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RADIO SERVICE NEWS

VOLUME XIII, No. 6 | RCA TUBE DEPARTMENT, HARRISON, NEW JERSEY | November-December, 1948

Season's Greetings to All

Good Health Much Happiness Abundant Prosperity

INDOOR TV ANTENNA BOON TO APARTMENT HOUSE VIDEO FANS

Attractive Indoor Dipole Offers Increased Sales Opportunities

A new indoor television antenna, for use in urban areas where outdoor receiving antennas are either impractical or not permitted, has been announced by the RCA Tube Department. A distinctively styled indoor dipole, it offers a solution to those caught in the dilemma of apartment house outdoor antenna rulings.

RCA engineers have developed a solution to this problem by utilizing a dipole, end-loaded with metal discs for optimum efficiency on all twelve channels. Non-tarnishing, aluminum fittings are mounted on a beautifully lacquer-finished base. Its compact size (only 12 inches high by 33 inches long) and modern design make it an attractive addition to home furnishings.

The RCA Indoor Television Antenna may be placed on any handy table top and the twenty-foot lead connected to the receiver terminals. The orientation of the antenna is then easily adjusted for maximum picture brilliance from the desired station.

Now you can sell those customers who have been holding off buying a TV receiver because of apartment house outdoor antenna rulings. Cash in on this double sales opportunity. The suggested list price is only $11.95. Order a quantity of the new RCA Indoor Television Antenna, 202A1, from your distributor, today.

SIX "SHOCK OF THE MONTH CLUB" MEMBERS SELECTED

The first two rounds of RCA's "Shock" contest are over and the writers of the winning letters have been notified by mail. The contest was built around true stories of electrical shock, such as that encountered in handling ac-dc receivers.

Each of the winning letter-writers was awarded one of RCA's newest shock preventative—an Isotap isolation transformer. The six winning letters, which have earned awards for their writers, are printed below.

There's still time to send in entries for the last contest period. Three more Isotaps are to be awarded plus an RCA WV-65A Battery Volt-Ohmyst electronic meter. The latter prize goes to the writer whose letter is adjudged the best of all those received during the entire contest period.

So—sit down and write us about your experience with shock—how that ac/dc bit you. The final letters will appear in the January-February RADIO SERVICE NEWS. Address your letter to Editor, RADIO SERVICE NEWS, RCA, Harrison, N. J.

EDITOR
RADIO SERVICE NEWS

I was working on some bench jobs and had a small radio playing near one end of the bench. I reached for a steel rule, which had slid under the radio and which touched the under chassis screws and also a heater pipe directly behind the radio. My hand was on the rule and the other on a grounded test lead on the bench.

The resulting flash set fire to some gasoline soaked waste nearby which in turn touched off a can of lacquer. In the meantime I was quite busy dropping the rule and getting away from the grounded lead. When I finally regained composure, my immediate job was to start pumping the pyrene that was needed by that time.

Believe me the mental shock was more severe than the electrical shock I got in the process.

J. W. Eckenrode
338 E. Chapel St.
Hazleton, Pa.

EDITOR
RADIO SERVICE NEWS

One day when both of our repairmen were working on the bench at the same time and on ac/dc's, Jimmie (that's me) asked Minnie (serviceman 2) to please pass the hacksaw which I needed to cut off the shaft of the volume control I had just replaced. I was holding my finger on the shaft where I had marked to cut. Minnie was holding a speaker cone he had just glued, and was in the process of putting clamps on it when I sounded off. Without a moment's hesitation, and not a thought of the consequences he passed the saw. So there we were linked together by a steel saw, each

(*Continued on Page 5*)

NEW PORTABLE TYPE RADIO 'A' BATTERY ADDED TO RCA LINE

Meets Requirements of Many New Portables

In response to extensive trade demand, RCA has announced the addition of a new portable 7½-volt 'A' battery to its comprehensive line. Designated as the RCA-VS129, this new battery is comparable to, but smaller than, the Burgess B5P. The dimensions are 4 1/16" x 15/16" x 3". Connections are made by means of a two-pin plug.

Announcement of the VS129 boosts RCA's portable 'A' battery line to a total of 11 different types, and the RCA battery line to a grand total of over 70 types, not counting special types.

The VS129 sells at a suggested list price of $1.10. Order a supply from your RCA Battery Distributor.

CALLING ALL HAMS

A new practical method for reducing the harmonic power output of radio amateur transmitters and resultant television interference has been developed by John L. Reinartz, of the RCA Tube Department's engineering group. Details of the method are described by Captain Reinartz in the current issue of RCA HAM TIPS.

Be sure to ask your RCA Distributor for a copy.

WIDE-BAND I F ALIGNMENT BY ALTERNATE LOADING

By ROBERT G. MIDDLETON
Commercial Engineering, RCA Tube Department

High-fidelity broadcast receivers and certain communications receivers use wide-band intermediate-frequency transformers. These transformers are usually over-coupled to obtain a pass band of approximately 10 kc, as shown in curve A of Fig. 1. Over-coupling broadens the top of the response curve and causes it to develop two peaks as shown at P_1 and P_2.

When properly aligned, an over-coupled transformer delivers equal output voltages at P_1 and P_2. Misalignment causes the response curve to become unsymmetrical, as shown in curve B of Fig. 1. Such misalignment results in impaired receiver performance, because various sideband frequencies are unduly attenuated.

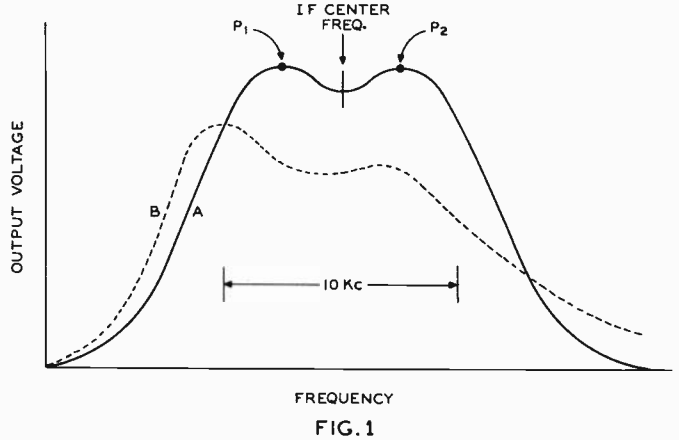


FIG. 1

Response curve A can be obtained most readily with the aid of a sweep-alignment generator and an oscilloscope. However, if a sweep generator is not available, satisfactory alignment can be obtained with a test oscillator such as the RCA WR-67A, and a VoltOhmyst electronic meter. When a test oscillator is used, the serviceman will find it advantageous to utilize the alternate-loading technique instead of the more laborious point-by-point method.

The alternate-loading technique is diagrammed in Fig. 2. The first step consists of peaking the secondary of an if transformer, while the primary of the same transformer is shunted with a load resistor. Secondly, the primary is peaked while the secondary is shunted with the load resistor. Finally, the load resistor is removed, and the transformer is in alignment.

The effect of the shunt resistor is shown in curve B of Fig. 3. Without the shunt resistor, a properly aligned transformer has a response curve similar to A. However, when one of the windings is loaded, a single peak-response point P (curve B) occurs at the if center frequency. The single peak is readily located, and greatly facilitates alignment procedure.

Note: Receivers may occasionally be encountered which use stagger-tuning or a combination of over-coupling and stagger-tuning to obtain a wide pass band. Such receivers must be sweep-aligned.

The value of the shunt resistor should be approximately 10,000 ohms for alignment of broadcast and short-wave receivers. A carbon-type resistor is better than a wire-wound resistor from the standpoint of reactive effects and, therefore, should be used. Since both types of 10,000-ohm resistors may have the same external appearance, care should be taken to make sure that the resistor is of the proper type.

Alignment of compact receivers is frequently facilitated by use of RCA Testpoint Adapters WG-265 or WG-260. These adapters make tube-socket terminals accessible on the tube side of the chassis, and afford ready access to "buried" socket terminals. Adapters also minimize the danger of underchassis shorts in crowded spaces.

To align a high-fidelity broadcast receiver by the method of alternate loading, provided the receiver is operating properly in all other respects, proceed as follows:

1. Connect the test oscillator to the control grid terminal of the mixer tube in any super-heterodyne receiver through a 0.01 uf (approx.), capacitor. Set the oscillator to the if center frequency.

2. Mesh the main gang tuning capacitor completely.

3. Disable the avc bus and substitute —3 volts of fixed bias to the if strip.

4. Connect the VoltOhmyst electronic meter across the load resistor of the second detector. Set the Volt-Ohmyst meter to the 3-volt dc range.

Note: If the receiver is completely misaligned, "rough-tune" the if transformers as well as possible, before proceeding to the next step.

5. Shunt the primary of the last if transformer with the carbon-type loading resistor.

6. Peak the secondary of the last if transformer for maximum indication on the VoltOhmyst meter. Adjust the output of the test oscillator for the mid-scale indication, if necessary.

(*Continued on Page 7*)

Talking Things Over

With W. L. ROTHENBERGER
Manager, Renewal Sales

How much does it cost you to step on the starter of your service car or truck?

I wonder if you know the answer to this apparently simple question. True it's a thought provoker, but it's intended to make you sit up and consider an important phase of your business operations.

I've asked it of many fellows in the field, and I've received a wide variety of answers. Most took it literally and said they figured it cost a penny or two for mechanical wear and tear plus a little physical effort. But it goes deeper than that.

Running an automobile takes up a certain portion of your working day. Time costs money so it follows that your trip on the road should be as carefully budgeted as your monetary expenditures. Assuming you operate one car, and do 90% of your servicing over a relatively small area, you'll find it profitable to consider these time-saving suggestions.

Follow a workable schedule that permits you to deliver and pick up sets in the most direct route possible. Try to avoid zig-zagging back and forth over a wide territory. If you can arrange your affairs so that you concentrate on a specific area each day, so much the better.

Make it a practice to phone your place of business for any new service calls that may have come in since you left. There's nothing as disheartening as having to retrace your steps to pick up Mrs. Jones' receiver after you've just returned from her neighbor across the street.

Plan your route so it passes close to your local tube and parts distributor at least once or twice each week. Remember every purchasing expedition consumes an appreciable amount of time, regardless of whether you need one or two items or are completely restocking your bins. Concentrating your purchases means you have more time for sales and service—and the gratitude of your distributor whose costs go down on large volume orders.

Finally, make it a practice to keep your truck or automobile in good running order. A regular checkup is insurance against unexpected and costly breakdowns when you have a fast service call to make. And while we're on the subject, it's much easier on the temper to "fill 'er up" once or twice a week instead of stopping off for a couple of gallons every time the needle approaches the "empty" mark on the meter.

Those of you who are budgeting your time this way know how profitable "saved hours" are. If you haven't yet adopted this practice, put it to the test and see for yourself how it helps your day-to-day operations.

Carry a little notebook and list your total activities by hour, each day for one week. Then total the actual number of hours spent on sales and service. After you have this data, budget your time carefully, and continue to keep a similar account of your working days for a second week. Then compare the two records.

We know you'll find the results surprising—more work done—more profit—and a reduction in the price of stepping on the starter of your automobile.

TELEVISION ANTENNAS AND TRANSMISSION LINES

By John R. Meagher
Television Specialist, RCA Renewal Sales

PART I. ACTION OF DIPOLE AND REFLECTOR

Assume that the metal rod in Fig. 1 is supported horizontally in space to pick up signals from a TV station. The rod is cut to one-half wave length at the frequency of this station. The rod is not broken at the center, and it is not connected to anything.

The rod will intercept or pick up signals from a limited area of space that for practical purposes may be regarded as being almost as long as the rod and about a half-wave high.

A small amount of this signal will be used up in heat (current flow along the surface of the rod). The rest of the signal cannot be absorbed because there is no load. So essentially all of the signal that is picked up by the rod is re-radiated or sent out again into space.

Suppose we break the rod at the center and connect an adjustable resistance across the gap. Also, suppose that we provide some means to measure the power in this resistor, which is the load. We then adjust the resistance for the value that develops maximum power in the resistor.

The antenna is now getting energy from two sources, from the station and from the reflector. For best results, these two must be in step (or phase) with each other at the antenna. This phase relationship depends on the spacing between antenna and reflector, and on the length (tuning, or phase) of the reflector.

The reflector acts to increase the energy in the antenna and also to decrease the radiation resistance. In effect, less energy is re-radiated by the antenna and more energy is used in the load.

The same result can be achieved by placing a rod in front of the antenna. In this position it is called a director. The two signals arriving at the antenna, also must be in phase; the phase relation in this case depends on the spacing between the antenna and director and on the length (tuning or phase) of the director.

SIMPLIFIED DIPOLE ACTION

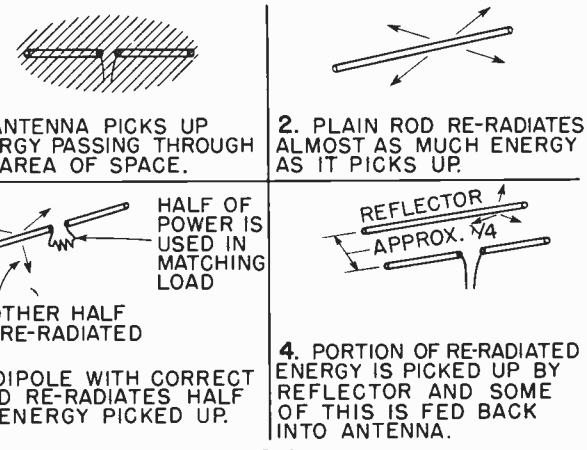


FIG. 1

Under this condition, we can assume that one-half of the energy picked up by the antenna is absorbed in the load, and the other half is re-radiated. For convenience we can assume that the re-radiated energy is consumed in another resistance, which is termed the radiation resistance.

Some of this re-radiated energy can be reflected back into the antenna by placing another rod (reflector) of suitable length in back of the antenna with a spacing of one-quarter wave or less.

The reflector picks up some of the energy that is re-radiated by the antenna. In turn, the reflector re-radiates practically all of this energy, and a portion of this is picked up by the antenna.

In TV reception, a practical difference between a reflector and a director is that with a reflector, the response is cut more sharply on the low-frequency side; with a director, the response is cut more sharply on the high-frequency side.

The use of both a director and a reflector results in greater gain, but with narrow band width and low antenna impedance.

Stacked Antennas

An antenna intercepts or receives the signal in a certain area of space. If two similar antennas are used, the intercepted area is doubled and the received *power* is doubled. When two antennas are connected together, with correct phasing and matching, the *voltage* across the input impedance of the receiver is increased approximately 1.4 times.

STACKED FOLDED DIPOLES

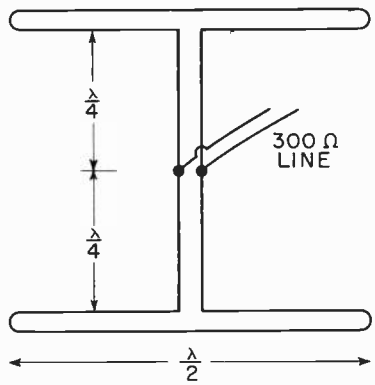


FIG. 2

Figure 2 shows a practical example, using two identical folded dipoles spaced one-half wave apart. If reflectors with spacing of 0.2 wave-length are used, it may be assumed that the impedance of each antenna is reduced to about 170 ohms. (For simplicity, the reflectors are not shown in Figure 2.)

The transmission-line impedance is 300 ohms. At the point where the line connects to the two antennas, the impedance of each antenna should "look like" 600 ohms, so that the two in parallel are 300 ohms.

Two quarter-wave lines are used as matching sections between the terminals of each antenna and the transmission line. These quarter-wave lines should have an impedance that will "transform" the impedance of each 170-ohm antenna up to 600 ohms. The quarter-wave line impedance can be computed from the relation:

$$\text{Line impedance} = \sqrt{\text{input impedance} \times \text{output impedance}}.$$

In this example the

$$\text{Line impedance} = \sqrt{170 \times 600} = 320 \text{ ohms approximately.}$$

When tubing or rods are used for the matching sections, the diameter spacing for an impedance of 320 ohms can be determined from Figure 3. Rods of ¼″ diameter spaced 1.8″, or rods of ⅜″ diameter spaced 2.8″ are suitable in this case.

The phasing or polarity of the signal voltage from each antenna is automatically taken care of in this arrangement because the signal from each antenna travels the same distance (¼ wavelength) to reach the transmission-line terminals.

When stacked arrays for low-band channels are installed, it should be remembered that if the top antenna is not very high above the effective ground plane, the lower antenna will intercept less signal than the top antenna. As a result, the actual voltage gain of the array, compared to the top antenna alone, will be less than 1.4.

The effective ground plane may be at roof level in a building with metal framing or a metal roof.

Folded Dipoles

In a conventional folded dipole, as shown in Fig. 4a, with rods of equal diameter, each rod has ½ the total conducting areas, and the impedance is 4 times that of a plain dipole.

The impedance of a folded dipole may be increased by increasing the area of the continuous section, or by using more than one rod in parallel with the split section, as shown in Figs. 4b and 4c. When the split section has ⅓ the total area, the an-

(Continued on Page 4)

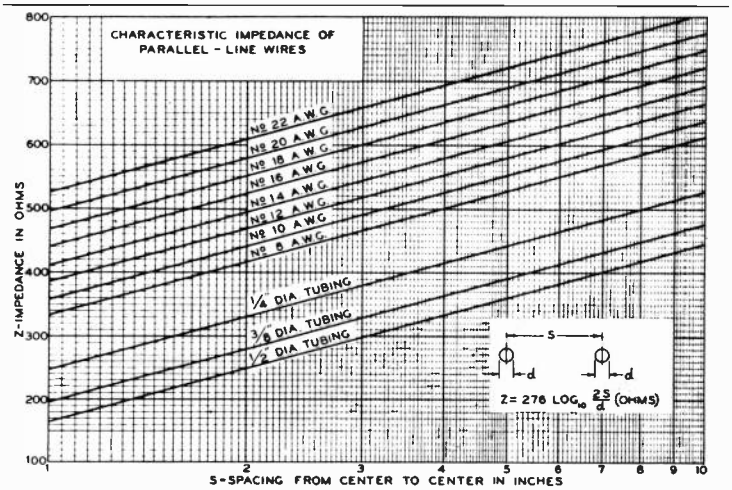


FIG. 3

TELEVISION ANTENNAS

(*Continued from Page 3*)

tenna impedance is 9 times that of a plain dipole. When the split section has ¼ the total area, the impedance is 16 times that of a plain dipole.

The presence of a reflector decreases the impedance of a folded dipole in the same ratio as for a plain dipole.

When both reflectors and directors are used to obtain maximum gain, the impedance of a plain dipole may drop to as low as 10 ohms. This value is too low for connection to a coax transmission line. However, a folded dipole with several parallel elements as shown in Figs. 4b or 4c, may be used in place of the plain dipole to obtain a higher antenna impedance to facilitate matching to a coax transmission line.

In some respects, a folded dipole may be regarded as a plain dipole shunted by two quarter-wave shorted stubs. The stubs function as parallel-tuned circuits, while the dipole functions as a series-tuned circuit. The reactances of the stubs and the dipole change in opposite directions and tend to cancel at frequencies above or below resonance. This tendency contributes to the somewhat wider bandwidth of a folded dipole as compared to that of a plain dipole.

Increasing Signal Input on an Incorrectly Terminated Line

As mentioned later, the impedance of the transmission line should equal the *rated* input impedance of the particular TV receiver. However, the *actual* input impedance of TV receivers does not remain constant on all channels, and frequently has a large reactive component. By "tuning out" this reactance on any particular channel, it is possible in many cases to get an appreciable increase in picture strength. Obviously, this expedient is required only on weak signals.

This improvement can be accomplished easily on installations with *ribbon*-type transmission line. The procedure is as follows:

1. Tune in the weakest TV station.
2. Grasp the transmission line between the thumb and fingers at some point along the line where it is convenient to observe the picture. Slide the fingers along the line, watching for change in picture brightness. At some point, the picture strength will increase. A quarter-wave further along the line, the picture strength will decrease.

The fingers act as a small capacitor across the transmission line. It may be necessary to vary the capacitance by increasing or decreasing the pressure or the finger area. If the effect of a larger capacitor is required, grasp the line between the palm and four fingertips.

Find the center point of the section where the hand capacitance increases the picture strength. Connect a small silvered ceramic trimmer (1.5 to either 7 or 15 uuf) across the transmission line at this point. Hold the insulation of the trimmer between the tips of the fingers and, using a fibre neut stick, adjust the trimmer for maximum picture strength. Refer to Figure 5.

Instead of a trimmer capacitor, it is possible to use a piece of metal foil, wrapping it around the line, sliding it to the position for best signal strength, adding or removing foil area if necessary, and finally fastening it in position with Scotch tape.

If hand capacitance decreases the picture strength at all positions along the line, it indicates that the receiver is correctly terminating the line on the particular channel. In this case, no improvement can be achieved.

The actual application of this method of partially compensating for an incorrectly terminated line depends on how many channels need improvement, whether a particular receiver has appreciable input reactance on these channels, and many other factors. We will leave, therefore, the actual application to the ingenuity of the TV technician. It should be noted, however, that the particular position and value of the capacitance apply only to one channel. For any other channel it is necessary to reposition the capacitor and change its value.

SPECIAL NOTICE

Mr. Meagher's article on TV antennas in this issue is published in place of part IV of his "Television Service" series—but for a very good reason. Mr. Meagher has come up with an outstanding idea by means of which he can present an even more dramatic demonstration of TV trouble-shooting. He has spent long hours readying this new technique and Part IV of Mr. Meagher's Television Service Series will appear in the next issue of RADIO SERVICE NEWS. We can't tell you more about it just yet, but we know that you will share our enthusiasm when you read it.

Meanwhile, we are starting another of the Meagher series, TELEVISION ANTENNAS AND TRANSMISSION LINES. It covers the real, down-to-earth facts that every serviceman has been looking for—the inside story on Television Antennas. Be sure to save every issue of RADIO SERVICE NEWS with its outstanding TV coverage, especially prepared by this recognized authority on television service. Ask your distributor to put you on his mailing list, or to reserve a copy of each issue for you.

IMPEDANCE OF FOLDED DIPOLES

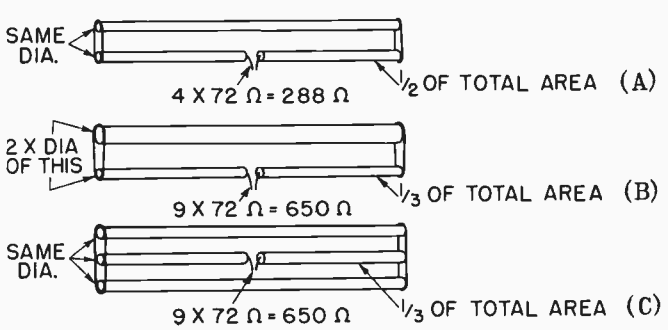
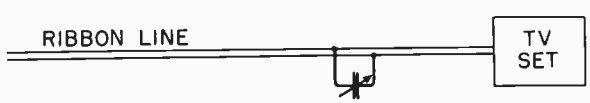


FIG. 4

IMPROVING SIGNAL

WHEN TV SET DOES NOT CORRECTLY TERMINATE LINE



1. FIND POINT WHERE FINGERS INCREASE SIGNAL.
2. CONNECT SMALL TRIMMER AT THIS POINT, ADJUST FOR BRIGHTEST PIX.

(USEFUL ONLY ON WEAK SIGNAL)

FIG. 5

FOUNTAINHEAD OF TUBE INFORMATION

Servicemen everywhere look to RCA Tube Publications for accurate data and unquestioned authoritativeness. For information on the material shown, see your local RCA Distributor, or write Commercial Engineering, RCA, Harrison, N. J.

SALES *and* SERVICE TIPS

Once again you can win a handsome RCA Resistor-Code Pencil by sending tips to RCA Radio Service News, Harrison, New Jersey . . . All tips become the property of RCA to be used as it sees fit . . . Service Tips are our readers' ideas, not ours. While we believe they are worthwhile, we cannot be responsible for them.

"SHORT CIRCUITS"

Lay a chunk of alnico V, from a discarded PM speaker, by the bit when drilling a hole in a steel chassis. No chips will fall into the set.

Clark Cressman
c/o Harry W. Carson
4th & Green Sts.
Bridgeport, Pa.

Fuse each bench receptacle individually. This not only adds a safety factor, but aids in locating the short quickly.

T. A. Day
Truble Lab.
422 N. 18th St.
Kansas City, Kansas

I keep a bronze bristle brush, generally used for cleaning suede shoes, fastened to the end of my bench. It's really tops for cleaning my soldering iron tip.

Earl Blackmun
Radio & Electrical Serv.
Croton, South Dakota

SHEET PLASTIC FOR ANTENNA LEAD-INS

The problem of bringing 300-ohm ribbon or a coax line into some buildings is really tough. I've solved it many times by utilizing a small unused window, replacing the pane of glass with a sheet of lucite or other clear plastic material. It's easy to drill holes in this new window pane, and yet no light is lost nor is the building marred. Furthermore, air space around the cable may be sealed off by using coil dope or some similar liquid plastic solution.

Myron S. Wolf
Ben's Radio
347 Tremont St.
Boston 16, Mass.

TUBE PRICE CARD IS USEFUL TOOL

I keep my RCA Tube List Price Card in an 8 x 10 inch picture frame. In so doing, I accomplish such things as—

1. Advertise my brand of tubes
2. Add neatness to the shop
3. Tubes priced in front of customers
4. Price card stays clean
5. New card easy to insert
6. Never have to search for the price list

J. W. White
White's Radio Service
Sterling Avenue
Winona, Mississippi

THE RCA INDOOR ANTENNA

Here is RCA's answer to the apartment house dweller who can't put up an outdoor antenna for Television—The RCA 202A1 Indoor Television Antenna. See the story about this unique antenna on page 1 of this issue. A TV "natural", its suggested list price is only $11.95.

(Continued from Page 1)

with a grip on an infernal machine and a perfect circuit with the local power plant's generators. We stood there for a few moments convulsing until one of the ac/dc's fell off the bench. I felt awfully bad about the whole thing for I asked him to hand me a tool which I should have gotten myself. If I am lucky enough maybe the Isotap Xformer will put me back in the good graces of Minnie, who incidentally is the boss here.

J. W. Sneed, Jr.
Menefee Radio Sales & Service
208 Cypress Street
Orange, Texas

EDITOR
RADIO SERVICE NEWS

Many men, used to working with the high voltages encountered in radio and television sets, scoff at "a hundred and ten." I don't anymore!

It happened on a hot, sticky summer afternoon. While working on a combination battery and electric portable I left an ac/dc midget, suspected of being intermittent, playing nearby. Suddenly the midget blared out and, while holding on to the portable chassis with one damp, perspiring hand, I grabbed the volume control of the midget with the other.

It didn't knock me across the room. It didn't even move me from my stool. But I'll swear my teeth chattered at a sixty cycle rate for at least a minute.

If there is a moral to this story this is it: Be sure your right hand knows what your left hand is doing!

Clark Cressman
c/o Harry W. Carson
4th & Green Sts.
Bridgeport, Pa.

EDITOR
RADIO SERVICE NEWS

Here is one you will not find in books: The shortest path of an electric current from one given terminal to another, is through the nearest serviceman's body.

One day, amid the quiet and peace of my shop, and in the middle of a job, I reached into a chassis to remove a tube. But, just as I had secured a good firm grip on the tube, with my right hand, my left hand touched some grounded object on the bench. What it was I shall never know. Apparently the bottom finger around the tube touched the chassis.

But things began to happen. The result was a rapid muscular action which sent the hand gripping the tube flying up and back. The tube came along in the hand and left it at the top of the arc, and went flying across the shop. It hit the opposite wall with a crash and fell to the floor in a hundred pieces. When I finished addressing the radio in no uncertain manner, I got the broom and swept up the remains.

The best safety first advice I can think of is for each shop to have one or more of your new RCA ISOTAP TRANSFORMERS on the bench at all times.

J. A. Corwin
538 Magie Avenue
Elizabeth 3, N. J.

EDITOR
RADIO SERVICE NEWS

One evening last summer, I was working late in my shop, on a typical ac/dc receiver, hunting an elusive intermittent. Finding that the overhead light was not sufficient, I grabbed up the trusty flashlight and leaned over to peer down into the "innards" of the radio. Not having much in the way of hirsute covering, the flashlight, (a metal one) came into contact, coincidentally with my bald noggin and the chassis of the radio. You know, of course, what happened. My arm, by reflex action, pulled back fast. And here's the payoff. My son, always eager to see what makes radios tick, was standing directly behind me peering over my shoulder. He received the full force of my elbow to his jaw, with a resultant technical KO to the floor. Five minutes later after being revived, he figured I did it on purpose.

E. F. Cornwell
Cornwell Radio Service
1855 W. Mound Street
Columbus 4, Ohio

EDITOR
RADIO SERVICE NEWS

It was a hot sultry day. The windows were open and not a breath of air was stirring. I was perspiring freely. I picked up an ac/dc set, and put it on the bench, connected the ac line and turned on the switch. I waited the customary time, but nothing happened. Well it could be a bad tube! I removed the back and cleaned the set. "There that looks like a new set again except for the drops of perspiration on the chassis." It's getting darker now, so I reach up to turn on the new light that I just installed over the bench."

As soon as I touched the light to press the starter button, I realized my muscles of both arms were contracting and relaxing as if in resonance with sixty cycles. I yelled "Yowie! Get this thing off," but I was still under the spell of the sixty cycles, the contracting and relaxing of the muscles. I began to visualize. "This is how it feels to be electrocuted, I won't see my two-year old daughter again, I won't know whether my next child will be a boy or girl, I won't see my wife again, is my insurance paid?

Somehow I found my legs would move. I took one step backwards quickly, pulling the ac/dc chassis and lamp with me. Just as I started to take another step the ac/dc chassis fell over the edge of the bench to the floor, releasing my contracted muscles. I immediately sat on a chair that happened to be behind me.

My one hand had a slight burn near the wrist, and my muscles began to pain as if I had shoveled out an excavation for a skyscraper. The pain disappeared in about one day. I had been shocked many times before, and even checked hot wires and fuses with moist fingers, as if defying the electron. But this incident taught me to have more respect for the lowly 110-volt 60-cycle ac line.

Lando K. Moyer
22 Mercer Ave.
Doylestown, Pa.

RECEIVER SENSITIVITY AND GAIN MEASUREMENTS AT HIGH FREQUENCIES

Measurements of sensitivity and gain of rf amplifiers and converters at frequencies above 80 megacycles should be based on the power input to a circuit rather than on the voltage input, since the power input required to produce a given output is independent of the point of input.

At high frequencies, difficulty is caused by the substantial reactance of even short pieces of wire. A signal generator is calibrated in terms of the open-circuit voltage across its terminals, but it is physically impossible to bring these terminals exactly to the points at which voltage-sensitivity measurements are desired, even when the terminals are at the end of a flexible cable.

It is possible, however, to introduce a measured amount of power into a receiver circuit without encountering these difficulties. In Fig. 1, a resistor R and an adjustable capacitor C are connected between the signal generator and the receiver tuned circuit. Maximum power in either Fig. 1a or 1b is transferred when C and C¹ are adjusted so that the circuit impedance between (a) and ground is resistive and equal to r (sum of R and the internal resistance of the generator). The power to the receiver is then given by

$$P = e^2/4r$$

where e = open-circuit voltage at the generator terminals, and r = sum of R and the internal generator resistance.

In practice, R is connected to the high-potential terminal of the signal generator, and C is connected between R and a point near the high-potential end of the receiver circuit. A value of 300 ohms for R has been found suitable for frequencies near 100 megacycles. At other frequencies, different values of R may be more suitable.

Two pieces of hookup wire twisted together may be used for the adjustable capacitor C. The circuit is tuned to resonance, and various adjustments of C are tried, with readjustment of the receiver circuit to resonance in each trial, until maximum receiver output is obtained. The signal-generator voltage is then adjusted to the value giving standard power output from the receiver and this voltage is recorded. The power sensitivity can then be computed from the signal-generator voltage and the resistance, r.

Measurements of an FM receiver are given below as an example. The signal frequency used was 98 megacycles frequency modulated with 400 cycles. Receiver output was 50 milliwatts. A 12BE6 was used as a converter, and a 6BJ6 as an rf amplifier. R was 260 ohms, and the output resistance of the generator was 26.5 ohms, making r = 286.5 ohms. Since the receiver antenna circuit was designed for 300 ohms, R was also used for the dummy antenna. Connection to points (2-2) and (3-3) of Fig. 2 were made through a twisted-wire capacitor, and connections to (1-1) were made through R only.

Point of Input	Signal Generator Output volts	Power to Receiver watts
(3-3)	125×10^{-6}	13.7×10^{-12}
(2-2)	23×10^{-6}	0.46×10^{-12}
(1-1)	23×10^{-6}	0.46×10^{-12}
Power Ratio, (3-3) to (2-2)		29.6
Power Ratio, (2-2) to (1-1)		1.0

The power ratio (3-3) to (2-2) is the effective power gain of the rf amplifier stage. This ratio represents the real advantage in sensitivity obtained by adding the rf stage to the receiver, and therefore, conveys more significance than a measurement of grid-to-grid voltage gain.

The power ratio (2-2) to (1-1) indicates the degree of coupling and the efficiency of the antenna transformer. The observed value of unity indicates that a close impedance match was obtained and that the additional losses obtained when the antenna winding is used are negligible.

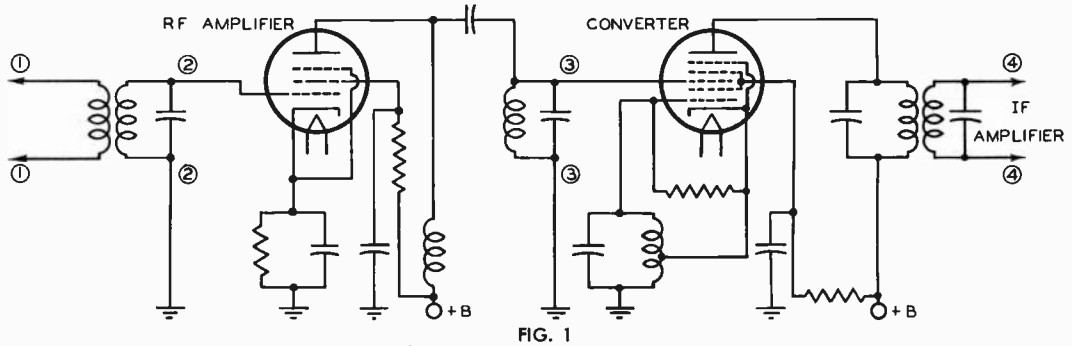


FIG. 1

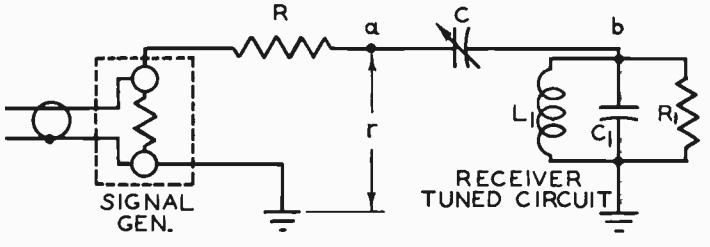


FIG. 2

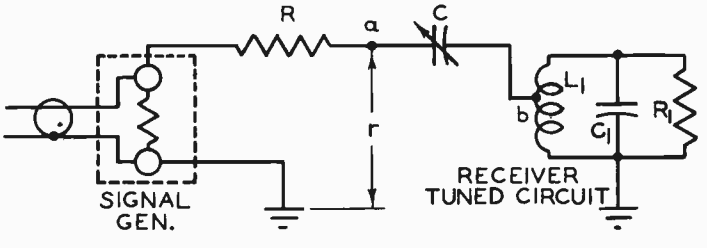


FIG. 3

GIRL GETS COMPETITION FROM TELEVISION SET

By ELIZABETH WOODWARD

THE QUESTION

Dear Miss Woodward: "Ralph and I have been going together for three years. But lately I've been getting some powerful competition from a strange source. He's started going around with a boy who has a television set! Ralph is very fond of sports and is now putting television and sports before me.

"I'm not selfish about this now, but if it keeps up, we're going to break up. How can I make him realize how I feel and settle this matter without a quarrel?"

THE ADVICE

You ought to be glad your competition's coming from a television set and not from some girl with beautiful big blue eyes!

If you'd share Ralph's interest in watching big games and matches you'd share more of Ralph's time. He could be persuaded to take you along to his friend's house when there's something special to see. And the friend could be persuaded to invite you along.

Reprinted from "The Chicago Daily News"

I F ALIGNMENT

(*Continued from Page 2*)

7. Disconnect the shunt loading resistor from the primary, and connect it in shunt with the secondary of the last if transformer.

8. Peak the primary of the last if transformer. Do not change the frequency of the test oscillator, and do not attempt to "touch-up" the secondary adjustment.

9. Disconnect the shunt loading resistor, and proceed to align the next-to-the-last if transformer as described in steps 5 through 8.

10. Align the other if transformers in a progressive manner, working backwards to the mixer.

11. Disconnect all leads. The if strip is now completely aligned.

FM-if strips can also be aligned by the method of alternate loading. However, the value of the shunt loading resistor should be approximately 500 ohms. It is necessary to use a carbon-type resistor.

When aligning receivers which have fm- and am-if transformers connected in series, consult the manufacturers recommendations to determine whether the FM or AM section should be aligned first.

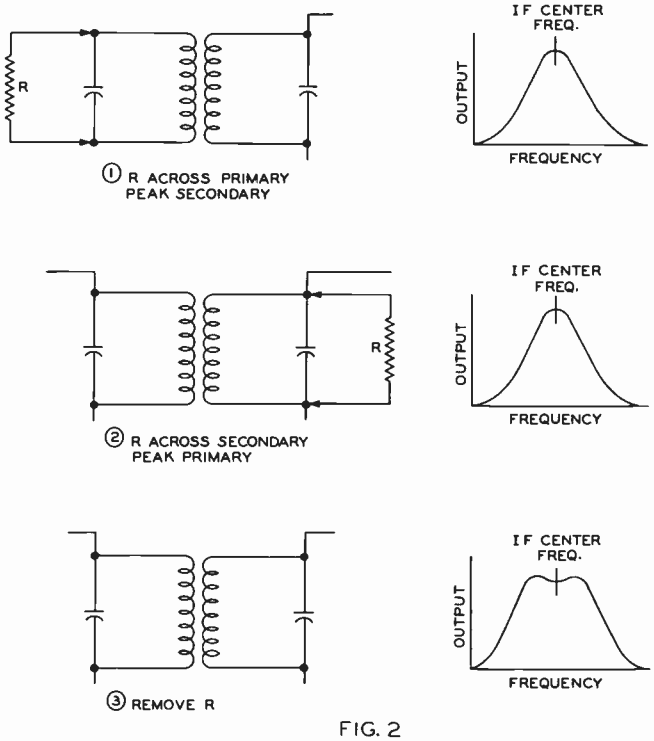


FIG. 2

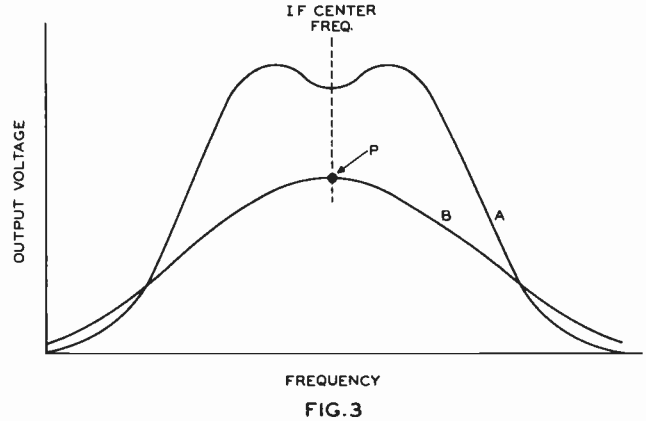


FIG. 3

REPLACEMENT PARTS Section

RCA SPEAKER SPECIFICATIONS

The many recent additions to RCA's speaker line have undoubtedly left some servicemen unaware of the completeness of the line. A brief resume of the specifications of all available speakers have been compiled into one handy comparative list and presented here for your information and reference. Keep this chart handy for determining the correct replacement of an RCA Speaker.

PERMANENT-MAGNET TYPES

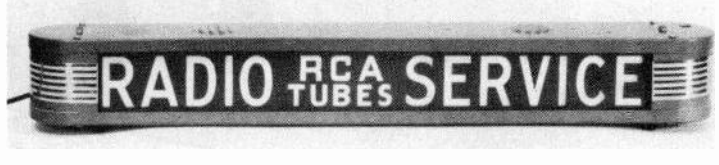
Size	Type No.	Res'n't Freq. (Cycles)	Mag. Wt. (Ozs.)	V. C. Imp. (Ohms at cps.)	Max. Pwr. Handling Capability (Watts)	Type Mtg.
2″ x 3″	423S1	250–365	1.5	11.8 at 1000	0.125	R
4″ (shallow pot)	304S2	175–225	1.0	3.2 at 400	3	R or P
4″	404S2	170–225	1.47	3.2 at 400	3	R or P
4″ x 6″	246S2	150–200	0.68	3.2 at 400	3	R or P
4″ x 6″	446S2	150–200	1.47	3.2 at 400	3	R or P
5″	205S2	150–200	0.68	3.2 at 400	3	R or P
5″	405S2	150–200	1.47	3.2 at 400	3	R or P
5″	305S1	150–200	1.0	3.2 at 400	3	R or P
5″ x 7	257S1	120–140	1.47	3.2 at 400	6	R or P
8″	208S2	75–95	2.15	3.2 at 400	8	R
8″	208S4	75–95	2.15	6.8 at 400	8	R
12″	312S1	70–85	2.15	3.2 at 400	12	R
12″	412S1	70–85	6.8	3.2 at 400	12	R
12″	412S4	70–85	6.8	6.8 at 400	12	R

FIELD-COIL TYPES

Size	Type No.	Res'n't Freq. (Cycles)	Field Resistance (ohms at ma.)	V.C. Imp. (ohms at cps.)	Max. Pwr. Handling Capability (Watts)	Type Mtg.
4″ x 6″	746S1	150–200	450 at 65	3.2 at 400	3	R or P
5″	705S1	150–200	450 at 65	3.2 at 400	3	R or P
12″	712S1	70–85	1000 at 70	3.2 at 400	12	R

*R—Rim Mounting P—Pot Mounting

RCA "FIREBALL" SIGN IMPACT MAKES IMPRESSION THAT LASTS



Here, for the first time, is terrific visual impact and contrast—in a compact sign. No one can possibly miss getting your sales message every time. You register "RADIO SERVICE" again and again—day or night, with every passerby. Attract attention to your window, your products, your service. Make an impression that lasts—that brings you business! This sign does it like NO OTHER SIGN of its type.

- More brilliant than neon by light meter test!
- One cent runs it 24 hours!
- Terrific visual impact and penetration!
- Heavy steel construction
- Tan enamel Hammerloid finish and chrome trim
- 20-watt fluorescent tube
- Operates on 110-120 volts, 60 cycles ac.
- 26″ long, 3½″ deep, 4″ high
- 6′ chain for hanging
- 4 heavy rubber grommets

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TO:

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