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RADIO SERVICE NEWS

VOLUME XIV, No. 2 | RCA TUBE DEPARTMENT, HARRISON, NEW JERSEY | March-April, 1949

RCA MAINTAINS SINGLE-QUALITY TUBE STANDARD

Tube Quality Vital for TV

The ever expanding applications of electron tubes have kept RCA engineers constantly on the alert to assure tube quality that will give satisfaction in these new fields.

Increased sensitivities of portable receivers have required more exacting standards for microphonics. Tubes now have to serve the dual function of AM and FM reception. The widespread use of RCA receiving tubes in industrial applications demands top quality for extremely diversified functions.

One of the most stringent requirements for the best in quality has been brought about by television. TV adds to hearing the far more critical sense of sight, and combines ultra-high-frequency performance and high sensitivity with complex scanning. In these varying fields, and particularly in television, RCA remains the leader in tube quality.

To achieve the numerous quality improvements in tubes for Television the following broad steps have been taken at RCA.

1. **Changes have been made in the construction of many types.**
2. **Additional control of manufacturing processes have been put into operation.**
3. **Facilities for additional tests, costing many thousands of dollars have been acquired and put to use.**

RCA maintains one quality standard. An improvement accomplished for a tube type is applied to all tubes of the type regardless of their ultimate use. Whether the tubes are finally used in a television receiver, home or automobile receiver, or in non-radio equipment, they will have been produced and inspected to the same high standards for each tube type. A quality improvement made for television reduces the possibility of trouble not only for the television user, but for all other users as well.

A product at a single quality level has many definite advantages to manufacturer, distributor and dealer. One stock only is maintained in warehouses, and all orders are filled from this stock. The dealer likewise can be assured, with RCA tubes, of supplying tubes of the same top quality regardless of the customer.

SCENE OF MARION, INDIANA CEREMONIES

The first spadeful of Hoosier soil was turned at ceremonies marking the start of RCA's new 16" metal kinescope plant. Distinguished participants shown above are, left to right, Henry F. Schricker, Governor of Indiana; L. W. Teegarden, Vice-President of RCA in Charge of Technical Products; and Willard G. Blackman, Mayor of Marion, Indiana. Mass production of the 16" metal tube is scheduled to be realized by this time next year. Meantime, 16" metal tubes, along with the popular 10" picture tubes, are being turned out at RCA's Lancaster, Pa., plant on an all-out production schedule.

RCA TELEVISION DYNAMIC DEMONSTRATOR MAKES DEBUT

A unique and spectacular television "demonstrator" which reveals clearly the exact functions of a modern TV receiver, both sound and picture, has recently made its debut. The RCA Television Dynamic Demonstrator is a complete 30-tube receiver with every circuit and component clearly exposed on a panel 3½ feet high by 5½ feet wide. It was designed and built by John Meagher, nationally known television specialist of the RCA Tube Department, whose articles currently appear in RADIO SERVICE NEWS.

Outstanding feature of the TV Demonstrator is the plug-in arrangement of more than 200 parts. All tuning and critical adjustments are accessible from the front panel, enabling the operator to simulate any conceivable type of trouble or combinations. The resultant visual or aural effect can then be observed and analyzed.

It is interesting to note that this is the receiver from which Mr. Meagher has made the remarkable series of actual screen photographs which accompany his "Television Service" articles in this and recent issues of RADIO SERVICE NEWS. These articles and actual kinescope photographs will be continued by popular acclaim, in order to bring to the service trade authoritative information about the many important phases of television receiver servicing. As each section of a TV receiver is covered, an accompanying circuit diagram will show the reader the exact functions of components as well as the exacting importance of correct alignment.

RCA BREAKS GROUND FOR 16" METAL TUBE PLANT IN INDIANA

New Facilities to Mass Produce 16-Inch Metal Kinescope

A new manufacturing center for additional mass-production of 16-inch metal television picture tubes will be erected in Marion, Indiana by the RCA Tube Department. Construction of the ultra-modern plant is being undertaken to meet the needs of the booming television industry.

The new building will provide 115,000 square feet of manufacturing space and is in addition to 160,000 square feet of factory buildings which have already been acquired by the RCA Tube Department in Marion.

According to present schedules the new building is expected to be completed by early fall. The entire new plant is scheduled to be in full-scale production of the large metal tubes by this time next year. These facilities will be similar to the high-speed automatic equipment especially designed and developed by RCA engineers and now turning out television picture tubes at the rate of better than one a minute at the Tube Department's Lancaster, Pa. plant.

The new 16-inch metal television picture tube to be mass-produced at the new Marion plant is the industry's first metal kinescope. The result of 13 years of research and development in the laboratories of the RCA Tube Dept., the new tube is designed to furnish at low cost a large-size direct-view picture intermediate between that of the 10-inch television receiver and projection-type sets. The new metal tube differs radically from previous television tubes in that it uses a metal cone center section instead of an all-glass envelope.

PLEASE NOTE:

The RCA 12AP4 is not interchangeable with the Type 12JP4 and can not be used to replace it. The RCA 12AP4 is a kinescope made only as a direct replacement for prewar RCA television receivers using that type, and will not operate in receivers using the 12JP4.

Remember this note and save time and effort when ordering TV tube replacements.

Photolithographed in U. S. A.

TELEVISION ANTENNAS AND TRANSMISSION LINES

By John R. Meagher
Television Specialist, RCA Renewal Sales

Why does there appear to be so much contradictory information about television antennas?

In the first place, there are wide differences of opinion based on individual experience under different conditions.

For instance, technician "A" in a *strong* signal area is convinced that a certain antenna has broad-band response because it gives satisfactory reception on all of the TV areas.

But technician "B" in a *weak* signal area is convinced that this same antenna has narrow-band response, because he must use several of these antennas, each cut for a particular channel to obtain sufficient signal on each station.

Here are two different opinions. Is this a wide-band antenna, or a narrow-band antenna? How should the manufacturer rate it?

In the second place, almost all of the practical information that is available on antennas applies only to the resonant frequency. This information includes the widely-known values of dipole characteristics, such as:

(a) impedance
(b) gain from the use of a reflector
(c) change of impedance due to the reflector.
(d) and the directivity pattern

All of these characteristics become entirely different when the antenna is used to receive channels at other than the resonant frequency, and this is exactly the condition that applies in television, because in probably 80% of all TV installations, a single antenna is used to receive two or more stations on different frequencies.

Yet we continue to think and to talk about television antennas in terms of characteristics that apply only at the resonant frequency.

To illustrate this point, assume that a technician stops to admire an antenna installation. He sees that it is a plain dipole cut for one of the low channels, so he classifies it as having 70-ohm impedance. The transmission line is 70-ohm coax, so he is satisfied that it matches the antenna correctly for maximum power output. He knows that a plain dipole has a figure "8" reception pattern, with best reception at right angles to the rods. This dipole is broadside to the direction of the stations, so he is satisfied that it is oriented for best signal pickup.

Of course, the technician is correct on all of these points, providing the owner happens to be looking at the particular channel for which the antenna is resonant.

But suppose the owner looks at another low-band channel: The antenna impedance is no longer 70-ohms; it may be quite different. So the 70-ohm coax does not match the antenna.

Or suppose the owner looks at a high-band channel: The antenna impedance is not 70-ohms, it may be several hundred ohms; so again the 70-ohm coax does not match the antenna. The antenna does not have a figure "8" pattern; it has four major lobes at about 40° angles to the rods, so the antenna is not oriented for maximum signal on these channels.

In the third place, it does not make sense to consider the "gain" of an antenna without considering the loss in the type of transmission line that must be used with that particular antenna. We are *not* interested in the voltage up at the terminals of the antenna; we *are* interested in the voltage down at the input terminals of the receiver.

At frequencies used in radio and short-wave work, the signal loss in low-impedance coax is seldom a serious factor. But at the higher frequencies used in television, up to 216 megacycles, the gain achieved on one channel by matching a low-impedance antenna to a coax line may be outbalanced by the high losses in the coax, compared to the much smaller losses in 300-ohm ribbon line.

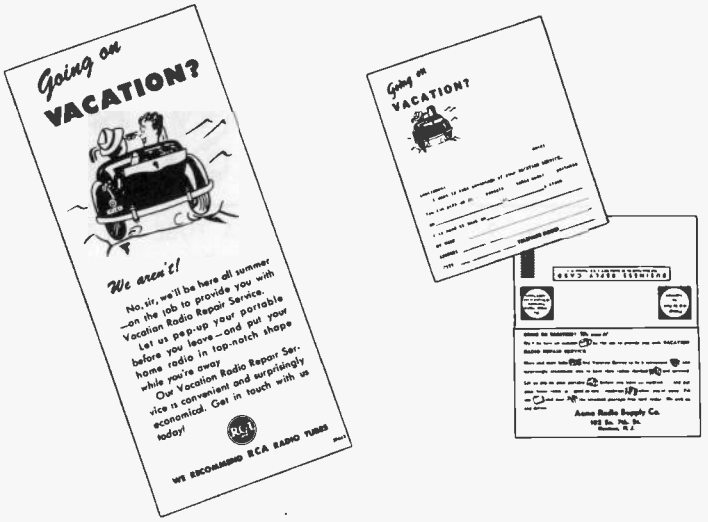
An additional reason for contradictory information is the fact that wide-band television antennas are not developed at an office desk with the aid of a handbook. They are developed by experimental methods with numerous measurements and comparisons every step of the way. Consequently there is disagreement in many cases between those who have become experts by reading the handbooks, and those who are

(*Continued on Page 6, Col. 1*)

LOCAL FACTORS } DETERMINE { ANTENNA REQUIREMENTS

STATIONS, FREQUENCIES	BAND WIDTH
FIELD STRENGTH	LO-GAIN, WIDE BAND, HI-GAIN, NARROW BAND, ONE ANTENNA, OR SEVERAL ANTENNAS
DIRECTION	
REFLECTIONS	
INTERFERENCE	
LINE IMPEDANCE	PLAIN OR FOLDED DIPOLE
COST	TYPE AND HEIGHT

FIG. 1



Here's the streamer and the cleverly designed double postcard for RCA's Vacation Service Plan. Read how you can cash in on added summertime servicing business with this RCA aid.

THE RCA VACATION SERVICE PLAN

Check the RCA-Dealer Cooperation For Planning Your Vacation Service Program It's a Bargain Package That Will Pay Big Dividends

Vacation-time is just around the corner and there's no better time than NOW—today—to lay concrete plans which will help bring you a profitable volume of service business through the normally slow warm-weather months.

Here's the 1949 Vacation Service Kit . . . similar to the plan introduced by RCA last year. Each Kit contains:

1. Direct Mail Card. A special double-fold business reply postcard (shown above) imprinted with your name and address in *two* places.

   The inside of this card bears a personalized sales message from you . . . describes your Vacation Service program over your imprinted name, address, and telephone number.

   The other half of the card consists of: (A) The customer's order . . . the date on which he wants his set checked, the type of set, his name, address, etc. (B) A business reply card addressed to you. (You pay two cents for each reply card returned to you . . . a bargain price for a service job).

   To make this mailing, you simply write the prospect's name and address on the front of the card, affix a one cent stamp, and drop it in the mail. (NOTE: Before mailing your first card, be sure to show your local postmaster a sample.)

2. Streamer. Second item in the Vacation Service Kit is a soft-sheet streamer which gives a tie-in bonus when used on your windows or doors, store interior, or over-the-counter. It has the same design as your postcard and serves to identify your store as local headquarters for Vacation Service.

Be sure to order your summer service kit through your RCA, Cunningham, or RCA Victor distributor. Postcards cost you $1.50 per 100 (including your 3-line imprint in two separate places) in minimum quantities of 100. And with each postcard order you place with your distributor, you automatically receive a streamer *free of charge.*

Get lined up now for VACATION RADIO SERVICE to build a profitable summer volume—with repeat business throughout the year.

TELEVISION SERVICE

by John R. Meagher
Television Specialist, RCA Renewal Sales

PART V

How RF-IF Alignment Affects Picture Quality

In the previous issue, through the aid of numerous photographs that were made by the author especially for this series of articles, we showed how the picture quality is affected by various troubles in the video amplifier of a typical television receiver. In this issue, continuing the series of photographs, we show how the picture quality is affected by incorrect rf-if alignment.

One illustration was intentionally left unidentified in the last issue. It is repeated in Figure 1. The poor picture quality shown in this photograph was produced simply by detuning one adjustment in the picture-if amplifier: The adjacent-channel sound trap, normally 27.25 Mc in this particular receiver, was detuned to about 26 Mc. This reduced the gain of the amplifier near the picture-carrier frequency of 25.75 Mc, decreasing the amplitude of low-frequency modulation, and producing poor phase response.

Note in Fig. 1 that the longer horizontal lines, which represent low-frequency picture signals, are weak or grey, while the lines in the vertical wedges, which represent high-frequency signals, are stronger or blacker. Note that the outer circle, which should be a uniform black across any scanning line, is composed of seven different shades followed by a white trace (trailing reversal).

Because of the poor low-frequency response, the horizontal sync action is not good, as evidenced by sidewise distortion in the shape of the circle. This distortion will vary with different scenes, and with motion of persons or objects in the picture. The effect is caused by picture signals "getting into" the sync. If the trap were tuned still closer to the picture-if of 25.75 Mc, the low-frequency signals would be virtually eliminated, and it would be impossible to hold the picture in sync.

Without alignment equipment (sweep, calibrator, and CRO), a technician might fumble around for days before locating the reasons for the poor picture quality shown in Fig. 1. Remember that this picture is the result of only *one* misadjustment.

It should be understood that incorrect rf-if alignment can cause other troubles in addition to poor picture quality. Incorrect alignment can produce unstable sync, inadequate blanking of the return lines, excessive noise in the picture, regeneration, and interference.

The numerous troubles that can originate in the rf, oscillator, converter, picture-if, second detector, and video amplifiers can be located quickly and easily with the aid of good alignment equipment.

Alignment equipment has particular interest for the writer, who has used a wide variety of such instruments during the last ten years, and has also designed several sweep-frequency generators and calibrators for special applications. The writer recommends the RCA WG-59A Sweep Generator and the RCA WR-39A Calibrator as being the most suitable and most accurate instruments on the market. The calibrator merits particular attention because it is the only TV service instrument available that provides the necessary crystal calibration at every quarter-megacycle point, not only in the if range, but throughout the rf range as well.

After studying the photographs in this article and in the previous one, it should become obvious to the reader why we devoted several of the early issues to an understanding of the wedges in the test pattern. Readers may find it helpful to review these early issues.

One major subject that is necessary for good understanding of how rf-if alignment effects the quality of the picture has not yet been covered. This subject is outlined in simplified form in the following paragraphs. It will be explained in detail in future articles.

TV picture signals are transmitted as amplitude-modulated waves. Low-frequency picture signals appear as two sidebands, one on each side of the carrier and relatively close to it. High-frequency signals appear as a single sideband, spaced relatively far from the carrier.

With normal rf-if alignment in a TV receiver, the carrier is placed at about 50% or half-way down the slope of the response curve. On high-frequency signals, where there is only one sideband, it falls on the flat-top of the response curve, so it is amplified 100%. On low-frequency signals, both sidebands are received: One is amplified less than 50%, and the other is amplified more than 50%. For example, for some particular low-frequency picture signal, one sideband is amplified 40%, while the other is amplified 60%. At some higher signal frequency the gain is 10% and 90%, etc. The two sidebands add together to provide approximately 100% amplification.

Consequently, with normal rf-if alignment, the amplification is the same for both low-frequency and high-frequency picture signals. This type of response is generally desirable.

If the carrier is placed lower than 50%, the gain at low frequencies is reduced. If the carrier is placed higher than 50%, the gain at low frequencies is increased.

The principal picture components and the blanking and sync pulses, represent relatively low frequencies, but the sharp edges on these signals require good high-frequency response also.

In considering rf, the low-frequency picture signals are relatively close to the *rf* carrier. In considering if, the low-frequency picture signals are relatively close to the *if* carrier. The if carrier is usually at the high-frequency end of the if response band. The carrier frequency, rf or if, corresponds to zero frequency in the video amplifier.

Bandwidth is always measured from the carrier frequency to a point on the opposite slope; this point is usually taken as 50% down.

It must be remembered that incorrect alignment is not always the primary reason for poor rf-if response. Off-value damping resistors (across the tuned circuits), open plate, screen, and grid-return bypass capacitors, open coupling capacitors, off-value coupling components, and regeneration, all affect the rf-if response. Abnormal bias on one or more of the rf-if tubes may cause poor response. This condition in turn may be due to a leaky coupling capacitor, or to a defect in the automatic gain control circuits, etc. Excessive input signal from a nearby TV station may necessitate biasing off several if tubes which also affects the frequency response.

THE ANSWER TO YOUR HOMEWORK

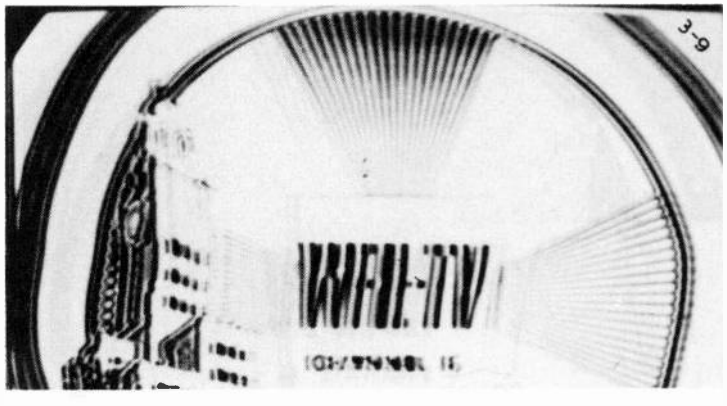
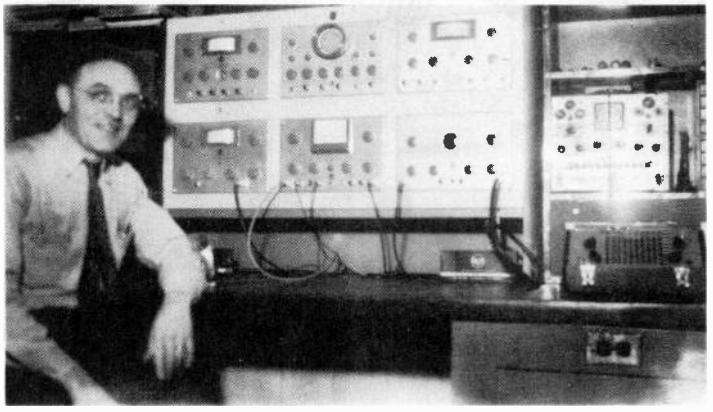


Fig. 1—Did you guess the trouble in this picture? It is poor rf-if alignment. Read text for details.

The photographs of the WFIL Test Pattern accompanying the current and past "Television Service" articles are reproduced with permission of the station management. The pictures were made by using a receiver in good operational condition except for the specific faults purposely introduced. The quality of the test patterns in no way reflects upon the quality of the transmitted signal of WFIL or the station personnel.

READY TO CHASE THOSE TV "BUGS"



Meet Harold Wright of Wright's Appliance Store, Spencerport, N. Y. He's all decked out with a shiny new set of RCA Test Equipment purchased from Masline Radio and Electronics of Rochester—ready and rarin' to do a top quality service job on ailing TV receivers. Good luck, Harold. (Thanks to Ed Masline for the swell picture).

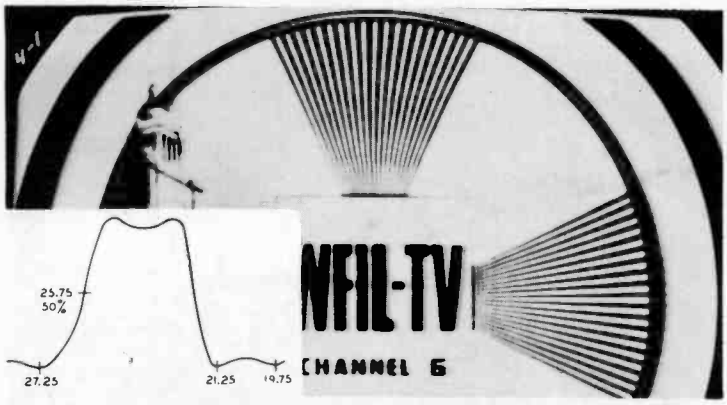


Fig. 2—Normal response with normal alignment, carrier at 50%

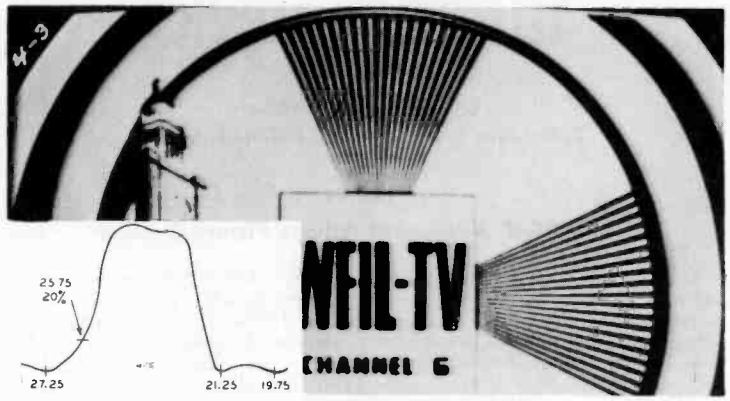


Fig. 3—Picture carrier at 20%. Good picture quality. Signal-noise ratio not as good as for alignment in Fig. 2.

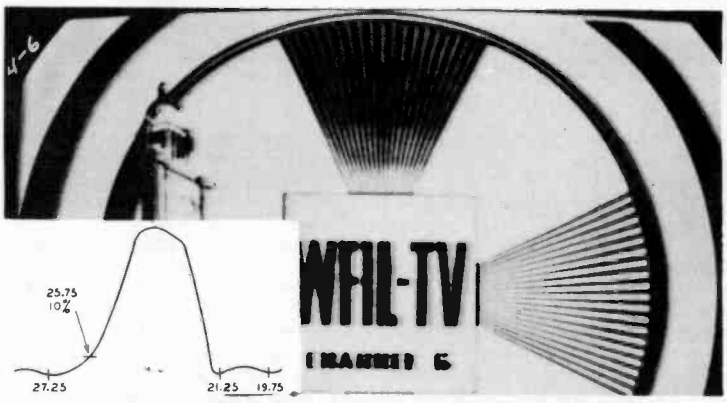


Fig. 4—Picture carrier at 10%. Poor low-frequency response, evidenced by the fact that horizontal wedge is lighter than vertical wedge. Poor sync, blanking, and signal-noise ratio.

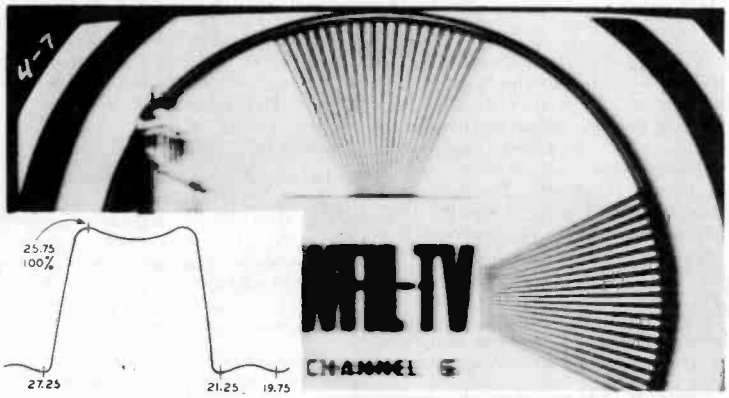


Fig. 5—Picture carrier at 100%. Excessive low-frequency response, evidenced by the fact that horizontal wedge is darker than vertical wedge. Considerable smear after lettering.

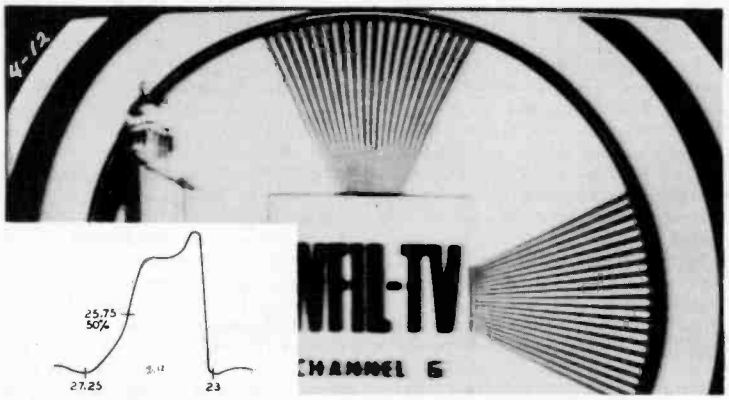


Fig. 6—Narrow bandwidth. Note that the lines in vertical wedge are cut off beyond about 3 Mc.

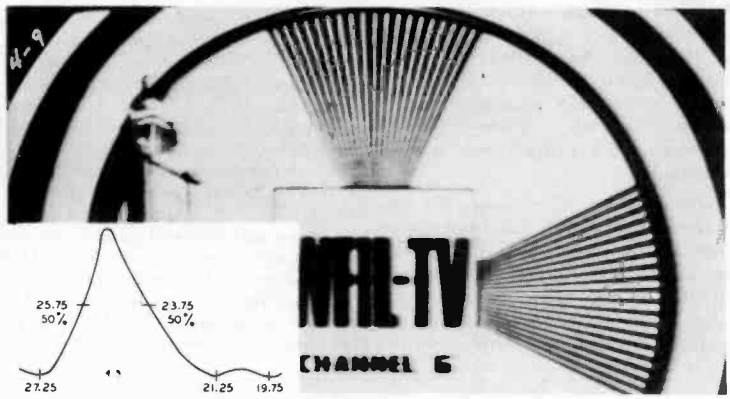


Fig. 7—Narrow bandwidth, single peak response, with carrier at 50%. Vertical wedge becomes lighter beyond 3 Mc, but is not cut off sharply as in Fig. 6. Good signal-noise ratio.

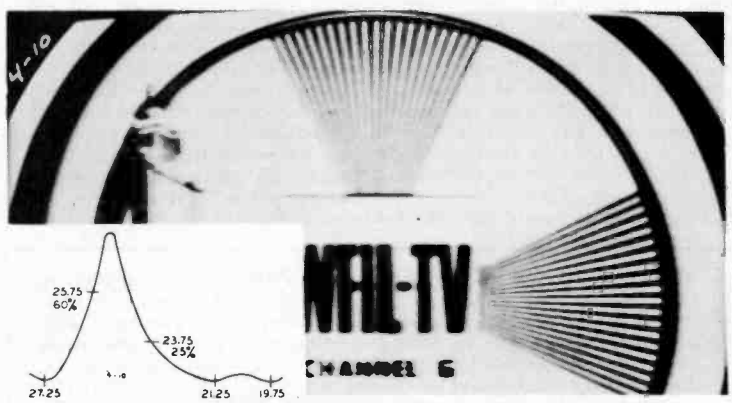


Fig. 8—Similar to Fig. 7, but vertical wedge is much weaker due to position of carrier, and narrower bandwidth.

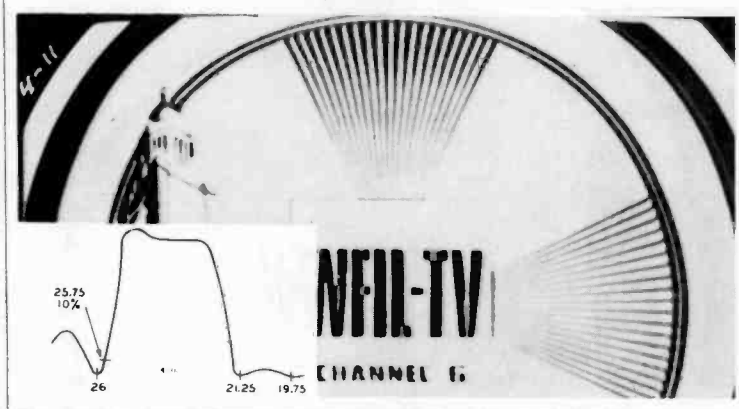


Fig. 9—Poor low-frequency response, evidenced by weak horizontal wedge. This was caused by tuning adjacent-channel sound trap close to picture carrier. Similar to Fig. 1.

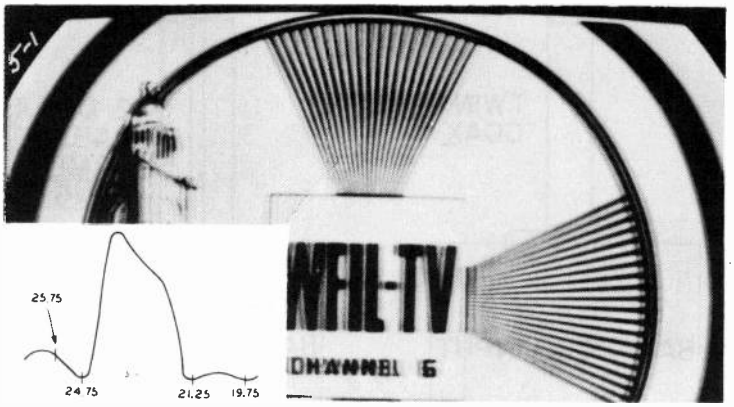


Fig. 10—Poor response in general, caused by tuning adjacent-channel sound trap lower than picture carrier. Note leading smear on left-hand side of lettering.

Try to determine the cause of this picture defect. The answer will appear in the next issue.

"Darken the store, please. I want to try this one out."

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.

OLD PHONO ALBUMS FOR SERVICE SHEETS

Service data sheets come in many sizes, making filing a problem. I've protected my valuable collection by filing them in a group of old phono albums of the type that formerly held 10 or so 12 inch records. They're always handy and stay in perfect shape.

Gerwing's Radio
1324 W. 1st St.
Santa Ana, Calif.

OBSERVE CAUTION IN WAFER SOCKETS

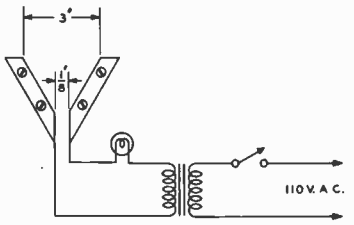
I've found in several instances a small leaded mark between pin holes on wafer sockets, apparently coming from the solder on the pin ends when the tube was rotated to position. In one case, this mark caused an arc-over between pins. An ordinary rubber eraser will clean this marking-up and eliminate this danger of an arc.

Stanley J. Spiece
2170A So. 35th St.
Milwaukee 7, Wisc.

HANDY STRIPS FOR CHECKING FUSES

Being in a position where frequent and rapid fuse and indicator lamp checking is required, I devised this simple test.

Two strips of copper or brass, each about 4 x ½ inches, are mounted against the masonite test panel in a V shaped arrangement. A simple series circuit with a flashlight bulb and a transformer or



batteries will give a means of a rapid check for continuity.

Bert Berg
Box 420 R.D. #14
Akron 3, Ohio

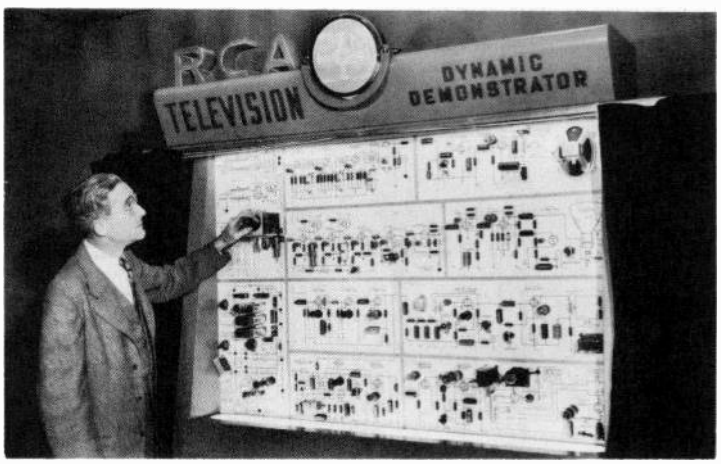
DON'T THROW AWAY THAT DISCARDED PENLITE!

An old penlite with a broken switch, a length of light flexible cable, an old filament transformer, and a plug and jack for the panel make up into the handiest gadget I've ever had for the service bench. It's unbeatable for peering into dark corners of those ailing radios, and, best of all, no battery to run down.

P.S.—I still keep a good penlite in my pocket for house calls.

Bob's Radio Service
Robert D. Vosbury
11 Main Street
Johnson City, N. Y.

THE RCA TELEVISION DYNAMIC DEMONSTRATOR



A complete, operating 30-tube television receiver "a-la- bread board" is put through its paces by the designer, John Meagher, Television Specialist of the RCA Tube Department. Mr. Meagher's "Television Service" series is currently running in RCA RADIO SERVICE NEWS.

TELEVISION ANTENNAS

(*Continued from Page 2*)

actually conducting antenna measurements and comparisons under controlled conditions.

Comparison of TV antenna characteristics over all the TV channels requires a carefully chosen location, special set-up, special signal generators, special loads, and special measuring equipment; plus specialized knowledge and experience. Only a few agencies in the country are equipped at present for this work.

What is being done to clarify the situation?

This article is one step in an effort to provide impartial answers to questions about TV antennas.

We are not including any "how-to-build-it" information. Frankly, the best plan for anyone who wants to build antennas is to copy a design that has proved satisfactory for the particular set of conditions.

What is the best antenna for television?

No one antenna is "best" for all TV installations. The best antenna for a particular location depends on many factors.

What factors are involved in selecting the best antenna for a particular installation?

We will name seven factors as shown in Figure 1.

1. The number of TV stations that are to be received, and their frequencies.
2. The field strength of each station at the receiving site.
3. The direction of each station from the receiver.
4. The reflection conditions (echoes or ghosts), and the direction of such reflections, for each station.
5. The interference conditions, rf and electrical for each station.
6. The type and impedance of transmission line.
7. The price that the owner is willing to pay for material and labor to get good reception on each station.

How are these factors related to the antenna?

The number of stations, and their frequencies determine the bandwidth that the antenna must cover.

The signal strength of each station determines whether low-gain broadband, high-gain narrow band, or a combination of such antennas must be used.

Direction, reflection, and interference conditions determine whether a single antenna, or several antennas are required so that each can be oriented for best signal and least reflections.

In addition, the line and receiver impedances may often determine whether plain dipoles or folded dipoles are required.

The cost naturally influences the final choice and may necessitate a compromise The cost also determines the height which is usually a very important factor in weak-signal areas.

Let's consider a center-city location with three stations, all strong, all in different directions, and severe reflections on all. What is the best antenna?

The safest answer, without making a survey at the particular location, is to use three separate antennas with reflectors, and three separate transmission lines running to a selector switch near the receiver, as shown in Figure 2.

Each antenna should be positioned on the roof and oriented for least reflections. The antennas should be plain dipoles for 50- or 70-ohm receivers and folded dipoles for 300-ohm receivers.

Consider a residential area in the city: Five stations, two on the high-band channels, all reasonably strong, all in the same general direction. What is the best antenna?

For receivers with 300-ohm input impedance, the best antenna in this location is an RCA-225A1 or 226A1 (the 225A1 has a reflector). This is a wide-band dipole. It was designed for these conditions. We will say more about it later.

Suppose we want to use a 50- or 70-ohm receiver in this same location: What antenna is required?

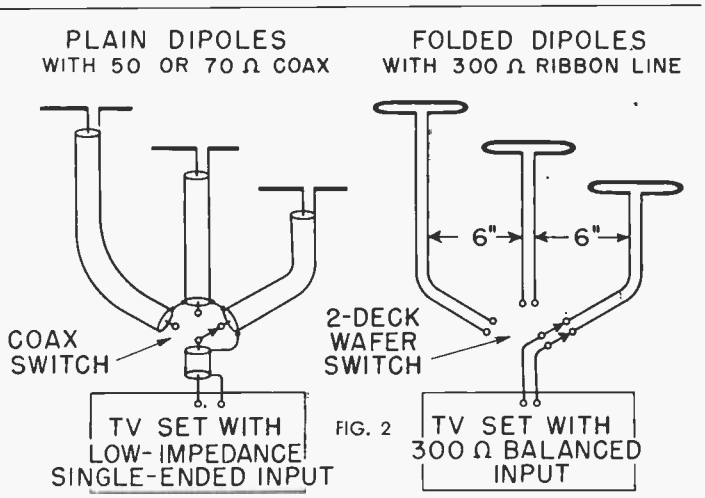


FIG. 2

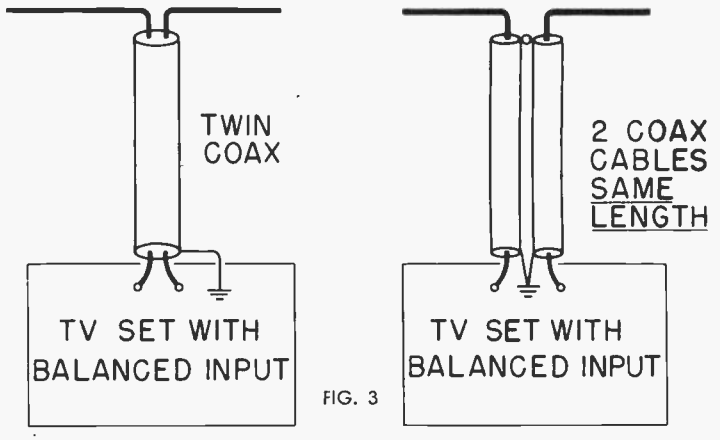


FIG. 3

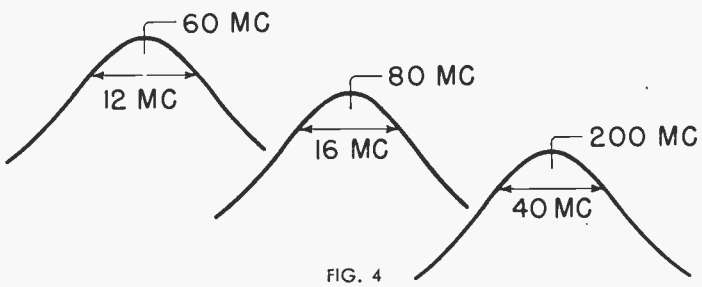


FIG. 4

At least two antennas; one or more for the low channels and one for the high channels. Each to be plain dipole with reflector. The antennas may be connected together as specified by the manufacturer and fed into a 50- or 70-ohm line.

Let's move away from the city, say 30 miles: Three stations, one on the high band, all in the same general direction, no strong local reflections. What antenna is best?

Again, it is preferable to make a survey on the spot, but for receivers with 300-ohm input impedance, the RCA 225A1 dipole and reflector is recommended. For receivers with low-impedance input, use at least one antenna for the low-band, and one for the high-band. The antennas may be connected together as specified by the manufacturer, or separate lines can be run from each antenna to a switch near the receiver.

In very weak signal areas, what is the best antenna?

A separate "high-gain" narrow-band antenna for each of the low-band stations and one high-gain antenna for the high-band channels —(channels 5 and 6 are generally covered by a single high-gain antenna). Run a separate line for each antenna as shown previously.

It is preferable to use folded dipoles with reflectors and 300-ohm ribbon line for least loss of signal in the line.

However, if noise pickup *on the line* is excessive, use plain dipoles and reflectors with 50- or 70-ohm coax. But decide this point carefully because coax has much higher loss of signal than 300-ohm ribbon line. When coax is used for a receiver having a balanced input, use twin coax as shown in Figure 3. The transmission line may be two-conductor shielded coax or two single coax cables *of the same length* run side by side with the braid outer conductor of each cable connected to the chassis close to the rf input. The cables must be almost exactly the same length: If there is a difference of a half-wave length at some frequency, the signals from each cable arrive at the receiver in phase and cancel. A half-wave of coax on channel 13 is only about 16 inches long.

In extremely weak signal areas, a stacked array of two antennas may be used for any one station.

When you say a "separate" antenna for a low-band channel, do you mean an antenna that is cut to the correct length so it resonates at the frequency of the particular channel?

Yes. For optimum gain with a half-wave dipole on a particular low-band channel, the antenna should be cut to correct length so that it is *resonant* at the picture-carrier frequency; it should also be *matched* to the transmission line.

For satisfactory matching, use a folded dipole for 300-ohm line, and a plain dipole for 50- or 70-ohm line. The line impedance is, of course, determined by the receiver input impedance.

Such an antenna, with a correctly phased reflector, is classified here for simplicity as a high-gain narrow-band dipole.

How can such an antenna cover all the channels in the high band?

It is necessary to think in terms of percentage as shown in Figure 4.

(*Continued on Page 7, Col. 1*)

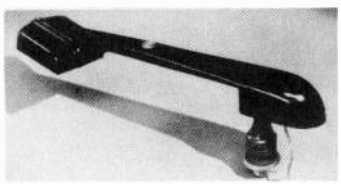
RCA PHONOGRAPH PICKUP ARM ASSEMBLY EXACT REPLACEMENT FOR MANY UNITS

The RCA 209X1 Phonograph Pickup Arm Assembly, featuring the RCA Magic Tone Cell, has hit a new high in popularity as an exact replacement for many existing RCA phono units. Its lightweight aluminum tone arm has been especially engineered for maximum performance of the already well-known Magic Tone Cell crystal cartridge.

Versatility is one of the prime features of the 209X1 pickup. It may be mounted and used with a manual record player, making it an excellent unit for those constructing their own instruments, or it may be used as a direct replacement with improved response for the older type pickup arm used with automatic record changers in RCA Models V135, V140, V175, V209, V210, and VHR212 radio-phono combinations. It also replaces the pickup arm assembly of the RCA-R556P record changer.

The Magic Tone Cell, which is fitted with a permanent-type sapphire stylus, has a low noise-level, provides improved reproduction, and decreases record wear. The stylus is protected from damage in use by a permanent guard.

The suggested list price of the RCA Crystal Phonograph Pickup Arm Assembly, RCA-209X1, is $13.00. See your RCA Parts Distributor today.



EIGHT NEW RCA BATTERIES ADDED TO RADIO LINE-UP

In line with the requirements of leadership, RCA has announced eight new additions to its comprehensive array of radio batteries for the radio trade. These units, described in detail below, are "musts" for your stock, many of them specially designed for 1949 model portables and other battery-operated receivers.

The RCA VS050

This is a portable type "A-B" pack with 6 or 7½-volt "A" and 75-volt "B" supplies. It is designed to service the RCA Victor 8BX5 and 9BX5 series of portables.

The RCA VS058

A portable 9-volt "A", 90-volt "B" pack, similar to RCA VS019 but with a 4-pin recessed socket. The VS058 services the Zenith Model 6G801.

TELEVISION ANTENNAS

(*Continued from Page 6*)

Assume an antenna with a bandwidth of 20%—

- at 60 Mc, 20% bandwidth is 12 Mc.
- at 80 Mc, 20% bandwidth is 16 Mc.
- at 200 Mc, 20% bandwidth is 40 Mc.

Obviously for the same percentage bandwidth, an antenna covers more channels on the higher frequencies.

Other factors, such as the ratio of rod diameter to length, increase the bandwidth at the higher frequencies, so it is possible with one plain or folded dipole to cover all the highband channels.

For maximum gain on channels 2, 3, and 4, separate antennas are required, each being designed for its particular channel. Only one antenna is generally required to cover both channels 5 and 6.

The RCA VS065

Here is a small 7½-volt portable "A" that services Admiral Model 5F11 and replaces Admiral Ensign Battery A-47 and Burgess type C-5.

The RCA VS067

This is a smaller size 4½-volt "A" battery used in many '48 and '49 model portable receivers. It is an equivalent to Eveready No. 736 and Burgess No. F3.

The RCA VS090

A small 90-volt "B" battery that will see a greater-than-ever demand this season. It is a replacement type for Eveready No. 490 and Burgess N-60.

The RCA VS138

A replacement for Burgess 4F2H, the VS138 is a 3-volt general purpose type combining two No. 6 cells.

The RCA VS139

This is a 6-volt metal enclosed general purpose type for heavy duty applications such as electrified fences. It replaces Burgess 4F5H.

The RCA VS140

A metal enclosed 9-volt general purpose type for applications similar to those of the VS139. It replaces Burgess 4F6H.

Take careful note of these eight new additions to a line of batteries FOR THE RADIO TRADE. Cash in on repeat business with a stock of RCA Batteries—a line that services 99% of all radio requirements.

RCA WV-65A BATTERY VOLTOHMYST* IS TOPS IN FIELD SERVICING

Electronic Multi-Meter Is Completely Battery Operated

The RCA WV-65A Battery VoltOhmyst is exceptionally convenient for everyday service work, and in addition, is indispensable for testing two-way car radios, marine equipment, farm sets, aircraft radios, industrial electronic devices, and electrical equipment. Here's an instrument that opens up hundreds of profitable new opportunities beyond the power lines.

In one instrument, completely independent of all power lines, there is a vacuum tube dc voltmeter, a dc milliammeter, dc ammeter, ac voltmeter, and electronic ohmmeter. It is capable of measuring both ac and dc voltages to 1000 volts, resistance to 1000 megohms, and direct current to 10 amperes.

Like all RCA VoltOhmysts, this instrument can be used to measure grid-leak bias voltages and AVC voltages. The WV-65A has an input resistance of 3.7 megohms per volt on the 3-volt dc range, and contains a 1-megohm isolating resistor in the blue probe.

For a lifetime investment that pays dividends in time and money saved—and at a new low price of $59.50 (less batteries)—the RCA WV-65A is the best buy on the market today. Be sure to see your RCA Distributor for further details on this first-line service instrument.

**VoltOhmyst is a registered trademark of the Radio Corporation of America.*

MINIATURE LAMPS ADDED TO RCA'S COMPONENTS LINE

A well-rounded line of miniature lamps to fill practically every radio panel and flashlight need has been announced by the RCA Tube Department.

Designed to give the radio service dealer a wide assortment of fast-moving types of lamps to take care of everyday replacement needs, the new miniature lamps are manufactured to RCA's high quality standards and are packaged in familiar RCA red, black, and white cartons.

The line includes sixteen different types for radio panel and miscellaneous replacement use, and eight types for flashlight replacement purposes.

Packaged 10 lamps to a carton, the new RCA miniature lamps are now available from RCA tube and parts distributors. Ask for your copy of the RCA Miniature Lamp price card, Form No. 3F605.

"KING OF THE KINESCOPES"

Another RCA First—the "King of the Kinescopes." This is the 16AP4, the new 16-inch metal television picture tube now being made in RCA's Lancaster plant. New facilities for mass production of the 16AP4 are now under construction at Marion, Indiana.

See it in RADIO SERVICE NEWS—all the details of the much talked about 16-inch metal kinescope, another RCA First. Be sure to get a copy of the May-June RADIO SERVICE NEWS from your RCA distributor.

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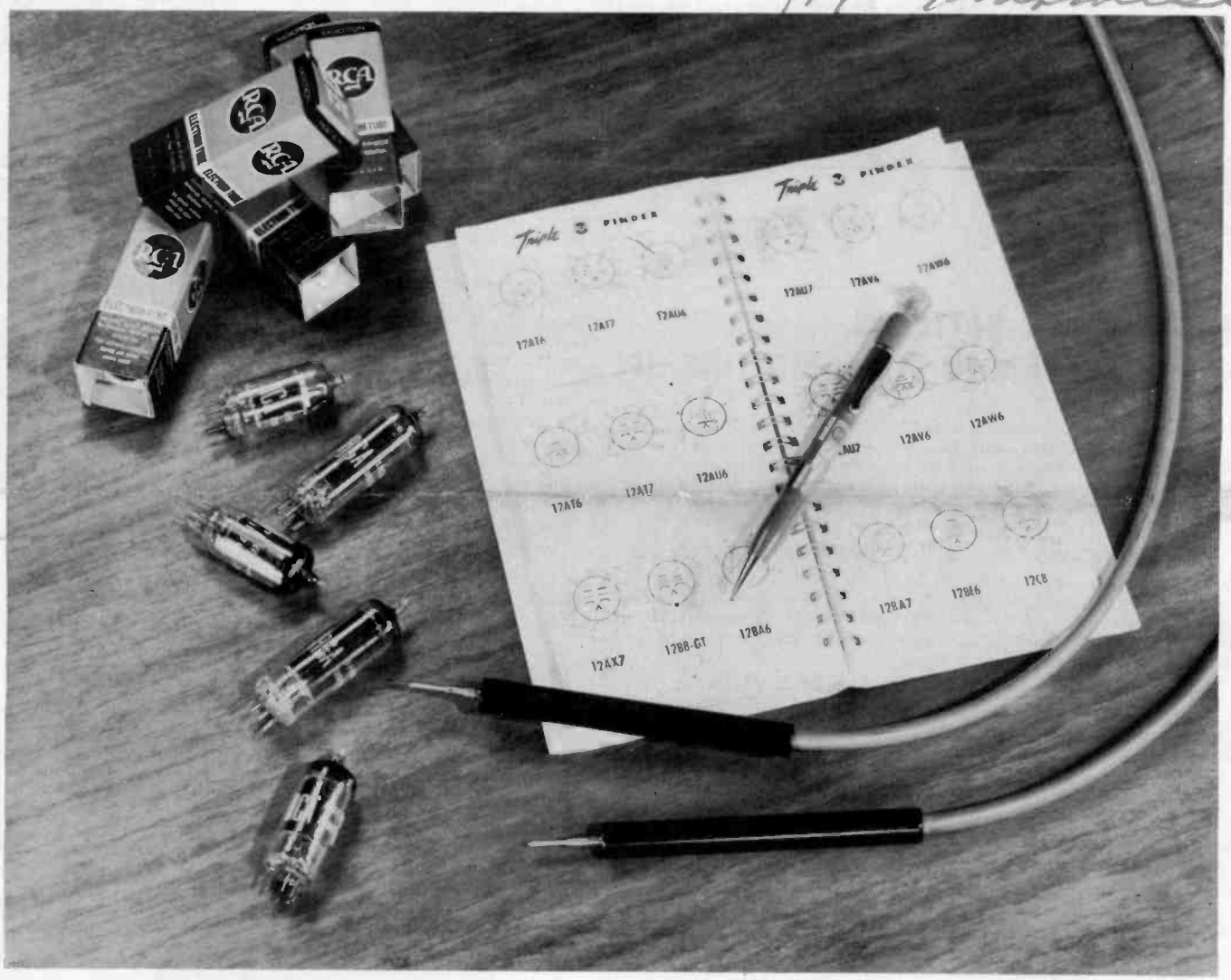

RCA helps you all the way . . . with the best in business and sales aids.

There's *more* business in RCA miniatures

FEATURE FOR FEATURE, RCA miniatures have electrical and mechanical characteristics that set them apart from other tubes. That's why more RCA miniatures are used in FM and TV receivers *where it's the tube that counts.*

This extra quality cuts down costly service call backs . . . builds customer confidence—brings you *more business.*

When you push RCA tubes you're selling the brand that holds top customer acceptance. So . . . *push RCA tubes and watch your business grow!*

RADIO RCA TUBES SERVICE

***Sign Up!* for more profits**

RCA's famous "Fire Ball" fluorescent sign out front will bring in more customers. Sign up for yours today.

ALWAYS KEEP IN TOUCH WITH YOUR RCA TUBE DISTRIBUTOR.