1927, Feb.-July-Aug.-Dec.; 1928, Apr.-May-June to Dec. inclusive.

RADIO BROADCAST—1923, Feb. to July inclusive; 1924, Mar.-June-July-Aug.-Sept.-Nov.-Dec.; 1925, Jan. to Oct. inclusive; 1928 and 1929, Jan. to Dec. inclusive.

GENERAL RADIO EXPERIMENTER—1926, Sept. to Nov. inclusive; 1927, Nov.; 1928, Feb.; 1929, Mar.-Apr.-May-June; 1930, Aug.-Dec.

QST—1922, Jan. to Sept. inclusive, Nov.-Dec.; 1923, Feb.-Mar.-Aug.-Dec.; 1924, Jan. to Sept. inclusive, Nov.-Dec.; 1925, Jan. to July and Sept. to Dec. inclusive; 1926, Jan.-June-July-Nov.

PROJECTION ENGINEERING — 1929, Oct.; 1930, Feb.-Apr.-Dec.; 1931, Mar.-Apr.-May-July to Dec.; 1932, Jan.-Feb.-Mar.-July-Dec.; 1933, Apr. to Dec. inclusive.

RADIO ENGINEERING—1926, Jan. to Mar. inclusive; 1927, Jan.-Dec.; 1928, Dec.; 1931, Jan.-Feb.-Oct.-Nov.; 1932, Jan.-Feb.-July-Nov.; 1933, Nov.-Dec.; 1936, Aug.; 1937, Aug.

ELECTRONICS—1930, Apr.-May-July.

Clipping Action

(*Continued from page* 1)

that any signal the negative peak voltage of which goes beyond 8 volts will place a momentary negative bias on the grid sufficient to drive the plate current to zero. Consequently, since no plate current flows when the negative grid voltage exceeds 8 volts, the negative half of the wave is cut off in the plate circuit. This clipping of the negative peak is illustrated in the diagram.

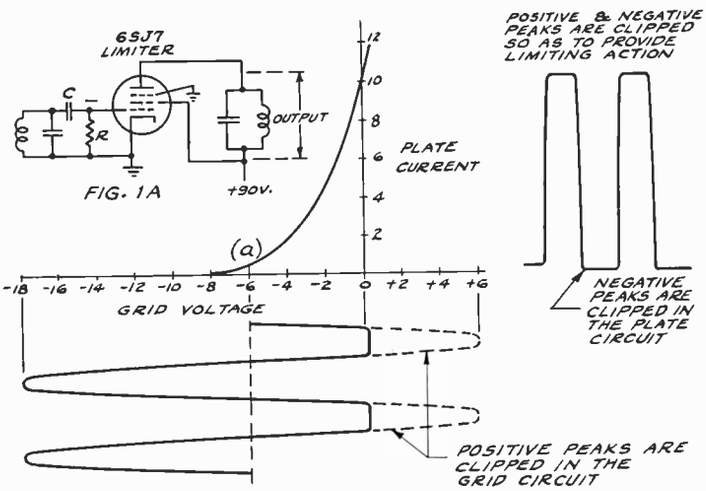


Fig. 1. The plate current-grid voltage curve obtained with the limiter circuit of Fig. 1-A with 90 volts on the plate and screen.

This does not mean that the applied signal voltage must exceed 8 volts on the negative peak to produce clipping in the plate circuit, though such would be the case if the effective grid bias, under operating conditions, were zero. Actually, when a signal voltage is applied the control grid draws current over the positive half cycle. This grid current flows through the resistor R in such direction as to apply a negative voltage to the grid which is constantly increased as the signal increases to a peak over the positive half of its swing.

As a result of the voltage developed across R, the condenser C becomes charged during the positive half cycle of the grid voltage swing. Since the time constant of the combination of R and C is long compared with time interval of a single cycle of the signal, the condenser keeps a large portion of its charge over the negative half cycle of the signal wave. Therefore, most of the negative voltage developed over the positive half cycle is retained. This results in a shift in the operating bias of the grid from zero to some point, such as (a) in Fig. 1, which depends upon the magnitude of the applied signal. Over the negative half-cycle, therefore, any signal peaks higher in voltage than the difference between the bias at point (a) and cutoff (–8 volts) are clipped in the plate circuit.

Clipping of the positive signal peaks takes place in the grid circuit. This is proved not only by the static curves but also by oscillographic measurements. In contradiction to the usual theory that the grid is driven several volts positive, our tests show that the grid never became more than very slightly positive. At the start of the positive swing, when the grid draws current, the circuit becomes heavily loaded, with the result that the peak becomes flattened. The positive peak does not drive the grid several volts positive, as might be assumed, with a strong signal input. In fact, the grid becomes only slightly positive and the only reason that practically all of the positive half cycle is not clipped is because at each instant over the positive half cycle, when grid current is produced, a corresponding negative voltage drop due to the grid current voltage drop across R serves to provide increasing negative bias, which permits a further excursion of the positive half cycle. If the negative voltage thus developed were exactly equal to the positive peak voltage, no clipping could result. Actually, the operating bias thus developed is less; consequently clipping results. The portion of the positive half cycle thus clipped is shown in the dotted lines of Fig. 1.

To check these results, the oscillograms shown in Figs. 2 to 5 were made, suitable values of R and C being chosen so that operation at audio frequencies could be obtained. An audio signal of 1000 cycles was used, rather than an r-f signal, in order that satisfactory sweep operation could be obtained from the cathode-ray oscillograph. While the results at high frequencies may be somewhat modified, these oscillograms serve to illustrate how the limiter operates.

For the oscillogram, Fig. 2, the oscillograph vertical amplifier input was connected across the grid circuit of the limiter. Note that the positive peak is clipped, as was predicted from the theoretical analysis, while the negative peak remains unaffected.

To obtain the oscillogram, Fig. 3, the oscillograph was connected across the plate circuit. The wave is now reversed in phase so that the upper peak represents the negative swing while the lower flattened peak represents cutoff in the grid circuit. The signal level at the grid is not sufficiently great to cause cutoff in the plate circuit of the negative peak.

Fig. 4 was made with the oscillograph connected as for Fig. 3, but the input signal amplitude has been increased so that cutoff of the negative peak just begins to take place. Note that both the upper and lower peaks are now rounded off.

(*Please turn to page* 4)

Fig. 2

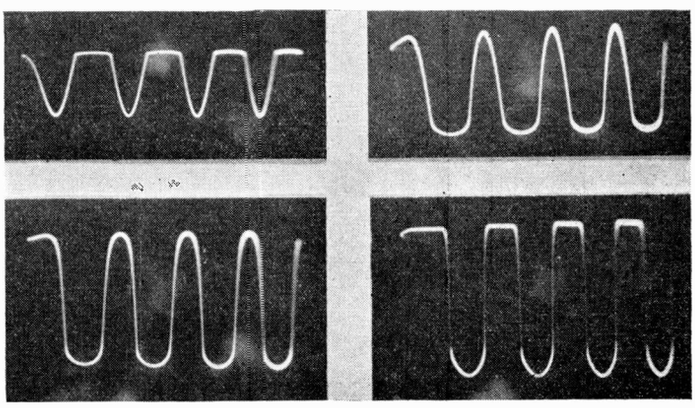


Fig. 3

Fig. 4

Fig. 5

Oscillograms showing limiter clipping action in the circuit of Fig. 1A. See text for descriptions.

Philco 38-35

To correct excessive hum in the Model 38-35 Philco, the following change was made, beginning with Run No. 3: The red wire which connects the filament of the 6Q7G tube to the on-off switch has been lengthened. This wire now follows the rear, side and front channels of the chassis near the base instead of being connected directly from the switch to the socket contact. This receiver is shown on *pages 9-7 and 9-8 of Rider's Volume IX*.

•

New Spiegel Model Numbers

We have been advised that this company has added new model numbers to some of their chassis, the servicing data for which have already been published in *Rider's Manuals, Volumes IX, X and XI*. It is suggested that the new model numbers shown in the accompanying table be written in your Manual Indexes, the proper entries being identified by the chassis designation and page number.

New Model Numbers	*Chassis No.*	*Page*
T2014, T2015, T2016	5A	11-11
T2000, T2050	6W	9-12
T2064	745	10-23
T2154	6Q	9-17
T2216	6A	11-10
T2100, T2150	109B	10-25
V1200, V1208, V1212, V1220, W304	128B	11-3
V1204	80B	11-7
V1010	216	10-9
V1100, V1112, V1160, V1164	202	10-11
V1052, V1066, V1070, V1074	218	10-10
V1104, V1154, V1170	220	10-12
V1108	211	10-13

•

G.E. GME-11

This wireless record player is the same as the GM-11, servicing data for which were published on *page 10-1 in Rider's Volume X*, with the exception that in this new model provision is made for 210-250 volt, 50-60 cycle operation. For operation at this higher voltage, the phonograph motor circuit is slightly changed. Instead of R2 being connected directly to the line plug, it is connected by means of a yellow lead to a tap on the coil of M-1.

•

The Cover

On page 1 is a photograph showing the radio shack of this country's largest liner *America* of the United States Lines. The installation was for the most part designed for the *America* and so was custom built. It includes eight transmitters, nine receivers, a radio compass, a radio alarm and equipment necessary for linking the ship to ports and other ships.

The emergency equipment consists of a 50-watt transmitter operated from emergency generators with two sets of storage batteries in reserve; two receivers, one covering from 15 to 500 kc and the other being a type B crystal receiver. (Yes—we said crystal receiver.) The radio auto alarm is always tuned to the emergency distress signals of other ships and automatically sounds a bell in the radio room and on the bridge when such signals are picked up.

A 75-watt radiotelephone outfit, operating on 2 to 3 mc, is installed in the chart room. This is used for communicating with tugs while the *America* is being docked and with the pier and home office when the ship is in port. When a signal is picked up on this receiver, it is fed into a selective signaling device which responds to certain audio frequencies and when the proper sequence is sent out by the shore station, a bell rings in the chart room indicating an incoming call.

Five operators are in the radio room, which is open 24 hours a day for telegraphic messages and from 9 a.m. to midnight for ship-to-shore telephone communication.

•

New Kadette Model Numbers

We have been advised that the servicing data for Model L-25, which you will find on *Miscellaneous page 11-4 in Rider's Volume XI*, also applies to the following model numbers: L-24, L-26, L-27, and L-28. Please add these numbers in your Volume XI Index.

NOTICE

If you are receiving SUCCESSFUL SERVICING regularly, please do not send in your name again if you come across a coupon in a Rider Manual or on a book jacket. Such coupons are only for new readers. If you change your address, advise us on a postcard, giving your old address as well as your new one. Thank you.

Clipping Action

(*Continued from page 3*)

Fig. 5 illustrates what happens in the plate circuit when, with connections as for the two preceding oscillograms, the signal level is increased so that plate current cutoff is obtained. The negative peak is thoroughly flattened out, while the positive peak is also rounded off due to grid circuit cutoff.

Note that, in all the measurements in the plate circuit, the image size remains substantially the same, showing that the amplitude of the signal remains practically constant at the plate even though the signal level at the grid has been varied over a wide range.

All the above tests were made at a single frequency. In f-m operation, the signal frequency will vary when modulated. Under such conditions, the overall response curve will be modified by the characteristics of the discriminator transformer, as was described in our previous article concerning limiter action.

As these tests and oscillograms indicate, clipping of the negative peaks occurs in the plate circuit of the limiter while clipping of the positive peaks takes place in the grid circuit—not, as generally supposed, in the plate circuit.

KNOWITT DOES IT THE EASY WAY

Successful
SERVICING

Reg. U. S. Pat. Off.

Dedicated to financial and technical advancement of the radio service man.

Published by

John F. Rider Publisher, Inc.
404 Fourth Ave. New York City

John F. Rider.....Editor
G. C. B. Rowe.....Assoc. Editor

This publication is the house organ of the publisher and if due credit line is given, permission is hereby granted editors to reproduce material contained herein.

Vol. 6 July-Aug., 1940 No. 6

PREPAREDNESS

IN the July issue of "The Texas Broadcaster," published by the Dallas Radio Service Association, appeared an editorial which we are reprinting below, as we feel that every serviceman should give the ideas set forth therein his very earnest consideration.

WAR!

What will be the status of the serviceman if this country ever engages in armed conflict? Just where and how will he fit into the picture? We suspect that the authorities well know the answers, all we can do is speculate.

Let's set our imagination dial down around ten or twelve megacycles and see what we can imagine. The first thing that strikes us is that every mobile unit will use some kind of radio communicator, possibly two-way jobs; compact, interchangeable transceivers. That means that thousands upon thousands will be manufactured and used, and they will have to be serviced. And then there will be larger semi-portable affairs installed in trucks. Installation possibly along the lines of the exploration trucks of the geophysical companies, housing several transmitters and receivers and lots of spare parts with several operators and maintenance men living right alongside the instruments. Such units would follow the advancing lines of the battle front.

Then we will find permanent installation of all sizes and kinds at bases, airports, concentration points, key cities, zone headquarters, etc. Every official automobile will have two-way communication, every airplane will have the same. In fact we can shut our eyes and see millions of radio sets in use, and each one of them will have to pass through the ministering hands of some serviceman. And the serviceman will have to be something besides a solder-slinger. Patched-up jobs will not go, it will be *produce* or else.

It seems to us that the serviceman should be about his business of learning more and more about servicing and how it will apply to national needs. We were never more uncertain in our national life than now. What with the ominous storm brewing in the east no man can say what will happen in a month or ten months or ten years. Every man who has a knowledge of radio repair and maintenance will be required and can be used. There will be no question of organization or long hours or whose test equipment is the best; nor will he be able to reach over and pick up Rider to see if the non-oscillating, double-jumped - up right and left angle "IF" fits in here or there. Brains will have to be used and the men who are prepared will be the ones who will be needed.

We should immediately get serious about this, and individually and collectively begin at once to do our part in preparing for the defense. Let us be able when the time comes to answer the roll call, to say, "Here we are, ready, able, and willing."

PORTER T. BENNETT

Heretofore we have been reluctant to give expression to similar thoughts inasmuch as some of our readers might get the impression that we were "waving the flag" to further our own ends, but now that Mr. Bennett has broken the ice the way he has, we are only too glad to pass his words on to you.

Needless to say, we are heartily in accord with the above editorial. No one can foretell what the future holds for us but if you would make that future as bright as it can be made, you will avail yourself of every opportunity to learn as much about your chosen job as you possibly can. Bear in mind: we do not care from what source you get this knowledge—*just get it!*

JOHN F. RIDER

ALIEN REGISTRATION

As part of the National Defense program, a nationwide registration of aliens will be conducted from August 27 through December 26, 1940, by the Immigration and Naturalization Service of the Department of Justice. Registration will take place in the post offices of the nation. It is expected that more than three and one-half million aliens will be registered during the four-month period.

Registration is made compulsory by a specific act of Congress, the Alien Registration Act of 1940, which requires all non-citizens to register during the four-month official registration period. The law requires that all aliens 14 years or older are to be registered and fingerprinted. Alien children under 14 years of age will be registered by their parents or guardians. When alien children reach their fourteenth birthday, they will be required to register in person and be fingerprinted.

A fine of $1,000 and imprisonment of six months is prescribed by the Alien Registration Act for failure to register, for refusal to be fingerprinted, or for making registration statements known to be false.

As part of its educational program to acquaint non-citizens with the registration requirements, the Alien Registration Division is distributing more than five million specimen forms listing the questions that will be asked of aliens at registration time. Besides the usual questions for establishing identification, the questionnaire asks the alien to tell how and when he entered the country, the method of transportation he used to get here, the name of the vessel on which he arrived. He is also asked to state the length of time he has been in this country and the length of time he expects to stay. He must also describe any military or naval service he has had, and list the names of any organizations, clubs, or societies in which he participates or holds membership. In addition, he is required to describe his activities in any organization, and to affirm whether or not the organization furthers the interests or program of a foreign government.

To make their registration easier, aliens are being asked to fill out sample forms, which will be available prior to registration, and take them to post offices where they will be registered and fingerprinted. Every registered alien will receive by mail a receipt card which serves as evidence of his registration. Following registration, the Act requires all aliens, as well as parents or guardians of alien children, to report changes of residence address within five days of the change.

The Alien Registration Act was passed so that the United States Government may determine exactly how many aliens there are, who they are, and where they are. *Both President Roosevelt and Solicitor General Biddle have pointed out that registration and fingerprinting will not be harmful to law-abiding aliens.* The Act provides that all records be kept secret and confidential. They will be available only to persons approved by the Attorney General of the United States.

The Immigration and Naturalization Service asks for the cooperation of all citizens in carrying out the Alien Registration program in a friendly manner so that our large foreign population is not antagonized. It is suggested that citizens may be of great help to their non-citizen neighbors or relatives by explaining to those who do not speak English well what the registration is, where aliens go to register, and what information they must give.

Next—METERS

IT would be a stupendous task even to try to estimate the number of electrical meters that are in use in the radio service field and if all the fields wherein electrical meters are employed were to be considered, the task would be practically impossible. Now when we think about this great number of meters and all the different conditions which they are capable of interpreting, the question naturally arises, "How completely has the subject been covered in the past? Are the users of all kinds of meters getting the most out of their instruments?"

In the first place—and we have made this statement before on more than one occasion—unless a man understands the theory underlying the instrument with which he is working, he is unable to get the maximum use out of that particular piece of equipment. Consequently, he should know the reasons why the pointer travels along the scale when a meter is connected into a live circuit. Naturally in order to understand those reasons he must have at his fingertips a thorough knowledge of the relationship that exists between the current flowing through a coil, the magnetic field set up, the interaction of two magnetic fields, etc.

If you were to look through the catalog of meters, you would find many, many different models. However, if you were to analyze the theory underlying all these types, you would find that from that point of view they could be classified under a comparatively small number of groups. This simplifies matters to a great extent, because a man should know how each meter differs in its functioning from the other on his bench.

Next in importance to knowing the reasons why and how a meter operates are the uses to which it can be put—its applications to the problems that arise every day—which meter can be used to measure which currents and voltages. Now just because the scale of a meter covers a certain range, and is calibrated in certain units, does not necessarily mean that this is the only use to which it can be put. On the contrary—many meters can be employed in different ways that expand their usefulness enormously and this expansion can be made with only a slight effort on your part. A shunt resistor in the meter circuit, for instance, will give you essentially another meter, but what resistance should it be and what must be its power rating? What corrections must be made in reading the scale of the meter with such a resistor in the circuit? How many different ways can a meter be used? What are the limits within which accurate readings can be made? What type of meter is best for any given test?

You realize that these are all pertinent questions and their answers should be a part of every serviceman's technical knowledge; that is, if he is getting the greatest possible use out of his meters. Naturally the question follows, if a man does not have the answers to these questions, where can he find them? Where can he find the necessary data that he needs covering both the underlying principles involved and the practical application of his instruments?

With these questions in mind we made a survey of the meter articles that have been published in various radio periodicals and found that there was a dearth of information on meters in general—totally inadequate for the needs of the serviceman working on present-day receivers. We decided to fill those needs and in "The Meter at Work" we are undertaking to give you what you require—to incorporate within the covers of one book all the essential information—technical and practical—that you require now in your daily work and that which you might need in the future.

We used those last few words advisedly. We believe in looking ahead as far as we can. Radio, being in the constant state of change and development that it is, nobody can foretell with any degree of certainty just what will come about tomorrow, but it is safe to say that with television, frequency modulation and other developments in the offing, the serviceman will have to look to other meters to provi him with the information he will need in his work. That is why you will find in "The Meter at Work" instruments explained that might seem foreign in their applications today but tomorrow will more than likely be commonplace.

The date of publication of "The Meter at Work" has not yet been set nor has its number of pages, but one feature of the book will come as a surprise to everyone. *This will be an innovation in radio publishing* and we feel sure that you will like it and appreciate it more and more every time you open the book. More about "The Meter at Work" in the very near future.

•

I.R.E. About Signal Tracing

IN the March, 1940, issue of *The Proceedings of the Institute of Radio Engineers* a comprehensive report entitled "Radio Progress During 1939" was published. Under the subhead of "Measuring Apparatus and Technique" appeared the following:

> "Service equipment, more convenient and reliable to use, was made available employing radio frequencies for receiver testing and checking of components. Several such instruments enable checking of radio-frequency and audio-frequency circuits *by tracing the passage of the signal* either through or around each stage *thereby greatly assisting* in identifying the nature and location of the fault." (Italics ours.)

Here is another instance where signal tracing has been recognized as something quite worthwhile and this time by a group of the country's foremost radio engineers who prepared the report for the *Proceedings*. From time to time, book reviews of "Servicing by Signal Tracing" have appeared in technical and popular radio magazines and each and every one have been unsparing in their praise not only of the book, but of the system which it describes.

And final evidence is offered by the fact that already several receiver manufacturers have included signal-tracing data in their servicing bulletins and that in the near future other manufacturers are planning to do the same. Such evidence should be sufficient to convince even the hardest-boiled skeptic. . . . If you have not seen a copy of "Servicing by Signal Tracing," get one the next time you're at your jobber's. . . . Try out the system yourself and see how you can do servicing the easy way. . . .

SERVICING SUPERHETERODYNES

The most complete explanation of the superheterodyne and its servicing ever written.

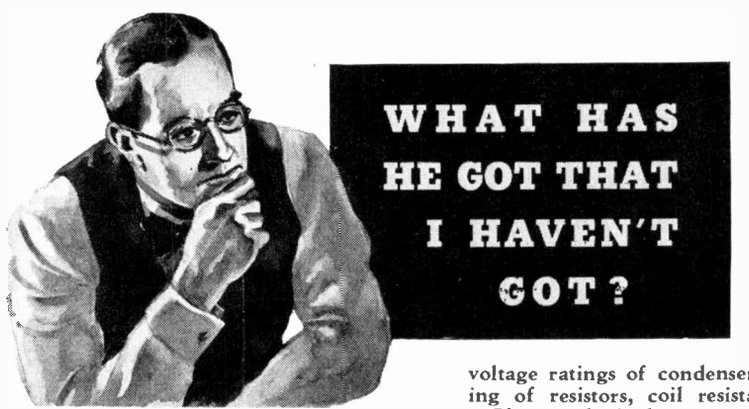
308 Pages $1.00

Meanderin' thoughts on a super-torrid day. . . .

"Double, double toil and trouble
Boil pot and cauldron bubble"

It musta been this kind of a day when W. Shakespeare batted out those lines for the horrid sisters in *Macbeth*. I feel as tho I was parked on a bubblin' cauldron or *mebbe would it be cooler????* And wot do you think oughter be done to a guy who starts out a phone conversation with "Well, is it hot enuf for you?" Me, I think he should be doomed to ride the East Side subway during rush hour for the next few thousand years and have the temperature AND humidity just like it was comin' over from Brooklyn this a.m. . . . Let's see—wot did I have for this here col.?????? Oh yeah. I remember . . . **W2XBS,** the NBC television station top-side of the Empire State Bldg., is planning to increase the number of its frame lines from 441 to 507 following the F.C.C.'s suggestion that some more skull work be done before standards are adopted. There's also whispers about vertical polarization instead of horizontal. The Don Lee station, **W6XAO** out Cal. way, is goin' to play around with 525 lines. . . . Here's hopin' things get ironed out SOON. . . . Just got news that **WCAU** over in Philly got the green light to build a television station there. They're goin' to play around with 441 to 729 lines—vertical vs. horizontal polarization—and see if FM is better'n AM to get the moosick over. . . . An' speakin' of FM (*as who ain't these days?*) more'n more mfrs. are gettin' set to push out sets that will unravel either FM or AM. . . . *An' an F-M loop already in sets!* Yep, the dope on these and others will be in Vol. XII. . . . An' speakin' of a vol. number, reminds me that our library of radio and other magazines is gettin' bound and that some back copies are missin'. *Give a gander at the box in this issue and let us know if you got any of those needed.* Look around up in the attic behind Gran'ma's trunk or Uncle Bill's high-wheeler or under that old Infradyne and mebbe you'll come across an ancient issue that will fill out a vol. for us. . . . Thanx. . . . By the way, have any of youse guys gotta copy of John Mills' book "Letters of a Radio Engineer to his Son"? And if you have, wouldja like to sell it? Or mebbe we could get together on a little high-class swappin', huh? That goes for the magazines too—we gotta lotta doops if you're wantin' some. . . . Lemme know about 'em as the Boss gave me the job of gettin' the issues together. . . . We're gonna have *some* library when we get through collectin'. Mebbe we'll take some pix of the offices and lab. and run 'em in here so you can see where Rider books are put together. . . . That reminds me, J.F.R. asked me to say that he has a Skyrider Diversity, Model DD-1, that he'd like to swap for some folding money or a check. . . . It's in A-1 shape and he'll let it go for a century and a half, F.O.B. Noo Yoick. . . . There's a bargain for somebody!!! I suppose that I should oughter stick sumpin' in here about all the opportunities there are for cashin' in on political speeches—especially for you who have sound trucks or their equivalent—but I won't. . . . Every radio sheet I pick up these days has got that sorta stuff plastered all over it, and you must have gathered in the idea by now. . . . An' while the subject of ideas is round and about, here's sumpin' to paste in yer bonnet. . . . Been readin' about conscription and other Home Defense measures? Didja ever do much thinkin' about the receivers the armed forces use? They're close relatives to the communication jobs sold by quite a few of the mfrs. and if you go thru your Rider Manuals, you'll find several. Wouldn't be a bad idea if you noted some of the features in those jobs and how they are different from those that park on your bench every day and then get yourself some workin' dope. An' don't forget that messages have to be sent out before they're received, so give a thought to X-mitters too. . . . Remember, it's the fellow who knows his stuff that goes places. . . . *An' don't be sayin' that you weren't warned.* . . . An that reminds me of that friend who sent me a box of cacti plants from the Mohave Desert for my garden. He wrote: "Warning—Open Carefully—Cactus plants inside", as though they would bite. **P.S. They did!!** Them thar desert babies sure are the toughnecks of plant life—I'll back mine against all comers—no holds barred, *if you can get a hold.* . . . Well, they sure are thrivin' in this weather, the which I ain't! Gotta note from **Bert Wehmeyer of Webster Groves, Mo.** answering our request for back issues of "Television". Thanks, Bert, for your offer but we're after the magazine published in London. Thanks to you, **Glen Smith of Watertown, N. Y.** for the nice things you say about our books. Certainly, we are working on some new stuff. You'll be readin' about 'em right soon. . . . **Henry Burwen** up in **Wakefield, Mass.** hands "*Servicing by Signal Tracing*" a whole field of roses when he says it conveys more basic information as to circuits and what happens to radio currents than anything else he has seen. . . . Thank YOU, sir. . . . **James Hill, down in Bahia, Brazil,** wants to know if the Boss would like some Brazilians for his stamp collection. The answer is in the affirmative and, Mr. Hill, if you would like to do some swappin', here I am. . . . How about some U.S. commems???? Well, it's time to blow the whistle—just got to the end of this in time—now I gotta hit the subway for Brooklyn, but believe you me, I *won't* be like old Massa in the song. . . . It's anything but cold down in those traveling Turkish baths. . . . Yours for shorter and cooler heat waves.

THE ROLLING REPORTER



DID you ever stop to wonder how some servicemen get more business and make more money than you? Here, perhaps, is the answer. The most successful men in *any* business are those who have learned never to pass up *anything* that will help them to accomplish an important job *in less time.*

This practice of taking advantage of every aid to *better work in less time* is often the only thing that stands between success and failure. In the radio service business, the man who uses all the information he can get to make trouble-shooting quicker and surer is the one who forges ahead. *He's* the man who has always had a complete set of RIDER MANUALS. He knows how foolish it is to depend on his own memory or intuition when complete, authoritative data can be at his fingertips for only 3c a day.

RIDER MANUALS give you, in the most convenient form, complete data on every set you may be called upon to service . . . data on alignment, I-F peaks, operating voltages, gain data, parts lists, voltage ratings of condensers, wattage rating of resistors, coil resistance data, etc.

If *you* don't have a complete set of eleven RIDER MANUALS, you are overlooking one of the surest ways of speeding up your trouble-shooting and increasing your profits.

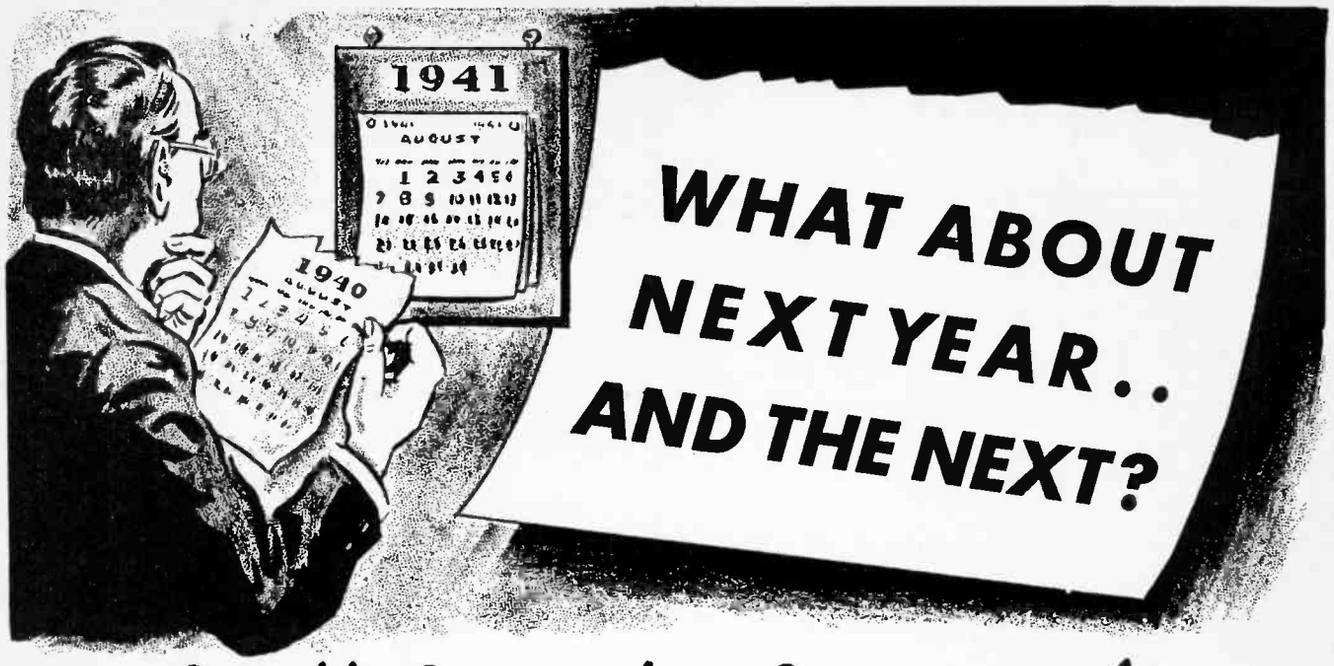
YOU NEED ALL ELEVEN RIDER MANUALS

Volume	Price	Covering	Volume	Price	Covering
		Up to			
XI	$10.00	May 15, 1940			
X	10.00	1939-40	V	$7.50	1934-35
IX	10.00	1938-39	IV	7.50	1933-34
VIII	10.00	1937-38	III	7.50	1932-33
VII	10.00	1936-37	II	7.50	1931-32
VI	7.50	1935-36	I	7.50	1920-31

JOHN F. RIDER PUBLISHER, INC.
404 Fourth Avenue New York City

VOLUME XI
HAS MANY *NEW* FEATURES
Includes data on FM receivers released up to press time.
New Index . . . cross-indexed for easy reference.
New "How It Works" section, with up-to-date information on the latest developments.
New Vest Pocket Supplement contains much useful information for on-the-spot reference.

***You* NEED RIDER MANUALS**



Will You be Prepared?

THE new developments in radio are going to change the servicing business greatly . . . and quickly! Servicemen who are "on their toes" *this* year, in keeping up with these developments, will find increasing opportunities for profit *next* year and the *next* . . . while those who "put off" the necessary reading and study will be wondering why their business is slipping away from them. *Now* is the time to begin *your* study of these important subjects. A few minutes a day with these fascinating, authoritative, easy-to-understand books by John Rider will prepare *you* for the new opportunities already opening up. Read over the brief descriptions below and select the one that interests you most . . . then order it from your jobber *today!*

FREQUENCY MODULATION
by John F. Rider

The most talked of subject of the moment. Rider offers this introduction to frequency modulation with special attention to F-M receivers and the problems they will present to the serviceman. Get this now — be ready. 136 pages — only $1.00.

SERVICING BY SIGNAL TRACING
by John F. Rider

Use the system of servicing which is proved and endorsed, fastest — most modern, the system you can apply to all receivers regardless of age, type or make. Servicing by Signal Tracing operates independently of every limiting factor heretofore encountered. In this new book you learn how all receivers are brought to a common servicing level. Learn how components receive a functional check! This is the most definite and positive form of trouble localization! Over 360 pages — hard covers — only $2.00.

THE OSCILLATOR AT WORK
by John F. Rider

Don't guess — KNOW! This new book tells all about ALL oscillators. Explains theory by means of simple illustrations, diagrams and curves. Gives you practical facts. Make certain to get your full money's worth from the test oscillator or signal generator you now are using. Get your copy TODAY! 256 pages — illustrated — $1.50.

THE CATHODE-RAY TUBE AT WORK
by John F. Rider

This is the most complete and practical book ever written on the subject — the only one prepared especially for the radio serviceman. New applications of the cathode-ray tube during the past five years require that servicemen know its operation. 336 pages — over 450 illustrations — $2.50.

AUTOMATIC FREQUENCY CONTROL SYSTEMS
by John F. Rider

With Automatic Frequency Control Circuits in most new higher priced models, knowledge of "AFC" means money in your pocket! Learn the practical facts from these easy-to-understand explanations. Get your copy today. Cash-in on profitable "AFC" work. Hard covers — 144 pages — $1.00.

AN HOUR A DAY WITH RIDER BOOKS

On Resonance and Alignment . . . On Automatic Volume Control . . . On D-C Voltage Distribution in Radio Receivers . . . On Alternating Currents in Radio Receivers. 60c each.

JOHN F. RIDER Publisher, Inc.
404 Fourth Avenue **New York City**

Export Division: Rocke-International Elec. Corp., 100 Varick St., New York City Cable: ARLAB

Read RIDER BOOKS

Successful SERVICING

SEPTEMBER-OCTOBER, 1940

Courtesy Western Electric Co.

NOTES ON SUPERHET CONVERTERS

MANY of the troubles most difficult to correct in superheterodyne receivers have been traced to defective operation of the converter stage. And, within this stage, most of these faults result from troubles in the oscillator section. Since the oscillator is far more critical in adjustment than any other receiver circuit, it is natural that variations in operating conditions, which may have little or no effect on other receiver circuits, frequently cause serious trouble in oscillator circuits.

In the more recent superheterodynes, the use of improved converter tubes makes the oscillator less subject to troubles due to changes in operating conditions within the receiver. To obtain proper performance from some of these new tube types, oscillator circuits which were generally employed in previous converter circuits have been replaced with others seldom used heretofore. There are definite reasons why one circuit works better than others in this application and it is important, from a servicing standpoint, that these reasons be known since there are occasions when exact replacement oscillator coils are not obtainable. And, if substitution becomes necessary, we need to realize that an oscillator coil which may work satisfactorily in older converter circuits will be found unsuitable for some of the more modern types.

One of the most common troubles associated with superheterodyne oscillators is frequency drift. The extent to which this fault has made necessary frequent readjustment of push-button tuning systems in some of the earlier receivers of this type is well known in the field. Not so generally realized, however, is the fact that frequency drift in the oscillator also may cause motor-boating on strong signals . . . a far more serious fault which is not overcome by simply readjusting trimmers.

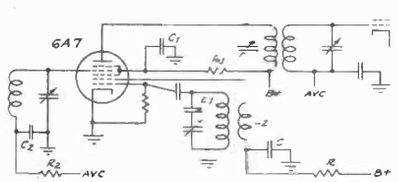


Fig. 1. A typical superheterodyne converter circuit using a pentagrid 3A7 tube.

Just how this motorboating condition arises may be understood from a consideration of the circuit, Fig. 1. As shown, this is a typical pentagrid converter circuit employing the 6A7 tube. The oscillator utilizes the tickler-feedback type of circuit and, in this diagram, *L1* represents the tank coil and *L2*, which is connected in the anode-grid circuit, serves as the feedback coil. The signal grid is under avc control.

When a strong signal is tuned in, the avc voltage increases, applying a high negative bias voltage to all tubes under its control. Under such condi-

(*Please turn to page 3*)

Proposed Frequency Reallocations

On September 11, 1940, the Federal Communications Commission filed with the State Department its proposed reallocation of frequencies for stations in the standard broadcast band in the United States. While these frequencies are not as yet definitely adopted, being at present under consideration by the other signers of the agreement, it is felt that the following shifts will be made as of March 29, 1941:

Present Frequencies of Stations Between	*Proposed Frequency Reallocations*
550—720 kc	No change
740—780 kc	Up 10 kc
790—870 kc	Up 20 kc
880—1450 kc	Up 30 kc
1460—1490 kc	Up 40 kc
Local 1500-kc stations	Down 10 kc

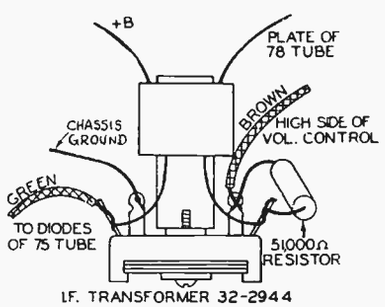
This means that stations whose carriers are under 720 kc will undergo no change. Station WJZ, for instance, which now broadcasts on 760 kc, will be advanced to 770 kc; WABC, now on 860 kc, will go up to 880 kc; WHN, now on 1010 kc, will be up 30 kc to 1040 kc, and so on.

We repeat that these are *proposed* designations and have not as yet been finally adopted; when they are, you will be advised. However, it is safe to state that in the near future, you can warn your customers about the changes and prepare them for the new frequencies next Spring.

•

Philco 38-15

To obtain more stable operation, the Philco Model 38-15 Code 121-124 second i-f transformer assembly has been changed. As shown in the parts list on *page 9-2 of Rider's Volume IX*, the old assembly (reference number 15) was Part No. 32-2674; the new

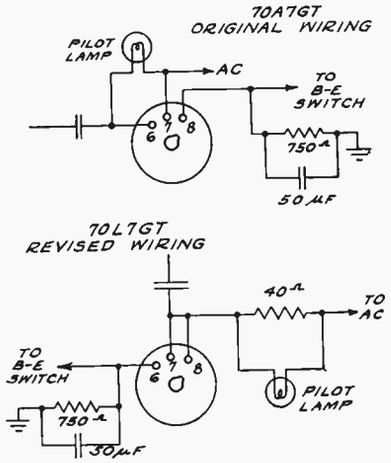


New i-f transformer for Philco Model 38-15.

assembly is Part No. 32-2944. The wiring of the new transformer, Part No. 32-2944, is indicated in the accompanying sketch. Condensers 15B and 15C are part of the compensator in these assemblies.

Fada P-58, PL-58

In a late production run the 25-mf condenser in the amplifier cathode circuit of the 70A7GT tube (*see page 11-5 in Rider's Volume XI*) has been changed to 50 mf. This condenser is



Original and revised wiring of the amplifier-rectifier circuit of the Fada Model P-58, PL-58.

shunted across a 750-ohm resistor to ground, and the change was made to reduce the hum.

A substitution of the 70A7GT by a 70L7GT has also been made, this necessitating a wiring change. As may be seen in the accompanying diagrams, the pilot-lamp lead is removed from pin 6 and moved to pin 8, the lead that was on pin 8 being connected to pin 6. Pins 7 and 8 are connected. A 40-ohm, 1-watt, resistor and the pilot-lamp lead are also connected to pins 7 and 8. A tie is fastened to a convenient place on the chassis to anchor the other pilot-lamp lead and the shunt resistor.

•

Belmont 579

Please make a note in your Vol. XI Index that this model is identical to Belmont model 577D, see *page 11-13 in Rider's Volume XI*, with the exception that model 579 has only four push-buttons whereas model 577D has five.

•

A PEOPLE may prefer a free government; but if, from indolence, or carelessness, or cowardice, or want of public spirit, they are unequal to the exertions necessary for preserving it; if they will not fight for it when it is directly attacked . . . they are more or less unfit for liberty.—*From an "Essay on Representative Government" by John Stuart Mill, published in 1860.*

RCA Leather-Covered Cabinets

The original coloring of leather-covered cabinets is not obtained by dye or stain, but is the natural color of the leather. The recommended procedure for restoring the finish for each type of cabinet follows:

Raw Hide. First wash the leather covering thoroughly with an alkaline soap and water to remove the dirt and grease. Then re-wax the surface with an ordinary paraffine wax to restore the original finish. If convenient, a more lasting finish may be secured by giving the leather a thin, even coat of clear lacquer instead of the wax.

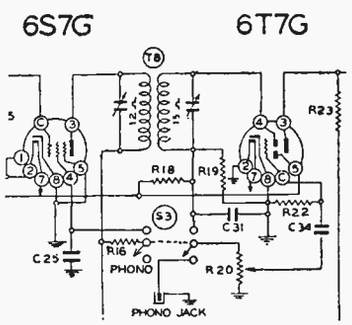
Cow Hide. Work leather covering with saddle soap until the discoloration is removed and a uniformly colored finish is obtained.

Buffalo Hide. First remove all dirt and grease by washing with an alkaline soap and water. Then work with saddle soap until desired finish is obtained.

•

Belmont Export Chassis 706, Series C

The Series C of this chassis, which may be identified by the serial number being above OC374700, is similar to the Series A, the data for which will be found on *page 11-17 in Rider's Volume XI*, with the exception that the Series C models have no push-buttons and that a change has been



This partial schematic shows the revised wiring of the radio-phonograph switch in the Series C of the Belmont export chassis No. 706. No changes in parts values have been made in this revision.

made in the radio-phonograph switch circuit. The partial schematic in the accompanying illustration shows this new switch, the part number of which is 12570. Note that the values of the parts in this partial schematic are the same as those in the original shown on page 11-17.

Notes on Superheterodyne Converters

(*Continued from page 1*)

tions, the plate current of all the tubes so controlled is reduced, thus lowering the current drain on the power supply system. As a result of this decreased current drain, the power supply voltage rises and the plate voltage applied to all tubes therefore increases.

The increase in plate and screen voltages applied to the converter as a result of this condition causes a change in the oscillator frequency. As soon as the oscillator frequency is thus changed, the circuit becomes slightly detuned and accordingly the resulting i-f signal frequency is also changed. Since the frequency to which the i-f amplifier is tuned then differs from the i-f signal, the i-f amplification is reduced, decreasing the signal level at the avc diode and thus lowering the avc voltage on all controlled tubes. The oscillator plate and screen voltages then decrease, tending to bring the oscillator frequency back to normal again. Then the entire cycle of changing plate voltages and oscillator frequency shift is again repeated.

These changes do not take place instantly, but at a frequency determined by the time constants of the resistors and capacities in the circuits in which the varying voltages occur. Largely they are controlled by the time constant of the avc system, which is ordinarily about 1/10 to 1/20 of a second, corresponding to a frequency of 10 to 20 cycles. Therefore motorboating at this frequency results.

One method of minimizing this effect is to employ resistance-capacity filters in the plate and anode-grid circuits which act as a bypass for the motorboating frequency. Such filters, shown as *R-C* and R_1C_1 in Fig. 1, serve to maintain the voltages substantially constant and thus reduce the frequency shift.

In power supplies having a low-resistance choke and large capacity condensers, large voltage variations due to such causes are not likely to occur unless the condensers change in capacity during use. When this happens, motorboating may result either as an effect of oscillator frequency variations or of common coupling through the power supply circuit of audic circuits.

In more recent superheterodyne receivers, using the 6SA7 and 12SA7 tubes, the tube structure and the oscillator circuit have been so changed that troubles of the type just described are here minimized. In Fig. 2, the converter circuit of the RCA V-300, V-301, V-302 employs a 6SA7 in a representative circuit design. Some departure from usual design of former converter circuits is immediately evident.

If we compare Fig. 2 with Fig. 1, starting with the various tube elements, we find that there is a fundamental difference in the design of the 6A7 and

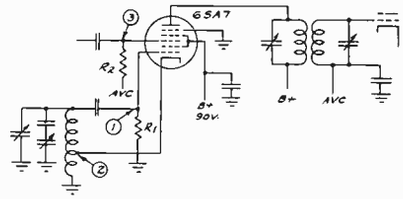


Fig. 2. The modernized converter circuit of the RCA Model V-300 using a 6SA7 tube.

6SA7 tubes which goes far deeper than the fact that the 6A7 has its control grid on top while the 6SA7 is a single-ended type. Note first that while each has five grids, the arrangement of the grids differs. In the 6A7, G1 and G2 are the oscillator grids, G3 and G5 form the screen and G4 is the signal grid. In the 6SA7, G2 and G4 form the screen, G5 is a suppressor and G3 is the signal grid. There is no equivalent for G2 of the 6A7 in the 6SA7, since the function of the screen in the 6SA7 is combined with that of the oscillator anode grid.

Therefore if the screen of the 6SA7 is to be effective in keeping the oscillator voltage off the signal grid, there must be no oscillator voltage on the screen. This means that a tickler-feedback oscillator circuit, such as that employed in Fig. 1, cannot be employed in the 6SA7 circuit. For, if it were, then the oscillator voltage developed across the tickler coil, which would have to be connected in series with the screen, would be impressed on the signal grid.

To avoid this, the Hartley circuit is used in Fig. 2. Note that the tickler is in the cathode circuit, obtained by tapping at point *2*. When this is done, it becomes possible to bypass to ground any oscillator voltage which might reach the screen circuit. Thus better shielding action in the 6SA7 is achieved.

However, since the cathode of the 6SA7 connects to a tap on the oscillator coil, the oscillation voltage between this tap and ground causes the

(*Please turn to page 6*)

IN *The Meter at Work*, which will be our next book off the press, an innovation in book making will be incorporated which will be as radical a step and as far-reaching as when halftone engravings were substituted for wood cuts.

It has ever been our contention that books should be so arranged that the reader obtains the information contained in the text with a minimum of effort. To this end, we have conducted numerous experiments on the readability of different type faces—the effect of the color, opacity, and finish of the paper—the physical size of the type page—the style of the illustrations and so on—all with the sole idea of making things easier for the reader.

Yet, with all this, it was felt that something was still lacking: there was one certain phase of reading that was a definite nuisance and a handicap to keeping the chain of thought intact throughout a discussion covering several pages of text. This was a handicap with which every publisher has been faced and which is especially annoying in the cases of books such as we publish. So we cast around to see if this nuisance could be eliminated and—*we have licked the problem!*

We feel sure that you will be delighted with the ease with which you can follow the subject matter of *The Meter at Work*, which we believe is of the same high calibre as our other publications and will prove of equal value to you in your work. . . . Naturally we will be intensely interested in your reactions and your criticisms, for this innovation in book-making is an experiment and whether we adopt it for some of our future books depends entirely on you.

At this writing we are unable to announce a definite date of publication, but it is not many weeks distant. . . . Watch for further announcements of this greatest forward stride in the history of radio publishing.

—*Editor.*

A New Series on SOUND

AT different times we have stated in these columns that the scope of the radio serviceman's activities—the horizon of his business, as it were—must be expanded in keeping with the times and the developments in the electronic arts. It is in line with this trend of a widening viewpoint that we are bringing to your attention a series of books, which we plan to publish in the near future, that will assist you not only in your present work of servicing receivers, but will also give you an insight to other important phases of the service industry.

These books will be written about Sound, its amplification and reproduction.

If you will give the matter some thought, you will see that this matter of sound is really a very vital part of a serviceman's technical knowledge. . . . In a radio receiver, no matter whether it be used in the home, in an automobile, in an airplane or on a yacht, the amplification of audio-frequency currents and their translation into sound energy is the sole reason for being of the apparatus. And furthermore, it does not make the slightest bit of difference whether the input to the a-f amplifier be from a detector tube, a phonograph pickup or a microphone, audio-frequency signals have to be considered and eventually sound itself.

During the past twenty years, which can be roughly said to cover the period when electron tubes have been utilized to amplify electrical energy with the idea of converting it into sound energy, many, many volumes have been written on the subject. Taken by and large, a very great percentage of these books have dealt with radio-frequency currents, their amplification and detection, to the almost total exclusion of the audio-frequency end of the subject. It is true that some books have been written which deal with a-f currents and their amplification, but on the whole these books are mathematical in their treatment and touch all too briefly, if at all, on the practical aspects of the subject. And it is this angle—the practical—that the serviceman is chiefly interested in.

It is, of course, true that the man who works with any sort of apparatus at all desires to know as many of the practical aspects about it as possible; yet on the other hand—and this has been stated in these columns many times before—it is just as essential for him to be thoroughly acquainted with the theory underlying the functioning of the equipment, if he is going to get the most out of it. Therefore, this series of books covering the sound field will contain, as others of our books have in the past, a combination of the theoretical and the practical, designed in the main to give the reader the necessary amount of information, so that he will know not only *how the apparatus functions but how to use it with the greatest efficiency.*

Now in regards to the subject matter of the books. . . . Inasmuch as everything in connection with sound and its amplification hinges on the vacuum tubes used in the apparatus, it is a natural starting point to begin with them. Furthermore, since this series deals solely with audio frequencies and their amplification, only the vacuum tubes encountered in this portion of the field will be considered: tubes used as a-f voltage amplifiers, power output tubes and rectifiers. The general functioning of these several groups will be explained together with practical data that will enable a man to select the proper tube to do a certain job, what voltages to use and all the related information.

The next logical subject is the apparatus in which these vacuum tubes are employed: the voltage and power amplifiers and the power supplies. If the vacuum tube can be considered as the heart of the amplifier, then the components making up the amplifier itself can be thought of as the body; consequently, the next subject to be discussed will be the various types of audio amplifiers. Under this general heading will come the various forms of voltage amplifiers—a discussion of which type is best suited for certain kinds of work, power requirements for different conditions as well as an explanation of the theory underlying the functioning of the several types. Power amplifiers and power supply circuits will be discussed in the same detail, with stress being placed upon the practical essentials.

While audio-frequency amplifiers can be broken down into several main classifications certain variations and improvements have been introduced from time to time: phase inverters, inverse feedback, tone controls, etc. Such circuits as these will be explained and also some of the ills to which the equipment is subject—such ailments as noise, hum, distortion, etc. Then will come a discussion of the source of operating energy—the power supplies and data concerning their functioning and operation.

It was mentioned above that the source from which the signal voltages come into the amplifier made no difference, as far as the amplifier itself went. True enough, but on the other hand, it is necessary to be familiar with what some of these sources are. In the radio and so-called "sound" fields today, the input to the amplifier can come from apparatus that while different in itself, is really closely related inasmuch as it has the a-f amplifier in common. We are here referring to microphones, phonograph pickups, electrical musical instruments, recorders, etc. It is just as essential for anyone to know about these accessories, their functioning and operating characteristics as the amplifier itself, so all these will be explained.

Last but not least sound energy itself will be discussed. Not only will the underlying theory be explained, but its applications in connection with the apparatus mentioned above. This will be one of the most important parts of the entire series and you will find it presented in the clear, easy-to-read style that characterizes all Rider books.

At the present writing, it is impossible to fix a date of publication for any of these books; nor can the price be established. One fact can be told that will be of interest: if the entire subject of sound were covered in one or two books, the price would have to be almost prohibitive. Therefore, it has been decided to publish the Sound Series in several sections, each one priced at a figure that will put it within reach of every man, for we feel positive that this series is one of the most important that has ever been published for the radio serviceman. Watch for future announcements.

Successful
SERVICING

Reg. U. S. Pat. Off.

Vol. 7 **SEPTEMBER-OCTOBER, 1940** **No. 1**

Dedicated to the financial and technical advancement of the Radio Serviceman

Published by
JOHN F. RIDER PUBLISHER, INC.

404 Fourth Avenue **New York City**

JOHN F. RIDER, Editor **G. C. B. Rowe, Associate Editor**

This publication is the house-organ of the publisher and if due credit line is given, permission is hereby granted to editors to reproduce material contained herein.

EDUCATIONAL EXPERIMENTS

ONE of the best ways to impress anything on one's mind is to translate the idea into action—in other words, to do some operation with your own hands that will illustrate some point under consideration. The point we have in mind is the performance of experiments that will clarify and tend to record permanently in your mind certain phases of radio technique about which you have read.

Let us say that you read something about some new developments in circuits—for instance, the lead article on superheterodyne converters in this issue of SUCCESSFUL SERVICING. After you have completed it, you have more than likely gained the general idea that the use of the 6SA7 and 12SA7 tubes has permitted new circuits to be employed that will minimize certain faults which were inherent in oscillator circuits of yesterday's receivers. Furthermore, unless you are an exception to the rule, you will make a mental note to compare the schematic of the first job using a 6SA7 that comes into your shop with the illustrations in the article, see if they are similar, note the performance of the set—and then forget all about it in the rush of getting out that particular job because Mr. Jones is in a hurry for it.

Now when you get right down to cases, what did you gain from an educational point of view from the reading of that article? The chances are, of course, that if you read the article properly, you do know more about converter circuits in modern sets than you did previously, but there is little doubt that with a relatively small amount of trouble on your part, you could get a whole lot more. . . . And that little amount of trouble to which we refer is some experimentation along the lines suggested by the contents of that article.

For example: the chances are that somewhere around your shop is a superheterodyne whose oscillator circuit is similar to that shown in Fig. 1. Now motorboating is mentioned as one of the troubles developed by this circuit if the values of the filter circuits, RC and R1-C1, and the filter condensers in the power supply vary to any great extent. . . . Here is a spot for experimentation: after checking the performance of the set, deliberately change the values of the components one after the other and see how they affect the performance of the set. . . . In other words, play around with the set, changing this part and that one—the voltages to plates and screens—and all the other factors that can introduce variations in the output and as you do all this, make some notes of what these results are.

These records of your findings are of as much importance as the actual experimental work that you do. Unless you have an extraordinary memory, it is practically an impossibility to remember data gathered as we have suggested. . . . And such data are particularly valuable, as you will realize when you have performed some experiments like those outlined.

You may not realize it immediately, but there is no doubt in our mind that if such experiments are planned and performed intelligently, your technical education will be furthered to a great extent. In any scientific school, anywhere from one third to one half of a man's time is spent in a laboratory where he is performing experiments that illustrate theoretical points that have been presented to him in the classroom—in other words, he is translating ideas into actions and by so doing, is impressing important facts on his mind.

You have no time for such experimenting? You *take* time for reading books and magazines that you believe will benefit you in your work and consider that time well spent, do you not? How about taking some of your "reading" time and devoting it to the bench where you can translate the ideas picked up from whatever you have read into actual meter readings and sounds from a loudspeaker?

We maintain that time spent like this will prove an excellent investment—no matter in what phase of the service business you are especially interested. Education is a *must* these days for the radio serviceman and it is never-ending, for you know, as well as we do, the progress being made in the radio field today.

Work with your hands; you'll remember more!

JOHN F. RIDER.

•

And Now—Volume 7

It's another birthday!

Six years ago we decided that it was essential for you to become better acquainted with us—for you to know what we were going to do and what we had done. Also we wanted to have some means by which we could talk to you directly without being hampered in any way whatsoever. Hence—SUCCESSFUL SERVICING. . . .

That our efforts have met with some measure of success is evidenced by the demand for this publication. *Our circulation is now more than 25,000!* This is a far cry from the number of No. 1, Vol. 1, we printed back in 1934 and we have every reason to believe that you like what we run in these columns, for if, by chance, someone fails to receive his copy, we are notified of that fact in no uncertain terms.

If we sometimes dip our editorial pen in vitriol instead of more placid ink, it is because we feel just that way about something and we do not believe in pulling any punches we want to throw out. You must know by this time that we have the welfare of the service industry too much at heart to

(*Please turn to page* 6)

Notes on Superheterodyne Converters

(*Continued from page 3*)

cathode voltage to vary at the oscillator frequency. Over the positive half cycle of the oscillation the cathode becomes positive with respect to ground while over the negative half cycle the cathode becomes negative.

Since all voltages are reckoned with respect to the cathode, it follows that the voltages on all other tube elements will fluctuate in accordance with the variations in the cathode voltage. Over the positive half cycle, since the cathode becomes positive and the screen and plate are already positive, the voltage difference between these elements and cathode becomes less. Over the negative half cycle, when the cathode is negative, the voltage difference becomes greater.

It would seem, since the voltages thus fluctuate at the oscillator frequency, that this variation in voltages should likewise affect the oscillator frequency, just as in the 6A7 circuit. However, in the 6SA7 tube, the design is such that, when the plate current increases, the screen current decreases. Thus when the cathode voltage varies in a direction which tends to increase the plate current, at the same instant the screen current is correspondingly decreased. The net effect of these opposing changes is to maintain substantially constant the total cathode current and the frequency shift is accordingly greatly minimized.

So far we have considered only the effect of oscillator voltage on the cathode current. Variations in the signal or avc voltage are similarly compensated for in the total cathode current, because the change in plate current thus resulting is offset by a change in screen current in the opposite direction which tends to keep the cathode current constant.

Due to the fact that, over the negative half cycle of oscillation, the cathode momentarily may become more negative than the control grid, it is possible, when a weak signal is being received, that some grid current may flow in the control grid circuit, causing a voltage drop across *R2* in such direction that point *3* becomes more negative. To keep grid current at a minimum, the tap on the oscillator coil (point *2*) is so chosen that peak oscillator voltage from point *2* to ground is about 2 volts. This is a design consideration, of course, and ordinarily need not be checked in servicing other than to make certain that a replacement is so installed that the tap is at the ground end of the coil to avoid excessive cathode voltage.

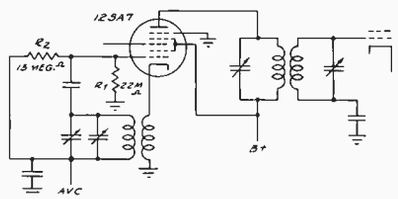


Fig. 3. Converter circuit of the Zenith Model 6A01-6A10 in which the oscillator coil design differs from that of Fig. 2.

Insofar as the rectified voltage across the oscillator grid leak is concerned, this will vary in different receivers. In the circuit shown in Fig. 2, the d-c voltage so measured with an electronic voltmeter varies from –4 volts at 1.6 mc to –10 volts at 1500 kc. In general, this voltage is greater at the high-frequency end of a band than it is at the low-frequency end.

In Fig. 3 is shown the converter circuit used in the Zenith chassis 6AO1-6A10. The 12SA7 converter, employed in this circuit, is similar in design to the 6SA7, except for the heater voltage. Note that, while the oscillator coil design differs, the feedback coil is again in the cathode circuit and serves the same purpose as that in the circuit of Fig. 2.

The oscillator grid leak is *R1*. The function of *R2* is to feed a portion of the rectified d-c voltage developed across *R1* into the avc network and thus secure avc delay action.

There are other new and distinctive converter tubes which will be described in a subsequent issue of Successful Servicing. Detailed analyses of fundamental oscillator circuits of every type and description of trouble-shooting methods in typical receiver converter circuits are given in "The Oscillator at Work" by John F. Rider.

•

And Now—Volume 7

(*Continued from page 5*)

gloss over anything that might be to the detriment of anyone or anything concerned with it.

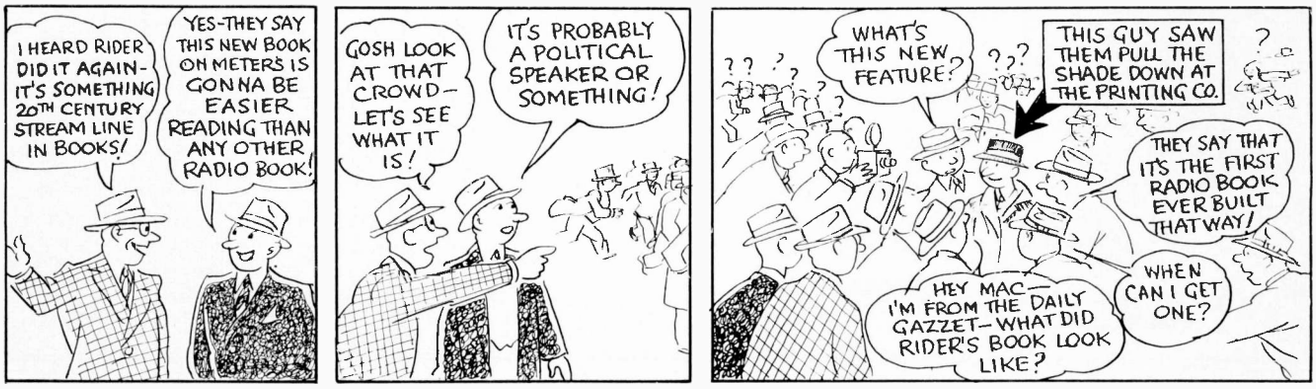
Once more—we are reminding you that Successful Servicing is *your* magazine. If you have any complaints to register or suggestions to make, here we are. We are planning big things for this coming season of 1940-41 and we are sure that you will approve of them in the future as you have in the past.

•

The Cover

The new speech input equipment that was especially designed and built for the f-m transmitter at WOR by the Western Electric Co. is shown on page 1. The well-known conductor, Alfred Wallenstein, and J. R. Poppele, chief engineer of WOR, are inspecting the apparatus, which is said to give to the station's f-m broadcasts a range and fidelity of the highest quality. We wish to acknowledge the courtesy of the Western Electric Co. for permission to reproduce this photograph.

The Whole Town s Talking . . . .



AND NOW COLOR

On Sept. 4th CBS slipped ye N.Y. scribes a look at COLORED television in their Photo Lab and we want to go on the record here and now that *it was good!* They had a regular black-and-white receiver parked right next to the one showing colors and the same sigs made the electrons wiggle in each. Take our word for it—there was just no comparison *a-tall*. We saw Dr. Ives' first demonstration of colored television down in the Bell Labs back in '29 when he used a neon tube and a pair of argon tubes to get his colors and even though the picture was the size of a postage stamp, we thought then —*that* was sumpin. . . . But t'other afternoon when we saw Dr. Goldmark's pix on the screen of his cat-ray tube, we doffed the derby to him, for *he's* pushed things another step forrard. We're takin' bets that if Mr. and Mrs. J. Q. Public gather an eyeful of telecasts in their true colors, they'll give the black and whites the go-by. . . . *And we wouldn't blame 'em!!!*

ONE FER DE BOOK

T'other night we were talking to a friend who knows his way around in the broadcastin' end of this biz of ours and he poured the followin' into our good ear: He was talkin' to an account exec. in one of the *biggest* adv'ing agencies in town. This exec's prize account was a BIG electrical company that sold pul-enty of a 15c item *all over* these United States and for the last coupla years had been telling radio listeners about this cheap item via a hotsy-totsy orchestra whose leader sorta likes to runs things his own way. . . . Well, it seems as to how this exec. was weepin' a harrowin' tale into my friend's ears about his troubles with this tempermental musicer and the account, etc. etc., when suddenly he yanks out his ticker and excuses himself with these words, "I've gotta catch a plane for ——. We just found out that the local advertising down there still carries *a price of 30c* on that item we were talking about." (*Aside to more'n one big company:* mebbe it'd be a good idea to let

yer right hand know wot yer left hand is doin'—at least, sometimes.)

WOT NEXT?

Just gotta flyer from a St. Paul mfr. tellin' about his latest gadget. . . . It's a combo. radio receiver and inter-communicator designed especially for talkin' between the kitchen and the front door. Now all Momma has to do when she's elbow-deep in cake dough is to flip a switch and tell the fuller-brush gent she doanwant some today without botherin' to leave the kitchen. . . . Say, there's an idea for you and *you*—why not sell one of these to the Madame of the house in place of the midget she has in the kitchen?????

NUTMEG COPS TRY F.M.

In our pedalin's round and about we often have occasion to consult the city's or the state's "finest" as to where we are or how do we get there. . . . Having mislaid our road-map while up in Conn. recently, we asked a State traffic boss how to do a bit of traffic dodgin'. While draped gracefully over the door of his buggy, we got an earful of the usual "Callin' Car No. 16, etc. etc." We got chinning about radio and this gent tells us as to how some of the State police buggies are equipped with f-m jobs. And we've heard tell that more'n one or two mfrers. are hustlin' through the design of 2-way f-m outfits for the finest. . . . (*Aside to Service servicers:* Didja hear about our book **"F-M"?** *Might come in handy for yuh soon.* . . .)

METER MEAT

That's what this new book is goin' to have pul-enty of. . . . The Boss says as to how **"The Meter at Work"** is goin' to be chuck full of *"how-to-do-it"* with enuf *"why-it-does-it"* so you'll know wot it's about. . . . Yuh know, those rare hunksa information, boiled down so they're easily digested—the whole thing welldone. (Aloysius saw the head on this paragraph and said *"Tell 'em to steak themselves to a copy when she comes out and they'll sure loin sumpin".*) **And wotta surprise you have comin' to yuh!**

THANX

We want to thank all youse guys who cooperated with us by letting us know about your old copies of radio mags. . . . If you haven't received an answer yet, it's on accounta we got such a PILE of letters to go through. . . . And we thank those fellows again who sent us some of our missing copies with no thought of payment or swaps, just because, as most of 'em said, they felt they owed us something for all the good they've dug outa our books. All of which proved to us that human nature *does* have its moments. . . .

FLASH!!

Just gotta release from the F.C.C. that the reallocations of broadcast stations' frequencies that we mentioned in this here col. some time back will take place **March 29, 1941.** There's a date to paste in yer bonnet for it'll mean lots an' lotsa jobs for youse guys doin' a reallocation job on pul-enty push buttons. . . . Betcha that'll be a *BUSY* weekend. . . . If it ain't, a lotta folks are goin' to push the button for Charlie McC. and get almost anything—mebbe even

THE ROLLING REPORTER

FREQUENCY MODULATION
136 Pages $1.00

SERVICING BY SIGNAL TRACING
360 Pages $2.00

THE OSCILLATOR AT WORK
256 Pages $1.50

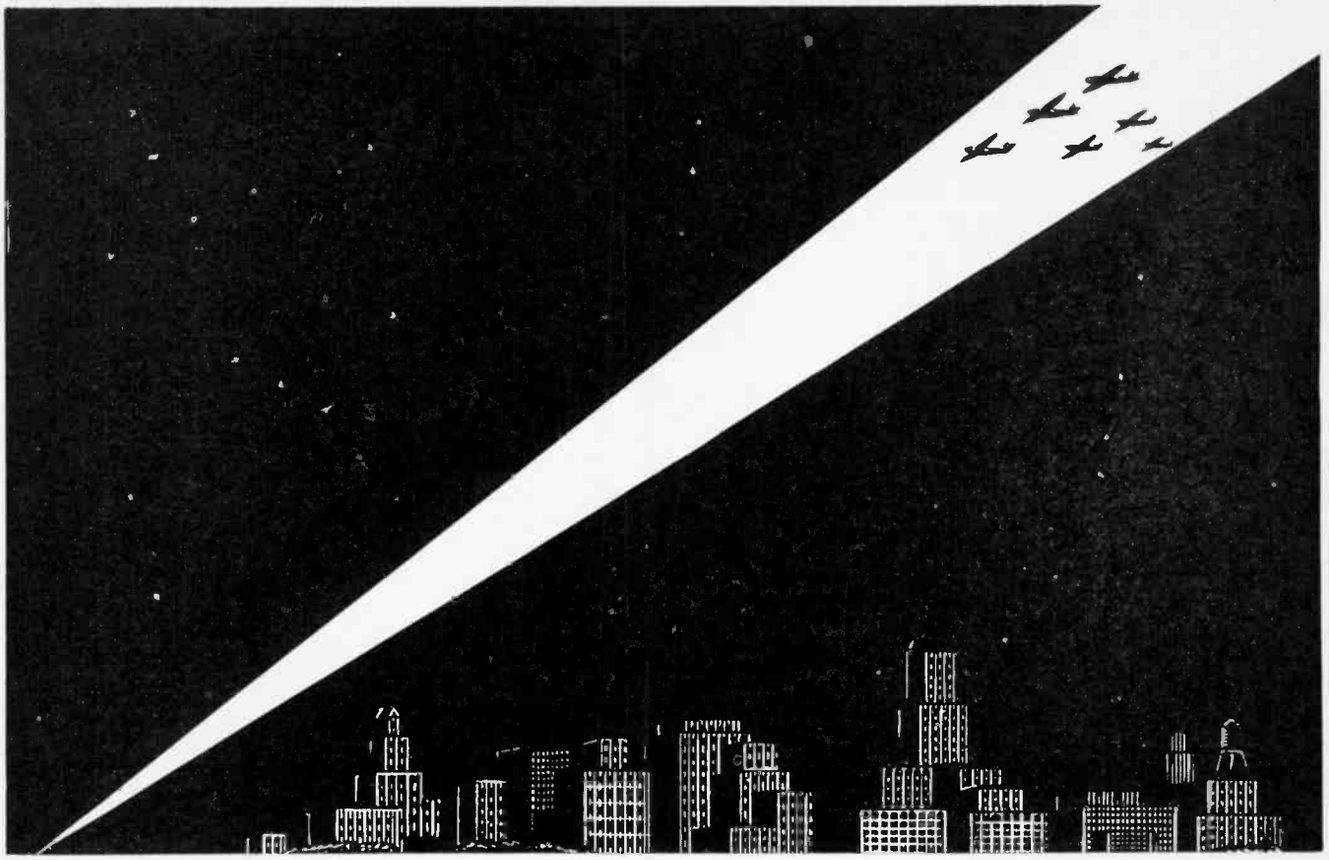
THE CATHODE-RAY TUBE AT WORK
336 Pages $2.50

SERVICING SUPERHETERODYNES
308 Pages $1.00

AUTOMATIC FREQUENCY CONTROL
144 Pages $1.00

AN HOUR A DAY WITH RIDER
on
RESONANCE AND ALIGNMENT
AUTOMATIC FREQUENCY CONTROL
D-C VOLTAGE DISTRIBUTION
ALTERNATING CURRENTS IN RADIO RECEIVERS
96 Pages each 60 cents each

'Nuff Said!



LIGHT

WHERE IT'S NEEDED
WHEN IT'S NEEDED

A modern anti-aircraft battery is useless until enemy planes are picked out of the black by the powerful beams of the searchlights. Without *light* . . . where it's needed, when it's needed . . . the accuracy of the guns and the skill of the gunners would be entirely wasted.

In radio servicing, even the most skillful trouble-shooter must have a thorough knowledge of every detail of construction and wiring of the particular set on which he is working in order to do his job quickly and efficiently. That is why the most successful servicemen never depend on guesswork or memory . . . they turn to their RIDER MANUALS for complete and accurate data on every set, instantly!

RIDER MANUALS provide, in the most convenient form, everything a serviceman needs to know about any make or model of radio receiver. They contain authoritative data on alignment, I-F peaks, operating voltages, parts lists and values, voltage ratings of condensers, wattage ratings of resistors, coil resistance data, gain data, etc.

No serviceman can afford to be without these essential data any more than the anti-aircraft gunner can do without searchlights. Like the searchlights, RIDER MANUALS provide *light* for the trouble-shooter . . . *where* it's needed, *when* it's needed. . . . Fill in any missing volumes of RIDER MANUALS at your jobber's. Do it today! You'll find it worth your while!

JOHN F. RIDER Publisher, Inc.
404 FOURTH AVENUE . . NEW YORK CITY
Export Division: Rocke-International Elec. Corp.,
100 Varick St., New York City Cable: ARLAB

DO YOU HAVE ALL *Eleven?*

You need all eleven volumes of RIDER MANUALS to cover all makes and models that you may be called upon to service. A complete set is "must" equipment for every up-to-date service shop. Check over this list.

Volume	Price	Covering
XI	$10.00	Up to May 15, 1940
X	10.00	1939-40
IX	10.00	1938-39
VIII	10.00	1937-38
VII	10.00	1936-37
VI	$7.50	1935-36
V	7.50	1934-35
IV	7.50	1933-34
III	7.50	1932-33
II	7.50	1931-32
I	7.50	1920-31

You NEED RIDER MANUALS

Successful SERVICING

NOVEMBER-DECEMBER, 1940

Courtesy of Westinghouse Elec. & Mfg. Co.

PHASE INVERTER CIRCUITS

WHEN using tubes in a push-pull connection it is necessary for the grids of each of the tubes in this stage to be supplied with signal voltages that differ in phase by 180 degrees and are equal in amplitude. When a transformer input to the push-pull stage is employed this result is automatically accomplished. However, in order to obtain the advantages of resistance-capacitance coupling, such as economy, low hum pickup, etc., it is frequently desirable to dispense with this input transformer and to employ resistors and condensers to perform this task. This is the function of phase inverter circuits. Although there are quite a number of different types of phase inverter circuits, we shall here examine those which are most frequently used.

Single-tube Ungrounded-input Type

In Fig. 1 a schematic of a single-tube ungrounded-input type of phase inverter is shown. The resistors R_1 and R_2 are equal in value, and each has a resistance which is approximately half that which would be employed as a load resistor in a resistance-coupled stage of amplification. The internal plate resistance of the tube, the B-battery, and resistors R_1 and R_2 form a series circuit and, since the current flowing in a series circuit is everywhere the same, the plate current flowing through R_1 is equal to that flowing through R_2. Since R_1 and R_2 are equal and since the same current flows through them, the voltage drops appearing across R_1 and R_2 will be equal in magnitude.

Now let us apply a signal between the grid and cathode of the tube. First, we shall consider the application of a positive signal to the grid. The plate current increases and this results in a larger voltage drop across each of the two resistors R_1 and R_2. Accordingly, taking ground as the point of reference, the voltage at point P decreases while that at point K increases. On the other hand, if a negative signal is impressed upon the grid, the resulting decrease in plate current produces a smaller voltage drop across R_1 and R_2 and the potential at P increases while that at K decreases. These signal voltage variations are illustrated in Fig. 2.

We see, therefore, that the arrangement shown results in output signal

(*Please turn to page* 3)

RCA 45X-11, 45X-12, 45X-13

The servicing data which may be found on *page 11-78 in Rider's Volume XI* also apply to Model 45X-13, the chassis number for this being RC-459A. Please add this to the Volume XI Index.

Several changes have been made in the second production of these chassis, which now bear the numbers RC-459D for the first two and RC-459E for the last. The partial schematic shown herewith is the revised circuit in which are incorporated all the changes with

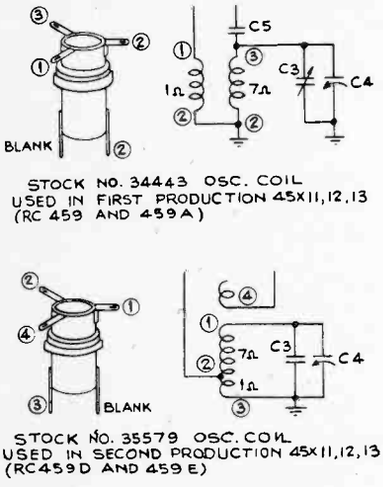


Fig. 2. Partial schematics of oscillator circuit in first and second production of RCA Models 45X11, 45X12 and 45X13.

the exception of the oscillator coil circuit, which is shown in Fig. 2 together with the oscillator coil terminal connections.

You will note that the resistor R-13, 100 or 150 ohms, is used in some chassis and not in others. When R-13 is used, the condensers C-11 and C-13 in the diode circuit of the 12SQ7 second-detector tube, are 220 mmf each instead of 120 mmf. In this case these two condensers are mounted outside the second i-f transformer shield, as they are in the original schematic shown on *page 11-78*.

The values of the filter condensers, C-19 and C-20, have been changed in the second production from 20 mf and 12 mf respectively to 30 mf and 20 mf. Note also the rearrangement of the volume control circuit and the change in the value of this component from 0.5 megohm to 54,700 ohms.

Since the release of the data covering the second production, two other changes have been made: R-15 in the control-grid circuit of the 50L6GT output tube has been removed and the condenser C-16 is connected directly to the grid of this tube; the first diode plate, DP1, of the 12SQ7 tube is now connected to ground instead of to the second diode.

The oscillator coil in the second production is different from that used in the first. The correct connections are shown in Fig. 2. Note that when installing a No. 34443 coil, it is necessary to connect a jumper from the bottom lug No. 2 to the top lug of the same number.

•

Stewart-Warner 5R Chassis

In some locations it has been found that the sensitivity of this chassis has been insufficient. If the chassis is housed in a wooden cabinet, it is possible to increase the sensitivity by the introduction of a small amount of regeneration, but if the chassis is housed in a plastic cabinet, it will oscillate if the sensitivity is increased beyond the present limit.

The procedure for the introduction of regeneration is as follows: disconnect the 0.05-mf condenser No. 23 from the suppressor-grid terminal of the 12SK7 socket. See schematic on *page 11-39 of Rider's Volume XI*. In the Underwriters' approved sets (Model 03-5R, etc.) connect this condenser to the B- terminal of the volume control. This terminal is the one closest to the 12SQ7 socket and can be identified from the socket voltage layout on the same page as the schematic. In those receivers that are not approved by the Underwriters (Model 07-5R, etc.), the condenser No. 23 is connected to the ground instead of B-.

After the condenser has been reconnected, re-align the receiver. It is especially important to readjust the broadcast oscillator padder No. 9 (see trimmer layout on *page 11-40*), exactly as explained in the alignment table. When aligning keep the chassis away from the loop or oscillation may occur.

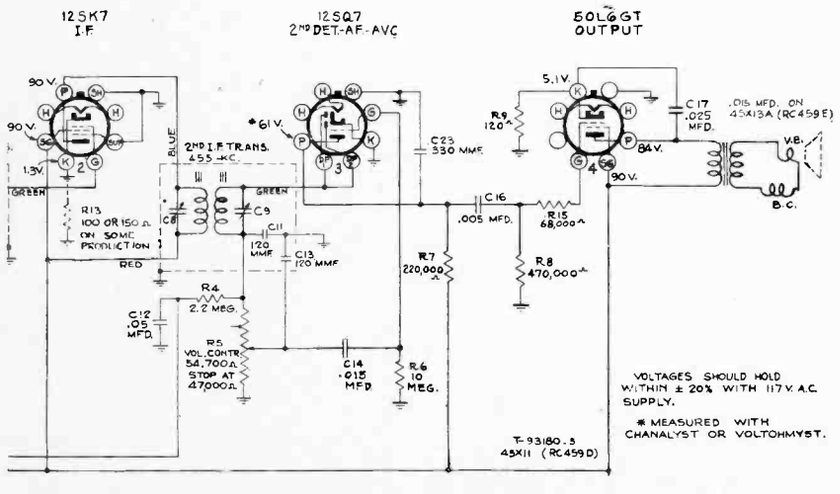


Fig. 1. Partial schematic of RCA Models 45X11, 45X12 and 45X13, second production. See other changes in Fig. 2 above.

Wells-Gardner 6B7-1

Later models of the 6B7 series have had an economizer switch and resistor added to the A-battery circuit, the schematic of which appears on *page 11-16 of Rider's Volume XI*. The issue letter was not advanced for this change.

On the mounting bracket for the ac-dc plug at the rear of the chassis the economizer switch is mounted. When the A batteries are new, the switch should be pushed up. When the receiver has been operated on batteries for approximately 100 hours and reception has become weakened, the economizer switch should be pushed down. If the set is operated about 3 hours daily on batteries, this would mean that the switch should be pushed down at the end of about 5 weeks. The position of this switch does not affect the operation of the receiver on either a.c. or d.c.

Be sure that the switch is pushed up when A batteries are replaced.

The switch is connected from the A-battery terminal to ground and it is shunted by a 30-ohm, 0.2-watt carbon resistor, which has been given the number R 28.

Phase Inverter Circuits

(*Continued from page* 1)

voltages which are equal in magnitude and opposite in phase and we can accordingly deliver these voltages through suitable coupling condensers to the grids of the push-pull stage. In passing, you should note that resistor R_k is the self-bias resistor and, since it is shunted by a large condenser C_k the bypassing action of this condenser prevents any signal voltages from appearing across R_k so that this resistor plays no part in the phase inverter action. The major disadvantage of this type is that the input circuit is not at ground potential.

Single-tube Grounded-input Phase Inverter

The circuit shown in Fig. 3 enables us to ground one side of the input. As before, the value of resistor R_1 is equal to that of R_2, for in the circuit shown the resistance of R_k is not considered as part of the plate load if the reactance of the cathode bypass condenser C_k is small for the lowest signal frequency that is to be reproduced.

You will observe that the signal is applied between grid and ground. However, since only that signal voltage which is applied between the grid and point K is effective upon the tube, resistors R_g and R_2 act as a voltage divider. The attenuation of the signal voltage due to this cause is of small importance, however, for R_g is usually large as compared with R_2.

Point K, with respect to ground, is varying in accordance with the input signal. However, since in vacuum tube applications it is customary to consider the cathode at a fixed potential, we shall take point K as being at a fixed potential and shall consider the signal voltage variations at points G and P with respect to point K. When a positive signal is applied to the input the plate current increases. The resulting increased voltage drops across resistors R_1 and R_2 cause the potential at P to decrease and the potential at K to increase. These voltage variations are equal with respect to ground and are 180 degrees out of phase. Similarly, when a negative signal is applied to the input the plate current decreases and the voltage drops across resistors R_1 and R_2 decreases. As a result, the potential at P increases while the potential at K decreases. Again, these voltage variations are equal in magnitude with respect to ground and are 180 degrees out of phase. Accordingly, the output obtained from points P and K may be applied, through suitable coupling condensers, to the grids of a push-pull stage.

Output Tube Type

The circuit shown in Fig. 4 is illustrative of a phase inverter which utilizes a portion of the output of one of the push-pull output tubes to supply the necessary signal voltage to the other push-pull tube. In the output circuit of the upper push-pull tube you will observe a capacitance-resistance network connected between plate and ground. The function of condenser C is to keep the high d-c plate voltage off the grid of the lower push-pull tube. Since this condenser is large, practically the entire output signal voltage of the upper push-pull tube appears across the voltage divider comprised of R_1 and R_2. A portion of this signal voltage is impressed upon the grid of the lower push-pull tube, the magnitudes of R_1 and R_2 being chosen so as to result in equal output signal voltages from each of the push-pull tubes.

Indicating the phase relations by means of encircled polarity signs, we see that a signal applied to the grid of the upper push-pull tube appears at the plate of this tube with its phase reversed. By means of the voltage divider a portion of this signal voltage is impressed upon the grid of the lower push-pull tube, this signal voltage appearing at the plate of the tube in opposite phase. Consequently, since the signal voltages at the plates of the two push-pull tubes are equal in magnitude but opposite in phase, they may be fed into the output transformer as shown in Fig. 4.

Two-tube Phase Inverter

The phase inverter circuit shown in

(*Please turn to page* 6)

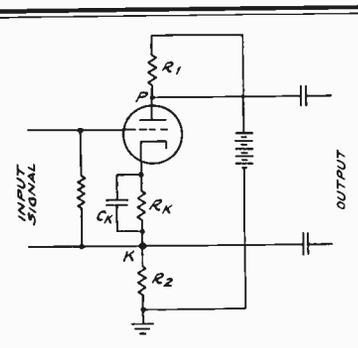


FIG. 1

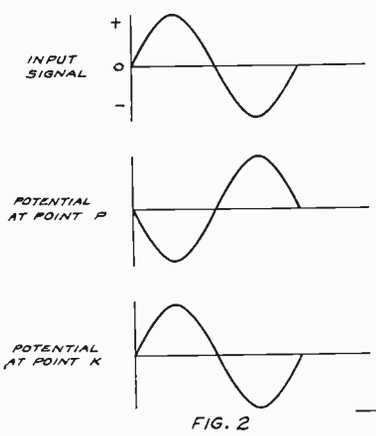


FIG. 2

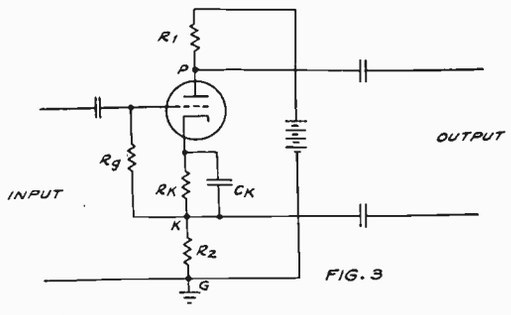


FIG. 3

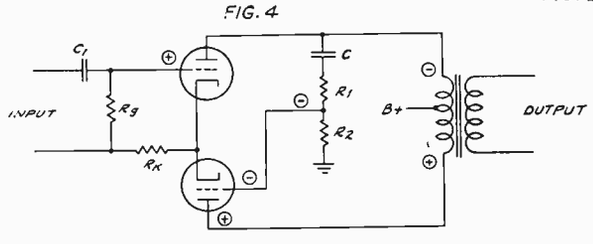


FIG. 4

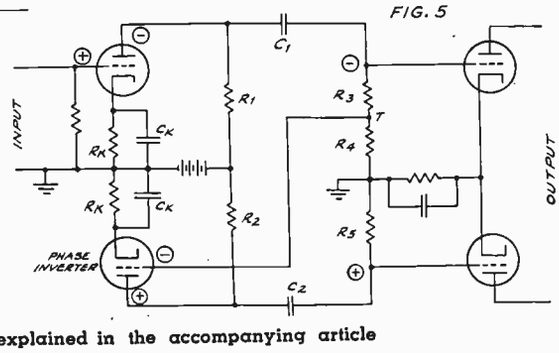


FIG. 5

Four widely used phase inverter circuits which are explained in the accompanying article

AND NOW— 1941

NOW that 1940 is drawing near its end, everyone is naturally looking forward to the coming year. In some respects our publishing plans are already laid and the program we have outlined can be described as ambitious, to say the least. We can tell you about some of it now—the rest will have to wait until our plans are completed. Suffice to say that we have some surprises in store for you.

About V-T Voltmeters

One of the first books that we will publish in 1941 will be one covering all phases of the vacuum-tube voltmeter. . . . This instrument is rapidly gaining in favor in the servicing field—it long has been in favor in the engineering field—and due to its importance it was deemed advisable to devote a separate volume to it instead of treating it all too briefly in a book about meters in general.

Vacuum-tube voltmeters can be divided into several classes; those employing diodes and triodes—"slide-back" type—those using a rectifier and amplifier, etc. Each of these classifications is thoroughly explained — the principles underlying their functioning and their operation. Then will be considered the v-t voltmeters for a-f measurements, d-c meters, ultra-sensitive microammeters and electronic ohmmeters.

Then in the usual combining of theory and practice common to all Rider books, the practical aspects of the v-t voltmeter will be considered. As is common to nearly all types of meters, multipliers and shunts are used to extend the range of these voltmeters. These are explained, as is the calibration of the different types. The latter portion of the book is devoted to the practical application of the v-t voltmeter—how it is used under different conditions, where it is most useful and just what it can be expected to do.

For the serviceman who wants to know more about vacuum-tube voltmeters, here will be a perfect mine of information, not only about the theory underlying their operation, but practical data, such as one man would tell another. All this information is the result of months of laboratory work, so you can rest assured that it is practical in every sense of the word. Moreover, if you have in mind the construction of a v-t voltmeter, you will find adequate information in this new book that will assist you in that constants are given for the different components of several types as well as a wealth of other data.

We are unable to tell you at the present writing any specific facts about the number of pages in the book, its date of publication or its price, whether or not it will be split—but we can say that it will be published in two bindings: *one paper and one cloth.* Of course, the paper binding will be quite a bit less expensive than the cloth. . . .

Needless to say we are working on *Volume XII of Rider's Manuals*—in fact, we have been working on the make-up of its pages practically since the day Volume XI went to press. Looking at the growing pile of pages, it appears as though this new Manual would have about the same number of pages as its immediate predecessors—somewhere about 1650. . . . Its date of publication is as yet undetermined but it will be sometime before Spring. . . .

The Editors and Technicians of SUCCESSFUL SERVICING wish you

A Merry Christmas

and a

Prosperous New Year

IN the last issue of SUCCESSFUL SERVICING, we told you something about the books covering the subject of sound in general. After talking the idea over with a number of men actively engaged in the sound field and finding out from them just what type of book would be most beneficial to them, it was decided to gather data together for a combination text-handbook. A great many men told us quite frankly that every once in a while certain theoretical facts slipped their minds and they would like to have a place where they could find such facts easily and without digging through a great lot of irrelevant material. Also they asked for such information in simple English with mathematical formulae kept to the necessary minimum. . . .

Sound Theory and Practice

So we are going to give them what they want. Naturally the explanations will be far less elaborate than they would be in a regular text, but in view of the fact that many phases of sound work are going to be covered as completely as possible, brevity will be sought. It is planned to have this book cover the theoretical and practical aspects of vacuum tubes used in the sound field—voltage and power amplifiers, rectifiers—and the different types of amplifying equipment in which they are used, as well as the power supplies. Then there is the necessary apparatus which is used in the p-a field—microphones, phonographs, recorders, etc. Also problems arise in this field not ordinarily encountered in the servicing of receivers—the problems of multiple speaker operation, the placement of speakers, the impedance matching of lines and a host of other items too numerous to mention here. These will all be covered in sufficient detail so that a man will have available the information he requires in an easily used form. . . .

It is also our intention to resume publication of specialized texts in *The Hour a Day with Rider* series. At the moment it is impossible for us to announce any specific titles, but we feel sure that you will welcome these to come as you did the others published in the past. . . .

•

The Cover

The tower shown on page 1 is Station KDKA's welded steel antenna that is 718 feet high. The men are connecting up the radio-frequency transmission line over which comes the signals for this 50,000-watt transmitter. We wish to acknowledge the courtesy of the *Westinghouse Electric and Mfg. Co.* for the use of this photograph.

Successful
SERVICING

Reg. U. S. Pat. Off.

Vol. 7 **NOVEMBER-DECEMBER, 1940** **No. 2**

Dedicated to the financial and technical advancement of the Radio Serviceman

Published by
JOHN F. RIDER PUBLISHER, INC.
404 Fourth Avenue **New York City**

JOHN F. RIDER, Editor **G. C. B. Rowe, Associate Editor**

This publication is the house-organ of the publisher and if due credit line is given, permission is hereby granted to editors to reproduce material contained herein.

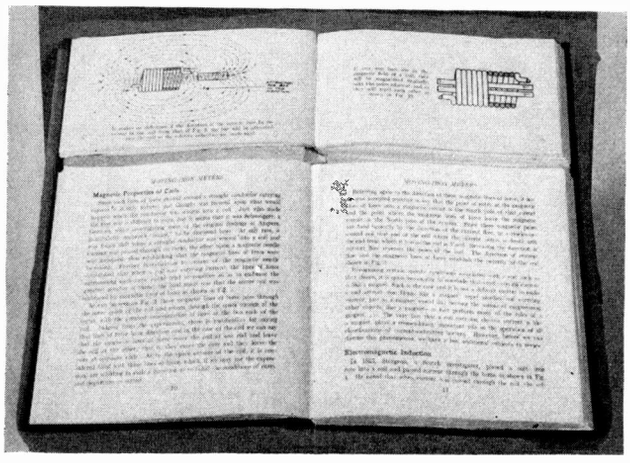
PROGRESS

SEVERAL months ago in these columns we stressed the point that there was no such a thing in this radio industry of ours as stagnation—that it was in a constant state of progress—some new idea or development was always being announced which was giving an impetus to the industry as a whole.

The majority of these new things have had to do with the technical aspects of radio in itself. . . . Now it is our turn, as publishers, to announce something new and something in which we feel you will be vitally interested.

While the technical side of radio is up to the minute in every respect, it has to be admitted that the publishing of texts explaining these technicalities is almost back in the Stone Age. Even though books are being published continually on the latest subjects, their physical make-up and construction have not been changed for generations.

It is true that a great deal of research has been accomplished by publishers along the lines of making texts in general more readable. They have expended much time and energy in their search for clearer type faces, better methods for reproducing illustrations and everything else that will increase the readability of their books, but one serious drawback existed: it was practically impossible to have all the text relating to an illustration adjacent to it so that it could be consulted while its entire description was being read. . . . In other words, it was necessary to turn pages back and forth almost continually and this often destroyed the continuity of thought that is essential when reading technical texts. Moreover, if the context demanded reference to an illustration in in a previous chapter and if this was discussed at some length, this necessitated more to-and-fro turning of pages.



Now this was a nuisance and tended to break the reader's continuity of thought, whether it was realized or not. . . . The ideal, of course, would be to have the illustration being discussed always before the reader no matter how many pages were required. We took our problem to our bookbinder and after many conferences, the solution took the concrete form which we now can show you in the accompanying illustration.

"The Meter at Work" is really two books in one binding. The upper pages which naturally can be turned independently of the lower pages, contain all the illustrations with their captions and figure numbers. The text is printed on the lower pages; so that no matter how many pages are needed to describe any one illustration completely the illustration about which you are reading is always before you. Again, suppose that it is necessary to refer to some illustration that occurred in an earlier chapter in order to clarify some particular point under consideration. Of course, you want to look at this figure and inspect it from time to time while reading the text concerning it. And now you can do just that! You merely turn the upper pages back to whatever illustration is wanted and continue to read about it while it remains before you.

Realizing that instead of having a single page to "mark" when you lay down the book, you now will have two "places" to keep, we have had a tape inserted at the top of the book which can be placed between the two sets of pages.

We have thus tried to make "The Meter at Work" as easy to read and handle as we knew how.

Frankly, this new idea in book making is an experiment, as it is a distinct departure from the traditional arrangement of technical texts or any other type of books, as far as that goes. But we feel justified in making this experiment because if it is received with favor by a majority of our readers, we can foresee a greater ease in reading. Moreover, it will mean a more efficient tool. The author will have no qualms about the amount of space he utilizes in describing anything which must be illustrated, for he will know that his readers can always refer from the text to the illustration with no break in the continuity of thought. . . . (And believe it or not, this was a serious problem to many writers!) And since books can be written with more elasticity, as it were, their value will be increased to the reader. . . .

Even if "The Meter at Work" does meet with the unqualified approval of all concerned, this does not mean that all our books in the future will have this feature incorporated in them. Naturally some types of texts lend themselves more readily than others to this split-book idea—books wherein the ideas must be gradually built up and developed upon basic facts—and we will publish such texts in the new con-

(*Please turn to page 6*)

PROGRESS

(*Continued from page 5*)

struction if it meets with your approval. On the other hand, texts of a different classification will be published in the conventional dress. . . .

So, it is entirely up to you. In order that you may express your opinions as easily as possible, we have inserted in some of the first copies of "The Meter at Work" return postage-paid cards which we would like you to send us after you have read at least several chapters of the book. In that way you can compare the ease of reading, the advantage of having the wanted illustration always before you, with other books. . . . In other words, give it a reading trial and then tell us what you think of the idea. Don't be polite. . . . If you don't like it—say so— tell us why you don't. . . . If you have any constructive suggestions to make, let us have them too. We publish books for you and we want to put them in your hands as you would like to have them. . . .

JOHN F. RIDER

•

We'll Lend A Hand

Doubtless quite a large percentage of the readers of SUCCESSFUL SERVICING are faced with the possibility of being called for a year's military training or perhaps have enlisted in some branch of the armed forces. In such event it is probable that some of you might want to dispose of part of your equipment or maybe are thinking about making arrangements for temporary assistance in your business while you are away.

In any case, we would like to offer our services and the idea occurred that we might be able to lend a hand by devoting some space in these columns to brief advertisements that those of you who have enlisted or are drafted for the year's training might want to run. And we request that only those who come under these two classifications ask us to cooperate with them in this way.

We in our turn, must ask you to observe certain restrictions: limit your "Wanted, Sell or Swap" advertisements to 35 words which will include your address. We reserve the right to edit these advertisements and to refuse to publish any that we deem unsuitable. Naturally we can not assume any responsibility for any of the transactions involved, neither can we guarantee that all advertisements will be run in the issue following their reception as we must be governed by the space available. Please address your advertising copy to Swap Advertisements, John F. Rider Publisher, Inc., 404 Fourth Ave., New York City.

•

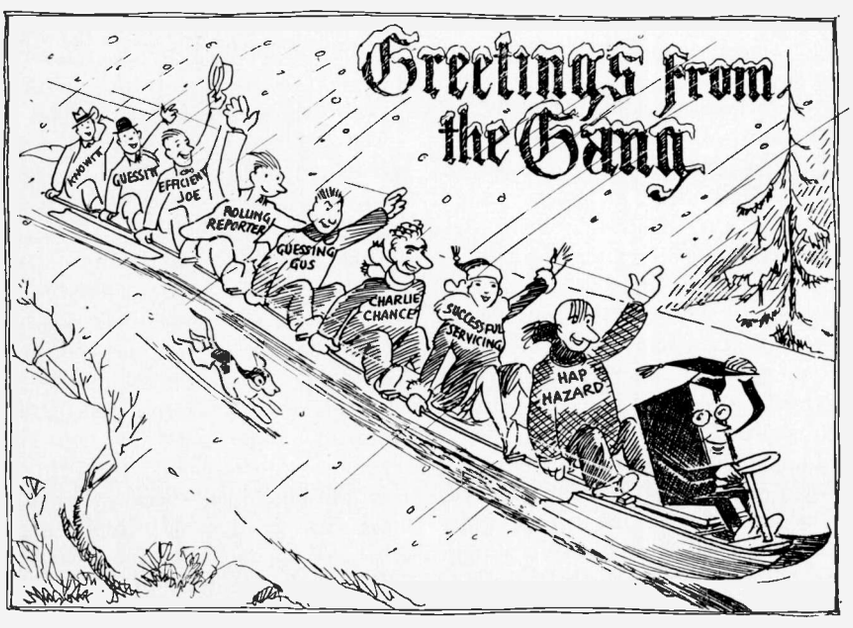
Phase Inverter Circuits

(*Continued from page 3*)

Fig. 5 is known as a "two-tube type," for although only one of the tubes acts as a phase inverter, the other functioning as an amplifier, two tubes are required for the operation of the circuit, although these tubes are frequently enclosed within a single envelope.

Resistors R_1 and R_2 are connected in the plate circuits of the amplifier and phase inverter tube respectively, the values of these resistors being those normally employed when the tubes are used as resistance coupled amplifiers. We shall assume that the amplifier tube and phase inverter tube have identical characteristics and that R_1 equals R_2. Resistor R_5 is the grid leak for the lower push-pull tube while resistors R_3 and R_4 serve as the grid leak of the upper push-pull tube. In order that equal signal voltages be impressed upon the grids of the push-pull tubes the sum of R_3 and R_4 should equal R_5. Resistor R_4 also acts as the grid leak for the phase inverter tube.

As indicated by the encircled polarity signs, when a positive input signal is applied to the amplifier tube, the phase of the signal at the plate of this tube is opposite that impressed upon the grid. This plate signal voltage appears across resistors R_3 and R_4. Since the phase inverter tube also functions as an amplifier and as it is desired to apply equal signal voltages to the push-pull grids, only a part of the amplifier tube output voltage can be impressed upon the phase inverter grid. This is accomplished by the aid of the voltage divider comprised of R_3 and R_4, the ratio of R_4 to R_3 plus R_4 being so chosen so that signals of equal magnitude are applied to each of the push-pull grids. The phase of the signal impressed upon the phase inverter grid is the same as that which appeared at the amplifier plate. In passing through the phase inverter tube its phase is again changed by 180 degrees, so that the phase of the signals at the amplifier plate and the phase inverter plate differ by 180 degrees. Accordingly, the signal voltages applied to the grids of the push-pull tubes differ by 180 degrees and, due to our previous adjustments, are of equal magnitude.



•

Opportunity

The New York manufacturer of a line of custom-built receivers and phonograph combinations wishes to establish service facilities in important cities throughout the country. Only one service organization is desired in each community and this must be capable of doing high-grade servicing and installation work. If you are interested, write your qualifications on your own letterhead in a letter addressed to Mr. H. Smith, in care of John F. Rider Publisher, Inc., 404 Fourth Avenue, New York City. Your unopened letters will be forwarded to the manufacturer.

Exit 1940

Well, lads and lassies (just in case we do have a reader or two or three of the so-called *weaker* sex), when we parked the torso in fronta Qwerty this sunny a.m. and did our regular *"what - the - hell - will - I - write - about - this - time?????"* act, someone in the office made a crack that he'd *already* got himself a party for New Year's Eve and that set us to thinking about **1940.** Lotsa doin's in the radio field and out this past year. . . . Right? Lookit some of the new words we gathered—*FM—blitzkrieg—smellies*. . . . And "smellies" makes us think of the departed glories of Mr. Whalen's World's Fair and the *swell* 3-dimensional colored moompix Chrysler showed there. . . . And speakin' of movies, there's the Disney-Stokowski brain-kid **"Fantasia"** where "sound" hit a new high. . . . Then we have another high in the speed that television boys are finding out new dope, to say nawthin' of Goldmark's kodachrome telecasts. . . . And we mustn't forget the velocity that the receiver mfrers are showin' with the increasin' number of new models they are shovin' out with gadgets galore and recorders so that you can can Junior's bright lispings or the Shadow's mocking mirth. . . . There were some nice little scraps in '40—the *Finns* and the *Greeks* giving the big boys lots to think about when they started heavin' their weight thither and yon in the other guy's backyard —the *Roosevelt-Willkie* set-to, with the result that you probably have heard tell about by now—the *Cornell-Dartmouth-referee* fracas where the official lost on a 5th down. . . . And we got pul-enty to think about this year —National defense—conscription of the lads for military training and last, but not the least *by far*, **the new way J.F.R's latest book is built.** (Not an advt. ***but fact!!!!***)

Canned Moosic

Didja know that back in 1932 radio had given phono-record sales such a kick in the panties that it was seriously considered tieing the can to canned stuff for keeps??? 'Sfact, *s'helpus*. . . . In 1921 just when folks was startin' to twiddle around and about with cat's whiskers, phonorecs were sellin' *beeutifully*, but when the gals and boys could shiver a shimmy to loudspeaker jazz a few years later, they adopted the *t'helmit-records-we'll-take-radio* stand and **BAM** went record sales. . . . Then in 1931 RCA picked up the pieces of Victor, played along awhile, and got going finally so that this last year about *75,000,000 records were toted home* to try on the family combination job. . . . And in 1941 the dope is that the industry is goin' to pass the 1921 peak of **100,000,000!!!!**

One Fer De Book

T'other day we met a gent who had just returned from China. On the way home he got chewin' the fat with Sparks on his ship and the talk got 'round to radio books. Says Sparks, "C'mon up to the shack and I'll show yuh sumpin." He did alright *alright*. . . . There was one of Rider's books *printed photographically* by the Japanese and it had been bought by Sparks for one dime, **its retail price!!!** At least, so he said.

F-Mers Get New Calls

The FCC just told us they were goin' to slap *new call letters onto f-m stations* so's you'll be able to spot 'em fast. First letter of the call will be either W or K, depending whether it's east or west of the Mississip, respectively. The next letter will be assigned in alphabetical order to each station on a given freq as licensed with the exception of E, which is reserved for educational non-commercial f-m stations. This gives yuh 25 stations in each area for a given freq and if there are more'n 25, they'll use double letters. Between the first two letters, two numbers will appear, these indicating the freq on which the station works. As all the f-m stations are between 42 and 50 mc and as all f-m freqs are assigned on the odd hundreds, the first and last figures of the assignment are dropped. Also the city or area will be indicated by a letter or combination. Sooo-o-o-oo when you hear in the future "Station K43SF" you'll know it's a station in or near San Francisco pushin' out f-m sigs on 44.3 mc. . . .

Split Book

We gotta break down and tell all. . . . We sure did wanna tell yuh about how **"The Meter at Work"** was goin' to be split so's *you can see the pix alla time you're readin' about 'em*, but ye Ed. says nix and that was *that!* So, we hates to admit it, but we fell down on our job of slippin' yuh the hottest and latest noos, but we did try enyhoo. Saa-a-ay, why doncha go round to yer jobber's and catch an eyeful of that thar vol????? Betcha you'll think it's *tops plus*. . . .

Flash!!!

Several days ago a little bird whispered that already *25 permits had been granted by the F.C.C. for F-M stations to start shooting come the Noo Year*! ! ! And them thar are permits to put *commercial* programs on the air. . . . Also 16 set mfrers are cooperating with you by making jobs to lure and snare f-m sigs. . . . Do yah happen to recollect that the Boss put out a book labeled **"F M"?** More'n ten thousand of youse guys has already found it worth **LOTS** more'n the buck they shelled out for it. . . . *Need more be said?* ? ? ?

Our Library

Thanx to *a lotta our readers*, we've been able to go places with our library of radio magazines. . . . In a good many cases, we've got 'em *from Vol. 1 No. 1 right smack up to Dec. 1940* and that means a good many years sometimes. We've got some of the foremost British wireless publications too, and believe you us it won't be long before we'll have the greatest collection of radio info that you ever heard tell of. . . .

As the Walrus Said

"The time has come—" yowsuh, here 'tis nigh on to Christmas again and so as per usual we gives yuh our **VERY *BEST* BRAND OF MERRY CHRISTMAS WISHES** and we hopes that when the driver of that 8-deer-power buggy stops at your home, he'll leave you *a slice of good luck that'll last you all through 1941*. . . . And if you do happen to talk to the old gent, willya tell him not to forget to come 'round to see

The Rolling Reporter

Be Santa Claus to Your Business

Give yourself those missing Rider Manuals you have meant to buy. . . . Every day will seem like Christmas when you have all the aids which a complete set of Rider Manuals can give you!

YOU NEED ALL ELEVEN RIDER MANUALS

Volume	Price	Covering	Volume	Price	Covering
XI	$10.00	Up to May 15, 1940	VI	$7.50	1935-36
			V	7.50	1934-35
X	10.00	1939-40	IV	7.50	1933-34
IX	10.00	1938-39	III	7.50	1932-33
VIII	10.00	1937-38	II	7.50	1931-32
VII	10.00	1936-37	I	7.50	1920-31

You NEED RIDER MANUALS

SOMETHING NEW UNDER THE SUN!

THE METER AT WORK

HERE is a practical book for practical servicemen. . . . Here you will find how each type of meter works — how each is used in the field — how to get the most from the meters you now own and what points to consider in selecting new meters. . . .

152 Pages $1.25

¶ Only by knowing the principles underlying your instruments can you get the utmost use from them. . . . In this book you will find the theory upon which each type of meter is based is complete in itself — all the facts about each type are together. . . .

¶ Because some types of meters can do several jobs, the practical applications of meters are covered in the latter portion of the book. . . . Thus you can cover any phase of the subject in which you are interested — the theory — the characteristics — the practical work with no lost motion. . . .

¶ And when you go to your jobber's examine the new, split-book construction of "The Meter at Work". With this modern, stream-lined method you can always have the illustration before you about which you are reading!

TABLE OF CONTENTS

A Rider Exclusive!

Other RIDER Books for the Serviceman

FREQUENCY MODULATION

Frequency Modulation is becoming more and more important with the advent of more f-m stations in all parts of the country. This book explains the transmission and reception of f-m signals.

136 Pages **Net Price $1.00**

THE OSCILLATOR AT WORK

You should know how your oscillator functions and what you can do with it. . . . With the trend towards higher frequencies in multi-range receivers, your signal source assumes even greater importance than ever before.

256 Pages **Net Price $1.50**

SERVICING BY SIGNAL TRACING

The description of a basic method of servicing that covers all types of communication systems—old or new, simple or complicated in design. Signal Tracing, founded upon the signal itself, is the most fundamental method of trouble-shooting ever devised.

360 Pages **Net Price $2.00**

THE CATHODE-RAY TUBE AT WORK

The theory underlying the functioning of the cathode-ray tube oscillograph and its accompanying circuits for practical applications are fully explained in this book that has become a standard in the radio servicing industry.

338 Pages **Net Price $2.50**

SERVICING SUPERHETERODYNES

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 fully explained in this book.

288 Pages **Net Price $1.00**

AUTOMATIC FREQUENCY CONTROL SYSTEMS

Everything from the simplest type of AFC circuit to the most complicated push-pull control circuit is explained.

144 Pages **Net Price $1.00**