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RADIO SERVICE NEWS

VOLUME XIII, No. 4 EDITORIAL OFFICES, RCA, HARRISON, NEW JERSEY July-August, 1948

RADIO SERVICE NEWS TO PUBLISH SPECIAL ISSUE ON TELEVISION

Entire September-October Issue To Be Devoted To Television Data

An all-Television issue of RCA's RADIO SERVICE NEWS is in the making and will be on the press soon. In response to an overwhelming demand for authoritative TV information, this special issue will be devoted entirely to television and servicing.

Here are a few of the subjects you will find in the Sept.-Oct. issue: Television Service — Part III, by John R. Meagher, RCA Renewal Sales TV expert; New Test Equipment, by Arthur Liebscher of RCA's Test and Measuring Equipment Section, an authoritative discussion of the new RCA TV-FM-AM Test Instruments; a resume of RCA Television components and accessories; and an article by John Rider on TV Antenna Installations. These, plus a host of other items of equal interest, will combine to make up an issue of RADIO SERVICE NEWS that everyone will want to keep in his permanent file.

Be on the lookout for the next RCA RADIO SERVICE NEWS. Have your RCA, RCA Victor, or Cunningham distributor put you on the mailing list or reserve a copy for you.

HOW TO GET YOUR RADIO SERVICE NEWS

Many inquiries are received at the Editorial Offices about where and how RCA SERVICE NEWS can be obtained, regularly. Here's the answer.

RADIO SERVICE NEWS is published bi-monthly by the Editorial Offices of the RCA Tube Department in the interest of radio servicemen and dealers everywhere. It is sent to the trade through RCA Distributors, who give it to their customers either by mail, or over-the-counter. Ask your RCA Distributor to put you on his regular mailing list or, if he passes it out in the store, to save you a copy.

If your are now receiving a copy from your local RCA Distributor, don't forget to notify him when you change your address.

THE NEW RCA MINIATURE TUBE FOLDER

This is the new MNT-30B Miniature tube reference folder just released by the RCA Tube Department. It's a "must" for every servicemans box and bench.

NEW RCA "ISOTAP" TRANSFORMERS TO BE AWARDED IN SAFETY CONTEST

A new and exclusive group to be known as the RCA "Shock of the Month Club", whose membership will be limited to those who have had an unpleasant experience with electrical shock, is being inaugurated this month by RCA RADIO SERVICE NEWS. Members will be awarded one of the unique RCA Isotap Transformers. Here are the details about joining.

At one time or another, you have undoubtedly served as the electrical path between a hot ac/dc chassis and ground, or from one peewee radio to another, or even from such a receiver to a piece of ac/dc test equipment. If you have, you probably remember it, because it's an experience comparable to practically no other servicing mishap.

We'd like the story of that "shocking incident"—just a plain-facts letter telling us all about it. Make it as humorous or serious as you wish. We don't want fiction, and if it's the "real McCoy", it will be a story not lacking in color.

The three letters which, in the opinion of the editors, are most original and which contain the best "safety first lesson" accounts will be published in each issue of RCA RADIO SERVICE NEWS. The writers of each will automatically become members in good standing of the RCA "Shock of the Month" club, receiving as an award one of RCA's latest cures for shock hazard —the new RCA Isotap High-Low Isolation Transformer.

The Isotap Transformer not only eliminates the chance of accidental shock from the foregoing causes, but speeds detection of many faults by permitting high-low line tests, and prevents damage to ac/dc test equipment. There's a complete story of the Isotap on page 3-S of this issue —be sure to check the outstanding features of this new service-aid.

And that's not all! The writer of the best letter at the end of this year will be further rewarded with an RCA Battery VoltOhmyst Electronic Meter. This is the famous model WV-65A, with its own power supply.

Get your facts down on paper today and send them in to the Editorial Offices, RCA, Harrison, New Jersey. All letters become the property of RCA RADIO SERVICE NEWS, and may be reprinted as desired to pass along valuable available anti-shock hints to our readers. The first set of letters will be published in the September-October issue of RSN. Get those letters in early for a crack at the first trio of Isotap Transformers to be given away.

NEW FOLDER DESCRIBES RCA'S COMPLETE LINE OF MINIATURE TUBES

Large Demand for Publication Seen in Television and FM Servicing

A new technical data folder listing RCA'S comprehensive line of miniature tubes — the MNT-30B — has just left the press. Covering 64 miniature tube types, it supersedes the Tube Department's MNT-30A and includes sixteen recently announced additional types.

Designed for quick and easy reference, the new folder lists miniature tubes numerically and alphabetically giving descriptions of each tube opposite the listings together with metal and GT equivalents. Tubes are classified by type and function in a simplified chart on the first page.

Complete characteristics and typical operation characteristics on each tube are provided in a characteristics chart which is also arranged for at-a-glance reference. Socket diagrams furnish a quick guide to terminal connections.

Ask your RCA Distributor for a copy of the new RCA-MNT-30B, it's a reference booklet you'll want to keep by your bench or in your tool box for ready reference.

A TEST RACK FOR THE MODERN SHOP

A new custom-built Test Equipment Rack, attractively designed as an efficient and ultra-modern cabinet for housing any six of RCA's matched units of test and measuring equipment, has been introduced by the RCA Tube Department.

The new rack (WS-16A), serves not only as an ultra-efficient test equipment service rack for the high-speed servicing of TV, FM, and AM receivers, but it also communicates an atmosphere of technical authority and prestige.

A full-color photograph of the RCA Test Rack was featured on the front cover of July "Radio News" together with a lead article on the use of the test equipment. A reprint of the article will appear in the next issue of RCA SERVICE NEWS. Meanwhile, ask your RCA Distributor for the facts on the new WS-16A service rack and instruments.

DBM CHART EXPANDS USEFULNESS OF RCA-VOLTOHMYST METERS

Servicemen Active in Sound and Public Address Work Will Find This DBM* Chart Extremely Handy

RCA VoltOhmyst electronic meters are practically universal test instruments in themselves. For example, the WV-95A Master model measures dc voltages up to 1000 volts rms at frequencies to 20 kc; rf rms voltages at frequencies to 250 Mc; dc currents from a few microamperes to 10 amperes; resistance values from 0.1 ohm to 1000 megohms; and capacitance values from 4 micro-microfarads to 1000 microfarads. The diode probe of the WV-95A is designed to measure voltage values which are proportional to peak-to-peak values of any wave form.

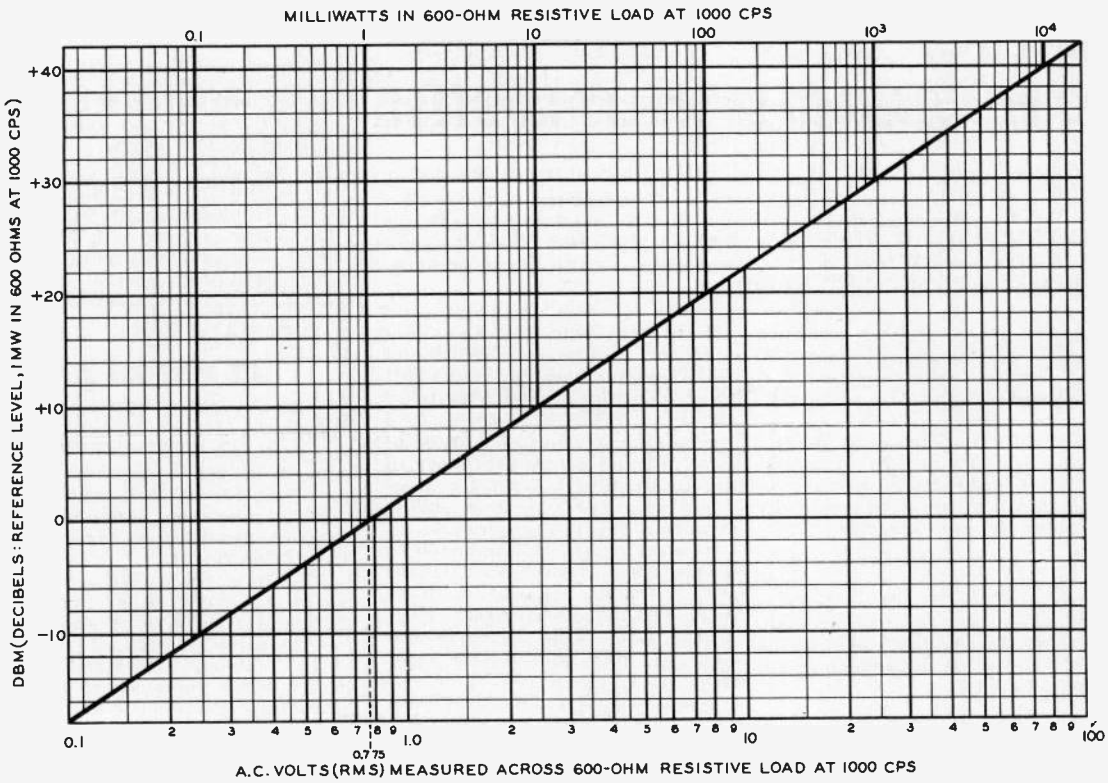
Sound specialists find the 195-A model especially useful because it has a decibel scale instead of the low-range ac scale of the WV-95A. This db scale reads from —20 db to +62 db in six ranges, and indicates dbm values when the diobe probe is placed across a 600-ohm resistive load. DBM values are defined as the number of db above or below a reference power level of 1 milliwatt in 600 ohms at 1000 cps.

Servicemen who wish to measure values of dbm with other Volt-Ohmyst meters which do not have a db scale will find the accompanying dbm chart useful. DBM values are particularly useful in audio work because they condense the power range into convenient units which have a tie-in with hearing abilities. This tie-in is maximum at 1000 cps, but becomes less accurate at higher or lower frequencies.

Because dbm values are referred to a 1-mw power level, this indicates definite power levels; the difference between two dbm values also shows the gain or attenuation in decibels and indicates whether a certain power increase will be worthwhile. Straight listening tests prove that unless the output has been raised several db, the resulting benefit is judged to be unimportant by the listener. Gains or losses of less than 2 db are usually unimportant.

For example, if the output of an amplifier is increased from 1 watt to 1.58 watts, the power output has

(*Continued on Page 3, Column 3*)



*DBM values are defined as the number of decibels above or below a reference level of 1 milliwatt in 600 ohms at 1000 cycles. Accordingly, 0 DBM indicates a power level of 1 milliwatt; 10 DBM, 10 milliwatts; 20 DBM, 100 milliwatts, etc.

Note: For ac volts (RMS) measured across a 500-ohm resistive load, add 0.792 DBM algebraically to values read from chart. For ac volts (RMS) measured across other resistive loads, use formula: $\Delta \text{ DBM} = 10 \log \frac{600}{R}$, where R is the load in ohms, and Δ DBM is the corresponding increment to be added algebraically to the DBM value read from the chart. (If R > 600, Δ DBM is negative).

Talking Things Over

With W. L. ROTHENBERGER
Manager, Renewal Sales

Where do your customers get their first impression of your place of business? Your store front, naturally; and the impression is a lasting one. What they see in the first few seconds as they approach your store or shop is, quite often, the factor governing their opinion of you as a business man. The first glance can attract attention and interest, or it can repel just as easily.

Experts on retail business methods rate store front and show window space as chargeable to approximately one-third rental value. In other words, if you pay $90.00 a month rental, $30.00 of that amount is for the front of your store. Viewing this analytically, are you realizing full returns on your monthly rent payments?

In comparison

Let's sharpen our perspective on this matter of storewindow housekeeping. Suppose you are in the market for a suit of clothes. It's quite doubtful that you'd patronize a store which displayed its merchandise in show windows by hanging or laying it haphazardly on the handiest hook or chair. It doesn't take a long stretch of the imagination to associate a sloppy window display with inefficient management and poor value of the wares being sold.

The impression a passerby receives from your store is also determined largely by what he sees in your window. Perhaps this potential customer passes your store every morning on the way to his office. Assume, also that he possesses, as an average American, anywhere from two to five or six radios in his home and car. If his eyes fall repeatedly on a not too artistic display of dust and cobwebs casually draped around wrecked sets, warped records, empty coke bottles, and the like, he is not likely to be impressed to the point where he'll stop by on Saturday with his ailing radio.

Looking at the other side of this hypothetical picture, perhaps there's another shop a few blocks or a few doors away. If our passerby sees a trim, clean window, it's a safe bet that he will note it as a direct reflection of the class of workmanship done within, and remember the place when he needs service.

Put your window to work

It isn't difficult to make show-window space support itself—and the effort really pay dividends. The show window need not have an elaborate display. Just a clean window glass, maybe a coat of paint or varnish around the woodwork, and a simple but neat arrangement of your products. If you sell radios or records, it's a good opportunity to plug your line. If you sell only *service*, there are many interesting ways of attracting attention. Old and new tubes, featuring a kinescope, for example. Or an inner view of a radio set with a few *cards* denoting simple functions. And there are a wealth of posters, commuras, banners, decals, and many other attractive items prepared by RCA that will add color and sparkle to your window. Your RCA, Cunningham, or RCA Victor distributor will be glad to help you obtain these free, or inexpensive promotional materials.

No matter how small the show space, it's your business face to passersby. Put your window to work —let it speak your message, and invite more business. The results will be well worth the effort.

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RCA SERVICE SUPPLEMENT

RADIO SERVICE NEWS

VOL. XIII, No. 4 EDITORIAL OFFICES, RCA, HARRISON, NEW JERSEY July-August, 1948

TELEVISION SERVICE

By JOHN R. MEAGHER

Television Specialist, RCA Renewal Sales

Ed. Note: In the last issue of RCA RADIO SERVICE NEWS, Mr. Meagher began Part I of the "Television Service" series with a discussion of test patterns, linearity, centering, focus, contrast, brightness, and interlacing. If you failed to obtain the May-June RCA RADIO SERVICE NEWS, ask your RCA Distributor for a copy, or drop a card to Editorial Offices, RCA, Harrison, N. J.

Low-frequency phase shift

The general subject of phase shift in relation to the diagnosis and repair of TV receivers will be covered in a subsequent article. At present we will give a brief outline of the trouble, and describe some of the symptoms as seen on the test pattern and in the picture.

Any horizontal line in the test pattern may be regarded as representing a half-cycle of a relatively low-frequency square wave. For example on a 10-inch receiver, a half-cycle of one-megacycle is approximately 1/16-inch long, and a half-cycle of 100 kc is 3/4-inch long. See Figure 5.

A square wave is composed of a fundamental and numerous harmonics of different amplitudes. For good reproduction all of these components must be amplified equally and have the same time delay in passing through the receiver. Otherwise, the signal arriving at the kinescope will be a distorted square wave: It may have a dip before or behind (leading and trailing reversal), it may trail off very gradually instead of sharply.

This trailing-off makes a long smear after horizontal lines. Incidentally, this accounts for "X-ray" effect, where a long horizontal molding or shelf can be "seen" right through a person standing in front of it.

The effect of low-frequency phase shift is more evident in the picture if the horizontal lines are fairly thick. The thick horizontal lines in the Indian-head test pattern are used to show and to check this effect, by the intensity, polarity, and duration of the trailing smear. However, most horizontal lines, such as in the horizontal wedge, and horizontal portions of lettering, will show the effect.

Open peaking coils and coupling capacitors in the video amplifier can cause phase shift and smear, but it may also be due to transmission troubles. This can be determined by checking a second receiver; if both receivers show smearing, it is most likely due to the station.

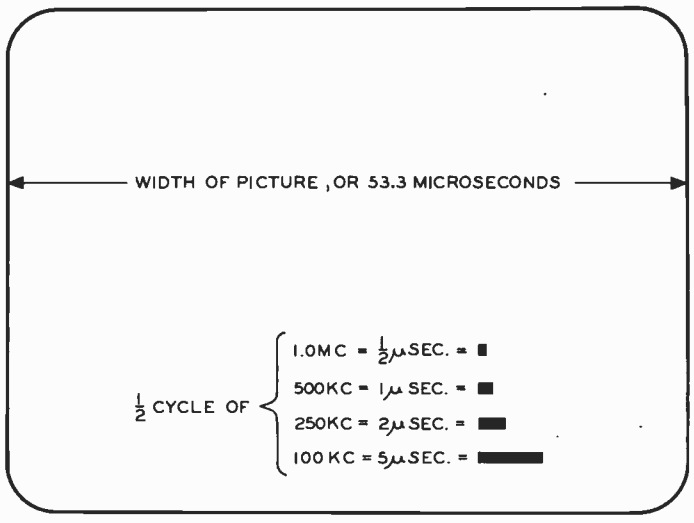


Figure 5. Relation of horizontal lines by a frequency vs. time comparison.

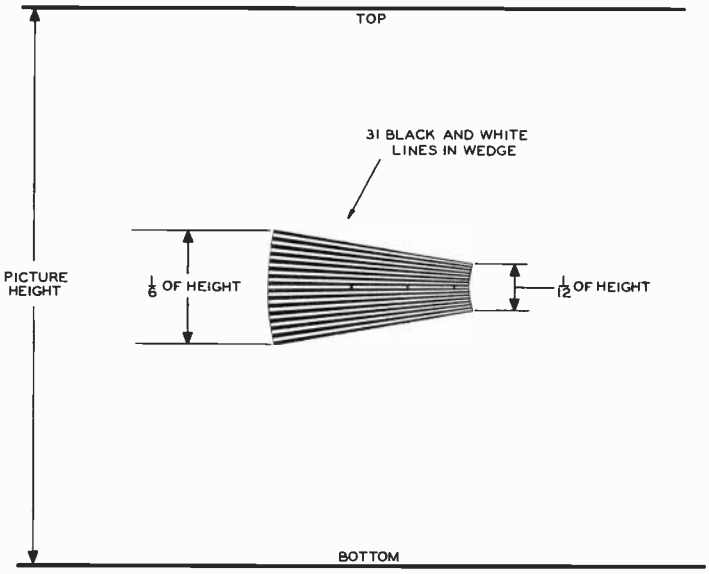


Figure 6. Horizontal wedge of pattern, showing relation to overall picture size.

Resolution or definition

Now we come to the final and possibly the most important application of the test pattern, its use in determining vertical and horizontal resolution.

The words "resolution" and "definition" are commonly used interchangeably in rating the capability of the receiver to resolve, or define, or make clear, small details in the picture or test pattern.

In a general sense, if a picture is sharp and clear, and shows small details we say that it has good resolution, or high resolution. If the picture is soft and blurred, and small details are indistinct, we say that it has poor resolution, or low resolution.

Owing to the manner in which a television picture is "drawn", the definition from top to bottom is generally different from the definition sideways. With present TV standards the definition from top to bottom is somewhat better than from left to right.

Consequently, in television we must distinguish between vertical and horizontal resolution, and accordingly we will treat each one separately.

Vertical resolution

The vertical resolution, (the resolution from top to bottom of the picture) is expressed in the number of *horizontal* lines that can be resolved. Therefore, we use the horizontal wedges in the test pattern to determine vertical resolution.

Vertical resolution depends primarily on the size of the kinescope spot. It does not depend on the high-frequency response or bandwidth of the receiver.

There are approximately 490 usable horizontal scanning lines (525 minus 7% for vertical blanking). If the kinescope spot can be focused to a small enough size so that it can trace these 490 lines without overlapping, the maximum vertical resolution in 490 lines: actually, the effective resolution is considerably less than this and can be determined from the horizontal wedges.

Figure 6 will help in explaining the calibration and use of the horizontal wedges in a test pattern. There are 31 alternate black and white lines in this particular wedge. The left-hand edge of the wedge is 1/6th of the picture height. Considering only the left-hand edge of the wedge, we could fit 6 x 31 or 186 lines in the space between the top and bottom of the picture.

Considering only the right-hand edge of this same wedge, which is 1/12th of the picture height, we could fit 12 x 31 or 372 lines in the space between the top and bottom of the picture.

Therefore the left-hand edge of the wedge represents 186 lines, and

(*Continued on Page 2S, Column 1.*)

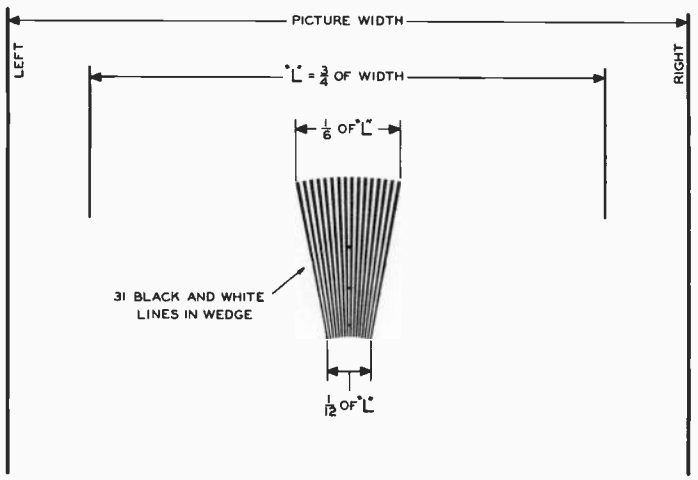


Figure 7. Vertical wedge of pattern showing relation to overall picture size.

TELEVISION SERVICE

(*Continued from Page 1S*)

the right-hand edge represents 372 lines.

Assume that when a test pattern with the wedge dimensions shown in Figure 6 is reproduced on a particular TV receiver, the separate lines in the wedge become blurred or indistinct at a point where the wedge is 1/10th of the picture height. This is equivalent to 10 x 31 or 310 lines. So in this example we can state that the maximum vertical resolution is approximately 310 lines.

It should be noted that it is not customary to refer to frequency in regard to the horizontal wedges, or in regard to vertical resolution. However, as a point of interest, if the center line in the horizontal wedge extends for about ¼th of the complete time for one horizontal scanning line, it is equivalent to ½ cycle of a 30-kc square-wave signal. The scanning lines cross the other lines in the horizontal wedge at various angles, equivalent to a maximum frequency of roughly one megacycle. *The intensity or blackness of the horizontal wedge, compared to the vertical wedge, is therefore dependent on the low-frequency response of the receiver.* If the low-frequency response is poor, the horizontal wedge may be grey when the vertical wedge is black.

Horizontal resolution

The vertical wedges are used to determine *horizontal* resolution.

Horizontal resolution depends on the high-frequency response or bandwidth of the receiver, and also on the size of the kinescope spot.

Horizontal resolution is expressed in two ways:—

1. Horizontal resolution in "number of lines" is based on the number of distinct black and white dots that can be produced by the kinescope beam in three-quarters of the usable length of a horizontal scanning line.

   This length (¾ of width) is selected because it equals the height of the picture and therefore gives a basis of direct comparison between horizontal and vertical resolution.

   In Figure 7, "L" equals three-quarters of the active or usable picture width.

   In this example, the wedge has 31 alternate black and white lines. The top end of the wedge is ⅙ of L. Therefore the equivalent number of lines at the top is 6 x 31 or 186. The bottom of the wedge is 1/12th of L, so the equivalent number of lines is 12 x 31 or 372.

   If this pattern is reproduced on a TV receiver, the separate lines in the vertical wedge might become blurred at the point where the wedge is 1/10th of the L. In this case, the maximum horizontal resolution is 10 x 31 or 310 lines.
2. The horizontal resolution may be expressed in frequency. This is very desirable in service work, because it indicates the effective bandwidth of the receiver.

   The explanation involves some simple arithmetic:

   The horizontal scanning frequency is 15,750 cycles per-second. One complete horizontal line takes 1/15,750 seconds, or approximately 63.5 microseconds, (millionths of a second). The horizontal blanking time is 10.2 microseconds so the time for the usable portion of one horizontal scanning line is 63.5 minus 10.2, or 53.3 microseconds.

   The spot therefore requires 53.3 microseconds to travel from the left to the right edge of the picture, but in speaking of resolution, we are interested in three-quarters of the width, which is traveled in ¾ x 53.3, or 40 microseconds.

   A video signal of one megacycle (Mc) produces one cycle in one microsecond. Each cycle has a negative half-cycle and a positive half-cycle, which when applied to the kinescope, produce a black dot and a white dot. Each cycle therefore produces two dots which we will consider as "lines".

   In 40 microseconds, a one-megacycle signal produces 40 cycles, or 80 lines: 2 megacycles, 160 lines; 3 megacycles, 240 lines; 4 megacycles, 320 lines.

   Horizontal resolution expressed in lines may be converted to frequency, by dividing the number of lines by 80. For example, if the maximum horizontal resolution of a set is 325 /80 or 4.06 Mc. Conversely the horizontal resolution of a receiver expressed in frequency may be converted to equivalent lines, by multiplying the frequency (in megacycles) by 80. For example, if the maximum horizontal resolution of a receiver is 3 megacycles, the equivalent number of lines is 3 x 80, or 240 lines.

   In the accompanying table, "Vertical Wedge Data", we have listed in columns 1 and 2 the corresponding lines and frequency for horizontal resolution.

   Here are two examples in the application of this table:—

   1. On a particular TV receiver, the vertical wedge becomes blurred beyond 250 lines. What is the equivalent frequency, or bandwidth?

      Using column 1 and 2, we find that 250 lines is equivalent to approximately 3 Mc.
   2. A receiver has a bandpass of 4 Mc. How many lines should it resolve on the vertical wedge? Using column 2 and 1, we find that 4 Mc is equivalent to 320 lines.

Wedge calibration

On some test patterns, the equivalent number of lines is indicated by numbers at a few points on each wedge. It is a general practice to omit the last zero; so "20" means 200, etc.

In some test patterns, the wedges are not numbered but are marked by dots or other means at major steps. For convenience, in Figure 8, we have shown the equivalent number of lines at each dot and at each end of the wedges for this NBC pattern.

In cases where the pattern does not indicate the number of lines, the information can usually be obtained from the TV station.

The equivalent number of lines at any point on either the horizontal or vertical wedges may be computed:

Multiply the number of black and white lines in the wedge, by the ratio of picture height to the width of the wedge, at the desired point on the wedge.

Even under the best conditions this is only an approximation, owing to inaccuracy in measuring the width of the wedge on the kinescope, and errors due to non-linearity.

The receiver must first be adjusted for the best possible linearity, with the test pattern just filling the mask, with a mask of the correct size and 3 x 4 proportions, and with contrast and focus set correctly.

Single lines for horizontal resolution

The single resolution lines in the Indian-head test pattern represent the width of a single line ranging from 50 to 575 lines.

Consider the thick line marked 50: It would take 50 alternate black and white lines of this width to stretch across three-quarters of the full width of the picture.

It would take 575 alternate black and white lines of the width shown, for the single line marked 575, to fill three-quarters of the full width of the picture.

These single lines are intended to show "ringing", or damped oscillation at certain frequencies.

For example, assume that the video amplifier response rises at 3 megacycles and is then cut sharply. (*Continued on Page 4S, Column 1.*)

Figure B. The NBC Test Pattern, showing the equivalent frequency and number of lines at the major points on the wedges.

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.

TEST CAPACITOR SPEEDS SERVICING

A block of filter capacitors equipped with a clip-type ground lead and test-prod positive leads is an extremely handy tool on the bench. It speeds trouble shooting and often shows up borderline or unsuspected cases of filter trouble.

P. S.—Don't forget to completely disconnect old capacitors when these are replaced by new units.

A. L. Friel
RCA Service Co. Shop
429 Fourth Avenue
Pittsburgh, Pa.

TRY THESE TRICKS ON YOUR SOLDERING IRON

For a light soldering job deep in the heart of a set, the ordinary iron is usually too large to use. A length of heavy copper wire (about #10 or 12) wrapped tightly around the tip of the iron and extended a few inches beyond will conduct enough heat to allow a neat solder job in very tight quarters.

Phil Rose
c /o Linden Radio Service
55 W. Oliver St.
Baltimore, Maryland

A piece of 2 x 4 lumber about six inches long, wrapped with heavy carpeting makes an excellent cleaner for the soldering iron. Rubbing the iron tip back and forth a few times will give it a clean bright surface.

Terre Radio
57 St. Nicholas Ave.
Brooklyn, N. Y.

EMPTY METAL CANS HOLD LOOSE PARTS

Empty flat metal cans, such as those used for packaging 35 mm film and scotch tape, make handy parts storage compartments. A label may be typed or printed for each and fastened to the top or edge with clear scotch tape for easy identification.

M. M. Gordon
Gordon Radio & Telev. Service
6934 Collins Avenue
Miami Beach, Florida

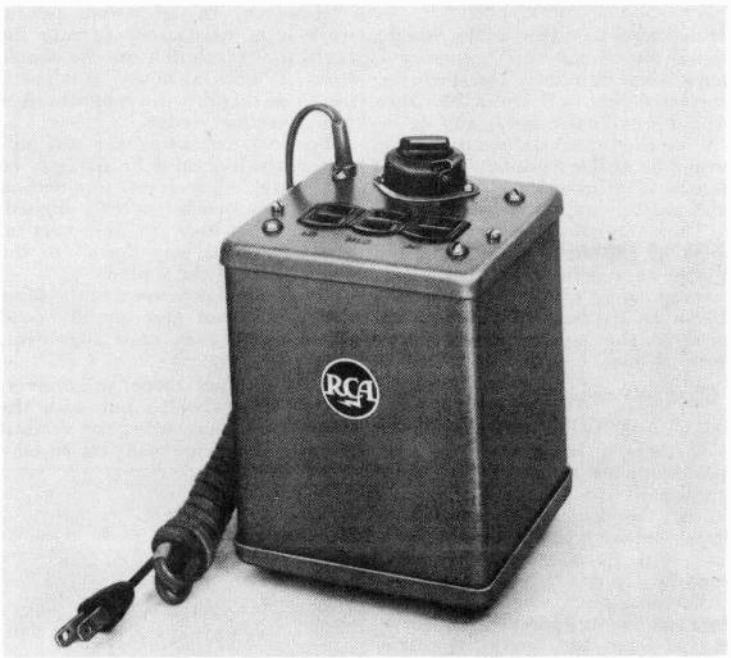
SAFETY FIRST ON KINESCOPES

If a small amount of talcum powder is dusted over the deflection yoke and focusing coil rubber fittings in television receivers, they will slide smoothly over the base and neck of the kinescope.

Harry M. Johnson
Electrical Appliance Co.
2140 Washington St.
Roxbury, Mass.

"MIKE, GET ME MY REPAIR KIT AND MY GOLF CLUBS. TELEVISION BROKE DOWN AT THE COUNTRY CLUB."

RCA'S NEW "ISOTAP" TRANSFORMER



This is the new RCA "Isotap" transformer, designed to eliminate shock hazard, speed servicing, and protect your Test Equipment. Don't miss the page one story on how you may win one of these transformers.

LANDLORD CONVINCED BY ANTENNA MODEL

We all experience some difficulty with landlords and superintendents about erecting FM or TV antennas on their buildings. I've made a small model of a roof and chimney on which miniature antennas are mounted. When the installation is illustrated and explained in this manner, it's much easier to obtain permission to do the job.

C. N. Bourgholtzer
14 Coddington Avenue
New Dorp, S.I., N.Y.

RAID THE SEWING BOX FOR THIS TOOL

An indispensible tool on my service bench is an ordinary crochet hook. I use a number 9, which is a handy size for stringing dial cords into some of the hard-to-get-at places.

Bob Lien
Box 64
East Stanwood, Wash.

DON'T LOSE THOSE BOLTS AND NUTS

A collection of those little cloth mailing bags, stuffed in the corner of the service kit, will save lots of time and temper. When removing a chassis from a console, I place all the loose parts into one of these sacks and tie it to the cabinet. They're always right there when I return the set—nothing lost—no mix-up.

Tremont Electrical Supply Co.
347 Tremont St.
Boston 16, Mass.

NEW RCA "ISOTAP" TRANSFORMER IS A VERSATILE TOOL

Eliminates Shock Hazard Protects Test Equipment Speeds Up Servicing

An outstanding new tool for the radio serviceman which permits speedier servicing of ac /dc receivers, provides greater on-the-job safety, and offers a number of other unusual advantages to the radio shop, is a new RCA "Isotap" Isolation Transformer WP-24A introduced by the RCA Tube Department.

Exclusive feature of the new instrument is a voltage tapped primary and secondary. With this tap arrangement the primary may be set to the prevailing power line voltage, and the secondary receptacles in the instrument will then provide a choice of 117-volt normal supply, a 105-volt low supply, or a 130-volt high supply, under medium load conditions.

Speedier servicing and quicker detection of faulty components is made possible by this choice of voltages. The 105-volt low supply permits a quick check for oscillator stability, and the 130-volt high supply makes possible a breakdown test to expose parts on the verge of failure and reveal intermittents. The new RCA Isotap transformer provides protection against shocks, and prevents damage to test equipment.

Suggested List Price of the new RCA Isotap Transformer is $8.95. Order one today from your RCA distributor.

TELEVISION SERVICE

(*Continued from Page 2S*)

It will tend to ring at 3 Mc, when a signal containing this frequency is fed into the amplifier. The single line corresponding to 3 Mc or 240 lines, would provide the signal, and the resulting ringing or damped oscillation would be visible as several echoes of diminishing intensity following this and possibly adjacent lines.

The same ringing should be evident at the right of the vertical wedge at a point along the wedge corresponding to 240 lines, or 3 Mc. However it is better to observe and analyze the ringing on a single vertical line.

Effect of regeneration on the vertical wedge

If there is tendency toward regeneration at some particular frequency in the picture-if amplifier, it may be evidenced by fine dark lines streaking horizontally across the vertical wedges at a point corresponding to this frequency.

For example, if the if amplifier is regenerative at a frequency 3 Mc removed from the picture if carrier frequency, the effect will be seen at a section along the wedge equivalent to 3 Mc, or 240 lines.

Regeneration depends on the gain of the if amplifier. Therefore it may be evident on a weak signal where the gain is high, and not evident on a strong signal where the gain is low.

When there is evidence of regeneration, the alignment, bypassing, and lead dress of the picture-if amplifier should be checked in an effort to reduce or eliminate the regeneration.

Practical rating of horizontal resolution

In most test patterns, the wedges are not marked by numbers to indicate the equivalent number of lines along the wedge.

However, in television service work it is satisfactory to rate the horizontal resolution on the simple basis of "how far down" it is possible to distinguish the separate lines in the vertical wedge.

For instance, using the test pattern of the highest-definition station in the area, all receivers of a certain model may, when correctly aligned, resolve the lines in the vertical wedge "all the way down" to the narrow end of the wedge.

If a particular receiver of the same model does not give equally good resolution, it may need alignment, or other work.

On a cheaper model of receiver, with less bandwidth but with the same size picture tube, the vertical wedge in the same test pattern may be clear "down to within ½-inch" of the narrow end of the wedge.

This practical method of rating has already become rather widespread, but it is hoped that with increased knowledge of the subject, and possibly the standardization of wedge limits and markings, it will become common to note the horizontal resolution in frequency, and the vertical resolution in "lines". In fact, for TV receiver servicing it would be possible to omit the horizontal wedges and depend on the scanning lines structure as a check of vertical resolution.

Precautions in checking horizontal resolution

In using the vertical wedges on a test pattern to estimate the maximum horizontal resolution of a TV receiver, the following points must be remembered and considered:

1. The size and shape of the kinescope spot has a definite bearing on the apparent resolution, as pointed out in the section on focus.
2. Contrast and brightness must be set correctly, and not high enough to make the spot "bloom".
3. Reflections (echoes, ghosts) can reduce the apparent resolution of the receiver if they fall within the wedge.
4. "Snow" on a weak signal will reduce the definition. On a very weak signal, the entire vertical wedge may be blurred and indistinct; on a strong signal the same set may show excellent resolution.
5. A few TV stations use experi, mental or temporary equipment-producing signals of low definition.

(*To Be Continued*)

VERTICAL WEDGE DATA

(Horizontal Resolution)

NUMBER OF LINES,* OR LINE RESOLUTION	EQUIVALENT FREQUENCY	NUMBER OF LINES,* OR LINE RESOLUTION	EQUIVALENT FREQUENCY
40	0.5 Mc	320	4.0 Mc
80	1.0 Mc	360	4.5 Mc
120	1.5 Mc	400	5.0 Mc
160	2.0 Mc	440	5.5 Mc
200	2.5 Mc	480	6.0 Mc
240	3.0 Mc	520	6.5 Mc
280	3.5 Mc		

*This is the total number of black and white vertical lines in ¾ of the active picture width, or in 40 microseconds.

RCA'S "RADIO WORLD'S FAIR" ENTERS SECOND YEAR AS N. Y. SHOWPLACE

THOUSANDS HAVE VISITED PERMANENT EXHIBIT AT ROCKEFELLER CENTER HALL

The elaborate electronic display in the RCA Exhibition Hall, 36 West 49th Street, in Radio City, New York, first opened to the public in June 1947, has since become one of the town's major attractions. During the past school year over ten thousand students and their teachers have been given guided tours and planned programs, in addition to the many others who have stopped in to witness the modern marvels of electronics.

DID YOU GET THE DETAILS ON THE RCA "SHOCK-OF-THE-MONTH" CLUB? TURN BACK TO PAGE ONE OF THE MAIN SECTION AND GET YOUR LETTER READY NOW.

Behind the expansive windows portraying the saga of the modern electron tube, lies a panoramic display of every phase of RCA engineering. One of the most popular features of the entire show is the television demonstration, where one may see his own image on the magic screen of video.

Other displays include the historical series pictured above, and a wall-sized plastic map of the United States with a point of light representing each NBC network affiliate. As the button on the baseboard corresponding to the station and city is pushed, the location is lighted on the map and the network program currently being carried by that station may be heard in an individual earpiece.

Service dealers and their families are cordially invited to visit the RCA Exhibition Hall Lounge and the many interesting displays whenever they are in New York City.

Moving stages present a series of forty pictorial displays, depicting the history of communications in the ultramodern RCA Exhibition Hall, New York City. This is one of the many fascinating, action packed demonstrations shown in the "Radio World's Fair" to thousands of visitors each month.

REPLACEMENT PARTS Section

Here are values available in limited quantities only. Many are hard-to-get items for use in the older RCA Victor models. At these special prices, our stock will soon be depleted; orders will be filled in the sequence they are received.

RCA TEST EQUIPMENT ACCESSORIES

The following list of accessories for RCA test equipment is published in response to numerous requests.

Component	Stock No.
AUDIO VOLTMETER WV-73-A	
Input Cable with Plugs, Clips	53676
Power Cord with Connectors	53678
Crystal Probe	400263
VOLTOHMYST ELECTRONIC METER WV-65A	
DC Test Lead Assembly (Blue)	48994
AC/OHMS Lead Assembly (Red)	51960
Ground Test Lead (Black)	48996
Crystal Probe	400263
Clip for AC/DC Probes	35267
Testpoint Adapters	400260
Locking Pin Plug	47089
Binding Post	47062
VOLTOHMYST ELECTRONIC METER WV-75A	
DC Lead, Shielded, with Probe	48994
Ohms Lead, Pin Plug and Probe	51960
Ground Lead, Clip, and Pin Plug	48996
Diode Probe	400275
Crystal Probe	400263
Clip for AC/DC Probes	35267
AC Probe Clip Attachment	52821
Testpoint Adapters	400260
Pin Plug for Gnd., Ohms Lead	47089
Binding Post	47062
VOLTOHMYST ELECTRONIC METER 165-A	
DC Volts Lead with Probe (Blue)	43915
AC/OHMS Lead, with Probe (Red)	43913
Common Lead with Clip (Black)	43914
Crystal Probe	400263
Clip for AC/DC Probes	35267
Testpoint Adapters	400260
VOLTOHMYST ELECTRONIC METER 195-A	
DC Lead with Probe (Blue)	48994
AC/OHMS Lead, with Probe (Red)	48995
Ground Lead with Clip (Black)	48996
Crystal Probe	400263
Clip for AC/DC Probes	35267
Testpoint Adapters	400260
Pin Plug for Ground Lead	47089
Binding Post	47062
OSCILLOSCOPE WO-79A	
Attenuating Cable (less clip lead)	53842
Direct Cable (less clip lead)	53843
OSCILLOSCOPE 158	
Input Cable, complete	33873
CHANALYST ELECTRONIC ANALYZER 162, 162-A	
AF Test Cable Assembly (Green)	35263
Interchannel Cable Assembly	43977
Oscillator Test Cable Assembly	35266
RF/IF Test Cable Assembly	35264
Voltmeter Test Cable Assembly	35265
Clip Attachment Assembly	35267
Testpoint Adapters	400260
Crystal Probe	400263
Flexible Connector	35710

Component	Stock No.
CHANALYST ELECTRONIC ANALYZER 162-B	
AF Test Cable Assembly	35263
Interchannel Cable Assembly	46685
Oscillator Cable Assembly	35266
RF/IF Cable Assembly	35264
Voltmeter Cable Assembly	35265
Clip Attachment Assembly	35267
Testpoint Adapters	400260
Crystal Probe	400263
Flexible Connector	35710
CHANALYST ELECTRONIC ANALYZER 162-C	
AF Test Cable Assembly	35263
Ground Lead Cable Assembly	47080
Interchannel Cable Assembly	46685
RF/IF Cable Assembly	35264
Oscillator Cable Assembly	35266
Voltmeter Cable Assembly	35265
Clip Attachment for Probe	35267
Testpoint Adapters	400260
Crystal Probe	400263
Flexible Connector	35710
Locking Pin Plug	47089
Binding Post	47062
TEST OSCILLATOR 167-A	
Low Capacitance Test Cable	46748
Testpoint Adapters	400260
TEST OSCILLATOR 167-B	
RF Output Cable Assembly	52524
Grounding Connector	52525
Testpoint Adapters	400260
AUDIO CHANALYST ELECTRONIC ANALYZER 170	
AF or VOLTS Cable & Test Clips	44842
Ground Cable, Clip, & Pin Plug	44844
Cable, Probe, & Connector (Red)	44845
Clip for Probes	35267
Testpoint Adapters	400260
Crystal Probe	400263
AUDIO CHANALYST ELECTRONIC ANALYZER 170-A	
Shielded Cable Assembly (Green)	35263
Shielded Cable Assembly (Black)	49320
Shielded Cable Assembly (Blue)	35265
Test Lead (Black)	49321
Test Lead (Red)	49322
Power Cord	52556
Clip for Probes	35267
Testpoint Adapters	400260
Crystal Probe	400263
Locking Pin Plug	47089
Binding Post Pin	47062

DBM MEASUREMENTS

(*Continued from Page 2, Column 2*)

been increased 58%. This increase of 0.58 watt is appreciable from the standpoint of power, but the chart shows the corresponding gain in db is only 30 to 32, or 2 db. This gain of 2 db does not justify the expenditure of much effort. However, if a gain of 2 db can be obtained at three points in a system, the total gain of 6 db is worth considering.

Since dbm values are defined with respect to a 600-ohm resistive load, power levels also correspond to voltage values, and dbm can be therefore measured in terms of rms ac voltage. For example, the chart shows that 0.775 volt rms corresponds to 0 dbm or 1 mw; 7.75 volts corresponds to 20 dbm or 100 mw, etc. While dbm can be measured at any frequency within the range of the VoltOhmyst meter, it is necessary to use a frequency free of harmonics. If harmonics are present readings will be incorrect.

Decibel units are convenient to work with because they need only be added and subtracted. For example, if an input of 1.5 dbm is fed into an attenuator which steps the input down to —2 dbm and is then supplied to an amplifier which steps the output of the attenuator up to 18.5 dbm (0.071 watt), the overall gain in decibels is 18.5—1.5 = 17 db. The amplifier gain is 18.5—1.5+2 = 19 db.

The chart is applicable to resistive loads other than 600 ohms when a suitable term is added algebraically to the dbm value found on the left-hand edge of the chart, as explained in the chart footnote. Don't make the common mistake of measuring dbm across resistors other than 600 ohms without using the necessary correction term.

For example, if 10 volts is measured across 500 ohms, the chart indicates a value of 22.22 dbm, to which a correction term of 0.79 dbm must be added, giving a round figure of 23 dbm (200 mw).

THE HANDY WAY TO SELL BATTERIES

The sale of a season-long supply of "A" batteries (flashlight size) for portable and personal radios, is made easy by a new handy little "Carry-Kit" just introduced by the RCA Tube Department. Containing 8 of the famed RCA "sealed-in-steel" batteries (they're made expressly for radios with a special radio "mix" to increase listening hours), the Carry-Kit is made possible by the unique design of the RCA batteries. These have a tightly sealed-in-steel jacket over the basic dry cell which eliminates deterioration of the battery materials and keeps the batteries fresh for years. The Carry-Kit of 8 batteries sells at a suggested list price of $.98 and is available from your RCA Battery Distributor.

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