MARCH 1949 40c

RADIO MAINTENANCE

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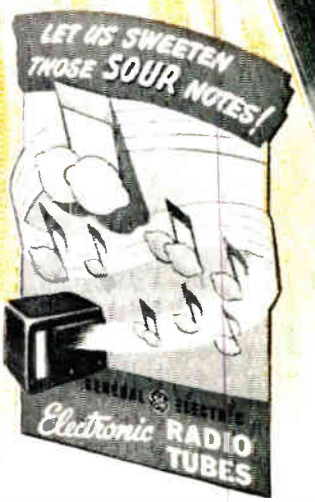

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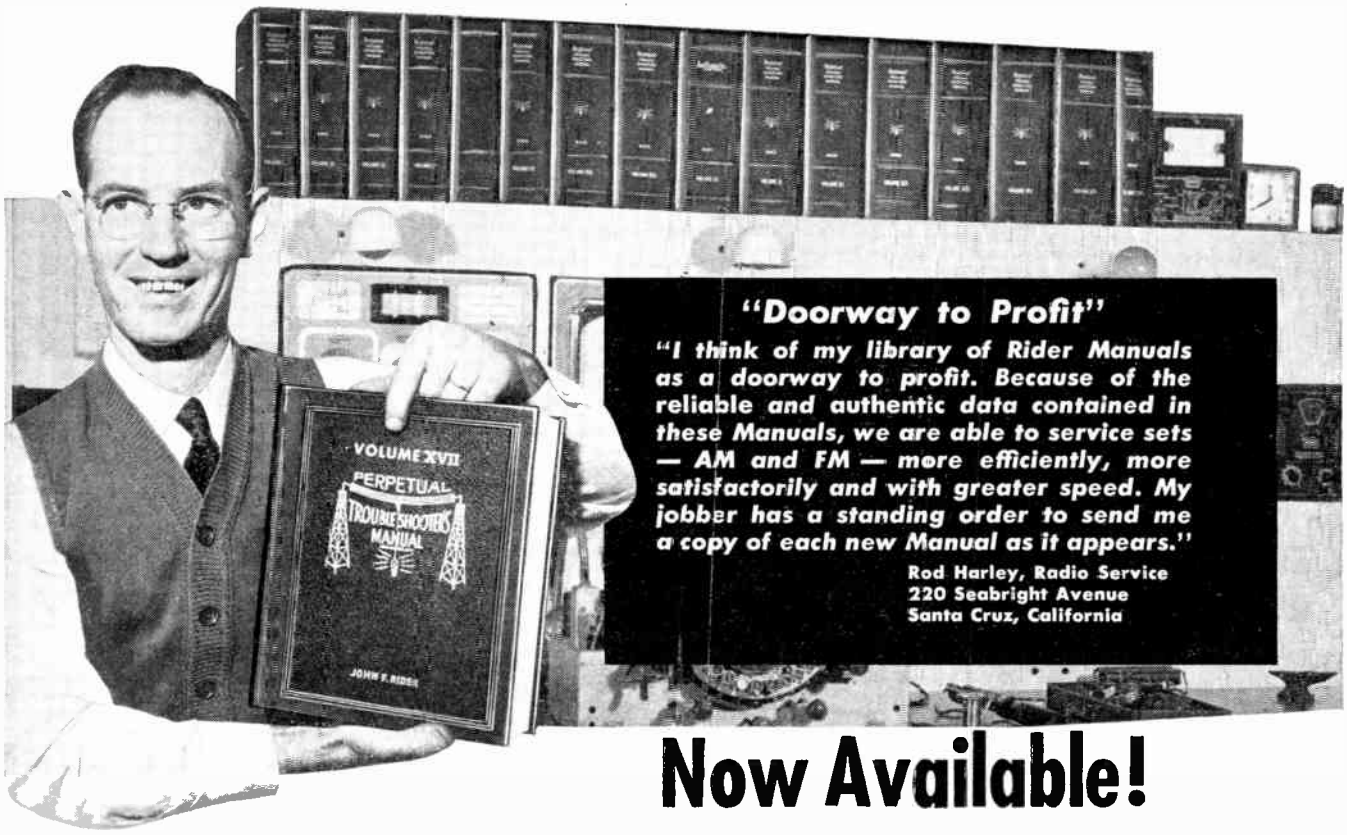

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NOTE: The Mallory Radio Service Encyclopedia, 6th edition, makes reference to only one source of radio receiver schematics—Rider Manuals.
ANOTHER NOTE: The C-D Capacitor Manual for Radio Servicing, 1948 edition No. 4, makes reference to only one source of receiver schematics—Rider Manuals.

Test Pointers

ON VISUAL ALIGNMENT

Always a useful service instrument, the oscilloscope has become indispensable since the advent of FM and television. Technicians who have familiarized themselves with oscilloscope operation are now able to capitalize on opportunities for present-day servicing requiring visual-alignment facilities.

Visual alignment is a technique which presents the frequency response curve of an amplifier upon the screen of an oscilloscope. A representative video-if response curve is shown in Fig. 1. In some cases, this curve will appear "upside down" or "left to right"; however, the position of the curve is of no consequence.

A response curve shows the selectivity characteristic of an amplifier in terms of output voltage versus frequency. Each point along the base line corresponds to a certain frequency, and the height of the curve above each base-line point indicates the output voltage at that frequency. A transparent graph screen is placed over the face of the cathode-ray tube to determine relative output voltage values. If the scope is calibrated in terms of volts/inch deflection, absolute voltage values can also be measured.

An over-all video-if curve, as shown in Fig. 1, should rise rapidly at the low-frequency end, while the high-frequency end should drop gradually. In this figure, the dip at 21.25 Mc is caused by a sound trap. Another dip at 19.75 Mc is caused by an adjacent-channel picture-carrier trap. The 4-Mc bandwidth of this curve is the frequency span from 21.75 Mc to 25.75 Mc. Note that the picture carrier frequency (25.75 Mc) is placed approximately 50% up the curve; this requirement arises from the single-side-band system used in television transmission.

Such a visual-alignment curve presents all necessary alignment information at a glance, and makes the over-all effect of a trimmer adjustment immediately apparent. Even when stagger-tuned if stages are individually peaked an over-all rf-if response measurement must be made to insure proper alignment. (The frequency at any point along the curve is determined by means of a "marker," as will be explained in another Test Pointers article.)

When the response curve is incorrectly shaped, various picture defects result. Insufficient bandwidth causes inadequate horizontal resolution which shows up as a blurred picture. If the curve does not dip properly at the trap frequencies, interference frequencies will enter the video channel and cause bars to appear in the picture. If the carrier is placed too far down on the curve, the low video frequencies are attenuated, which results in poor picture quality, unstable sync, and poor blanking. Numerous other difficulties arise from improper alignment, which are beyond the scope of this article.

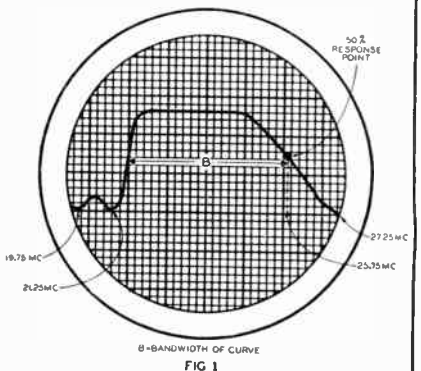

FIG 1

Contrary to popular opinion, an oscilloscope used for television alignment or for video-amplifier adjustment need not have a wide frequency response range. However, the vertical amplifier should have good linearity in order to obtain accurate voltage measurements. A crystal probe is used in combination with the oscilloscope to observe video-amplifier frequency-response curves. Additional operating convenience is afforded by a built-in calibrating voltage source, and a VTVM-type vertical range switch.

RADIO MAINTENANCE

INCLUDING ELECTRONIC MAINTENANCE

Volume 5 MARCH 1949 Number 3

CONTENTS

Radio Maintenance is published monthly by Boland & Boyce, Inc., at 34 No. Crystal St., East Stroudsburg, Pa., U.S.A.; Executive and Editorial Office, 460 Bloomfield Ave., Montclair, N. J. Subscription Rates: In U. S., Mexico, South and Central America, and U. S. possessions, $3.00 for 1 year, $5.00 for two years, single copies 40 cents; in Canada, $3.50 for 1 year, $6.00 for 2 years, single copies 45 cents; in British Empire, $4.00 for 1 year, $7.00 for 2 years, single copies 60 cents; all other foreign countries, $5.00 for 1 year.

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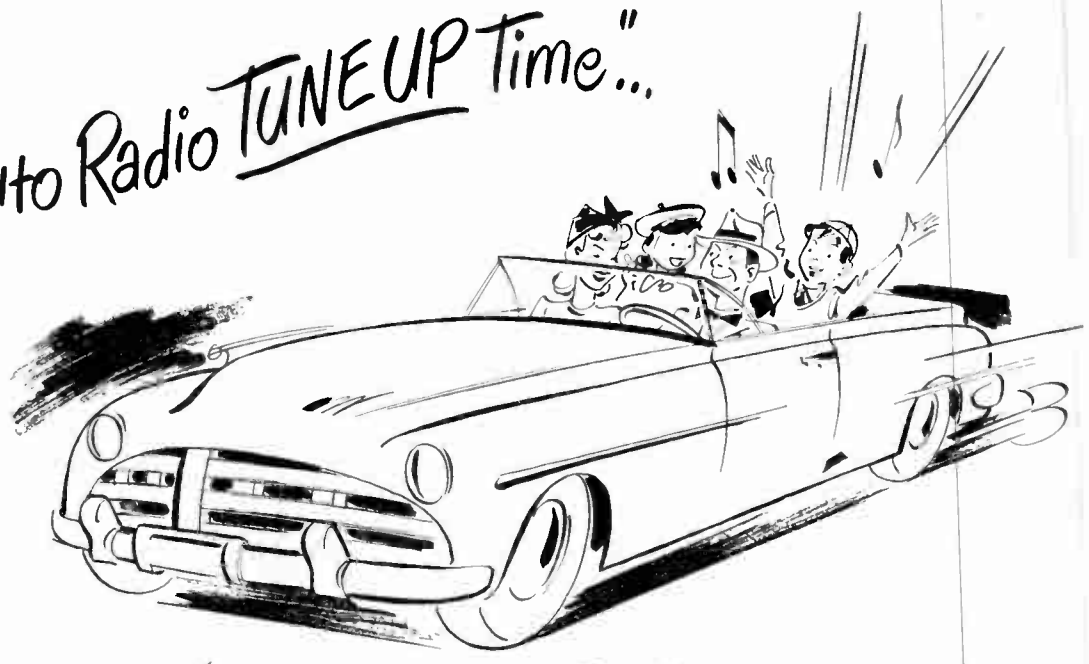

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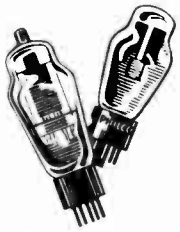

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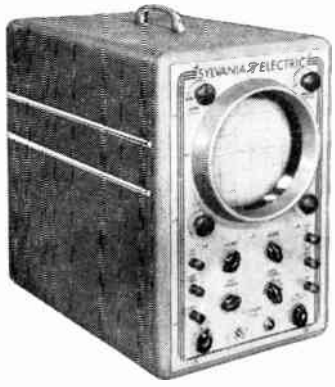

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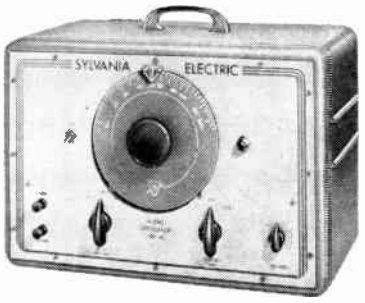

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Editorial

"Don't Lose Your Shirt"

A FEW days ago I ran into an old acquaintance of mine. A service technician of long experience. And, as usually happens on such occasions, the conversation drifted to people we had both known before the war.

I asked my friend if he had heard anything of a particular fellow—I'll call him Bill—whom I had always admired. Bill was what I considered a first rate technician, a real wizard with a test prod. He could move sets across a bench faster than anyone I knew.

My friend told me that he had met Bill, on and off, in the last few years. Early in the war Bill had entered the Armed Forces. He had served in the artillery as a gunner. If I know Bill, I'll bet he would have preferred the Signal Corps. He had always liked his work and I'm sure he would rather have stayed in radio.

When Bill was discharged, you might have suspected that he would have been pretty rusty but, according to my friend, he didn't show it. He went to work for an outfit which employed four technicians and, in a matter of weeks he had proved himself to be the best man in the shop.

It seems that Bill had been making his own post war plans. He had saved his money and when television arrived he was ready for it. Just like a good technician he was, Bill had studied and read everything on television he could get a hold of. Radio was his hobby, his work and, according to his wife, his worst vice.

Bill opened his own business, specializing in television service. He knew the value of good test equipment and a well organized shop. He bought the best. It was no wonder that he had no trouble in securing appointments as an authorized service organization for several teleset manufacturers. He bought a truck and began installing sets as fast as he could. When Bill did an installation, it stayed put. That was Bill's style.

It wasn't long before Bill had bought a second truck and then a third. He had three crews working

six days a week. They installed more than 200 sets a month.

All work was done on contract. Each customer signed a contract for the installation of his set and a year's service. Payment was made at the time the contract was signed.

After about three months Bill found it necessary to assign one truck to the job of answering the calls of customers having service contracts. In another three months he found it necessary to assign a second truck to the same job. This was necessary, it seems, because in the intervening months he had doubled the number of sets he had on contract.

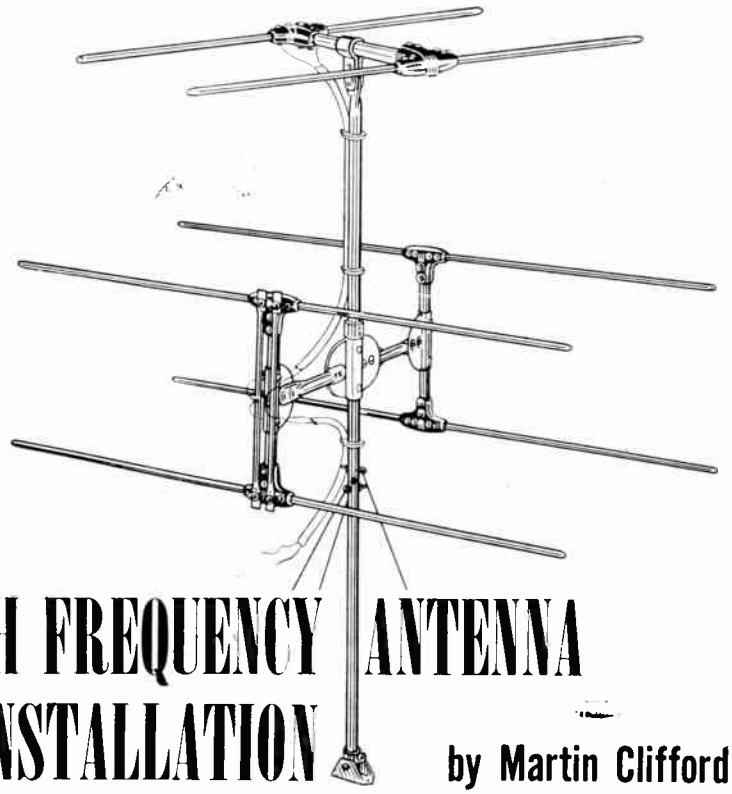
When all three trucks had been installing receivers Bill was being paid for the installation and an additional sum for service work. The payment for service was actually an advance on work which was to be done when a customer's set failed. In the early part of the year Bill did not have many sets on contract and therefore he did not receive many service calls. As time went on the number of receivers on contract continued to grow. Since the number of sets installed each week remained approximately the same, during the period the three trucks were operating, Bills income remained the same. However as the backlog of receivers on contract grew, the number of service calls increased until the installation crews were spending more time answering service calls than they were installing new tele-sets. As a result income began to drop.

It wasn't long before Bill received a bad shock! Because he had failed to hold a sufficient part of his income in reserve, the part which was paid for the year's service, he was broke.

Without money to meet his payroll Bill had to let most of his help go. He had to sell one and then a second of his trucks. By working twelve and fourteen hours a day he managed to stay in business for the rest of the year until his service contracts began to run out. As the contracts ran out the quantity of work diminished and Bill was able to begin taking renewal contracts. So, he managed to stay in business.

The moral of the story, of course, is that no matter how good a technician you are you will lose your shirt if you don't know how to run your business.

JJR



HIGH FREQUENCY ANTENNA INSTALLATION

by Martin Clifford

The techniques described in this article are the result of practical high frequency antenna installations. They will save you time, effort, and money; and they will improve your work

MORE and more television stations are going on the air, the available channels being occupied rapidly. For the owner of a television receiver, this would appear to be highly desirable, since it gives him a wider choice of entertainment. For the service technician it poses the problem of *how* to enable the set owner to get *all* the active channels.

A single antenna could be installed to receive all the television stations. However, an antenna is actually a broadly tuned circuit, and thus, no matter what the size of the antenna will be, it will be impossible not to favor certain stations. As a result, when using a single antenna to cover an enormously wide frequency range (from 44 Mc to 216 Mc) we can expect good results in receiving only a few stations.

The most obvious solution is to install two television antennas instead of trying to rely on just one. One of these two antennas can be used to cover stations in the lower frequency range (from 44 Mc to 88 Mc) while the other antenna will be used to receive signals in the high frequency range (from 174 Mc to 216 Mc).

These two antennas, the low frequency antenna and the high frequency antenna, can be connected to the television receiver in several ways. The first of these methods is the one in which two separate lead-ins (a pair of 300-ohm twin leads) are used. One lead-in is connected to the high frequency antenna and the other to the low frequency antenna. At the receiver end the two lead-ins are connected to a wafer type double pole double throw switch. This switch is knob controlled from the front end of the set. The set owner thus decides which of the two antennas he will use. This method, although fairly practical, has two very serious disadvantages. Using two lead-ins is an installation nuisance and expense, particularly where very long lines are involved; and forcing the customer to switch from one antenna to the other is bad. There are enough controls on a television set without having an antenna switching arrangement.

Eliminating Separate Lead-ins

Instead of using two separate leadings, we can use the four wire line shown in Fig. 1. The four wire line is simply a double twin lead imbedded in polyethylene plastic. Three of the wires in the four wire line are made of plain, untinned six-strand copper wire. The fourth wire is tinned. The tinning is a color code and helps identify the leads going to the low frequency antenna and those leads going to the high frequency antenna. However, using a four wire line, while eliminating two separate lead-ins, still leaves us with the disadvantage of having an antenna switching control at the receiver.

We can get rid of the switch by connecting the two antennas in shunt with a small piece of 300-ohm transmission line, and then using only one lead-in to the receiver. This type of installation has much to recommend it, since we have only one transmission line going from the two antennas to the receiver and no antenna changeover switch.

In many instances, however, it will be found that the overall picture quality is not always good, because the two antennas, when so installed, will react or interfere with each other. The two antennas will try to behave as such, that is, each will try to pick up as much signal as pos-

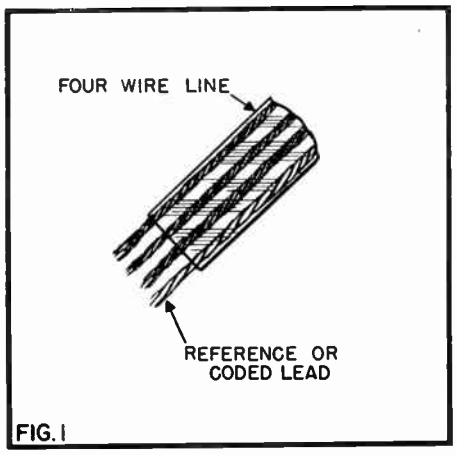
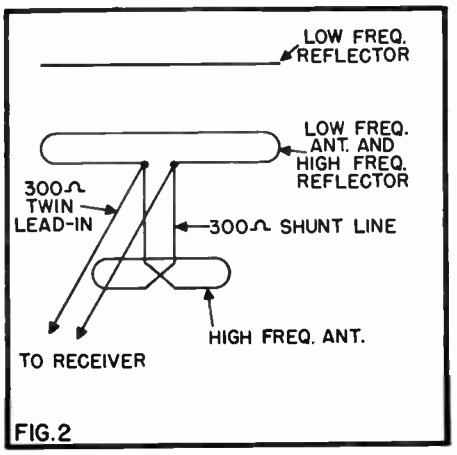


FIG. 1



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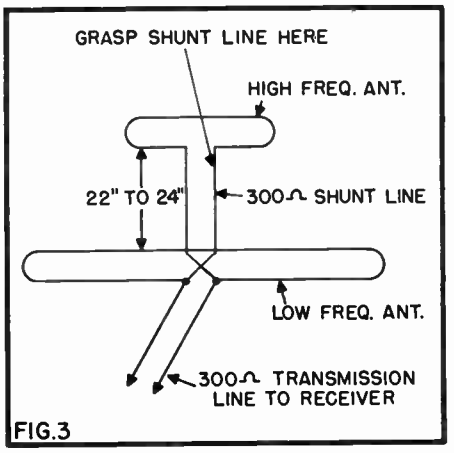

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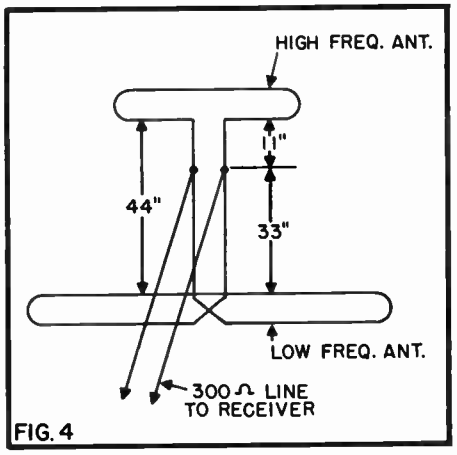
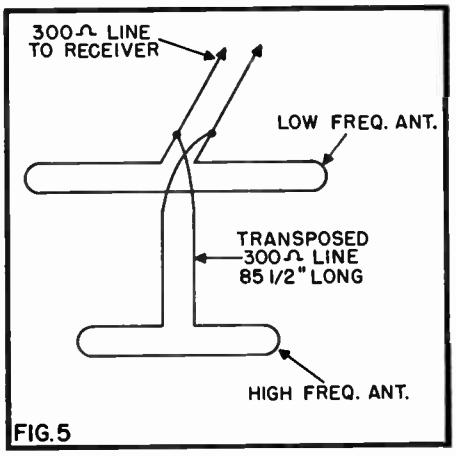


FIG. 4



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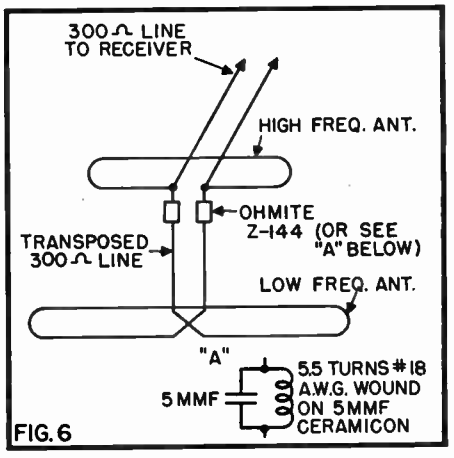

FIG. 6

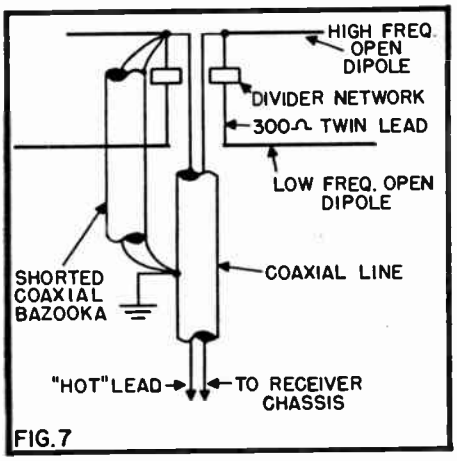

FIG. 7

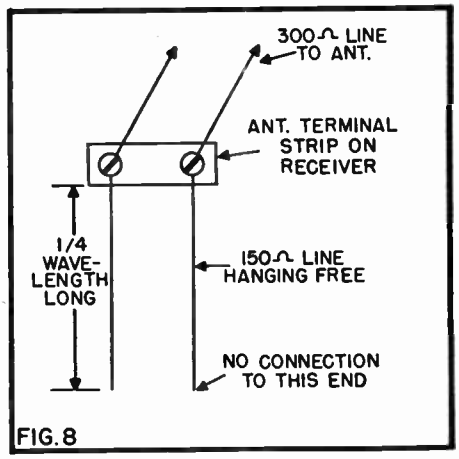

FIG. 8

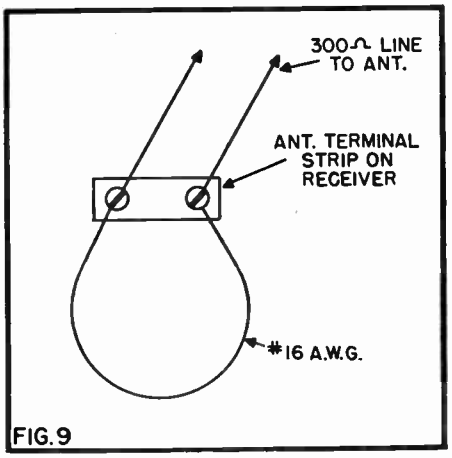

FIG. 9

sible and send it along to the receiver. What we need then is some system whereby the two antennas will be made fairly independent. While this fundamental circuit (shunting the two antennas) is a good one, there are a number of things that we can do to minimize reaction between the two antennas.

The first and easiest remedy is simply to twist (once) the transmission line connecting the low frequency to the high frequency antenna. This is shown in Fig. 2. Note the double use of the low frequency antenna both as an antenna proper and as a reflector for the high frequencies.

Distance Between Antennas

It will be found that the distance between the two antennas will affect the picture results. Vary the distance between the two antennas until the best pattern is obtained. A method used by practical servicemen is shown in Fig. 3. The two antennas are set up at a distance of approximately 22 to 24 inches from each other and are shunted by a piece of 300-ohm transmission line, transposed once. The television receiver should be turned on and a test pattern tuned in. Starting from the high frequency antenna, grasp the shunt transmission line connecting the high and low frequency antennas. Holding this transmission line between your two fingers, move them slowly toward the low frequency antenna. The test pattern will gradually get weaker and will finally black out. Cut the shunt transmission line at exactly this point and connect the high frequency dipole to it.

An installation of the type just described requires the services of two

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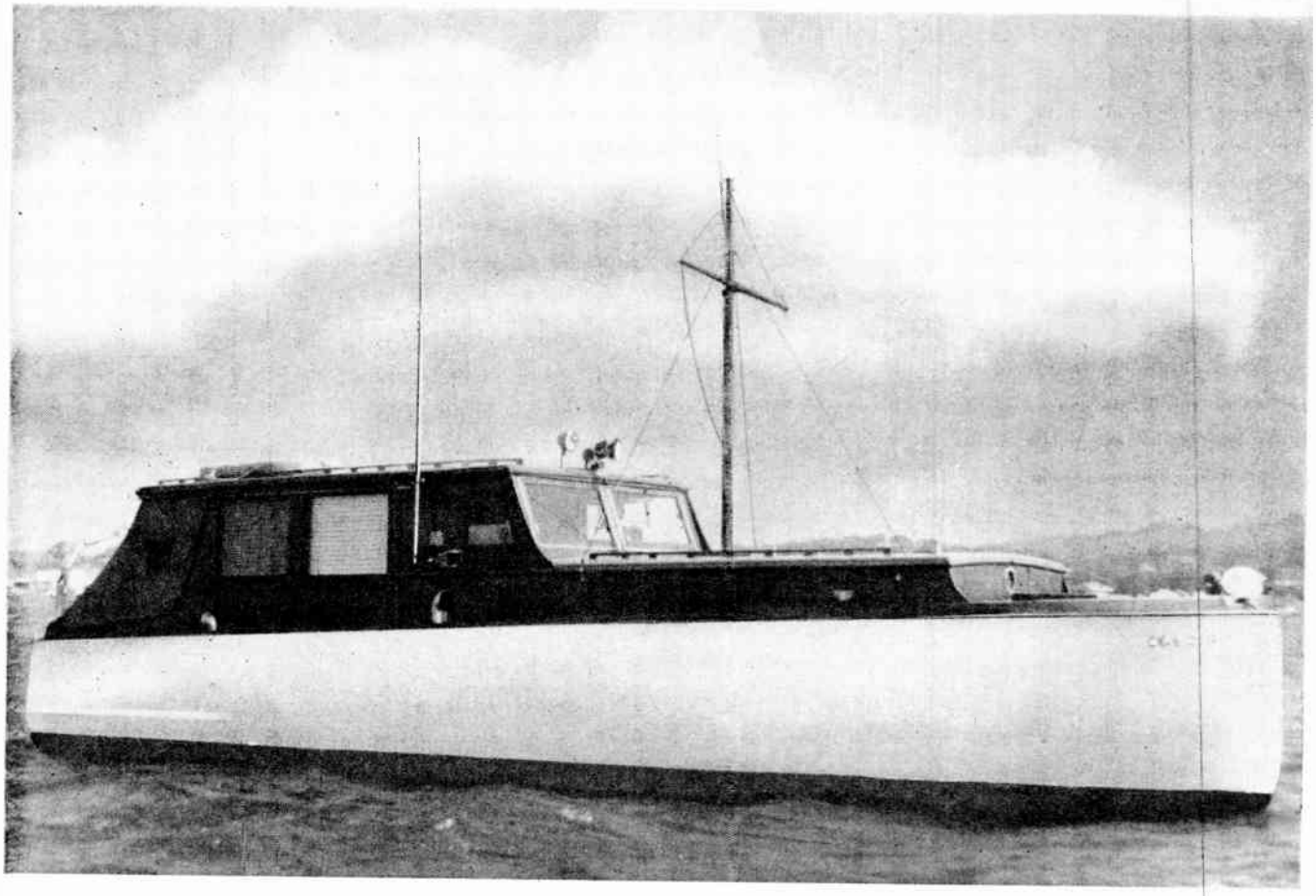


MARINE servicing

by C. C. Erhardt

Here is the first in a series of two articles of particular interest to technicians on the coasts. With summer around the corner the field of marine servicing is of immediate interest

IN March and April of this year thousands of pleasure craft, in boat yards all over the country, will be readied for their return to the water. In addition, hundreds of new boats will be sold. Here is the time for alert servicemen to cash in on the sales and service of marine radio equipment. In warm localities such as Florida and Southern California year-round opportunities are afforded; in the northern sectors spring and summer are the boom seasons. Every time you see a radioless boat, whether it be a skiff or a super deluxe yacht, you are looking at a potential sale for a radiotelephone.

Many service technicians have shied away from marine work because of their unfamiliarity with the equipment, particularly the transmitter end. It is the purpose of this article to clarify this situation and to outline the necessary steps to follow in order to become established in marine radio.

First of all, what is a marine radiotelephone? It is a short wave receiver and transmitter capable of voice communication in the following categories:

1. Ship to shore (Marine Operator). By establishing an account with the local telephone company, a boat owner or passengers may make telephone calls at sea. Through the land line facilities of the Bell Telephone system he is able to make long distance as well as local calls. The marine operators also broadcast weather reports and aids to navigation.

2. Ship to ship. Two channels are available for communication between boats.

3. Coast Guard. The U. S. Coast Guard maintains a continuous watch on its marine frequency and is available for calls relating to safety at sea.

A selector switch on the front panel enables the operator to choose the desired channel. For a boat going on long trips, additional channels will be needed as the marine operator works on different frequencies in different localities. On some sets, as many as ten channels are incorporated.

Power Ratings

Marine radiotelephones come in a variety of sizes and power ratings. They range from simple 5 watters to powerful sets of 75 watts or more. On small boats where space is at a premium and where the cruising range is not very great, a 5, 10 or 30 watt radiotelephone will give very satisfactory service. However, on larger craft which at times are 100 or more miles off shore, a more powerful set is necessary. The 75 watt, Model ET8012D, manufactured by Radiomarine Corporation of America, is a typical example of a radiotelephone designed for long range communication.

Storage battery operation is used almost exclusively on the lower powered sets and there are many types on the market which operate from 6, 12, or 32 volts of storage battery. In the higher power bracket, most sets are designed to operate from a-c or d-c generators.

Before the boat owner may legally use his set he must first obtain two licenses—a station license and a limited radiotelephone operator's license. Both of these are very simple to obtain. They merely involve filling in the required information concerning the boat and the set and stating that the applicant is familiar with the radio laws governing this service. Application blanks may be obtained from the local FCC office, or by writing direct to the Federal Communications Commission, Washington, D. C.

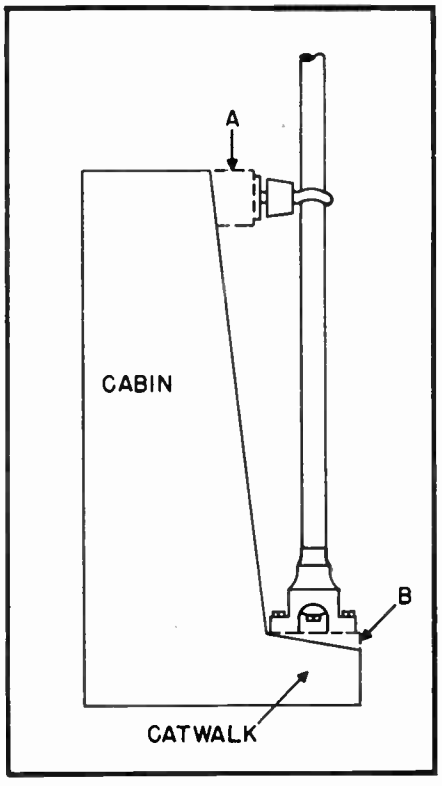
Anyone may install a marine radiotelephone; however the actual transmitter tuning must be made by a holder of a second class (or higher) telephone license. The technical examination that must be passed in order to obtain this license is not too difficult, and it would be well worth a serviceman's while to study up and receive his ticket. An alternative method would be to have someone with the necessary license make the final adjustments on each of the installations.

Establishing Business Contacts

By far the best way to get started in the marine radio field is for the serviceman to set himself up as a distributor for one or more manufacturers. In this way he will realize a profit on the sale as well as on the installation of the sets. Most manufacturers are glad to secure extra outlets for their products.

Another way would be for the serviceman to ally himself with an established distributor and to confine his activities to installations and repairs at an hourly fixed rate.

The average fee charged for a complete installation is about $75.00. This fee covers labor plus necessary cables and hardware, but does not include the antenna or any other extras. The time involved depends on the type and size of the boat and the number of obstacles (if any) encountered. Generally speaking, two men can make an installation in approximately four to six hours. On more elaborate installations, where the power supplies are located away from the set, a somewhat larger period of time will be necessary. Although it is quite possible for one man to make an installation, it has been found that two men, working as a team, can do a more efficient job in less than half the time.



Compensating blocks A and B are needed to obtain square surfaces for mounting antenna

As in the case of any other business establishment, some sort of advertising campaign should be mapped out. However, in this type of specialized field, the usual methods of newspaper ads, handbills, etc., may not be very effective. Where then should we focus our sales activities?

The logical place to begin would be at the boat yard where the boats are kept during the winter months. Most boat owners have a great deal of confidence in the men who care for their craft and they are the ones they turn to for advice when they are contemplating the purchase of a radiotelephone. It is decidedly helpful to cultivate the acquaintance of the boat yard owner or manager before the onset of the boating season. If he is impressed with your ability as a serviceman and with the quality of the product you handle, you can be sure that he will remember you whenever radiotelephones come under discussion. Be sure to leave with him some sales literature as well as a few of your business cards. Literature on the radiotelephone may be obtained free of charge from the manufacturer.

Some Sales Pointers

Perhaps even more important than the foregoing is the direct approach to the boat owner himself. Many of these individuals have never given any thought to radio communication on their boats and the subject, whether it culminates in a sale or not, will usually interest them. Without resorting to any high pressure methods, point out to him the advantages of having a radiotelephone aboard his boat—the pleasure of conversing with friends and relatives over the air, the convenience of being able to talk to other boats and, most important of all, the secure feeling that he may be able to contact the Coast Guard should an emergency ever arise. Here again, the illustrative literature is important be-

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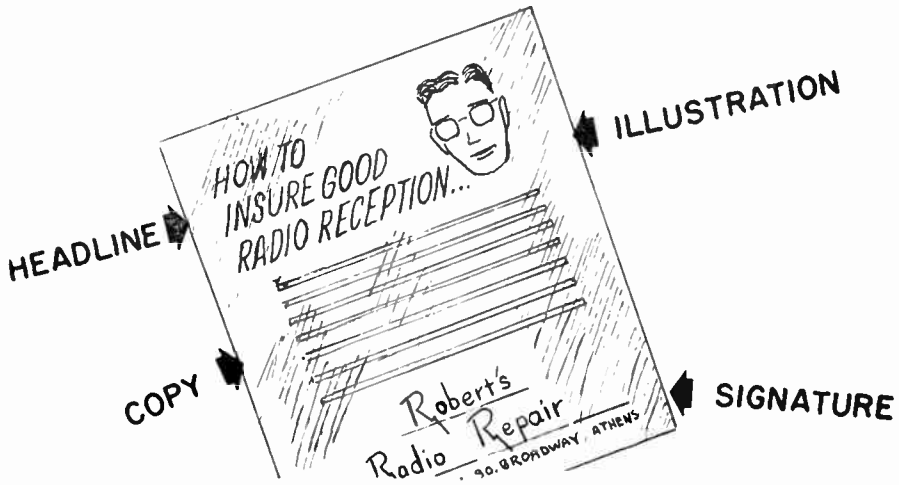

Creating your Ad

by Victor M. Turner
Advertising Manager, Radio Maintenance

Plan your advertising so that it's clear, has snap and freshness, and keep changing and rotating yours ads

AFTER covering the process of establishing your advertising budget (RADIO MAINTENANCE, *February 1949*), we will now take up the mechanics of producing the ads themselves.

Before beginning the layouts or copywriting on an individual ad, you will want to plan your campaign. Decide just how your ads will appear—will you use newspapers, local periodicals, direct mail, etc? How many places in these various media will your ads appear in simultaneously? In other words, is an ad of yours being displayed on a carcard or poster at the same time another ad is appearing in the daily papers?

If you are using an advertising agency, these are details that they will generally assume responsibility for after consulting with you for an overall outline. If you are doing all your own advertising work, however, these details must be carefully organized by you.

In planning your campaign, try to employ several methods of presentation. A customer of yours who sees your name in a newspaper and on a carcard will be that much more impressed and is less likely to forget you than if your ad appears in the paper only. The more media carry you, the more new customers will be drawn to your store.

Here are three suggested methods of coverage for different locations.

Rural Community

By rural community we mean a small village or town removed from larger centers. All potential customers are living and working in the area and on surrounding farms.

In such locations, place your ads in the local paper, on posters or billboards in the shopping district, and use direct-mail for the outlying places. Develop a good "giveaway" at least once a year. This can be the old stand-by, a calendar or a small address book, etc., all with your name prominently displayed. Use imagination on giveaways as in all your advertising—try to get something especially attractive and useful. When choosing a calendar to bear your name, get a modern one with a picture containing universal interest. Dogs and children are excellent, and landscapes are also effective. Remember that the modern housewife is much more conscious of her interior decoration and will not hang a calendar that is old-fashioned or crude.

Your personal activities in a small community are especially important. The best advertisement here will be that which builds respect for you and your family. Become energetic in social and local administrative activities.

Medium Sized City or Town

Place your ads in the local newspaper as often as you can afford. Use direct mail extensively and use one-minute spot announcements over the local radio station. Carcards in the busses and street cars are effective here.

If you are in a television area, stress the fact that you are a qualified television technician. Make as much as you can of this in listing your services, for even customers who do not have television receivers will respect you for this ability and will more readily entrust you with their a-m or f-m receivers.

Some localities have magazines devoted to social and organizational activities. It often pays to run your ad in these periodicals.

Large City or Metropolitan Area

Direct mail is usually the best advertising medium in a large city, concentrating on your neighborhood. Build your mailing list constantly, making sure you add the name and address of every new customer who comes into your store. The phone company will rent street-address indexed lists of their customers for a reasonable fee. You can also purchase lists from other local businessmen.

The large metropolitan daily papers are usually too expensive to use for your advertising, unless you are located in the center of the city with a large shop and have facilities for making calls and pick-ups all over the area covered by the newspaper.

If you are in a suburban district of a large city, you can effectively use the suburban newspaper and posters in the railroad and bus stations used by commuters. You want to make sure to impress the local

residents that you have complete facilities convenient to their homes, or else they will be patronizing servicemen in the city proper.

Here again, you should be fully equipped for television maintenance and advertise this fact.

It may be possible to place car cards in a bus or street car line that runs near you, but paying for space in transportation lines elsewhere in the city would be superfluous.

The above are general outlines for advertising campaigns in various types of communities. You will note that direct-mail is effective in all cases. Something else that is always effective is your name in the classified telephone directory. You should take an extra amount of space here to list your services in bold type and to make your name and address larger than the average listing.

Designing Your Ad

Let's say that you have taken into consideration your particular location and, weighing the possible media to use against your budget, you decide to adopt a campaign as follows:

An advertisement in the local newspaper once a week.

A card in the transportation system, to be changed every three months.

A mailing once a month.

Design your name and address, which of course will appear on all this advertising, in a distinctive type face or shape that will be easily read and instantly recognizable. If you have a trade-mark, use it in conjunction with your name. This arrangement is your "signature" in all your advertising, and it is vitally important. The whole purpose of advertising is to promote your name to the public. (By name, of course, we mean the name of your shop—if you call your establishment "Main Street Radio Service," that's the name to promote.

It is better to form the letters of your name into a distinctive shape than to rely on a separate trade-mark. Let the name itself be the distinguishing symbol of our service. Very often a trade-mark is distracting in an advertisement and it is more useful in connection with a product sold in many outlets than when representing a solitary establishment.

You should also incorporate your trade into the name. If you do a good job of displaying your name alone,

A few examples of distinctive "signatures" from ads of famous radio manufacturers

Follow through your layout and signature style in your ads in different media

The tested and proven formula for copy presentation illustrated in a newspaper ad with examples of treatment for each point

people may remember it but not associate it quickly enough with your service. Thousands of people look over ads seeing only the headline or illustration and the name at the bottom—never reading the explanatory copy. It is for this reason that your name and the nature of your business be prominently displayed under the copy and/or illustration of every ad.

In making this name and service distinctive, we *don't* mean to make it elaborate. Simplicity is a virtue throughout all advertising, but especially in signatures. The letters should be plain and bold—the idea is not to confuse or amaze the reader by distorted shapes, but to repeat the *same, easily recognizable* signature in all your advertising. And it would be best to repeat this same signature style on your truck, over your shop, on your letterheads and business cards, etc.

In doing this you tie all your advertising together. This element of repetition is very important. Notice how the cigarette advertisers repeat their slogans until they become generally used in our conversation—jestingly perhaps, but constantly reminding us of the product.

Hence, a passenger on the bus reading your car card remembers the signature from the ad in the newspaper, then he receives your mailing piece and your name is on the road toward being a permanent fixture in his subconscious mind. As a result, when he thinks of radio repair, he'll think of your name automatically.

Making up Copy

The next step is to design the contents of your ads. Here again simplicity is the keynote. *Stick to the subject!* In this case, what you want to say is that you can fix radios to the customers' utmost satisfaction. That is the story, and don't deviate from it. It is true that in every daily newspaper and every magazine there are countless ads that use tricks to attract attention. You may start off reading a story about how Julius Ceasar met Cleopatra and half way down the page find yourself subtly led into a sales talk on buying more life insurance. This is the worst kind of extravagance in advertising money, because those who are not interested in ancient history will not read the page at all and those who are will become enraged at being duped.

There is a simple rule to follow in organizing your ad. which is boiled down to four words: Picture—Promise—Proof—Push.

In radio service ads, these four words would be elaborated on like this:

Picture—by "picture" is meant the ideal in the reader's mind, in this case a beautifully functioning radio (not necessarily a photograph or

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How is your business IQ?

by Dan Valentine

Modern day business is rapidly and necessarily turning into a science of charts and studies. In the interest of judging your business and merchandising ability, test yourself on the following questions. Answer each question either yes or no.

1. Do you have an annual budget earmarked for advertising, and is this budget based on your last year's sales? ☐

2. Do you keep an accurate list of your customers, both past and present, for reference and mailing list purposes? ☐

3. Have you complete insurance coverage on your establishment, fire, burglary, lightning, plate glass, hail, wind, automobile, public liability, workmen's liability, life insurance in case of partnership? ☐

4. Do you make it a point to read the trade journals and technical publications in the radio field, and do you attend meetings of your local organization to keep abreast of new developments in the field? ☐

5. Do you make it a special point to concentrate on your window display, always striving for something unusual, eyecatching? ☐

6. Do you keep a sufficient amount of working capital on hand at all times? ☐

7. Do you take advantage of all trade discounts on your bills, paying them within 30 days and receiving the customary 2 percent discount? ☐

8. Are you taking advantage of all available advertising mediums in your trade area—newspapers, direct mail, classified ads, business cards, telephone directory advertising, signboards, rural weeklies? ☐

9. Do you exactly know—to the very penny — how much gross business you did last year? ☐

10. Do you know how this year's gross business compares to last year's, month by month, day by day? ☐

11. Are you allowing in your operating expense sheet for depreciation of all your equipment? ☐

12. Do you know—to the decimal point—how much your operating expenses run for each dollar's worth of business? ☐

13. Do you know how much inventory you are carrying at present—the exact total? ☐

14. Do you know—to the cent—how much money you owe, and how much money you have outstanding? ☐

15. Does your truck have the name of your firm painted on the panel in large, bright, eyecatching letters? ☐

16. Do you take an active part in the social and business life of your community, making friends for yourself and your firm? ☐

17. Have you remodeled the interior of your shop, the windows, the front of your shop, or installed new equipment in the past 12 months? ☐

18. Do you take special pains to treat your employees like human beings and not like hired hands, making them feel themselves part of the business? ☐

19. Have you checked your shop recently for accident traps which could bring injury to others and damage suits to you? ☐

20. Do you go out of your way to make friends out of customers, customers out of your friends? ☐

Score yourself five points for each of the above questions to which you can truthfully answer yes.

If you score:

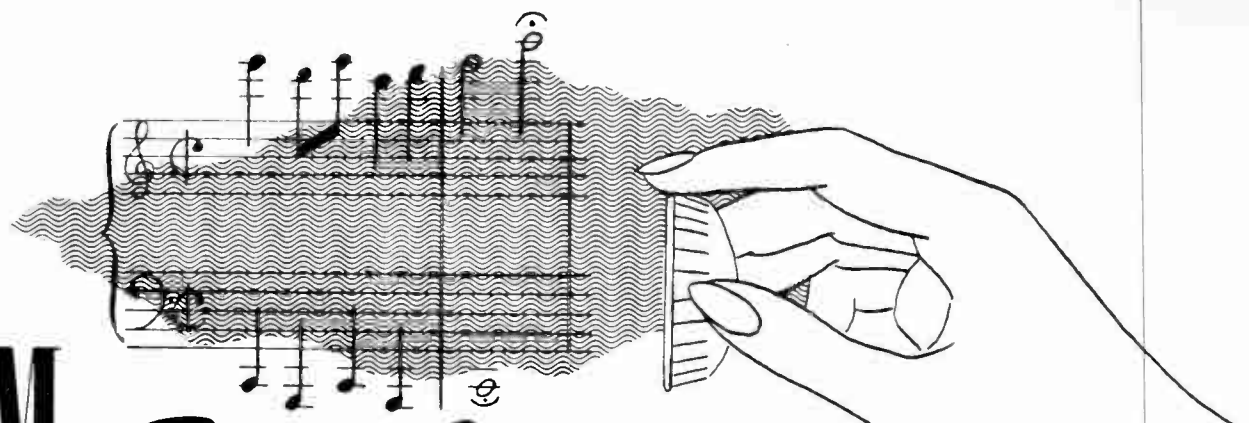
100 — Your're a good, wide-awake businessman, and you needn't waste your time taking tests like this one.

80-90 — No need to worry. You are holding your own in the modern business world.

70-80 — You're still making money, but better get on the ball. Times are going to get tougher.

60-70 — You might be making money, but that's about all.

Under 60—Watch out! You're flirting with failure!



FM Tone Controls & Booster Circuits

by J. Richard Johnson

The author provides us here with a clear analysis of some very important f-m receiver circuits

ALTHOUGH tone controls and booster circuits are found in some a-m receivers, it is in f-m receivers that they reach their greatest development and exhibit their most complete forms.

This means that the technician who is to service f-m receivers must be familiar with the characteristics of these circuits and the troubles to which they are subject. Because the quality standards for f-m receivers are generally higher than those for a-m receivers, defects in tone controls show up more readily in the f-m type. Also, many times the tone control or booster circuit is connected so that a defect in its circuits can cause the quality of the a-f output signal to be worse than it would be *without the tone control circuit.*

Manufacturers' service information usually includes very little about the operation and maintenance of tone control and booster circuits. It is therefore felt that the following discussion of their practical aspects will be helpful.

Purpose of Tone Controls

Tone controls are designed to enable the listener to modify the frequency response of the a-f amplifier section (and thus the response of the whole receiver) so that the sound emanating from the loudspeaker is most pleasing to his ear. This most pleasing condition may not be, and in fact seldom is, one in which the response of the amplifier or the complete receiver is "flat".

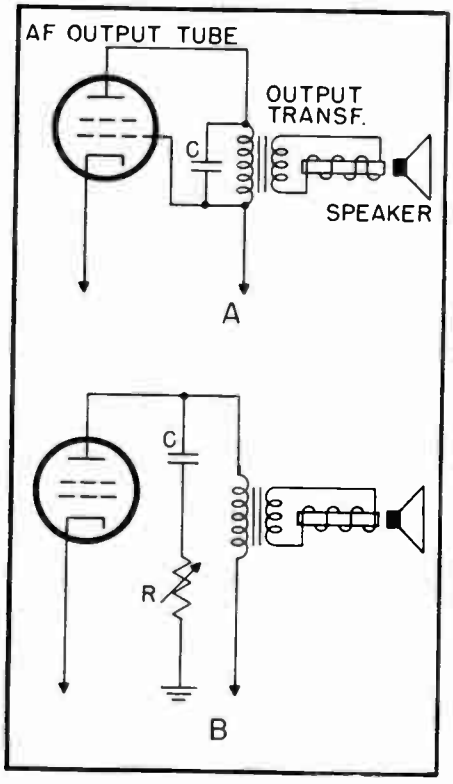


Fig. 1 *A* shows schematic of the simplest type of tone control using a single condenser. *B* illustrates a variable form

The kind of overall response the receiver is to have is influenced by many factors. Some of these factors are:

1. Limitations of the r-f and i-f response characteristics. For instance, the designer of the receiver may for some reason wish to limit the band width or the skirt selectivity of the i-f amplifier, thus modifying the a-f response at the higher sound frequencies.

2. Limitations of the output transformer and/or loudspeaker system. An example of this is the small, relatively inexpensive table model in which both the physical dimensions and the price prohibit the use of an elaborate reproducer. If the loudspeaker does not reproduce high or very low audio frequency components of the modulation signal, or reproduces them only with considerable signal, it is obviously better that they be minimized or excluded in the receiver circuits. In such a case, passage of frequency components over a wide a-f range is worse than having only a relatively narrow response.

3. Personal preferences of the listener. As discussed in a previous article (*Audio Systems in FM*, RADIO MAINTENANCE, *January 1949*), fidelity and quality characteristics of the f-m receiver are appreciated differently by different people. Although listeners in general are gradually being educated to high fidelity reproductions, the average receiver owner still seems to prefer something far less than perfection. A majority of people feel that few high frequency components and plenty of "boomy bass" (characteristics similar to that of many juke boxes) is

"mellow" and "good quality". Since this preference will undoubtedly persist for some time, receiver manufacturers will continue to cater to the largest number of buyers for the general run of their receivers, reserving special efforts toward quality perfection for those of that rapidly growing but still small group who can really appreciate it.

For the above and other reasons, tone controls and booster circuits in receivers can be seen to be designed, not always for absolutely flat acoustic output but rather to achieve, by adjustment of the a-f section of the receiver, some desired compromise characteristic response.

Simplest Types of Tone Controls

The simplest types of tone controls include either a single condenser or a combination of a condenser and resistor. The condenser is the basis of operation, because the reactance is inversely proportional to the frequency of the signal component being handled. For instance, a condenser which has a reactance of 100,000 ohms at a frequency of 1,000 cps, has a reactance of 10,000 ohms at 10,000 cps. The reactance has *lowered* in the same porportion as the frequency has been raised. A very frequently found fixed tone control in many a-m and f-m receivers is simply a capacitor connected across the primary winding of the output transformer. Such an arrangement is illustrated in Fig. 1A. This condenser is of such a value that, at higher modulation frequencies which are to be suppressed, the reactance is low compared to the impedance of the transformer primary circuit (output tube plate circuit).

This simple circuit is used not only to lower the percentage of high modulation signal frequency components from the loudspeaker output (where they would be distorted if reproduced at all) but also to minimize any tendency of the 10 kc heterodyne between station carriers from being reproduced in a-m receivers.

The variable arrangement of Fig. 1B allows adjustment of the degree to which the condenser is allowed to affect the a-f signal as described above. This arrangement constitutes the tone control in many receivers of both the f-m and a-m types. In this case, it is the series impedance of C and R which produces a shunting effect across the output transformer at the a-f frequencies which are to be attenuated. When the control R has its maximum value, the circuit has no effect, since its maximum value is made high compared to the output tube plate impedance and there is no shunting even for very low reactance values of C. When R is turned to its minimum value, which is ordinarily zero ohms, the circuit is identical to that of Fig. 1A. Values of R between these extremes give different values of high frequency attentuation and different values of frequency at which the attenuation becomes great.

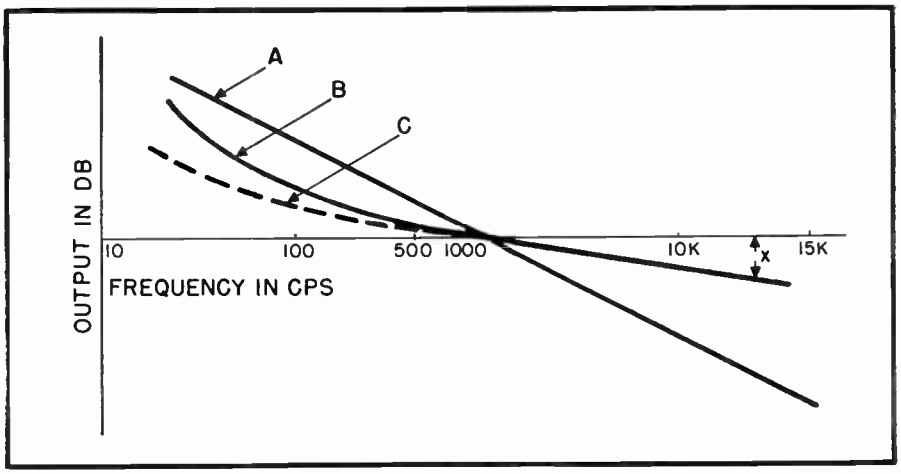


Fig. 2 The above graphs show the response characteristics of a condenser alone connected across the circuit (A), bass boost full on (B), and bass boost reduced (C)

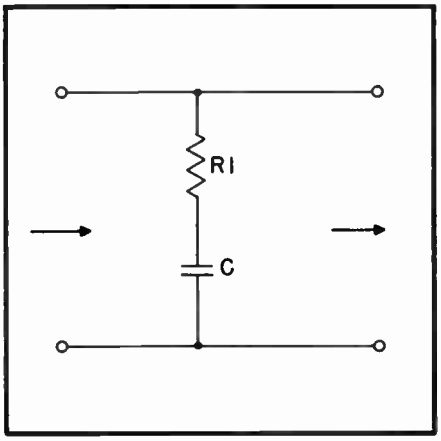


Fig. 3 With values R1 and C carefully chosen, this simple bass boost will not affect the high or middle range frequencies

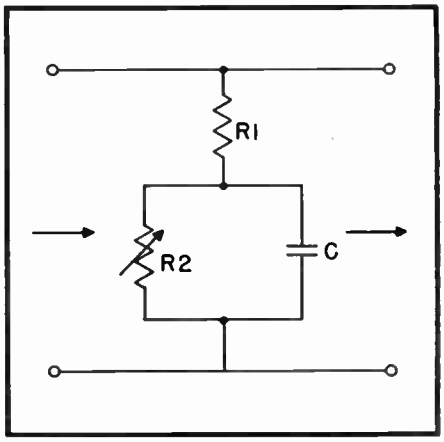


Fig. 4 How a variable resistor R2 can be added to the circuit of Fig. 3 to provide variation of the degree of boost effect

Need for Single Range Boosting

While the cricuit of Fig. 1B accomplishes the object desired in ordinary a-m and the less expensive f-m receivers, several of its characteristics have led manufacturers of elaborate models to adopt other circuits, generally referred to as "boosters."

The Fig. 1 circuit, being based on the characteristics of a single condenser only, causes some attenuation at all audio frequencies. Although the attenuation is greatest at the highest frequencies, this attentuaion decreases gradually with frequency, thus affecting the middle range as well as the "highs." When the control R of Fig. 1B is at zero value, it is at its "bass" position. The low frequency response is greater only because the high frequencies (and, unfortunately, the middle range to a great extent) have been attenuated, thus making the bass components of the remaining signal a greater proportion.

To compensate for deficiencies in response of other sections of the receiver (and the listener) it is desirable to increase the bass notes and/or the treble notes in the a-f signal without affecting the middle frequency range. Booster circuits, designed to accomplish this, provide their effect only in a limited range, and become a negligible part of the circuit at other frequencies.

Bass Boost

To illustrate the difference between the characteristics of a simple tone control as in Fig. 1, and a genuine booster circuit, refer to Fig. 2. Curve *A* represents the characteristic of a simple condenser connected across the a-f output circuit. The output in db is proportional to the frequency (plotted on log scale). In this example, 1,000 cps is taken as the frequency at which the tone controls show no influence, which means that this frequency is taken as a reference value. Notice that while the condenser boosts the low frequencies, it also affects most frequencies and attenuates the high frequency components greatly.

Suppose now, that we use the bass boost circuit of Fig. 3. This is a simple series R and C combination. While it appears the same as the variable control of Fig 1B, we now use fixed values for both R and C and carefully choose these values to produce a bass boost effect instead of attenuating highs as with the Fig. 1B circuit. This circuit has a characteristic like that shown in Fig. 2, curve B. Notice that in the very low frequency region, the response curve is taking a sharp upswing, giving good "boosting." In the high frequency region the attenuation is very low compared to the simple condenser connection of curve *A*.

The circuit is now giving us some bass boost, but it not variable either as to frequency or degree of boost. So we add a variable resistor (one end and the arm of a potentiometer) as shown in Fig. 4 as R2, connected in parallel with C. The maximum resistance value of R2 is chosen to be high compared with the reactance of C at the lowest frequencies. Accordingly, when the variable resistor is at maximum, its effect is negligible and the circuit acts as though it were not there, giving the boost of the circuit of Fig. 3. At the zero value of R2, C is shunted (shorted) out of the circuit and the impedance across the signal is only R1 and thus has no frequency characteristic at all

However, for values at R2 in between these extremes, the response of the system is modified as the resistance is reduced.. For instance, when the shunting effect of the resistor becomes appreciable, the system may have the characteristic

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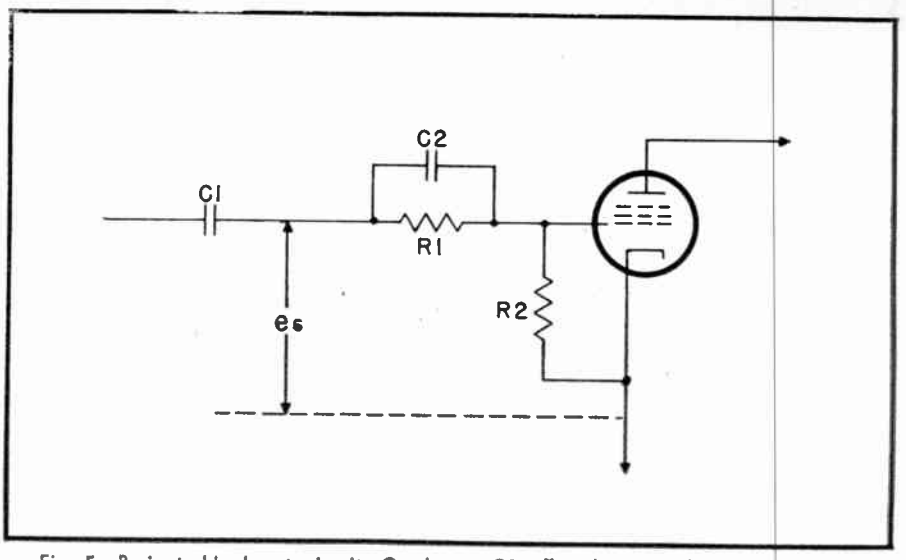

Fig. 5 Basic treble boost circuit. Condenser C2 offers low impedance to high frequencies but appears as open circuit (compared to R1) in middle and low frequency

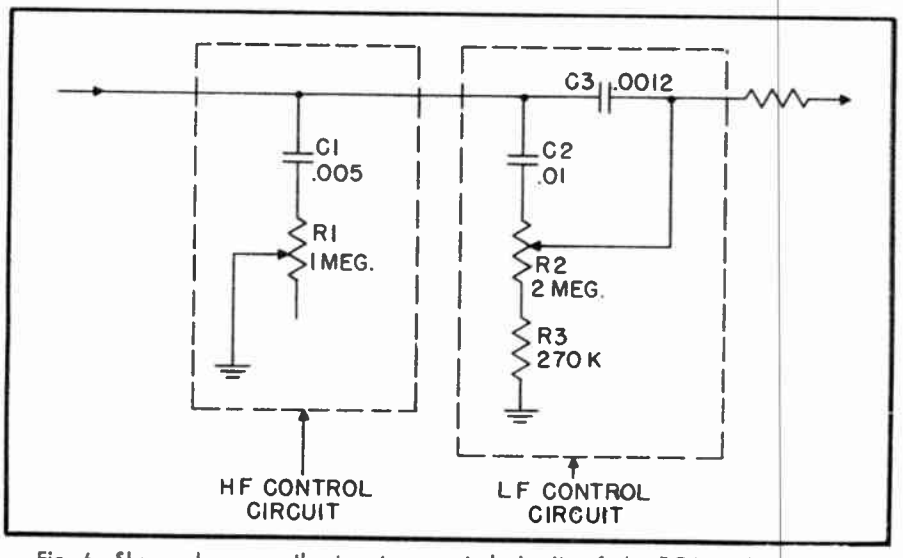

Fig. 6 Shown above are the two tone control circuits of the RCA 6I2V1 receiver. The high frequency control circuit is a series attenuator like the one shown in Fig. 1B

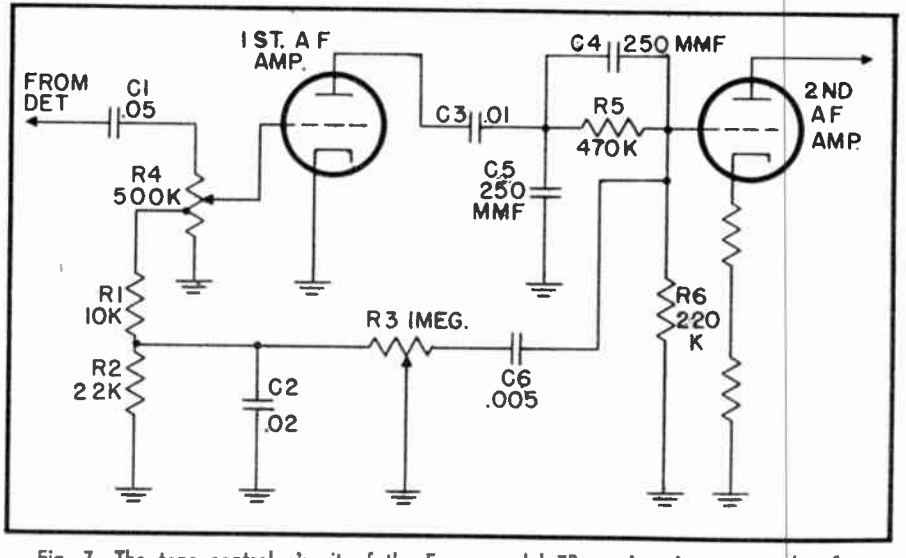

Fig. 7 The tone control circuit of the Espey model 7B receiver is an example of a single control which allows separate, but not simultaneous, bass and treble boost

by John T. Frye

MY mail makes it more and more apparent that many servicemen are looking forward to the advent of television in their service area with the same amount of enthusiasm that a condemned man has for catching his first glimpse of the scaffold. These servicemen are honestly and thoroughly scared of TV.

Some write that they are "too old to start all over," and they argue that you cannot teach an old dog new tricks. Others complain that the necessity for hundreds of dollars worth of new TV servicing instruments will squeeze them right out of the picture. Still others point out that a television installation, especially in a fringe area where the antenna has to be really up in the air, calls more for the abilities of a reformed second-story man or a steeple-jack than it does for those of a radio technician; and, as far as they are concerned, climbing is strictly for the monkeys. One group takes a very dim view of having to work on the television set right in milady's parlor with milady peering over your shoulder all the while and having a very dampening effect on your favorite magic swearwords that are so effective on a stubborn set back in the shop.

They have a dozen different ways of expressing or disguising their fear, but it is still just that—and they are so wrong!

Let us take the case of the fellow who is "too old to start all over." Where does he get that stuff? He did not start over when the battery sets went out and the a-c sets came in, did he? Nor when the superhets pushed aside the tuned radio frequency receivers . . . nor when a.v.c. and a.f.c. came in . . . nor when the ac-dc sets (bless 'em!) hit the market . . . nor when f-m came over the horizon! Every one of these innovations simply made it necessary for him to add to the knowledge of radio that he had already mastered, and television servicing does exactly the same thing.

Do not fall into the mistaken idea that television is something entirely foreign to the radio theory you already have. It is simply a repetition and extension of the things you now know. Why, when you come to think of it, you have been working on television every time you worked on a tuning-eye circuit. A tuning-eye is a cathode ray tube that gives you a visual response to the amplitude of a received signal, is it not?

I know it is confusing to see and hear all of the new terms that are cropping up in our magazines these days, but let me tell you that I can recall when "full-wave rectifier," "bleeder resistor," "brute-force filter," and "cathode resistor bypass" were every bit as strange sounding and as awe inspiring as are "horizontal fly-back high voltage supply," "damper tubes," "restorer circuits," etc. Whether or not familiarity breeds contempt, it at least banishes groundless fears; and I predict that within a year those new terms will be sliding as glibly off your tongue as "Ay-ay" does off the tongue of Carmen Miranda.

And now for the matter of new equipment. You are going to have to purchase some new equipment, probably. But it is not going to be hundreds of dollars worth—at least not all at once. For one thing, the television receiver itself it almost a complete self-contained service tool, for practically any trouble that develops will reveal itself on the screen of the tube. Think of what that means. Consider all of the trouble we have gone to so that we could inspect radio circuits visually. We have built our square-wave generators, our sweep frequency oscillators, and our cathode ray oscilloscopes so that we could "see" what was taking place in the various receiver circuits. And now all of this test equipment comes "built-in" with the television receiver.

What is more, the test patterns that are sent out by the television stations are deliberately designed to be of the utmost aid in putting the finger on any trouble that may occur in a television receiver. All we have to do is to teach ourselves to read and to understand what the pattern appearing on the screen of the tube is trying to tell us.

Another thing to keep in mind is that there are not many really new parts in a television receiver. It is the same old collection of tubes, sockets, condensers, resistors, coils, transformers, and connecting wires to which we have become accustomed; so we may reasonably expect the same failure of these parts that we have been experiencing in our a-m and f-m receivers. We are not going to run across any such trouble as "acute agglutination of the beezledorf!"

In fact, John R. Meagher, television specialist for RCA, says that possibly 80% of television service calls are due to troubles that can be located and corrected without requiring a great amount of technical knowledge on the part of the technician outside of a reasonable familiarity with the particular television receiver at fault. For example, a very high percentage of troubles can be cleared up simply by locating and replacing defective tubes.

Another consoling thought is that there are so many different aids to help you to get a good running start in television. Every issue of every magazine is filled with good information on both theory and practice. The book presses are turning out books by the dozens on the subject. And specialists are going up and down the country lecturing to groups of servicemen on how to handle the subject of television service. About the only way you can keep from learning about television servicing is to be blind, deaf, and idiotic.

No attempt is being made to argue that television service is not going to require some new knowledge and some new techniques on the part of

→ to page 22

Have ALL THE FUN
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Heathkits are beautiful factory engineered test equipment kits supplied complete but unassembled with all parts — tubes, grey aluminum cabinets, punched, formed and plated chassis, calibrated panels, ready wound coils and complete detailed instruction manuals for assembly and use. With costs zooming up, Heathkits save the labor cost of assembly enabling thousands to have equipment which they otherwise could not afford.

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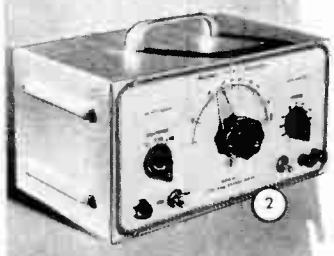
Everything you want in a VTVM. Shatterproof solid plastic meter face, automatic meter protection in burn-out proof circuit, push pull electronic voltmeter circuit assuring maximum stability. Linear DC and AC scales. AC and DC full scale ranges of 3V-10V-30V-100V-300V-1000V. A total of 24 ranges. Isolated DC test prod for signal tracing and measurements of voltage while instrument is in operation. An ohmmeter section accurately measuring resistance of 1/10 ohm to one billion ohms with internal battery. Extremely high input resistance 11 megohms on all ranges DC and 6.5 megohms on AC. All these features and many more are the reasons hundreds of radio and television schools are using Heathkit VTVM's and recommending them to all students. Like all Heathkits, the VTVM kit is complete, 110V. 60 cycle power transformer, 200 microamp meter, tubes, grey crackle cabinet, panel, test leads, 1% ceramic precision divider resistors and all other parts. Complete instruction manual. Better start your laboratory now.
Shipping weight 8 lbs. **$24.50**



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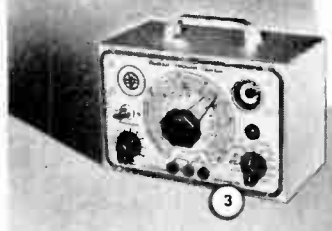

3 *Heathkit* CONDENSER CHECKER KIT

Checks all types of condensers, paper, mica — electrolytic — ceramic over a range of .00001 MFD. to 1000 MFD. All on readable scales that are read direct from the panel. NO CHARTS OR MULTIPLIERS NECESSARY. A condenser checker anyone can read without a college education. A leakage test and polarizing voltage of 20 to 500 volts provided. Measures power factor of electrolytics between 0% and 50%. 110V. 60 cycle transformer operated complete with rectifier and magic eye tubes, cabinet, calibrated panel, test leads and all other parts. Clear detailed instructions for assembly and use. Why guess at the quality and capacity of a condenser when you can know for less than a twenty dollar bill.
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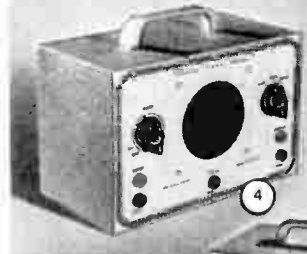

4 *Heathkit* SIGNAL TRACER KIT

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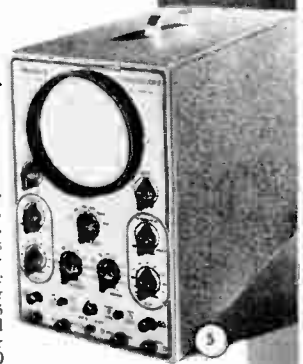

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Over The Bench

→ from page 20

the serviceman. For one thing, television installations throw a bright spotlight on the subject of antenna theory, a field about which the average serviceman has not troubled himself since the heyday of the short-wave DX hound. At the same time he is going to have to brush up a little on such subjects as electronic lens theory, magnetism, and wave-shaping; and a television installation job means something more than carrying the receiver into the house and plugging it into a wall socket.

But there is nothing in all of these things to be afraid of. Most servicemen were attracted to radio in the first place because it was something new, and they were not going to get out of it because it continues to be new. Not by a long shot. Let us announce to one and all that anything the engineers can dream up and build halfway right, we servicemen can keep working, just as we have done in the past.

So bring on your TV. ✓ ✓ ✓

Tone Controls

→ from page 18

shown by curve *C* in Fig. 2. Notice that only the degree of boost is varied and the frequency range in which the boost is effective is about the same. This is desirable in many cases, because the system usually calls for a certain distribution of frequency components in the a-f output and a variable adjustment is only needed for how much the boost is to be. Notice that curves *B* and *C* overlap each other for all frequencies above 1,000 cps. Thus, no matter what degree of bass boost is obtained, there is no effect on the high frequency response, proving it to be a good bass boost circuit.

Treble Boost

It is also desirable to provide treble circuits in many cases, although not as frequently as bass boost, because in most receivers there is sufficient treble response to start with, and for other reasons mentioned earlier in the article.

Treble boost circuits usually make use of a small series condenser connected in a circuit like that of Fig. 5. The signal voltage e_s is divided between grid resistor R2 and the parallel combination of R1 and C2 with the part across R2 being applied to the grid. At high frequencies at which the reactance of C2 is small compared to the resistance of R1, practically the full voltage e_s is applied to the grid. In the middle and low frequency ranges, however, the reactance of C2 is so high that R1 is the effective upper leg of the divider and the grid signal voltage remains constant with frequency. A response characteristic similar to that for bass boost is produced except that it is now the high frequency range that is boosted.

Examples of Tone Controls

Although the ideal system is one which contains both bass and treble boost controls, this arrangement is seldom found except in the most elaborate commercial receivers, in certain PA systems, and in custom built high fidelity receivers. Instead, the serviceman will frequently encounter controls which, turned in one direction, give treble boost, and in the other give bass boost, without provision for both at the same time.

An example of the separate control arrangement is illustrated in Fig. 6, which is a schematic diagram of

the bass and treble control circuits of the RCA 612V1 receiver. The high frequency control circuit is really a series attenuater as in Fig. 1B. When R1 is zero, minimum treble components are reproduced because C1 is shunting the signal. When R1 is a maximum, the total impedance is very high at any frequency, so the control is ineffective and the treble components originally in the signal are passed.

In the low frequency control section, more low frequency components can pass through C2 than through C3 because the former has a greater capacitance. By moving the arm of R2 upward, more of these low frequency components can be passed on to the following stage, until at the topmost setting of this arm, the signal has a direct path through C2 and C3 in parallel. When the arm is near its lower extremes, the path through C2 has too high an impedance and the signal must pass through C3 alone, making it much more difficult for low frequencies to be transmitted.

Since C3 is by itself still a relatively low impedance path for the middle and high frequency ranges, these ranges are not affected and a true boost effect is realized.

An example of the single control which allows either bass or treble boost separately but not simultaneously is given in Fig. 7, the schematic diagram of the tone control circuit of the Espey model 7B receiver. The circuit composed of R1, R2, and C2 forms a bass boost circuit tapped into volume control R4. The degree of bass boost is lessened when the arm of R3 is turned toward the left, thus shunting C2 (and R2) with a low resistance. The treble boost circuit consists of C4, R5, and R6, and operates as described in the general discussion above. The degree of treble boost is lessened as R3 is turned to the right, thus shunting the input circuit of the second amplifier and the treble boost circuit.

In this article we have briefly considered the principles of tone control and booster circuits in a-f amplifiers of f-m receivers. One of the uses of these tone controls circuits is to compensate for the response characteristics of loudspeaker systems. The next article in this series will discuss the newest types of loudspeakers and loudspeaker systems used in f-m receivers.

Creating Your Ad

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drawing—a headline or sentence can form the picture).

Promise—this is the part conveying the idea that *you* can fulfil the ideal for the reader. You can fix his radio to perfection.

Proof—this can be a statement of the radio training you have as a background, or a testimonial letter from a satisfied customer.

Push—this is the punch line or paragraph urging the customer to act now, such as: "Special offer this week only—complete, free examination of your radio," or, "Get your radio overhauled now and save bigger expense later."

It's a good idea to cover all these points in each of your ads. There's a prevailing practice of small business establishments, especially in rural districts, to simply list their names, addresses, and the service they offer without any selling copy. This is not good; it's lifeless and promotes no interest or confidence on the part of the reader. Even if you only have room to put a sentence or two on each of the four points above, do so, and put all the sincerity you can in what you say. The only exception to this is on a poster in a station or billboard on a highway, where the passerby has only a moment to grasp the message thereon. That's where your distinctive "signature" is sufficient and best.

In the newspaper advertising, which we suggested running once a week, change the ad each time. Follow the same general pattern, but with a new headline and different copy each time.

On your monthly mailing you may use one of the ads you have run in the paper, but write it more in the form of a personal note to the prospective customer. Then on the following mailing, change the copy as you have in your newspaper ads.

(See next month's article for more on headline and copy writing, and using illustrations in your advertising. In the meantime don't forget to contact the radio and parts manufacturers for the selling and advertising aids they provide, and write any questions you have on advertising to Vic Turner here at RADIO MAINTENANCE) ✓ ✓ ✓

High Frequency Antennas

→ from page 9

television installation men. If you must work alone, then try the circuit shown in Fig. 4. The high and low frequency antennas are separated by exactly 44". The transmission line going to the receiver is taken off the shunt transmission line exactly 11" from the high frequency end. This system has the advantage of allowing a pre-cut assembly to be made so that no work is necessary on the roof other than orienting the antenna. A similar system is shown in Fig. 5 with the addition of a transposed line. The stub is used for the purpose of impedance matching and helps bring up the overall picture signal strength.

Using Shunt Transmission Line

Quite often, in a particular location, none of the devices we have discussed will seem to help. In such cases, the circuit appearing in Fig. 6 is very useful. The low and high frequency antennas are connected by a short piece of shunt transmission line, each side of which is in series with an Ohmite Z-144 unit. These units are very inexpensive (less than fifty cents each) and are broadly resonant from 80 Mc to 200 Mc. At high frequencies, the Ohmite unit acts as a parallel resonant circuit and consequently has a high impedance at those frequencies. Thus it prevents any high frequency signals, or harmonics of the lower frequencies, from being fed out of the low frequency antenna into the high frequency antenna. At low frequencies the Ohmite units have a very low impedance, thus permitting signals from the low frequency antenna to pass right on through to the transmission line.

All the installation system discussed use twin lead transmission line, but where severe noise conditions exist, coaxial cable can be used. An antenna system (Amy, Aceves & King) makes use of a patented divider network to prevent antenna interaction, in conjunction with a 72-ohm coaxial line, plus a shorted coaxial "bazooka" line balancer, ¼-

→ to following page

High Frequency Antennas

→ from preceding page

wavelength long, see Fig. 7. The "bazooka" is not necessary for twin lead since such transmission line is a "balanced" line. A balanced line is one in which both conductors are identical in length and spacing and which terminate in a "balanced" antenna coil having a grounded center tap. The purpose of "balance" is to prevent the transmission line from acting as an antenna. A coaxial line, on the other hand, is basically an unbalanced line, feeding into an antenna transformer which is grounded at one end. The use of a "bazooka" makes the coaxial behave as though it were balanced. A "bazooka" can be made out of a piece of coaxial cable cut to one quarter wavelength.

Low Signal Areas

After following these suggestions some antenna installation difficulties may still exist particularly in areas of low television field strength intensity. If so, try the technique shown in Fig. 8. Cut a piece of 150-ohm transmission line for a length of ¼ wavelength. Connect one end of this transmission line to the receiver antenna terminals and allow the other end to hang free. This simple device helps bring up the signal strength and at the same time removes any fuzziness from the sound. A quick way to determine the length of this 150-ohm line is to hang a short piece (about 2 feet long) from the antenna terminals and, starting at the free end, short the twin lead by a pair of connected needle points. Cut the line when the test pattern appears most brilliant.

On the contrary, an installation may often be necessary in an area of very strong television signal intensity. Tearing of the picture will result. Take a small piece of #16 AWG tinned wire and connect across the antenna terminals as shown in Fig. 9. Signal strength will be reduced and tearing eliminated. Make the loop of wire larger or smaller until the picture pattern has the most satisfactory intensity level.

→ from page 11

cause the layman cannot visualize radio equipment or radio installations, he must be shown. Any little extra services that you may offer, such as helping him obtain his licenses, giving him advice on care of storage batteries, etc., will usually go a long way at this point.

Although so far the emphasis has been on privately owned pleasure craft, other possibilities, such as boats engaged in carrying passengers for hire (launch services and fishing vessels) should not be overlooked as sales possibilities. The added safety factor of having a radiotelephone aboard is even more important in these cases.

If the serviceman is starting marine work for the first time, he should be careful to study the instruction manual which the manufacturer supplies with each set. In this manual he will find detailed information on the circuits, instructions on adjusting the receiver and transmitter, antenna recommendations—in fact, all the details necessary for a complete understanding of the equipment. Suffice it to say here that most of the 10-watt sets (these are the most popular on small craft) are operated from storage batteries and receive their plate power from a vibrapack. The higher powered sets may use a combination of vibrapack and dynamotor(s) are straight a-c power supply.

Insofar as antennas are concerned, there has been an almost universal acceptance of the collapsible vertical mast antenna. These antennas are rugged, light in weight, and can be mounted on almost any kind of boat. They can be obtained in aluminum, stainless steel and monel, with steel being the least expensive and monel the most costly. A few boat owners prefer homemade antennas such as bamboo poles wound with wire; however, the low cost and neater appearance of the metal antennas more than justifies their use. On larger boats, such as schooners where masts are available, it is usually more convenient to use a horizontal or vertical wire antenna. The subject of

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ELECTRONICALLY SPEAKING

For Outstanding Service and Cooperation. The recently formed Radio Technicians Guild of America has awarded a plaque to Howard Sams, President of Howard W. Sams & Co., for outstanding service and cooperation in the field of Radio Maintenance. The award was made

by Bertram Lewis, National Coordinator of the RTGs, (left) at a dinner in Rochester, N. Y., which was attended by delegates of the various Radio Technicians Guild from New York State and the New England States.

200,000 A Year Let's take a look at a sample of what is in store for television receiver production in 1949: General Electric. This firm is going to produce sets at the rate of 200,000 a year in 1949. Almost half the working force of the company at Electronics Park will be employed in the production of television equipment. This production rate will contribute considerably to the television receiver production total predicted for the entire industry by W. R. G. Baker, vice president of G-E: between 1,600,000 and 2,000,000. Such a production rate would double the television receiver retail business of 1948. If the production of picture tubes can keep pace, the higher figure quoted by Mr. Baker may well be reached.

Oil Via The Ether What would you do if you lived on a farm and ran out of kerosene, oil, gasoline, or some other fuel oil? You'd call your supplier and you'd get your delivery when the truck makes its next run. But in the meantime you'd be in a fix. To take care of just such situations, the Grange League Federation Exchange at Ithaca, N. Y., is now experimenting with a General Electric two-way f-m radio as another way of expediting delivery of vitally needed fuel supplies from its many bulk stations to farms throughout New York, Pennsylvania, and New Jersey. Two trucks have been equipped with radio communications equipment. With it, these trucks can be rerouted to farms in need of emergency supplies without loss of time or driving of needless miles. Of course, the system is invaluable in cases of truck breakdowns.

National Service Convention On January 9 and 10, the first service convention in the history of Philco Corporation was held in Philadelphia. Built around the theme of service, the first day of the meeting was concerned with such appliances as refrigerators, freezers, and air conditioning systems. On the second day of the meeting, attention was focused on the techniques of television, home, and automobile radio servicing. The emphasis throughout this convention was on service, and its aim was to train dealers in developing good service facilities. There is a moral in this for us: When dealers are beginning to develop servicing techniques, the service technician would do well to start developing sales techniques.

More Picture Tubes Last month we reported here that the Pittsburgh Plate Glass Co. had broken one of the major bottle necks in the production of television picture tubes. We have more good news today. Kimble Glass will expand its television tubes production by reopening its Columbus plant. This plant has been idle since the middle of last year, and is now being readied for production. Full operation is expected by May of this year. Slowly but surely the demand of television receiver manufacturers for more and more picture tubes is being met. In this respect, as in most others concerning television, the industry is pretty optimistic as to the future. And well it may be. During the first 9 months of last year, about 750,000 such tubes were sold to receiver manufacturers. During the entire year of 1947, about 250,000 units were sold. An increase of more than 300% per year!

Onward And Upward With TV To all those who have been worried about the future of television because of channels growing increasingly crowded, present receivers becoming obsolete, and the cost of possible future "two-band" sets being very high, a plan recently presented to the FCC by a committee of the Radio Manufacturer's Association will come as good news. This plan proposes to continue and expand the use of standard (VHF) frequencies in the larger cities, while employing higher (UHF) frequencies for smaller communities. The present standard VHF system would become the "backbone" of a national television service, while the proposed addition of UHF channels would fill the needs of the smaller towns. Some decision on this matter will certainly have to be made in the near future. Once the go-ahead is given, 1949 may indeed become the "television year."

TV In Comfort No more straining of necks to see the television screen. A new television receiving system has been developed by the Raytheon Manufacturing Company which allows as many as 10 remote-controlled television viewing units—all centrally connected to one master tuner—to be placed in one or more public rooms. These "Trans-Vue" units are connected by coaxial cable to the master tuner; and the entire system can utilize existing amplification equipment. The faces of these units and the television picture tubes are tilted at an eight-degree downward angle. Now, no matter where you're sitting, you'll be able to watch the fight without bodily distortions or squirming.

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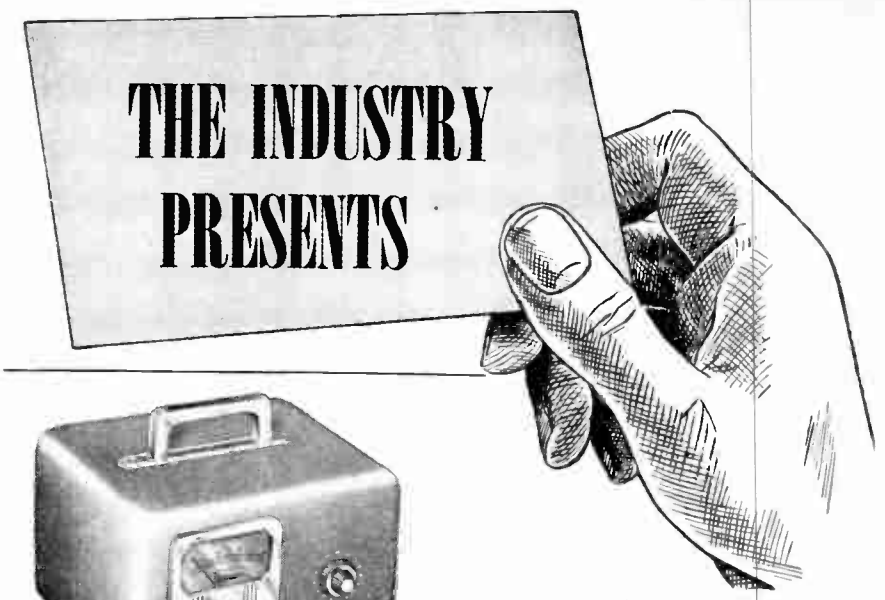
THE INDUSTRY PRESENTS



FIELD STRENGTH METER

Technicians who are about to enter the field of television servicing, and those who are already working in it, will be interested in this new test instrument. It measures actual picture signal strength without the use of a complete set, it facilitates exact antenna orientation, it measures loss or gain of various antenna and lead-in combinations, and it is useful for checking receiver re-radiation (local oscillator) and the amplitude of interfering signals. The instrument consists of a compact receiver with a calibrated meter to indicate signal level. Overall size: 10½ x 7 x 8 inches; weight: 13¼ pounds; immediately available.

Manufacturer: Transvision, Inc., New Rochelle, N. Y.

CATHODE-RAY OSCILLOGRAPH

By the addition of a suitable external power supply, the Du Mont Type 248 oscillograph can be operated at accelerating potentials up to 14,000 volts without modification. The basis for this feature is the incorporation of the Type 5RP-A high-voltage cathode ray tube in the instrument. Photographic writing rates of the order of 69 inches per microsecond can be recorded when using the increased accelerating potential. Where less light output is required or where the writing speed is not so great, the instrument can be operated at the normal accelerating potential of 4,000 volts.

Manufacturer: Allan B. Du Mont Laboratories, Inc., 1000 Main Ave., Clifton, N. J.

ATOMS

Atoms are not only the smallest particles of matter, but also the tradename for Sprague's dry electrolytic capacitors. Word has now been received that many of them have been reduced in size a full half inch. This is of considerable interest to the serviceman who finds himself confronted more and more with smaller and smaller pieces of radio equipment. In the new personal receivers, portables, automobile radios, and the like, the underside of the chassis looks like an overcrowded sardine box, with parts literally stacked on top of each other. Being able to work with smaller-sized parts will certainly be welcomed by the service industry.

Manufacturer: Sprague Electric Co., North Adams, Mass.

OSCILLOSCOPE—SWEEP GENERATOR

Weighing 25 pounds, this instrument, which combines an oscilloscope and sweep generator in one unit constitutes another addition to the servicing tools for television work. Though housed in one unit, both the oscilloscope and the sweep generator can be operated independently. Attenuation of r-f is continuously variable, and output is applied through low loss coaxial cables.

Manufacturer: Radio City Products Co., Inc., 152 East 25th St., New York 1, N. Y.

Marine Servicing

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antennas will be treated in greater detail in another article.

As an added convenience for boats equipped with a radiotelephone, Western Electric has developed a device known as the selective ringer. This device will ring a bell whenever there is an incoming telephone call. It also eliminates the necessity for someone to maintain a continuous listening watch on the marine operators channel. Most sets are equipped with a socket in which the ringer plug may be inserted.

Preliminary Work

Assuming that a sale has been made, there is a certain amount of preliminary work that must be done before the installation can take place. First and foremost, the serviceman must make a thorough inspection of the boat in order to plan the installation intelligently. The only tools he needs are a pad, pencil and tape measure. It is most important that the boat owner be present during this survey in order that his preferences for type of antenna, location of radio, etc., may be taken into consideration. Don't let him dodge this interview by telling you—"Oh, put the set wherever you think best"—or you will find yourself doing the job twice, the second time his way.

The first thing to determine on your inspection is the available voltage. On small and medium craft, this is usually 6 or 12 volts from storage batteries. Unless these batteries are already operated at maximum load they may also be used for powering the radiotelephone.

In choosing a site for the radiotelephone try to keep it as close to the battery box as possible in order to keep the connecting cable short. Usually some compromise will have to be made on location. Many sets have slotted holes in the rear of the cabinet which allow it to be hung on the wall (bulkhead) from wood screws or bolts. If this is not feasible, it may be necessary to have a shelf made up. After a temporary location has been agreed upon, figure out the exact path you intend to run your battery wires, and measure the distance. Make sure that the holes you intend to drill do not hit any beams or other obstacles. All wiring should be as concealed as possible—the usual place is under the floor boards, just above the bilges.

Vertical mast antennas require a good solid foundation for the base mounting. Although this should be as high as possible, bear in mind that in most cases a supporting arm is necessary so try to choose a location which will accommodate this type of installation. If it is impossible to mount a supporting arm, or if a non-collapsible antenna is to be used, then you must count on using guy wires.

On boats which have a sloping cabin structure, or a sloping cat walk, it will be necessary to have one or more compensating wooden blocks made up in order to provide flat surfaces for the antenna base and/or supporting arm.

The usual method of bringing the lead-in wire into the cabin is to use a deck feedthrough insulator. It is a good idea to measure the path between the antenna base and the feedthrough insulator, and between the insulator and the set.

Although not absolutely necessary, it is highly desirable to have a ground plate mounted on the bottom of all wooden hull boats. Inasmuch as the ground is part of the antenna system, it will materially improve the performance of the transmitter. A ground plate usually consists of sheet copper, number 16 to 24 gage, secured to the hull by means of copper nails. The area of the plate may be derived from the formula:

Six square inches per watt output. You will need at least five square feet for a 10 watt set. A bolt is brought through to the inside of the boat and heavy copper braid is used to connect it to the chassis. More detailed information on this subject will usually be found in the manufacturer's instruction manual. Needless to say, the ground plate should be mounted at the boat yard by a competent marine carpenter before the boat is placed in the water. The cost of the plate, together with any other necessary carpentry work is borne by the boat owner and is considered preliminary to the actual radio installation. In the event that the boat is already in the water, it will be necessary to forego the mounting of the ground plate, at least until the following spring. The engine frame, which in turn connects to the propeller shaft, will in many cases provide a fair ground.

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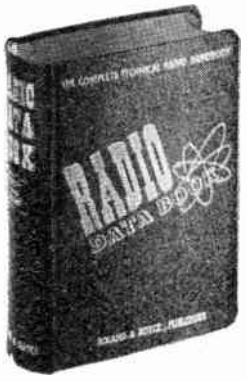

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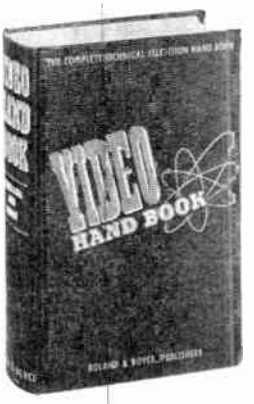

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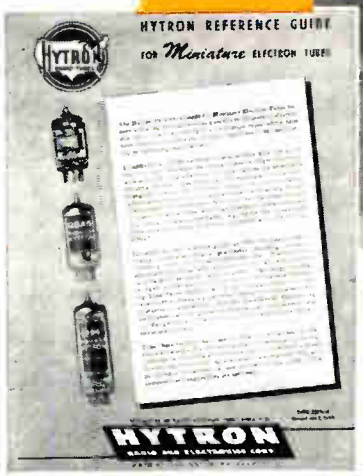

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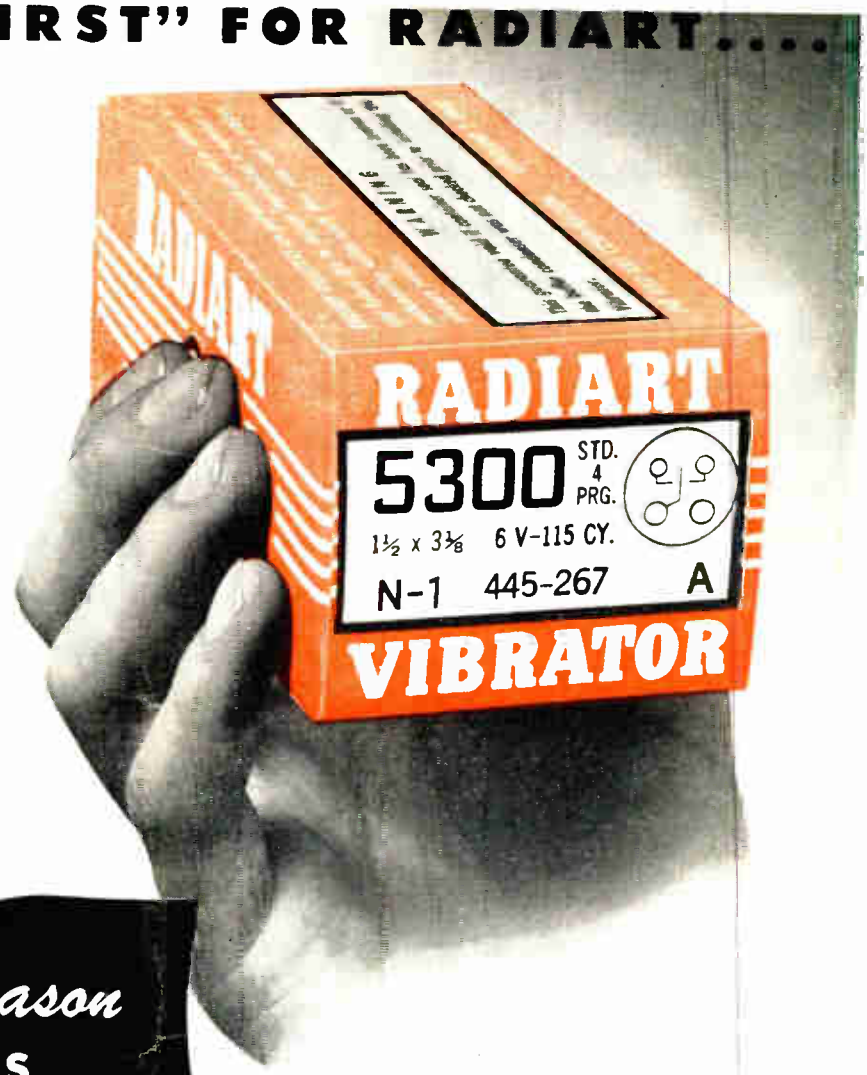

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