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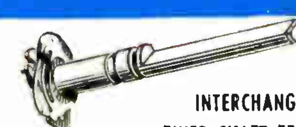

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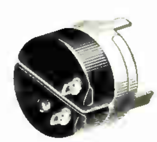

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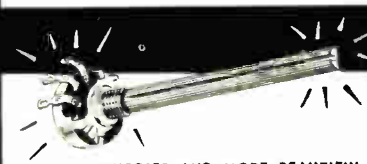

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RADIO INDUSTRY Newsletter

edited by Joseph J. Roche

October 1, 1949

Television Channel allocations continue to be the biggest news in the industry, as the FCC proposals meet opposition from many quarters.

ABDuMont declared that the FCC assignment proposals, if adopted, might result in a one-network monopoly of television. DuMont's T. T. Goldsmith had a solution ready. Main features of his plan...

It would minimize the intermixture of VHF and UHF assignments, and consequently the requirements for converters and other additional equipment.

Most metropolitan districts would have four or more channels.

It would reserve 12 channels for future assignments to small communities, and 9 for non-commercial educational use.

* * * * *

Communications Measurements Laboratory, Inc. also found fault with the FCC proposal. CML proposes that the FCC move all television broadcasting into the UHF band, vacating the VHF band entirely.

The company claimed that use of both bands would complicate future receivers because they would be required to operate over an enormous band of frequencies.

CML pointed to the shift of FM as an example and said that the time to make the change is now.

Such a plan, if adopted, would have the opposite effect of the DuMont plan in that everyone now owning a receiver would need a converter.

The RMA and several others filed statements with the commission.

* * * * *

While all this activity left the average observer slightly bewildered one thing remained clear . . . it will be some time before the Commission can reach decisions which will enable it to lift the TV freeze.

* * * * *

Color Television has been stirring up a great deal of feverish activity in many parts of the industry.

CBS filed the details of its system withthe FCC and as it prepared to demonstrate it at the hearings . . .

RCA filed the details of its all electronic system.

* * * * *

Said RCA of its system:—no changes in present black-and-white transmission standards are necessary, performance is equivalent to present black and white, present sets could receive color programs in monochrome without modification, color programs could be received either on special receivers or existing receivers with an adaptor.

Since it would not require changes in standards or cause present receivers to become obsolete, RCA's system seemed to meet all Commission requirements and, from the description released by the company, was superior to the CBS system.

* * * * *

As CBS, RCA, and a third contender, Color Television, Inc. prepared to demonstrate in Washington, Dr. DuMont requested permission from FCC's Wayne Coy to install commercial black and white receivers alongside the color receivers in order to compare the quality of the various color systems.

In response, Mr. Coy called a meeting to prepare a schedule for comparison tests.

* * * * *

With the possible exception of CBS, the industry agreed that no matter what took place at the hearings, color was years away as far as the public is concerned.

Nevertheless, fear persisted that the public might not see it that way and continue to hold on to its purse strings.

The Industry's efforts to acquaint the public with the facts were looked upon with suspicion in some government quarters.

RMA answered the Industry's critics in its statement to the FCC. Wrote RMA: The industry does not oppose the development of a sound and thoroughly tested system of color television. The industry has not retarded nor opposed the development of color . . . on the contrary, has spent many millions of dollars and years of time in experiments and research.

Members of the Pennsylvania and New York State Federations are staging a "Preventative Radio Maintenance Month" during October. Local distributors, broadcast stations, and manufacturers' reps are cooperating with the State Federations.

Sales of Philco's new teleset line are exceeding expectations, according to the company.

* * * * *

ABDUMont Labs report 87% increase in sales over 1948 for 24-week period ending June 19. This is a good indication of the kind of progress television is making, since this firm is producing almost exclusively for TV.

* * * * *

Motorola August & September teleset deliveries were 103% above same months of last year.

The company hired an additional 1,000 workers in August, bringing the number of its employees to 4,500.

Raytheon, which has been producing and marketing telesets on a small scale for some time, announced that it will enter the market on a national scale.

Samples of its new Belmont Line: a 7" table model at $129.95; a 16" table model at $289.95.

* * * * *

G-E announced a price reduction on its TV sets—lowest in their line is $189.95 ten-inch table model.

Altec-Lansing, which to date has been producing a TV chassis for custom installation, announced that it will enter the "high end of the high-quality market" with a new line of TV sets.

Capeheart-Farnsworth demonstrated a wired television system for use in industry. The equipment will permit one person to observe activity at several distant points and in places he could not ordinarily see.

Sylvania announced a price protection policy to cover period of August 31 to October 31. It provides for reimbursement to distributors of losses due to price declines within 60 days after receiving tubes shipped during the protection period. According to company, the chief beneficiary will be the radio and TV service industry.

Standard Transformer also announced price protection policy. Will protect distributors against loss for period of 90 days from date of shipment.

Joseph J. Roche, Editor

1949 IS TV YEAR

Here are some of the many reasons why there are more Simpson 260 high sensitivity volt-ohm-milliammeters in use today than all others combined. The Simpson 260 has earned world-wide acceptance because it was the first tester of its kind with all these "Firsts":

Simpson 260 SET TESTER

WORLD FAMOUS FOR ALL THESE *"FIRSTS"*

- First high sensitivity instrument to use a metal armature frame.
- First to use fully enclosed dust proof rotary switch with all contacts molded in place accurately and firmly.
- First to do away with harness wiring.
- First to provide separate molded recesses for resistors, batteries, etc.
- First to cover all resistors to prevent shorts and accidental damage and to protect against dust and dirt.
- First with a sturdy movement adapted to the rugged requirements of a wide range of service work or laboratory testing.
- First to provide easy means of replacing batteries.
- First to use all bakelite case and panels in volt-ohm-milliammeters.
- First volt-ohm-milliammeter at 20,000 ohms per volt with large 4½" meter supplied in compact case (size 5¼" x 7" x 3⅛").
- First and only one available with Simpson patented Roll Top Case.
- First to provide convenient compartment for test leads (Roll Top case).
- First to offer choice of colors.

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VOLTS: AC & DC—2.5, 10, 50, 250, 1,000, 5,000
OUTPUT: 2.5, 10, 50, 250, 1000
MILLIAMPERES, DC: 10, 100, 500
MICROAMPERES, DC: 100
AMPERES, DC: 10
DECIBELS: (5 ranges)—12 to +55 DB
OHMS: 0-2,000 (12 ohms center), 0-200,000 (1200 ohms center), 0-20 megohms (120,000 ohms center).

Prices: *$38.95 dealers net; Roll Top $45.95 dealers net.*

The Model 260 also is available in the famous patented Roll Top safety case with built-in lead compartment. This sturdy, molded, bakelite case with Roll Top provides maximum protection for your 260 when used for servicing in the field or shop.

25,000 volt DC Probe for television servicing, complete, for use with 260, $12.85

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INSTRUMENTS THAT STAY ACCURATE

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Courtesy Allen B. DuMont Labs.

Here are the five specifications for

VERTICAL DEFLECTION AMPLIFIERS *in oscillographs*

by Morton G. Scheraga

Allen B. DuMont Laboratories
Co-author *Video Handbook*

THE primary function of a cathode-ray oscillograph is to provide a means for plotting a visual curve of an electrical signal on the fluorescent screen of a cathode-ray tube. In the conventional oscillograph, the electrical signal is applied to the vertical deflection plates of the cathode-ray tube. Another signal, generated inside the instrument, is applied to the horizontal deflection plates in order to produce a time base.

Unfortunately, the cathode-ray tube itself is a relatively insensitive device and potentials of the order of several hundred volts must be applied to its deflection plates for full scale deflection. Most oscillograph uses for f-m and television servicing involve signals of much lower potential, and an amplifier is therefore necessary.

As pointed out above, the electrical signal is applied to the vertical deflection plates. The amplifier which is interposed between the signal and this set of plates is called the vertical, or Y-axis deflection amplifier. This article deals with the characteristics of the Y-axis amplifier and how they affect the techniques employed in servicing various sections of the receiver.

Simple Y-axis Amplifier

The Y-axis amplifier in low cost oscillographs has generally a frequency response from 30 cycles to 50 kc. Usually, a single amplifier stage, of the type shown in Fig. 1, is sufficient to cover this range. Certain points in the design of this simple amplifier are of interest.

Since an ordinary resistance-capacitance coupled amplifier stage does not provide sufficient bandwidth, some form of low and high frequency compensation must be employed. High frequency compensation is secured by placing a suitable inductance, L1, in the plate circuit. Its function is identical to similar inductances utilized in the video amplifiers of television receivers. L1 adds a reactance which increases with frequency. Stray capacitances and interelectrode capacitances of the vacuum tube have the effect of decreasing the plate load impedance as the signal frequency is increased, therefore attenuating the higher frequencies. For this reason, L1 is employed to increase the load impedance at high frequencies and thus maintain the amplifier gain.

Another method of obtaining high frequency compensation in amplifiers of this type is to use a small cathode bypass condenser, between 0.001 mmf and 0.01 mf. At low frequencies, this capacity is insufficient to give adequate bypassing, and cathode degeneration results. This produces less gain than would be obtained with a fully bypassed cathode resistor. At higher frequencies, where the gain of the stage would start to drop off, the bypassing action becomes more effective. The cathode degeneration is eliminated and the gain of the amplifier is raised to compensate for the loss caused by the stray capacities shunting the plate load resistor, R1.

Low frequency compensation takes the form of resistor Rc and capacitor Cc. These components, and Cg and Rg, are chosen for optimum low frequency response.

In addition to frequency response, the gain of the Y-axis amplifier is also important. It is convenient to express the gain of an amplifier in an oscillograph by *deflection sensitivity.* This is the number of volts required at the input of the amplifier to produce one inch of deflection on the screen of the cathode-ray tube. For example, if the Y-axis amplifier of an oscillograph is said to have a deflection sensitivity of 1 volt peak/inch, it means that a signal, having a peak-to-peak amplitude of one volt, will produce one inch of deflection on the screen. Sometimes the deflection sensitivity is expressed in terms of rms volts per inch, which means that the root-mean-square value is used. To obtain the peak voltage from the rms value, multiply the latter by 2.8.

Simple, single stage amplifiers, such as shown in Fig. 1, have deflection sensitivities of about 0.5 volts peak/inch when coupled to a cathode-ray tube operating at about 1000 volts accelerating potential. For television servicing, it is desirable to have an oscillograph with a sensitivity at least ten times higher, or 50 millivolts peak/inch, otherwise special techniques, which will be described later, must be employed when using lower gain instruments.

It will be noted in Fig. 1 that the Y-axis amplifier is connected to one deflection plate, while the other plate is grounded. This type of circuit is called a single-ended, or unbalanced deflection amplifier, and is generally confined to the smaller, more inexpensive oscillographs. When a signal is applied to only one plate of a deflection plate pair, it is ordinarily not possible to properly focus the resultant trace across the entire screen. The focus control on the oscillograph may be adjusted in order to focus some particular portion of the trace, but then some other portions will be defocused. This effect is compensated for in more expensive oscillographs which employ push-pull amplifiers to feed both deflection plates.

High-Gain, Wideband Amplifiers

The properties of an amplifier are such that the higher its gain the narrower is the bandwidth, and visa versa. The gain of an amplifier is determined mainly by the value of the plate load resistor, and is higher for greater values of resistance. On the other hand, the high frequency response is reduced as the load resistance is increased. In designing an amplifier, it is necessary to compromise on gain if one wants a wideband amplifier, or to reduce the bandwidth if a high gain amplifier is desired. Of course, a high gain, wideband amplifier can be built, if one wishes to employ a sufficient number of wideband, low-gain stages.

To increase the gain of the amplifier system shown in Fig. 1, it is necessary only to add another stage or two of similar design. If a wider

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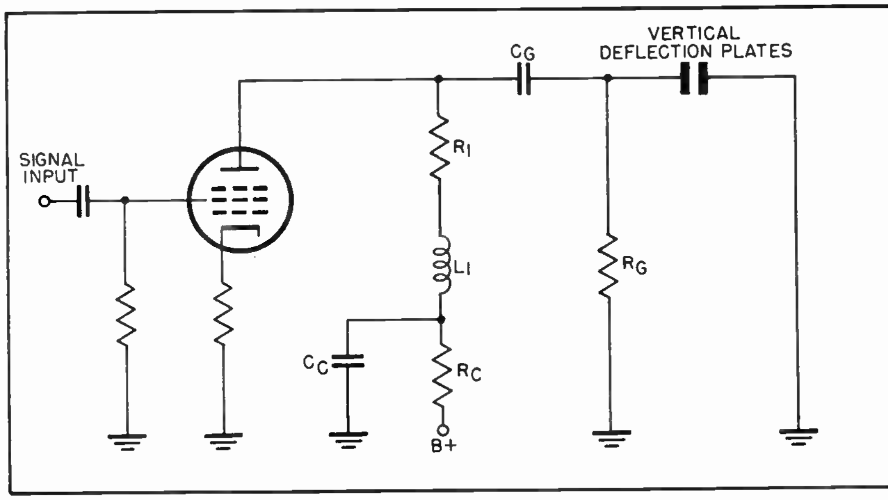

Fig. 1 Schematic diagram of simple vertical deflection amplifier. This is a single-ended deflection amplifier. It is connected to one deflection plate, the other plate is grounded

When buying an oscillograph, check Y-axis amplifiers for these:

- **high gain**
- **good 60-cycle square wave response**
- **high impedance input, low output capacity**
- **good high frequency response**

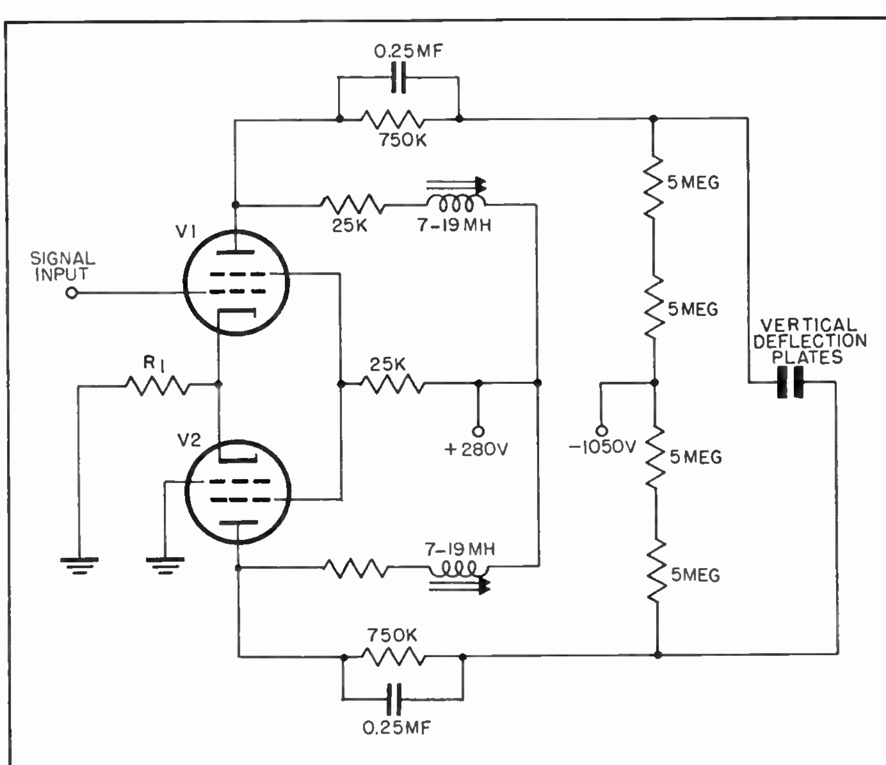

Fig. 2 Balanced amplifiers in vertical deflection system of some oscillographs. This is a typical wide-band amplifier. A cathode-coupled, self-inverting output stage is used

step by step procedure tells

HOW TO CHECK AUDIO AMPLIFIERS

The author details the methods of checking audio amplifiers which he has found most successful

EFFICIENT audio amplifier testing calls for checking of (1) frequency response, (2) gain, (3) distortion, and (4) power output. No overhaul of p-a equipment may be considered complete unless these four performance characteristics have been examined by the technician. Instruments required for complete amplifier testing are (1) sine-and square-wave audio oscillator tuneable from 20 cycles to 20,000 cycles, (2) a.c. vacuum tube voltmeter, (3) electronic switch, and (4) oscilloscope. They are shown in Fig. 1, set up for amplifier checking.

The several test instruments are employed in various ways to check the amplifier characteristics. The connections shown in Fig. 2, 3, and 4, and the simple methods of making the tests will be described in this article. Each of the measurements are explained separately in the following paragraphs.

Gain Measurement

A sine-wave audio oscillator and a-c vacuum tube voltmeter are required for this test. The apparatus setup is shown in Fig. 2. Connect the output of the oscillator to the input terminals of the amplifier under test. Connect the regular loudspeaker to the amplifier output terminals. If it is desired to keep the test noiseless, replace the speaker voice coil with a resistor (preferably non-inductive) having the same resistance as the voice coil impedance and a wattage rating equal to twice the expected power output of the amplifier. Arrange a double-throw switch, S, so that the voltmeter may be switched back and forth between the input and output terminals of the amplifier.

Either overall gain (that is, for the entire amplifier) or gain per stage may be checked. To measure overall gain:

(1) Set the amplifier gain control for maximum gain.

(2) Set the amplifier tone control to its middle (flat-response) position.

(3) Switch the meter to the input position 1.

(4) Adjust the oscillator output control to give a small, readable deflection of the meter. Record this voltage as E_1.

(5) Switch the meter to output position 2 and record its new reading as E_2.

(6) Divide E_2 by E_1 to obtain the overall voltage gain.

If distortion, such as plugging or blocking occurs, it will be necessary to reduce the oscillator output. If the reduced output voltage then is too

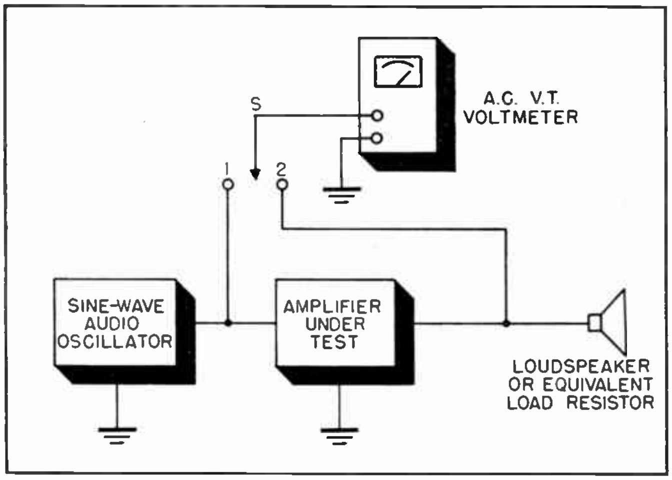

Fig. 2 Above is complete instrument setup for gain measurement. A sine-wave audio oscillator and a-c vtvm are required for the test

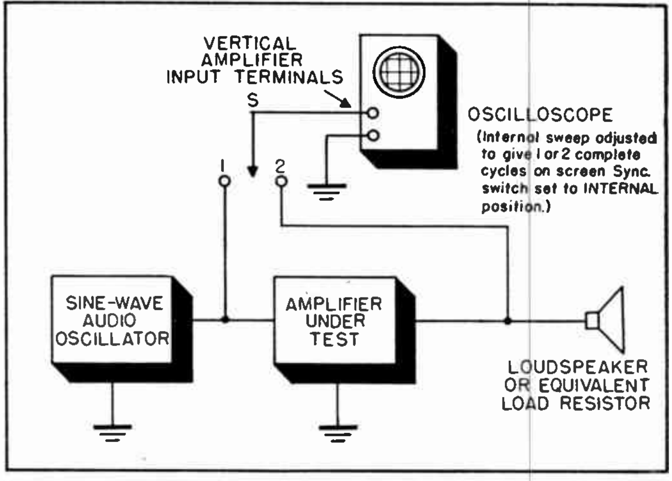

Fig. 3 One apparatus setup for checking distortion in audio amplifiers. Oscillograph is switched permanently to output position 2

by
Rufus Turner

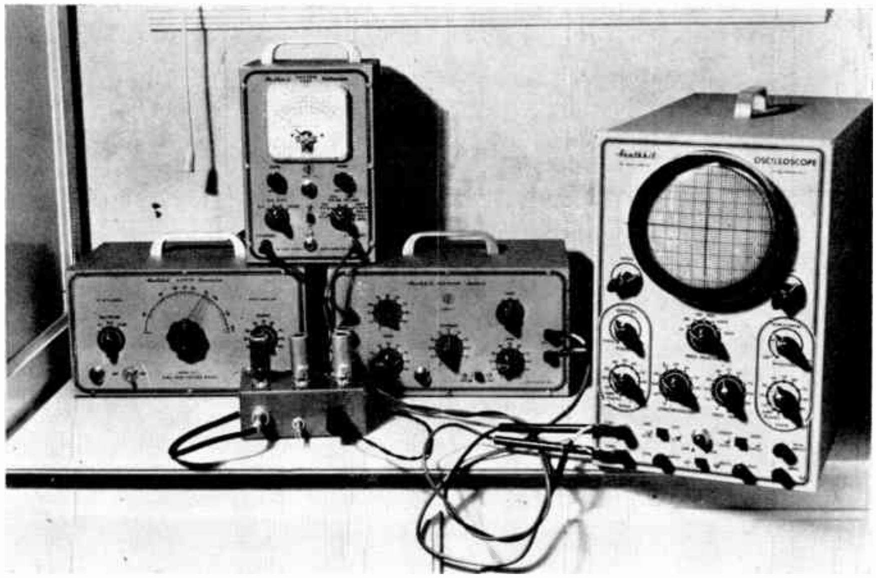

Fig. 1 Setup for audio amplifier checking. A sine-square wave audio generator, electronic switch, a-c vtvm and oscillograph are shown

small to give a readable deflection on the lowest range of the v.t.v.m., install a 10-to-1 or 100-to-1 resistance-type voltage divider between the oscillator output and amplifier input. Connect contact 1 of the switch S to the input terminal of the voltage divider. Note the meter reading and divide this value by 10 or 100 (according to the voltage divider ratio) to obtain E_1. Output voltage E_2 is obtained in the manner described in the preceding paragraph.

Repeat the gain measurement at several oscillator frequencies such as 100, 1000, and 10,000 cycles, and at several selected settings of the amplifier gain control and tone control.

To check separately the voltage gain of any stage in the amplifier apply the oscillator signal voltage to the grid input of the stage under test and check the input voltage (E_1) and output voltage E_2 (the latter at the plate output terminal of the stage). Divide E_2 by E_1 to obtain the stage gain. When coupling transformers are present, make them a part of the measurement circuit. For example, where both input and output transformers are employed in a single stage, apply the signal to the primary of the input transformer and connect the meter to the secondary of the output transformer. When checking stage gain, an isolating capacitor (0.1 mf, 600-volt tubular) should be connected in the "high" output lead of the oscillator to prevent any d. c. in the circuit under test from entering the oscillator.

If an a. c. vacuum tube voltmeter is not available, an oscillograph may be used in its place, as shown in Fig. 3. The screen of the oscillograph must be calibrated in voltage. In this way, input voltage (E_1) and output voltage (E_2) may be read by measuring the height of the wave pattern on the 'scope screen.

Still another apparatus setup for gain testing is shown in Fig. 4A. With this arrangement, both the input and output voltage waves appear simultaneously on the oscilloscope screen and the height of each may be measured separately to determine the E_1 and E_2 values. The electronic switch used in this setup is a tube-type instrument which rapidly switches the 'scope input back and forth electronically between the input and output terminals of the amplifier, actually building up both input and output signals in little bits on the screen. However, the action is so rapid that the eye sees only the completed picture rather than the

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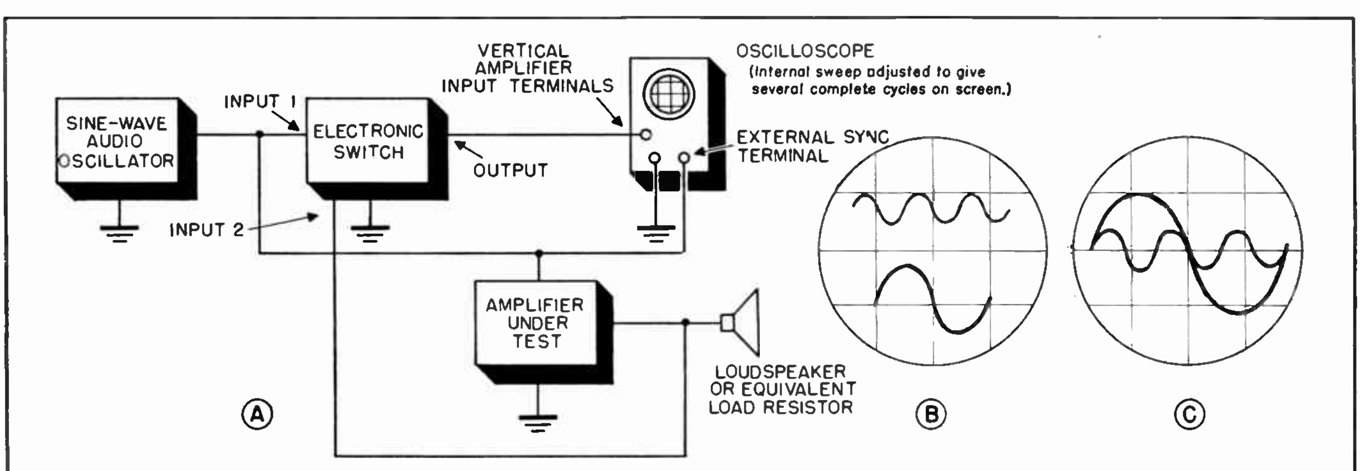
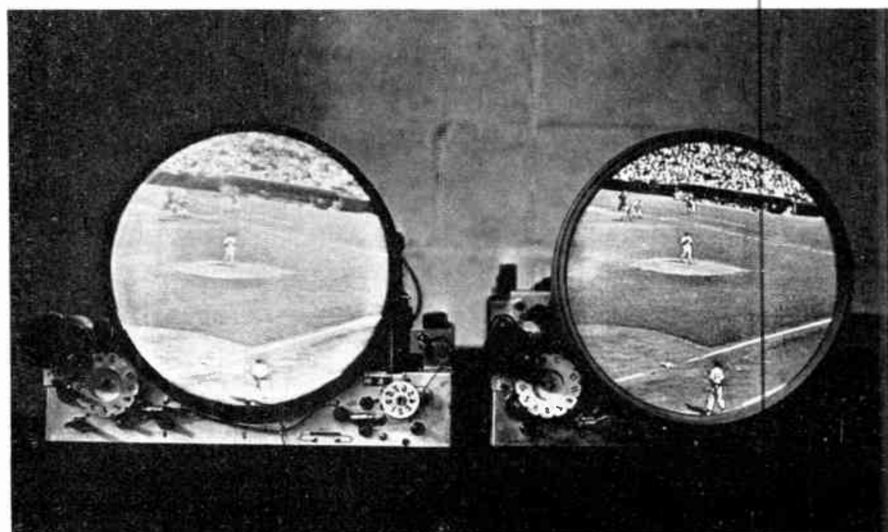


Fig. 4 Shown in A is another setup for checking audio amplifier distortion. The oscillogram in B shows the input and output patterns separated. In C the input and output patterns are superimposed. The technician can choose whichever he prefers

what's NEW in PICTURE TUBES?

by Isidor I. Gross

Many manufacturers have announced new developments in picture tube design and material. The more important ones are reviewed in this article



Two identical television receivers with same signal, photographed on same negative at Zenith Labs, illustrate the difference in contrast between the conventional type tube face and Teleglas. Tube to the left has conventional glass, tube at right Teleglas

LAST year, when the shortage of picture tubes was acute, manufacturers had as their slogan: *More Picture Tubes.* Today when supply has caught up with demand, their motto is: *Better Picture Tubes.* Quite a number of improvements in picture tube design have been effected during the past few months, most of them intended to enhance the quality of the picture as it appears on the screen and thereby reduce the incidence of eyestrain. Some of these developments will be discussed here.

New Glass

Two of the problems which face the televiewer are the effect of ambient light (i.e., the external light in a room, for example) on the contrast of the picture, and a phenomenon known as halation (discussed below).

In order to achieve good contrast in the picture, it is necessary that its black areas be really black. The reason for this is the fact that the television picture is composed of black areas, white areas, and different degrees of grey areas in between. It is clear that the greater the difference between the black and the white areas, the greater will be the possible number of shades of grey, and the higher the contrast. Increasing the blackness of the black areas would therefore be one of the ways to increase contrast. Black areas in television pictures, however, can only be obtained by the absence of light. For this reason, any light falling on the screen would normally change the blacks to a lighter shade, thereby reducing the overall range of contrast. It can thus easily be seen that one of the ways to *increase* contrast would be to keep the amount of external light which might fall on the picture tube to a minimum. But how?

Viewing the screen at night with radically reduced room illumination has been one of the ways the public has found to cope with the problem. But medical and optometrical authorities have agreed that this practice is detrimental to the health of the eyes.

Pittsburgh Plate Glass Co. has now developed a glass for use with metal tubes (called Teleglas) designed to solve this problem. The diagram in Fig. 1 shows how it works. It is a colorless glass which acts as a filter for external light. Illumination striking it is absorbed into it and is not reflected to the viewer or onto other parts of the screen. In effect, it reduces the amount of external light hitting the picture tube. The accompanying photograph shows the effect achieved by this new development.

Teleglas also cuts down halation. Normally, light from a bright picture area of the tube striking the exterior tube surface at angles greater than 48° is 100% reflected over into the dark area, thereby diminishing contrast. The design of the glass is such that this reflection is held to a very low level. Fig. 2 shows how this is accomplished.

A company spokesman stated that Teleglas maintains a contrast of the order of 35 to 1 under widely varying conditions of room light. This means that the highlights of the picture would be 35 times brighter than the darkest shade obtainable.

Zenith has already adopted the glass (under the tradename "Glare-Ban"), and other manufacturers with whom we have checked were experimenting with it prior to arriving at a final decision.

Coating

The problem of contrast was attacked from a different angle by American Television, Inc. They started with the observation that the phosphorescent powder in the screen of the picture tube is of a crystalline nature. Now, when the electron beam hits these crystals, light is scattered uniformly in all directions. For best viewing results, however, light should be traveling only toward the observer. In the conventional tube, that part of the light not traveling toward the viewer goes either back into the tube or toward the surrounding crystals. The net result of this action is that the black areas in the picture seem to be grey and give a washed-out appearance. Fig. 3 shows what happens.

The task which the researchers set themselves was to devise a method whereby side dispersion of the light produced on the screen by the electron beam would be eliminated. They found that manganese dioxide (an opaque powder) combined with sodium metasilicate and mixed with the crystals, would give satisfactory results. The opaque powder acts in such a way as to confine the light emission of each crystal to that crystal alone, as shown in Fig. 4. This action prevents the scattering of light which has heretofore taken place, and as a result increases the contrast of the picture.

Incidentally, American Television Inc. engineers also found that opaque powders of various other chemical composition were equally suitable for this purpose.

This new coating has already been incorporated by Garod is its latest receiver models, and others may follow.

New Tube

Also concerned with the problem of contrast, but going beyond it, DuMont engineers developed the 19-inch 19AP4. They attacked the problem of better pictures via a process which they call "flow-coating." This process involves the more uniform settling of the phosphorescent screen during the coating process, which brings about a reduction in the scattering of light by the phosphorescent crystals.

The tube, however, has some additional and more important features designed to improve picture quality. A very short neck gives it an overall length of 21½ inches, which makes it 2 inches shorter than the 15-inch tube. The result of the shorter beam throw in this tube is a more clearly defined spot and a sharper focus. The problem to be overcome in this design was one of increased power. Because of the short neck and the large screen diameter, wider deflection angles are required, and these can only be obtained with increased power.

The tube is also equipped with the "bent electron gun," as contrasted with the "slashed field" in conventional tubes. The effect of the bent gun is that the electron beam is bent only once, instead of twice, as in earlier tubes. A single ion trap magnet (rather than the conventional two) is used. Since the electron beam is bent only once, distortion of the spot is considerably reduced. The bent electron gun combined with the shorter beam throw in the tube thus

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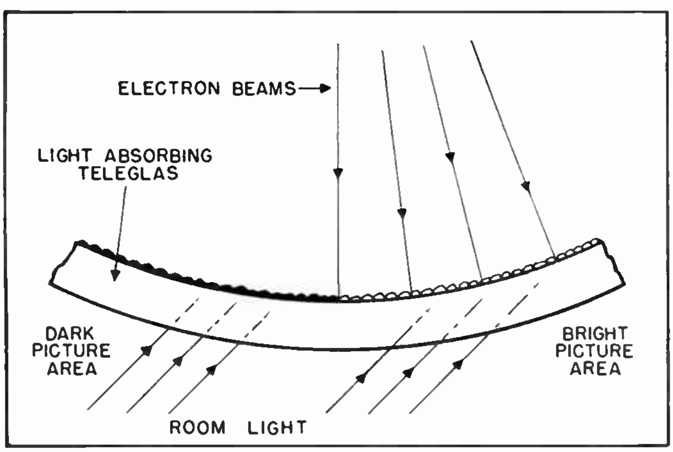

Fig. 1 Diagram showing the effect of room light on television picture. Teleglas absorbs unwanted light, keeps black areas black

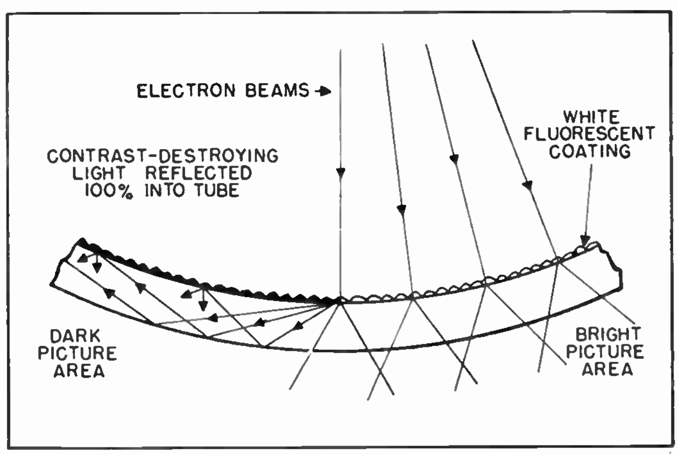

Fig. 2 Illustrating the effect of halation. Some of the light from bright picture area is reflected over into the black portion

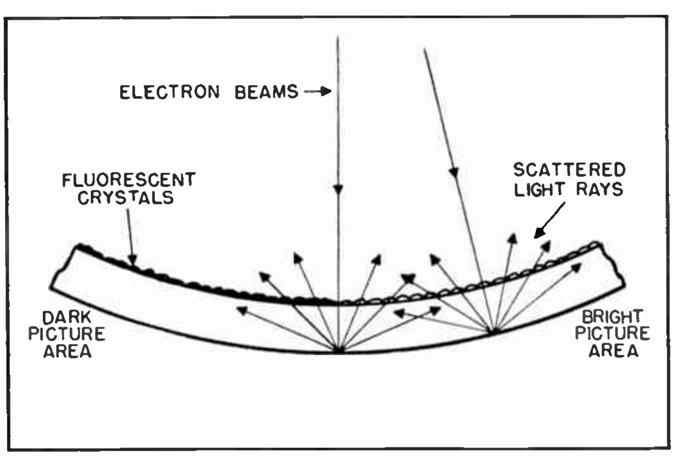

Fig. 3 In the conventional tube, fluorescent crystals in the face coating lower contrast by causing light rays to be scattered

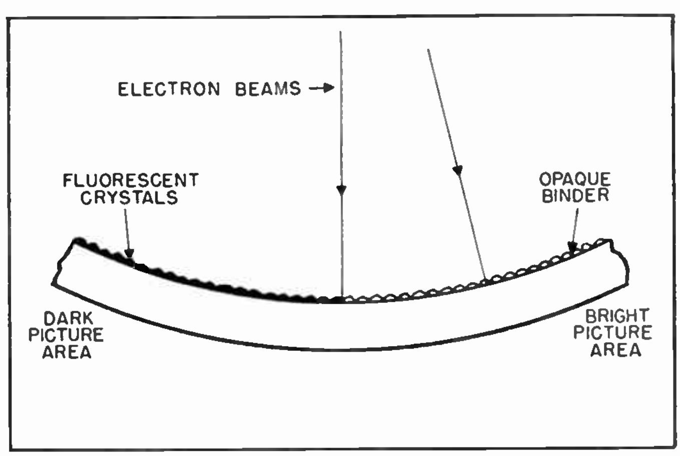

Fig. 4 American Television's method of using opaque binder eliminates scattering of light rays, thereby increasing contrast

choosing the right antenna IS important

by Martin Clifford

TELEVISION technicians have come to realize that the success of an installation depends almost entirely upon the selection of the proper antenna, that it's the antenna which finally determines the performance of the receiver. As a result there has been an increasingly strong interest on the part of the technician in the suitability of the various types of antennas for different installations; and we wish to devote this article to a discussion of some representative examples of practical television antennas which are available to the technician today.

Selection of the antenna is complicated by such factors as location, gain, selectivity, directivity, elimination of unwanted signals, reflections, interference, and finally the ability to receive either a particular station or stations. No wonder that some antenna installations look like—and almost are—engineering construction jobs.

The simplest of all our television antennas is the open dipole. In areas where there is only one station, and where the field strength intensity is good, this antenna has proven to be quite satisfactory. Its performance can be improved for greater signal strength and the reduction of ghosts through the use of a director or a reflector. Additional dipoles can be added if more than one station exists in the area, but the practice today is to have a low and a high frequency dipole in such cases. Both dipoles can be made to have a sufficiently low Q—and therefore broader bandwidth—for the frequency range to cover several stations.

Variations

All television stations radiate waves which are best received by antennas which are horizontal to the earth, because television transmitters radiate horizontally polarized waves. If buildings, trees, or other obstructions exist between the station and the receiver, particularly near the receiving antenna, the radio wave may be so altered that it may be necessary to change the antenna angle.

It also happens occasionally that a "direct" and a "reflected" signal combine at the receiving antenna. Where an ordinary horizontal type dipole antenna is used, this combination of signals produces a minimum of desired signal since one signal tends to cancel the other. In such instances we can use an adjustable V dipole antenna.

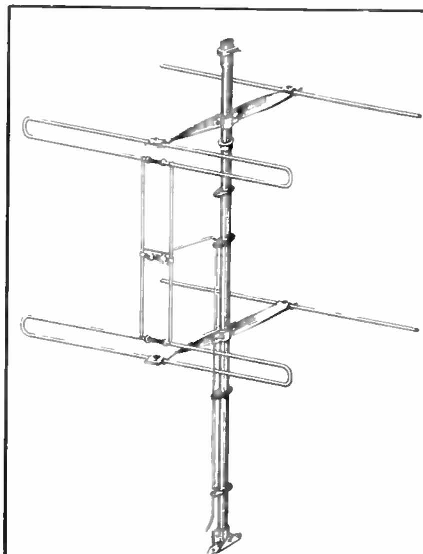

Fig. 2 Ward TVS48. This antenna is designed for high band reception in those areas where low signal intensity obtains

This antenna is simply a dipole whose arms may be moved up and down. In this manner it is possible to make the two signals combine in phase, thereby increasing the signal. The arms of the antenna are moved up or down until best overall reception is secured. Some adjustable V-antennas, particularly of the indoor type, have, in addition, a telescoping arrangement with which its arms can be made longer or shorter, thus physically tuning the antenna to a station.

The folded dipole is a variation of the open dipole. It has a broader bandwidth and a higher input impedance than the open dipole. This antenna is designed for use in areas of medium to high signal strength, or in cases where bi-directional sensitivity is desired. Where elimination of ghosts is necessary, a reflector may be added. The reflector, not electrically connected in any way to the dipole or the receiver, is placed behind the dipole, that is, on the side farthest away from the station. Low and high frequency dipoles, and their reflectors, may be combined into one antenna to serve those areas having television stations in both the upper and lower channels.

It's customary to see the high frequency dipole placed above or below the low frequency dipole, each oriented separately for best reception. However, in areas where both the high and the low frequency stations are located in approximately the same direction from the receiver, both the low and high frequency dipoles may be placed in the same plane, that is, in line with each other. Having both dipoles in the same plane makes it

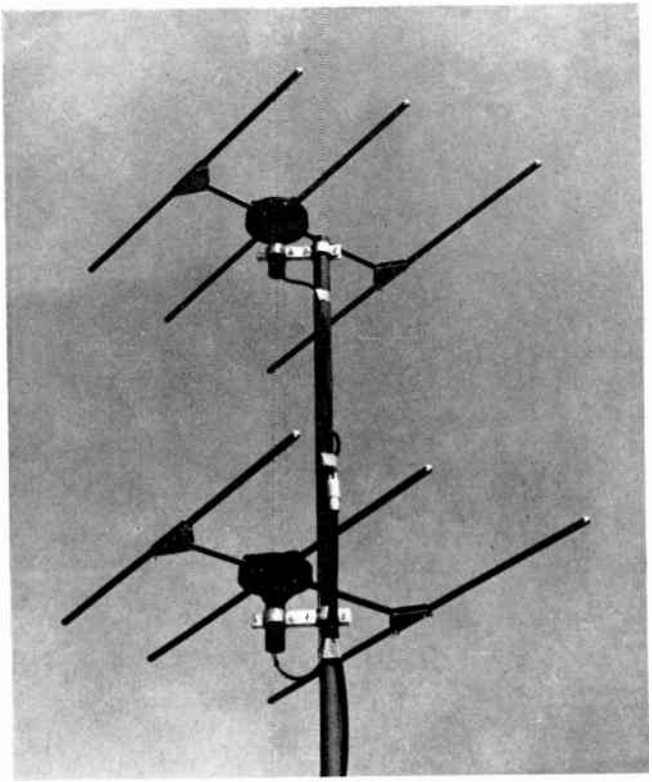

Fig. 1 Workshop Associates Series 2A multiple stacked array. Such antennas are often needed in fringe areas to bring in picture

Troubled by ghosts or snow? Out in the fringe area and no picture? Proper antenna choice may correct these troubles

possible to have one reflector serve both.

The Array

In addition to reflectors, television antennas also use directors to increase directivity and gain. The director, like the reflector, is not electrically connected to the antenna. It is about 4% shorter than the antenna, and is placed between it and the television station. When an antenna is used with a reflector or a director, or a combination of both, it is called an array. Such arrays are used within the normal range of the television station, where it is necessary to discriminate against reflected or interfering signals within this normal service range. Combinations of two or more of these three-element arrays can be mounted on a single mast so that signals on separate channels can be received from different directions.

Where "line-of-sight", or clear optical paths do not exist between station and receiver, the technician must use more elaborate means to furnish the receiver with signals strong enough to give acceptable pictures. Particularly in fringe areas, multiple stacked arrays, such as that shown in Fig. 1 may have to be used. Four, and sometimes even six element arrays are used. For more severe requirements, a twelve-element array could be assembled, consisting of stacked six-element arrays. The six-element array shown in Fig. 1 consists of two basic three-element antennas aligned in the same direction, connected together by a special cable harness, and spaced one-half wave-length apart. The array is commonly referred to as a broadside array, and is capable of furnishing high gain and sharp directional pattern to bring weak television signals up out of the "snow" and discourage ghosting. While it is essentially single channel in terms of optimum reception, the stacked array shown in the illustration will accept adjacent channel signals with a slight loss of gain (about 2 db). Any interfering signal approaching from the rear will be reduced as much as 98%. Multiple array systems should, in some instances, employ guy wires, depending on the method of support.

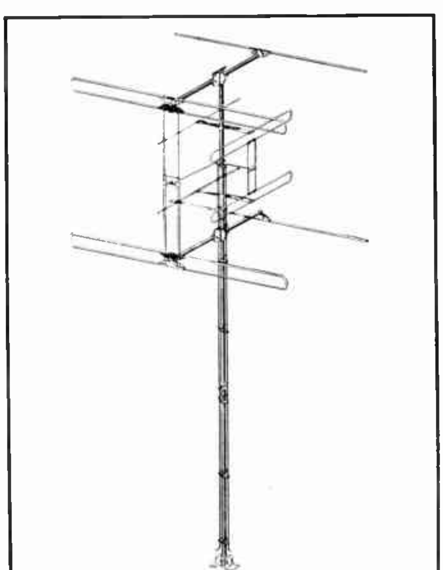

Fig. 3 This Ward antenna, TVS47, is designed for fringe areas where both the low and high band signals are to be received

The forward gain of such a multiple array is much greater than the conventional half-wave dipole and will produce a signal approximately six times as strong in power. The sharp directional pattern, combined with the advantages of shielded coaxial transmission line, means that the signal-to-noise ratio is greater.

Stacked arrays can be designed for reception of a limited number of television stations, whether in the low or in the high frequency range. In Fig. 2 we have a four-element high-frequency band stacked array consisting of two folded dipoles and reflectors. This antenna is designed to be used in areas of low signal intensity where only high band reception is desired. For all-channel work, a dual stacked array consisting of one low-band four-element array and one high-band four-element stacked array can be used. This antenna is designed for use in areas of low signal intensity (fringe areas) where reception of both low and high band stations is desired, as illustrated in

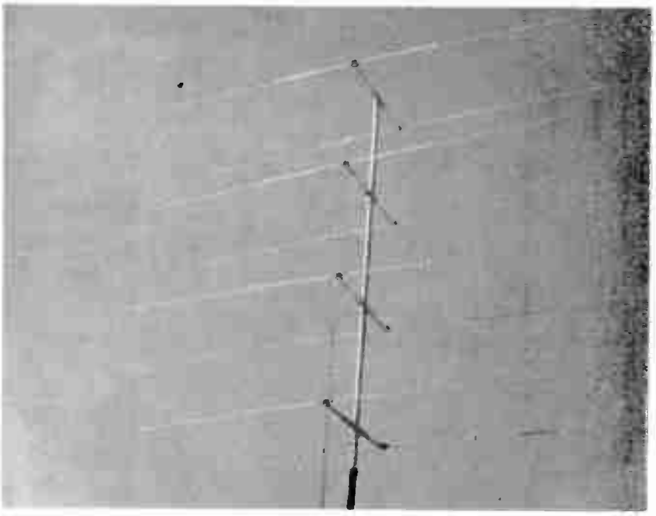

Fig. 4 Four-bay, sixteen-element stacked array, Vee-D-X type RD-13. This antenna features a convenient matching section

Fig. 5 Here is a simpler four-element array, the Vee-D-X type JR-13. Antenna has 72-ohm impedance and provides Q section

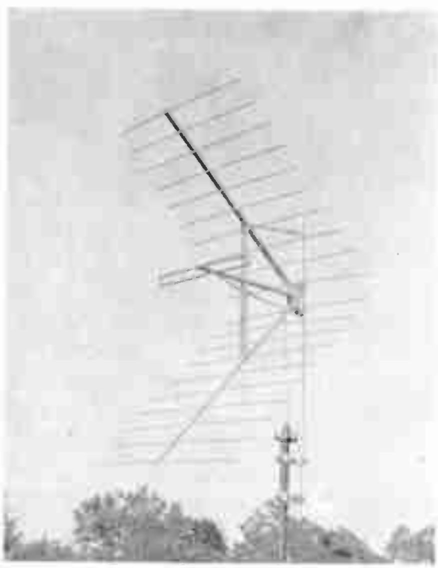

Fig. 6 Called the "Channel Chief", this antenna kit utilizes radar principles to bring in pictures on all high channels

Fig. 3. Individual transmission lines are suggested for use with this dual antenna to minimize inter-connector losses.

Matching Section

In Fig. 4 we have another of the antennas characterized by high forward gain, giving maximum pick-up in one direction, while affording mimimum pick-up from the sides and rear, thus helping in the elimination of interference.

A unique feature of this antenna is a "Q" or matching section which affords a convenient and accurate method for matching impedances of the transmission line (which may be from 60 to 600 ohms) to that of the antenna, resulting in the elimination of ghosts and other undesirable char-

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Fig. 7 The Radiant Tele-Rotor shown here provides a practical means of securing peak performance from a given antenna

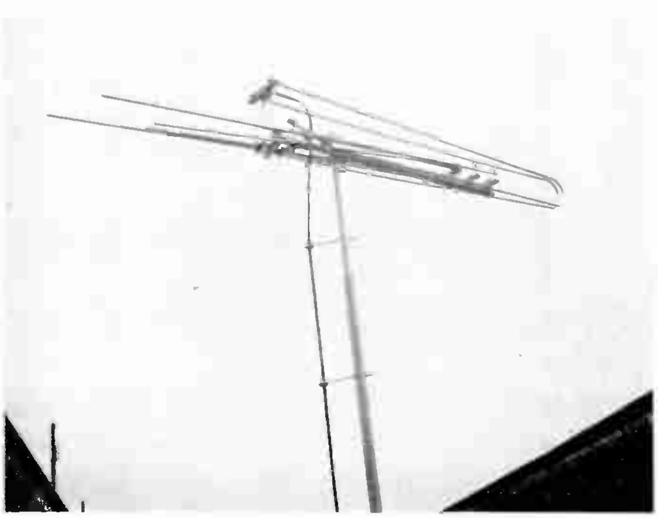

Fig. 8 The "Duoband" antenna shown here is of the collapsible type. This is the way it appears before it is actually installed

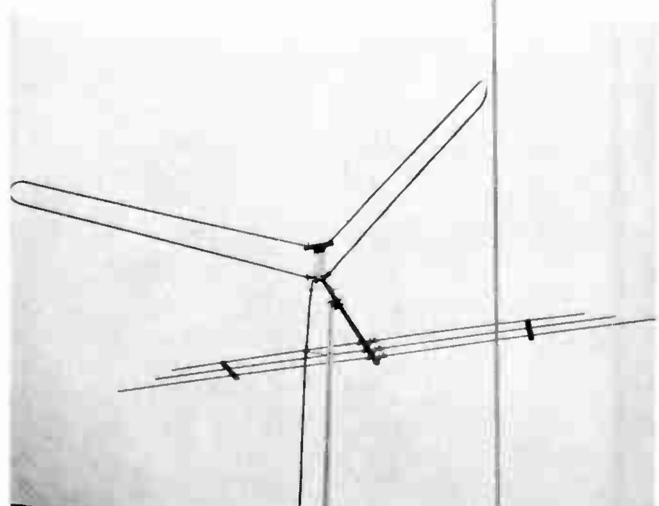

Fig. 9 The same "Duoband" antenna installed for operation. Total assembly time for this type antenna is about 2 minutes

USING THE

by Henry H. Huff

THE terms "repair" and "fixing" are never used by William A. Holmin & Co., Radio & Electronics Laboratories, Rockford, Ill. In its promotion work, as well as in its dealings with customers, the organization speaks only of "radio reconditioning."

"When people call us they expect to pay more money than the so-called 'radio repair shop' would charge," says Mr. Holmin. "Through our advertising and contacts with customers we have educated people to expect a professional job from us, not just the replacement of a tube or minor repairs. We sell them on the idea that a radio that has been in use a long time requires a thorough going-over, as well as replacement of worn or defective parts. It should be made to duplicate its original performance.

"To the customer, a radio is just a box with knobs which he turns to make it talk, sing, or play music. When the radio goes dead or loses volume, about ninety-five percent of the people think the trouble is simply a bad tube. If the radio service technician replaces a tube or repairs the part that is causing trouble, and does not give the entire receiver a thorough checkup, the customer is likely to get mad and blame the serv-ice man if the radio goes bad again. After the customer has paid once for having it fixed, he feels that it is the serviceman's responsibility to keep it in repair if more trouble should occur a short time later. The later trouble, of course, may have nothing to do with the original breakdown. That is the reason our company re-

PROFESSIONAL TOUCH

gives the customer confidence in your sales and service, and increases his respect for the radio service industry. Here's the story of a firm that tried it and found it worked

fuses to take 'repair' jobs. We insist on a thorough reconditioning."

The Holmin radio service includes everything required to put a receiver into an electrical condition equal to or better than it was originally. Not only defective parts are replaced, but the fatigued ones as well. If a bypass condenser is a bit leaky, all bypass condensers are replaced. In addition, new filter condensers and controls, etc. are provided. When the set comes in for reconditioning, it is inspected as thoroughly and as conscientiously as though it were Mr. Holmin's own personal radio.

The Professional Touch

A radio technician cannot build a reputation around a "fix-it" shop. "We Fix Radios" is a sign which implies that minor adjustments are all that is required to put a radio in working order. The customer feels that a tube replacement or simple adjustment will usually do the trick and expects to pay only a small fee for the work. As a result, the repair man just fixes what is immediately causing trouble, although something else may develop after the radio has been back in the home a few days. By making a profession of radio reconditioning, one can assure the customer of continuous and satisfactory service from the set. When this is explained to him, he usually agrees that it is better to pay a sufficient amount for lasting service than smaller amounts repeatedly as various defects show up.

Mr. Holmin believes that it is a function of the trade to elevate the ideas of the public about radio servicing. From experience with radio shops, it is the impression of many people that minor adjustments will usually start a radio working again. Once they have become educated to the fact that a radio is a complicated machine which requires professional knowledge, they are not inclined to think of reconditioning as a minor matter. They are willing to pay higher prices for such work when they understand what it involves to do a first-class job.

About Giving Estimates

William A. Holmin & Co. never give customers estimates on the cost of reconditioning a radio. People like to know in advance what the job will cost, so an exact price is quoted. This avoids quibbling over the price when the work is finished. The firm is prepared to state the cost of a job over the telephone, even without seeing the set. This is accomplished by inquiry as to the make of radio and the model. They have an established price for reconditioning any set, the only exception being that the set must have had normal care and use. The price would not apply if the radio has parts missing or has been in a fire or accident.

When a type of radio is encountered on which the firm has had no previous reconditioning experience, reference is made to the standard manuals describing the make and model number of the radio and its construction. Records of previous jobs reveal what any set is likely to require to put it in "like new" order. When the reconditioning job is completed, the customer gets a list of parts used, but parts and labor are not individually itemized. This has a psychological effect on the customer, inspiring confidence. Because people become accustomed to the inferior reception of a set that has lost its efficiency, they frequently assert that an instrument which has been reconditioned in the Holmin shop sounds "better than new."

Advertising Campaigns

By imparting to its newspaper advertising a "professional" appearance, the company leads its customers to expect really first-class work. It attracts the better type of customers. As the firm also manufactures custom-built radios, it identifies its reconditioning service as the "Radio Rebuilt" division. Their newspaper ads have ample white space and a catchy heading to intrigue readers. Some of the headings in recent ads are: "The Man Said . . .," "Booster Bait!" "The Atomic Bomb," all of which arouse curiosity and induce people to read further. A light face, dignified type is used in the ads.

Bill Holmin has virtually grown up in the radio business. At the age of 12 years, he constructed crystal sets. Upon his return from military service, he started his present business. "After all, people think of you what you think of yourself," he says, "By treating radio reconditioning business as a profession, they are willing to pay the prices that professional work justifies." The growth of Wm. A. Holmin & Co. is proof that people like good work and are willing to pay what it costs. This firm's success may offer inspiration for others in the trade. ✓ ✓ ✓

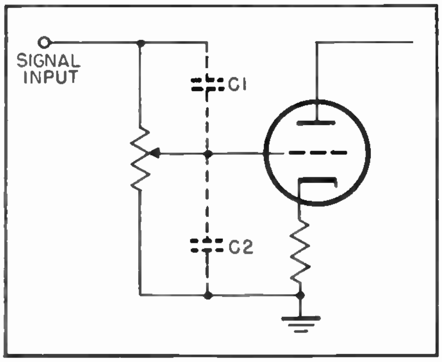

Fig. 3 Typical high-resistance gain control circuit found in some low-cost oscillographs

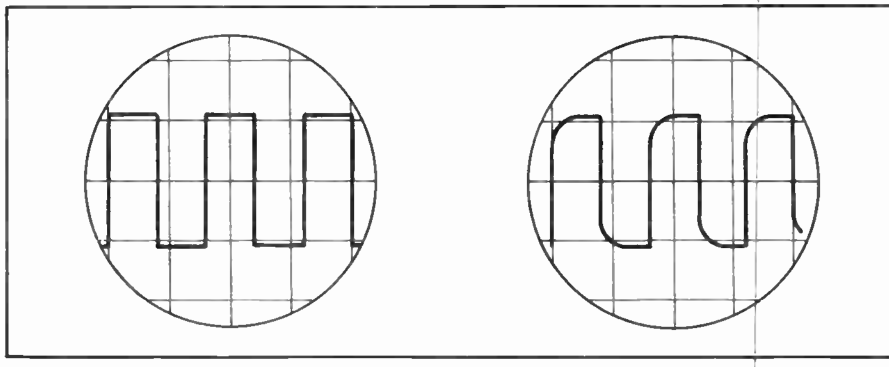

Fig. 4 Oscillogram of square wave response, high-resistance gain control set at maximum (left). Distorted square wave response, gain control set at intermediate position (right)

Vertical Deflection Amplifiers

→ from page 11

band amplifier is desired, then the plate load resistor must be reduced in order to obtain a better high frequency response. A typical wide-band amplifier is shown in Fig. 2. Because of the low value plate resistors employed, it is difficult to obtain sufficient voltage to deflect the cathode-ray tube with single-ended deflection. Therefore, push-pull output stages are employed. Many of the phase inverting circuits used at audio frequencies are not suitable at video frequencies, and almost all oscillographs having push-pull amplifiers use the cathode-coupled, self inverting output stage shown in Fig. 2. In this circuit, the signal applied to the grid of V1, produces across the common cathode resistor, R1, a voltage wave of the same shape and polarity, but of approximately half the amplitude, as the input. This voltage is used to drive V2. Since it is a degenerative voltage for V1, the effective voltage between grid and cathode of this tube is approximately half of the input voltage. Thus the input voltages of the two tubes are of nearly equal, but opposite polarity with respect to the grids. Thus, the outputs of the circuit are two voltages of approximately the same amplitude and opposite polarity. The plates of the two amplifiers are directly coupled to the deflection plates of the cathode-ray tube to prevent attenuation of the low-frequency signals. This type of push-pull arrangement is employed in higher priced oscillographs.

Gain Controls

It is necessary to provide the Y-axis amplifier with some type of gain control in order to adjust the size of the pattern on the screen. The simplest method of obtaining a gain control is to put a high resistance potentiometer in front of the amplifier, as shown in Fig. 3. This is the method employed in low cost oscillographs. The use of such an attenuator has certain disadvantages, particularly extreme high frequency discrimination at intermediate settings of its movable arm. As shown in Fig. 3, the distributed capacitances, C1 and C2, produce a voltage division at the higher frequencies. This voltage division is essentially constant and independent of the setting of the potentiometer arm. Thus, as the position of the potentiometer arm is changed, the relative voltage division across the sections of the potentiometer and the fixed, stray capacitances will differ, producing serious frequency discrimination. Although this frequency discrimination could be reduced by using a low-resistance gain control, the loading upon the circuit under test would be excessive.

The oscillograms of Fig. 4 illustrate what may happen if a square wave signal is applied to an oscillograph which has an amplifier with a high resistance gain control. The response in 4A is obtained when the gain control is at maximum position, while that in 4B is obtained with the control at an intermediate position. It shows distortion produced by the narrower bandwidth characteristic of the gain control. If this oscillograph were used for square wave testing the video amplifier of a television receiver, it would be impossible to tell whether the high frequency distortion of the square wave is caused by the received amplifier or the oscillograph amplifier.

A solution to this difficulty is to provide an input attenuator with fixed steps and adjustable capacitance elements, as illustrated in Fig. 5. This scheme will permit individual adjustment for each attenuation ratio, maintaining uniform voltage division over a wide frequency range. Obviously, this cannot be used as

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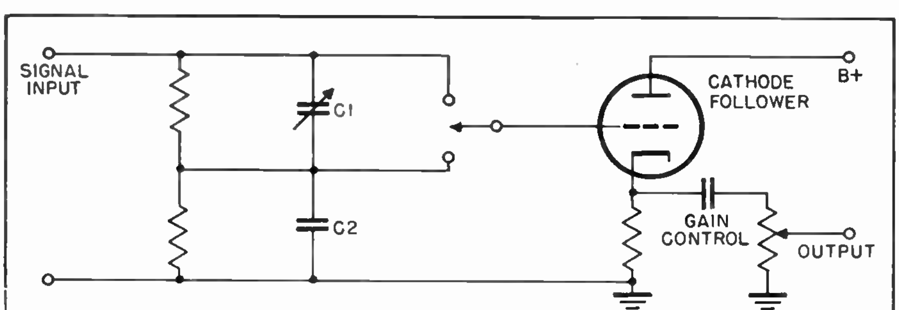


Fig. 5 Stepped attenuator and cathode follower circuit. This circuit is employed to overcome the difficulties produced by the use of a high-resistance gain control (see Fig. 4)

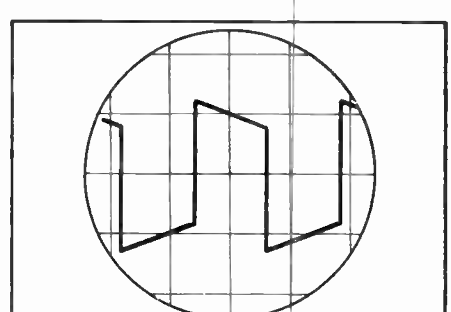
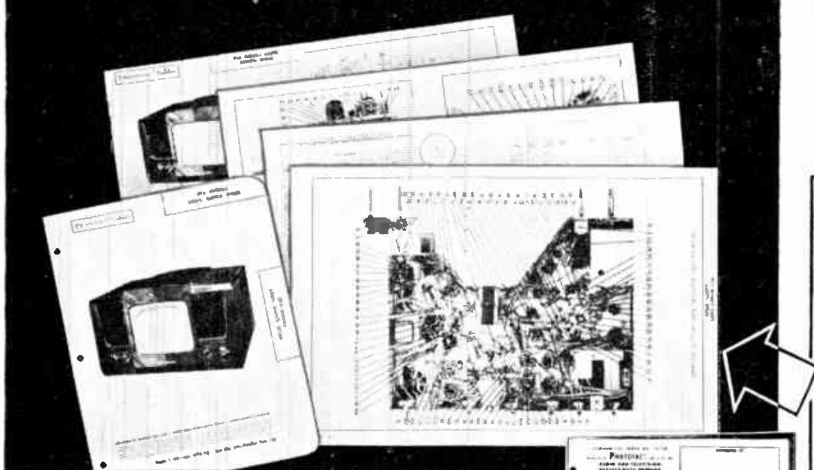


Fig. 6 60-cycle wave distorted by amplifier with poor low-frequency response

The Offer Still Stands!



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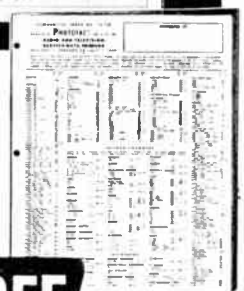

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ELECTRONICALLY SPEAKING . . .

by Isidor I. Gross

Getting Clipped. We're indebted to reader B. McGehee for sending in an item from the Tampa Morning Tribune concerning the experiences of a Florida barber. How do barbers get into a radio magazine you ask? Read on.

Seems they have a law in Fla. requiring the licensing of barbers. One day, a tonsorial artist from Elmira, N. Y., came to settle in that state, and discovered that he was required to take a license examination before being permitted to practice his trade. He didn't object to that, but was a little surprised when he found it would cost him $27 just to be allowed to take the exam. His surprise grew considerably when he heard broad hints that it would cost him another $500 to *pass* the test; in fact he got pretty mad.

He reported the matter to the police who, with the aid of some marked bills, arrested two members of the licensing board on charges of bribery.

Now if you will substitute the words "radio technician" for the word "barber," the point of the story becomes obvious. Says reader McGehee: "This sort of thing happens all the time where there is a 'licensing board' to pass on the applicant's qualifications, and it is only once in a lifetime that it comes out."

Oh, incidentally, in all the excitement, the barber never got around to taking his examination.

In the Heart of Texas. Speaking of licensing, here is a letter we received from the Galveston Master Radio Technicians Associations.

"This organization is planning to ask our city commission to introduce an ordinance that will establish a license for radio and television servicemen. If you can help us with copies of any such license ordinances that exist in other cities, we will be most grateful. Also, we would like to know of any cities that have laws controlling the erection of television antennae."

We're passing this letter on without our comments. What are *yours?*

Do You Remember? The other day we were looking over some estimates on 1949 automobile radio production, and were impressed by the fact that output was expected to top the four-million mark and possibly to outstrip the number of a-m home receivers manufactured this year. This got us to thinking back to the early days of auto receivers and we began to wonder just what progress had been made over the years. Unfortunately, we found our memory much hazier than we would care to admit; so, to satisfy our curiosity, we sent our man Rollo over to the library to get all the info he could on the subject and report back to us.

Here are the notes he brought back:

"Arrived at library 10 a.m., doors just opened. Went to librarian and stated errand (very cooperative lady). Found seat, got old magazines and started reading (very dusty here).

"First experimental auto receiver in 1922, but nothing commercial till 1930 when Transitone (later merged with Philco) came out with first. No production figures available before 1935. That year output 700,000, grew to 3,500,000 in 1948. Nobody very interested in it at first, 25% of dealers in '30 saw no future in it. Very expensive proposition, cost car owner up to $200, took one to three days to install.

"First car radio came in six parts: radio chassis in steel box, tuning control, volume control, B batteries, loudspeaker, suppressor. Tubes powered by car storage battery. Was a t-r-f (first superheterodyne was RCA's

→ to page 26

Electronically Speaking

→ from page 24

Radiola Super in 1923, but superhet patents not released by RCA till late 1930). Early sets headache all around. Problem was where to put all the components of receiver. One guy cut hole in floorboard, suspended B battery from it. Another, with a small sedan, also found the underside of his car a likely place, put a speaker there. Saw picture of one car with equipment (plus wires) hanging all over. Interference from ignition system fierce, had special suppressors to cut it out. Some of suppressors used, suppressed motor instead of static. No whip antennas; instead, capacitor plates under the car or in roof. Reception very poor. Don't see why anybody bothered with these radios. Took til about '35 for all units of the radio to be combined into one. Started placing the entire assembly under dashboard.

"Safety officials worried about effect of radio on drivers, feared they'll be detracted. Also worried about pedestrians being disturbed by blaring receivers. M. Metcalf, then Pres. of RMA eased their mind, said that no one expects car radios to be played in crowded traffic, suburban travel, at noontime. One of main purposes, he said, was to make waiting in parked car pleasure. Guess motorists didn't pay too much attention to him.

"Craze for DX (long distance reception) hit just about the same time. Some adventurous spirits tried to get DX via car radio. Had to park car, rig up antenna. Should have stayed home.

"The whole business a far cry from today.

"Left library 1 p.m. for lunch. Found I had left radio on in car. Battery dead. Making trip to garage."

Rollo

The Eyes Have It. Last month we reported here the findings of our physicians with regard to health and TV. Now the optometrists have made a study of their own, published their findings in the Journal of the New York State Optometric Association. After viewing images of varying sizes from several different receivers, they found that projection television offers pronounced advantages to the viewer from the standpoint of visual health.

We're waiting for word from our dentists.

Latest on Licensing. Seems we were a little premature last month in reporting that sales and service contracts by independent service organizations would be considered illegal under New York State Insurance law. Word has just reached us that the N. Y. State Insurance Department has made a ruling on the question (last month's report was based on an opinion by the N. Y. State Attorney General), and has interpreted the opinion of the Attorney General as follows: Television manufacturers, including wholly owned subsidiary corporations, as well as dealers who sell television sets may enter into yearly sales and service contract agreements. These contracts must be limited to keeping the telesets in proper operating conditions because of failure arising from normal use. No manufacturer or his subsidiary or a dealer is allowed to renew such an agreement. A service organization which is not the dealer or the manufacturer of a television receiver may *not* enter into such agreements.

This, we believe is the final word on the matter.

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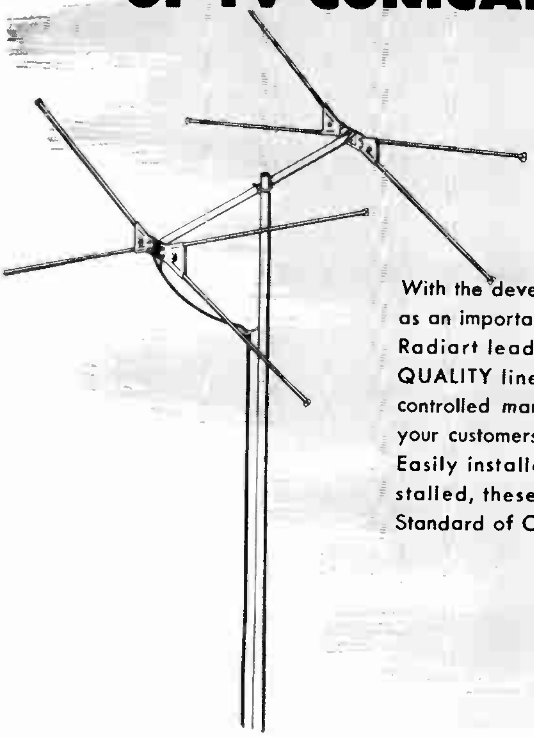

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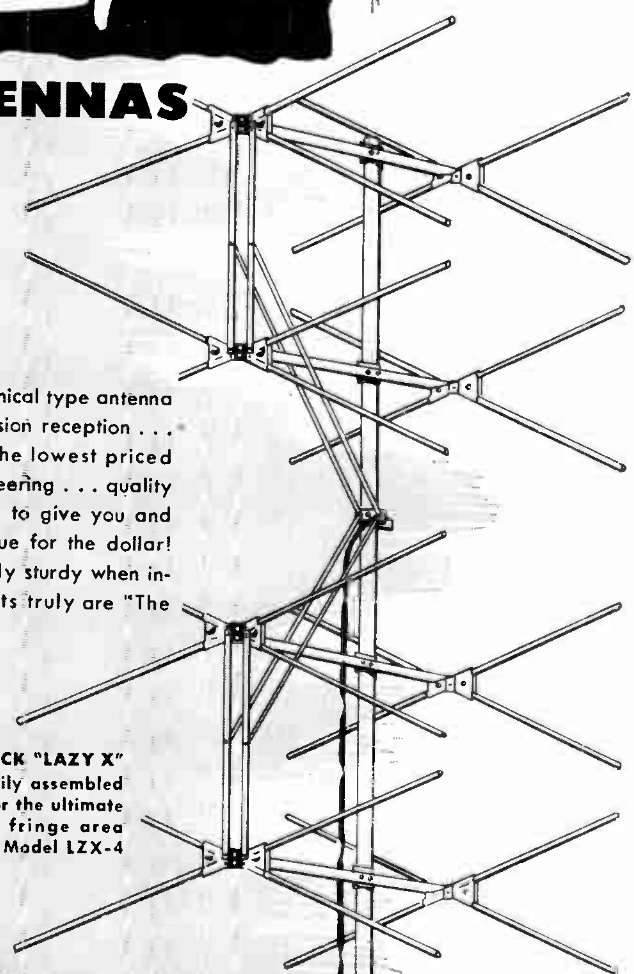

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Manufacturers of the Famous Red Seal Vibrators

Antennas → from page 18

acteristics caused by mis-matching. The matching section provides maximum signal transfer with minimum losses. The antenna is a four-bay, sixteen-element stacked array, cut and stacked for maximum performance on any specific high channel, although it performs well on other channels.

A simpler job is the four-element array shown in Fig. 5. Since this antenna (like that of Fig. 4) has an impedance of 72 ohms, a matching section is provided so that connection may be made, without loss of signal strength to different types of transmission line.

An interesting array designed for single channel performance is the well-known Vee-D-X Yagi array. The four-element beam is cut especially for each particular channel. The antenna has high forward gain and is sharply directional. High front-to-back ratio helps reject unwanted signals. The stepped-up driven element (the element to which the lead-in is connected) is a modified folded dipole and matches a 300-ohm line. For multi-channel reception, several arrays may be mounted on the same mast and directed to different transmitters.

Of course, the stacked array is not a cure-all, particularly in metropolitan areas in which multiple reflections exist. Sometimes a single reflection can be picked out and utilized to greater advantage than the direct picture. To overcome the problem of multiple reflection, a radar type antenna has been developed, known as the "Channel Chief" and shown in Fig. 6. This antenna, offered in kit form for assembly by service technicians, provides a method of obtaining long distance pictures on any high band television channel. The antenna is designed to take advantage of radar techniques. The unit employs a square corner reflector type curtain, mounted in back of a broadband folded dipole. The curtain functions as a mirror, catching and reflecting back to the antenna, many times the amount of signal that would normally be present if the antenna alone were used.

Being precision tuned to any one television band, this antenna has a gain of 8 to 10 db over a conventional dipole. The folded dipole and associated curtain reflector provide stagger tuned response in order to cover the video and sound channel width requirements. Large diameter tubing, combined with folding of the dipole, provides low Q response, thus aiding full frequency coverage. In addition to the high gain feature of the curtain design, the directional response pattern is sharp. This means freedom from interfering signals, reflected responses and ground noise. Ghost patterns, ignition noises, f-m signals, are virtually eliminated. Because the signal is in effect amplified by the antenna without boosting noise, longer distance reception is practical, since the amount of snow in the picture is greatly reduced. Signal-boosters used at the set become even more effective, since the signal-to-noise ratio is greatly improved by antenna gain before amplification. Accurate matching to 300-ohm twin lead is provided by proper spacing between the antenna and the curtain.

Rotators

For satisfactory reception of television, a highly directional beam antenna can be used to advantage. To obtain maximum signal strength, the beam must be properly directed. The antenna rotating device shown in Fig. 7 provides a practical means of securing peak performance from a given antenna system by allowing the user to turn his antenna in any direction. The system consists of an electrically powered rotator unit which is mounted on the antenna mast and is connected to a control box located at the receiving set. This control box, plugged into the 110-volt 60-cycle house line, provides power for the rotator, which slowly turns at 1 r.p.m. The point of optimum reception is found by watching the screen of the television receiver for the clearest picture.

Some antennas, such as the "Duo-band" feature flexibility in installation or permit adjustment after installation. In Fig. 8 this antenna is shown collapsed, prior to installation. In Fig. 9 we see the same antenna set up for proper reception.

No, matter where the installation—whether close to the station or out in the fringe area—problems will arise. Making a station come in where none came in before, getting rid of multiple images, eliminating interference, these are logical sources of service and profit.

How to Check Audio Amplifiers → from page 13

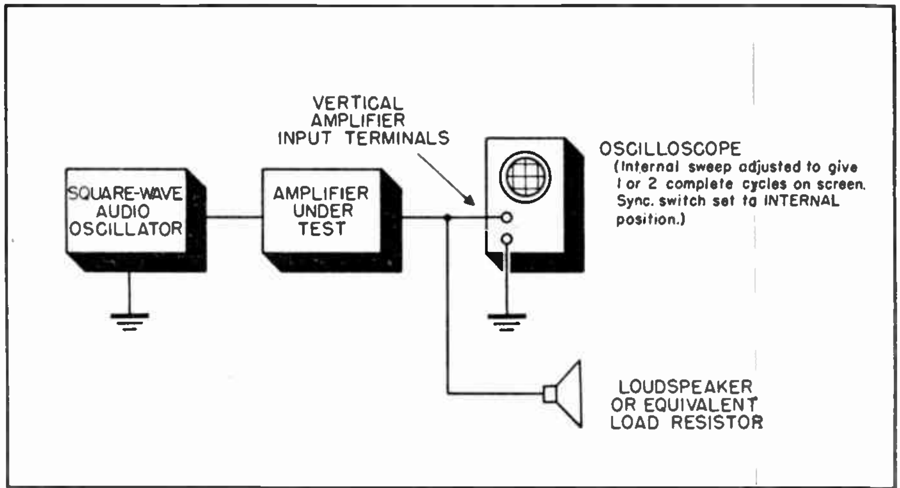


Fig. 5 Another method of checking amplifier distortion. Here square-wave audio oscillator supplies test signal to amplifier, output waveform is observed on oscilloscope screen

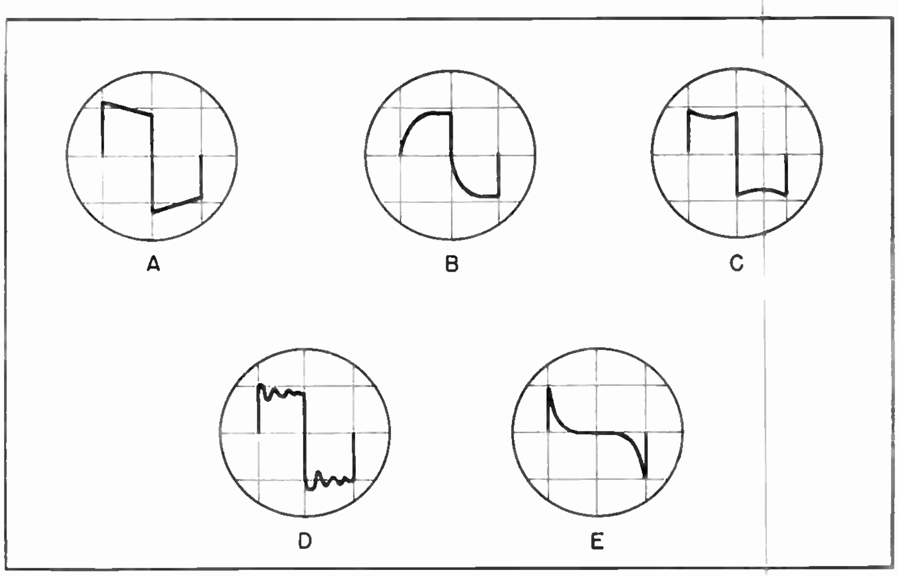


Fig. 6 Some distorted square waves. A— poor low-frequency response, B—poor high frequency response, C—resonant attenuation (dip) in amplifier, D—oscillation in amplifier, E—presence of output-to-input capacitance (found in some low-grade transformers)

small pieces by means of which the pattern is constructed.

By adjusting the "position" control of the electronic switch, either the two separated input and output patterns (Fig. 4B) or the superimposed patterns (Fig. 4C) may be obtained. The technician may use whichever of the two he prefers, ease of height measurement being the determining factor.

Frequency Response

To check frequency response, the sine-wave audio oscillator frequency is varied gradually throughout the audio spectrum, starting at 20 cycles and progressing to 20,000 cycles. The oscillator output voltage is held constant, while variations in the amplifier output voltage are read and recorded. If the amplifier has a perfectly flat frequency response (an ideal situation seldom, if ever, realized in practice), the output voltage will not change one way or the other as the input frequency is shifted. If the output voltage variations are plotted on graph paper against frequency steps, the result will be an informative frequency response curve.

The apparatus setups for checking frequency response are shown in Fig. 2 and 3. If an a-c v.t.v.m. is available for this measurement, the technician undoubtedly will prefer the arrangement shown in Fig. 2.

The test should proceed as follows:

(1) Set the amplifier gain control to maximum.

(2) Set the amplifier tone control to its center (flat-response) position.

(3) Apply a low-voltage 20-cycle signal from the oscillator to the amplifier input terminals. Switch the voltmeter to input position 1. If the input signal is too low to be read accurately on the lowest-voltage scale of the meter, employ an input voltage divider as explained above.

(4) Switch the meter to output position 2.

(5) Record the output voltage for 20 cycles.

(6) Increase the oscillator frequency to 50 cycles, switch the voltmeter back to input position 1, and reset the oscillator output (if necessary) to give the same reference voltage as that used in the preceding 20-cycle measurement.

(7) Switch the voltmeter to output position 2 and record the 50-cycle output voltage.

(8) Repeat at as many frequencies as practicable.

(9) Repeat at various selected settings of the amplifier gain control and tone control.

(10) The numerous output voltages obtained in this test may be plotted against frequency settings on graph paper, to give a family of highly-informative frequency-response curves.

Distortion Checking

A distorting amplifier changes the wave shape of the signal it amplifies. The oscilloscope is a convenient instrument for examining waveforms for distortion.

If we use the apparatus setup shown in Fig. 3 (with the oscilloscope switched permanently to output position 2) or that of Fig. 4A, we will be in a position to observe whether the amplifier output is sine-wave (as was the input signal from the oscillator) or if it has been distorted. Separate tests should be made at several frequencies and at several settings of the amplifier gain and tone controls. Pronounced harmonics in the amplifier output cause severe mis-shaping of the output waveform and are readily observed. However, small percentages of distortion are rather difficult to detect and evaluate by means of this method.

Another convenient method is illustrated in Fig. 5. Here, a square-

→ to following page

How to Check Audio Amplifiers

→ from preceding page

wave audio oscillator supplies a test signal to the amplifier, and the output waveform is observed on the oscilloscope screen. If no distortion is present in the amplifier, the output wave will be square. Variations of the output waveform from squareness indicates various faults within the amplifier. A few representative distorted square waves are identified in Fig. 6. It is a rule-of-the-thumb among amplifier technicians that a rise or fall of the horizontal portion of an output "square" wave indicates low-frequency deficiency in the amplifier under test, while a sloping of the vertical sides of the pattern with a rounding off of the corners indicates poor high-frequency response.

Distortion checks should be made in the low, medium, and high-frequency portions of the audio spectrum (for example, at 20, 1000, and 10,000 cycles) and at several settings of the amplifier gain and tone controls. These tests may be applied to a single amplifier stage, as well as to the complete amplifier.

Power Output

For power output measurement, use the apparatus setup shown in Fig. 2, with the v.t.v.m. permanently connected across the speaker voice coil or, better still, across a load resistor (preferably non-inductive) having the same resistance value as the voice coil impedance and having a wattage rating equal to twice the expected power output of the amplifier.

Set the amplifier tone control to its center (flat-response) position and the gain control to maximum. Set the oscillator output control to give maximum *undistorted* output of the amplifier. At this point, record the voltmeter reading as E. Calculate the amplifier power output by dividing E^2 by R, where R is the ohmic value of the load resistance (or the voice coil impedance).

Repeat the power output measurement at several frequencies and at several settings of the amplifier gain control. If desired for comparison, the measurements may also be made at each extreme setting of the amplifier tone control.

Picture Tube News

→ from page 15

act to improve the resolution of the picture.

Some of these developments have been incorporated in other DuMont tubes; and we have been informed that further improvements are in the mill there now (specific information on what these were, however, could not be obtained).

Tilting

Still another attempt to cope with external and internal light reflections has been made by Philco. In its "No-Glare" system, the picture tube is tilted back so that the viewer looks slightly downward at the screen, approximating his normal line of vision; and a glass plate has been tilted forward in front of the tube, so that distracting reflections from external light sources are reflected to the floor, rather than the eye. To reduce reflections further, the picture mask area has been covered with a green lacquer which has been used during the war for camouflage purposes.

This basically mechanical system has been incorporated in the 1950 Philco Receiver line.

Deflection Amplifier

→ from page 22

the only attenuator, since a large number of steps would be required to cover a wide voltage range and still maintain useful attenuation ratios. Consequently, an additional method of attenuation is employed for fine adjustment of gain. Such a method is the use of a cathode follower stage, providing a low impedance cathode output suitable for use with a continuous attenuator. Although this stage has a gain of less than unity, the low output impedance permits it to work into a low-impedance potentiometer (500 to 5000 ohms). Even with the capacity of the next stage which exists between the arm of the potentiometer and ground, the response of this type of gain control is flat to 10 Mc or more.

Amplifier Specifications

The foregoing discussion of the design of the vertical amplifier system of an oscillograph will enable the reader to appreciate the important specifications to look for when choosing an oscillograph. The following specifications apply only to the vertical amplifier system. Additional factors on other sections of the oscillograph will be discussed in later articles.

1. High Gain — The deflection sensitivity of the Y-axis of the oscillograph should be 0.05 volts per inch. This high gain is required when aligning a single r-f or i-f amplifier stage, using a sweep frequency generator. If the oscillograph does not have this high gain, it is necessary to increase the output signal from the sweep generator in order to produce a sufficiently large pattern on the oscillograph screen. Increasing the sweep generator output to more than a few millivolts is not recommended, because it may overload the stage that is being aligned.

Although it is often desirable to do a stage-by-stage alignment with a high gain oscillograph, the next best thing to do, if only a low gain oscillograph is available, is to connect the instrument to the output of the second video detector. An overall alignment of each stage may then be accomplished, because the gain of each amplifier in the receiver makes up for the low sensitivity of the oscillograph.

2. Good 60-cycle square wave response—For aligning the r-f and

→ to following page

Vertical Deflection Amplifiers

→ from preceding page

i-f amplifiers with a sweep generator, the Y-axis of the oscillograph should have good 60-cycle square wave response, because the sweep generator has a sweep frequency of 60 cps which, when detected, approximates a square wave. If the oscillograph does not have good 60-cycle square wave response, the curve which appears on the screen will be distorted. Good low frequency response is also required when square wave testing the low frequency response of a video amplifier. Fig. 6 shows the distortion of a 60-cycle square wave that is introduced by an oscillograph having poor low frequency response. To avoid such distortion, the oscillograph should either have a direct coupled amplifier, or an a-c amplifier whose response is down only 10% at 2 cps.

3. **High Impedance Input and Low Input Capacity**—To prevent loading of the circuits in the receiver, the oscillograph should have an input impedance of at least 2 megohms. The shunting capacity should be 30 mmf or less. To prevent frequency distortion in the input gain control, the oscillograph should have a high-frequency compensated, stepped attenuator, followed by cathode-follower and low-impedance gain control.

4. **Good High Frequency Response**—A vertical amplifier response extending to 100 kc is adequate for alignment work with a sweep generator and for observing the 60-cycle sync and sawtooth signals in the vertical sweep circuit of a TV receiver. If the oscillograph is used for examining horizontal sweep signals, and for checking video amplifiers by means of a high-frequency square wave, the response should extent to better than 30% down at 2 Mc. and preferably to 30% down at 4 Mc.

Now that we know what is required of an oscillograph with regard to the Y-axis deflection system, we shall consider next the X-axis circuits and sawtooth generators which provide the time base. These will be discussed in the next issue.

(The article scheduled for that time will cover essentially the same ground as Mr. Roche's proposed discussion on sawtooth generators, which is therefore cancelled)

TRADE LITERATURE

★ ★ ★ ★ ★ ★

How to Service Radio with an Oscilloscope, *(Sylvania Electric Products, 72 pages, $1.00)*

This little book is intended for the radio technician or student who has been doing a-m and f-m work without the aid of a scope. It tells him briefly how the instrument operates, and shows him a number of applications. Included in the booklet is a technical discussion of the two oscilloscope models (131 and 132) produced by Sylvania.

Here are a few of the oscillograph uses which are discussed: a-m receiver alignment using a-m signal generator, f-m receiver alignment, checking frequency response, and superhets, testing audio amplifiers, checking frequently response, and many more.

The presentation of the material is excellent. The instructions which are given for the various tests are written in great detail, and provide step-by-step procedures. Connections are clearly indicated, and 'scope patterns are shown for various types of fault.

Selected for inclusion in the book have been those applications which were considered by the publishers to be of greatest interest to the service technician. Many others have necessarily been left out. But as far as it goes, the book is recommended.

Radio-Television Questions and Answers, *(Editors and Engineers, Ltd., $.85 each)*

As a study aid to those planning to take the commercial operators' license examination, Editors & Engineers, Ltd., has published six booklets, each dealing with a different subject. The booklets are made up of questions taken from the Government publication "Study Guide and Reference Material for Commercial Radio Operator Examination," and are representative of the scope of the questions for that examination. Immediately following each question, the authors supply fairly detailed answers. For example, what is the purpose of a 'shunt' as used with an ammeter? Answer: The purpose of the shunt is to permit use of the meter for measurement of currents greater than the full scale reading of the basic instrument.

At the present time, only three booklets are available: Element 2: Basic Theory and Practice; Element 3: Radiotelephony, and Element 4: Advanced Radiotelephony. Other elements are awaiting expected FCC revision of questions.

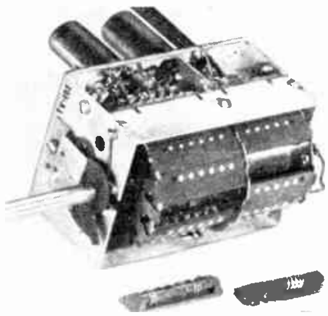
Catalogs and Pamphlets

Capacitor Catalog. A 6-page supplementary folder lists Duranite molded paper tubulars, several types of electrolytics, oil-filled tubulars, mica capacitors, interference filters, and auto radio suppressors. Copy of the condensed catalog (Form SC-549) is available from Aerovox jobbers or Aerovox Corporation, New Bedford, Mass.

Switchcraft Catalog S49 has a complete listing of jacks, plugs, and switches carried by the firm. Gives specification data. 1328-30 N. Halsted St., Chicago 22, Ill.

INDUSTRY PRESENTS

★ ★ ★ ★ ★ ★



REPLACEMENT TUNER

The "Standard Tuner", until recently available only to teleset manufacturers for factory installation in TV receivers, can now be had by the technician for his replacement needs. The tuner, similar to a type described in the January '49 issue of this magazine, features interchangeability of channel inductors, individual oscillator adjustment screw for each channel, one control shaft for fine tuning and channel selection, and covers all 12 channels.

The tuner is available through local jobbers or by writing directly to the company. **Standard Coil Products Co., Inc., 2329 N. Pulaski Rd., Chicago 39, Ill.; or 2901 E. Slauson Ave., Huntington Park, Calif.**

AUTO RADIO TOOL

Here we have the third tool to come out from the Hytron Contest of last year. This one is an auto tool for tuning, adjusting volume and tone, realigning dial, etc. after cables of universal auto radio have been detached. It has a square tip which fits splines. Another feature is the slotted V-shaped tip for different thicknesses of spade and similar key fittings. 24c at Hytron jobbers.

SCREWDRIVER

You may be interested in this screwdriver for work in dark places. It has a built-in battery and bulb that focuses light on your work. It's called the Flashdriver, has shockproof handle and comes with interchangeable blades. **Town-Talk Products, 308 Hoffman Building, Detroit 1, Mich.**

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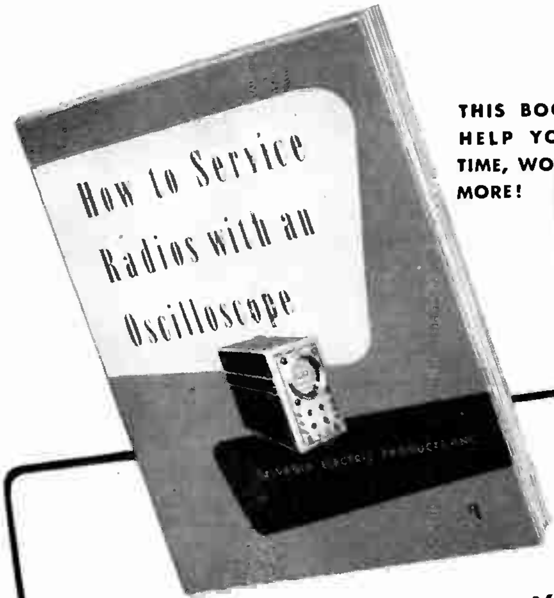

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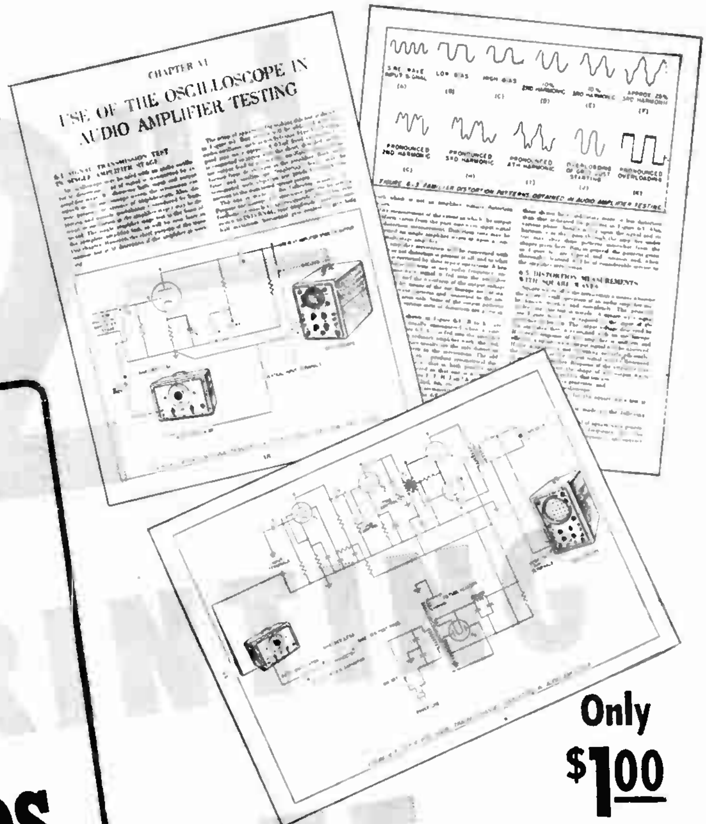

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