

# TRACING CROSS MODULATION

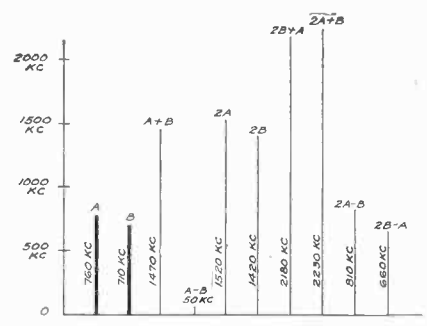
Methods for Eliminating Interference in High Signal-Strength Areas

BY JOHN F. RIDER

Recently there have been many reports of a puzzling type of interference with broadcast reception. The most strenuous and earnest efforts on the part of servicemen have often failed, especially in intermittent cases, to disclose the cause of this trouble. We feel that servicemen who are located in parts of the country where the cross modulation has been especially severe, will welcome this article which gives specific ways and means for eliminating the interference. . . . Editor.

CROSS modulation, sometimes referred to as cross talk, is the term used to designate interference wherein the programs of one or more stations are heard on other than their assigned frequencies. In past years interference of this type was largely due to defects within the receiver itself. The outstanding cause of this trouble was eliminated when the variable-mu tube was introduced. By reducing greatly the amount of rectification in the amplifier stages of the receiver (especially pronounced with the volume control retarded for the reception of strong signals), the use of these tubes has made possible improved volume control design and eliminated the generation of harmonic

and combination frequencies which were largely responsible for the cross modulation. We are not concerned in this article with the above type of cross modulation which is due to conditions present in the receiver and which is generally understood by servicemen. However, we might mention in this connection that a reduction in the length of the antenna and the replacement of sharp-cutoff tubes with variable-mu tubes (with the necessary circuit changes, of course) are two of the most effective ways of eliminating cross-modulation which occurs as a result of conditions within the receiver.



The two original frequencies, which represent two different stations, are indicated by the heavy black lines. As a result of rectification, eight new frequencies are introduced. These frequencies are responsible for the cross modulation effect, as explained in the text.

With the advent of high powered stations, which are frequently located within comparatively short distances of each other, a new type of cross modulation has made its appearance. Representative of this new interference effect, are numerous cases that have occurred in the vicinity of New York, where both WJZ and WOR operate 50-kilowatt transmitters within ten miles of each other. WOR operates on 710 kc., while WJZ operates on 760 kc. Almost invariably, in localities not far distant from these stations, it was found that WOR and WJZ interfered with WNYC (810 kc.) and WEAF (660 kc.). That is, it was possible to hear the programs of WJZ and WOR while listening to the program of either WEAF or WNYC and in many cases the interference was so strong that satisfactory reception was virtually impossible.

It is well known that when two signals are passed through a rectifying element, certain combination and harmonic frequencies are produced. If in this case we represent the 760-kc. frequency by A, and the 710-kc. frequency by B, then the following frequencies and effects are produced:

Please turn to page 3

Stromberg-Carlson 130

If the "shadow" of the 6E5 tube closes or over-laps, it is generally due to variation in characteristics of the tube, and another one should be selected for that particular receiver.

First, make sure that the 6E5 is not soft nor gassy. This is evidenced by a blue glow in the lens of the tube and can be seen by looking across the tube in a dim light. Some hard tubes are also unsuitable. Any 6E5 that draws more than 5 ma. plate current in the receiver circuit (measured by a set analyzer, not a tube analyzer) should not be used. Incidentally, the percentage of such tubes is fairly low and becoming smaller.

Sometimes it will be found that the 6E5 is suitable and that the difficulty is caused by excessive plate current in the 6K7 tube used in the i-f. stage.

If the shadow on the target of the 6E5 does not reduce on signals from nearby stations, check the following:

- 1. Aerial and ground connections for open lead-in; insufficient pick-up; high resistance joints, etc.
2. Sensitivity control knob on the rear of chassis (See page 7-19 in Rider's Volume VII). Clockwise rotation increases sensitivity.
3. A faulty tube in the r-f. system, causing low avc. voltage.
4. A grounded cathode bias resistor at 6K7 r-f. or 6K7 i-f. socket.

Acratest 194 P.A. Tuner

Since the publication of Rider's Volume VII, we have been advised that changes have been made in the circuit and also the voltage readings, both of which are given below. The schematic of this set will be found on Acratest page 7-1.

A 6C6 tube is now used as a detector. An 0.01-mf. coupling con-

denser has been substituted for the 0.1-mf. condenser in the resistance-coupled amplifier and also the same substitution has been made in the case of the condenser between the plate of the 76 tube and the upper output terminal. A connection should be shown at the intersection of the high-potential lead from the voltage divider and the common lead from the plates of the 78 and 76 tubes.

Table with 4 columns: Tube, Plate, Screen, Cathode. Rows include 78 or 6D6 1st R.F., 78 or 6D6 2nd R.F., 6C6 Detector, and 76 O.P.

The color coding of the power transformer leads, starting at the top of the secondary and going down, are as follows: Rectifier filament, Red and Red solid; Rectifier plate, Green, Red stranded, Green; Tube heaters, Black, White, and Black.

Philco I-F. Peaks

In certain localities it has been found advisable to align certain two- and three-gang Philco sets at some other i-f. peak than the one for which they were designed, i.e., 470 kc. This change has been found necessary because of some interference that is peculiar to these localities: Portland, Maine; Miami, Fla.; New Haven, Conn.; San Diego, Cal.; about one third of northern Long Island; Newark and southern New Jersey.

Therefore, if you are operating in any of these places and are bothered by code interference, align either of the two type sets mentioned above at 456 kc., 465 kc., or 480 kc. The i-f. peaks just mentioned are to be used depending on the location and type of interference.

Westinghouse WR-28

In case you come across low amplification troubles in this set, note that the suppressor grid of the second i-f. tube is fed -15 volts. To correct the trouble, disconnect the lead which supplies the grid with this negative voltage and cut off the negative lead. Then connect the suppressor grid to the cathode of the tube.

The servicing data for this receiver is the same as that for the RCA model R-37-P, which will be found on page 4-32 of Rider's Volume IV.

Servicemen Attention

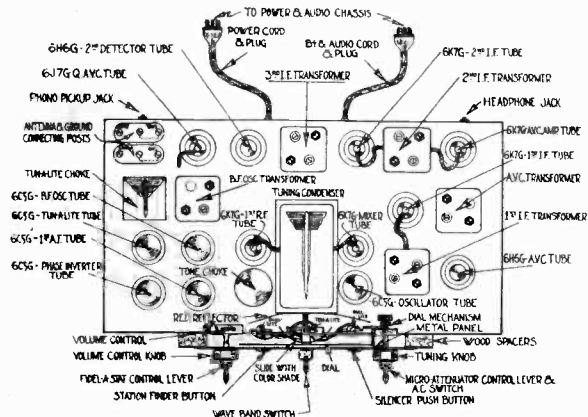
We have been requested to run the following announcement:

The Midwest Radio Corporation invites competent servicemen or organizations all over the country to write in for an attractive service proposition. Address Service Manager, Midwest Radio Corp., 909 Broadway, Cincinnati, Ohio.

Midwest Royale

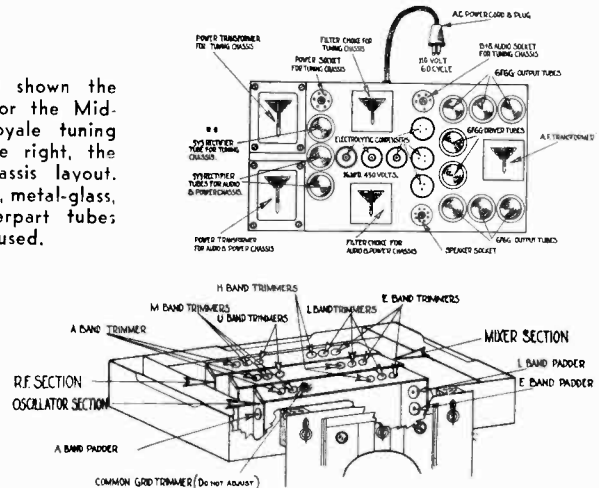
The schematic of this receiver will be found on page 7-1 and the alignment data on page 7-4 of Rider's Volume VII. Below will be found the voltage data, the layouts for the tuning and audio-power chassis, and the locations of the various trimmers.

Table with 6 columns: Tube, Plate, Screen, Suppressor, Cathode, Grid. Lists various tubes like 6K7 R.F., 6K7 Mixer, 6C5 Osc., etc. with their respective voltage readings.



On the left is shown the chassis layout for the Midwest Model Royale tuning unit and on the right, the audio-power chassis layout. Note that metal, metal-glass, or glass counterpart tubes may be used.

On the right is shown the trimmer locations for the Midwest Model Royale.



Tracing Cross Modulation

(Continued from page 1)

- A + B = 1470 kc. No interference resulted in this case because there is no useful station operating on this frequency in the New York area.
- A - B = 50 kc. No interference resulted in this case because this frequency lies outside the broadcast band.
- 2A = 1520 kc. WJZ can be heard at this point on the dial but there is no station to interfere with. If there were, interference would be produced at this point.
- 2B = 1420 kc. WOR can be heard at this point on the dial but there is no station to interfere with. If there were, interference would be produced at this point.
- 2A + B = 2230 kc.  
2B + A = 2180 kc. No interference in these cases because both these signals lie outside the broadcast band.
- 2A - B = 810 kc. This is the frequency of WNYC. Both WOR and WJZ are heard on this frequency in some locations.
- 2B - A = 660 kc. This is the frequency of WEAF. Both WOR and WJZ are heard on this frequency in some locations.

The above analysis explains how the frequencies originate that are responsible for the cross modulation in the New York area.

Similar types of cross modulation have been reported in the vicinity of San Francisco, Chicago, Cincinnati, and Ohio. The difficulty is not general throughout the area where it is experienced, but only where a high field intensity exists (of the order of 0.5 volt per meter) and then only in certain locations. It may exist in a given house, whereas an adjacent house is free from the trouble—although the same receiver is used in each case. In places where the cross modulation occurs the effect is substantially the same on all makes of receivers.

So much for the manner in which the presence of a non-linear or rectifying element is capable of accounting for the type of cross modulation produced. The question now arises, where is the rectifying element which produces the effect?

Observation and experiment have disclosed that the most common source is the power wiring, the effect being present generally where the power mains are of the exposed overhead type.

The rectifying element may be a

poor ground connection, it may be an oxidized copper conductor in contact with another copper surface, and may even be electrolytic in nature, if the soil where the power wiring is grounded be moist. Another possible source of rectification is in certain types of lightning arrestors.

When such conditions exist, namely exposed wiring in a region of high signal strength and the presence of a rectifying element—even though it be a relatively poor rectifier—the interfering frequencies will be generated. These frequencies will then be picked up by the antenna and introduced into the receiver.

If you have been experiencing trouble from this type of cross modulation, the first step is to eliminate all poor contacts and joints which may be present in the antenna and ground circuits. These connections should be clean and preferably soldered. If the cross modulation still persists, one or more of the following remedies will clear up the situation:

- (1) Ground the neutral of the house wiring at the house in addition to retaining the ground at the distribution transformer.
- (2) Use an improved ground at the receiver.
- (3) Install r-f. bypass condensers from the power line to ground at the point where it enters the house, near the receiver, or in both places.
- (4) In some cases, it is necessary to

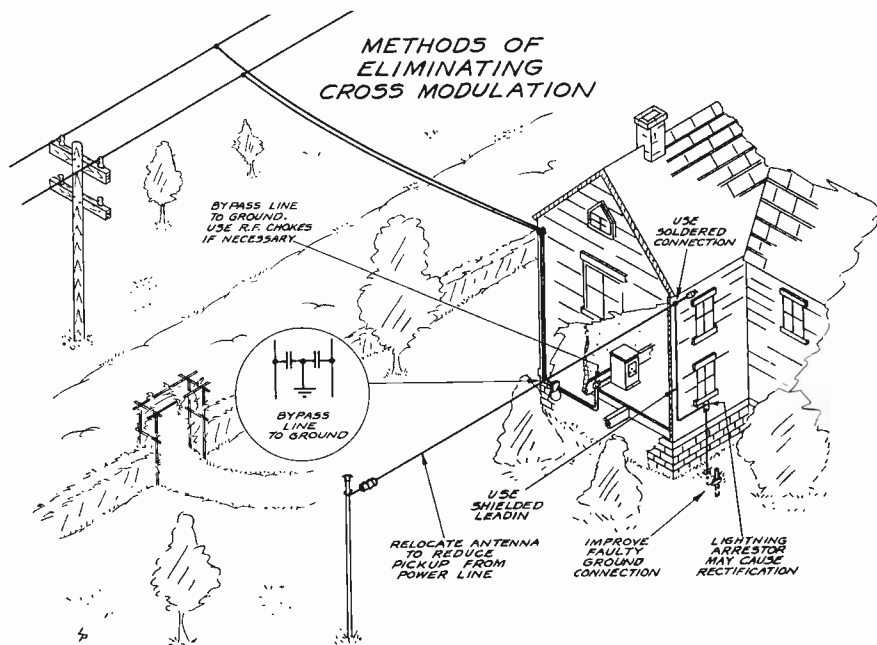
- install r-f. chokes in the line, as well the bypass condensers.
- (5) Relocate the antenna so that there is less pickup from the power line to the antenna or lead-in. Use a shielded lead-in where necessary.

In determining the source of the trouble and its location, a small battery set equipped with a short antenna is useful. With its aid the place where the interfering frequencies are being produced can be determined with little effort, so that the appropriate steps can be taken.

The above remedies have been found very effective in eliminating a great deal of trouble which has been due to the presence of r-f. voltages on the power lines and house wiring. Familiar experiences of this type are those in which the output of the receiver varies in accordance with whether certain light switches are turned on or off. Cases have also been reported where the cross modulation effect was so related to the lighting circuit that it was produced only when a certain switch was closed.

These cases have been cleared up by the same general procedure described above, which operates on the basic principle of the removal of r-f. potentials from the power line and the elimination of any rectifying elements or contacts.

We wish to express our indebtedness to the RCA License Laboratory for their cooperation in preparing this material.



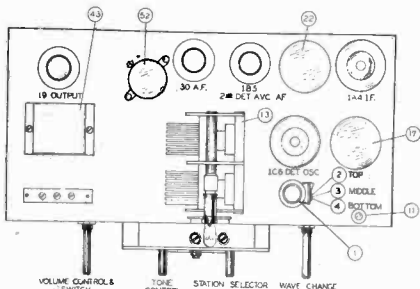
Cross modulation can be eliminated by means of one or more of the measures indicated in the figure. Considerable time can be saved by using a small portable battery receiver, equipped with a short antenna, to trace the source of the interfering frequencies.

**Silvertone 1452**

Please note that this model uses the same chassis as model 1320, found on page 2-11 in the revised edition; 524-19 in the early edition of *Rider's Volume II*, and page 2077 in the *Rider-Combination Manual*.

**Bosch 601**

Several omissions of parts values were in the preliminary schematic diagram of this set which was published on page 7-20 of *Rider's Volume VII* and these missing values will be found below opposite the diagram number by which the various components are designated. The connections are the



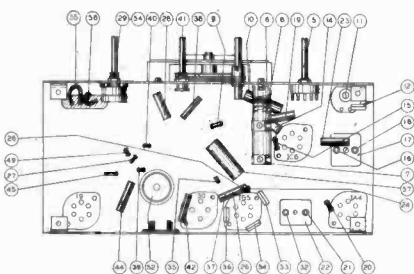
Top view of Bosch 601 chassis

same in the final schematic as they are shown on the above-mentioned page with the one exception: A 0.5-mf. condenser has been inserted between the high side of the filament supply and ground. Draw this in on your schematic just to the left of the dial lamp (No. 53) where the lead to the filament of the 1A4 tube is connected. The part number of this new condenser is CW 2-50 and its diagram number is 57.

**Diagram**

No.	Part No.	Description
10, 28, 37	CW 4-02	0.02 mf., 400 v.
19, 23	CW 2-05	0.05 mf., 200 v.
29	VR 9538	0.5 megohm, vol. con.
38	CW 4-005	0.005 mf., 400 v.
42	CW 6-005	0.005 mf., 600 v.
44	CW 4-01	0.01 mf., 400 v.

Also check the values of diagram numbers 55 and 56; they should be 0.94 and 0.42 ohm respectively.



Bottom view of Bosch 601 chassis

Below will be found the alignment data for this receiver together with the layouts of the apparatus on both the top and bottom of the chassis. The numbers of the parts correspond with the diagram numbers on the schematic already published in *Rider's Volume VII*.

Wave Switch	Dial Position	Dummy Antenna	Freq. 465 kc.	Sig. Gen. 1A4 grid	Sig. Gen. Connec- tion	Trim- mers	Out- put Signal
Brdst. <sup>1</sup>	600 kc.	.5 mf.	465 kc.	1A4 grid	21, 32	4	Max.
"	"	"	"	"	IC6 grid	10, 18	4
"	1600 kc.	.0002 mf.	1600 kc.	"	"	8	Max.
"	"	"	"	"	"	3	"
"	600 kc.	"	600 kc.	"	"	11 <sup>2</sup>	"
"	1600 kc.	"	1600 kc.	"	"	8, 3	"
Sht. Wave	6000 kc.	"	6000 kc.	"	"	7	"
"	"	"	"	"	"	2	"

<sup>1</sup> Volume control to maximum and tone control to treble  
<sup>2</sup> While rocking condenser.

**Stewart-Warner Color Code**

Commencing with the R-130-A chassis, the sets produced by this company are wired in accordance with a definite wiring color code. For example, all plate wires are yellow and all grid wires are green. Knowing this code will assist you in identifying the terminals of a tube socket without locating the heater prongs or reference pin.

Color	Circuit
Green	Grid
Yellow	Plate
White	Screen (approx. 100 volts)
Orange	Cathode
Green & White	AVC diode and AVC circuit
Green & Black	Detector diode
Blue	Ungrounded heater or antenna
Blue & Black	Doublet
Black	Ground, grounded heater, grounded B minus
Brown	Ungrounded B minus
Red & Blue	Highest B + (filter input, generally over 300 volts)
Red	Normal B + (200 to 300 volts)
Red & White	Intermediate B + (100 to 250 volts, other than screens)
White	B + (approx. 100 volts on screens only)
Gray	Low B + (below 100 volts on special elements)

Grid returns are coded according to where they are connected, i.e., if they return to ground they are black, but if they return to AVC they are

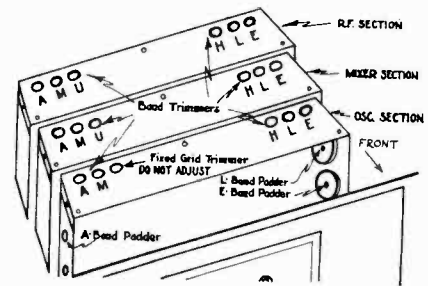
green and white. Power transformers, chokes, speaker fields, and i-f. transformer leads follow the above code. Insulating tubing (spaghetti) may deviate from the code. Some colors may change when the leads are impregnated with the coils.

**Acknowledgment**

The servicing data appearing on *Philco pages 7-1 to 7-152 in Rider's Volume VII* and the various changes in Philco receivers appearing in **SUCCESSFUL SERVICING** are copyrighted by the Philco Radio & Television Corp. and are reproduced in both publications with the permission of the company.

**Midwest 18-36**

The alignment instructions and the schematic diagram of this receiver will be found on pages 7-4 and 7-5 of *Rider's Volume VII* respectively. At the time of publication the voltage



Trimmer locations of Midwest 18-36

data and layout showing the locations of the various trimmers were unavailable and we are reproducing them herewith.

**Voltage:**

Tube	Plate	Screen	Supp.	Cathode
6K7 R.F.	300	120	2.1	2.1
6K7 Mixer	280	120	3.3	3.3
6C5 Osc.	160	..	..	3.3
6K7 1st I.F.	280	120	2.2	2.2
6K7 2nd I.F.	280	110	5.5	5.5
6H6 2nd Det.	..	..	..	0
6K7 AVC Ampl	280	110	5.5	5.5
6H6 AVC Gen.	..	..	..	0
6C5 Whistle	270	..	..	0
6C5 Tunalite A.C.	..	..	..	0
6C5 1st A.F.	220	Tied to plate	..	7
6F6 Driver	290	"	28	28
6F6 Output	370	"	40	40
5Z4 Rect.	650 v. a-c.	plate to plate	..	..

**Wells-Gardner 6F Series**

On page 2 of the December issue of **SUCCESSFUL SERVICING**, a notation should have accompanied Fig. 3 stating that the dotted lines in the schematics indicated the *old* wiring and that the solid lines showed the *new* wiring.

# Successful SERVICING

Reg. U. S. Pat. Off.

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

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## GETTING NEW BUSINESS

A GREAT deal has been written and said about how the serviceman should conduct his business . . . how he should know his costs . . . what he should charge for his services and all that which is vital to the good health of an up-and-coming business. One phase of the whole thing has been more or less neglected and that is the getting of new business—advertising.

It goes without saying that in this day and age, some form of advertising is essential for the well-being of any business—be it large or small. Of course, many factors enter the picture of how much and what form of advertising must be done: the community in which the business is located—the size of the business—the amount of money available for promotion purposes, etc. These are only some of the items that must be taken into consideration and decided by you as

owner of a service business. However, certain elements of advertising should be incorporated in every piece of "copy" that you distribute. Let's see what some of them are.

First and foremost, the one idea that must be put across is that you are capable of servicing any receiver . . . in other words, you want Mr. Set Owner to know that when he calls you in to fix his set that you are going to do a good job on it. To a certain extent, this is something that the public has to take your word for until you have proved that you can do the job, but here is something that you might try: Invite your prospective customers to come around and inspect your shop—show them your tube tester, your set analyzer, your service data, your meters, your bridges,—show them everything and so prove to them that you have the equipment to diagnose the troubles of any and all sets.

And that brings us to something else. If you are going to follow this suggestion (and it has proved of value to many servicemen) it is important that your shop be orderly—not a nodge-podge of junked parts and tools and sundry apparatus. Have a place to store everything that you use and then keep everything in its place. You would be astounded at the amount of time per month that is used up looking for things that "are somewhere on the bench". Incidentally, if you keep your shop neat, you'll be able to turn out better work in less time than usual . . . Try it and see.

To return to advertising . . . We suggest that you study some of the advertisements of concerns that have services to sell—automobile repair shops, public utilities of all kinds and so on. Find some advertisements

that "stop" you or appeal to you for some reason; analyze them and find out exactly why you did stop to read them or why you like them. Then you can assume that your customers in turn can be appealed to in the same vein. It might be a picture that starts a certain train of thought or a catchy phrase—turn that around—play with it—think about it—and apply it to your own business. Sketch the idea out roughly on paper and see if you like it as well as when you had it in your mind. Try it out on a couple of your friends and see how they react to it.

It is impossible for us to lay down a hard and fast set of rules that anyone can follow in regards to advertising—there are too many variables. We can only give general suggestions—you have to do the rest. However, we can tell you this: advertising of the proper kind will pay . . . It has for thousands of others, why not you?

G. C. B. ROWE

### Did You Know That

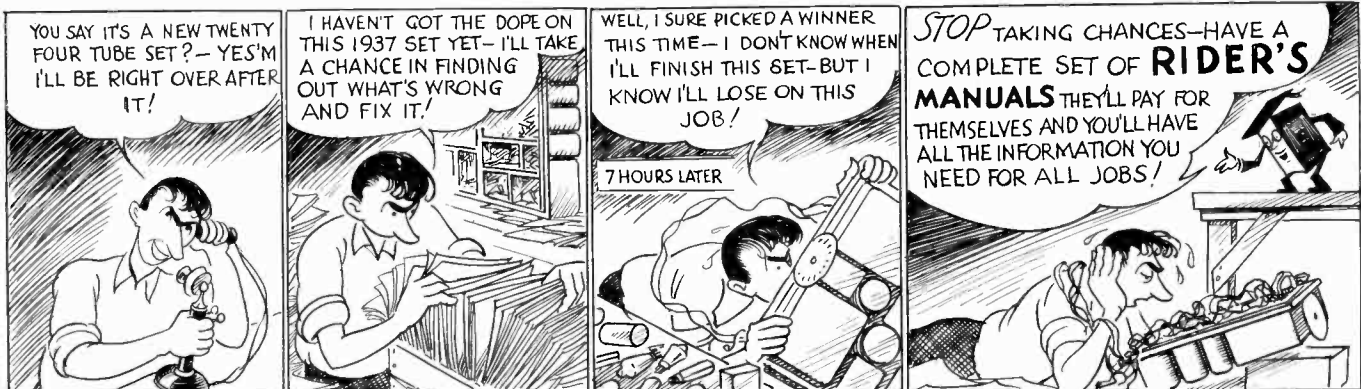
In the proposed 13-month calendar the extra month of 28 days would be called **SOL** and would be placed between *June* and *July*.

The Chinese are said to have started reckoning time in **2350 B.C.** and the Egyptians in **2780 B.C.**

The **Hindu** civil days of the solar months start at *sunrise* instead of midnight and their day is divided as follows: 60 vipalas = 1 pala = 24 seconds; 60 palas = 1 ghatika = 24 minutes; and 60 ghatikas = 24 hours.

Before **Julius Caesar** revised the calendar in 46 B.C., certain Roman magistrates had the existing calendar changed so that the year would be longer and *they would remain in office for a longer period.*

## CHARLIE CHANCE—He Gambles and Loses



## Behind RIDER MANUAL PAGES

When a receiver comes into your shop for repair, the first thing you do is to reach for the Index to Rider's Manuals, see in what volume the servicing data on that set is, and then study over the information that you find. Have you ever thought about the work involved in the preparation of this great mass of material for publication?

First of all, the gathering of the servicing data. Almost daily correspondence is maintained with receiver manufacturers all over the country requesting data on their newest models—asking about changes made in their existing models—clarifying points here and there that perhaps are obscure—seeking information about sets no longer in production—checking up on “final” servicing notes as against the “preliminary”—in short, the thousand and one things that come up continually.

All this is true for the sets made within the last two or three years . . . but how about the old timers? We are always on the search for them and they are discovered in the most out-of-the-way places. Perhaps a serviceman cleans out his files and finds several old data sheets—maybe an employee of a manufacturer, long out of business, finds the schematics of some of the sets made ten or more years ago and sends them in to us with the expressed hope that they will help some serviceman out of a jam—recently a well-known instrument company did some house-cleaning and sent a mass of old service bulletins, some of which will be published in a future volume of Rider's Manuals. . . . Yes, here, there and everywhere, we look for data that you need.

Periodically Rider makes a trip to various manufacturing plants to pick up the servicing data—both new and old—and to gather new ideas in testing or servicing that can be passed on to you.

All this material has to be recorded, checked, and filed. All year long the editorial department is preparing the “dummy pages” for the printer. Many diagrams have to be redrawn; perhaps because they are on faded blueprints or very soiled or torn paper . . . or perhaps the values are lettered in so small that they would not reproduce clearly when printed. Sometimes values are omitted from the schematics

and these have to be obtained and inserted. Last fall while “dummying” Volume VII, it was found that the i-f. peaks of three receivers made by a manufacturer in the Middle West had been omitted. Even the exchange of telegrams would be too much of a delay, so the service manager at the plant was phoned to find the missing peak frequencies . . . at a cost of about six dollars . . . Literally, hundreds of dollars are spent in telegrams and telephone calls so that each volume of Rider's Manuals will be up to the minute.

Then the material has to be arranged and pasted on the dummy pages—checked several times to see that all the data needed is given and that it can be reproduced properly—and then comes one of the most important phases of Manual making: *the indexing of the data.*

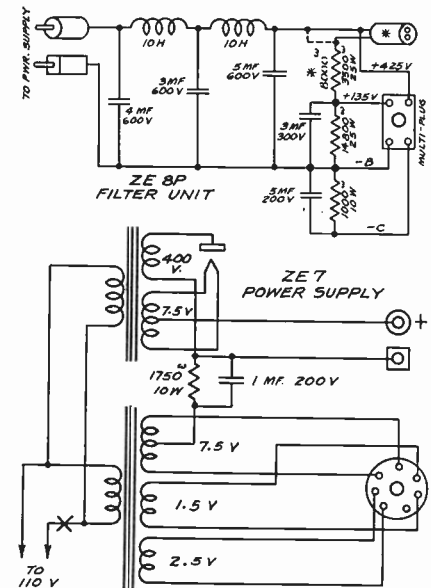
It has been said that no reference book of any kind is better than its index and this is especially true of books like Rider's Manuals. **As you know, every item on every page of Rider's Manuals is listed in the Index and every thing is listed numerically by model numbers.** That means that when a new Manual is published, the entire Index has to be revised and the items on the pages of the new book inserted in the correct places. Not only is this a tremendous editorial job, but one that involves great printing expense and the utmost in pains-taking checking.

Space does not permit us to tell you about the more mechanical phases of Manual production—the choosing of the type of binder and a cover material that “can take it”—the checking of the master plates from which the pages are printed—the checking of the arrangement of the pages in the binder—all of them of the greatest importance in the making of a Manual that will conform with Rider standards. However, you can take our word for it that every part of the production of a Rider Manual—right from the first letters written to the various manufacturers to the containers in which the Manuals are shipped to the jobbers—receives the utmost in careful attention to detail that make Rider's Manuals the world's finest and their contents the greatest collection of complete ser-

vic-ing data possible . . . in short, while Rider Manuals are more expensive than others, **they are far more complete and valuable to you in your work.**

### Zenith ZE7, ZE8, ZE8P

The power pack ZE7 and the filter ZE8 are used with models 15E and 16E. The same power pack and filter ZE8P are used with models 15EP and 16EP. The schematic diagram of the receiver chassis will be found on page 7-26 in *Rider's Volume VII*; page \*655 in the early edition of *Volume I* and on page 2689 of the *Rider-Combination Manual*.



Schematics of Zenith ZE7 power supply and ZE8 and ZE8P filter units.

We have been able to secure from the manufacturer the schematics and values of this power pack and the filter units, which are reproduced herewith. We suggest that you make a notation on the pages mentioned above where this data may be found.

The ZE8 filter unit is the same as the ZE8P except that the receptacle marked (\*) in the schematic is not used. An 8000-ohm resistor is used instead of the 3500-ohm resistor and is connected to the +425-volt line, as is indicated by the dotted line in the top illustration.

*We glory not in never failing, but in rising every time we fall.*

—Confucius.

# Rolling Reporter



**RUMORS AND FACT**—RCA has a miniature cat-ray outfit which will be available beginning January 15th and the price will be \$47.50. . . . A brand new motif (that's a four-bit word) in panel colors and design has been effected. . . . R. saw the first unit off the line and says it's a honey! . . . Tube prices will be increased all around . . . by increasing the list and not cutting the discount. . . . A servicemen's assoc. is being formed in Bethlehem, Pa., in Allentown, Pa., and in North Adams, Mass. . . . 'Tis said that the "Plea for Education" in the December, 1936 issue of S.S. hit the nail on the head. . . . Before we forget. . . . Another unit seen at the "Master's Voice" plant is a combination C.W., amplitude and frequency modulated oscillator. . . . Price somewhere around \$64.00. . . . Rider's book on the alignment of about 8,000,000 Philco receivers scheduled for public appearance during last week in January.

**GULLIVER'S TRAVELS** . . . According to the boss, there's a guy in Allentown, a servicer, what lapped up a gallon of beer in 15 minutes. . . . Yes and he was off form that night!! . . . According to a spiel between R. and Kalker of Sprague, 6 servicemen in North Adams have posted a forfeit of 5 bux each to guarantee against price cutting. Kalker is the stake holder and the dough is burning a hole through his pocket. **BUT THERE'S BEEN NO PRICE CUTTING IN NORTH ADAMS.** . . . Imagine this: a night club in Philly—about fifteen drinks and four sandwiches and a bill for only \$10.90. . . . Wow! . . . And a place in Allentown, with a small floor show where sandwiches can be had for 15 cents and a chicken and bacon sandwich cost 35 cents instead of \$3.50. . . . Competition is making the condenser business tough. . . . J.R. spoke at Philly and Allentown and had men from as far as Lancaster. . . . In Springfield, Mass., the attendance at his talk included servicers from Holyoke, Pittsfield, No. Adams . . . and in every place men have installed cost accounting systems. . . . Not very many of 'em—but enough to show that the business is fast becoming business minded. . . . In Providence, R. I., the Radio Technicians Guild advertises as a unit and each member states his connection in his ad. . . . Down where the longhorns come from—(Texas to you)—servicers complain that the line voltage is very high and is razing merry hell. . . . How about other places in the country? . . . Anibody have ani comments? . . .

**OUTA DE GAG:** . . . Alfred Bi-beault, Norwich, Conn.—You're sure living up to the old Connecticut Yankee tradition when you use the carton that your Vol. VII came in, for a filing cabinet . . . guess we'll have to award you the 'issue-paper bicycle or sumthin'—you're

the first that had that brainthrob . . . E. H. (Ky. Kernel) Sleeth, Dawson Springs, Ky.—If you can't get to lectures, we dunno a better place to get the real info. than from Rider's books—you've got the right idea there, all right . . . and we don't blame you for the trek from Pittsburgh to the blue grass—*We hear tell the hosses and the Bourbon are A1 in yr. neck of the woods.* . . . Gustave P. Becker, Rochester, N. Y.—You must've been doing some peeking (and we don't mean alignment, either) when you say that Vol. VII is a swell book and you are goin' to buy it. . . . Boy, it may look good to you, but wait till you use it—it'll be better than good!!!! . . . James L. Kearns, Brooklyn, N. Y.—Thanx lots for your Crismus card—sorry that we can't do some swopping with you, but there's just three copies of Vol. 1, No. 1, of S.S. here in the office—and just try to pry one of those loose—you have to sign your life away just to borrow one for a few minits. . . . (P.S. And we sing a mean basso in any good scrap-iron quartette!!!!) . . . Theo. L. Seyboldt, Chicago, Ill.—Yep,

you're right 101%—J.F.R. does tell you servicers the how and the why of things and there's 1000's of other guys who feel the same way as you do . . . incidentally, there's a gang of the 1937 sets covered in Vol. VII. . . . John W. Bedford, Schuylkill Haven, Pa.—You'll be getting S.S. from now on. . . . (Aside to the rest of youse guys wot want it—you're ALL on the list.) . . . It would be a lot better if some other fellows gave a thought or two or three to how their business was run—that's been Rider's favorite theme song for a loooooooong time. . . .

**GAG** . . . As one servicer to another. . . . Bob is peeved and writes a letter to a friend of his.—Dear Jack: "I hear that you've made love to my girl friend and I don't like it. . . . Please come to my house so that we can talk this over. . ." Signed Bob. . . Came the reply. . . Dear Bob: . . . "I received your circular letter and will attend the meeting." . . . Signed Jack. . . . Was you there? . . .

Rolling Reporter.

## Silvertone Wave-trap Change

Wave-trap, Part No. 1013114477, used for eliminating code interference in models 1986, 1987, 4403, 4463, 4464, 4484, 4563, and 4584 (see page 7-45 of Rider's Volume VII), is described as having three leads.

In later production of this trap only two leads were used, having the colors black and green. The green lead is to be connected to the green lead of the set's antenna lead or connected to the antenna terminal, if the receiver has a terminal board. The black lead of the trap is to be connected to ground.

This trap acts as a series resonant circuit connected across the antenna and ground terminals of the set.

## Midwest Royale and 18-36

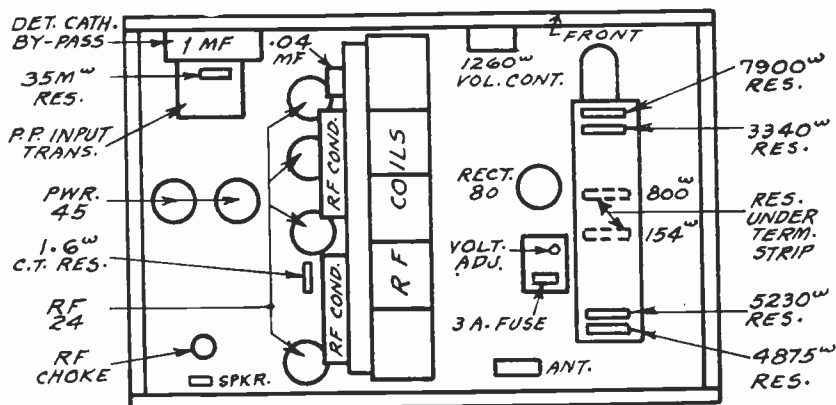
Please make a notation in your Rider's Volume VII on pages 7-1 and 7-5 that the volume control in each of these models is 500,000 ohms and that the tone control in the latter

model also has this same value. These values were omitted in the manufacturer's schematics.

## Majestic Chassis 130-A

The schematic of models 130, 131, and 132, in which this chassis is installed, will be found on page 1-13 of the revised edition and page \*386 of the early edition of Rider's Volume I and on page 1165 of the Rider-Combination Manual. Below will be found the chassis layout of this set.

To adjust the reflected capacity of the antenna, a small compensating condenser is provided, which can be reached through the hole in the rear of the gang condenser housing. Tune in a station between 1000 and 1400 kc. on low volume, then adjust this condenser by turning the black knob until maximum volume is attained. Further adjustment is unnecessary unless antenna length or position is changed.



Chassis layout of Majestic Chassis 130-A



THE SEVEN PILLARS OF SUCCESSFUL SERVICING





## ALIGNING A. F. C. CIRCUITS

An Explanation of the More Important Methods

BY JOHN F. RIDER

THE most important consideration in the alignment of receivers equipped with automatic frequency control is that by far the greater part of the alignment procedure is identical with that associated with receivers not so equipped; all the existing rules of good alignment practice are still applicable and should be observed. Expressed in a slightly different manner, a. f. c. alignment is an operation which is supplementary to the regular alignment procedure. However, so important is it that improper adjustment will result in the production of distortion, faulty dial calibration, and generally unsatisfactory performance.

Before we can go into any discussion of the general principles which are basic to a. f. c. alignment, it is essential that you have an understanding of the manner in which a. f. c. circuits operate. For this reason we shall briefly review this question, stressing especially those points which are important from an alignment viewpoint. We want to emphasize that this is not intended as a complete exposition of how a. f. c. functions, but rather is in the nature of a very brief outline. (See also "Automatic Frequency Control," *SUCCESSFUL SERVICING*, October, 1936.)

To begin with, you should understand that any a. f. c. system functions by controlling the frequency of the oscillator so that it is always higher (or lower) than the signal frequency by an amount equal to the i-f. peak of the receiver. To accomplish this control over the oscillator frequency—so as to correct for inaccuracies in the setting of the tuning condenser and for oscillator drift—two new elements are introduced into the receiver circuit. These are shown in Fig. 1 and are called the *discriminator* and the *oscillator control* stage.

The i-f. signal is fed to the discriminator, consisting of the special tuned trans-

former and the associated diode circuit. As a result of the arrangement of this circuit, a control voltage is produced which varies in magnitude and polarity in accordance with the frequency of the signal passing through the i-f. amplifier. When this frequency is higher than the i-f. peak, then the discriminator produces a negative control voltage and similarly, when this frequency is lower than the i-f. peak, the discriminator produces a positive control voltage. Zero control voltage is produced when the signal frequency is exactly equal to the i-f. peak. This variation of the a. f. c. voltage with the frequency of the signal applied to the discriminator is shown in Fig. 2.

The a. f. c. voltage is applied to the grid of the oscillator control tube, which is arranged so that it varies the frequency of the oscillator in accordance with the value of grid bias applied to the control tube. When this bias is large (negative), the frequency of the oscillator is lowered, and similarly, when the bias is made more positive, the frequency of the oscillator is raised. As a result of this connection between the discriminator circuit and the oscillator frequency, the a. f. c. voltage acts to maintain the frequency of the oscillator so that the signal will always pass through the i-f. amplifier at the i-f. peak.

You will note from Fig. 1, that the only tuned circuits associated with the operation of the a. f. c. system are those in the discriminator transformer. *The proper alignment of an a. f. c.-equipped receiver resolves itself, then, into the proper adjustment of the trimmers Cp and Cs, in addition to the ordinary alignment procedure.* When the discriminator is properly adjusted, both Cp and Cs are tuned so that the primary and secondary are resonant at the i-f. peak of the receiver.

### PRIMARY A. F. C. TRIMMER ADJUSTMENT

We shall consider first the method by means of which the adjustment of the primary trimmer Cp is made and, because there are a number of different types of circuits, it is convenient to classify the method of operation in accordance with the circuit used.

Where the audio voltage is obtained from the discriminator circuit, as it is in a number of receivers, Cp is most conveniently adjusted by feeding a signal into the last i-f. stage and peaking Cp for maximum output. This adjustment is made at the same time that the i-f. amplifier is aligned and all the precautions which are ordinarily observed should be followed here. At the same time that this adjustment is made, it is possible to obtain a rough adjustment of the secondary trimmer by peaking Cs for minimum output. This latter adjustment, however, is very broad and is only preliminary to a more accurate adjustment, as we shall explain further on.

In many receivers a separate second detector is used and consequently it is not possible to apply the above method. In these cases there are several alternative methods for adjusting Cp. Where the discriminator circuit is used to supply a. v. c. voltage, the adjustment of Cp can be accomplished (after the signal i-f. amplifier has been aligned in the usual manner) by feeding a modulated signal into the grid of the mixer tube and adjusting the primary trimmer for minimum output with the output meter connected as usual across the voice coil or output tube. A fairly strong signal is desirable for this adjustment since the method depends upon a v. c. action taking place.

Where neither a. v. c. nor audio voltage is obtained from the discriminator, a method which is applicable in all cases

(Please turn to page 3)

**Grunow 12B, 12W, 15W**

Cases have been reported where lack of a. f. c. action has been due to insufficient mechanical clearance in the Teledial switch. This switch functions to short the a. f. c. bus to ground momentarily when the index pin of the Teledial strikes the stop pin, in order that the a. f. c. circuit may "take control" on the desired channel and not on one adjacent. Normal a. f. c. action can be restored by dressing the switch contacts so as to increase the clearance.

**Motorola Dual "6"**

The power supply units of the chassis with serial numbers above and below 10,500 are interchangeable, i. e., the power supply of the chassis with serial number below 10,500 can be used with the chassis having a serial number above 10,500 if the change be made indicated below and vice versa. For schematic, see page 5-6 in *Rider's Volume V*.

Fig. 1 shows the power supply and chassis having serial numbers *below* 10,500. To use this type of power pack with the Dual "6" chassis having a serial *ABOVE* this number, the 300-ohm, 1-watt resistor must be inserted in the circuit as illustrated in Fig. 1.

Fig. 2, shows the power supply and chassis having numbers *OVER* 10,500. To use the power pack (serial numbers *ABOVE* 10,500) with a chassis having a number *BELOW* 10,500, the 300-ohm resistor must be removed, as shown in Fig. 2.

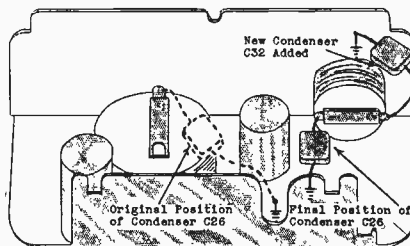
Note that the Dual "6" power supply with serial numbers *over* 10,500 is **NOT** interchangeable with the Twin "8" chassis.

**Wells-Gardner 6R Series**

In order to reduce motor noise, a change has been made in the chassis, the schematic of which will be found on page 7-27 of *Rider's Volume VII*, this having been made in the "A" line filter circuit.

The 2000-mmf. condenser, No. C26, has been moved to the right-hand side of the switch from the position at the left of the switch shown in the schematic. A new condenser, No. C32, 0.002-mf., has been added and is shunted across C24. The original and final positions of C32 are shown in the accompanying sketch.

Receivers of this series having this change incorporated can be identified



The positions of the condenser C26 in the Wells-Gardner 6R before and after the change to eliminate excessive motor noise

by a green paint mark on the battery lead and a letter "C" stamped on the chassis.

These changes are not required for most car installations and are made to take care of extreme cases of motor noise. It will be necessary, however, in many Ford V8 installations to take the steps described above, but only after the usual noise elimination procedure has been followed. If the noise persists even after these steps have been taken, it may be found that the noise radiates through the openings in the chassis case on the tuning

condenser side. Remove the chassis from the case and solder a piece of tin plate on the inside of the case so as to cover completely these openings.

**Zenith 18E**

This model uses the same chassis as that used in Models 11E and 14E, the schematic for which will be found on page 1-3 in the revised edition and page \*654 of the early edition of *Rider's Volume I* and on page 2687 of the *Rider-Combination Manual*. The power pack used with these three models is ZEG.

We have received from the manufacturer a schematic which includes the values of some parts that were omitted from the original diagram. The value of the volume control is 6 ohms. The tapped resistor in series with the heater of the 227 is 10 ohms and the grid leak of the 227 is 3 meg-ohms. The fixed condenser between the plate and cathode of the 227 has a value of 0.001 mf.

The schematic of the power pack, Model ZEG, will be found on page 2-2 of *Rider's Volume II*, revised edition, and on page 654-A of the early edition, and on page 2688 of the *Rider-Combination Manual*. The resistor in the lead from the mid-tap of the upper 5-volt winding of the power transformer has a value of 3000 ohms. The three sections of the voltage divider, starting at the top (+B) and going down, are 8000, 7800, and 6000 ohms respectively.

Please mark these values on the respective schematics in your *Rider's Manuals*.

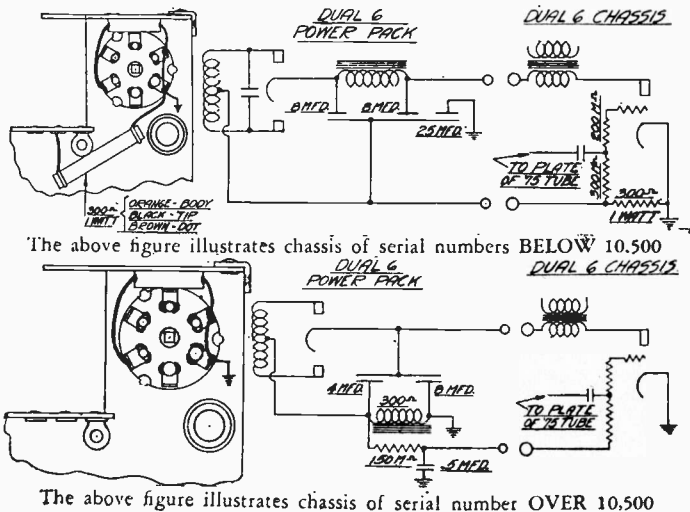


Fig. 1, above and Fig. 2, below

Two different power supply units have been furnished with the Motorola Dual "6" and are interchangeable. The schematics and wiring diagrams at the left show the changes necessary if the power units are interchanged

**Be on Your Guard**

We have been advised that a man calling himself R. J. Jacobsen has been representing himself as our agent in California and taking orders for *Rider* publications. This man is an impostor and if he solicits any of you, notify the police immediately.

Take Notice: *We have no agent named Jacobsen.* It is our rule that all checks for any of our publications must be made payable to John F. Rider, Publisher, and be mailed direct to our office, 1440 Broadway, New York City.

— Editor.

### Aligning A.F.C. Circuits

(Continued from page 1)

can be used. We shall discuss this further on in connection with a more general method of alignment.

#### SECONDARY A. F. C. TRIMMER ADJUSTMENT

The secondary trimmer  $C_s$  of the discriminator transformer is by far the more critical of the two adjustments and upon

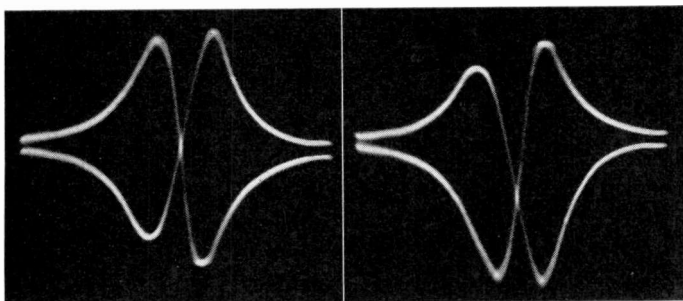


Fig. 3. The oscillogram on the left indicates the pattern obtained when the discriminator is correctly adjusted. An incorrect adjustment is shown on the right

its accurate adjustment depends the entire operation of the a. f. c. system. For this reason its adjustment should be made with special care.

An accurate and convenient method follows: With the a. f. c. switch in the off position, a local station in the neighborhood of 1000 kc. is carefully tuned in so that the output is a maximum. Without disturbing the receiver, a signal generator is coupled loosely to the grid of the first detector tube through a 50-mmfd. condenser, or clipped to the rubber insulation of the grid clip. The frequency of this signal generator should be set at exactly the i-f. peak, and its unmodulated output should be advanced until a beat is heard between the signal generator and the station. The tuning condenser of the receiver should now be readjusted for zero beat. When the a.f.c. switch is turned on, the frequency of the beat note will change, and the adjustment of  $C_s$  is effected by setting the trimmer so as to return the note to zero beat. This adjustment is extremely critical and should be made with great care. As a check there should be no change from zero beat as the receiver a.f.c. switch is turned on and off.

#### CONTROL-TUBE CATHODE CURRENT METHOD

A method which can be used to effect an alignment of both the primary and secondary trimmers of the discriminator transformer depends upon the fact that the cathode current of the oscillator control tube varies in accordance with the a.f.c. voltage applied to its grid. In using this method, the cathode circuit of the control tube is broken (see Fig. 1) and an 0-5 range milliammeter inserted. In this way the control tube is used as a vacuum tube voltmeter.

The first step is to note the reading of the milliammeter with the a.f.c. switch off. Connect a signal generator to the grid of the tube which works into the discriminator transformer and adjust its frequency to the i-f. peak of the receiver. Turn on the a.f.c. switch, and raise the output of the signal generator until a change in the meter reading is noted. The proper adjustment of  $C_p$  is effected by setting this trimmer so that the greatest deviation from the initial current is obtained. If the deflection obtained is too small, it can be increased either by slightly turning the secondary trimmer or by raising the signal generator output.

The final adjustment of the secondary trimmer follows this operation. With the

a.f.c. switch on,  $C_s$  is adjusted so that the plate current is the same as the initial current with the a.f.c. switch off. This adjustment is very critical and should be carefully made. As a final check, there should be no change in the plate current as the a.f.c. switch is turned on and off.

The a.f.c. alignment can be conveniently tested under ordinary operating conditions. To check the accuracy of the discriminator alignment, set the a.f.c. switch in the off position and accurately tune in a local

approximately by noting whether or not the receiver will hold a signal of medium strength over a range of about 10 kc. on either side of the correct dial setting without distortion.

The following are some of the precautions which should be observed in connection with the adjustment of a.f.c. systems:

1. The receiver should be turned on 15 minutes before it is aligned, to allow it to reach its normal operating temperature.
2. The alignment of the r-f., oscillator, and i-f. amplifier must be made in the conventional way with the a.f.c. switch in the off position.
3. The same frequency setting of the signal generator which is used to align the i-f. amplifier must be used to align the discriminator.
4. There are generally three adjustments of the secondary discriminator trimmer which will give the proper indication. These occur with the trimmer set at maximum capacity, at minimum capacity, and at some intermediate position. The last adjustment is the correct one and can easily be recognized because of the critical control which it has over the a.f.c. voltage.
5. The oscillator control tube should not be changed once the alignment has been completed, as a tube having a different mutual conductance will change the dial calibration.
6. Inadequate a.f.c. action may be due to low mutual conductance of the oscillator control tube—try another tube.
7. It is desirable that all alignment operations, including

(Please turn to page 7)

station in the broadcast band. If the alignment has been properly carried out, then there will be no change in the received

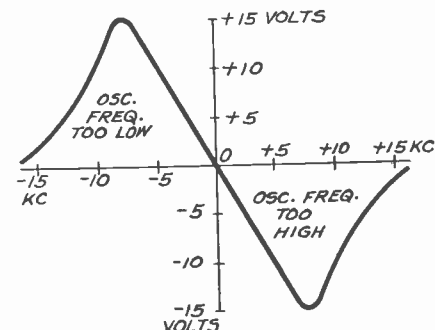


Fig. 2. The variation of the a.f.c. voltage produced by the discriminator as the intermediate frequency is varied below and above resonance. Zero control voltage is produced at the i-f. peak

signal as the a.f.c. switch is turned on. If a hiss or distortion appears, then the adjustment of  $C_s$  must be repeated. The operation of the a.f.c. action can be checked

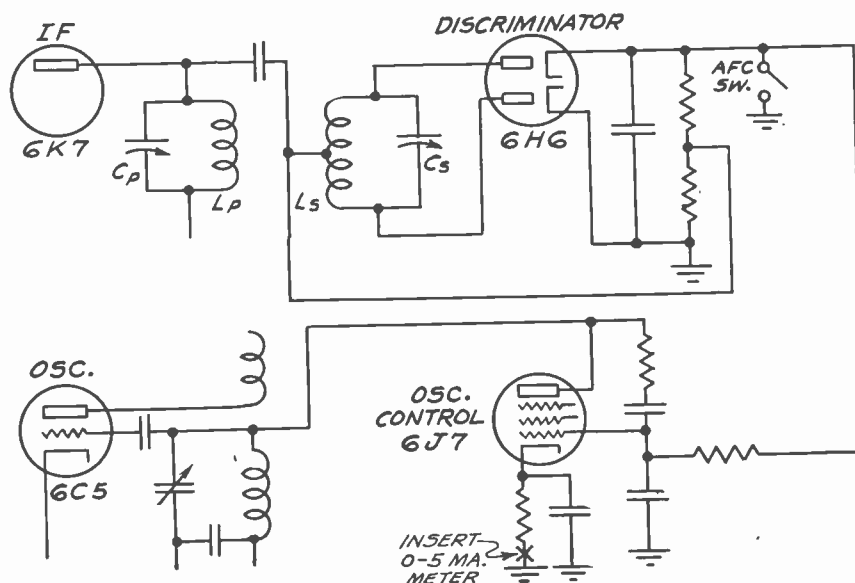
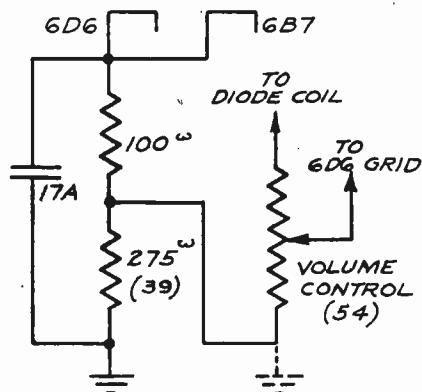


Fig. 1. A typical discriminator and oscillator control circuit, which form the basic elements of an a.f.c. system. The discriminator produces the a.f.c. voltage which controls the oscillator frequency by means of the oscillator control tube

**Delco 630**

A few cases have been found where the sensitivity of this receiver has been quite a bit below normal. After first finding that the antenna compensating condenser had been correctly set to the car antenna and that the tubes were not at fault, it was found that the low sensitivity was caused by a change in alignment of the oscillator section of the gang condenser. In order to facilitate the proper tracking of this section of the condenser in production, it was found necessary in some of the sets to make use of a "capacity wire", which is about 2 inches long and soldered on one end to the lug on top of the oscillator section of the condenser



Change made in the Delco 630 to increase the sensitivity of the receiver

and run flat across the top of the condenser gang to the r-f. section. Further checking revealed that the change in oscillator alignment was due to a shift in the position of this capacity wire.

To correct this fault, place the capacity wire in a position so that it lies flat across the top of the condenser gang and runs from the oscillator section to the r-f. section parallel to the back of the condenser gang.

Cement the free end of this lead in position with household cement so that its position will remain unchanged.

Reset the parallel trimmer for the oscillator section of the condenser gang in accordance with the instructions on *United Motors page 7-12 of Rider's Volume VII*.

There is also a number of cases where the normal sensitivity was apparently too low to obtain reception on weak signals in localities where reception conditions were not of the best. This is due to the fact that the normal sensitivity of the set was insufficient and should not be confused with the loss of sensitivity caused by the shifting of the "capacity wire," mentioned above. This lack of reception on weak signals is due to the weak signal blocking effect of the noise suppression circuit for reducing inter-station and circuit noise while tuning.

This trouble can be corrected by making a simple wiring change. Before doing this the set should be placed in a normal operating condition, which should include a careful check for a change in oscillator alignment.

The wiring change is as follows: Remove the wire connecting the ground end of the volume control to the chassis ground. Connect the ground lug of the volume control to the cathode of the 6D6 tube.

In some instances it was found that the above change resulted in the appearance of eliminator noise or interference. This trouble can be remedied by the addition of a 100-ohm resistor as shown in the accompanying illustration.

Connect a 100-ohm resistor (Part No. 1209015) in series with the 275-ohm resistor, No. 39 on the schematic

found on *United Motor page 7-10 in Rider's Volume VII*. This is the common bias resistor for the 6B7 and the 6D6 tubes. This resistor should be connected at the cathode end as shown in the illustration.

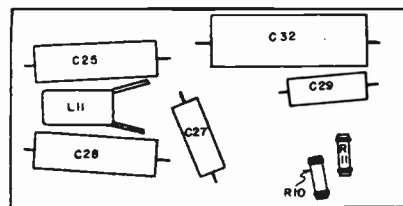
Disconnect the cathode end of the lead running from the ground end of the volume control to the cathode of the 6D6 tube. Connect this lead to the point where the 100-ohm and the 275-ohm resistors are connected together in series, as shown in the illustration.

**RCA T11-8**

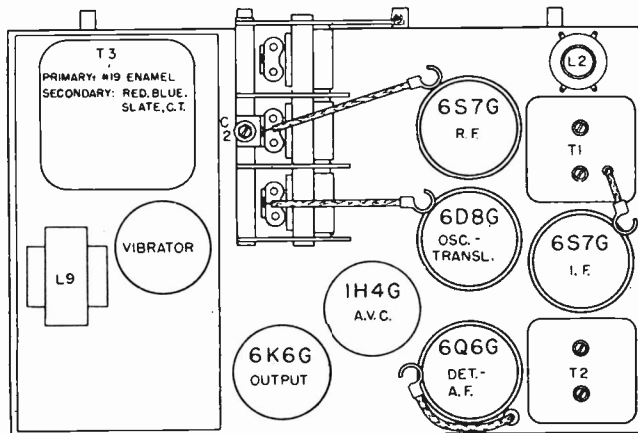
A 5Z4 metal rectifier has been substituted for the 5Z3 in this chassis, the schematic for which will be found on *page 7-144 of Rider's Volume VII*.

**Silvertone 4428A, 4448A, 4528A, 4548A**

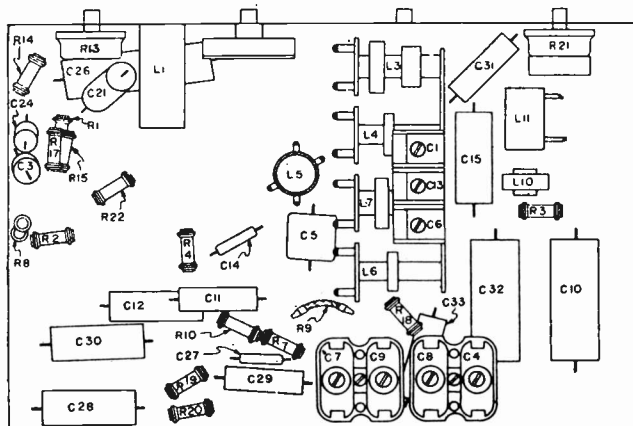
We have been advised by the manufacturer that the tube layout and the two chassis views that were supplied with the servicing instructions of the chassis used in the above models, were incorrect. We are reproducing here the three correct layouts that should appear on *pages 7-61 and 7-62 of Rider's Volume VII*. Please make proper notation on these pages in your Manual.



The locations of the parts under the power supply unit of the Silvertone 4428A and other models



LOCATIONS OF PARTS ON TOP OF CHASSIS



LOCATIONS OF PARTS UNDER CHASSIS

The correct chassis views of the Silvertone models 4428A, 4448A, 4528A, and 4548A.

# Successful SERVICING

Reg. U. S. Pat. Off.

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

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Vol. 3 FEBRUARY, 1937 No. 6

## HOW MUCH AND WHAT SERVICE DATA?

THE past five years have witnessed a great change in the servicing data that have been prepared for servicemen by receiver manufacturers. It was found that more and more information was needed due to the increasing complexity of the circuits and the more complicated tests necessary for their successful servicing. It is true that all the information possible about a set is valuable, but the question now has been brought up—*just what information does the serviceman find necessary and what could he do without?*

For instance, some manufacturers give the prices in their lists of parts—others omit them. Some give more or less elaborate explanations of the functioning of different portions of the circuit; others assume that the serviceman can find this out from the schematic. By and large, is such information really of great value to you in the majority of cases? In other words, do you find such data needed in say seven out of every ten sets that you service?

The Service Section of the Western Division of the Radio Manufacturers Association for several years has been working toward a standardization of service manuals. It is their aim to simplify these manuals to the greatest extent and at the same time, to retain every bit of information that is important and necessary to the serviceman in doing his job.

We, too, have similar ideas and have endeavored to incorporate some

of them in SUCCESSFUL SERVICING. May we call your attention to the tabular arrangement of the alignment data of several receivers in the past two issues? This is an example of simplification and at the same time, a retention of all the information necessary for the proper alignment of a set. Note that in a comparatively small space we have presented the following data: The positions of the dial and the waveband switch; the dummy antenna; the frequency of the signal generator and the point to which it is connected; the trimmers to be adjusted and whether the output signal is maximum or minimum. These facts together with several footnotes and a layout showing the locations of the trimmers on the chassis, are everything needed.

Now we would like to get your opinion. Bear in mind that the inclusion of *all* information about the multitude of sets put on the market annually while it may be nice to have, is not absolutely essential. *Just what do you require in the way of servicing data? In what form do you find it most handy?* Also keep in mind that **standardization and simplification** are the aim.

We suggest that you look over the servicing data you have on hand. Perhaps you like the way one manufacturer presents his voltage data—the manner in which another arranges his schematics. Maybe some prefer having a list of parts with parts numbers and prices and other men feel that the values of the parts on the schematics are sufficient. *Just what do you find necessary and how would you prefer that the information be given?*

Will you let us have your ideas?

It is realized that standardization is sorely needed and we ask your cooperation so that we, in our turn, may cooperate with the R. M. A., which we are only too happy to do . . . We will see to it that your ideas are forwarded to the proper parties . . . This is your chance to voice your wants and opinions, so take a few minutes and let us know *now* what they are.

JOHN F. RIDER.

*If confidence is a plant of slow growth, credit is one which matures much more slowly.—Beaconfield.*

## Did You Know That

**John Scott Harrison** was both the *son and father* of Presidents of the United States. He was the son of William Henry Harrison, the ninth President, and the father of Benjamin Harrison, the twenty-third.

**The Giant Eucalyptus** or peppermint tree grows taller and larger than any other species, reaching heights from 400 to 480 feet and diameters from 18 to 35 feet.

The **Cheetah** or hunting leopard of Asia and Africa is the *fleetest animal*. It can outrun a greyhound or horse, which are credited with speeds of 60 and 40 miles per hour respectively.

A cubic yard of dry sand weighs between 10 and 15 pounds *more* than a cubic yard of wet sand, up to a certain percentage of moisture. It is said this is due to a film of water that forms around the individual grains and prevents them from flowing together and packing.

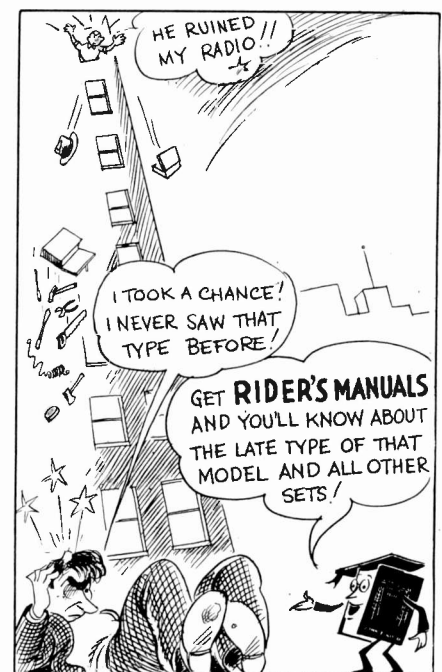
The **male mosquito** has no proboscis for biting and blood sucking—another case of “The female of the species is more deadly than the male”.

It is unlawful to dun a person for a debt *past due* by the medium of a post card sent through the mail.

## CHARLIE CHANCE—

*He Gets*

*Thrown For A Loss*



# "ALIGNING PHILCO RECEIVERS"

SOON after set manufacturers first realized that their products did not always function as they should in the home and that servicemen were needed to repair them, a search was started for the best way to prepare servicing instructions so that they could be easily understood and readily applied.

That search is still going on. Various methods have been tried—how many can be seen by looking over your servicing data . . . some were good and retained . . . others more or less mediocre, and while these last are still in use, the search mentioned above is still continuing.

We, too, have been searching and experimenting continually. Lately when the opportunity presented itself for us to publish the alignment instructions for every Philco receiver ever made—and there are 8,000,000 of them!—our first thought was "How can we arrange this mass of material so that the serviceman can use it with the greatest ease and with a minimum chance of error?"

It was realized that here was an opportunity to put some of our ideas to work . . . to arrange the instructions so that when you were aligning a set on the bench you could follow them with the least amount of effort.

It naturally followed that the

instructions must be brief—compact—and yet contain all the necessary information, which, of course, included the layouts showing the locations of the various trimmers and padders. First it was thought that the present method could be condensed, but as it was desirable to have the layout on the same page with the instructions, this would make a large page size a necessity. So that was discarded, as it was decided that a book about five by seven inches would be the handiest size. Then someone suggested a tabular form of presentation and after many a conference, this was declared the best.

And that is the way you will find the data in "Aligning Philco Receivers"—covering all models—from the very first up to the latest 1937 set.

You will find that it is compact—easily followed from one step to the next and with all the information that you need for the alignment of any Philco set. As was mentioned, the instructions are in tabular form and each line of the table is for the adjustment of one trimmer or padder, as the case may be. The trimmers are numbered and each one can be identified and located on the chassis by means of the clearly drawn layouts that appear on the same page as the tables.

Let us consider these tables more closely and see how they follow the

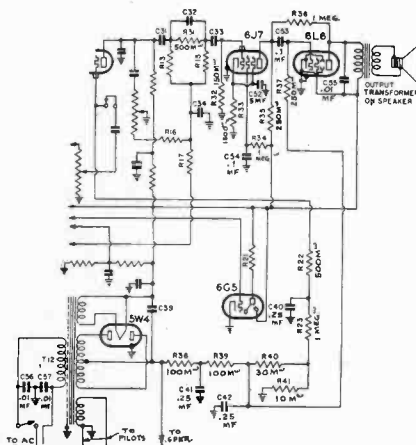
logical procedure you use when aligning a set. First—where is the signal generator connected to the set? The answer will be found in the first column. At what frequency is the signal generator set? The second column tells you that. What are the positions of the receiver's dial pointer and wave-band switch? The next two columns give you these. The fifth column indicates the trimmer number and the last, whether the output signal is maximum or minimum.

Beneath the table appear any other facts that do not readily adapt themselves to tabular form or would take up too much room if they did. For instance, the value of the resistor or condenser used as a dummy antenna; special instructions for different sets, etc. These extra facts are referred back to the points in the tables by number and take the form of footnotes. On the same page appear one or more layouts showing just where every trimmer is located and the frequency at which it is adjusted.

Space does not permit a more elaborate explanation of "Aligning Philco Receivers"—the newest Rider book. The next time you are in your jobber's, look it over and see for yourself how, by using it, you will be able to speed up the alignment of any Philco set.

## Emerson Chassis C and CLW

The 6C5 and the 6F6 tubes of these chassis have been replaced by a 6J7 and 6L6 respectively. There have also been other changes in the audio



Changes in Emerson Chassis C and CLW

amplifier, which can be seen by comparing the partial schematic shown herewith and the original which will be found on page 7-36 of Rider's Volume VII. The values of parts on the accompanying schematic are the new values. These changes apply to sets carrying serial numbers above 880,050 of Chassis C and above 848,410 for Chassis CLW.

Also please make a note that Chassis CLW is the same as Chassis C, except that a long-wave coil has been substituted for that one covering the police range.

The voltage data that appears on page 7-35 applies to sets having the above changes incorporated with the exception of the readings for the 6J7 tube; these are: Plate—115; Screen—45, and Cathode—1.2. This means that the readings for the 6L6 are the same as those for the 6F6.

**Announcement**  
**AN HOUR A DAY**  
**WITH RIDER**

on

**ALTERNATING**  
**CURRENTS**  
**IN RADIO**  
**RECEIVERS**

Will be Available  
at your jobbers  
**MARCH**

# Rolling REPORTER



Dear R.R. . . . You're the luckiest bozo south of Yonkers! How do you know when we are going to have a flock of bad weather so that you can go some place where rain is only found in the dictionary? Just as soon as you climbed on that chariot of yours and headed for the ferry *the weather got worse* and ever since its been worse+. The other day when I was taking some proofs back to the printer, I came up the subway steps behind a trio of dames. One of them yips out "Oh lookit theres the sun" and darn if she wasnt rite. Beleive me i know how Bird felt in the Auntartic. . seeing the sun these days is *news*

Are you going anywhere near Miami Beach? The Boss has been on a trip and stopped over there. Said he'd like to do some absorbing of the vitamens but didn't have time and by the way youre outa luck the boss sent up some oranges and grapes-fruits for the gang and as you werent here i took care of your share for you. (*Editorial note: You bet he did; he said he was afraid they would spoil.*) Anyhow you can thank him when and if you see him or did you?

The other day a tall gent named Bryant came in looking for you. said he was from Texas and had just come up here through the flood the which he didnt seem to like. Hes been in the serviceing biz down by the Riogrand and says the humidaty down there is pretty bad and he spent a lot of his time fixing sets that could stand the heat but not the humidaty. I heard him tell Jack in the lab. that he found by ringing out a piece of cheese-cloth in crude oil and thumbtacking it over the openings of the back of sets that the humidaty didnt do so much harm to the sets innards. Said it ought to be renewed every couple of weeks. i gess it works something like when you go out to see that guy Tom Collins in the summer. You used to say seeing him helped your humidaty—and you *renewed* his acquaintance often enuf.

Tell any of the servicers you call on that the *Philco alinement book* will be out about the **1st of march** and boy has that book got layouts (pictures to you) i never saw so many cuts in all my life for one book and i herd someone say it was *all tables instead of reading.*

By the way theres been three guys in here looking for you. they didnt say what they wanted but i dont *think* they was servicers. One of them had a big bunch of papers in his pocket and looked like a bozo that used to come in the place where i used to work and collect bills. He was the one that was most interested in your health. I took there names and addresses

and told them Id let them know when youd be back. Thats me, always helpful to everybody, so tell me when youre comeing.

Say why didn't you tell me your name was *Rollo*? Whats the idea of holding out on me and the gang here at the office? How'd I know? Well, the other day a letter comes in from *Vangunten* out in *Cleveland* addressed to you and he starts out with "**Dear Rollo**". He says as to how he left the women and children to shift for themselves and bought a Vol.VII. and though he hates to admit it, but we're getting better and better. *Guess we ought to take a bow, huh?* He also says that the Cleve. chapter gave 1937 a rousing start with a big stag party with all the trimmings and SOHARSM. Nobody will tell me what that means. Do you know and will you tell me if you do???

Remember you said that you might go up North for some skiing when you got tired of swimming down South? Well, on your way through *Poughkeepsie* stop off and see **Ed DuFour**. He wrote us the other day asking if that Majestic chassis layout we ran last month didnt have the rf choke in the wrong place. I got Jack to check it for me so I could tell you and you could tell Ed and Jack says as to how its ok as is and will you please now tell Ed that thats the way it is in the majestic book. you might also thank him for the nice things he says about S.S.

On your way up North you might stop over in **Chattanooga** and see **F. P.**

## Whistle

In localities where a station is operating at approximately twice the i-f. peak of a receiver, it is not unusual to find a whistle when this station is tuned in. This is due to the second harmonic of the i-f. signal feeding back into the input of the receiver and beating against the incoming signal.

The best way of eliminating this whistle is to shift the i-f. peak by a small amount so that the interference occurs at some less objectionable point on the dial. For example, if the whistle occurs when a station operating on 920 kc. (receiver i-f. peak 460 kc.) is being received, and no useful station is at 930 kc., then the most convenient method of procedure is to realign the i-f. amplifier at 465 kc. or at one half the value of the frequency to which it is desired to shift the interference. If there were a station operating on 930 kc. but none on 910 kc., then it would be advisable to shift the i-f. peak to 455 kc. (one half of 910 kc.).

The i-f. peak should be shifted by the smallest possible amount so as not to disturb the tracking in the broadcast band. The i-f. and broadcast band alignment must be completely gone over when the i-f. peak is shifted.

**Jones.** He asks about some Metrodyne hookups. Tell him we aint never heard of such sets but if he'll tell you where theyre made we'll try to get the info for him and all other servicers.

I new you wont get out as far as **Washington**, so i wrote **Macs Radio shop** in **Colton** and told them that there wasnt a chance for them to get the first few numbers of S.S. Once I tried to swipe some out of the Assoc.Ed's file for a guy here in N.Y. but i got caught at it and i aint aiming to wear anyones footprint on my hide again—*no sir not for nobody.*

Did the red-head tell you she got a new fur benny? She says its minx or link or something like that it didnt cost her much only a little overtime work so i thought i might get one for my sisters birthday but when i went into a coat store and asked the price *i thought i was in an automobile salesroom.* Just wait till that wench gets over her cold—will I tell her things or tell her plenty???

The answer is **YES!!!!**  
Well I gess id better get to work and boy *am I busy!* With you down among the sheltering palms and the boss traipsing around I'm getting away behind on my detective stories...and I'm just where the Master Sluth is going into the crooks hangout with a 45 in each hand and a gasbomb in the other..That dont look right does it? Maybe Im mixed up a little. Oh well — Hoping youre the same.

Yours truely,  
Aloysius Winenwiski  
Head Officeboy

## Aligning A.F.C. Circuits

(Continued from page 3)

those with the a.f.c. switch in the *off* position, be made with the line voltage set at a value which corresponds to the average line voltage experienced at the customer's home. Failure to observe this precaution may result in poor dial calibration and asymmetrical a.f.c.

## VISUAL ALIGNMENT

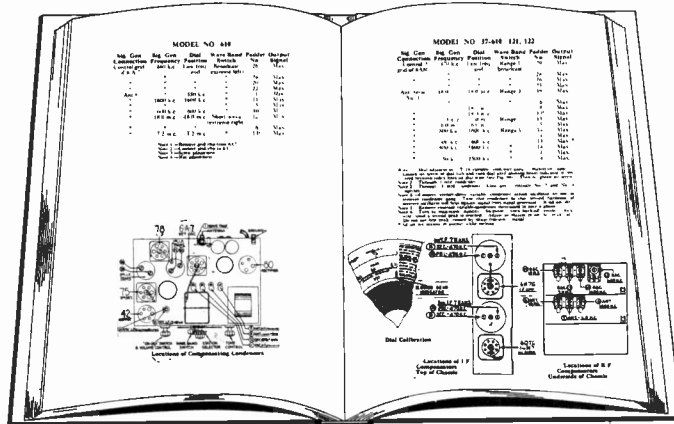
The frequency-modulated signal generator and the cathode-ray oscillograph can be used in the alignment of a.f.c. circuits. In this connection, the oscillograms shown in Fig. 3 are representative of the type of pattern which is obtained. Correct alignment is indicated when the two traces intersect each other symmetrically along the zero axis. As before, the secondary adjustment is by far the more critical and determines whether the two traces intersect above or below the zero axis.

There are many considerations involved in the correct use of this method. Unless the operator is skilled and experienced in the use of visual alignment, we strongly recommend that the alternative procedures previously described be used.

We regret that lack of space prevents us from going into a more complete discussion of the many other factors which are related to the proper alignment of a.f.c. circuits. However, this subject is fully covered in "An Hour a Day with Rider on Automatic Frequency Control" which will be published in the very near future.

# TO MAKE YOUR JOB EASIER

*That's the purpose of*



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by  
**JOHN F. RIDER**

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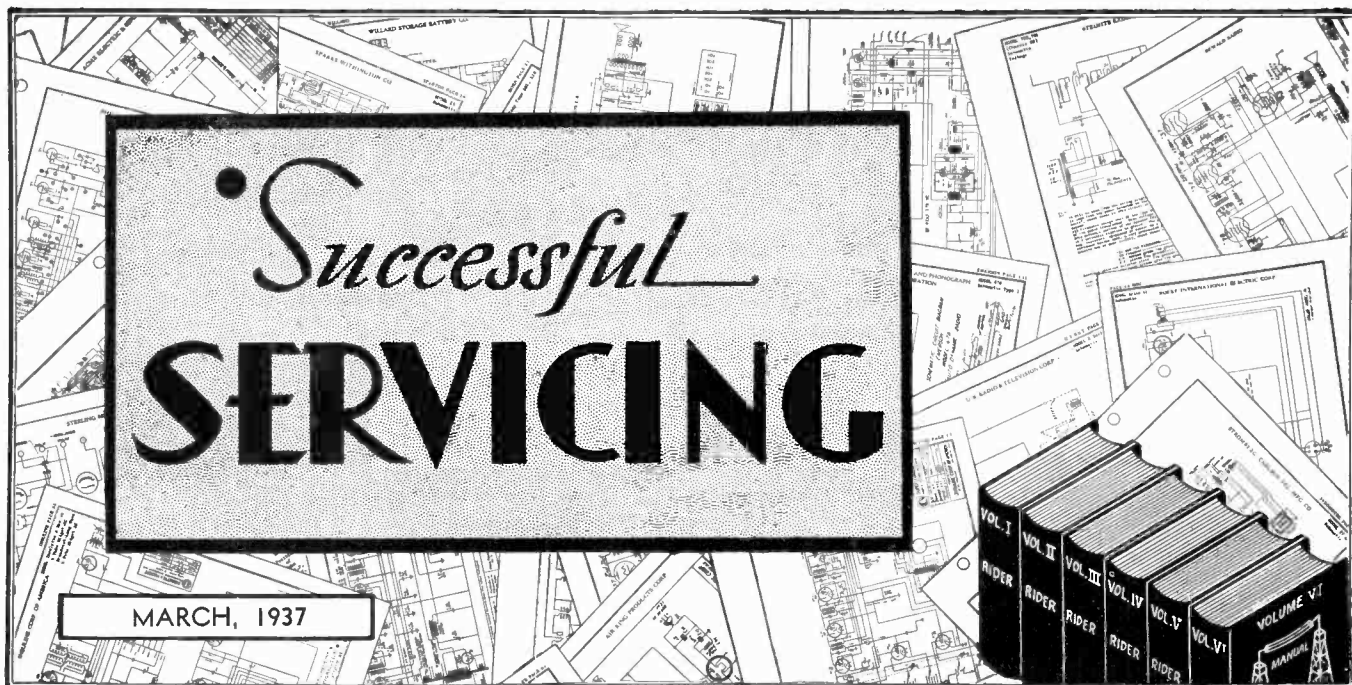
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## WHY SENSITIVITY TESTING

Advantages of Gain-Per-Stage Measurements in Localizing Trouble

By JOHN F. RIDER

*This article indicates in general terms the application of sensitivity data and gain-per-stage measurements as an aid to the rapid localization of defects in radio receivers. Up to the present time this method of trouble-shooting has been, for the most part, limited to the manufacturers' production lines. The reasons for this condition are discussed and the objections which have been mentioned against the introduction of sensitivity testing into the servicing field are answered. This article is not to be considered as a complete treatment of the many considerations involved in sensitivity measurements, but rather as an introduction to the part that these measurements can play in cutting down the time required to locate trouble.*

**T**WO basic methods of approach are in use today in finding the cause of trouble in a defective receiver. One is the method which is too widely used—that which depends upon the hit-or-miss checking of every single part in the receiver. On the utter inefficiency of this method we need not dwell. Naturally sooner or later the defective part will be located, but the amount of time consumed is out of all proportion to that which is really required.

The second method recognizes the simplification and saving of time which can be brought about through a preliminary examination to determine the approximate location of the trouble. Such methods have always been used by wide-awake servicemen since the

earliest days of radio. Many of you will recall in this connection the tests which are fairly well established in service practice for determining approximately the operating condition of the various sections of the receiver.

Analogies can be pushed too far, but the following should serve the purpose of indicating the great amount of time which can be saved by progressively limiting the possible places where a defective condition can exist. It is just as time consuming to test blindly every condenser, resistor, and coil in a receiver until the defective condition is found, as it is to examine every single name in a telephone directory until the one desired is found. In the same way that the name is first located alphabetically in a certain section of the directory, so the trouble should first be localized as being in a particular section of the receiver,—such as the power supply, the audio system, the i-f. system, or the r-f. system. Having found the trouble to exist in one of these principal sections of the receiver, a further series of tests will indicate just what part of the section is inoperative or abnormal, and in this way a progressive narrowing down of the zone in which the trouble can lie, finally culminates in the location of the actual defective part or condition.

While it is not our intention in this article to go into great detail as to just how this localization of trouble is accomplished (we shall reserve a discussion of these problems until a later date), reference to the accompanying figure will make clear the general procedure which is suggested. Basically the method operates by feeding a known signal to each of the points in the receiver, which are designated on the typical skeleton diagram by the circled numbers from (1) to (6). In this way the trouble is localized by comparing the signal voltage which is actually required to produce the standard output as indicated by an output meter, with the values which should be necessary when the receiver is operating normally.

For example, if the signal voltages required at points (1) and (2) are in accordance with the data supplied for the particular receiver, and an abnormally high voltage is required at (3) to produce the standard output, then it follows that the stage between (2) and (3) is not functioning. Just why this stage (i-f., in this case) is not amplifying the signal to the extent that it should, can be found by the application of conventional testing methods to the i-f. stage alone (strictly speaking, the

*(Please turn to page 3)*

**G. E. Series E Pickup Connections**

The accompanying series of schematics shows how phonograph pickups should be connected in the circuits of the various receivers indicated above each drawing. The pickup should be either a crystal or a high-impedance magnetic type. The only other parts required besides the pickup and the turntable are a single pole—double throw switch and sufficient shielded single conductor. No pickup transformer is necessary.

If the phonograph turntable is not located very near to the receiver chassis, the leads from the turntable to the set should be shielded and the shield grounded. The changeover switch (SPDT) should be located as closely as possible to the point where the switch leads tap into the a-f. circuit. These shielded leads should be as short as possible.

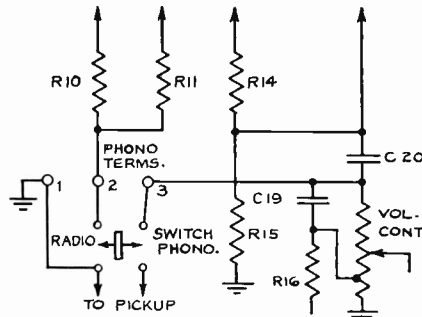
Both the volume control and the tone control of the receiver will be effective when records are being played. If needle scratch is noticeable, the tone control may be set in a position that will attenuate the higher frequencies. This will practically eliminate all "hiss" or needle scratch.

The complete schematics of the models covered in Figs. 1, 2, and 3 will be found in *Rider's Volume VII*; those covered by the other two were released after the publication of Volume VII

and will be published in Volume VIII. The models and the pages on which their schematics appear are as follows: *Models 61, 62, 68*—page 7-9; *71, 72, 76*—page 7-13; *81, 86*—page 7-17; *91, 95*—page 7-25; and *101, 105, 106*—page 7-29.

**Atwater Kent P810**

This model has a phonograph-radio switch added to the chassis used in Model 810, the schematic of which



The addition of a phonograph switch to the A-K. 810 as shown converts it to the Model P810.

was shown on page 6-44 of *Rider's Volume VI*. The accompanying partial schematic shows where this addition was made, no other changes having been made in the circuit.

**Halsion 50-M and 50-S**

Please make a note on page 7-4 of your *Rider's Volume VII* that the i-f.

tube is a 6K7 for model 50-M and a 6D6 for model 50-S. Otherwise the circuit is identical for both models.

**Crosley 136-1**

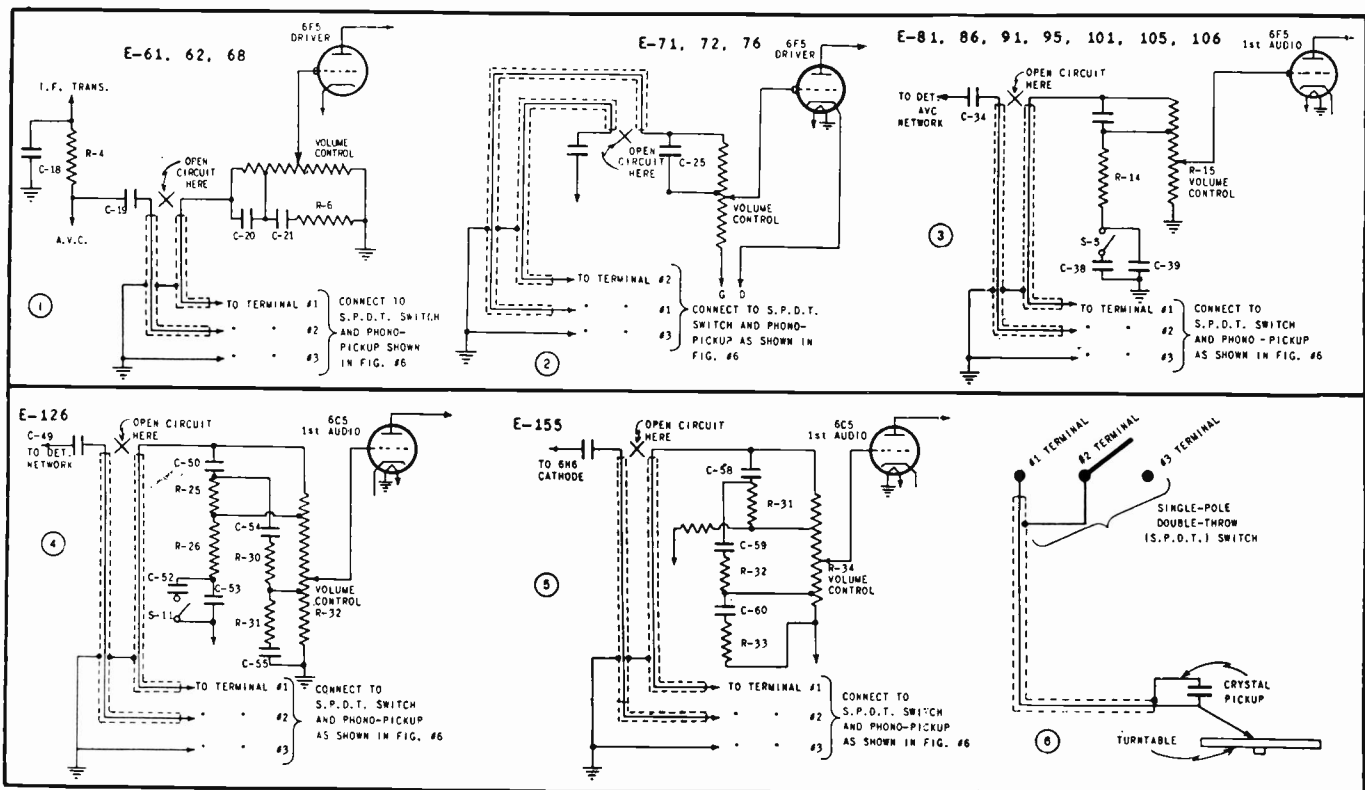
Two i-f. peaks are shown on the schematic diagram of this model, which will be found on page 3-20 in *Rider's Volume III* and on page 744 of the *Rider Combination Manual*. The correct i-f. peak is 456 kc. Please cross the other one out, so that no error will be made if you work on this set. Thanks.

**Philco 651**

The leads of the i-f. transformer should be separated as widely as possible from each other, in order to reduce the possibilities of i-f. oscillation. This means, too, that the leads from one of these transformers should be as far as possible from the leads of the other.

The -B lead from the suppressor plate terminal of the 78 r-f. tube to the wiring panel mounted on the 0.05-mf. condenser, No. 72, should be run close to the baseboard and away from the wave trap coil. This should eliminate motor-boating at 540 kc.

For schematic, see page 7-111, *Rider's Volume VII*.



Schematics showing how phonograph switches should be added to the G.E. receivers indicated above each diagram.

Why Sensitivity Tests

Continued from page 1

diode detector should be included). By conventional testing methods we mean the ordinary voltage, current, resistance, and capacitance measurements. Obviously, the saving in time comes about because the complete checking of component parts need be made only in connection with the known failure of a single stage to function properly.

While radio manufacturers have recognized the efficacy of gain-per-stage measurements in troubleshooting on their own production lines, very few released this information in their service literature. In talking over this question with several organizations, the opinion expressed was that unfortunately the service industry as a whole is not in a position to profit by the release of such information, both on the basis of the lack of adequate equipment and, in many cases, insufficient knowledge to interpret properly the manifold conditions which can arise in the course of sensitivity checking.

Let us take up these considerations one at a time. As far as the lack of knowledge on the part of the serviceman, there is a great deal of truth in this. But taking a broad view of present day conditions, we would say that many servicemen are in a position to profit from the release of such sensitivity data, and that the good which would be accomplished in increased efficiency and better servicing would more than compensate for the small amount of trouble involved in making sensitivity data an integral part of service notes. As for those who would not be able to use the data because of insufficient knowledge of basic radio principles, experience has shown that the service industry is in process of evolution, and that those who would survive must keep pace with developments in the art and acquire the knowledge.

The cost of equipment required for making sensitivity tests is one that has been mentioned as being almost prohibitive. Calibrated signal generators if is true, cost in the neighborhood of

four hundred and fifty dollars and this price is beyond the reach of even the above-average equipped service shop. We will grant this, but fortunately gain-per-stage measurements can be made without the use of a calibrated attenuator—with the ordinary signal generator—by noting the change in audio output—on an ordinary output meter—when the same signal voltage is applied to the grids of two successive stages. The gain is then equal to the ratio between the two audio outputs or, if an attenuator (audio) is used between the output meter and the receiver, then the gain is numerically equal to the attenuation required to keep the output meter reading at the same value when the signal generator is switched from the grid of the one stage to the grid of the one preceding.

To our way of thinking, a precision, calibrated signal generator constitutes a luxury and convenience in making gain-per-stage tests and as such is not absolutely necessary. However, it so happens that the introduction of sensitivity testing will automatically bring about an increased demand for signal generators with calibrated attenuators, and we have it on good authority that on a quantity production basis such generators can be sold for under one hundred dollars.

One of the objections which has come to our attention in connection with the inclusion of sensitivity data in service notes is that it is impossible to supply accurate figures on the various gains-per-stage, because of the variation in these figures among individual receivers of a particular model. The objection is a valid one to a certain extent; however, it is quite possible to specify the sensitivity and gain-per-stage figures in terms of an average value with the tolerance indicated. This is a fairly common practice in service data, as we often find that resistors and condensers are specified in terms of an average value and are stated as being subject to a variation of plus or minus 20%. In by far the majority of cases, the tolerance is omitted from the data, and then it is

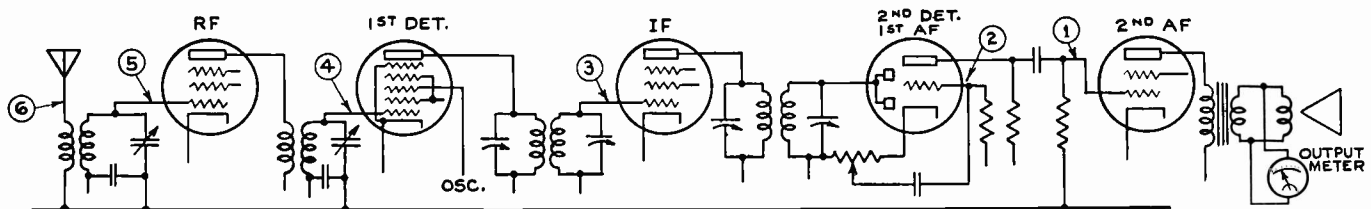
left to the judgment of the serviceman to understand from the manner in which the part is used in the circuit that a certain variation from the stated value is permissible.

The same sort of reasoning applies to the inclusion of sensitivity and gain-per-stage data in service notes. The serviceman must understand or must be taught to understand that the figures given are subject to variation as a result of manufacturing tolerances, humidity, temperature changes, and other factors. Almost invariably, however, when a fault occurs in a receiver, the effect upon the gain is so marked that the question as to whether the variation is due to a real defect or whether it is a permissible one and therefore not a significant variation, is one that will seldom arise.

In connection with the use of sensitivity and gain-per-stage data, there is a natural and understandable tendency on the part of the serviceman to use this information as a basis of comparison among different receivers. This has been an objection voiced by some manufacturers and while a basis for the objection exists, it certainly is not an insurmountable obstacle. The service industry can be made to understand that the purpose of sensitivity data is to expedite service operations, and not for the comparison of the relative merits of different receivers. The serviceman will not take upon himself the functions of a design engineer and condemn a certain receiver because in his opinion the gain of a certain i-f. stage should have been higher than the data supplied indicates. Too many other considerations are involved in a receiver besides that of sensitivity and gain-per-stage, to enable the serviceman to pass judgment on a receiver on this basis. *The only function which sensitivity data has in servicing is that of reducing the amount of time required to restore a receiver to its original operating condition.*

The sensitivity method of checking is no panacea for the problems involved in the servicing of present day receivers.

(Please turn to page 6)



Skeleton diagram with numbered points at which signal voltages are introduced. By comparing the voltages needed to give standard output readings, defects are localized

**Silvertone 2- and 3-Volt Chassis**

The model numbers in which these chassis are used are as follows: 4404, 4406, 4424, 4444, 4524, and 4544 for the 3-volt models; 4410, 4411, 4425, and 4445 for the 2-volt models. The schematic for both chassis will be found on page 7-55 of *Rider's Volume VII*.

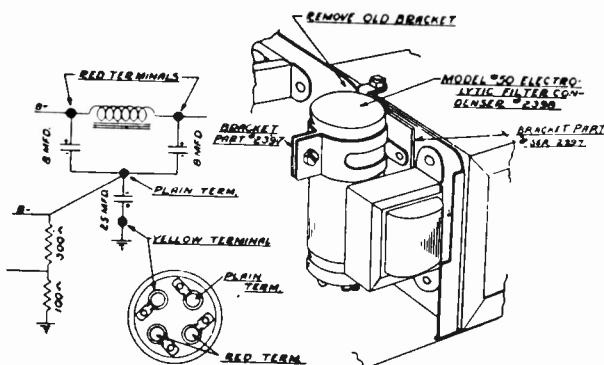
In some localities where a 930-kc. station is operating, it may be desirable to shift the i-f. peak — 465 kc. — of these chassis to eliminate a whistle due to a beat between the second harmonic of the i-f. peak and the signal of 930 kc.

First determine at what point between 900 and 960 kc. the whistle will be least objectionable. Dividing this frequency in half will give the new i-f. peak at which the receiver should be aligned. For example: assume that the whistle at 915 kc. would be unobjectionable, then the new i-f. peak would be  $915 \div 2$ , or 457.5 kc. Align the i-f. transformers at this new frequency and then realign the rest of the receiver, as described on page 7-56 of *Rider's Volume VII*.

**Motorola 50**

The electrolytic condensers across the filter choke of this receiver (see schematic on page 7-2 of *Rider's Volume VII*) have been changed in accordance with the partial schematic shown in the accompanying diagram. The part number of this new unit is 2398, replacing Part No. 2317.

Previously to this change, the electrolytic condenser was equipped with a stud in the bottom of its can and was mounted with this stud in the chassis plate adjacent to the power transformer. In the new unit this stud is eliminated and the condenser is mounted as shown in the accompanying sketch.



Schematic of the electrolytic condensers used now in the Motorola 50 and the sketch showing how the new unit is mounted.

**Wells-Gardner 6L Series**

If r-f. noise or vibrator hash is encountered in this model, the following procedure may be followed to eliminate the trouble. See schematic on page 7-22 of *Rider's Volume VII*. Models in which these changes have already been incorporated may be identified by the paint mark on the "A" cable near the bayonet connector.

The lead from the antenna section of the gang condenser (section nearest 6D6 r-f. tube) should be unsoldered from the antenna coil terminal and cut to the exact length necessary to reach the terminal. It should then be resoldered to the terminal in the position shown in Fig. 1.

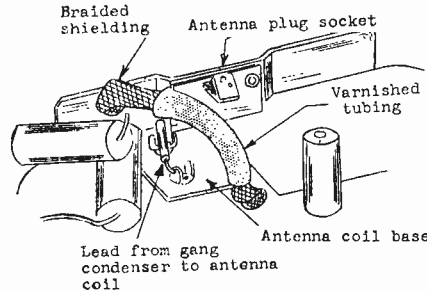


Fig. 1—New position of the antenna lead with shielding and tubing in place.

One end of a 4 inch piece of heavy braided shielding should be soldered to the ground lug on which the gang condenser braided cable is grounded—See Fig. 1. This piece of shielding must be very heavy and should be composed of 4 pieces of ordinary braided shielding, each of which is made up of at least 64 strands of No. 34 wire. Slip a piece of varnished tubing 2 inches long over the free end of the cable. Then solder this end to the chassis base between the antenna and interstage coil bases at the point shown in Fig. 1.

On the side of the chassis case opposite the control cables, a hole should be drilled through the case and chassis

base at the point shown in Fig. 2, using a No. 32 drill. Enlarge the hole in the case by using a slightly larger drill. Clean off the paint around the hole in

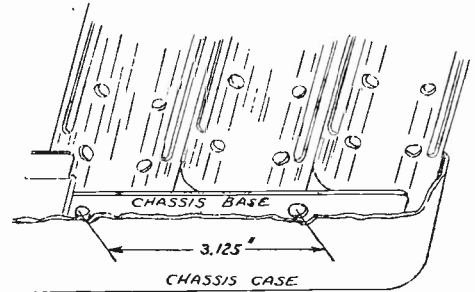


Fig. 2—Location of the hole through the chassis case and chassis base.

the chassis case so that the screw head will be well grounded. Then use a No. 6 self-tapping screw to ground the case to the chassis.

**Delco 628**

Several cases of audio distortion or high-pitched whistle have been reported on this receiver. In some instances, the distortion was intermittent and similar to the distortion resulting from a set working with an open grid circuit. The whistle was usually found to occur when the volume control was turned to the maximum volume position, whether the set was tuned to a station or not.

It has been found that both these troubles were due to excessive capacity in the small 3-mmf. condenser intended to increase the high-frequency response. See *United Motor page 7-8 in Rider's Volume VII* for the location of this condenser, where it is designated on the layout as No. 41.

To remedy this trouble, the following is suggested: Remove the 3-mmf. condenser, No. 41, and the 0.00025-mf. condenser, No. 40, from the chassis. Connect a 0.0001-mf. condenser, Part No. 1209993, across the two outside terminals of the volume control.

If complaints are received of intermittently poor tone quality that is not evident on test, it will usually be found, where the 3-mmf. condenser is suspected, that this trouble can be made to appear by testing the receiver on 8 volts. In cases of severe distortion accompanied by low sensitivity, a careful check should be made to see that the second i-f. coil adjustments have not changed, due to wax entering the trimmers.

# Successful SERVICING

Reg. U. S. Pat. Off.

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

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Vol. 3 MARCH, 1937 No. 7

## "DON'T—"

THE other day in the course of a conversation with our good friend Charley Golenpaul, the topic of good servicing arose and he told us about some important "don'ts" that he has passed on to some servicemen. When we heard a few of these "Golen" nuggets, we asked for all that he had. . . . We thought so much of them that we are passing them on to you.

### DON'T BE TOO EAGER

Naturally you want to get that job — to sell this accessory or that extra set — *but don't be too anxious.* It makes a prospect suspicious. Rather, build up the desire — paint a picture of what that accessory or set or repair will mean in the way of satisfaction or pleasure or protection of the investment. . . . Let the prospect sell himself or herself.

### DON'T HIGH PRESSURE

Don't push the prospect too hard — don't be insistent. One hint that prices are rising is better than harping on it — far more effective. *Leave your blackjack at home.*

### DON'T BE AFRAID

Work up enthusiasm . . . paint a nice word picture for the prospect and let him do part of the selling job. When you have worked up desire, *don't be afraid to ask for the order to do the work.*

### DON'T KNOCK COMPETITORS

Present the good points of your side. . . . Make fair comparisons, if necessary, but don't waste time knocking the other fellow. If you do, you

might sell your competitor's proposition instead of your own.

### DON'T FORGET YOUR MANNERS

In the heat of a sales argument, some chaps forget their manners and even become abusive. . . . *Don't do it!* Be diplomatic always. . . . Maintain good taste.

### DON'T ARGUE

Don't argue just for the sake of arguing. Stress all the good points of your case and shy away from any weak ones. Arguing only generates resistance. Remember, *the customer is always right* — you have to make him see the right way in your case by explaining — not arguing.

### DON'T DRIFT

Keep to your subject. . . . Remember, you are there to sell a job. . . . *After* you have sold the job — you can make social talk. . . .

### DON'T BE NEGATIVE

Keep in mind that it is hard for most people to say "No" when it comes to turning you down — so don't say "No" for them. Don't have a negative selling attitude. . . . *Don't* say "Would you . . .", but "*You should . . .*" Don't say "I think" — say "I know" — but be certain you're right.

### DON'T TALK TOO MUCH

There comes a time for action in any selling job. Learn to keep quiet at the right moment. . . . You can just as readily talk yourself out of a job — as into one.

### DON'T CHARGE TOO LITTLE

You have costly testing equipment, so don't be afraid to ask a fair price for your work. *The customer is paying for a good job.*

### DON'T DO JOBS WHILE THEY WAIT

The watch repair man tells you to call in a week or so for your watch. Do likewise in your radio repairs. . . . tell the customer it will take some time to do the job. *Don't do the job in the customer's home, if you can possibly help it and don't do it in the shop while the customer waits.*

### KNOW YOUR STUFF

Be properly equipped with test equipment and information, so essential in working on today's intricate receivers. The service field has no place for the ham-and-egger at this late date.

The untrained chap simply can not have confidence in himself, so why should the customer? *You must know your stuff.*

There you are. . . . Read them again . . . think about them and remember them. Don't forget that good servicing is your best form of advertising — "*Sell to sell again*" is Golenpaul's motto. A job well done is fully worth a fair price. Gain a reputation for good work, not cheap work. It's the old idea of the better mousetrap, you know!  
John F. Rider

### Did You Know That

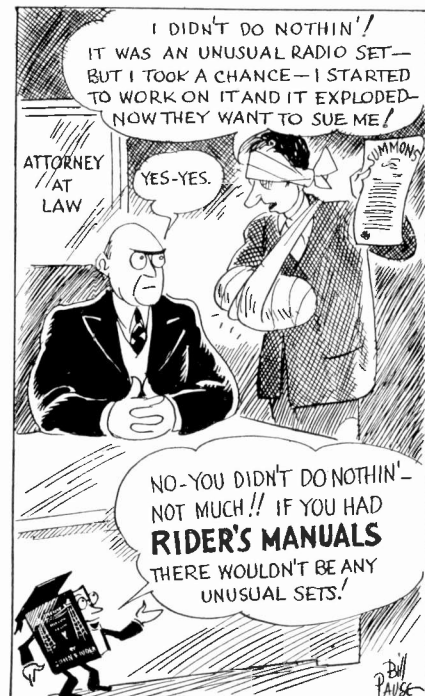
The holes in **Swiss Cheese** are the results of the action of gases that are generated and freed by the action of bacteria during the process of fermentation.

**Red** is not the only color that will infuriate a bull. Dr. Stratton of the University of Chicago claims that any bright color in motion has the same effect as the proverbial red.

**Florida** has the longest coast line — 1197 miles — of any state in the Union. **California** is next with 913 miles.

On certain United States currency notes an asterisk precedes the serial number instead of the customary letter of the alphabet. Such bills replace those that were spoiled in the process of printing.

## CHARLIE CHANCE He Courted Trouble



## RIDER'S VOLUME VII

IN describing Rider's Manuals reference has been made many, many times to the fact that the servicing data in them are as complete as is humanly possible to make them. It has been our aim — right from the time Volume I was published — to give the radio serviceman *everything* that he might need in the successful servicing of a receiver . . . to present the servicing instructions on the products of as many manufacturers as there were in the field.

Even a casual glance through the Index of Volume VII of Rider's Manuals will reveal the name of every major manufacturer in this country and upon closer inspection will be found the names of others who might not fall in the former classification and yet who are decided factors in the field. Naturally, we do not claim 100% coverage — that would be idiotic — but we do claim that **in Rider's seven Manuals will be found servicing instructions on more manufacturers' products than in any other manual or book offered to the service industry.**

Now let us look at the other statement that was made above: it is our aim to give the serviceman *everything* he needs for servicing a set. Look over this accompanying table which we have

compiled from Volume VII. It represents the sections devoted to only a few of the 105 manufacturers whose servicing data appear in that Manual. . . . The products of these twenty-seven manufacturers — because of the great number of sets that they have made since they have been in business — are naturally those which you will be called upon to service most frequently and so you will want to know whether their data are available.

Now a word about the table. In the first two columns will be found the number of chassis — T.R.F. and superheterodyne — and in the third column the number of models. The six columns under the general heading of "Percentages" show the percentages of superheterodyne chassis that have the various servicing instructions noted. In the cases where these percentages are below 100, it is due to the fact that the manufacturer does not supply that particular item or it was unavailable at the time Volume VII went to press. Also these percentages have been and will be consistently raised, because we are continually publishing in **SUCCESSFUL SERVICING** the data that were missing whenever they became available. And this holds true for *all the Rider Manuals*.

Why do we tell you all this? Well,

when you are going to buy some piece of testing equipment for your shop, you naturally and wisely look around to see which is the best — which one will fill the bill — and you choose one that will give you the best all-around service regardless of the price. Now anything that is as useful and important in your business as a service manual, should be thought about carefully before its purchase. Because you must have the best manual in the field, in order to have what you want when you need it — we are giving you these facts, which speak for themselves. Look over Volume VII of Rider's Manuals — we are sure you will agree that its 1600 pages comprise the world's ultimate in completeness, clarity, and coverage. So are all the other Rider Manuals. . . . **Remember — you can't go wrong with a Rider Manual!**

### Why Sensitivity Tests

(Continued from page 3)

ers. However, based on our own experience and the experience of manufacturers who have for a long time used this obvious and logical method of troubleshooting, we are led to the conclusion that the widespread use of this method will go far toward putting radio servicing on a scientific and systematic basis. After a careful consideration of all the factors involved, we find that servicing has much to gain by adopting sensitivity checking as a means for the rapid localization and isolation of defective conditions. Naturally many considerations are involved in the correct use of this method, and many problems must be worked out and explained. This will come later on.

For the present we want to leave with you the idea that a more systematic approach to the problems of modern troubleshooting is necessary. The day when it was possible to localize trouble by tapping the detector tube and noting whether or not a "ping" was forthcoming as a result, was adequate in its time. The modern receiver with its complex and involved circuits demands something more effective than this. It is our firm belief that sensitivity and gain-per-stage checking will constitute an important step forward in the simplification of modern servicing.

Manufacturer	No. of Chassis		No. of Models Super-het.	Percentages					
	T.R.F.	Super-hets.		I-F. Peaks	Socket Lay-outs	Trim. Locations	Alignment	Voltage Data	Misc. Data
Amrad		4	4	100	100	100	100	100	100
Belmont	1	14	20	100	100	100	100	100	93
Case		5	7	100		100	100	100	100
Continental		9	9	100	78	78	89	65	78
Crosley		37	48	100	100	100	97	100	100
Emerson	2	23	66	100		100	100	96	91
Fairbanks-Morse		15	15	100	80	80	80	87	74
Galvin		4	4	100		100	100		100
Gamble Skogmo	3	49	58	98	75	84	84	78	90
General Electric		10	20	100	100	100	100	100	100
General Household		17	31	100	94	94	65	65	94
International	1	5	10	100	80	20	100	80	100
Montgomery-Ward		10	18	100	90	80	90	100	90
Noblitt Sparks		12	22	100	100	100	100	100	100
Philco		53	59	100	93	95	95	78	100
Pilot		10	19	100	100	100	100	90	80
R. C. A.		38	64	100	100	100	100	100	100
Sears Roebuck	7	40	127	97	85	75	87	75	50
Sparks-Withington		12	30	100	100	100	83	83	25
Stewart-Warner		9	117	100	100	89	89	78	67
Stromberg-Carlson		9	30	100	100	89	56	100	45
Bosch		22	36	100	68	68	73	50	64
United Motors		17	18	100	88	88	100	100	59
Wells Gardner		12	12	100	100	100	83	100	100
Western Auto		5	6	100	80	80	60	80	20
Westinghouse		3	3	100	33	100	100	100	100
Zenith		17	54	100	83	83	59	77	.....

# Rolling REPORTER



**HOME AGAIN . . .** Well, it's good to be back—to be kicked around in the subway—to be slapped in the face by revolving doors—to have a taxi splash slush on a brand new overcoat—*anyway, there's no chance of being bopped with a cocoanut.* Yep, you guys down in the sunny south with your sheltering palms can keep 'em—they're okeh for a change, but gimme the Old Home Town . . . . .

**THE NEW ONE . . .** While we were going thither and yon Rider and the gang had to struggle along without our help and they struggled so well that **Aligning Philco Receivers** came out on March 11th—just when it was promised!!!! Mebbe they're better off when we're not here—not so good for us. Incidentally, here's a brainthrob for you fellers—give this book the O.O. *It's a pip!!!!!!*

**RIDER RIDES . . .** Amid a mild, unoffensive little snow flurry on March 15th, J. F. R. stepped on an Albany-bound train in Grand Central, but—when he got off at his destination he found a *first-class blizzard in full blast.* He went up to talk to servicers of the Capitol District and was surprised and delighted to find that more than a 100 had braved snow, wind—and ice. . . . They came from Rotterdam, Amsterdam, Soharie, Balston, Hudson, Schenectady and its suburb, Scotia—Saratoga, Cohoes—and heaven only knows where else. Anyhooooo—it was a grand meeting.

**FUTURE DATES . . .** The Boss is scheduled to do some orating at the following: On **March 29, 30, and 31**, he'll be in **Erie, Buffalo, and Elmira**—On **April 1st**, he hits **Ithaca**—on the **13th** the servicers of **Reading, Pa.**, will get an earfull and on the **23rd**, he goes to **Baltimore.** *Will you be there????*

**TRENDS????** In giving the March 8th issue of *Advertising Age* a going over, we were stopped by an item which related how the gen. mgr. of the Hotel William Penn in Pittsburgh, had recommended to the board of directors that every room of his hostelry be **wired for television!!!!** The Waldorf-Astoria here is already so equipped. *She's a' comin', boys, she's a' comin'!!!!*

**BETTER 'N' BETTER . . .** We see by the March issue of our contemporary, *The Bell Laboratories Record*, that the Labs. have gone Hollywood. . . . Seems as to how the customers who sat along the edges of the famous Bowl couldn't hear all that went on a tenth of a mile away on the stage, sooooooo—the Labs. engineers installed a special p.a. outfit that gives the whole 22,500 listeners music with **auditory perspective** (swell reproduction, to you) . . . They had to build a bridge, 112 feet long, 45 feet up over the stage, to hold the two and a half tons of loud speakers. . . . The whole system is capable of giving a gain of 16 db.—wottayamean 16 db? Okay

—forty times as loud as the orchestra! It's a thought, you servicers, — or at least, it should be to some of you. . . . *Why not install a good p.a. system in your hometown park???????* Can you build a bridge???

**NOT A GAG . . .** Recently yr. Reprtr. was presented with a box of imported Chinese tea (It's ok in some punches) (*Editor's Note: Yeah, and some people drink it straight*) Excuse the interruption—well, as we were saying, inside the box was a slip of pink tissue on which were directions how to make tea and also a list of the names of some of Mr. Wong Hank Kew's teas. AND among these names were: **Loong Soo or Dragon's Beard**—**Pekoe No. 1 or Old Eyebrows**—and **Gunpowder.** *Sounds like the makin's of a Mickey Finn.*

**FROM DE SACK . . .** **K. L. Chapman, Balto., Md.** . . . Thanks for sending your reply to last month's editorial. . . . We do try to make-up each issue of S. S. so that you and anybody else can cut 'em up without busting into some service information. . . . Sorry, but we gave all advs. the rootyeteoot some months back. . . . This is **YOUR** sheet and *written for you alone.* . . . **C. L. Dart, Brunswick, Ga.**—**Thanx** for the nice things you say about **Rider's Manuals.** . . . Don't ever forget

that we're human here and can't do everything. . . . Those new sets you speak about, most likely came out since we put Vol. VII to bed. . . . **N. B. Platt, Philadelphia, Pa.**—**Thanx** for your letter. . . . You're 1000% right when you say that your **Rider Manuals** help you more than any handbook, guide, or encyclopedia. . . . However, you're not the first to discover *that fact—1000s of others have.* . . . **Wm. E. Krah, Manchester, Conn.**—**Hope** you got the Jan. issue of S. S. you asked for—'twas sent you. . . . Let us know about the Vol. II pages also, will ya? *And to the rest of you who gave your ideas of wot servicing data should oughter be—Thanx*—and if you haven't had time to slip us your ideas yet—**do it now**—there's still time. . . . *What—no Vangunten???*

**100%ers . . .** Don't give up!! Wait a little longer!!!

**FEUDS . . .** This apparently is the age that will go down in radio history as the day of the feuds what with the **Bernie Winchell** and **Allen-Benny** bouts of wrist slappings. . . . We feel as if we oughter be in keeping with the times and get us a good, old-fashioned feud under way. . . . All right, bezos, let's go and no hitting below the belt. . . . Oh, yeah, we forgot to mention it—the **referee** will be **The Rolling Reporter.**

## ANNOUNCEMENT

The latest addition to the series "**An Hour A Day With Rider on Alternating Currents in Radio Receivers**" will be off the press about March 31st. It will be found that its contents are basic, explaining fundamental conceptions of alternating currents: the cycle and frequency—peak and effective values—the sine wave—phase relations—complex waves—modulated waves—and a practical summary of where these various alternating currents appear in a receiver. It was felt that it was of the utmost importance to have a comprehensive explanation of what alternating currents really are, so that their actions in relation to the various components of a set will be better understood. And for this reason, the present contents of this book differs from that originally advertised and we feel sure that you will find this change will aid greatly in a thorough understanding of the subject.

This announcement of the contents supersedes others previously made. The price of the volume is 60 cents and the number of pages, approximately, 96.

### Emerson 117

We are advised by the manufacturer that receivers having serial numbers above 761,440 of this model (Chassis C-5) have the following changes incorporated in the circuit:

The compensator on the oscillator coil trimmer strip, which formerly went from the grid condenser to ground, now goes directly across the

broadcast oscillator secondary. This change facilitates alignment.

The compensator on the antenna coil trimmer strip, which formerly went from the grid end of the broadcast antenna secondary to ground, now goes from the grid end of the broadcast antenna secondary directly to the antenna lead. This change introduces capacity coupling and increases the sensitivity at the high-frequency end of the broadcast band.

The schematic of this receiver will be found on page 7-21 of *Rider's Volume VII.*

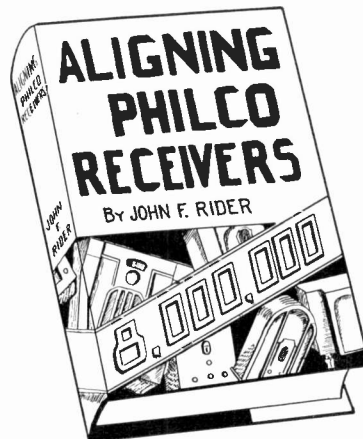
### Parts Show in Chicago June 10-13

The 1937 National Trade Show will be held at the Stevens Hotel in Chicago from June 10th to 13th. It is sponsored by the Radio Manufacturers Association and the Sales Managers Club, which are holding their conventions there at the same time. The Institute of Radio Service Men and the "Representatives" have also scheduled their conventions during this period.

All servicemen are invited, so ring those dates on your calendar. It will be the biggest parts show ever held—135 booths have been sold . . . See you there!

# TO MAKE YOUR JOB EASIER

*That's the purpose of*



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by  
JOHN F. RIDER

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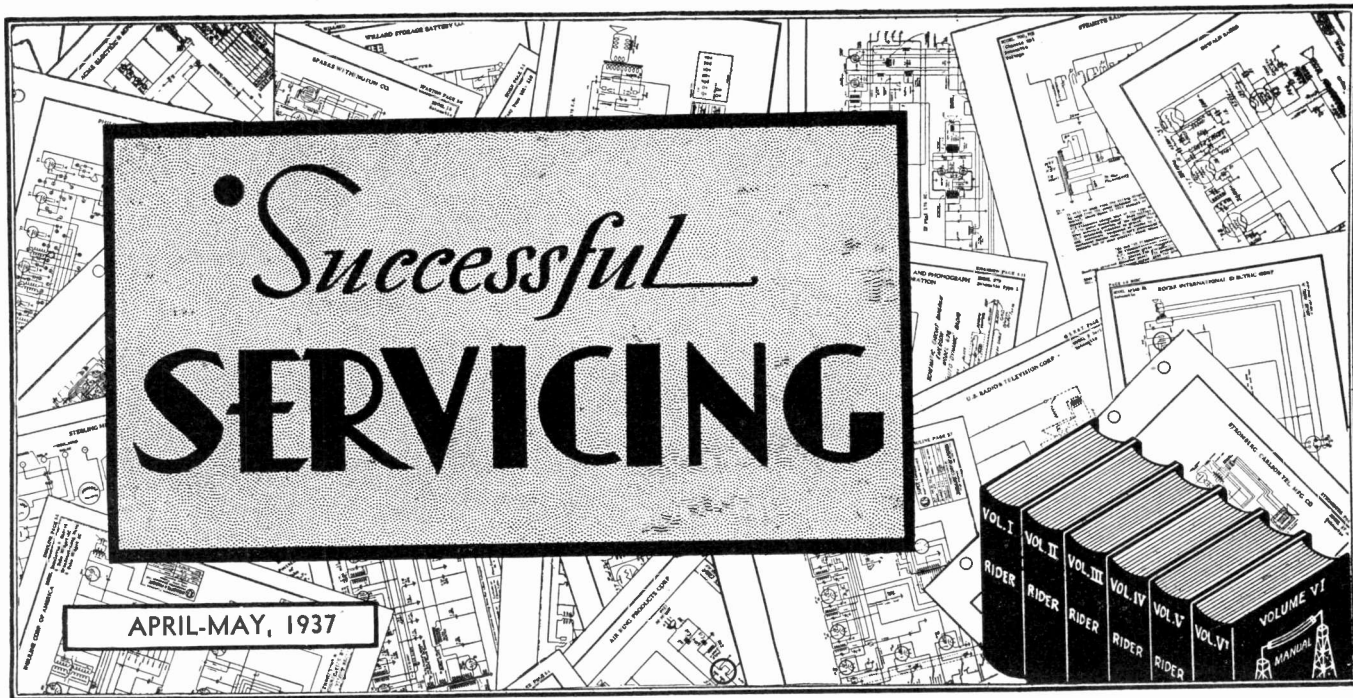
Let Rider tell you where to look for troubles and how to fix them . . . This book has helped thousands of serviceman over tough spots—let it do the same for you.

**288 Pages Profusely Illustrated  
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## RIDER 100% GROUP

A Plan to Use Rider Manuals to Gain Public Confidence

BY JOHN F. RIDER

It has been brought to our attention that a number of servicemen in different parts of the country have been using their Rider's Manuals to prove to their prospective customers that they have available the service data applying to their particular receivers. . . . In other words, they use Rider's Manuals as a powerful sales argument—and it has proved successful, so successful in so many instances, that it was decided to amplify it and give it to the servicing industry as a whole.

It seems needless to inform any of our readers that the seven volumes of Rider's Manuals today comprise the greatest collection of servicing data between covers. Therefore, any serviceman who has these seven Manuals on his shelves has this vast store of technical information at his command. His customers should know that he has at his finger tips all the data released by the American set manufacturers—that he is therefore familiar with the technical and mechanical specifications of the receiver—that there is no uncertainty about the adjustment of the set. . . . Everything that will gain public confidence.

As was said above, this is a powerful sales argument and to assist you in putting it over and so gain more cus-

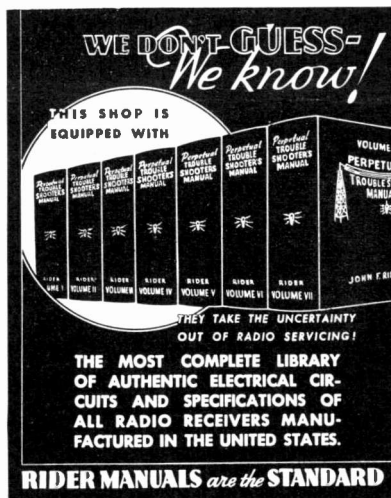
tomers, we have founded the Rider 100% Group. To those men or organizations who are owners of Volumes I to VII of Rider's Manuals, we will issue a certificate (see page 3) stating that the holder is equipped with the seven Manuals. This certificate is suitable for framing and should be placed in a conspicuous position in your shop. Also an attractive counter display—printed in three colors and shown below—will be sent. This

will inform your customers that your shop is equipped with authentic technical data—new and old—issued by the manufacturers of American receivers.

So much for sales occurring in your shop. When you are talking to a customer in his home, the same sales argument can be backed-up with a smaller certificate, which can be carried in your wallet and which has the same wording as the larger one. On the reverse of this pocket-size certificate will be found a list of the manufacturers and trade-names—and they number more than 360—that appear in the seven volumes of Rider's Manuals.

Just how is this sales argument employed? Assume that a prospective customer inquires if you are familiar with the circuit and the mechanical details of his receiver. If you are the possessor of a Rider 100% Group certificate, you can point it out to him on your wall or show him your pocket certificate. If you are in your shop, you can open that particular volume of Rider's Manuals to the data covering his set. That will answer his question better than a half hour's talk on your part. Of course, you must sell the customer as to your ability to ap-

(Please turn to page 3)



This is the design of the 11 x 14 inch counter display which will be printed in red, cream, and blue and which will be sent along with the two Certificates, shown on page 3, to all men qualified for the Rider 100% Group.

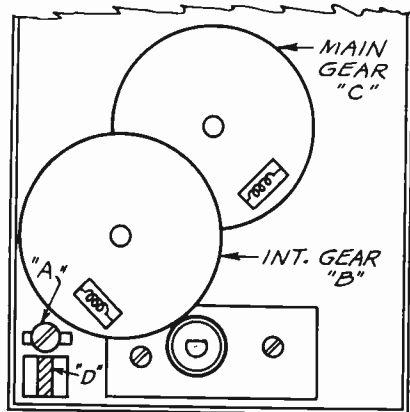
**Stromberg-Carlson 145, 150, 160, 180**

Slipping of the secondary dial is caused usually by the dial gear not meshing with the driving gear. For the correction of this, it is necessary to remove the chassis from the cabinet and to remove the dial escutcheon plate, which is secured to the dial assembly with four self-threading screws. Then remove the large dial disc, which is locked on the shaft by two set screws at the rear of the disc. If the dial disc sticks, insert a 10/32 machine screw in the center; screwing this up will remove the disc without damage.

The secondary dial then slides off the shaft. Note from the accompanying illustration that below the locking screw "A" is a small bar marked "D" seen through a rectangular opening. Loosen "A" and with the point of the screwdriver, pry the bar "D" as far to the left as it will go. During this operation, the little gear on the rear side of gear "B" will disengage from gear "C".

Notice that both gears, "B" and "C", consist of thin sections with small springs inserted through openings in the gears. These springs prevent backlash when the gears are properly engaged.

Rotate the back section of gear "C" counterclockwise for a distance of two teeth and hold in this position while the bar "D" is pinched gently to the right (with a screwdriver point inserted to the left of the bar), so that the small gear on the back of gear "B" engages the teeth of gear "C". The rear section of gear "C" can now be released. Again, with the screwdriver pry the bar "D" very, very slightly to the left, to make the gears work smoothly and freely, and then clamp



Dial gears of the Stromberg-Carlson Models 145, 150, 160, and 180.

screw "A". Rotate the tuning shaft several times through its range to determine if the gears work the same throughout.

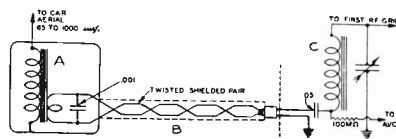
Rotate the back section of gear "B" counterclockwise for a distance of one tooth and hold in place while the secondary scale is put in place, meshing the teeth of its gear with those of gear "B". Release "B" and test smoothness of action by rotating tuning shaft. Replace the main dial and other parts as they were originally.

The servicing data of Model 145 will be found on pages 7-23 to 7-26 in *Rider's Volume VII*. Data on the other models will be published in *Volume VIII*.

**Arvin Phantom Filter**

A circuit for connecting a car radio to the antenna is shown in the accompanying schematic. Essentially the circuit consists of an antenna coupler, the transmission line, and the tuned resonance circuit.

The antenna coupler is designed to resonate at 500 kc. with an antenna capacity of 75 mmf. Higher capacities resonate the circuit to lower fre-



Schematic diagram of the Arvin Phantom Filter for automobile receivers.

quencies with a slight reduction in efficiency, although performance is quite satisfactory with a metal insert top antenna.

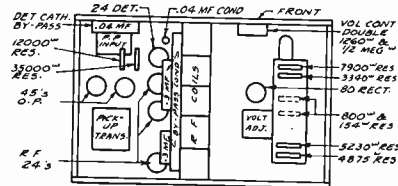
The signal in the antenna is impressed on the primary of coil A, where it is induced in the low-impedance secondary and fed into the matched line B. This is loaded with 1000-mmf. capacity at the input end. Terminating at the antenna coil in the set, the twisted pair is coupled in series with the antenna coil winding and the capacity of the line and loading condenser. This is also the automatic volume control blocking condenser.

**Philco 630**

The schematic of this receiver shown on page 6-31 of *Rider's Volume VI* indicates a field-coil resistance of 1140 ohms. This is incorrect and should be 640 ohms. Please make this change in your *Volume VI*.

**Majestic 230-A Chassis**

The schematic of the Model 233 Combination receiver will be found on the following pages in *Rider's Manuals*: page 1-13 of the revised *Volume I*; page \*386 in the early edition of *Volume I*; and on page 1165 of the *Rider-Combination Manual*.



Chassis layout of the Majestic Model 230-A Chassis.

The voltage readings herewith were taken with the volume control at maximum and a line voltage of 115 on the 115-volt tap.

Tube	Plate	Grid	Cathode	Screen	Plate M.A.
G-24 1st R.F.	180	3	3	90	3
G-24 2nd R.F.	180	3	3	90	3
G-24 3rd R.F.	180	3	3	90	3
G-24 Det.	263	12	12	125	0.5
G-45 O.P.	250	50	—	—	32

The accompanying illustration shows the location of the parts on the bottom of this chassis.

**Philco 655**

In the paragraph titled "Police" of the alignment instructions on page 7-116 of *Rider's Volume VII*, it reads that the detector trimmer No. 11 should be adjusted for maximum output. This should be trimmer No. 12 to conform with the layout of Fig. 4 at the top of the page.

In Fig. 1, the designations of the r-f. transformers on page 7-114 should be changed as follows: 15-A, oscillator, to 16; 9, antenna, to 3; and 14, detector, to 10. To correct the lead designations of the oscillator transformer, No. 16 on the schematic, change No. 3 to 7; 7 to 5; 5 to 4; and 4 to 3.

Another error in the manufacturer's data was in the tube layout shown on the top of page 7-115 of *Rider's Volume VII*. The second detector is a 75, not an 85. The designation on the schematic on this same page is correct. Please make these changes in your *Volume VII*.

Beginning with Run No. 2, the 51,000-ohm resistor, No. 14, was removed and a 32,000-ohm resistor, Part No. 33-332334, 1/2 watt, was connected from the oscillator grid of the 6A7 to the suppressor of the 78 r-f. tube.

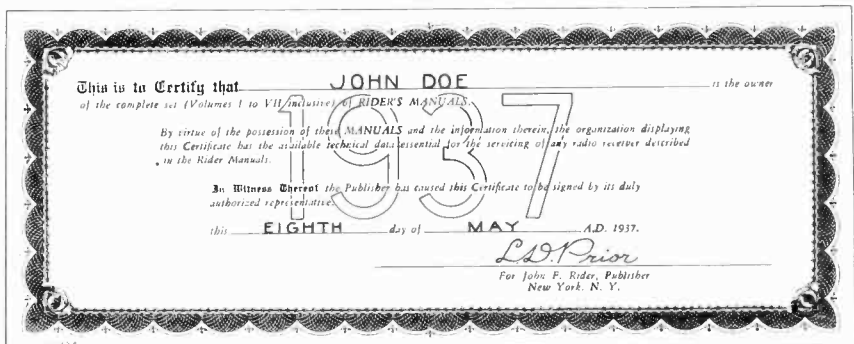


**Rider 100% Group**  
(Continued from page 1)

ply the information contained in the Manuals—that is up to you—but if you are worth your salt as a serviceman, that should not be a difficult task.

Now, how can you obtain these two certificates and the counter display? Remove the TITLE PAGE from each one of your seven Manuals (*certificates will be issued only to those of you who own all seven Rider Manuals*) and send the seven title pages, and the name which you wish to appear on the certificates to this office, addressed as follows: Rider 100% Group, John F. Rider, Publisher, 1440 Broadway, New York, N. Y. **Please PRINT the name and address to which you want everything sent.** Upon receipt of your seven title pages, they will be stamped to show that certificates have been issued for your Manuals, and the seven title pages, together with the two certificates and the counter display, will be returned to you.

Here is a means whereby you can assure your customers that you have all the information needed to repair his receiver. . . . It has been used successfully in many cases by servicemen



The Rider 100% Group Certificate shown at the top of the page is about one half the size of the original, whose border is printed in green. The pocket certificate is shown below and this, too, is about one half the size of the original, which also has a green border. On the reverse of this Pocket Certificate, the names of the manufacturers and trade names appearing in the seven Rider Manuals, are listed.

who had no certificates or counter displays to help them; therefore, it stands to reason that the whole plan should be just that much more effective now that it has the certificates and displays. . . . **Send in the title pages from your seven Rider Manuals at once and start using the Rider 100% Group plan now to increase your customers—and your profits.**

Philco 37-84

Starting with Run. No. 5, the electrolytic condensers, No. 29, have been

changed from 4-8 mf. to 8-8 mf., Part No. 30-2079. Please note this on page 7-27 of *Rider's Volume VII*, where the schematic will be found.

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**RIDER MANUALS**

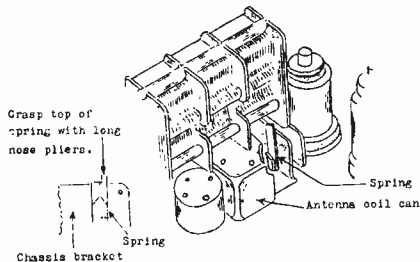
## RCA 690

We have been advised by the manufacturer that no service data on this model were issued, but that it contained a Radiola Model 82 chassis and a Capehart Model 1012-C automatic record changer.

The schematic diagram of the 82 chassis will be found on page 1-45 of the revised Volume I; page \*502 of the early edition; and on page 1929 of the Rider-Combination Manual. Other data will be found on the following pages: 2-92, 2-93, and 2-94 of the revised Volume II; 502-C, 502-D, and front of the early edition; and on pages 1930, 1931, and 1932 of the Rider-Combination Manual.

## Wells-Gardner 6K Series

If noise (not motor or vibrator) is encountered in this model, it may be due to the fact that the antenna transformer shield can is not grounding satisfactorily. The noise brought about by this condition is a popping or scratching, and will be heard only when the chassis is bumped or shaken.



By inserting a spring as shown above in the Wells-Gardner 6K series chassis, a good ground is assured for the antenna transformer shield.

This condition can easily be remedied without removing the chassis from the case by inserting a phosphor-bronze spring between the antenna coil can and the chassis bracket. This spring is inserted with a pair of long-nose pliers and the position after insertion is shown in the illustration.

For other data, see pages 7-20 and 7-21 in Rider's Volume VII.

## Philco 37-33

Starting with Run No. 3, the filament wiring of the 1D5G i-f. tube was reversed, thus improving operation of the set. In Fig. 1 on page 7-16 of Rider's Volume VII, the left-hand filament terminal of this tube is now grounded to the chassis.

Referring to Fig. 3 on the same page, resistor No. 8 has been removed

from the r-f. terminal panel and connected directly from the oscillator grid contact on the 1D7G socket to ground. This change improved the sensitivity in the center of the broadcast band.

## NOTICE

From now until October **SUCCESSFUL SERVICING** will reach you every other month. This is the April-May issue, the next will be the June-July, and the third will be the August-September issue. Then starting in the fall, we will resume monthly publication.—The Editor.

## Majestic 324

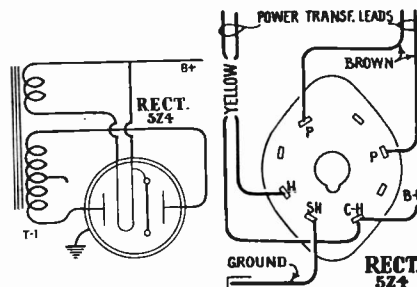
The schematic on page 3-26 of Rider's Volume III and page 1218 of the Rider-Combination Manual, has an error in the value of R-5. This should be 4900, instead of 49,000 ohms. This is part of the multiple wire-wound resistor, Part No. 7855.

## Philco 90, 90A

Please make a note on page 84 of *Aligning Philco Receivers* that the i-f. peak of both chassis used in these models (with two 45s and one 47) is 175 kc. Note 1 on this page should read "175 kc. for both chassis." The correct i-f. peak is indicated on the schematics in Rider's Manuals.

## RCA T6-1 and C6-2

A metal rectifier tube, 5Z4, has been substituted in the chassis used in these models in place of the type 80 shown in the schematic on page 6-83 of Rider's Volume VI. The partial schematic and wiring diagrams in the accompanying illustration, show how the 5Z4 is connected.



These diagrams show the connections for the 5Z4 rectifier in the RCA models T6-1 and C6-2.

The resistor, R3, in the cathode circuit of the 6A8 tube has been changed from 56,000 ohms to 100,000, the new Part No. 3118. The resistor, R4, in the screen grid circuit of the same tube, has been changed from 12,000 ohms to 33,000, the new Part No. 8072. New power transformers have also been substituted, depending on the voltage and frequency of the line; they are: 105-125 volts, 50-60 cycles, Part No. 11848; same voltage for 25-50 cycles, Part No. 11849; for 100 up to 250 volts, 40-60 cycles, Part No. 11850. The following parts are not used in the revised chassis: the .1-mf. condenser, C23; and the resistors, R8, 1200 ohms, and R9, 220,000 ohms.

## RCA D11-2

Several changes have been incorporated in this model, the schematic of which may be found on page 7-137 of Rider's Volume VII.

A 5Z4 metal rectifier tube has been substituted for the 5Z3 formerly used. The phonograph motor has been changed and is now of the capacitor type. The motor is wired in this instrument as follows: One power supply lead connects to one terminal of switch S14, the main toggle switch. The other terminal of S14 connects to one terminal of the brake switch S15. The other terminal of S15 connects to the yellow motor lead. The green motor lead connects to one lead of the motor capacitor, Part No. 12051. The red motor lead connects to the other capacitor lead and also to the remaining power-supply lead. A new suspension spring is also used, Part No. 12050.

The 0.01-mf. condenser, C24, is no longer used. The following parts are added to the revised model D11-2: the motor, 105-125 volts, for 60 and 50 cycles. Part Nos. 9650 and 9651 respectively for the motor formerly employed; filter pack for phonograph that is used in some models, Part No. 12037; and a new reproducer, complete, Part No. 6952.

## RCA R-14

For servicing information on this model, please refer to the data covering Radiola Model 42, which will be found on page 3-19 of Rider's Volume III and on page 1866 in the Rider-Combination Manual.

# Successful SERVICING

Reg. U. S. Pat. Off.

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

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Vol. 3 APRIL-MAY, 1937 No. 8

## BOOKS and STUDY

**D**URING the past few years we have said and written over and over that the serviceman must continue to study—that he must keep up with the times. . . . Such was the theme of our article in the December, 1936, issue of SUCCESSFUL SERVICING and even at the risk of criticism for hammering at this subject, we feel that its repetition is justified.

What is more, we feel that every man who has his own good and that of the industry at heart, will agree with us.

The reason we bring up the matter of study now is that summer is in the offing and no matter whether we like to admit it or not, the servicing business does fall off during the hot weather. . . . That means that you, as a serviceman, will have time on your hands which you can make show a real profit—maybe not today, but surely in the future.

And please don't say "Winter or summer, I never have time for study." . . . To that we answer, "If your work is done on a *business basis* with proper profits, you *will* have time."

As you know, we are continually receiving servicing information from manufacturers all over the country. Because of this we feel that we are in a position to sound a warning: the sets being sold to the public—and they will eventually find their way to your service bench—are more complicated than ever.

Yes, we know that we have said that before and it has been true, has it not? Well, we are saying it again and will continue to do so—the *new sets are more complicated than ever!!!* And because they are just that, *you have to study to know about them.*

Look at this matter of studying from another angle. . . . Suppose that you are in the middle of a job and your soldering iron goes dead or your tester becomes damaged. . . . Do you hesitate for a second to buy another soldering iron or have the tester repaired? Certainly, you don't. . . .

Again—before you bought your analyzer or tube checker, someone told you or you read that having one of these instruments would enable you to diagnose the trouble in a set just so much quicker. . . . You could show a profit on that instrument—make it pay for itself in a reasonable time. You did not hesitate very long to invest forty or fifty dollars for such an aid. Yet how many men hesitate and fight against spending a small fraction of that amount for a book, when its proper use would be just as valuable a tool as either of the instruments mentioned above?

Much as we hate to, we must admit that by and large human nature is mentally lazy. . . . The average man usually reacts to suggestions that he study by replying that he will get going to-

morrow. . . . Certainly—he sees why he should study and he will—tomorrow. . . . *And you know when that tomorrow comes! Never! . . .*

Such men are in a mental rut and it takes plenty of dynamite to blast them out of it. Generally the sad part of it is, when someone does set off the charge, it is too late for them to do anything about it. . . . They're on the outside looking in.

We wish that we knew the formula for the proper blast that will give men who need it just the right amount of jolting to get them out of this mental rut. . . . We have tried to use just one stick of this explosive in the past—perhaps it has been effective in some cases—we hope so, but we are positive that such a small charge is insufficient to goad many men into progressive action. . . . It's sort of like shooting at an elephant with a pea-shooter.

We can anticipate what somebody will say: "All this talk about studying is just to sell more of his books." And to this "somebody" we reply—and we mean every word of this—certainly, if our books are any good, they should be bought and studied. . . . And furthermore, if somebody else's books are good, they should be bought and studied, as well as ours. Books are important factors in every line of work and they must be used as reference whether you use them alone or in conjunction with a correspondence course or with work in a resident technical school.

The whole thing boils down to this: *if you're going to do a successful servicing job, you must study—and continue studying to be abreast of the times.*

JOHN F. RIDER.

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## CHARLIE CHANCE—A Two-time Loser



# CATHODE-RAY TUBES

and

# SINE WAVES

With the arrival of the one-inch and two-inch cathode-ray tubes, instrument manufacturers, catering to the radio service industry, were quick to see the possibilities of less expensive oscillographs. As was said on the jacket of *The Cathode-ray Tube at Work*—"This instrument is destined to become the most universally used testing device in the radio field" and the truth of that statement is more and more evident as time passes.

It is needless to say that receivers are becoming increasingly complicated—you know that, but your customers do not take that into consideration when you give them an estimate. In order for you to make a decent profit on a job, you must get it through your shop in a certain time and to do this, you must know how to use the most up-to-date instruments in locating the trouble. The cathode-ray oscillograph is the instrument today and every serviceman worth his salt must know how it functions and how to use it.

Since the publication of *The Cathode-ray Tube at Work*, we have received literally hundreds of letters commending it and in many, many cases they contained the sentence, "I was convinced that I had to have an oscillograph, after reading your book" or "We bought an oscillograph, but didn't realize its possibilities until we had read your book." . . . Many thousands of servicemen, here and abroad, have read *The Cathode-ray Tube at Work* and have profited accordingly. . . . Here is a golden opportunity for you. . . . Less expensive oscillographs are now obtainable and with one of these and *The Cathode-ray Tube at Work*, you will be able to get more work done in less time.

While referring to the cathode-ray tube, the thought comes naturally about the various patterns seen on the screen . . . a great number of them sine waves and complex waves. If you are going to use the cathode-ray oscillograph intelligently, you should know all about these waves. Waveforms have become such common things to most servicemen that the average man accepts them without really knowing much, if anything, about them . . . and that is a sad state of affairs.

When you read Rider's new book *Automatic Frequency Control Systems*, you are going to find many references

to "phase." . . . When you are reading something on a-f. amplifiers, you are going to find numerous references to "harmonics," "fundamentals," "mirror symmetry" and the like. . . . Perhaps those words and phrases are commonplace with you, but can you honestly say that you understand them? The next time you are at your jobber's, look over the latest addition to the "An Hour a Day with Rider" series, entitled *Alternating Currents in Radio Receivers*. In there, you will find a complete and easily understood explanation of sine waves, complex waves, phase relations, modulated waves—in fact, everything that you should know about alternating-current waveforms.

And speaking of fundamentals and harmonics—an entire chapter has been devoted to that subject in Rider's *Servicing Superheterodynes* . . . it is just that important, for if you are to be thoroughly acquainted with the functioning of every part of a superheterodyne, you must understand the various forms in which alternating currents appear. (Incidentally, the third edition of *Servicing Superheterodynes* is just off the press and contains in the appendix descriptions of the latest developments made in the circuit and a list of i-f. peaks.) It is interesting to note that 95% of the receivers in *Volume*

*VII of Rider's Manuals* were superheterodynes and when you consider that fact, you can see what percentage of superhets will come into your shop. It follows then that you must know all

about this circuit and its variations and the best place to get this information is from Rider's *Servicing Superheterodynes*, in which theory and practice are combined for the greatest ease in understanding.

Two of the phases of servicing touched upon in this book are explained in much greater detail in two books in the "An Hour a Day with Rider" series: *Resonance and Alignment*, and the second, *Automatic Volume Control*. You all know the importance of proper alignment and because of its importance, it should be understood. It is certainly not enough just to go through the mechanical motions—you must know what these motions do and why it is necessary to perform them. And the same thing holds true for a.v.c.—it is common knowledge that here is another development that has come to stay, therefore it is logical that you should know the various systems of automatic volume control that are common; what their functioning is—where to look for trouble—and how to fix that trouble when it is located. In both these books, Rider has explained the subjects so that they can be understood readily and you will find these and all the other books carrying his name as author, to be invaluable in your servicing work.

## Skull Teasers

1. Suppose that the earth were a perfect sphere with a perfectly smooth surface, and that in some way a girdle of steel were bound around the Equator so that it touched every point. Now suppose that six yards were added to the length of the girdle. What then would be the distance between the earth's surface and the girdle, assuming that this distance was the same all around? JUST GUESS AT THIS without doing any calculations, and you'll be surprised at the answer.

2. In a certain small town only one man owned a coffee grinder and, being thrifty, he ground coffee for the rest of the townfolk at a toll of one-tenth of the coffee he ground for them. *How much coffee would you have to*

*take to the grinder in order to receive one pound after the toll had been taken?*

3. A has a peacock which one day flies over the fence into B's garden. The bird lays an egg on B's property which is immediately claimed by him. A says the bird belongs to him, so the egg is rightfully his. . . . To whom does the egg really belong?

4. You can't see it—yet many people pay thousands for it. . . . Everybody owns it, but you can't cash in on it. . . . If it were not around, a lot of people would be unemployed. . . . WHAT IS IT?

6. If it is 11 A.M. Eastern Daylight Saving time, what time will it be a half hour later by Central Standard time?

# Rolling REPORTER



## SPRIG HAS COBE

Yep, it's here all right . . . More pigeons than ever are being fed around the Library . . . the benches in Bryant Park are filled . . . the first robin has been seen . . . Aloysius, the office boy, is readin' *love* magazines instead of detective yarns . . . **but**—the surest sign of all is all the buzzing around by the mfrs. getting ready for the *Chi* show in June and dopping out their 1938 models.

## A.F.C.

That's to be the next one for you Servicers to read . . . The Boss and the Technical Dept. and the Art Dept. and the Editorial Dept. and the Shipping Dept. are just about set to shoot out to you the **how and why and where of A.F.C.** . . . We were working on another one of the Hour a Day series, but so much interest was shown in the lead story of Feb. S.S. that J.F.R. decided to give you A.F.C. before anything else . . . It will sell for \$1.00. Hard Cover *Watch for announcements . . . . .*

## REV. IN SPAIN

The argument now under way in the land of the toreadors, good sherry, and beautiful señoritas (*Editor's note: Spring has come.*) was brought onto our own doorstep the other day when we got a letter from an E.E. in that country . . . We're not going to mention his name, but he is the gent who whispered about good wine that makes you dream. He sent us his thanks for our "little giant radio-paper" (*S.S. to you*) which he has trouble getting through the various battles and he also sent the Boss and us some Spanish stamps for the which we thanks him lots. (*Aside to the Spanish E.E.: Let us know exactly how you want any of our books sent and tell us more about the "compensation basis".*)

## RUMOR

We hear tell that a 2-inch cat-ray tube is among those present . . . . .

## FUTURE DATES

You servicers out in Flint, Mich. were able to listen to J.F.R. on the 20th of April—those in Baltimore were told things on the 23rd . . . On the 23rd, 24th, and 25th of May, Lone Star servicers may hear the Boss talk at Dallas . . . . .

## RANDOMS

In our meanderings we've gathered that servicemen are pretty generally interested in the *business side of their work* . . . If we had a mean disposition, we could say "Yeah—wot did we tell yah—huh?", but, as we said above, Spring has finally arrived and we're in tune with the times and aren't feeling mean . . . . . Soooo we just pass that fact on to you with the hope that more and more of you fellows will realize that **costs are as important as soldering iron** . . . . . We've also heard it around and about that *50c. calls are becoming a thing of the past* . . . More and more fellows are finding out that it is good business to charge a fair price for their work with the result

that *more men than ever are making money* . . . Of course, lots of other fellows just can't think that way and little by little they're losing confidence in the servicing industry and dropping by the wayside . . . . .

## MR. FARLEY'S DEPT.

T. B. Barringer, Birmingham, Ala. . . . Thnx for them kind words about "Aligning Philco Receivers" and the rest of the Boss' books. You say **they're a service-man's best friend when he's in radio trouble**—well, isn't a serviceman generally in that kind of trouble? And so according to you, he ought to turn to J.F.R. *That's just what every one of 'em does!!!!* F. L. Berger, Danzig, Germany . . . . We, too, would like to see schematics standardized—there's a movement afoot now to do this . . . and *we sure agree with you that it would cure a lotta headaches* . . . . L. ("Official Observer") Vangunten, Cleveland, Ohio . . . Yep, the Boss is going to Chi. for the show and he's goin' by TRAIN . . . . Sooooo, you have two "Aligning Philco Receivers", huh, "just in case . . ." Wotta you do—have one on each side of the set you're working on so you don't have to crane your neck???? Okay, big boy, we're playing with the idea of putting out "An Hour a Day with Rider on Antennas" . . . dunno when, but *it's*

*on the way* . . . . Sure, we know where you put your fishing rod . . . . look behind your palm-beach suit in the upstairs closet—*right there in the lefthand corner* . . . . E. Warshal, Gary, Ind. . . . So, the Cat-Ray book *unveiled the mysteries of the oscillograph* for you . . . well, it's not so complicated as it, when you do get the low-down? **Lotsa your bro. servicers have gone oscillographic via the same route** . . . . Al Anderson, Flagstaff, Ariz. . . . Glad to know you agree with us about sensitivity testing . . . . We've beat you to it—*already there's a book in the works covering testing* . . . . It will be along later . . . Chet Aydelotte, East Gary, Ind. . . . Sorry, but we've never heard tell of the Addison set . . . *Any of you fellows tell us where this set is made and the name of the mfr.???????*

## HO-HUMMMM

We won't be seein' you again till the month after next . . . . The Boss decided last summer to give you fellows S.S. in shorter doses during the hot weather and that's okay by us . . . . Our ideal way of spending the summer is to have someone say, "*Who's that parked in that hammock in the shade with a long, cool drink near him?*" and have the answer "That, sir, is

The Rolling Reporter

## More Skull Teasers

5. A man bought an electric clock. He set the hands at five minutes of eleven before he went to bed Sunday night, plugged in the clock's lead, and gave the red hand the spin necessary to start it. When he awoke Monday morning the clock was still running, but the time was 2:45. Finally he saw what had happened and was able to figure out the right time. *What did happen and what was the time?*

7. Two Americans were crossing the Atlantic. They met in the ship's bar and had several drinks. One was the father of the other's son. *What was the relationship of the travellers?*

## ANSWERS

1. Most people would say that an increase in circumference of only six yards in 25,000 miles would add an infinitesimal distance to the diameter. However, the increase is independent of the original length, and six yards would add almost a full yard to the radius of the girdle.
2. One and one-ninth pounds.
3. The egg belongs to neither. . . . Peahens lay eggs, not peacocks.
4. Radio waves.
5. He had spun the red hand the wrong way, so that the clock had run backwards all night. The right time was 7:05.
6. 9:30 A.M.
7. The Americans were man and wife.

## NOTICE

Due to increased production costs, which have mounted greatly during the past four months, we are forced to announce that starting July 1, 1937, the price of Volume II of Rider's Manuals will be advanced to \$7.50.

John F. Rider, Publisher.

## Zenith Chassis 5516, 5634, 5707

The alignment data given below applies to the three chassis, the servicing data for which will be found on the following pages in Rider's Volume VII: Chassis 5516 on page 7-7; chassis 5634, page 7-17, and chassis 5707, page 7-18.

Wave-band Sw. Position	Dial Position	Sig. Gen. Frequency	Sig. Gen. Connection	Trimmer Adjusted	Output Signal
A . . . . .	550 kc.	456 kc.	Cont. grid of 1st Det.	Note 1	Max.
A . . . . .	550 kc.	456 kc.	Antenna	Wavetrap	Min.
B . . . . .	6 mc.	6 mc.	Antenna	Osc. H.F.	Max.
A . . . . .	1400 kc.	1400 kc.	Antenna	Broadcast	Max.
A . . . . .	1400 kc.	1400 kc.	Antenna	Antenna	Max!
C . . . . .	18 mc.	18 mc.	Antenna	Sh.-Wave <sup>2</sup>	Max!
A . . . . .	600 kc.	600 kc.	Antenna	Bdcast. Pad. <sup>2</sup>	Max!
A . . . . .	1400 kc.	1400 kc.	Antenna	Broadcast	Max!
A . . . . .	1400 kc.	1400 kc.	Antenna	Antenna	Max.

Note 1. Follow usual procedure, starting at the trimmer of the secondary of the 2nd i-f. transformer and working to the primary of the first.

Note 2. Make this adjustment while rocking gang condenser about 600 kc.

Do you know how A.F.C. operates?

How does the control tube act as a variable inductance?

Which of the three possible settings of the discriminator secondary trimmer is correct?

Can you align an A.F.C. circuit?

How is Motor-boating overcome in A.F.C. sets?

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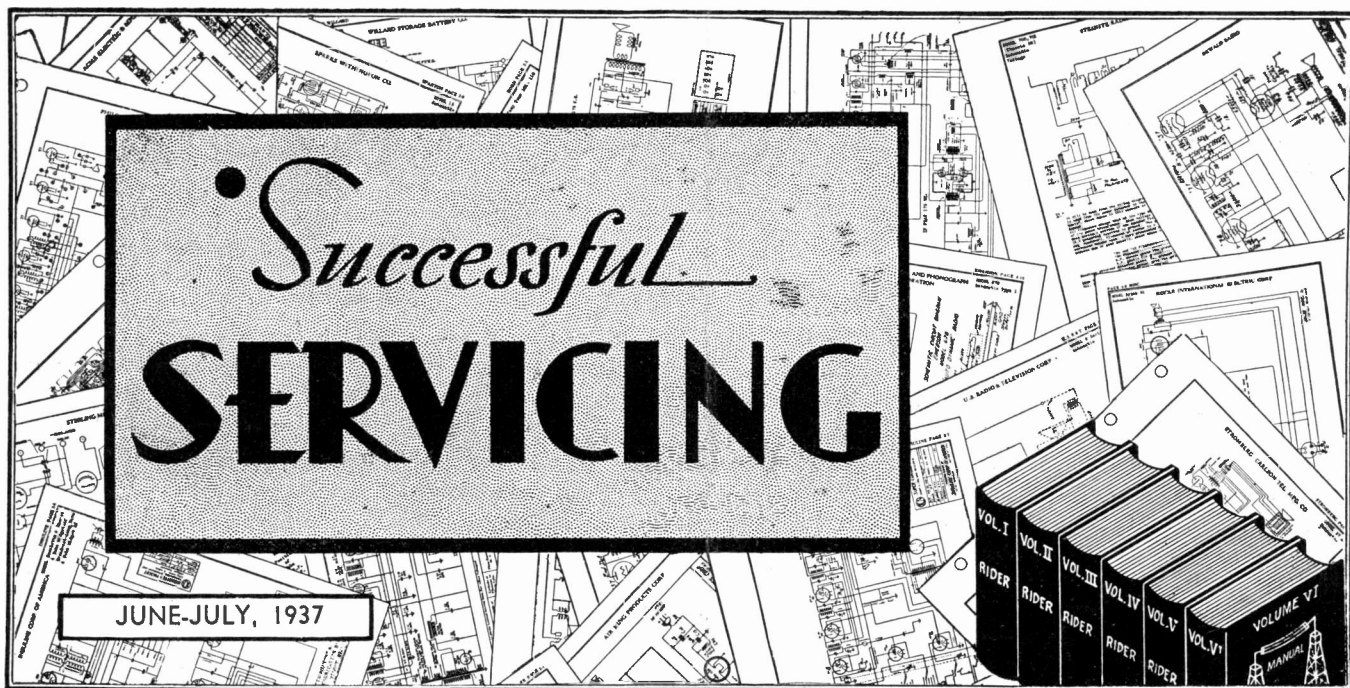
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## AUDIO AMPLIFIER CHECKING WITH THE OSCILLOGRAPH

### How the Cathode-Ray Oscillograph Shows up Imperfections in A-F Amplifiers

BY JOHN F. RIDER

WITH the introduction of the new small screen cathode-ray tubes and the resulting economies which they make possible, an ever increasing number of servicemen are becoming owners of cathode-ray oscillographs. Now, more than ever before, many servicemen are surveying these shiny new instruments with their array of knobs, and wondering just how the new instruments will help them speed up their service work.

To those of you who use the cathode-ray oscillograph for the first time, let us say at the outset that you will probably be disappointed. It is going to take a considerable amount of experience and study before you will be able to save time in service operations through the use of the oscillograph. At the beginning, if you are an average serviceman, you will attempt to do things with the oscillograph that it was never meant to do. You will find the large number of controls confusing; and you will run across all sorts of puzzling effects. But with experience and study, an understanding of just what your instrument is capable of will come, and then you will find yourself amply repaid for all the effort expended.

The peculiar adaptability and usefulness of the cathode-ray oscillograph

over other types of measuring instruments is that it permits the visual observation of waveforms. Whereas the ordinary type of instrument can tell us only the magnitude or the size of a given voltage or current, the oscillograph can tell us not only the magnitude but its waveform. As such it is to be expected that the oscillograph will be especially useful for making measurements which involve waveform considerations, while other instruments will be better adapted for measurements where the waveform is of no special importance.

Beyond a doubt the greatest usefulness of the oscillograph in the service field lies in the ease with which it makes possible the checking of audio amplifiers. We do not mean to imply that the oscillograph cannot be used for making any r-f. measurements, but rather we should like to dispel any impression that measurements, quantitative or otherwise, can be made on r-f. amplifiers in receivers. There are two reasons why the oscillograph, as produced commercially for service use, is not adapted for making r-f. measurements. In the first place, the signal voltages found in the radio and intermediate-frequency amplifiers of receivers are too small to permit a reasonable

deflection of the cathode-ray beam and in the second place, the input capacity of commercial oscillographs is of the order of 50 mmfd., so that the detuning of the circuits caused by placing the oscillograph across the r-f. circuit renders the test meaningless.

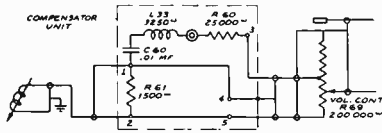
On the other hand, in the case of audio-frequency measurements, the signal levels found in receivers are appreciably higher and furthermore it is possible to use the internal amplifiers included in commercial oscillograph units. The input capacity of the oscillograph for audio-frequency work is, of course, small enough to be entirely negligible. We further stress the application of the oscillograph to a-f. measurements because most r-f. measurements can be made indirectly through their effect on the final a-f. waveform. Thus, for example, if distortion is taking place in the mixer stage of a receiver, then this can be located by noticing that no distortion is present when the signal is applied to the first i-f. stage but that it does appear when the signal is applied to the first detector.

With this article we present a number of interesting oscillograms which explain graphically the operation of audio amplifiers and which should be of

(Please turn to page 7).

### RCA 342

This combination radio-phonograph set is similar to the Model 341 with the exception of the pick-up coupling transformer. Instead of this unit, the



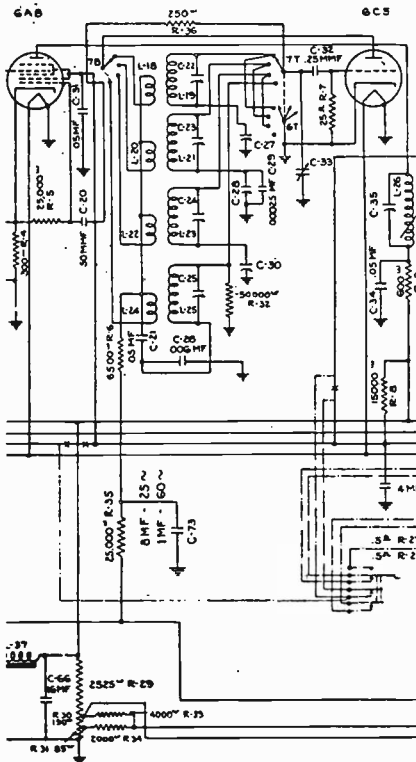
Change in the pick-up circuit of the RCA 342. Compare with Model 341.

apparatus shown in the schematic herewith, has been substituted in the 342. The schematic for Model 341 will be found on page 5-157 in *Rider's Volume V*.

### Stromberg-Carlson 83 and 84

In the early production of these two models, a condition of motorboating was sometimes reported on the 31-meter band. It was found that by making a change in the oscillator circuit the motorboating was completely eliminated.

Compare the partial schematic shown here with the schematic of Model 83



Partial schematic of the Stromberg-Carlson Models 83 and 84 to eliminate motorboating on the 31-meter band.

on page 6-21 of *Rider's Volume VI* and that of Model 84, found on page 7-11 of *Rider's Volume VII*. It will be noticed that a 250-ohm resistor is connected between the movable arm of the

switch 7T and the 50-mmf. condenser, C20. Formerly C20 was connected to the movable arm of switch 7B. Also the 6500-ohm resistor, R6, which formerly went to the high-voltage side, now has a 25,000-ohm resistor, R35, in series. A condenser, C73, has also been included. The value of C73 for 25-cycle operation is 8 mf. and 1 mf. for 60 cycles.

### Wells-Gardner 2DL Series

If a-c. hum is encountered in this model, check the following:

Be sure that the volume control lugs are not grounding on the flat portion of the metal chassis wall which supports the rubber mounting foot.

The bottom plate under the chassis must be under the r-f. end of the chassis and away from the filter choke. If it is in the center or left side (from back of radio) move it to the right side about one-half inch from the mounting bolt holes.

For schematic, see page 7-7 in *Rider's Volume VII*.

### Echophone 139, 139C

Please correct the error in the manufacturer's schematic of this chassis, which is published on page 6-1 of *Rider's Volume VI*. The tone control should be connected at the upper side of the condenser to the plate *only* and not to the screen of the 42 tube and the primary of the output transformer. There should be a jumper shown where the lead from the screen to the transformer passes the tone control connection to the plate of the 42.

### General Electric E-101, E-105, E-106

A change should be made in Fig. 3, which is the socket and trimmer layout on G.E. page 7-32 of *Rider's Volume VII*. In the upper left-hand part of the layout, three electrolytic condensers will be seen, the left one of which is grounded. This one should not be grounded, but the right-hand one should be grounded instead.

Waveband Sw. Position	Dial Position	Dummy Antenna	Sig. Gen. Frequency	Sig. Gen. Connection	Trimmer Adjusted	Output Signal
Sh.-Wave	Plates out	.02 mf.	450 kc.	6D6 I.F.	2nd I.F. <sup>1</sup>	Max.
Sh.-Wave	Plates out	.02 mf.	450 kc.	Cont. Grid		
Sh.-Wave	Plates out	.02 mf.	450 kc.	6D6 Det.-Osc.		
				Cont. Grid	1st I.F. <sup>1</sup>	Max.
Brdst.	Plates out	.00025 mf.	1570 kc.	Antenna	H. F. Osc.	Max.
Brdst.	1400 kc.	.00025 mf.	1400 kc.	Antenna	Antenna <sup>2</sup>	Max.

Note 1. Adjust secondary and primary trimmers.  
Note 2. Do not disturb oscillator trimmer adjustment at this point. There are no adjustments on this receiver for the Police Band.

### Philco 645

The schematic of this set will be found on page 7-109 of *Rider's Volume VII*. Several changes have been made, as follows:

Starting with Run No. 3, the 51,000-ohm resistor, No. 16, has been removed. A 32,000-ohm resistor, 1/2 watt, Part No. 33-332334, has been connected from the oscillator grid of the 6A7 to the suppressor grid of the 78 r-f. tube. The 0.05-mf. condenser, No. 61, has been removed. The 25,000-ohm resistor, No. 60, has been replaced with one having a value of 240,000 ohms, 1/4 watt, Part No. 33-424143.

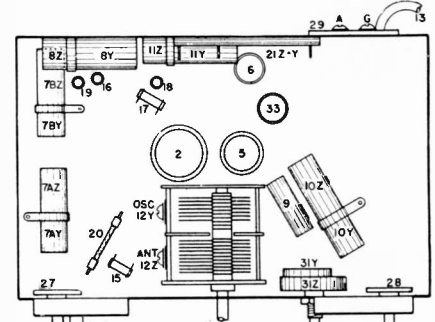
A 0.06-mf. condenser, Part No. 30-4114, has been connected from the —C end of the B.C. resistor, No. 64, to the junction of the 1-megohm and 490,000-ohm resistors, Nos. 66 and 67.

The filament voltage of the 80 rectifier is shown as 6.3 volts in Fig. 3 on page 7-108 of *Rider's Volume VII*. This should be 5.0 volts.

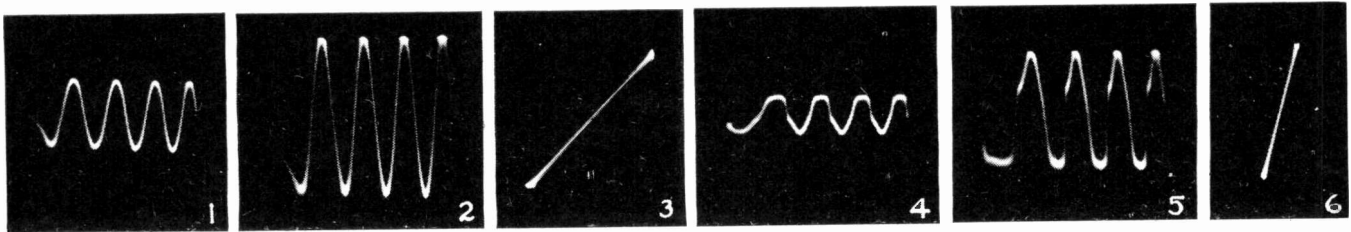
Beginning with Run No. 4, the green and yellow leads of the a-f. input transformer, No. 52, were reversed to reduce hum.

### Crosley 516, 5516, 6516

Below will be found the alignment instructions for the chassis used in the above models, the schematic for which will be found on page 7-58 of *Rider's Volume VII*. Below will also be found the chassis layout, the parts of which can be identified by the corresponding numbers on the list of parts on the same page with the schematic.

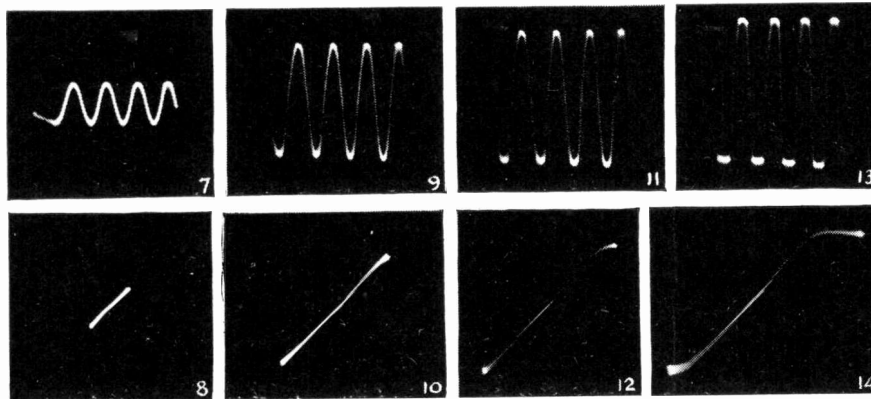


Chassis layout for Crosley 516, 5516, and 6516. Below are the alignment data.

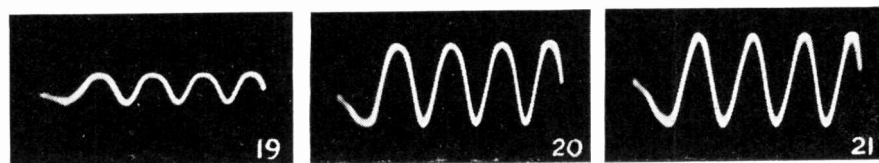


**NORMAL AMPLIFIER OPERATION.** Fig. 1. The input signal obtained by using the linear sweep on the horizontal plates of the oscillograph and connecting the vertical plates to the input of the amplifier stage. Fig. 2. Amplified output of the stage, obtained by connecting the vertical plates to the amplifier output. Note that both these oscillograms have identical waveforms, but different amplitudes. Fig. 3. Amplifier characteristic showing the linear relation between the input and output voltages; this pattern was obtained by connecting the vertical plates to the output and the horizontal plates to the input of the stage.

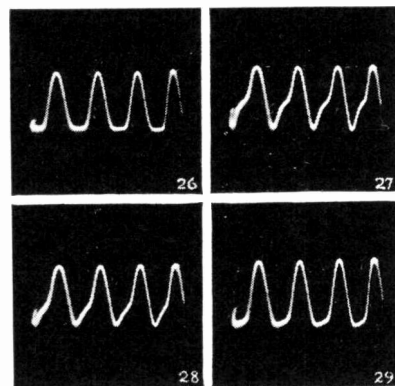
**NORMAL AMPLIFIER OPERATION WITH COMPLEX WAVE INPUT.** Figs. 4, 5, and 6 are similar to Figs. 1, 2, and 3, except that these oscillograms were made with a complex wave input instead of a sine wave. The output oscillogram, Fig. 5, is similar to the input, Fig. 4, except that the positive and negative peaks are reversed. This occurs also in Fig. 2, but does not show as the peaks are alike. This phase reversal is characteristic of a tube, which shifts the phase by about 180°. Fig. 6 shows that the plate voltage changes follow the input voltage changes, as the trace is a straight line. Note that the oscillograph controls for Fig. 6 are adjusted for equal gain of both amplifiers, so that the trace represents the actual grid and plate excursions to the same scale. In Fig. 3 the oscillograph controls were adjusted to obtain a trace inclined at about 45°. This latter adjustment makes it easy to see if the trace is linear.



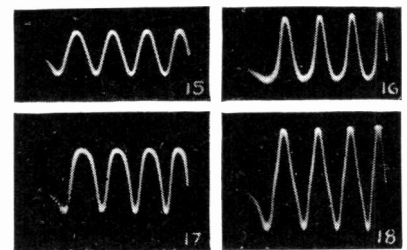
**OVERLOAD OF AN AMPLIFIER.** Figs. 7 to 14 were made by connecting the vertical plates across the amplifier output and using a sine-wave input. For a low value of input signal, Fig. 7 shows the output to be a sine wave and Fig. 8 shows the corresponding characteristic to be linear. As the input signal is increased, Fig. 9 shows an increased output, but with some distortion, since the stage is operating at a high signal level. Note that the upper part of the characteristic, Fig. 10, is slightly curved. A further increase in signal input does not produce an appreciable increase in output, Fig. 11, but it does introduce distortion, shown by the flattening of the peaks. The characteristic, Fig. 12, shows a greater flattening of the peaks. A still greater input increases the distortion, as shown in Figs. 13 and 14.



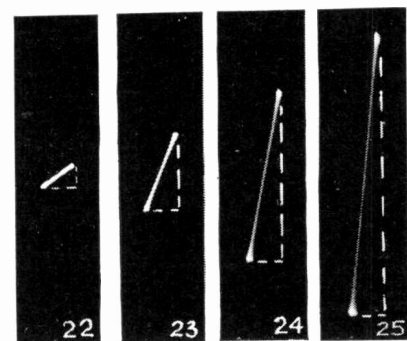
**DISTORTION DUE TO LOAD MISMATCH.** When a tube is improperly matched to its load, distortion is generally produced. Fig. 19 shows the distorted output caused by too small a value of load impedance, while Figs. 20 and 21 show how the distortion is reduced for increasing values of load impedance. A power loss also occurs when the amplifier is incorrectly matched to its load.



**PHASE DISTORTION.** The signal through an a-f. amplifier is a complex wave and contains many different frequencies. If too small a value of coupling capacity is used in a resistance-coupled stage, the relative phases of these frequencies will be altered, so that the output will not be the same as the input. Fig. 26 shows the input signal and Fig. 27, how the waveform is changed when a small coupling condenser is used. As the coupling capacity is increased, Figs. 28 and 29, the output waveform becomes more nearly the same as the input, Fig. 26. More important than the phase distortion, which normally is undetectable by the ear, is the frequency distortion, which takes place under the above conditions.



**PUSH-PULL AMPLIFICATION.** Fig. 15 is the sine-wave input to the push-pull stage. When only one tube is excited, the output, Fig. 16, shows the distortion, due to the curvature of the tube characteristic. When the other tube is excited, the output shows the same type of distortion, Fig. 17, with the phase reversed. With both tubes excited, the flat peak produced by one tube combines with the sharp peak produced by the other, so the overall output is symmetrical, Fig. 18, and can have no even harmonics.



**ESTIMATION OF GAIN.** The input-output voltage characteristic can be used to indicate the approximate gain of a stage. Figs. 22 to 25 show this characteristic for a stage of variable gain, the input signal (horizontal deflection) being constant for all traces. The gain equals the ratio of the vertical and horizontal projections, drawn dotted on the oscillograms in white ink. Note that the gain increases as the vertical height increases. Both oscillograph amplifiers must be adjusted for equal gain to obtain accurate results.

(Please turn to page 7)

### Stewart-Warner R-149 Chassis

If hum is encountered in any of the models using this chassis, and if it is not caused by defective tubes or parts, it can be reduced to a satisfactory level by means of the changes described below. (For servicing data see pages 7-19 to 7-22 in *Rider's Volume VII*.)

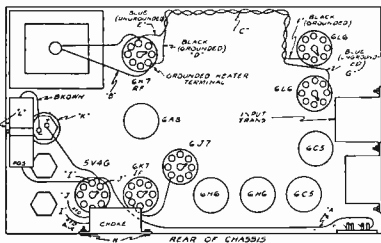
#### Modulation Hum:

To reduce this type of hum—on stations only—connect the 6J7 screen grid to the 6K7 i-f. screen grid. Remove the 0.01-mf. condenser and the 110,000-ohm resistor connected to the i-f. screen grid. Add a 0.01-mf., 1500 volt, line buffer condenser from the chassis to the side of the power transformer primary not already connected to the original line buffer.

#### Residual Hum:

To reduce this between-station hum, the following changes are suggested:

Locate the red-blue wire running from the 5V4G socket heater terminal to the speaker socket. Disconnect one end of the wire and re-route it along the rear of the chassis so that it is at least two inches above the 6H6 and 6C5 sockets when the chassis is upside down. See (A) in accompanying illustration. Reconnect the wire.



Chassis layout showing wiring changes for Stewart-Warner R-149 chassis.

Locate the long blue wire running from the power transformer to the front 6L6 socket. Cut this wire so that the part from the transformer is about 7 inches long and connect it to the grounded heater terminal of the 6K7 r-f. socket. See (B) in illustration. Remove the rest of this wire which went to the 6L6 socket. The blue and black special twisted pair—see (C) in illustration—should be placed along the front of the chassis so it can be used to connect the heater terminals of the 6K7 r-f. and 6L6 sockets. First connect the black wire to the grounded heater terminal—see (D)—and the blue wire to the hot heater terminal of the 6K7 r-f. socket

—see (E). The other end of the black wire must be connected to the grounded heater terminal of the 6L6 nearest to the front of the chassis—see (F)—and the other end of the blue wire must be connected to the hot heater terminal of the other 6L6 socket, which is the one nearest the 6C5—see (G).

Remove the mounting screw nearest the front of the set holding the input a-f. transformer. Rotate the transformer around its other mounting screw so that the free end can be fastened by one of the output transformer's mounting screws. Pull the transformer leads away from the tube sockets.

Tighten down the power transformer's mounting bolts, preferably when the set is hot.

Check the set for residual hum and if there is still too much, install a filter choke and condenser as explained below:

Drill two holes in the rear of the chassis, 2.25 inches apart, see (H), for mounting the filter choke, Part No. 110058, in the position shown in the illustration.

Connect the red-blue choke lead to the unused terminal of the 5V4G socket marked (I) in the illustration. The long red-blue lead, marked (A) in the illustration, from the speaker socket should be unsoldered from the 5V4G heater terminal and connected to the terminal (I) to which you have already soldered the red-blue choke lead. Then connect the red choke lead to the 5V4G heater terminal, which is marked (J) and which is connected to the input electrolytic condenser, (K), by a red-blue wire.

Drill a hole at (L), which is 5.25 inches from the front of the chassis and  $\frac{3}{8}$  inch from the bottom, and mount the 8-mf., 450-volt electrolytic condenser, Part No. 110057, as shown, so that the brown lead is towards the front of the chassis. Connect this brown lead to the negative terminal of the input electrolytic condenser, (K). Connect the red-white condenser lead to the "dead" 5V4G socket terminal to which the red-blue choke and speaker leads were connected.

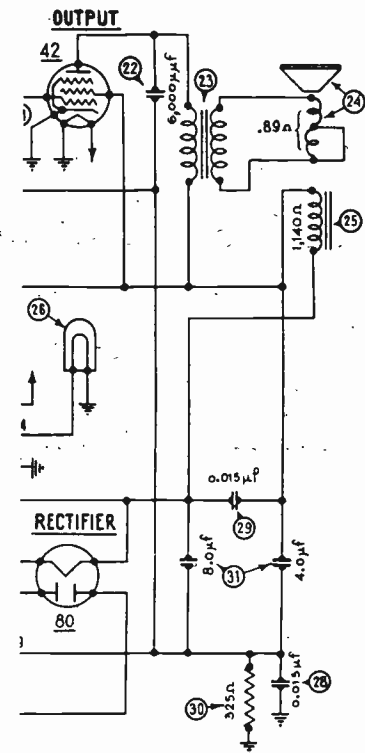
If excessive hum persists after the above changes, it is most likely due to defective tubes. Check first the 6L6 tubes, by noting if they heat up equally. Unbalanced rectifier tubes can also be the reason for hum.

### Motorola Golden Voice

The designation of "AVC" applied to the 6H6 second detector tube in the schematic on page 7-1 in *Rider's Volume VII*, is incorrect and should be on the preceding tube, the 6R7, where the AVC voltage is developed. Please make this change on your schematic.

### Philco 59

The schematic, furnished by the manufacturer and shown on page 5-30 of *Rider's Volume V*, has an error in the field coil circuit, Part No. 25. Compare



Partial schematic of Philco 59, showing correct wiring of the field coil, Part No. 25.

the partial schematic shown here with the one mentioned above and you will see the difference in the connections to the field coil.

### RCA Automatic Record Changer

Data and notes on the automatic record changer will be found incorporated in the service data of model RE-73. These notes will be found on the following pages in *Rider's Volume II: revised edition, pages 2-79 to 2-83 inclusive; early edition, pages 504-Q to 504-U inclusive; and in the Rider Combination Manual, pages 1897 to 1901 inclusive.*

Please make a note in your Index where these data may be found.

# Successful SERVICING

Reg. U. S. Pat. Off.

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

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Vol. 3 JUNE-JULY, 1937 No. 9

## FORECASTING— PAST AND PRESENT

THE other day we had occasion to refer to an early issue of SUCCESSFUL SERVICING and our attention was caught by the words "Resistance Measurement" at the head of a short article. Apparently we had received several letters asking if we had "dropped the idea of servicing sets by means of point-to-point testing and we had replied that nothing was further from our thoughts . . . that on the contrary we still considered it to be one of the best methods of trouble shooting. And incidentally that is still our opinion.

Those two words "Resistance Measurement" set us thinking about that and some of the other points we had advocated in the past. We took down our file of early "Service" magazines—when we were still steering its editorial policies—and started going through. We came to the April, 1932 issue and there was a prediction which read in part ". . . resistance measurement will constitute a major consideration in future servicing operations." Well? Has that come to pass? Just a glance through your servicing data and see how many manufacturers have incorporated point-to-point testing as part of their service notes. You will be surprised at the comparatively large number.

In commenting on noise elimination in the July, 1932 issue of "Service," it was stated editorially ". . . we just cannot erase from our mind the possibility of one or more manufacturers embarking upon the production of such units (transmission lines) to be connected between the aerial and the

receiver for the avowed purpose of minimizing or eliminating noise type of interference." And then further in the same article ". . . It is not a far-fetched idea to picture the radio serviceman in the field selling millions of such units."

There, again, we seem to have scored a bulls-eye. Certainly it is a well-known fact today that some type of transmission line is necessary between the antenna and set—especially if it is an all-wave job. We venture to say that approximately fifty per cent. of the new antennas installed today are of the doublet type. And who does the installing?

Just four years ago this month we looked into the future again with these words "It is not a far-fetched thought to imagine cathode-ray tubes being sold from \$5.00 to perhaps \$10.00 and instrument manufacturers producing oscillators for use with oscillographs." Again, "Equipment the same or similar to the oscillograph may in the end tend to simplify servicing procedure." Well, you know what the current prices of cathode-ray tubes are today and it is needless for us to reiterate the manifold uses of the oscillograph in servicing work today.

We believe that you will concede that the above examples entitle us to do another bit of forecasting. . . .

In the past two or three months we have heard something from laboratories and manufacturers that has given us food for thought: the multi-band receiver of the future is going to be a highly mechanized instrument. The trend in this direction has been going on for the last couple of years with more complicated dials and driving mechanisms, wave-band switching arrangements, remote controls, etc. Now we hear about sets with push-button controls, motor driven condensers, complicated systems of gears and cams in band switches and so on . . . all of which are going to be in some of the sets coming out this autumn and bear in mind—this is only the beginning.

How does all this affect you as a serviceman? In this way . . .

Not only will you have to be thoroughly conversant with all the new circuits and the variations of old ones, but you will have to know mechanics as well as radio. It is not difficult to imagine a set coming to a service shop which will not function properly because of some mechanical imperfection—perhaps a small screw missing from the dial or switching mechanism. Here

it will be a case where the electrical performance of the receiver would be normal if the mechanical end of the job were in shape. And it will be up to the serviceman to ferret out and repair the mechanical trouble.

So not only is the servicing industry confronted with more complicated electrical structures, but in addition, it will be necessary to know literally how the wheels go around.

JOHN F. RIDER.

### SKULL TEASERS

1. What is wrong with this statement? *A polar bear killed a penguin.*
2. A certain town in the state of Ohio passed a law that they would not bury any person living in the state of Illinois. Why?
3. Recently a salesman on the road got short of cash and wired this message to the home office:

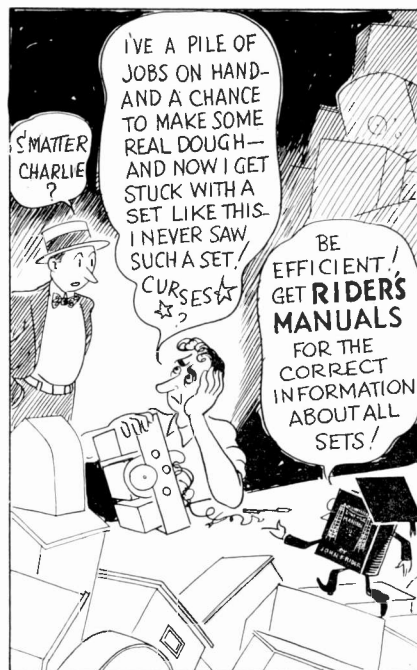
SE. ND  
MO. RE

MON. EY

- Substitute figures for the letters and find out how much the man needed. It has to add up.
4. A man bought a radio set which cost him \$30.00 more than one-fourth of its price. *How much did he pay for it?*
  5. Place a penny on the inside tip of each finger of your right hand. Try to work them all in one pile onto the tip of your first finger. *Don't use your thumb nor your left hand.*
  6. Say this slowly to someone and unless he has an excellent memory, he will be unable to repeat it in three trials:  
"Good evening, Madam," to Eve said Adam,  
"Good evening, Sir," to Adam, said her.
  7. A married couple named their baby "Electricity" after their own first names. What were their names?

Answers on page 7.

## CHARLIE CHANCE— In Trouble Again



## AND NOW—VOLUME VIII

Along about this time of the year, when most fellows are figuring out where they are going on their vacation and how long they can afford to stay there, we are faced with another kind of problem: how is the best way to present the servicing data we have in our files in Volume VIII of Rider's Manuals.

And you can take our word for it, there's a problem that *is* a problem!

In all the years that we have been publishing Manuals never have we seen such a mass of servicing material released by set manufacturers. We have had advance word that this manufacturer is going to release sixteen new chassis—that the other is going to have twenty-nine new models and a third—fifty-three! Of course, the average

number of new sets put out by all the manufacturers is away under these figures, but that average is sufficiently large to give us something to think about . . . especially, when you consider that *data on the products of more than one hundred manufacturers are published in every volume of Rider's Manuals.*

Fortunately for all concerned, the engineering and service departments of the receiver manufacturers have been striving to make the servicing information on each chassis as complete as possible—with everything superfluous eliminated. For example, more and more manufacturers have adopted the tabular form of alignment instructions, such as was employed in Rider's "*Aligning Philco Receivers,*" and what

formerly needed perhaps two or three pages in the Manual, is now condensed into a fraction of a page—and that without losing any of its value or readability—in fact, just the contrary is true!

One of the most important features of Rider's Manuals is the inclusion of the changes made in their receivers during production runs by the manufacturers. In Volume VII these changes were placed at the rear of the Manual in a special section of 16 pages. These changes were included in the regular Index under the listing of whatever model or chassis they applied to. Naturally more and more changes are coming through from the manufacturers as the number of their chassis increases, so in *Volume VIII you will find more changes than ever.*

In addition to all this, **three new features of great importance will be incorporated in Rider's Volume VIII.** . . . You will be told later on what these will be, but we feel positive that you will find them to be of the utmost value in your servicing work. . . . We are constantly striving to make the *perfect* service Manual—each year we approach a little nearer to our goal and again we feel sure that you will agree that **Rider's Volume VIII has gone another stride forward.**

## VIBRATOR SERVICING

What do you know about vibrators?

This subject is one that is assuming more and more importance in the radio servicing field, as vibrators are now being employed in increasing numbers in different types of installations. Exclusive of the auto radio receivers wherein the vibrator type power supply is the commonplace system, they are used in farm receivers powered from 32-volt circuits—mobile public-address systems—coin-operated phonographs and radio receivers and myriad amusement devices.

The maintenance of some of these devices is already in the province of the radio serviceman and there is very little doubt that in the future all of these systems will come under his hand. Because of the ramifications of vibrator power supply systems, we are certain that you will be pleased to learn that within 60 days *we shall publish what is the first book ever written about the design, theory and maintenance of vibrators and vibrator power supply circuits.*

Very little other than strictly engineering material has ever appeared in radio periodicals concerning such vibrator units. Consequently, the servicing fraternity has a tremendous need for practical every-day information relating to this subject. *That is why we say that you will find this book of inestimable value.* While it is no doubt true

that the average serviceman is familiar with the structure of the vibrator, the servicing has been a mysterious problem.

**This book about vibrator power supply systems opens this field by giving the servicing industry all the information it needs.** Not only is this book the first of its kind, but it is written by a man who is foremost in the vibrator field—a man who designed the first practical and commercial vibrator power supply for radio receivers and who, since the inception of such power supply units, has been responsible for the manufacture of hundreds of thousands of vibrators used in all branches of radio and allied industries.

If anyone should be able to tell the serviceman all that is to be known about vibrators, particularly in connection with servicing, it is the author of this book, and there is no doubt in our mind that the serviceman who reads this book thoroughly will find himself in a position to service vibrator-type power supply devices with the greatest ease and economy.

Watch for the announcements about the publication date of this latest addition to the service books published by Rider. **Take our word for it, you will find it invaluable in working with any set which has the vibrator-type power supply.**

### 100% ERS, NOTICE

In the event you have all seven Rider Manuals, but do not have the title page for each, send in those title pages that you do have together with a letter stating that you are the owner of the volume or volumes for which you have no title pages. This letter must be affirmed or sworn to before a duly authorized official, such as a notary public.

In the case of men who are the owners of the Rider Combination Manual, that was distributed through RCA or Cunningham, send in the title page of that for credit on Volumes I, II, and III. Those of you who obtained your Rider Manuals on tube deals, are entitled to the Rider 100% Group Certificate if you are the owner of Volumes I to VII.

Please be sure to specify what name you wish to appear on your certificate and *please print this name.*

John F. Rider, Publisher.

# Rolling REPORTER



## HEY, YOU 100%ers

Don't worry, we're shooting out the certificates to you just as fast as we can . . . and are we busy doing that??? **YOWSA!!!** The stacks of title pages were soooooo high that we lost track of the red-head for two days and had to send Aloysius W. on a rescue expedition. When he didn't return, then we were worried and decided to do the job ourselves. So we whistled to our faithful newshound (he's the one NOT riding the chariot above), mounted the vehicle, and sped to the far-away parts of the office. . . . After a lo-o-o-ong time, far off in the distance we heard a faint tapping. We traced this and eventually found the titian-haired one, stamping certificates. She hadda sorta dazed look in her eyes and was completely hidden by the piles of title pages and certificates. . . . *And hadn't eaten since Tuesday*—thinka that!!! **BUT**—Aloysius is still missing!! *Has anyone seen our head office-boy???*

## BEEF-HEAD GATHERING RANDOMS

A swell turn-out for the Dallas convention . . . servicers from Okla.—Ark.—La.—and from ALL OVER Texas . . . those fellows down there think nothing of climbing in their buggies and doing 400—500—or even 600 miles in a day (guess them western men IS men and cantakit!) . . . without counting the Boss, the furthest registration was Miami, Fla. . . . between 400 and 500 cocked an ear while the Boss expounded . . . T. P. Robinson elected Pres. of N.R.S.M.A. . . . *Congrats again, Robbie* . . . 1938 convention—same town . . . H. Gable, the *Dallas Society Pet*, is a master at the capering cubes . . . Wilkinson & Campion gave J.F.R. a gol-luf lesson—seems the Texas ground is too hard so the Boss couldn't take a divot . . . Prizes drawn for after the banquet were BOUGHT and PAID FOR by the assoc. **Hi!**

## FROM THERE—AND HERE

P. R. Mallory & Co. have bought the assets, good will, trade-marks, patents, and patent rights of *Electrad, Inc.* of New York—the plant and offices will be moved out to Indianapolis. . . . *Arcturus Tube* engineers have been selected by the *Chinese National Government* to be the official technical advisors to assist the Republic in its radio tube manufacturing program. . . .

## A VOICE FROM BEYOND?????

Joe X. Doaks, a servicer in a town not 1000 miles from N. Y., recently had a phone call to come and get a set at an address that was quite a jaunt from his shop on the outskirts of the town. There weren't no sich address a-tall, but there was a nice, well-kept cemetery where the address should have oughter been. . . . Couple of days later—another call—this time on t'other side of town—and *another cemetery!!!* This kept up quite awhile, until it was brought to Joe's attention that mebbe there wouldn't be so many phoney phone calls if he'd lay off the price cutting and act more like a regular business-man. *Well, there's more'n one way to kill a cat—*

## CHI. TRADE SHOW

From the 4 corners—and points between—came parts mfrsrs, their reps and parts jobbers

. . . *wotta mob and wotta swell show!!!* 'Twas the BIGGEST AND BEST one yet (let's hope the N. Y. show in the Fall will be as successful) . . . Everyone serious and lotsa business done—*between drinks*. . . . Exhibits were best we've seen in many a moon. . . . Campion presented the Boss with another gol-luf lesson, but some day, somewhere J.F.R. vows and declares he's goin' to give Bob such a whale of a lesson in the ancient and honorable game he'll never, never have the heart to look a divot in the face again. . . .

## VIA GRAPEVINE

Ever on the alert to slip you all the latest info, we have it from a very, VERY reliable source that pretty soon you'll be able to get the low-down on vibrator power supplies from a book written by the foremost vibrator engineer in the country. (*Whisper—and don't tell where you heard it, but the Boss is goin' to publish it—shhhhhh!*)

## MINNEAPOLIS

June 20—21—22. . . They're the dates of the N.W.R.S.M.A. show—J.F.R. is going to be guest of honor at the banquet Monday nite—Sure, he's goin' to talk and so's Walter (*Sylvania*) Jones—Bill (*Electronic*) Garstang—Chas. (*RCA*) Herbst—and a flocka others—**Be seein' yah there!!!!**

## OUTA DE BAG

Edw. N. Philbrick, Milwaukee, Wisc.—Thanx for all the orchids you sling our way. . . . Don't worry—a book on A.F.C. is in the works and will be out your way *very soon*. . . . We've changed your address on the S.S. file and we'll tell ye Ed. about the articles you want. . . . *We aims i' please*. . . . Jim (*Pussional Service Puhsonified*) Kearns, Brklyn.—Yep, you rate a 1000% Cert. but you'll have to be satisfied with just two zeros. . . . Sorry about Vol. 1, No. 1 of S.S., but 'taint no use—they

*just aint!* Andrew Rostas, Clarion, Pa.—We've been telling servicers for years just wot you said—that if every one had all the Manuals there wouldn't be so many headaches trying to fix up the other guy's boners. . . . Don't worry, Andy, the first 100 yrs. are the worst. . . . Earl A. Brayman, Philly—Those circulars of yours are good—as good as your business policy. . . . 'T would be a lot better for all concerned if everyone at least *tried* to give a square deal . . . results *do* speak for themselves, don't they? Thomas C. Ealy, Dickson, Tenn.—Boy, you ought to clean up pul-enty if you're the only servicer in your neck of the woods that's a 100%er . . . *Go to it!!!!* H. M. (*Cappy*) Ricks, Cleveland, Ohio—Thanx for the brain throbs. . . . Can't say we'll use 'em all, but they'll get considered. . . . Ideas are always welcome—even if those sent in are not used, they might lead to something even better. . . . W. B. Davis, Weston, W. Va.—We take a bow and thanks you lots for saying that you owe 50% of your success to Rider Manuals. . . . *Their's happy words to our ears, mister*. . . . Paul V. (*Auf Wieder*) Zeyn, West Milton, Pa.—Yesir, already several orders for Vol. VIII are here—the *old early bird stuff*. . . . Thanx for the nice little piece you spoke about *The Hour A Day* series—glad you like 'em!!! L. Vangunten, Cleveland—Wot kinda drink is a UHF??? We ain't never heard tell of that one!

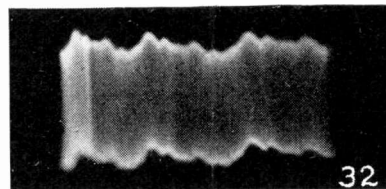
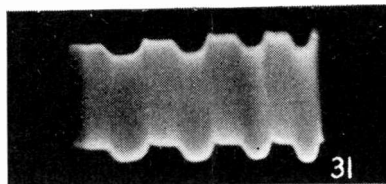
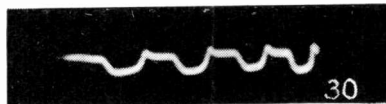
## FLASH!!!!

Just before going to press, the chief of our army of sleuths reports no further trace of Aloysius W. Three Pall Mall cigarette butts were found in the far reaches of the office and they were the only clues. . . . *So-o-o-o-o-ooooo*, if anybody sees a tow-headed brat dressed in a green shirt and a purple tie and smoking Pall Malls, kindly bop him, hog-tie him, and send him parcel-post to the Russian air base at the North Pole and NOT to

The Rolling Reporter

## AUDIO AMPLIFIER CHECKING

Continued from page 1



**HUM AND NOISE.** It is sometimes difficult to obtain a stationary pattern because of the presence of hum voltage. The waveform of the hum voltage which may be present is shown in Fig. 30 and the same voltage superimposed on an a-f. signal may be seen in Fig. 31. Note that the pattern appears solid because the sweep is synchronized at a multiple of the hum frequency instead of the audio frequency to permit a stationary pattern. When the receiver output contains noise, the pattern will appear fuzzy, as shown in Fig. 32.

value in that they illustrate both normal and abnormal conditions of operation. See page 3. To avoid the necessity for constantly referring to the text, we have included a description of each oscillogram in the accompanying caption. While the oscillograms shown by no means constitute a complete treatment of all the phases of audio-amplifier tests with the oscillograph, the more important cases are treated. Circuit connections and complete information for all of these tests will be found in "The Cathode-Ray Tube at Work," by John F. Rider.

## ANSWERS TO SKULL TEASERS

1. The only place this could happen is in a Zoo, because the polar bear lives in the Arctic region and the penguin in the Antarctic.
2. Because the person would have to be dead.
3. The salesman needed \$106.52. Letters and figures:  
9 5 6 7 1 0 8 2  
s e n d m o r y
4. \$40.00.
7. Dinah—Moc

# IT'S COMING!

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of

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## AERIALS AND REPUTATION

### A Non-Technical Discussion on the Purchase of Aerial Kits

BY JOHN F. RIDER

**T**HERE is no doubt that the aerial is one of the very important parts of a radio installation. We say this despite the fact that such excellent reception is often experienced with exceedingly poor antenna systems. However, the criterion is not what takes place in a few instances, but rather the experiences of the majority, and this means that no matter how well designed the receiver may be, it nevertheless requires a good antenna system.

This is particularly true with respect to noise elimination. What with the tremendously increased sensitivity of receivers and the greatly increased number of electrical devices used inside and outside the home, which devices are sources of electrical disturbance, it becomes necessary to institute all possible measures to provide the greatest freedom from such noises. . . . The antenna system plays a very important rôle in this connection.

Now all of this is not new to the men who read these pages. . . . Much has been written about antenna systems, but in practically every case, a great deal of space was devoted to the technical considerations associated with antenna systems. We intend depart-

ing from that routine and it is our aim to present the subject of antennae from the practical angle.

What antenna kit to buy? . . . that is a common-place question. . . . As a rule, the antenna is intended for use with a certain receiver. Then it becomes necessary to locate, if such is possible, an antenna kit most suitable for use with the receiver. . . . In this connection we can appreciate that every antenna will operate with every receiver, but—and the *but* is strong—very few people can deny that some systems perform better with certain receivers than others.

Under the circumstances, let's be logical. . . . Some receiver manufacturers have recommended certain antenna systems for their receivers. . . . Is it conceivable, bearing in mind that the receiver manufacturer wishes his receiver to perform to best advantage, that such a manufacturer will suggest an antenna system which is not best for his receiver? Very unlikely. . . . Accordingly, it is a safe bet, without making a study of the technical considerations, to employ the antenna kit suggested by the receiver manufacturer.

You may say that the receiver manufacturer who also makes antenna kits

and who suggests these kits for his receiver, has a personal axe to grind. . . . That may be so since he makes the kit, but somehow or other we cannot overlook one important consideration: the manufacturer who makes an antenna kit is in a position to develop that most ideally suited to his receiver. Whether or not such actually is the case is beyond the point at present. . . . The fact remains that he is in a position to do so and it is only natural, if the belief is expressed, that he does so.

As to the technical considerations, do not for one moment believe that we belittle this factor. . . . It is an excellent means of making comparisons, so as to arrive at a decision, providing that the technical specifications are available and can be interpreted. . . . Bearing in mind that the modern antenna may be required to perform upon possibly five wavebands, a great deal must be considered from the technical angle. . . . If we analyze the antenna-kit field today, we find a large number of kits—all of which are classified as being good—all of which will work—although all are not of like design, construction, or price. . . . Can they be equally good? . . . How can the ser-

(Please turn to page 3)

**Bosch 640**

The final schematic is the same as the preliminary, which will be found on page 7-31 of *Rider's Volume VII*, with the following exceptions:

Diagram No.	Old Value	New Value	Part No.
10	.0001 mf.	.000065 mf.	C59511
23	40,000 ohms	25,000 ohms	SA99777
38	.05 mf.	.25 mf.	CW2-25
50	.05 ohms	.1 mf.	CW2-10
56	65 ohms	50 ohms	RE9537

Please make these changes in the list of parts on *Bosch page 7-32 in Rider's Volume VII*.

**Crosley 646**

Several changes have been made in this receiver, the schematic of which will be found on page 7-41 of *Rider's Volume VII*.

Condenser No. 14, 2757 mmf., has been changed to 1750 mmf., Part No. G7-34007.

Resistor No. 31, 30,000 ohms, has been reduced to 10,000 ohms,  $\frac{1}{4}$  watt, Part No. 21876.

A .0005-mf. condenser, Part No. W-29591, has been connected between the P1 terminal of the 19 output tube and the left-hand heater terminal. (See schematic.) This condenser has been numbered 55 on the diagram.

A ballast tube has also been added as shown in the partial schematic here reproduced. Note that the red, green, brown, yellow and black leads go to the same points as those similarly designated in the schematic on page 7-41. The battery supply cable assembly has also been changed from Part No. C-37106C to B-41762; the part number of the harness for this assembly is C-41972.

The socket for the ballast tube is located just to the left of the socket of the 19 output tube, Fig. 2 on page 7-42. The position of condenser No. 14 has been changed from the place shown in Fig. 3 on page 7-42 to a point under the condenser No. 17. The new condenser, No. 55, is located just above the condensers, Nos. 19Y and 19Z in

Fig. 3. The component designated as 15A should be 16 and the one designated as 16 should be 15A.

It is now possible to use a 3-volt "A" battery (Burgess 20F2 or Eveready X125) and a "B" and "C" battery pack (Burgess G90-D6 or Eveready XP-7). If the 3-volt battery is used instead of those designated in the specifications on page 7-41, it is necessary to use a ballast tube, Part No. W-43282. If individual "B" and "C" batteries are used, use the harness mentioned above. A 22 $\frac{1}{2}$ -volt "C" battery is specified instead of the two 4 $\frac{1}{2}$ -volt batteries.

**Bosch 605, 605C**

The final schematic is the same as the preliminary, which will be found on page 7-25 of *Rider's Volume VII*, with the following change in the value of the .01-mf. condenser, Diagram No. 39. The new value is .005 mf., Part No. CW4-005.

Below will be found the resistance of the windings of the power transformer:

Winding	Primary	Sec. Total	6.3 Fil.	Rect. Fil.
TR 9555	15.5 ohms	600 ohms	.24 ohm	.17 ohm
TR 9564	16.5 ohms	570 ohms	.23 ohm	.14 ohm
TR 9565	61 ohms	580 ohms	.23 ohm	.15 ohm

Please add these data to the schematic.

**Bosch 650**

The final schematic of this model is the same as the preliminary, which will be found on page 7-33 of *Rider's Volume VII*, with the following exceptions:

Diagram No.	Old Value	New Value	Part No.
10	.0001 mf.	.000065 mf.	CM9511
18	.005 mf.	.005 mf.	CW4005
23	40,000 ohms	40,000 ohms	SA99957
38	.05 mf.	.25 mf.	CW2-25
51	30,000 ohms	50,000 ohms	RE95116
56	65 ohms	50 ohms	RE9537

Note that the part numbers only of items 18 and 23 are changed; the values remain the same.

Please make a correction on the schematic. The lower plate of condenser No. 10 should be connected to the

junction of the tuning condenser and condenser No. 12. This was omitted from the drawing.

**Philco 37-60**

Run No. 2. The 1000-mf. condenser, No. 11, was changed to 250 mmf., Part No. 30-1032, and resistor No. 12 was changed from Part No. 33-351339 to No. 33-332339. This change was made to prevent relaxation oscillation.

Run No. 5. Refer to the Base View of the chassis on page 7-22 of *Rider's Volume VII*. The condenser No. 46 has been moved from the location shown—near the front—to the rear of the power unit. The tubular condenser No. 40 has been replaced with Part No. 8318-SU Bakelite condenser and mounted in the location from which No. 46 was removed.

Run No. 6. The suppressor grid of the 6K7G, i-f tube, is removed from ground and connected to the -2.5 negative tap of the bias resistor, No. 43. See schematic on page 7-19 of *Rider's Volume VII*.

Beginning with Run No. 9, the i-f transformers were changed. The first i-f transformer No. 15 now is Part No. 32-2274 and the second, No. 27, is Part No. 32-2276. The first i-f transformer has a stabilizing winding which is placed in series with the suppressor grid of the 6K7G i-f tube. The short or yellow lead is connected to the ground lug and the long lead to the suppressor grid.

**Philco 37-61**

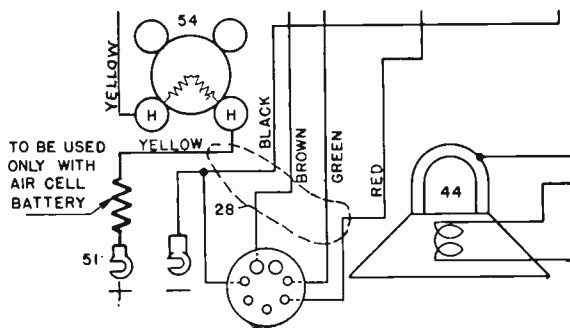
The changes applying to Philco Model 37-60 also apply to Model 37-61 with the exception of the first paragraph. The schematic diagram appears on page 7-23 in *Rider's Volume VII*.

**Wells-Gardner 1936 Receivers**

In all 1936 receivers using 5Z4MG rectifier tubes it will be advisable to use 5Y3G rectifier tubes for replacement purposes. The latter is a common tube, easy to obtain and is not subject to the breakdown that was encountered in some of the 5Z4MG tubes.

**Crosley 1016**

Make a notation in the parts list on page 7-65, *Volume VII of Rider's Manuals*, Item No. 36Z, Tone Control, Part No. 37966, has a resistance of 80,000 ohms.



Partial schematic of Crosley Model 646 showing the ballast tube. The color coding of the leads corresponds to that in the schematic on Crosley page 7-41 and the leads go to the same points.

### Aerials and Reputation

(Continued from page 1)

ving industry judge the merits of these systems? . . . To attempt to judge by technically analyzing a modern noise-reducing antenna—even if all of the information is available—without the resources of a good laboratory and a large number of receivers upon which they can be tried so as to establish the practical value—is a mighty difficult task. . . . Accordingly it becomes necessary to choose along commonsense lines. . . . Maybe you will make a mistake, but acting with commonsense has proven itself to be a mighty good method of procedure.

How can we tell a good antenna from a poor one without having tried both? Certainly not by appearances only, although well constructed devices are invariably superior to those of inferior construction. . . . Not solely by advertising, because paper is very patient and each manufacturer will naturally laud his product to the fullest extent—although it is true that even types of advertising differ. The cost is not necessarily a barometer, even though the best is the cheapest in the long run—that is when the customer is willing to pay the price. How, then, are we to judge? . . . After due consideration of all factors, there is but one way: the reputation of the maker. . . . Fortunate are those men who can interpret by analyzing technical details—but all servicemen are not in this category—hence reputation is as good a basis as any for these less technically trained men.

It is logical to say that a manufacturer with a reputation will not attempt to sell an inferior product—at least not continue selling the product—so that if we select the manufacturers with well established names and who are known to be capable of producing a good antenna kit, it is safe to buy it. . . . The magnitude of the concern—its financial standing—the knowledge that they have good engineers and a good laboratory, are significant factors. . . . Of course, there are small organizations of good reputation, but less magnitude who may specialize in antenna kits and who off-

set the size of the others by specialization—so that they, too, deserve full consideration. The decision then hinges upon personal experiences with the antenna units in question.

There are of course times when judgment is tempered by cost, so that the product with the reputation cannot be bought because it is too expensive. . . . Yet that should not be so, because so much depends upon a good antenna and the difference in price is as a rule comparatively little. Knowing that the function of the serviceman, who makes an antenna installa-

tion, is to do the best job possible—to give the best possible service—so that the job will stay sold, the safest move is to buy the product according to the reputation of the maker and not according to the price.

We realize fully that this is a peculiar presentation of a subject which normally is treated in a technical manner, but we feel that with the large number of different types of antenna kits offered to the service industry, it is time to view the subject from an unorthodox, but perhaps more sensible angle.

## NEW SET-UP IN I.R.S.M.

AT a recent meeting of the Board of Trustees of the Institute of Radio Service Men, Joe Marty, Jr. of Chicago, was elected acting Executive Secretary, replacing the former Executive Secretary, Ken Hathaway.

According to information given us by Marty, it shall henceforth be the aim of the I.R.S.M. to make all possible affiliations with other radio service associations all over America, so that a friendly spirit of cooperation will exist between all servicemen. The new leadership of the I.R.S.M. has gone on record as stating that it is not their desire to absorb other associations, because they realize that each present association is proud of its identity and there is no definite need for the loss of this identity. . . . However, a need does exist for cooperation between various service associations in different parts of the nation and with this in mind, the new I.R.S.M. leaders express the hope that the leaders of other associations will see their way clear towards affiliation with some national association, wherein all associations now existent and those to be formed will have full representation.

As a matter of fact, it is a pleasure to quote from a letter recently received from Joe Marty, which expresses that wish so often mentioned by service association heads with whom we have had the opportunity to speak during the past few years. We quote a para-

graph from the aforementioned letter of August 14th:

"The Board of Trustees (of the I.R.S.M.) has considered very carefully the possibility of an amalgamation of all radio service organizations into one very strong national group, and the Executive Secretary was instructed to contact and cooperate with all other groups with this end in view. The Board felt that if all groups were unselfish in their expressed desires to aid the serviceman, a great deal of good would result from the arrangement."

This expression on the part of the I.R.S.M. has been something everyone has been looking forward to hear. Although we cannot speak officially, it is our belief that it is the intention of the I.R.S.M. leaders to make the Institute one of the members of this national association, just as any other association. Negotiations between the Institute and other associations have been going on for years but were not culminated successfully because the Institute wanted to absorb the other associations. Those ideas no longer exist and the opportunity now exists for a loosely knit national association representative of all radio servicemen operating in the United States.

As you read in the quotation from the letter we received, the Institute is going to contact other associations. May we at this time suggest that these communications be received with an

(Please turn to page 7)

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## RCA AR-4229

Certain changes were made in this police auto radio receiver, necessitating new components. Below will be found corrections for the parts list, which was run on page 5-206 in *Rider's Volume V*.

New Stock No.	Old Stock No.	Description
4049	3745	C-12, 1310 mmf.*
7701	7601	3-gang variable condenser
7702	6540	R-f coil assembly
7703	6731	Antenna coil
7704	6471	Oscillator coil
6570	6784	Dial scale
7698	G-7850	Control box cover
7705	G-7851	Control box complete
6161	G-5021	Station selector knob

\*Was 745 mmf.

## T.C.A. 480

It has been called to our attention by W. F. Klein of Brooklyn that he had difficulty in aligning this receiver at the i-f peak of 465 kc, as noted on page 4-12 of *Rider's Volume IV*. He advises that the set functioned properly when it was aligned at 175 kc.

Has anyone else experienced a similar difficulty? Please let us know if you have, as the Chicago company, which made this set, is now out of business, and we have no means of making our usual check-up. Thanks.

## Philco 37-600

To prevent reduction in sensitivity at the low-frequency end of the band, the 200-ohm resistor, No. 7, has been changed to 300 ohms, starting with Run No. 3. This change has been noted in the Parts List on page 7-37 of *Rider's Volume VII*, but it still shows as 200 ohms on the schematic, which will be found on the same page.

The lead connecting the suppressor grid to the cathode of the 6J7G i-f tube has been changed. It now runs from the suppressor grid to the junction of the sensitivity control, No. 23, and the secondary of the i-f transformer, No. 19.

## Philco 37-116

Up to Run No. 4, a condenser was connected between the heater contact and ground of the 6K7G r-f tube. This condenser was removed starting with Run No. 4 to prevent hum modulation on Range 5. It is not shown on the schematic appearing on page 7-31, 7-32 of *Rider's Volume VII*.

Electrolytic condensers, Nos. 126 and 127, 8 mf., have been changed to 4 mf. Part No. 30-2174, starting with Run No. 5.

Starting with Run No. 6, the two 25,000-ohm resistors, Nos. 110 and 111, have been removed from the audio unit and relocated in the power unit near the 6B4G sockets.

To obtain the proper selectivity curve in the expanded position of the i-f expanding unit and to avoid regeneration, dress the plate lead (white) of the 6L7G tube as follows: The plate lead should lay across the 6L7G socket, then pass into the oscillator section close to the base; from here the wire must pass through the second aperture from the front of the r-f unit into the i-f unit.

To prevent clicks when tuning the bass compensation control on a very strong carrier, a 2-megohm resistor, Part No. 33-520339, was connected from the lug on which the 70,000-ohm resistor, No. 103, and the .008-mf. condenser, No. 104, are connected in the audio unit, to ground.

It will be noticed in the schematic on page 7-31, 7-32 of *Rider's Volume VII*, that two parts carry the same number: No. 135. One is the pilot light and this is the correct number for this part; the second is a switch, located on the schematic just below and to the left of the 6J5G AVC tube. The number of this switch should be 137. This number does not appear in the list of parts on page 7-36, but the switch is used on the automatic dial mechanism and appears in the parts list under "Code 122" as "Plunger Stop and Switch Assembly, Part No. 45-2330."

Another switch located between Nos. 100 and 103 on the schematic with the wording "used in code 122 only," is used to short the audio system when using the automatic dial. This switch is located on the vernier drive assembly. The part numbers of the removable sections which contain the riveted contacts, are 45-2350 and 28-4110.

The magnetic tuning transformer has been changed. Its old part number was 32-2217 and its new number is 32-2361.

## Philco 37-38

Starting with Run No. 4, the filament wiring of the 1D5G i-f tube was reversed to improve the operation of the set. In Fig. 1 on page 7-18 of *Rider's Volume VII*, the "F+" of the 1D5G socket becomes "F—" and is grounded to the lug near the socket.

The 32,000-ohm resistor, No. 8

(see schematic on page 7-17 of *Rider's Volume VII*) has been replaced with one having a value of 51,000 ohms, Part No. 33-351339. The resistor is removed from the range switch assembly and is connected directly to the oscillator grid of the 1C7G tube and ground. This change was made to improve the sensitivity in the center of the broadcast band.

## Stewart-Warner Tuning Eye

Since the narrowing of the shadow in a tuning eye depends on the strength of the received signal, it will narrow the most for powerful nearby stations, while on distant stations it will close much less. If a set is used with no aerial or too short an aerial the eye will not close the normal amount.

In all models, if the tuning eye does not close enough and if this is not caused by the above reasons, be sure to check the tubes and the alignment.

In the later production of the model 1495 (see page 7-20 in *Rider's Volume VII*) the circuit has been changed slightly to give more deflection of the eye on weaker signals. You can determine whether this change has been made without removing the chassis from the cabinet.

Tune in a local station and then remove the 6H6 tube located next to the 6C5 tube. If the proper tube is removed, the radio signal will get louder or distort. In the latest production sets removing this tube should cause the tuning eye shadow to narrow or disappear. If removing the above 6H6 tube causes the shadow to widen to its full width then the eye is not connected properly.

To correct the wiring proceed as follows:

Remove the chassis from cabinet.

Trace the wiring of the tuning eye grid wire which is the green and white wire in the tuning eye cable. This wire will be found connected to the "blank pin" terminal on the 6H6 socket located adjacent to the 6C5 tube. Disconnect the green and white tuning eye lead from this terminal.

Then connect this wire to the "blank pin" terminal of the 6H6 tube located nearest to the 6J7, AVC amplifier tube. The R-149 circuit diagram shows the proper connection.

Realign the I.F., A.V.C. and broadcast trimmers.

# Successful SERVICING

Reg. U. S. Pat. Off.

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

Published monthly by  
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Vol. 4 AUG.-SEPT., 1937 No. 1

## Be Methodical

WHEN things come easy, it is simple to get into a rut. Take for example the changes which are recorded each month in SUCCESSFUL SERVICING, and also in the various Rider Manuals. Now, it is not our intention to use these editorial columns for publicizing our books, but the subject of changes lends itself admirably to what we wish to discuss.

A change made upon a chassis by a manufacturer is the result of one or more contributing causes. It is possible that further engineering, that is, additional research after a chassis is in production, brings to light some method of improving performance and a change is made. . . . Then again it is possible that after the set has been out in the field for awhile, field engineers, dealers, or jobbers may discover some condition in it which impairs operation in one community and a change is made. . . . Sometimes such changes are specified as being necessary under certain conditions and then again, it is possible that the change made for the benefit of one part of the country is satisfactory for the rest of the country. And a third reason may be that the most painstaking examination during production does not disclose the likelihood of failure of a part—but this part fails after a period of use and a change is recommended. . . .

No matter what the reason, changes made upon chassis are costly to the manufacturers—and if they deem it necessary to make such a change—alter their routine—print bulletins, etc., that change should be viewed with equal importance by the serviceman who re-

ceives the information. . . . We realize that many servicemen accept such data as important information—but because of a lackadaisical spirit—the absence of any training which would make him methodical—proper records are not kept and the full value of the information is not obtained. . . . To many the pass-word is “mañana”—meaning tomorrow. . . . Everything will be done tomorrow—and tomorrow never comes. . . .

Then again there is the man who feels that he knows what it is all about and does not deem changes very important—until some very mysterious differences between chassis and receiver diagram appear—and then he deplors the haphazard manner in which manufacturers release diagrams and publishers make errors, never realizing that manufacturers check their diagrams and that publishers likewise check the material before printing and that the discrepancy is not an error. . . . As a matter of fact, the chassis has been changed and more than likely a change notice appeared—but passed without being noticed.

Methodical procedure is not necessarily mechanized action. . . . No one loses his individuality just because he thinks it worthwhile to make a written record of all things that should be recorded and keeps everything in its proper place. . . . Knowing where to find what you seek is not being an automaton. . . . Neither is the task too laborious. . . . because, as a rule, change notices are completely and clearly identified with the chassis in question—so that proper correlation between the change notice and the chassis data is easily accomplished. . . .

We realize from personal experience that it is difficult to cultivate the habit of being methodical, but let us assure you that it is worthwhile—once acquired it means a saving of time and money. . . . We have found it to be the difference between order and chaos. . . . We cannot conceive of what would happen in our own office if our records of the service data on hand—the new receivers announced—material requested—data in work, etc.—were not methodically kept. . . . Maybe you do not require the same routine—but there are innumerable operations associated with the proper running of a service station which require methodical treatment—not once in a while—but every day. . . . Be methodical.

JOHN F. RIDER.

## Birthday Number Three

THREE years ago when we said “Hello” to you editorially in the first issue of SUCCESSFUL SERVICING, we outlined the aims and policies that we planned to follow. We told you that we were not only going to give you technical information in these pages, but also suggestions for conducting your business in a business-like manner.

Maybe we have succeeded—maybe not, but we like to believe that the former is the case. . . . Anyhow if we are to take literally the hundreds of letters that have come to our desk in the past three years, then a mighty large number of men like our efforts. Also it must be that SUCCESSFUL SERVICING is discussed among servicemen, because very frequently we get requests stating that the man would like to have us send him all the back issues and put him on the list to get those of the future.

Perhaps in the past we have employed some pretty harsh editorial language. . . . Don't think we're apologizing—we aren't. . . . We meant every word we wrote and we meant it for those men who should have had it said to them years ago. . . . You know far better than anyone else, whether those words were addressed to you and if they were and you profited by them, then all our work has not been in vain—yes, even if only a dozen or so profited out of our 23,000 readers, it has been worthwhile.

As we enter into our fourth year of publishing SUCCESSFUL SERVICING, we would like to impress again on all our readers that this is *your* magazine. If you have any suggestions or criticisms, please write to us. . . . Also we want to take this opportunity to thank you all for the support you have given our organization. . . . We have tried to live up to our pledge set forth in the masthead at the top of this page and we are going to keep on trying. . . .

## SKULL TEASERS

1. Jack returned from his fishing trip and was asked the size of his biggest catch; he replied, “The head was as long as the tail and one half of the body. The body was as long as the head and tail together. The tail was 12 inches long.” *How long was the fish?*
2. Jack also claimed that he caught 50 fish in 5 days, each day pulling in 3 more than on the previous day. *What was his catch each day?*
3. A man starts a non-stop flight around the earth at the equator, starting at noon on (Please turn to page 7)

# MAKING RIDER'S

## VOLUME VIII

The compilation of the servicing data for Rider Manuals and its preparation for the printer is an exacting job and a job that is without end—just as soon as one volume is sent to the printer, work is started on the next. Now we are entering the final stages of preparation of Volume VIII and in another few weeks we will be able to breathe a sigh of relief that it's been "put to bed."

The data for Volume VIII has been pouring in the office in increasing quantities these last few weeks—data covering the 1938 receivers. This material has to be checked—parts list against the values of the components on the schematic—trimmer numbers on the layouts against the numbers indicated in the alignment instructions—tube types in the schematic against the tubes in the layouts. Then if any discrepancies are found, a check-up with the manufacturer is necessary and the corrections made.

You have noticed that all the pages in Rider Manuals are a uniform size, with the exception of the double-spread pages. In order to get this uniformity, it is generally necessary to rearrange the manufacturers' printed material so that it will fit within the confines of the border on the standard size page. Sometimes the schematics, as they come in to us, are several times this size; these have to be reduced photographically. Sometimes the data comes to us in blue-print form with insufficient contrast for photographing; if schematics are like that, they are sent to our Art Department, where they are redrawn with strict observance of the manufacturer's style and use of symbols.

Often it is possible to save space—which is always at a premium—by including some of the data on the schematic. For instance, the voltage readings are sometimes lettered in on the schematic at the various terminals of the tube symbols. Perhaps some of the layouts showing the locations of the tubes, trimmers, or parts are very large and the lettering very small, so that if the layout were reduced to fit into the border the lettering would be illegible. More work for the Art Department . . . they redraw and reletter the layout so that it can be squeezed into a small space—and another page is saved

for something else. Sometimes the alignment instructions are presented in great detail and at some length. To print these full size would mean several Manual pages, so they are reduced photographically and "stripped in." Or perhaps they are condensed into tabular form, such as was used in "Aligning Philco Receivers." . . . Anything to save space and to insure legibility.

When the pages are "dummied," they are checked to see that all the necessary data has been included. Then the company name is pasted at the top and a description of the page's contents is typed and pasted to the outside corner of the page along with the folio.

Then they are ready for the printer.

When a series of reference books assumes the proportions of Rider's Manuals, an Index is essential and above all, it must be as accurate as it is humanly possible to make it. Moreover, it must show where every bit of information—the schematic, the alignment data, the voltage readings, the mechanical adjustments of the dial or drive, etc.—can be located as quickly as possible. For that reason, we have listed in the Index everything on every page on every one of the eight Rider Manuals.

It would be a relatively simple matter to insert at the end of each manufacturer's section in the Index the new data in Volume VIII, if the model numbers followed consecutively those appearing in Volume VII. But they don't!! Just glance over your Index to

Volume VII . . . look at the Philco, RCA, or some of the other long listings . . . see how some of the higher model numbers are in early volumes? That means that the listing of the new and lower model numbers and all the data pertaining to them, had to be inserted in their proper place, so that the whole Index would be arranged numerically.

This preparation of the "copy" for the new Index is a job that requires the utmost care. All the listings for the new volume have to be typed—the one or more model numbers, the chassis number, early or revised models; then the data which appear on the different pages with the page numbers or folios. Two indexes of the previous Manual are taken apart (two must be used as the Index is printed on both sides of the paper), the model numbers of a manufacturer's section compared with the new model numbers, and the complete listing of each model is inserted in its proper place. Often the model numbers pertaining to a single chassis are not consecutive—see the Sears-Roebuck or the Zenith listings—and the widely separated numbers have to be cross-indexed.

As you can imagine, it is the easiest thing in the world to make errors in an Index the size of the one that will go to you with Volume VIII of Rider's Manuals. The man typing the copy can hit the number keys of his typewriter in wrong sequence—the typewritten copy can be inserted in the wrong place—the linotype operator at the printer can strike the incorrect keys on *his* machine—the make-up man can put the slugs in the wrong places, when he makes up the pages—and so on *ad infinitum*. Therefore, as much time or more is spent on checking each operation as is consumed in doing the actual job. And all this must be done at top speed, because the Index can not be made up until all the Manual pages are ready for the printer.

So taken all in all, you can see that getting Volume VIII ready for you is really one big job. . . . Just the physical labor, to say nothing about checking all the work that has been done before. . . . But it's worth it . . . worth it to us in satisfaction at another job well done . . . because we know that you have found Volumes I to VII of Rider's Manuals helpful and that you will also get even more use from your Rider's Volume VIII. . . .

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SERVICING BY RESISTANCE MEASUREMENTS		
203 Pages		\$1.00
ALL by John F. Rider		

# Rolling REPORTER



## DRIP, DRIP, PLOP

That's us these dog days . . . they're a Sirius biz . . . Sirius is the dog star, y'know, and the old boys of Rome, Athens, and points east thought that Sirius was one of the causes of August's sultry heat—hence dog days . . . and hence the trail of dampness that we leave as we push our chariot around town gathering wot news there is . . .

## COMFORT & EFFICIENCY:

The other day we saw in one of our colleague's colyums that Daddy Knickerbocker's home town was getting to be quite a summer resort, due to the air-conditioning of practically everything there is to cool off . . . Mebbe so—*mebbe so*, but some of the service benches we've leaned up against during this spell o' heat in our traipsing hither and yon, could stand a bit of cooling. *Any of you guys ever think that a few bux invested in an electric fan might kick up the old percentage of efficiency enough to pay for the fan?????*

## SPEAKING OF HEAT—

A. B. Cole of Caldwell, N. J., came in to see the Boss recently to show his new soldering outfit, he's named the *Instansolder*. It looks something like the regular iron except that it has a small brass tip which is heated in a few seconds by a small arc set up between the tip and a carbon electrode. Power is obtained from a transformer and is controlled by a thumb switch on the side of the handle. Cole says he doped this out because he hated to clean soldering-iron tips and **this new tip never has to be filed!!!** *Ain't that sumpin????*

## ELECTRONIC MUSIC

And we *don't* mean radio music—these are regular musical instruments where the vibrations of the strings or reed are used to set up currents that are amplified and then shot out from a loud speaker. At the Piano Maker's convention your Reporter was given a private demonstration of these instruments by their inventor, **Ben Meissner** of X-mitter fame, and take our word for it—*they're swell!!!* We were even invited to try out the *Electone* (*electronic piano, to you*) by the Krakauer engineer, **M. K. Bretzfelder**, who's done a lotta the development on it. Contrary to all the ads, nobody laughed when we sat down at the piano, but how they guffawed when we finished up that immortal classic, *Chopsticks!!* We were followed at the keyboard by **Lew (Organist) White**, who played our favorite *Rhapsody in Blue*. (P.S. They applauded him!)

Now, where does all this fit into servicing? Every one of these instruments has a pick-up (either electrostatic or electromagnetic), an amplifier, and a loud speaker. The logical man to fix these up, when and if they go bye-bye, is a radio serviceman and *so-o-o-o-ooo* in **Volume VIII of Rider's Manuals**—yep, you've guessed it, not only will be run the service notes, but also *how they perk and why*. Here's just one more field for the serviceman and from all that we've heard, it's gonter be a honey!!!!

## NOTICE TO 100%ERS

Next Fall, when the breezes are making us think of getting the overcoat out the moth-bag, (*boy, oh boy, how we long for those days!!!!*) you 100%ers are going to find in your **Volume VIII of Rider's Manuals** a Rider 100% Group coupon, which you will fill out, send in to this office, and *then get your 1938 certificate . . .* Youse guys who rate a 1937 Certificate and haven't as yet sent for yours—**DO IT NOW . . .** And to youse other guys who don't own the SEVEN Rider Manuals and so don't rate a Certificate, we says: You're missing out in moren one way—you're *missing the help that Rider Manuals can give you and missing out on a powerful sales argument . . .*

## AIDED BY "SMILING JIM'S" HELPERS

E. C. Sneed, Trona, Cal.—You'll be able to get *AFC Systems* any minute now—it's in the works and then you'll have 'em all . . . Yes, indeed, a guy would be foolish not to have all the help he can . . . and you're right again: Rider does give that lift. (*No, that is NOT a Camel adv.*) . . . **Emil Steinbach, Corona, L. I.**—The reason the schematics in *Rider's Manuals* are dependable are that they are reproduced right from the manufacturers' notes, often with additions to make things easier for you . . . Yeahs and Yeahs ago, the Boss did publish a book on radio mathematics. It's outa print now . . . We'll tell him wot you said. (*Anyone else interested in a book covering that subject????*) . . . **J. L. Davis, Basin, Wyo.**—Thank for all the nice things you say . . . We hope you've found the 100% Cert. helpful as some of the other boys have . . . **F. Claude Moore, Pekin, Ill.**—S been quite a spell since we heard from you . . . Okeh—let's see those pix of your shop . . . Wadya mean a 200% certificate?—don't be a piker—

## New Set-Up in I.R.S.M.

(Continued from page 3)

open mind and without any antagonism which may have been created one or more years ago. . . . Here is an opportunity for the revival of real cordial relations between all service associations with benefit to all.

It is possible that some of you may be interested in the status of the qualification project, which was started by the old management of the Institute. According to advice received, the complete qualification project has been postponed indefinitely, so that this item need not be an obstacle to those who have deemed it such in past negotiations.

one fellow wanted a 1000% certificate and he had the same books you have!!! **Geo. Harrill, Idaho Falls, Idaho**—It sure gives us a kick to read that you "attribute a large measure of your success to your constant use of Rider publications" . . . We blushes, bows, and thanks you, George . . . **N. A. Williams, Wellington, New Zealand**—You can keep up to date on the new Rider books by reading S.S. You've proved one of our points—that a fellow can use the Hour A Day Series as a review, as well as mebbe larn sumpin from 'em . . . **L. Vangunten, Cleveland, O.**—Certainly, you rate a 100% Certificate if you have Vols. I, II, and III all in one binder—see last issue of S.S. . . . (Let's not go into that anatomical subject you raised) . . . Did those empty bottles result from fixing that cold????? Or vice versa???? **K. S. Avasty, Kathiawad, India**—Glad you liked S.S. You'll get it regularly . . . **Colin Fraser, Santa Margarita, B.W.I.**—We're trying to find that "Ace" dope for you . . . Will let you know . . . **E. G. Christensen, Westbrook, Minn.**—Sorry we can't run blank pages for case histories in *Rider's Manuals*—space is too valuable and paper too expensive . . .

## S'LONG . . .

Yowsa, we're gonna pack the old white ducks, the other shirt, our painting duffle—grab our golf clubs and climb on an *air-conditioned* train (no chariot this summer) bound for the coolest place we know and there do our vacationing . . . So-o-o-o-ooo, while you're a'readin' of this, think of us parked by a river sketching a regatta—or else pushing the pill around the sportiest course we ever cursed at . . . Goo'bye, gang . . . *Green fields and cool rivers, here comes*

The Rolling Reporter

## Skull Teasers

(Continued from page 5)

the first of the month and flying westward. If he completes his flight and arrives at his starting point on the eleventh day of the same month, how many times has he seen the sun rise, assuming that the weather has been clear?  
4. What two different numbers (excluding 1 and 10), the product of which equals twice their sum?

## ANSWERS TO SKULL TEASERS

1. The fish was 96 inches long; the body 48 and the head 36 inches.
2. 1st day, 4; 2nd day, 7; and so on up to the last day, when he caught 16.
3. Nine times.
4. 3 and 6.

## TRY THIS YOURSELF

Stand a cork on the edge of a table and have someone stand off about eight or ten feet. Tell him to run at the cork—not walk—and try to snap the cork off the table with his finger. Sounds simple, doesn't it? Well, try it yourself.

## 2 NEW RIDER BOOKS

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**READY FOR YOU NOVEMBER 10, 1937**

# **VOL. VIII**

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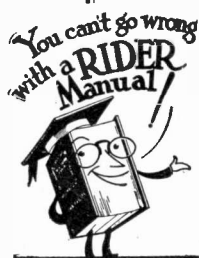
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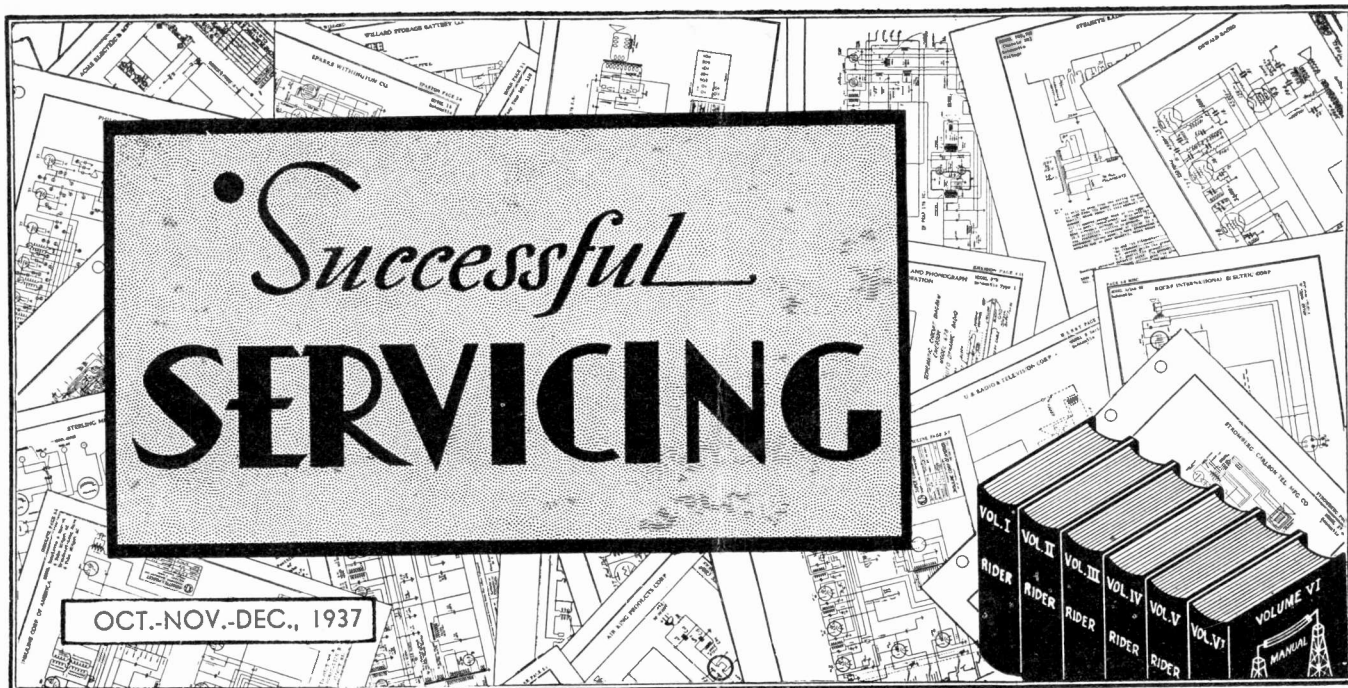
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## NEEDED — MORE THEORY

Modern Service Problems Make Knowledge of Theory Imperative

BY JOHN F. RIDER

Progress and education—these two go hand in hand whether you consider individuals, industries, nations, or races of people. You have only to read history and you will find this to be true: that man, industry, nation or people—whoever has the better education is further along in the scheme of things.

As is to be expected our concern is with the radio servicing industry. . . . What is to be said in these pages is not intended as an indictment of radio schools, resident or correspondent. . . . As a matter of fact just the reverse is in order. . . . The schools are to be complimented. . . . They have contributed largely to the very existence of a radio servicing industry. True that the service branch of the radio industry is necessitated by the very existence of the radio industry—but we cannot ignore the fact that the various radio schools taught radio to many thousands of men who had no conception of the subject, other than the desire to learn. . . . At the same time, the words to follow are not intended as an indictment of the radio servicing industry; for while it is true that its members are rapidly approaching the day when they will find it very difficult to cope with the industry's technical problems, they too have fought their way up from the classification of a necessary evil to a dominant position.

However, recognizing the merits of the schools and the merits of some members of the radio servicing industry, does not solve the existing problem. . . . Today the servicing industry finds itself in a peculiar position, namely, a definite gap exists between the technical education of the radio service personnel and the technical requirements of the day as established by the developments in the laboratories of America's radio receiver manufacturers and research laboratories. . . . Just what do we mean by this gap? . . . Expressed in the simplest of words, it means that present-day radio receiver design entails radio theory which is not fully understood by the majority of the men associated with the radio service industry; consequently, the suc-

cessful repair of these receivers at a profit to the service man is problematical—yes, even doubtful. . . .

Who is to blame for this gap? . . . Are the schools?—the Servicemen themselves—the magazines catering to the Service field? . . . In view of the fact that the various so-called complex circuits employed in radio receivers are elaborations and modifications of well-aged radio theory—the theory which was taught to the student—it is unjust to say that the schools have failed. However, it is possible to say, bearing certain things in mind, which items will be mentioned, that schools have done one of two things. Recognizing that the student is not very much in love with theory, since it is a very monotonous subject—at least so he thinks—and recognizing that featuring practical information is an added attraction in the eyes of the student, it is quite reasonable to expect the schools to subdue the study of theory and to feature the practical. Thus the schools have either failed to stress the importance of theory or have not devoted sufficient time to the effort to convey the required theory to the student. . . . Thus it is possible to say that some revision in the mode of teaching may be necessary, at least as far as theory goes, and therefore the existence of the gap we mention may be partly due to the nature of school training. . . .

On the other hand, it is only right to see clearly the problem of the school. Granting that the schools do what was stated in the previous paragraph, that is, feature the practical rather than the theoretical, it is done because that is the most sensible thing to do from the commercial angle—namely, to satisfy the student. After all, the student is paying for his training—therefore maybe we should place the blame upon the door-step of the student rather than the school. . . . As a matter of fact, we think that it belongs there.

As a rule, the men who have studied radio servicing have not been content just to study and wait for the day when their studies were

completed and then go out into the field. . . . These men desired to enter the servicing industry and were willing to study, providing that the curriculum was such that they could study and also do service work . . . and with a minimum of effort devoted to the assimilation of radio theory. . . . Unfortunately such was possible in the past, hence there was no need for a change and today we pay the piper. . . . The student's desire for a practical form of instruction made him a mechanical worker and so the servicing of a receiver developed into a series of routine steps very much like the construction of a toy train in accordance with the instruction sheets.

Magazines catering to the radio service industry can also shoulder some of the blame, because very few pages of each issue published during the past ten years were devoted to theory and very few editorials were written about its importance. . . . Once again it may be said that all of the criticism is not to be placed upon the editors, because after all is said and done they cater to their readers and their readers are the servicemen, who by and large actually request practical data and a minimum of theory. If we say that the magazines show the way to the readers, then something has misfired somewhere because theory has not been very conspicuous.

All in all, the average serviceman does not possess the required grounding in radio theory accompanied by the power of interpretation, whereby he can recognize the relation between a modern development and the basic theory underlying the operation of the circuit or device. To attempt to cite examples of this type would require more space than is contained in fifty such copies of *SUCCESSFUL SERVICING*, but one or two examples most certainly will not be amiss.

Take as an example the subject of "phase relation." The subject is mentioned in every radio course we have examined. Facts stating the phase relation existing between the primary and secondary voltages in transformers

(Please turn to page 3)

Emerson Chassis AB and X

The Chassis AB is the same as Chassis X with the exception that the former chassis does not include the 6G5 tube. Also two more model numbers have been added to the X chassis, X-178 and X-183. The model numbers for the AB chassis are AB-178, AB-182, and AB-183. These new numbers should be added to your Index for *Rider's Volume VIII* and referred to the data appearing on pages 8-25 and 8-26.

Several changes have been made in the circuit and the new schematic diagram is here reproduced. The changes follow:

In Chassis X receivers below serial No. 1,065,450, R-39 (20,000 ohms, Part No. GR-31) was not in the circuit.

In Chassis X receivers below serial No. 1,156,977, no phonograph terminal strip was used. The volume control was connected to R-11. (See schematic on page 8-25.) R-4 was 200,000 ohms and is now 50,000 ohms.

In Chassis X receivers below serial No. 1,216,700 and in Chassis AB receivers below No. 1,291,097, C-22 was 0.00005 mf. It is now 0.000025 mf.

In Chassis X receivers below serial No. 1,293,633 and in Chassis AB receivers below No. 1,320,357 R-4 and C-22 were connected in the circuit as shown by the dotted lines. When these are in the circuit, there is no direct con-

nection between the 6A8 oscillator plate and the grid of the 6C5 oscillator.

The following parts have been changed and are listed here with their new part numbers: Antenna coil, T-1, Part No. 4BT-396; Interstage coil, T-2, Part No. 4BT-397; Oscillator coil, T-3, Part No. 4BT-398; and Variable condenser, C1, C2, C3, Part No. 4BC-361.

The short-wave fixed padder, C9, was 0.0038 mf and is now 0.0042 mf (Part No. 3EC-267). The trimmer, C53, on the short-wave interstage coil was not in the circuit; it is part of the interstage coil. R6 was 40,000 ohms and has been changed to 25,000 ohms. C21 was 0.00005 mf and is now 0.000025 mf. C16 was 0.01 mf and is now 0.02 mf. R3 was returned to ground instead of the wave-band switch.

Note that when the above parts are used the frequency range is as follows: Broadcast band—540 to 1800 kc; Police band—1800 to 6250 kc; and Short-wave band—5.8 to 22.0 mc.

In Chassis X receivers with serial numbers below 1,328,250, the 1-megohm resistor R15 was in the chassis and not in the 6G5 socket, as is indicated. The Part No. is 3XZ-684, which includes the cable. The color code for this is as follows: Black with white tracer—cathode; Red—target; Black—filament; and Green—grid.

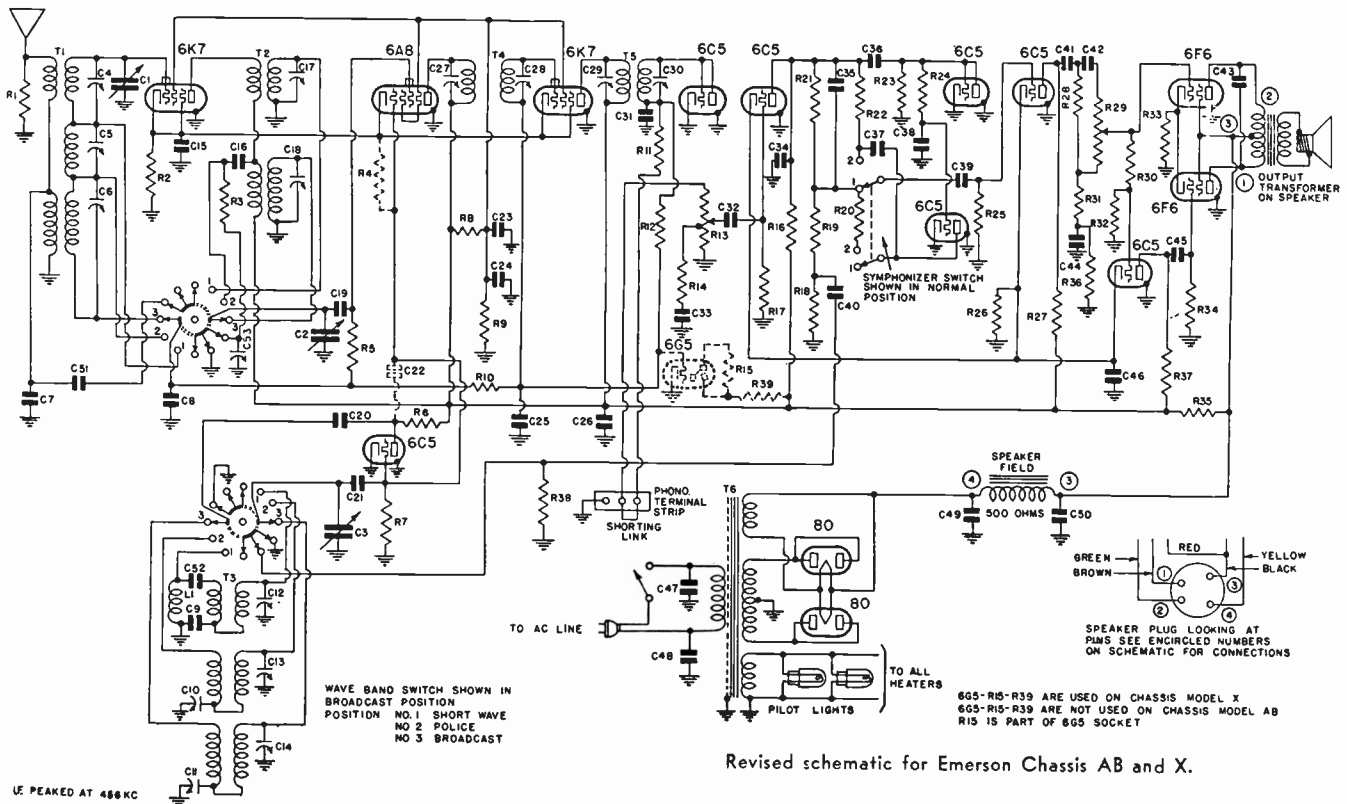
Short-Wave Alignment:

In Chassis X receivers with serial number above 1,293,633 and in Chassis AB receivers above 1,320,357, the alignment of the short-wave band is different from that given on page 8-26 in *Rider's Volume VIII*, which applies to those sets with serial numbers below those mentioned above.

Set dial pointer to 20 and signal generator to 20 mc, using a 400-ohm dummy antenna. Adjust short-wave oscillator trimmer from maximum output, then the interstage and antenna trimmers for maximum. Move pointer to 6 mc, feed 6000 kc to the antenna and adjust the r-f interstage trimmer (that at the right of the variable condenser) for maximum response.

In Chassis X receivers with serial numbers above 1,328,650 and in Chassis AB receivers with serial numbers above 1,373,394, 6J5 tubes are used in the following positions: oscillator, diode detector and avc, first a-f amplifier, symphonizer rectifier, symphonizer amplifier, phase inverter, and second a-f amplifier. The other tubes remain as they were, with the exception, of course, that the 6G5 is not used in the AB Chassis.

The voltage data is the same as that given on page 8-25 with the exception of the reading on the symphonizer amplifier plate, which is 15 instead of 40, with the switch in the symphonizer position.



Revised schematic for Emerson Chassis AB and X.

## Needed—More Theory

(Continued from page 1)

and between current and voltage in tuned circuits at resonance and off resonance, etc., is given in these texts, but no stress is placed upon the importance of the subject. The practicing servicemen of today who studied or at least read the text years ago paid very little attention to it because the nature of the circuits of yesteryear was such that comprehension of the theory underlying their operation was not essential to servicing. . . . Today we have automatic frequency control, wherein phase relation within the discriminator transformer plays a very important role—and the majority of servicemen who studied years ago cannot see any similarity between what they studied then and what confronts them today. . . .

Continuing with the subject of phase, such operations as push-pull amplification, phase inversion tubes used in resistance-coupled audio circuits to eliminate the push-pull input transformer, phase inversion by utilizing the relation between the plate and cathode circuits, between the control grid and screen grid, etc., are all subjects which were discussed in connection with vacuum tube operation, yet when used today present so-called new ideas, when in reality they are nothing more than adaptations of theory stated years ago and now used in commercial receivers.

It is possible to conceive that the average serviceman will require some time to absorb all of the details pertaining to these new adaptations because it is a new application—but he should be able to correlate these new arrangements with the basic theory underlying the operation and NOT consider the use of the circuit as being founded upon a newly discovered theory, which is the usual custom. It is because of the existence of such a condition that servicemen find it is very difficult to keep abreast of radio receiver design—that servicemen have found it more and more difficult to analyze receiver circuits during the past three or four years. . . . They do not recognize the modification of the basic transformer or tube circuit. Such items as audio degeneration, automatic volume expansion, automatic bass amplifiers are considered items founded on new theory, rather than elaborations and modifications of the original vacuum tube circuits. . . . They are new ideas in receiver design, it is true, and full credit is due the engineers who developed the circuits, but the underlying theory is still basic.

The gap exists. . . . What can we do about it? . . . Much indeed—and a great deal of the correction must originate in the mind of the radio serviceman. . . . Help must come from the schools and magazines. . . . The radio serviceman must make up his mind to acquire a sound grounding in radio theory. . . . He must realize that it is of the utmost importance and he cannot help but do so when he thinks for but a few moments about those items found in today's radio receivers, the operation of which he does not understand. . . . Nothing that we know of is better proof. . . . The radio serviceman who takes his present method of earning a livelihood seriously must drive out of his mind the thought that radio theory is "dry" and "uninteresting". . . . In addition to being vital for his welfare and advancement in the servicing field, radio theory is of extreme interest and anything but "dry." . . . As a matter of fact it is to be quite the contrary! . . . It is the open sesame to many mysterious performances. . . . It is actually romantic, if we may use that word. . . . A great deal of pleasure is to be found in the accomplishment of correct analysis or breakdown of what originally ap-

peared to be an extremely complicated electrical network. . . .

The radio serviceman who is not thoroughly conversant with radio theory—who has become stale because he studied years ago—must go back to school. . . . The purely practical worker who never has gone to school, must go to school. His success or efforts in radio servicing have been partial, never complete, and never can be complete because he is working blindfolded when he tackles a modern receiver. . . . Of course every man can try the "cut and try" or "hit or miss" methods, but no business operating upon such a technical foundation can survive. . . . The serviceman who has taken and completed his general course, will find it necessary to enroll



for a more advanced course or perhaps a specialized course in theory. His daily activity will give him the practical experience, but to school he will have to go. . . .

The schools in turn must do their share to make the servicing industry a technically proficient group. . . . Theory will have to be stressed much more in the future. . . . We admit that the required theory is contained in every course, but steps will have to be taken to ensure that the student properly digests the information—that the students be made to realize the terrific importance of theory. . . . Schools must cultivate the power of analysis and interpretation in the mind of the student. . . . They must show the all-embracing magnitude of the basic theory and inculcate in the mind of the student the paramount fact that the theory does not apply only to the illustrations given, but that it is possible that future arrangements of a tube circuit or transformer circuit will look different from the basic circuit, but are nevertheless founded upon the basic arrangements. . . .

If schools' texts are limited to certain levels and these levels are not up to the requirements of the present times or are too elementary, then either advanced courses must be established or the courses changed so as to give the student the required theory. . . . Once again we say that schools have included theory and plenty of it in their texts, but the students were permitted to consider this part of the course as a necessary evil. . . . This must be changed.

Radio magazines must likewise do their share if they are going to be of benefit to the radio servicing industry. . . . Theory must be stressed and its importance must be repeated again and again. . . . More theory should appear in magazines. . . . A much greater purpose is served by a series of articles covering the operation of oscillators, for example, with full detail to all of the facts pertaining thereto, than by articles which describe the operation of any one particular commercial device. . . . It is true that such articles, being of the practical nature, have their place, but at a sacrifice of the sorely needed theory. . . .

Servicemen who read these lines may wonder where the money is coming from in order to again attend schools. . . . Naturally it will come from the public, but at any rate further advancement in theory is imperative.

Without the proper theoretical background as the foundation for the servicing establishment, there will be no such establishment in a few years. . . . No one knows what receiver design engineers have in store for the future. . . . Whatever it is, the only way of preparing for it is to recognize the value of theory and to go after the facts. . . .

## Radio Servicemen of America, Inc.

Announcement of the formation of Radio Servicemen of America brought a large number of applications for membership from existing local groups of servicemen including such outstanding groups as Cleveland, Chicago, Binghamton, Denver and Duluth. During the first week of its existence they made inquiry to join and receive Local Charters from Radio Servicemen of America.

These men represent only a small percentage of the servicemen in the country who are now favorably considering affiliation with the Radio Servicemen of America. The work of contacting the various groups and individuals is going ahead rapidly, but due to the magnitude of the task there are many who have not been contacted. Any group or individual who has not been contacted is invited to write RSA, Room 1533, 304 S. Dearborn Street, Chicago, for application blank and information on how to become a member. Where a number of servicemen are formed in a group, such groups are invited to inquire concerning Charters for their local groups.

The Board of Directors of RSA is indeed glad to know that its efforts are receiving such widespread support all over the country and pledges itself to the continuation of its plans to create and maintain a national servicemen's organization of, by and for radio servicemen.

### Silvertone Replacement Parts

We have been advised by the manufacturers of Silvertone receivers that all replacement parts are to be ordered directly from Sears-Roebuck & Co., Chicago, Ill., or any of the company's retail stores or mail-order branches, and not from individual manufacturers, even though it was so stated in the manufacturers' data published in *Volume VII of Rider's Manuals*. Please make a note of this and pass the word on to your serviceman friends. Thanks.

## United Motors 980393 B-O-P

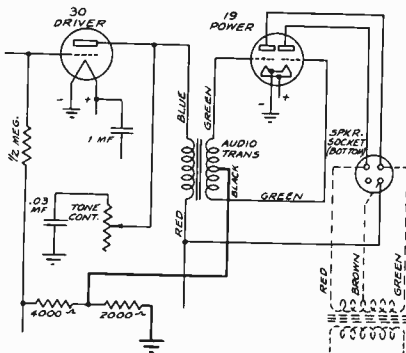
Please add this note to the data on *United Motors page 8-31 in Rider's Volume VIII*. If the receiver does not oscillate at all or oscillates on one end of the dial only, try a new 36 as an oscillator. If this does not cure the trouble, check resistor R-1-A (the 4200-ohm resistor in the cathode circuit of the 36 detector-oscillator) and condensers C-3 (735 mmf) and C-10 (0.002 mf). As the capacities of these condensers are rather critical, they should be tested by replacement. If these tests do not locate the trouble, it will be necessary to replace the oscillator coil.

## Zenith 668

Please make a note on *Zenith page 6-1 of Rider's Volume VI* that the chassis of this set and that of Model 666 are the same except for some mechanical parts changes. An 8-inch dynamic speaker (Part No. 49-114) is used instead of the 6-inch speaker in the Model 666. The output transformer is not included in the 8-inch speaker assembly and its part number is 95-285. A speaker cable (Part No. 52-69) is used in the Model 668 that is not used in the Model 666. The part number of the complete speaker assembly is S-3665.

## Sentinel 65B

The "B" battery drain of the early production of Model 65B sets can be reduced by about 20% and a corresponding increase in battery life obtained by adding the 2000-ohm and 4000-ohm resistors as shown in the accompanying partial schematic. It is also necessary to change the connection of the black wire, which is shown going to ground from the tap on the sec-



The addition of the two resistors reduce the battery drain in Sentinel Model 65B.

ondary of the output transformer on *page 8-27 in Rider's Volume VIII*. This ground connection is changed to the junction of the two resistors mentioned above. This change puts a 3-volt bias on the 19 tube and reduces the "B" battery drain to 18-20 ma.

This change is incorporated in late production receivers and these will be stamped with the letter "A" on the chassis.

## RCA 6K1, 7X1, 8K1

Model 6K1 is similar to Model 6K (for schematic see *page 7-37 in Rider's Volume VII*) except for the following changes: A 5W4 rectifier is used instead of the 5Z4; R-15 in the heater circuit is omitted; a three-point tone control is used instead of the variable control, R-14; and different power transformers are used.

The tone control is connected as follows: Looking at the control (Part No. 13681) from the rear and starting from counter-clockwise lug, lug No. 1 goes to a 0.017-mf condenser, C-30 (Part No. 11451); the other side of this condenser connects to the chassis. Lug No. 2 goes to the junction of C-20 (0.01 mf) and R-9 (27,000 ohms). The third lug is not used. Lug No. 4 connects directly to the plate contact of the 6F6 output tube.

The d-c resistance of the power transformers are: Part No. 12644 (105-125 volts, 50-60 cycles) primary, 8.6 ohms and secondary 745 ohms; Part No. 12645 (105-125 volts, 25-60 cycles) primary 12.9 ohms and secondary, 1120 ohms; Part No. 12646 (100-130/140-160/195-250 volts, 40-60 cycles) primary, 24.5 ohms and secondary 760 ohms. The voltages for the 5W4 rectifier are: Plate to plate, 692 volts and plate to chassis ground, 346 volts. Other voltages remain the same.

The service data found on *pages 7-37 to 7-40 in Rider's Volume VII* are applicable to Model 6K1.

Model 7X1 is identical to Model 7X (see *page 8-33 in Rider's Volume VIII*) except for cabinet design. Model 8K1 is the same as Model 8K (see *page 7-56 in Rider's Volume VII*) except for cabinet design.

## Lafayette M-31 (1935)

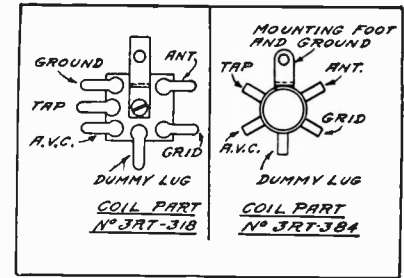
Please make this change on the lower schematic on *Lafayette page 8-6 in Rider's Volume VIII*: A connection

should be made where the lead from B+ crosses the lead from the plate of the 58. A jumper appears there in the schematic.

## Emerson AC Chassis

Please make a note on *page 8-9 of Rider's Volume VIII* of the following change which was received too late for inclusion.

In receivers with serial numbers above 1,335,494 a new antenna coil



Lug arrangement of old and new antenna coils in Emerson AC Chassis.

(Part No. 3RT-384) was substituted for the one having the Part No. 3RT-318. These two coils are interchangeable and the lug arrangements of both coils are shown in the accompanying illustration.

## RCA 6K10, 6T10, 8T10, 9K10

These receivers are similar to models 6K2, 6T2, 8T, and 9K2 respectively, except for cabinet design. The servicing data, as published on the following pages in *Rider's Volume VII*, applies to these new model numbers: 6T10 and 6K10, *page 7-41*; 8T10, *page 7-56*; and 9K10, *page 7-99*.

## Philco 602

The tap between the voice coil and the hum bucking coil should be grounded to minimize hum. See schematic on *page 7-83 of Rider's Volume VII*.

The 133-15 ohms resistor, No. 36, has a part number 33-3235 instead of 33-3225.

Beginning with Run No. 3, the tuning condenser assembly was changed to a vernier type. The part number of this condenser, scale, and pointer remain the same.

The 1-megohm resistor, No. 40 had a rating of 1/4 watt. This should be replaced with a 1/2 watt resistor of the same resistance value; the Part No. 33-510344.

# Successful SERVICING

Reg. U. S. Pat. Off.

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

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Vol. 4 Oct.-Nov.-Dec., 1937 No. 2

## DOOR PRIZES

AS most of the readers of this publication know, we have had occasion to speak before many servicemen at various types of meetings—associations, jobbers, clubs, etc. Likewise our contacts have given us the opportunity of conversing with other men who are called upon to deliver lectures before gatherings of the radio servicing industry. Accordingly, it is quite natural that the subject of door prizes received definite attention.

As a matter of fact, so interested have we become in the subject of door prizes at service meetings, that we wrote an article in "Parts" magazine discussing just that subject and made the suggestion that those responsible for the meetings, usually the jobbers, refrain from giving door prizes. . . . Since the ultimate recipient of the door prize is a reader of SUCCESSFUL SERVICING, it is only natural that we explain the reasons behind the stand we have taken on this subject.

Upon the surface it would appear that all we are after is to deprive the serviceman of the door prize. Such is not the case. . . . Giving door prizes to servicemen in order to attract them to a meeting is actually an evil. . . . Recognizing the tremendous importance of lectures—the value of the information disseminated during such talks—the fact that servicemen of the nation require all possible information, something is vitally wrong if it is necessary to give door prizes in order that the men attend. . . .

We do not wish to feel that something is wrong in the service fraternity. . . . We much prefer to feel that it has become a habit—a bad habit—one

that should be eliminated. . . . It is possible that servicemen attendance falls off because the speaker is not interesting. . . . If such is the case, service association members should request the speakers they like . . . but attend without receiving door prizes. . . . If the subject matter is not of interest, then the servicemen clientele of the jobber should be asked to name the subjects of interest, so that the proper subjects are selected and the men will attend without receiving door prizes. . . . If it is an association meeting then the men can state their wishes during the meetings—but attend without receiving a door prize.

It is true that jobbers vie for the servicemen business and as such each jobber will outdo the other—but servicemen should realize that the value of the merchandise given away each year by jobbers in the form of door prizes totals a respectable sum of money—much more than jobbers should be called upon to give away. . . . They are in the business of selling instruments, oscillographs, tubes, condensers, resistors, etc. . . . They need the profit derived from such sales. . . .

To be just, we must say that many servicemen do not care about door prizes and attend the lectures because they are interested in listening to the speaker. . . . The giving away of door prizes is an injustice to these men because the remainder of the attendance, interested in door prizes, impair the

meeting—make it more difficult for the speaker to deliver an enthusiastic lecture. . . . These men interested solely in the door prizes squat themselves comfortably in chairs and promptly go to sleep until the time arrives for the drawing of the prizes. . . . Then they are wide awake. . . . Because prize drawing tickets are given to all who enter, those who seek prizes bring friends and relatives who have no interest in the subject but to receive a door prize ticket—consequently speak to each other, fidget impatiently—in fact do everything—perhaps unconsciously so—to disturb the speaker. . . . When this happens the serious-minded serviceman does not receive that which he came to get.

It is up to you as servicemen to make your meetings of greatest value to yourselves. It is up to you to recommend to your jobbers that they do away with door prizes. . . . When this is done, the meetings will be attended by the type of men who are really interested in the subject at hand. . . . In order to eliminate the door-prize evil, your jobber depends upon you. . . . Each is afraid to act independently because each fears that he will be sticking out his chin for a knock-out punch if he stops donating door prizes and his competitor continues the practice. . . . Do your share to make service meetings of 1938 successful meetings. . . . Do away with door prizes.

JOHN F. RIDER



## RIDER'S VOLUME VIII

**I**N the last issue of **SUCCESSFUL SERVICING** we told you something about the makeup of a Rider Manual and now you can see for yourself the results—Volume VIII is published and without doubt *it is the biggest and best Rider Manual yet offered to the servicing fraternity.*

Let's look at the record . . .

First of all, Rider's Volume VIII has **1650 PAGES** and each one contains as much servicing information as was possible to get on it. And fortunately for you in the service field, the manufacturers are releasing more detailed data that will help you—and you will find it all in Rider's Manuals. It is true that in many cases the data will be found in a different form than supplied to us originally, but we found it was possible to condense some of the information—for instance, the alignment instructions—and in that way provide the needed space to run the data on more models. And here is something else for the record—there are **1715 models covered in Rider's Volume VIII.** . . .

Next—the Index. . . . As you know, the Index to Rider's Manuals is always cumulative—the data of the new Manual are listed according to model number in proper sequence with those already published. The exact contents of every page in Rider's Manuals is stated in the Index—so that you can instantly locate the exact page you seek. . . . This means greatest convenience and most rapid use of all Rider Manuals. **The Index you will find with your Volume VIII contains 128 PAGES!**

Now the special section—"HOW IT WORKS." . . . The first thirteen pages are devoted to a discussion of conventional alignment—why alignment is necessary—how and where the signal generator and output indicators are connected—the various adjustments that have to be made—image check—wave-trap and 10-kc filter adjustments, etc. Then follows a discussion of the functioning of various circuits which are incorporated in the models listed in Rider's Volume VIII—interesting and new r-f and i-f circuits—audio regeneration—avc and afc circuits—a discussion of the sensitivity data and its value to the serviceman—a theoretical de-

scription of the electronic piano, a fore-runner of other electrical musical instruments that will come within the province of the serviceman.

Throughout this special section we have chosen circuits right out of Volume VIII to illustrate our various discussions. These circuits are typical of several others that you will more than likely meet in your service work and having such an explanation and breakdown will prove of the greatest value. For instance, we chose the Philco Model 38-116 as illustrative of a multi-band receiver. Just a glance at the schematic will show how complicated the switching arrangements are. Therefore to make all this clear, we have drawn four breakdown schematics showing just how the various components are connected for each band. This method of breaking-down a circuit is employed throughout "How It Works," so that with a bit of study you can become thoroughly familiar with the newest circuits and as a result, do a better servicing job on any of the new sets that come into your shop.

And here is another important factor—even though the cost of paper, cover material and steel for the binder, labor, and everything has increased, we have kept the price of Rider's Volume VIII equal to that of last year's Volume VII. No increase in price despite the increase in the size of the Manual itself, in the number of pages in the Index, not to speak of the additional special section, "How It Works."

The next time you go into your jobber's ask him for Rider's Volume VIII. Look it over carefully—look at the twenty-seven double-spread pages—notice the completeness of the data, its legibility—notice the coverage of manufacturers—103 altogether, not counting trade names. . . . Then examine the Index and "How It Works" section bound with the Index. Look it over carefully and we are positive that you will come to the only possible conclusion—**Rider's Volume VIII is the finest and biggest collection of servicing data ever gathered and bound between two covers and the eight Rider Manuals represent the most complete—most accurate and detailed compilation of radio service data the world has ever seen.**

Rider's Manuals "Changes" Pages

*In the rear of VOLUMES VII AND VIII OF RIDER'S MANUALS will be found pages containing data that have been published in SUCCESSFUL SERVICING in issues from September, 1934 to September, 1937. For the most part, these items concern the various changes that manufacturers have made in their receivers between the time that the original service bulletin was issued and the publication of the Manuals. Also supplementary data were included on those pages which were unavailable when the Rider's Manual containing the original material went to press.*

*The items on these pages of Volumes VII and VIII are listed in the regular Index under the manufacturer and model number as "Changes" or "Additional Data" and you are there referred to "Changes 7-1" or "Changes 8-2", etc. So if you are working on a set and find such a reference in the Index to Volume VIII under the model number of that particular receiver; be sure to look it up . . . something will be there that you should know about.*

### BRAIN TEASERS

1. Laws of most states provide punishment for certain anti-social acts and also for their attempted commission; however, the attempt is not considered as heinous as the actual commission and is punishable in a lesser degree. There is one act for which the offender can not be legally punished if he actually commits it, but the attempted commission is punishable. What is it?
2. A man went hunting birds and rabbits. After a day in the woods he was asked what luck he had. He replied "I got 36 heads and 100 feet". How many birds and how many rabbits did he kill?
3. Can a man marry his widow's niece?
4. Add two strokes to I I I I and make nothing.
5. The combined value of two U. S. coins is \$1.01. One of the coins is not a penny. What are the coins?
6. Can you translate this?—YYURYYUBICURYY4ME
7. One of seven guests of a restaurant dined there each day; a second guest dined there every second day; a third every third day, and so on up to the seventh who ate there every seventh day. After how many days would the entire seven appear at the same time?
8. A man buys a pipe and tobacco for \$1.10. The pipe cost a dollar more than the tobacco. How much was the tobacco?

For answers, see page 7

### TRY THIS YOURSELF

Apply a strong solution of salt and water several times to your forearm. When the several layers are dried, scratch a message on your skin with a pointed stick. Now if the arm is rubbed briskly; the message will appear in red under your skin.

# Rolling Reporter



## RUMOR—

We saw in the paper the other morning that head cops from all over the country had gathered here in town to talk a little shop and that in the course of all the conversation that was spilled it came out what a great help radio was to the country's "finest." That's no rumor, of course, but this is—television is going to be used to give the mobsters and gangsters their just desserts—and we don't mean apple pie or *crêpe Suzette* or *zabaglione* . . . (gosh—that makes us hungry . . . Anybody gotta ham-and-swiss-cheese sandwich in his pocket???)

## FACT

Well, gang, the printer has pushed the 1650 pages of Rider's Volume VIII into their binder and now thousands of these 1650-page behemoths (*heluva large object to you*) are going to all parts of the country . . . And is your Reporter glad that Manual is done??? YES!!! The Boss even had us working on it!!!!!! Laff that off, willya? We never saw so many pages in one office in our life and we had a scrap on our hands every time we wanted to use our Qwerty (*typewriter to you*). And wotta flock of artists and paster-uppers there were under foot!!!! Yep, we're glad Volume VIII is history, as far as we're concerned.

An' speakin' of history—that's wot Rider's Volume VIII is goin' to make, or may we lose our skill at mixin' a dry Martini—(*Editor's Note—Or drinking it?*) Not only are those 1650 pages *chuck-full* of the latest stuff you guys need in your biz, but the Boss has compiled 64 pages of technical information that will answer that famous question, "*Now, how does this thing perk?*" It's called "*How It Works*" and you'll find it *bound right in with your 128-page index* . . .

## NEW CIRCUIT

Ever on the alert to give you the *latest*, we pass on this AP item we culled from this morning's public prints—A psychology instructor at fair Harvard can receive radio programs by filling one ear with salt water, inserting a piece of wire into the water and strapping a second piece of wire to another part of his body. It goes on to say that musical programs can be heard but not announcements. (*Is that a break, we ask you???*) It was explained that the energy carried into the ear by the wires caused hairs in the inner ear to vibrate. Of course, all this sounds like something *Doc Savage* or *Buck Rogers* might dope out, but we've gotten over saying "it can't be done" . . . mebbe so, mebbe so—but what will be the effect on servicing???? *Looks as though the serviceman of the future will have as his tools an ear-dropper and a bottle of Atlantic or Pacific!*

## N. Y. PARTS SHOW

Guess we might just as well go on record with the following . . . This show was a grand, glorious, etc. etc. ETC. success. When we wandered around the exhibits, we had to stretch our neck to see over the shoulders of servicemen who

were crowded around every booth and going along the aisles, our life was constantly being menaced by our feet getting all tangled up in the canes sported by the servicers, most of whom certainly did NOT know how to wear 'em. *The speeches?* Yes, lots of those and we stopped our sight-seeing long enough to listen to J.F.R. tell the gang that if they wanted to keep up with the times, they'd have to burn a lotta midnight oil and find out how the innards of some of these 1938 sets perked.

## OUTA DE SACK

Goh Gin Kooi, Penangradio, Penang.—Thanks for offering to pay for Successful Servicing, but we're only too glad to know our efforts are appreciated on the other side of the world . . . You're on the list . . . and it won't cost you anything . . . *it's free to all.* H. W. Angel, Salem, Ill.—Thanks for letting us know about that i-f peak . . . Harold Wilder, Wallingford, Vt.—When you get your Volumes VII and VIII of Rider's Manuals, you'll find quite a few pages devoted to changes that have been run in S.S. *And you'll also find them listed in the regular Index* . . . How's that for service? Something done *even before you ask for it!!!!* Edgar C. Dragon, Putnam, Conn.—Yes, we know that case histories are important, but most of the fellows we know use a card file. One man told us he indexed his his-

tories right on the page carrying the schematic in his Manuals . . . Robt. Waugh, Montreal, Canada.—We're glad you like Vol. VII and find it such a help. We see you're taking Rider's oft-given advice—going to school and getting the low-down on servicing the new sets. Congrats on your energy and you'll get S.S. (*Aside to a lotta other guys—How about following Bob Waugh's example???*) S. F. Pusey, Madera, Pa.—We have sent you the data requested. Thanks for letting us know. Sorry we can't adopt your suggestion . . . A. F. Harri-man, Erving, Mass.—If you think that Manual is good, *wait till you see Vol. VIII!* Boy, it's a HONEY!!!

## IN THIS CORNER—

We have Sleigh-Ridin' Santa who is about to stage THE battle of 1937 with Pop's bank account (*if any!*) . . . And so-o-o-o-ooooo—here's a collection of the *Heartiest*, HOLLY-WREATHED wishes for a MERRY CHRISTMAS that you've ever had dumped in your lap (Clamor from The Red Head and Aloysius W.—*Hey, you wanta get in on that Merry Icksmus stuff, too!!!*) (OK, you're in—*pardon the interruption gang*)—and now listen to this: 1938 is goin' to be the Luckiest and Most Prosperous year yet for ALL OF YOU... Yes, sir, that's the prognostication of

## THE ROLLING REPORTER.

## Emerson AR Combination Chassis

We received too late for publication in Volume VIII of Rider's Manuals data on Models AR-165, AR-166, and AR-177 in which are incorporated the Chassis AR with a phonograph. The service notes on the AR chassis which may be found on Emerson pages 8-41 to 8-44 in Rider's Volume VIII, apply to the early production of these combination models, less, of course, the phonograph connections. The later models (those after serial No. 1,326,200) have two 41 tubes in push-pull, instead of the single 41 in the output; also a 6Q7G is substituted for the 76 second detector and avc. This new tube is also used as an audio amplifier.

## Philco 610

We have been advised by the manufacturer that the following changes should be made in the schematic numbers of this model found on page 6-19 of Rider's Volume VI: the schematic number 54 should be changed to 41; No. 41 to 56; No. 56 to 54; No. 39 to 40; and No. 40 to 39. This will make the numbers of the wiring diagram, the base view, and the parts list agree.

Beginning with Run No. 15, the oscillator circuit of the second type of this chassis (*see page 7-87 of Rider's Volume VII*) was changed to improve the oscillator action at 6.0 mc. Re-

sistors No. 17 and No. 18 (51,000 ohms and 25,000 ohms) were removed. A 32,000-ohm resistor (Part No. 33-332133) was added from the switch terminal side of condenser No. 7 in the antenna circuit to ground. A 20-ohm resistor, Part No. 33-020133 was connected between the 6A7 cathode and ground.

## Double Spread Pages

In Volumes VI, VII, and VIII of Rider's Manuals double-spread pages have been used for those schematics and diagrams which could not be reduced to fit on the standard size page. These pages will be found in the front of the regular pages of each manual, bound together with a paper band. The serviceman is requested on this band to place the double-spread pages in their proper places in the Manual.

In Volume VIII it was necessary to use twenty-seven double spreads and as usual they will be found in the front of the Manual. Banded with them will be found two single pages which should also be inserted in their proper places according to manufacturer and page number.

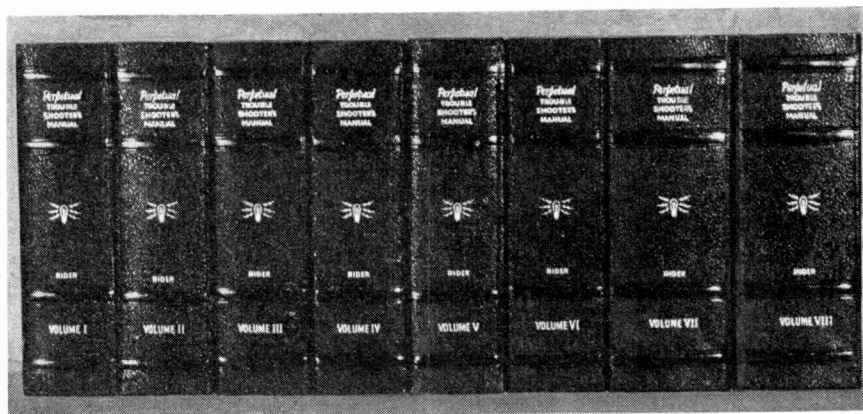
## ANSWERS TO BRAIN TEASERS

1. Suicide.
2. 22 birds and 14 rabbits.
3. No; he would not be alive.
4. NIX.
5. One is *not* a penny, but the other coin is a penny.
6. Too wise you are, too wise you be, I see you are too wise for me.
7. 420 days.
8. Five cents.

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