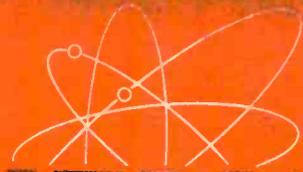


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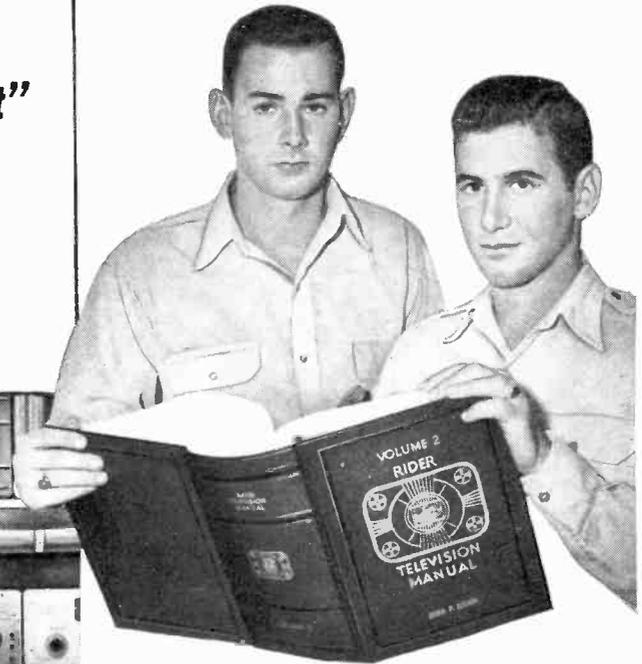
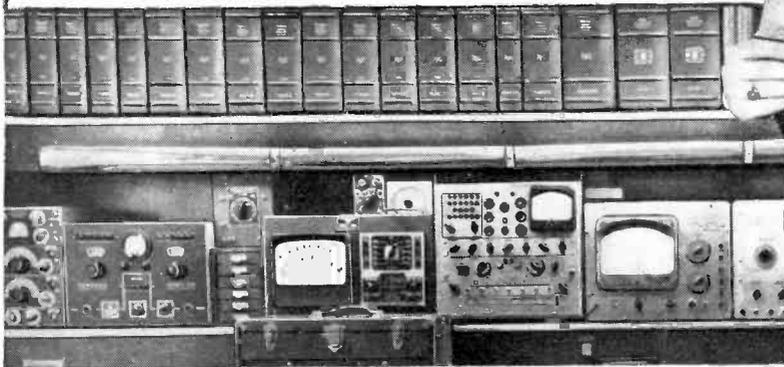


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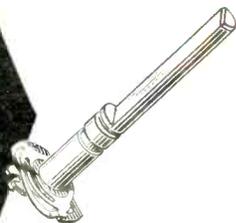
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Volume 5

November 1949

Number 11

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Radio Distribution and Maintenance is published monthly by Boland & Boyce, Inc., at 34 No. Crystal St., East Stroudsburg, Pa., U.S.A.; Executive and Editorial Office, 460 Bloomfield Ave., Montclair, N. J. Subscription Rates: In U. S., Mexico, South and Central America, and U. S. possessions, \$3.00 for 1 year, \$5.00 for two years, single copies 25 cents; in Canada, \$3.50 for 1 year, \$6.00 for 2 years, single copies 30 cents; in British Empire, \$4.00 for 1 year, \$7.00 for 2 years, single copies 45 cents; all other foreign countries, \$5.00 for 1 year.

Entered as second class matter June 15, 1949, at Post Office, East Stroudsburg, Pa., under the Act of March 3, 1879.

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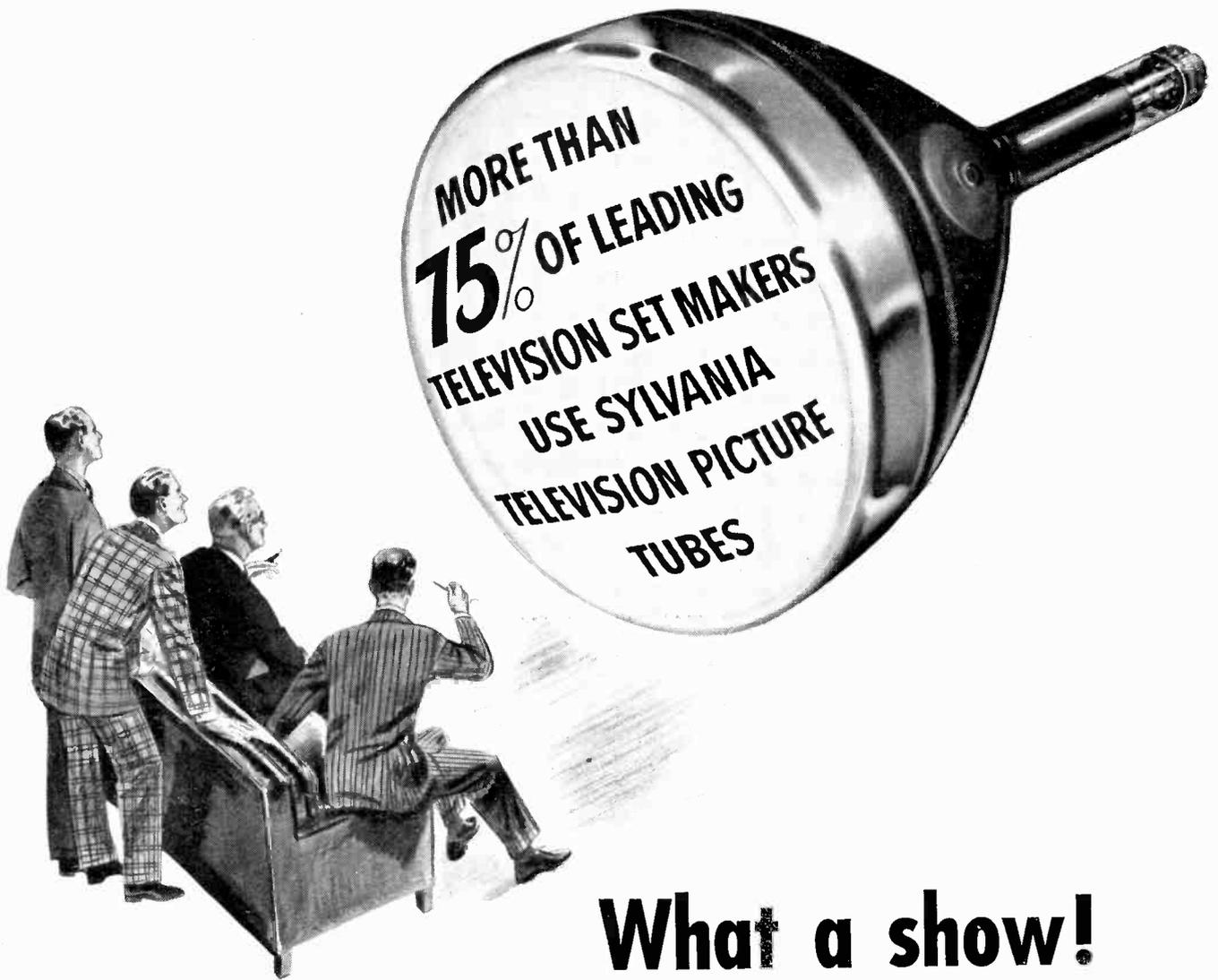
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SYLVANIA ELECTRIC

RADIO INDUSTRY

Edited by Joseph J. Roche

NEWSLETTER

F.C.C. HEARINGS—The Washington hearings will last a long time. As the freeze on new station permits goes into its second year, it appears likely that it will continue for at least another six months. The tremendous importance of the decisions to be made, by the FCC, has attracted representatives from all parts of industry. Their testimony, and the color demonstrations to be given, will take many weeks to complete. RMA's Raymond Cosgrove explained the importance of the hearings in his Washington statement. Said he, "A television set is a useless thing by itself . . . it becomes of value only to the extent that it receives a picture and a sound accompaniment . . . each set must be synchronized with the transmitting station. This necessitates the fixing of definite standards by the commission. The establishment of . . . standards will set the pattern for years to come. It is therefore essential that they permit the finest performance that now can be foreseen."

COLOR TELEVISION—The first weeks of the FCC hearings are being devoted to color television. Several companies have, or are about to demonstrate their color systems. RMA has urged FCC to adopt color standards only if such action will call for a minimum of changes in present receivers. In general, the industry feels that none of the systems so far devised, of which there are at least eight, is far enough advanced to warrant its adoption at this time. The Columbia Broadcasting System opposes this viewpoint, and is asking the Commission to adopt the CBS color system immediately. FCC has not given any indication as to what its decision will be. When color television standards are adopted, there is a good chance that some modification of present sets will be necessary. That's where the service technician comes in—he will be called upon to make the changes.

AND ANOTHER—The Sightmaster Corporation announced that it too had a color TV system. The system, which is still under development, uses prismatic color screens. The addition of a screen at the camera and another at the receiver is all that would be required to convert present black and white equipment to color. Sightmaster estimate of cost to install screen at receiver, \$5 to \$25.

IF AND WHEN—Several manufacturers have announced that they will produce u.h.f. converters for use with present TV sets, if the u.h.f. band is allocated. Although there is no assurance that FCC will adopt its recent allocation proposal, the plan finally chosen is almost sure to include opening of the u.h.f. An analysis of the several allocation plans to be considered indicates that from one-half to over two million converters will be required. In addition to converters, new antennas will be necessary. The installation of this equipment will be a big job for the service industry.

SALES—Reports from service dealers all over the country indicate that teletest sales have taken a sharp upturn. The summer sales drop is now looked upon as seasonal. Most manufacturers are already feeling the effects of the rise. Several have been forced to allocate production. The suddenness of the upturn has been attributed to the World Series, improved programming, and cooler weather.

PARTS INSURANCE—RCA has announced its answer to the recent New York State ruling that renewal service contracts are a form of insurance. The ruling declared that the inclusion of replacement parts and tubes in the contract violates the state's insurance laws. RCA's plan provides for replacement parts and tubes under an insurance policy issued by the Massachusetts Bonding and Insurance Company. It has been approved by the Insurance Department of New York State.

SHOW—The Philadelphia Radio Service Men's Association reports that 4,500 registered at its Radio and Television Show. That makes it about the biggest gathering of service technicians on record.

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ELECTRONICALLY

SPEAKING

BY ISIDOR I. GROSS

Maybe it's the plug. Last year, while conducting the Town Meetings of Radio Technicians, RMA discovered something which most technicians had known for some time: That one of the biggest problems confronting an active sales and service organization was the unnecessary service call. But while the technician could do little more than complain and take it, RMA proposed to do something to get it straightened out.

The result was a series of 22 sound film television spots, produced jointly by RMA and TBA, and designed to educate the televiewing public to the "facts of television life." We went to a press preview of these spots the other day and can report that RMA and TBA have come up with a nice job.

The need for educating the public was pointed up when R. C. (capacitors) Sprague, chairman of the Town Meetings Committee of RMA and of the press preview, predicted a total of 24 million operating telesets by 1956. With that many sets working, the amount of lost time due to unnecessary service calls could indeed be appalling.

The spots, 20 and 60 seconds long, cover a variety of subjects. One exhorts the owner to check the plug before calling the technician, another tells him not to touch any controls on the rear of the set. A few spots show different types of interference. One sixty-second announcement tells about the complexity of television and emphasizes the training which technicians have to undergo in order to do competent work, another tells the viewer to let his set warm up before asking for the serviceman, and others.

Most television stations have agreed to show the spots. They will get them free from RMA and in turn will provide the time. You'll be seeing them soon.

There are two points at which the spots could be improved (and they will be revised as soon as public reaction is available, according to Mr. Sprague). The 20-second long spots

are awfully short (but if they lasted longer, stations would not be able to show them at peak audience times), and most of them say "don't call the technician until . . ." (instead of "Do call the technician when . . .").

These however, are minor criticisms. From the overall viewpoint the films are excellent; and for the service rendered to the technician (and to the public in general) RMA and TBA are to be highly commended.

New Receiver Lines. Having received an announcement from the Motorola people to the effect that eleven new inventions were incorporated in their 1950 TV receiver models, we dropped over to a press showing of their new line to take a look.

We didn't get a chance to obtain a detailed account of these 11 new inventions, but we managed to buttonhole Kurt Schlesinger, Motorola engineer responsible for most of them, and were able to garner a few facts from him—before another member of the press buttonholed him in turn.

He was very enthusiastic about the new improvements (naturally) and started off by telling us about the new Motorola focus control. It's a specially constructed yoke with a critical distribution of coupling and four dead angles in which there is no winding. This arrangement is supposed to cut down distortion at the edges of the picture considerably (it seemed to on the sets we looked at).

He then began to speak of the addition of flywheel circuits for the synchronization of the horizontal sweep (he had presented a paper on the subject at the last IRE convention). The purpose of the circuit was to increase selectivity between the picture and noise signals. Older sets were often unable to distinguish between these two, and the familiar "tear-out" resulted.

At this point, Mr. Schlesinger took us over to a receiver and started a

→ to page 24

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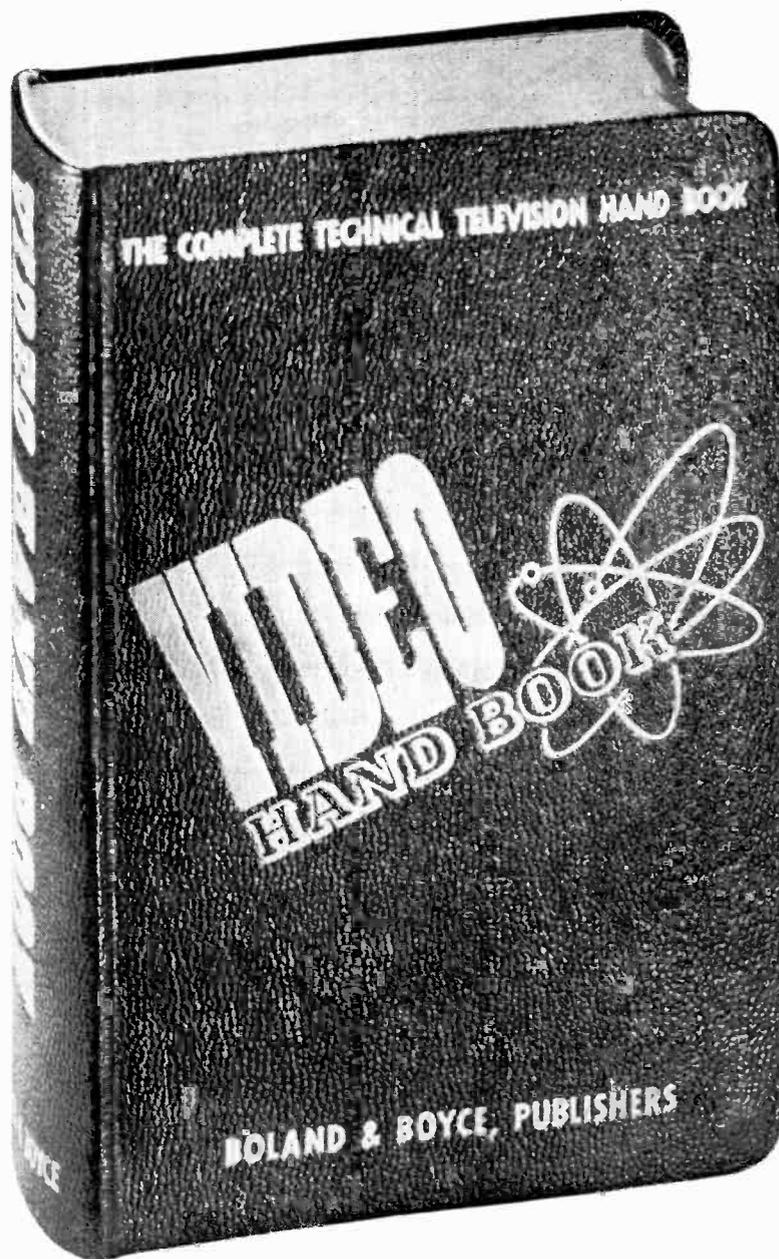
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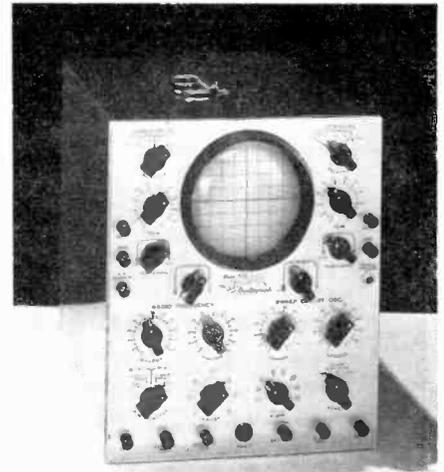
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Courtesy Hickok

stable synchronization, linear sawtooth signals, good low-frequency response X-axis amplifier are signs of a good instrument

by Morton G. Scheraga

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

IN our last article we discussed the Y-axis deflection circuits which amplify the incoming signal and apply it to the vertical deflection plates of the cathode-ray tube in oscillographs. If a signal were applied only to the vertical plates, a straight line would appear on the screen, as shown in Fig. 1A. However, to observe the actual waveshape of the signal, another signal must be applied to the horizontal deflection plates at the same time. This latter signal, when combined with the incoming signal, spreads the pattern out across the screen as shown in Fig. 1B.

For most applications in f-m and television servicing, the horizontal deflection signal is a sawtooth voltage. This particular waveshape is used because it provides uniform motion of the spot across the screen. This voltage is produced in most oscillographs by the sawtooth generator, often called the time-base generator.

Generally, the voltage obtained from the sawtooth generator is insufficient for direct application to the horizontal deflection plates. An amplifier, known as the horizontal deflection amplifier, or X-axis amplifier, is interposed between the sawtooth generator and the horizontal deflection plates to provide a large enough signal to deflect the beam across the screen. The X-axis amplifier is very similar in design to the vertical deflection amplifier.

In most oscillographs it is possible to disconnect the sawtooth generator from the horizontal deflection amplifier and apply an external signal to the horizontal deflection plates through the amplifier. A typical use of this feature arises when the oscillograph is used with a wobbulator for aligning wideband amplifiers. Most wobbulators generate their own sawtooth voltage for the X-axis of the oscillograph. The time-base generator in the oscillograph is switched out and the sawtooth voltage from the wobbulator is connected to the X-axis amplifier.

Another circuit that is important to the operation of the horizontal deflection system is the synchronizing circuit. In order to obtain a station-

ary pattern on the oscillograph screen, the frequency of the sawtooth voltage must be exactly equal to the frequency of the incoming signal or to some whole multiple thereof. A stationary pattern is obtained by synchronizing the sawtooth generator to the signal itself which is tapped off from the Y-axis amplifier.

The manner in which the circuits are interconnected in the horizontal deflection system is shown in Fig. 2. A signal from the Y-axis circuit is fed to the sync circuit. The synchronizing signal is then applied to the time-base generator to lock the sawtooth voltage to the frequency of the incoming signal. The sawtooth voltage is amplified by the X-axis amplifier and fed to the horizontal deflection plates. A switch is provided to disconnect the amplifier from the sawtooth generator and allow connection of an external signal to the amplifier. A gain control is used at the input of the amplifier to adjust the width of the pattern.

Linear Time Base Generator

The sawtooth generator in most low-cost 'scopes is a relaxation oscillator using a thyatron, or gas filled, triode tube, as in Fig. 3A. This circuit produces voltages of the waveshape shown in Fig. 3B. The interval from A to C constitutes one cycle. The linear portion AB represents the "go" or "sweep" time. The interval BC represents the return of "flyback" time, during which the fluorescent spot returns to the position it had at the beginning of

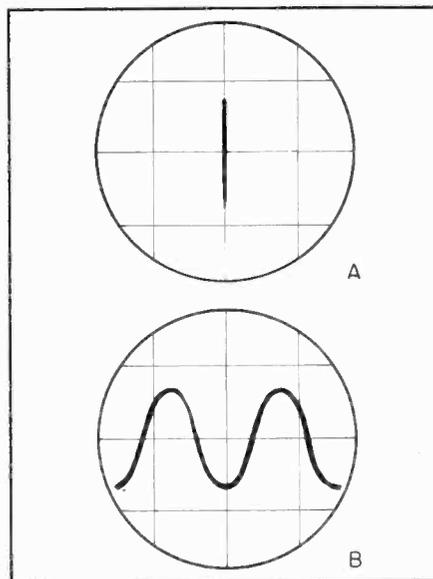


Fig. 1 A) Signal is fed only to vertical deflection plates. B) Pattern when sawtooth signal fed to horizontal deflection plates

the cycle. An ideal linear time base would have a perfectly linear sweep and a return time of very short duration. Practical circuits for generating linear time bases are usually compromises between these desirable features.

The operation of the simple thyatron circuit which generates a sawtooth voltage is described with reference to Fig. 3A and 3C.

1. When B+ voltage is applied, capacitor C1 begins to charge (curve OAB). The thyatron tube is initially non-conducting. But at a certain voltage, called the firing or ionization potential (point B on the curve), the gas in the tube ionizes and conducts, discharging C1 suddenly (B to C). When the voltage across C1 drops to the point where the gas no longer is ionized (point C), the tube ceases to conduct, and C1 again begins to charge. Repetition of this action produces the sawtooth voltage.

2. The rise of the sawtooth wave (A to B) is curved slightly because it is part of the charging curve of the capacitor C1. If the B+ voltage is high enough for only the lower portion of the charging curve to be used, the rise of the sawtooth is sufficiently linear for most purposes.

3. The firing potential of a thyatron may be varied by changing the bias on the grid and may be used to control the frequency of the sawtooth wave as shown in Fig. 4A. If the grid bias is reduced, the tube fires at point D instead of B. The potential drops from D to E and then begins to rise again. One cycle of the sawtooth thus requires less time, its frequency is increased, and the amplitude is decreased at the same time.

4. The frequency of the sawtooth generator may also be varied by changing the time constant of the charging circuit of C1. If either R1 or C1 is decreased, the capacitor charges more rapidly and reaches firing potential more quickly (D in Fig. 4B). When the frequency is varied in this manner, the amplitude remains unchanged.

A commercial application of the thyatron is shown in Fig. 5. Tube V7 (6Q5G) is the thyatron tube.

1. The voltage divider, consisting of R34, R31, and R61, maintains a fixed bias on the grid of the thyatron. The bias may be varied slightly by R61 in order to adjust

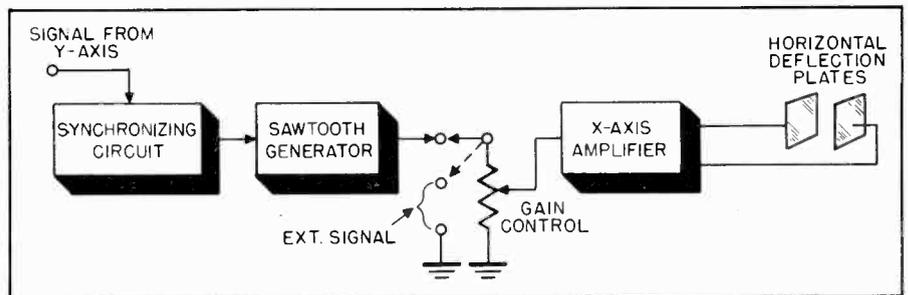


Fig. 2 Block diagram of horizontal deflection system in oscillograph. Gain control is used at input of X-axis amplifier to adjust width of the pattern

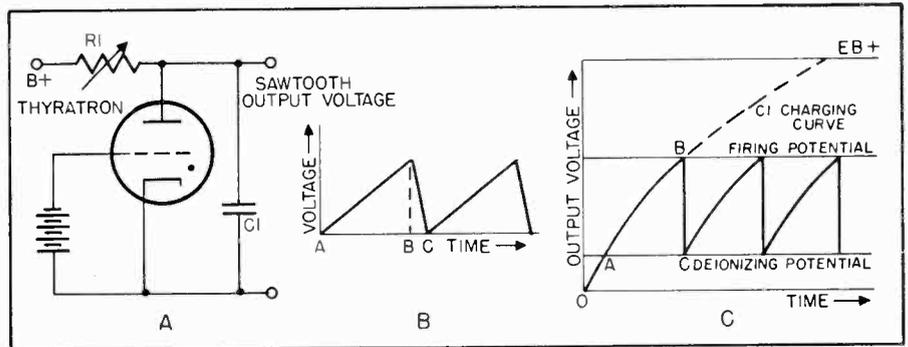


Fig. 3 Shown in A is basic thyatron oscillator circuit. B shows linear time-base waveform. C illustrates sawtooth output voltage from relaxation oscillator

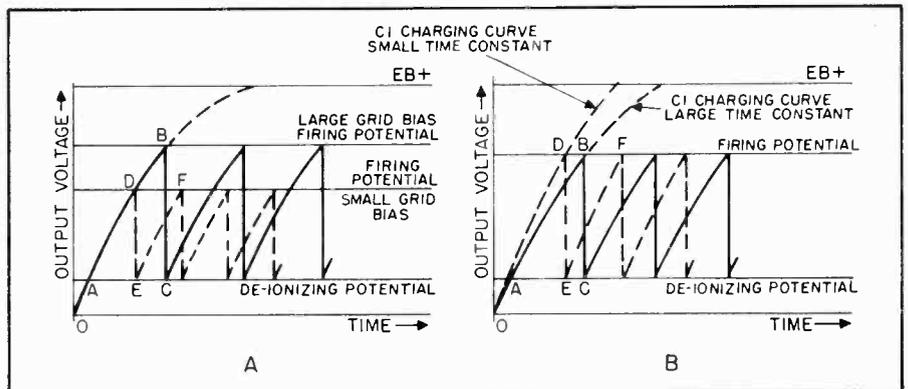


Fig. 4 Showing how frequency of sawtooth wave is changed by varying grid bias. A, and how it is changed by varying charging circuit time constant

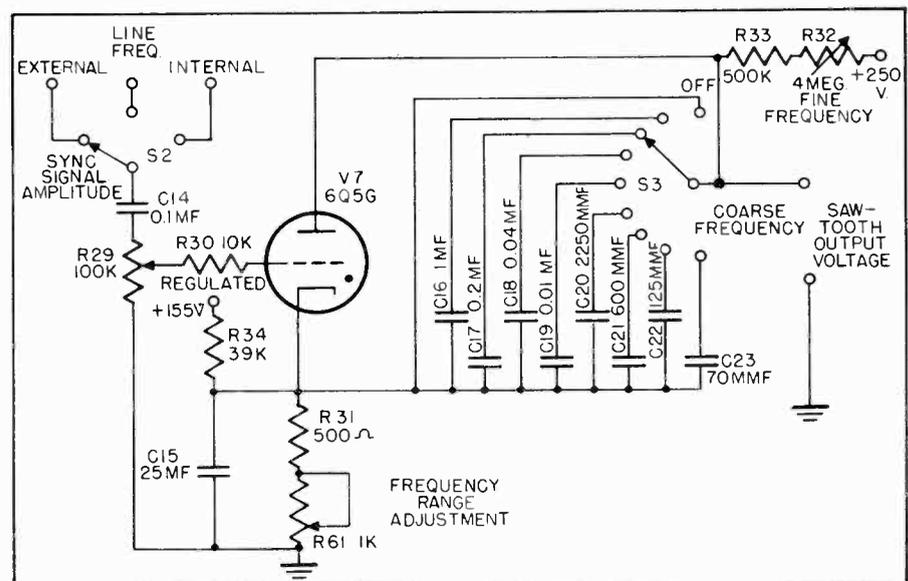


Fig. 5 A commercial application of the thyatron in a cathode ray oscillograph. Above schematic is the sawtooth generator circuit of the DuMont Type 208-B

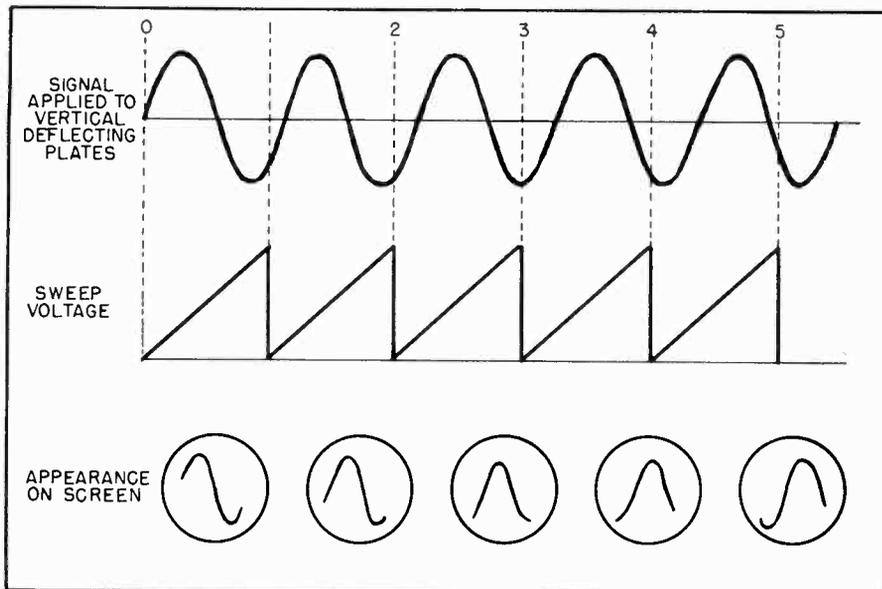


Fig. 6 Apparent motion of sine wave across scope screen, as it is observed when incoming signal and sweep voltage are approximately the same frequency

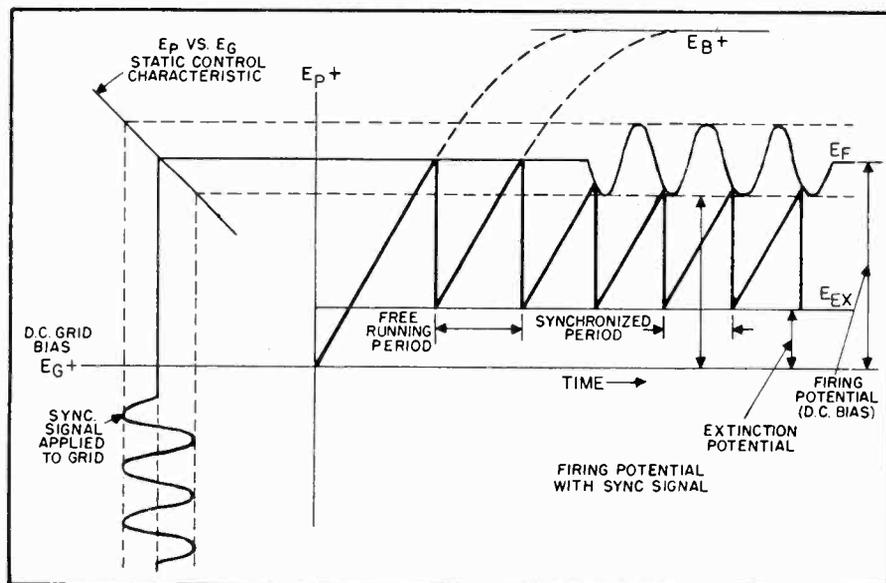


Fig. 7 Showing how incoming signal and sawtooth voltage can be made to have exactly the same frequency by synchronizing gas-triode sawtooth generator

will slow down the sweep during the last portion of its sweep period. A form of feed-back circuit is used in some oscillographs to compensate for non-linearity in the sawtooth voltage. It utilizes some of the sawtooth voltage and feeds it back to a point in the charging circuit of the capacitor. If non-linearity exists, it tends to compensate itself.

Synchronization

If the frequencies of the incoming signal and the sawtooth voltage are almost the same, the pattern will drift slowly across the screen as shown in Fig. 6. The signal voltage shown is a sine wave whose period is slightly longer than that of the sawtooth sweep. In the pattern shown at A, only the part of the sine wave included between 0 and 1 will appear. On the second sweep the part between 1 and 2 will show, differing slightly from the part shown in A. In the sweeps that follow, the picture continues to change and appears to travel across the screen from left to right.

To synchronize the sweep so that it will have exactly the same frequency as the signal, a synchronizing signal is applied to the grid of the thyratron. The effect of this synchronizing voltage is shown in Fig. 7. The first two cycles of the sawtooth show the condition when no synchronizing signal is applied. Line E_f represents the ionization potential of the thyratron, and line E_{ex} represents the de-ionization potential. When a sine wave synchronizing signal is applied to the grid, the firing potential varies with the synchronizing signal as shown by the sine wave portion of the line E_f . The rising curve of the sawtooth voltage now reaches the firing potential on its downward cycle, instead of at the d-c bias firing potential as before. A new cycle of the sawtooth is started for each cycle of the synchronizing signal, and the sweep is thus exactly synchronized to the incoming signal.

In the circuit of Fig. 5, the synchronizing signal from the SYNC SIGNAL SELECTOR switch S2 is applied through coupling capacitor C14 to the voltage divider R29. The amplitude of signal fed to the grid of the thyratron is determined by the setting of R29, the SYNC SIGNAL AMPLITUDE Control.

When the SYNC SIGNAL SE-

the total frequency range of the generator. This is an internal adjustment and is set at the factory. Capacitor C15 bypasses the sawtooth voltage wave around biasing resistors R31 and R61.

2. The frequency of the sawtooth is varied by changing the time constant of the charging circuit. The COARSE FREQUENCY control, S3, is a nine-position, two-gang switch which selects the proper capacitor (C16 to C23) for the frequency range desired. The FINE FREQUENCY control varies the charging rate of whatever capacitor is in the circuit by varying the resistance of R32.

3. The only position in which the COARSE FREQUENCY switch has no capacitor is the OFF position.

In this position, the sweep generator is inoperative and the input of the X-axis amplifier is connected to a pair of binding posts to which external signals may be applied. In all other positions of the switch, the sawtooth output of the generator is fed to the X-axis amplifier.

A time-base generator such as the one just described will furnish sawtooth voltages over a range of frequencies from about 0.5 to 50,000 cycles. At higher frequencies, the time required to discharge the capacitor becomes an appreciable fraction of the total sawtooth cycle because of the de-ionization of the gas tube. At low frequencies, leakage of the capacitor becomes a factor in determining the linearity of the sawtooth sweep time. The leakage

LECTOR switch is in the EXTERNAL position, the sync signal is taken from the EXTERNAL SYNC SIGNAL terminal. In the LINE FREQUENCY position, the signal is taken internally from one of the low-voltage secondaries of the power transformer. This applies a sinusoidal synchronizing signal of power line frequency. In the INTERNAL position, the signal is taken from the output of the final stage of the Y-axis amplifier. Thus the sweep is synchronized to whatever signal is being applied to the Y SIGNAL INPUT.

Recurrent and Driven Sweeps

The thyatron sweep circuit just described is known as a recurrent sweep generator. That is, sawtooth voltages are generated continuously, even when no synchronizing signal is applied to the relaxation oscillator. Recurrent sweep circuits are useful whenever the incoming signal repeats itself at a constant rate. Under such conditions it is possible to synchronize the sweep generator to the signal. In f-m and television servicing, the signals that must be observed are of constant frequency, and recurrent sweep circuits may therefore be used. In laboratories and stations, signals of random frequency are encountered, and it is necessary to employ a driven sweep circuit in the oscillograph to observe them. With a driven sweep circuit, the sawtooth generator does not oscillate until fired by the incoming signal. Thus if the signal occurs at random intervals, the driven sweep circuit will keep in step with it, and the pattern will appear stationary on the screen.

The thyatron sweep circuit lends itself to driven sweep operation without much revision of the circuit. Fig. 8 illustrates a typical driven-sweep circuit in which the only addition is the diode vacuum tube and a suitable source of bias voltage. If the cathode of this diode is set at some potential, say E , which is below the conducting potential of the thyatron, the diode will conduct when its plate also reaches potential E . As long as the diode is conducting, the plate of the thyatron is held at potential E , and will not conduct. If a synchronizing signal of positive polarity and sufficient amplitude is introduced to the grid of the thyatron, its firing potential will

be lowered to a value below E , at which it is held by the diode, and the thyatron will conduct. The capacitor discharges until the triode ceases conduction, at which time it begins to charge again through the resistor R . If the synchronizing signal has meanwhile been removed from the grid of the thyatron, the capacitor will recharge only to potential E , fixed by the setting of the diode. Thus a single sawtooth cycle is generated. Another sweep will not occur unless the circuit is again initiated. By initiating the driven sweep with the succession of random signals, the pattern will appear stationary on the screen.

High-Vacuum Time Base Generators

As the name implies, these time base generators do not make use of gas discharge tubes and are therefore not subject to the limitations of de-ionization time. High-vacuum sweep circuits are generally found in higher-priced instruments and extend the sweep frequency capabilities of such instruments to 250,000 cycles and higher. Most of these sweep circuits employ variations of multivibrator circuits.

Suppose in Fig. 9 that V_1 is cut off while V_2 , having no bias, is conducting. A positive voltage of sufficient amplitude to cause conduction and applied to the grid of V_1 will produce a negative signal at its plate. This negative signal will be transferred to the grid of V_2 through capacitor C_1 . V_2 will be cut off and its plate voltage will rise rapidly to power supply potential. The time constant of R_2 and C_1 determines the length of time which V_2 is cut off. When C_1 is no longer discharging through R_2 at a sufficient rate to bias V_2 to cutoff, V_2 will conduct and in so doing will develop a potential across R_1 which will bias V_1 to cutoff. Thus the circuit produces a rectangular pulse, the duration of which depends upon the values of C_1 and R_2 .

It is only a step from the elementary circuit of Fig. 9 to one which is suitable for recurrent sweep and driven operation. Fig. 10 is a typical example of a circuit for generating recurrent sweeps. V_2 and V_1 are connected as an unbalanced multivibrator, and the circuit is so designed that a short positive pulse of large amplitude is delivered

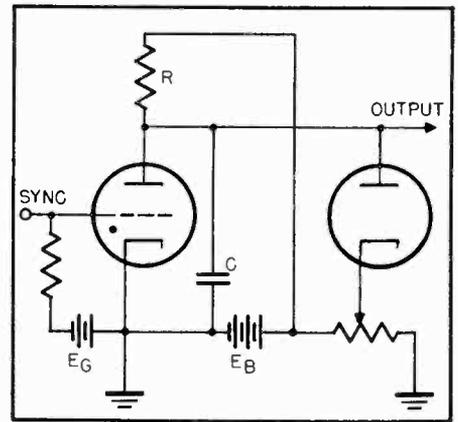


Fig. 8 Schematic diagram of basic gas-triode circuit for generating driven sweep

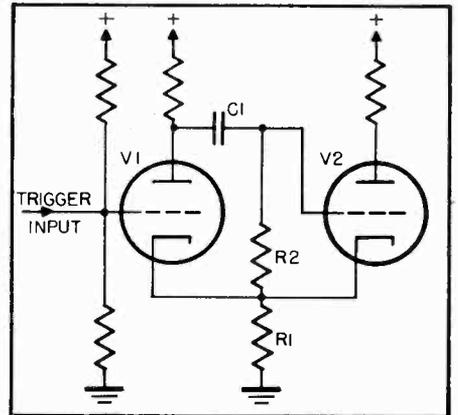


Fig. 9 Basic multivibrator used in high vacuum sweep circuit, eliminates gas-triode

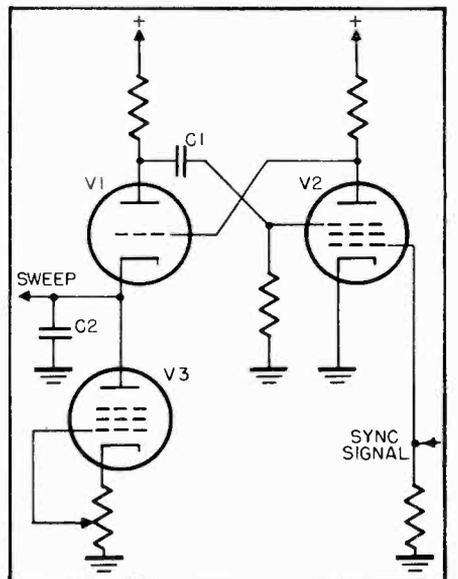
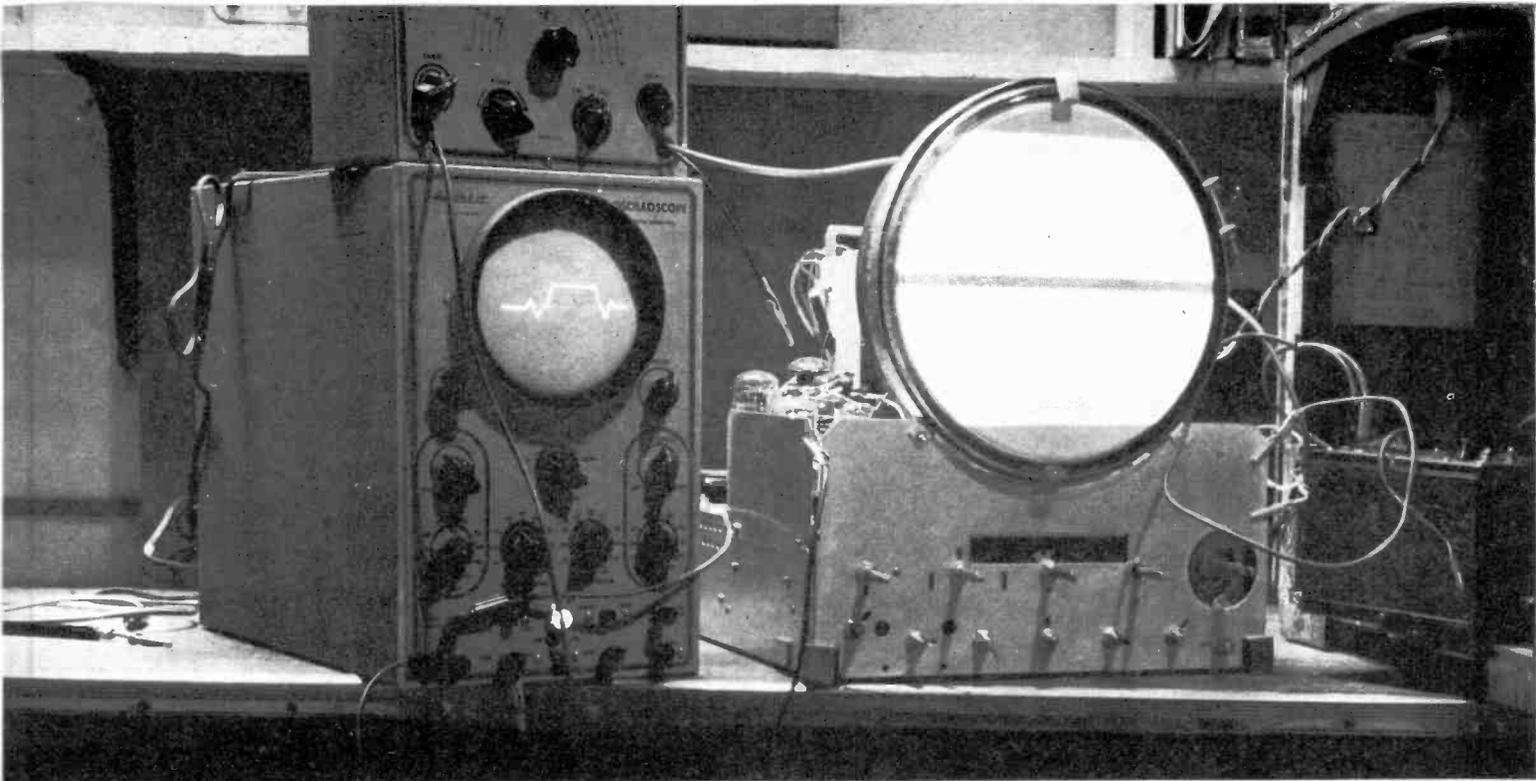


Fig. 10 Schematic of high-vacuum circuit for generating recurrent and driven sweeps

periodically to the grid of V_1 . This pulse lowers the impedance of V_1 and allows C_2 to charge rapidly from the power supply. In the interval between pulses, C_2 charges through V_3 , a constant current pentode. The multivibrator frequency, and there-

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HOW TO ALIGN VIDEO I-F STAGES

by Matthew Mandl

Procedures for aligning stagger-tuned i-f stages, overcoupled i-f stages, and traps are discussed here in step by step detail

THE need for aligning modern television receivers is usually confined to those stages which follow the mixer circuit. Occasionally it will be necessary to make oscillator adjustments, but the use of compact, pre-tuned front ends, which are carefully assembled into one integral unit, means that very few tracking problems will be encountered with most of the telesets on the market today. Serious trouble with the tuner usually means a complete replacement, unless it uses plug-in coils.

In the i-f stages of the receiver, however, adequate provisions have been made to facilitate alignment of the sound i-f transformer, picture i-f transformer, and the various traps.

The wide band-pass of most picture i-f stages (3-4 Mc) means that drift of a few kc, or change in resonant tuning over several years, will have little effect on performance. In an a-m receiver, having a bandpass of 10 kc, drift of a few

kilocycles would be serious, and i-f.'s off by 10 or more kc would make the set inoperative. In tele-sets, however, a 10 or 20 kc change in alignment has little effect on i-f stages.

Picture i-f alignment of a television receiver should therefore not be attempted until the technician is sure the trouble is due to misalignment and not the result of other defects.

Poor picture quality and gain are not always caused by poor alignment, but may be due to any one or combination of such faults as: Improper antenna installation, defective part in r-f or i-f stages, improperly tuned oscillator, improperly set focus control, defective focus coil, defective peaking coils in video amplifiers, defective picture tube, defective tuner, and improperly positioned ion trap.

When these have been checked and everything found satisfactory, then we may assume that i-f alignment is necessary.

The ability of the receiver to pass fine detail can be observed by tuning to a station which is broadcasting its test pattern. The vertical wedges of this pattern should converge clearly and sharply to the center circle. If this vertical wedge has its center-of-pattern section blurred and fuzzy, it indicates loss of high video frequencies. With proper alignment and a correctly positioned focus control, both vertical and horizontal wedges should be sharp and clearly defined, particularly at the narrow section near the center. The set should be checked in this manner both before and after alignment.

Types of I-F Stages

There are two different types of i-f picture stages in use at the present time, and each one requires a different alignment procedure. The two types are: Overcoupled i-f stages and stagger-tuned i-f stages. The overcoupled i-f stages get broadband characteristics and low

Q by coupling primary and secondary interstage r-f transformers close together. All stages are tuned to the same i-f frequency. For over-coupled stages, a sweep generator, an accurate marker generator, and an oscilloscope are used in alignment.

The stagger-tuned system consists of three to four stages, each tuned to a slightly different frequency. In this manner, the overall response curve is broad and substantially flat. With this type of circuit arrangement, i-f alignment can be done with a regular signal generator. For checking signal gain changes as the stages are aligned, a v. t. v. m. is placed across the video detector load resistor.

Preparation for Alignment

Complete alignment of a television receiver invariably requires chassis removal so that tuning adjustments above and below chassis are available. With sets where the picture tube is mounted to the cabinet rather than to the chassis proper, it will be necessary to remove it as well. Alignment is best accomplished with the tube in the circuit.

After the chassis is removed, it should be placed on the bench, resting on a side free of controls and capable of supporting the weight of the chassis in a vertical position. If the picture tube is not chassis-mounted, it should be inserted through yoke, focus coils, and beam bender and attached to socket. Its weight should not rest on its neck alone, or breakage may result. A leather strap or improvised bracket may be used around the tube face for support.

The set should be turned on and the station selector switch set to a channel on which no television

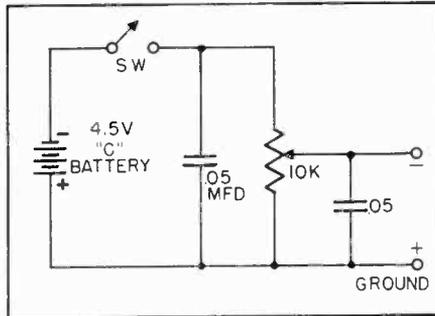


Fig. 1 Bias box recommended by Westinghouse for alignment of their TV receivers. It may be used also when aligning other sets

signal is being broadcast. The contrast control should be adjusted to give from 3 to 4 volts of minus bias on the i-f tubes. In sets using a.g.c., the intensity of the input signal will have a controlling effect on the bias and for this reason a fixed bias source may be recommended by the manufacturer. This can consist of a "C" battery, or a battery and resistor network as recommended by Westinghouse for their models H-169, H-217, H217A. This bias box is shown in Fig. 1. RCA, on the other hand, recommends removal of the 6SN7 a-g-c amplifier tube in their 8T24 series. After tube removal, a 250 K ohm pot is connected between pins 5 and 6 of the 6SN7 socket and adjusted for a -4.5 reading.

Where the Signal is Injected

Signal injection for alignment of i. f's should be into the grid of the mixer tube. Such a direct connection is not always feasible, however, particularly with completely shielded tuners. Alignment can be made by injecting the signal into the antenna terminals, but this is not always satisfactory, because the signal suffers attenuation since the r-f stages will not be tuned to the i-f frequency.

If the socket terminals of the

mixer tube are not readily available, several make-shift methods can be employed. One method is to remove the converter tube and twist a section of bare wire around the grid prong of the tube. Replace tube, letting one end of wire stick out from under the tube. Make sure this bare wire does not short to chassis. The signal generator can thus be connected to this wire through a small isolating capacitor of 1000 mmf or less. One lead from this capacitor could be used as the bare wire which wraps around the grid pin of the mixer tube.

Some of the older receivers, such as the RCA 630TS, or Admiral 30A1, which use incompletely shielded tuners, make the mixer grid terminal available through a hole in the chassis side to afford shielding during normal operation. Later models do not have these signal injection provisions.

A rather novel method is that recommended by Westinghouse for their new 11-223 receiver. This consists of using a miniature tube shield which fits over the tube snugly and does not ground to chassis. A .005 mf capacitor is then soldered to the shield, and the signal generator cable attached to the capacitor. The ground side of the cable is connected to the chassis. By sliding the shield up and down over the tube, the capacity can be varied, and coupling is achieved by virtue of the capacity between shield and tube elements.

Where the Signal is Observed

Either the signal generator or the oscilloscope — depending on the alignment procedure used — is attached across the load resistor of the video detector tube. The schematic of the set under alignment

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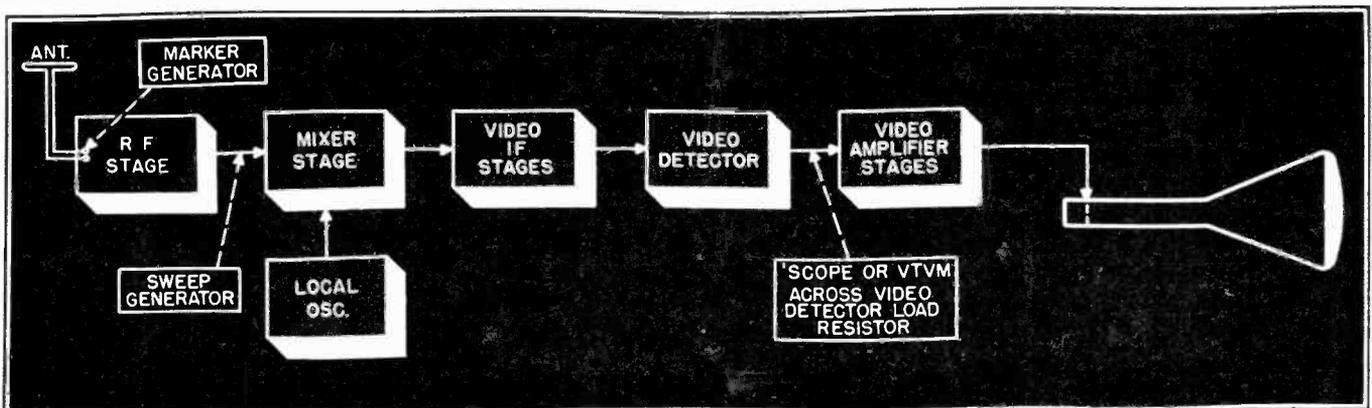


Fig. 2 Block diagram showing points where signal is injected and where it is observed when aligning television receivers

Some practical hints for

Eliminating



interference

telling you exactly how to eliminate TV interference caused by noise generating machines or by other radio waves

by Martin Clifford

WHEREVER television interference problems exist, the initial step towards correction is to locate the source and, whenever possible, the frequency of the interfering signal. We can list the main causes of TVI (television interference) conveniently in the following manner.

Interference caused by radio signals or their harmonics. This would include regular a-m, f-m, television, short wave, CW, and services provided by police broadcast, aeronautical stations, and the like.

Interference caused by receiver re-radiation, chiefly by the local r-f oscillator in communications receivers and telesets.

Interference caused by machinery, industrial and domestic—and under this heading we have quite a collection. A partial list would include electric razors, refrigerator motors, trolleys, busses, ignition systems, electric fans, mixers—all electric household appliances, including doorbells—and many more.

Interference caused by electronic devices, other than radio. Here we have diathermy, dielectric heating, X-ray machines, induction soldering equipment, sterilizing equipment, and smoke and dust precipitators.

Since the interfering noise signal created by machinery and that caused by electronic devices, other than radio, generates broad, and in many cases, damped waves, finding the frequency of the interfering signal in these cases is of doubtful value. Fortunately, however, there are a number of general remedies which apply to almost all of the devices listed under the last two groups.

In those cases where the locally induced interference is severe, or

where the transmission line, usually twin lead, is unusually long and more subject to noise pickup, use of coaxial cable is recommended. Since switching from 300-ohm twin lead to the lower surge impedance of coaxial cable (about 72 ohms) results in impedance mismatching, shielded two-conductor cable, such as type KT-51 (Intelin), made by Federal Telephone and Radio Corp., can be used. Avoid locating transmission line, shielded or not, near motors, roof elevator housing, etc.

It may be necessary to experiment with the location of the antenna. While the antenna should generally be as high as possible, quite a number of cases have been reported in which the signal-to-noise ratio has been improved by the lowering of the antenna. The addition of parasitic elements to the antenna and stacking may also help increase antenna sensitivity.

Machine Interference

In the case of fixed equipment, such as diathermy and X-ray, it would be ideal if such noise radiators were placed in shielded rooms; but unfortunately, this is not quite practical. Wherever possible, bond the machine to ground. Do not use the usual wire which you have for repair work, but obtain heavy metallic braid, preferably half inch. The braid should be kept short. One end of the braid should be thoroughly soldered to a good ground. Since braid usually comes tinned, soldering isn't too difficult. Still it is advisable to use a 300-watt iron. A cold solder joint will defeat your work.

Having soldered one end of the braid to ground, keep moving the other end over various portions of

the machine until the braid rests on that spot which seems to kill most of the noise. Solder the braid securely to that point. If the machine is a motor or generator, make sure that the commutator is clean. If not, clean with a piece of canvas or 0000 sandpaper. Do not use emery paper. Examine machine brushes. These are ordinarily carbon. If worn, replace them. If not worn, make certain that they ride satisfactorily on the commutator. Whenever possible, turn the machine on and watch the action of the brush. There should be a minimum amount of sparking visible. If the brushes are properly set, and are in good condition, and the armature is clean, but strong sparking persists, then the commutator is out of round. The only cure in this case is either to replace the commutator or have it turned down on a lathe.

Filters

These are not the only remedies. Ignition systems may respond to the use of distributor suppressors. We should also realize that the power line going into industrial and electronic equipment often acts as an antenna (and quite a good one, too). A good remedy is to make use of one of the power line filters shown in Fig. 1. The filter choke must have wire of sufficient thickness to carry line current. For greatest efficiency the filter should be placed as close to the offending machinery as possible. It also helps to put an additional filter close to the power line input to the receiver. Another expedient which is available is the use of isolation transformers having a 1:1 ratio, placed at the power line input of the receiver. Since the electromagnetic field around such

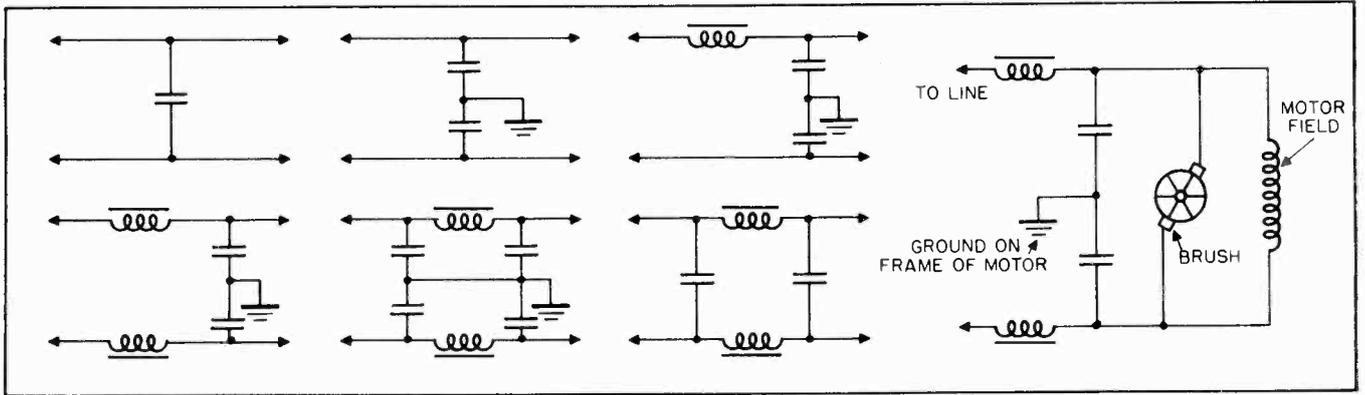


Fig. 1 Several types of filters used to reduce noise. The left side of each filter goes to the line, the right side to noise

generating device. At right is one type filter used to reduce noise radiated by power line connected to shunt wound motor

transformers is rather strong, it will have a tendency to modulate the cathode ray beam in the picture tube—giving the picture a characteristic 60-cycle hum. If this occurs, rotate the transformer until the hum disappears, or else keep the transformer at a suitable distance from the picture tube.

It is not always necessary to use a power line filter to cure TVI. Quite often, just a capacitor having a value of approximately .02 mf. connected across the line, will be of great help. It is good practice to put such a capacitor across any sparking or contact points. Examine contact points carefully. If these are pitted, or if one of the points has a hollowed out appearance and the other point looks built up, this is sufficient evidence of sparking. Put the .02 mf capacitor across the points.

Radio Interference

In those instances where the interference is caused by a radio signal (f-m radio, shortwave broadcast, local oscillator radiation, etc.) the first step in eliminating the interference is to determine the frequency of the interfering signal. It is often possible to identify the signal by listening to it. This can be done by means of the very simple detecting device shown in Fig. 2. Since the interference rides through the video i-f stages, a logical place to connect the interference detector would be as shown in the illustration. There are a number of places in the receiver to which the interference detector could be connected. If placed across the cathode resistor, be sure to open one end of the cathode bypass condenser. If you find that the interfering signal is drowned

out by the sound of the vertical blanking and sync pulses, run your test at a time when the TV station is not on the air.

In place of the interference detector, the frequency of the offending signal may be determined through the use of a tuned circuit, as shown in Fig. 3, calibrated with a signal generator. When the dial of the tuned circuit is set at approximately center, it should be at the video i. f. The frequency coverage of the tuned circuit should be from about 16 to 28 Mc. The use of the tuned circuit is simple. Hold it near the last picture i. f. transformer so that magnetic coupling exists between the two. If the i. f. transformer is shielded, remove the shield. As you rotate the dial and approach the i. f. frequency, the low frequency picture element, vertical blanking and sync pulses will be heard. You will be able to tune in the interfering signal, provided it is not directly on the i. f.

Having tuned in the interference as carefully as possible, read the frequency from your calibrated dial. The frequency of the interference will then be this frequency, plus or minus the local r-f oscillator frequency.

Just to make sure we understand this, let's try a typical case. Let us say that you are servicing an RCA teletest. The interference complaint concerns channel 5 alone. For this channel, and for this particular receiver, the local oscillator frequency is 103 Mc. Let us also assume that you have picked the interfering signal at 20 Mc (from the calibrated dial). Then the interfering frequency will be $103 \pm 20 = 83$ or 123 Mc.

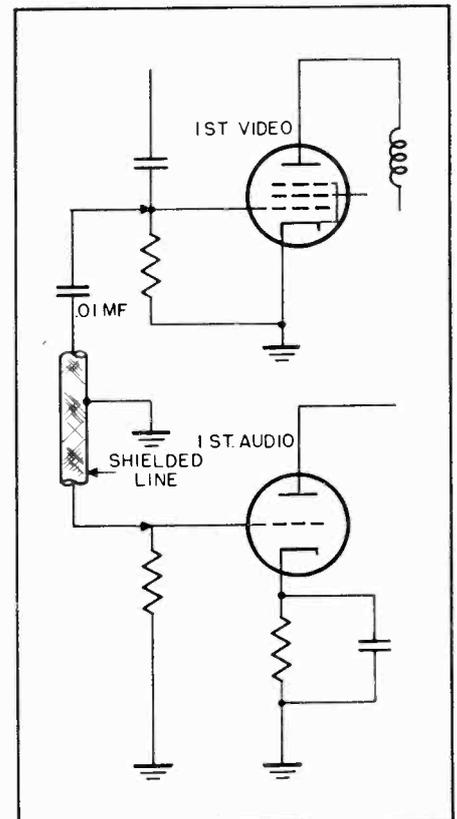


Fig. 2 You can listen to interference on the picture channel by connecting a shielded conductor in the manner shown above

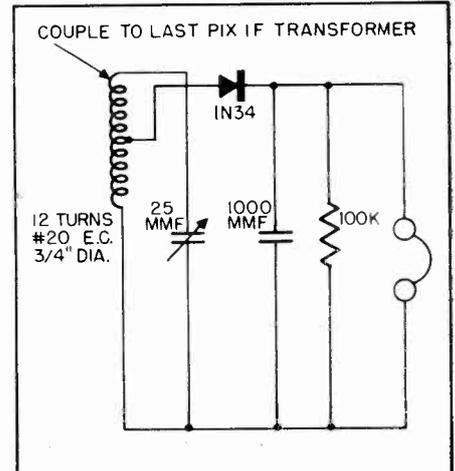


Fig. 3 Shown in the above diagram is a tuned circuit which can be used in determining frequency of an interfering signal

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In SELLING TV it's SERVICE that counts

by Isidor I. Gross

Yesterday Lou was operating a service shop for home and car radio. Today he has discovered that that was the best basis for successful tv receiver sales

IN the fall of 1937, the policeman on the beat in one of the Bensonhurst neighborhoods in Brooklyn began to notice a strange phenomenon. Late every afternoon a small crowd would gather in front of Sound Radio and Electronics Corp., at 210 Kings Highway. After a while it would disperse, chattering excitedly. The crowd grew daily and he check-

ed into the matter. What he saw amazed him as much as the people gathered there. In the window of the store was displayed the first television receiver any of those present had ever seen. The policeman was just as interested in the exhibit as the other onlookers; but so many people gathered to watch that a traffic hazard was created and he found

it necessary to request that the receiver be removed from the window.

Lou Brown, president of Sound Radio and Electronics, complied. But he had achieved his aim. He had become known as the first radio shop in that neighborhood to have television.

He had come a long way. Back in 1928 he was making a living as a private chauffeur and not being too happy at it. He didn't believe that this occupation had a future, and began looking around for greener pastures. He had been working on radios, as a hobby, from the time the first crystal sets appeared, and decided to try it as a career. He has stuck with it ever since.

His first shop was strictly and exclusively service. He felt that the sale of radio receivers was not his business and that the dealer down the block was better equipped to handle it. He concentrated instead on establishing a good reputation as a competent technician and reliable business man. Good service plus integrity seemed the only basis on which to build his business; and this policy paid off. His customers stuck by him and recommended his shop to their friends. Within a relatively short period of time he had established a reputation for satisfactory service and reliability. Although the depression hit just as he was getting started, he was able to make out.

Starting to Sell

One day a lady for whom he had previously done some work came into his shop with a little table model. The cabinet was completely broken down, a few tubes were dead, the r-f coil wire was snapped, the tuning control didn't work, and a few soldered



Lou keeps his windows active at all times. Signs and displays are changed frequently. With three windows he always manages to show something new



Most of Lou's stock consists of table models; but just a little while before these pictures were taken he sold his 3 x 4 Ansley projection set



This is the view which greets the customer when he enters Lou's store. At one glance he sees the receivers on the floor and

the service department in the rear of the shop. This layout of the shop has been exceedingly helpful in making receiver sales

joints had come loose under the chassis.

Lou shook his head. This set was beyond economical repair. Would he sell her another set cheap, the lady wanted to know; and then and there launched him on receiver sales.

Not that he liked it at first. A customer who came in to buy a little table model or a midget just as he was servicing a receiver was regarded by him as a source of annoyance rather than a source of income. He found the switch from troubleshooting a receiver to selling a customer quite a strain, with his mind remaining in the service department, worrying about a hot iron. He could make more money spending his time servicing, than devoting part of it to sell. Service and sales just didn't mix.

But when television arrived, Lou changed his mind fast. He realized immediately that it would be impossible to sell receivers without providing the necessary service to maintain it. The radio technician was the ideal person to do just that. Here was a chance to reap a rich harvest. He promptly made television receiver sales an integral part of his business operations.

As time went by, he discovered a number of techniques which proved exceedingly helpful in boosting his sales volume, most of them predicated on the fact that he is a competent and reliable service technician, employing an equally competent and reliable staff.

For the store, one of the more suc-

cessful techniques he developed was the construction of a service department at the far end of the shop facing the entrance. The department is separated from the remainder of the store by a partition with a large window. The first thing the customer sees upon entering the establishment is this service department, neatly framed by the large window, with equipment on the racks, reference volumes on the shelves, receivers being repaired. Lou points out that quite a few customers remarked that it was this department that sold them on buying.

Because of his reputation he has been able to sell quite a few television receivers. It is this aspect of sales which he pushes most. What about other radio equipment? He sells it too, and very often by way of tele-set servicing.

He has found a number of sales techniques for use in the customer's home for making such sales.

Sales Techniques

There is first the situation where action is initiated by the client. Lou had a man up at the customer's home on a television service call. After the set had been adjusted, the customer asked him to take a look at an old portable which they hadn't used for months but which they would like to get fixed for the summer. He examined the set carefully, noted that the required repairs were extensive, and told the customer that it would cost about \$15.00 to get the set working again. When the customer showed surprise at the figure, he added that

a new set might be bought for not much more. The customer said she'd think it over.

The next day Lou went back with a few samples. He pointed out some of the features on the new sets, and spoke about the advantages of having a set in the summer. He also stated that the set was guaranteed for 90 days. Finally he added if this were not a bargain he would not be recommending it. He made the sale.

Most service calls are attended by technicians employed and trained by Lou. He himself, however, attends to the follow-up work, in order to clinch the sales.

This technique is used whenever the customer wants to replace radio equipment. We may summarize it in a few brief steps:

- 1) Examine the old instrument carefully and give an honest appraisal of the cost of repair. Even if no sale is made on the spot, the confidence instilled in the customer will bring him to the shop a year later to make that purchase.

- 2) If the cost of repair is uneconomical, suggest replacement from your stock.

- 3) If you carry samples in your truck, bring one up for demonstration. If not come back the next day with a selection of models.

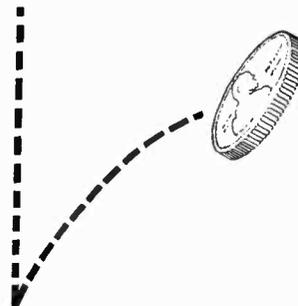
- 4) In the actual sales talk, stress the quality of the replacement, the guaranty which comes with it, and add your personal guaranty as to the performance of the instrument. Pointing out such factors as the summer season, the baseball season, holi-

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increase your business and raise your profits

FOR JUST A PENNY

tremendous sales returns result from very small investment



AN eastern airline recently mailed 500 postcard advertisements. Results so astounded the company's sales manager that an immediate and revolutionary change was ordered in the airline's advertising plans and policies.

The postal card mailing cost the company an overall total of \$14.83. This sum included postage, the stock on which the advertising message was written (since 1-cent government postal cards were used), and the overhead cost involved in addressing, sorting and mailing the cards to a select list of prospects.

A steady newspaper campaign, costing around \$40,000 annually, had worked a slow increase in business over the years. These 500 penny advertisements brought in business (directly traceable to the mailing) that came to over \$9,000 — for a total cost of less than 15 greenbacks!

This result was so surprising that tests were immediately made to discover whether the result of the first mailing was an exceptional stroke of luck or whether the firm had been missing something all of its 20 years.

Another batch of cards was sent out. Again, the penny ads brought home the ticket reservation bacon. So a revolutionary change was ordered in the advertising policy. Henceforth the advertising appropriation was to be concentrated in postal card mailings. The result? A jump in business so large that company executives are still scratching their heads.

What does this mean to the sales and service organization? Just be-

cause postal card mailings sold airline seats, will they also sell for you? Penny postal cards have been used with great success to sell everything from automobiles to lipsticks. And they have proven very successful for many advertising-wise radio and TV shops who have used Uncle Sam's little 1-cent piece of paper to build booming sales.

One radio sales & service organization in Chicago decided to test the advertising effectiveness of the penny postal card. Because the owner of this company was a shrewd businessman, he wanted to know not only if penny advertise-



ments could pull, but also how they compared with the other forms of advertising he had been using. For this reason, each postal card was keyed with an identifying number in the street address so that results could be easily traced.

How do they compare?

When the records were completed, the owner found that his penny postal cards, at a lower cost, had pulled nearly double the dollar results of the next most effective advertisement.

Of course, this does not say that penny postal cards are the world's best advertising media. There is no one best way to advertise. Often, penny cards pull *lower* results than other kinds of advertising. A well-balanced advertising program would never depend on a single method or medium. But that simple postal card, which costs only a penny to carry your message to the prospect,

can do a whale of a lot of selling. Postal card advertising is a method that can help any dealer-technician increase his profits.

To make postal card advertising effective, you must observe two important rules:

(1) Pick a good offer to advertise, one that will be a true "leader." It either must be low in price or a great number of prospects must need it at the particular time you send them the penny advertisement.

(2) Be sure that you send your penny advertisements only to good prospects — people who should and can logically buy from you, people who need what you have to sell, can buy it at your price, and are within easy buying distance.

How to get the most out of it

How can you make sure that your penny advertisements go to active prospects — people who should logically buy from you? Good lists with no dead weight in the form of useless names are the foundation of sound direct mail advertising. Obviously, the person who was a hot prospect last year may be only mildly interested now for a variety of reasons.

A practice one southern technician found effective is to keep lists on three by five-inch cards. These are separated into three divisions: on blue cards, he puts the names of those who buy regularly; on pink cards, the names of those who buy only occasionally; on white cards,

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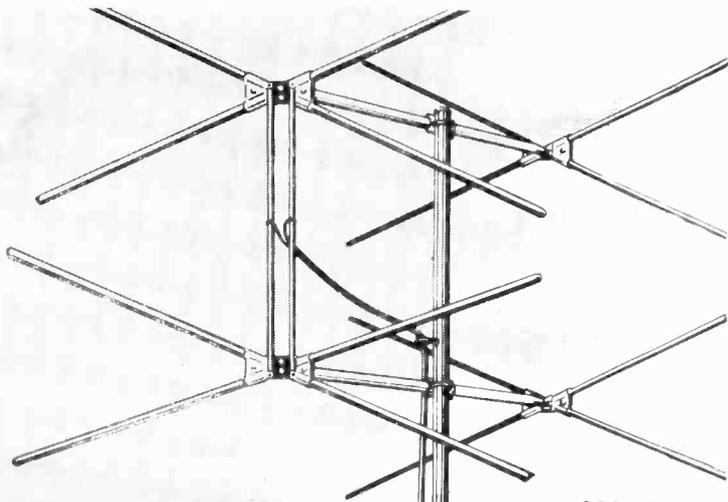




Radiart features

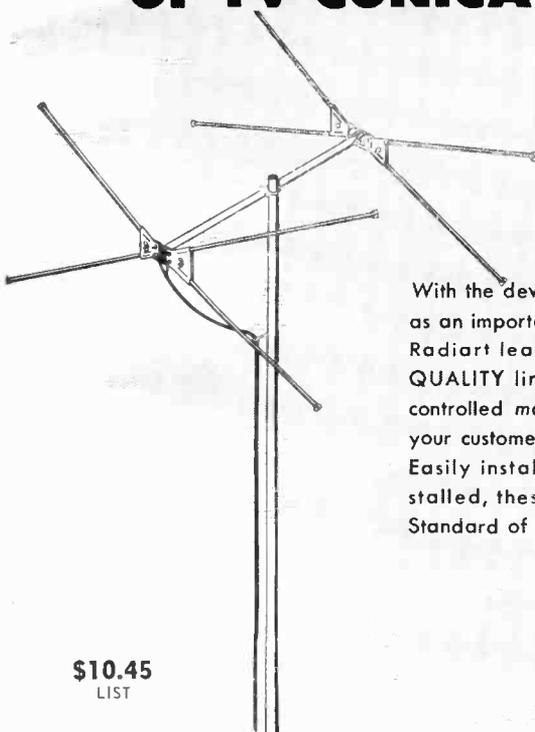
**THE
Lowest Priced Quality Line**

OF TV CONICAL ANTENNAS



\$22.95
LIST

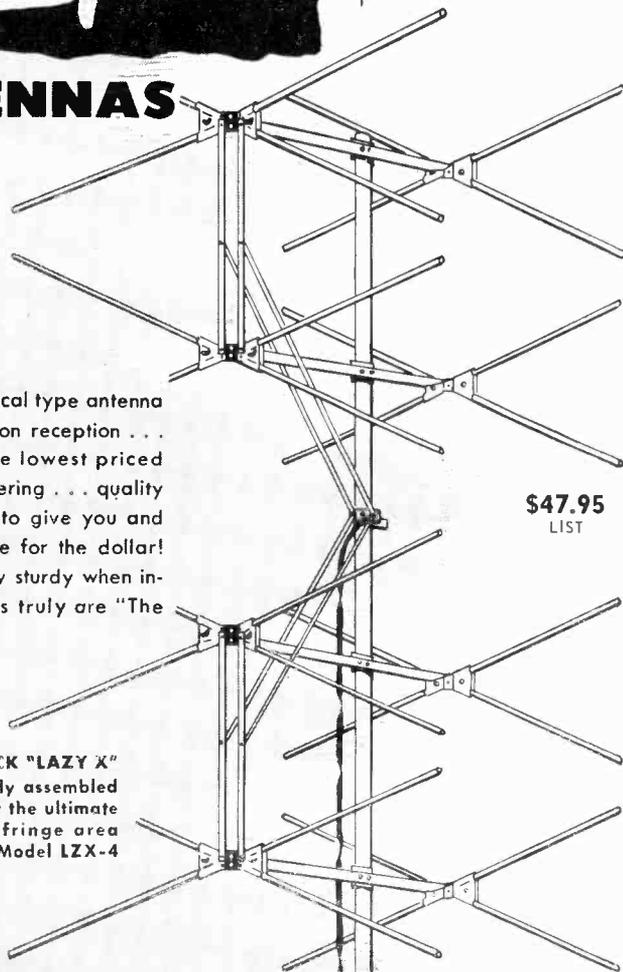
THE DOUBLE STACKED "LAZY X" ARRAY . . .
for improved gain in low signal strength areas — also where a higher signal-to-noise ratio is desired . . . Model LZX-2



\$10.45
LIST

THE SINGLE BAY "LAZY X"
... for primary service areas
..... Model LZX

With the development of the conical type antenna as an important factor in television reception . . . Radiart leads the way with the lowest priced **QUALITY** line. Precision engineering . . . quality controlled manufacture combine to give you and your customers the greatest value for the dollar! Easily installed . . . and rigidly sturdy when installed, these Radiart products truly are "The Standard of Comparison."



\$47.95
LIST

The **QUAD-STACK "LAZY X" Array** . . . easily assembled and installed for the ultimate in all channel fringe area reception Model LZX-4

IT'S RIGHT WHEN IT'S RADIART!

DEALERS:

For Special "Quantity Prices" . . . See Your Radiart Jobber About These **BULK PACKED Models:**

Model LZX-6B—six unassembled LZX bays in one carton.

Model LZX-6BQ—same as above PLUS 3 pairs jumper bars

a good DEAL—more for your money



THE RADIART CORPORATION
CLEVELAND 2, OHIO



Manufacturers of the Famous Red Seal Vibrators

the RD & M Survey

Readers Find Newspapers, Direct Mail, Good Ad Media

With this issue, Radio Distribution & Maintenance is inaugurating a series of articles based on surveys conducted among its readers. Each survey will deal with one specific problem and will attempt to answer questions current in the industry. Our aim in conducting this survey is to enable our readers to mutually benefit from each others experiences. We therefore ask your cooperation. Each survey is mailed on post cards. When you receive one, just fill it out and return to us. It takes no time at all and will benefit the entire trade

ONE of the most important problems confronting the active sales and service organization of today is the question of which medium of advertising to use for best results. In recent years the scope of activities of the average service dealer has gradually expanded so that questions of business promotion have become increasingly important in developing a sound and prosperous enterprise. The question asked today by many sales and service organizations is "Which advertising medium shall I use for best results?"

This month's survey was an attempt to answer that question. It tried to answer it by finding out from those actually engaged in the business which methods they, in their own experience, had found most successful.

In addition to giving the overall picture, the survey was also designed to indicate any differences which might exist between the methods used by large firms, and those used by small ones; by young organizations and by older ones, by shops which sell TV and those which don't. These breakdowns were made to increase the usefulness of the results.

In drawing your conclusions, one fact has to be kept in mind. When

we speak of "successful advertising" we are thinking of two things: the cost and the result. While newspaper advertising, for example, may be very effective, it may be of no value to you because of its high cost; and you will have to use some other medium which will be less expensive to you, and more in keeping with the amount of business you are capable of handling.

We would like to point out one more thing. To make the various results comparable with each other, all figures are given in percentages. You will notice that the percentages in the various categories add up to more than 100%. The reason for this is the fact that respondents listed more than one method in their replies. There is therefore some overlapping which brings the total percentage to above 100%. The actual amount of overlap is about 2.5, that is, the respondents to the questionnaire listed on the average between 2 and 3 preferred media of advertising.

Respondents to this survey have been in business for about 15 years, on the average. Their experiences should therefore be indicative of good business practice.

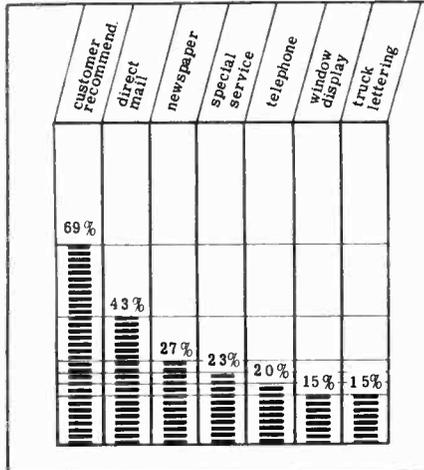
The Results

A first glance at the overall replies

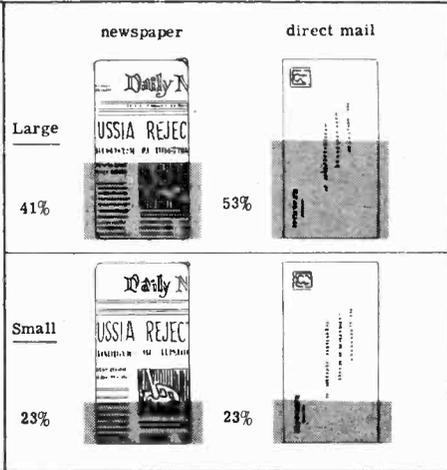
shows one thing very clearly: The majority of the respondents considered **customer recommendations** as the most effective means of increasing business. 69% listed it among the most effective trade builders. This high figure is what would generally be expected. Yet, at the same time, 31% did not list **customer recommendations** among the three most effective methods of securing new business. This indicates a shift from earlier years, when the reliance of the technician was almost exclusively on such recommendations; and it shows that the sales and service organization of today is becoming increasingly business-minded by following a more aggressive advertising approach. This conclusion is borne out by other findings listed below.

Next in order of preference was **direct mail**. 43% of the respondents included it in their list of most successful promotion activities. Direct mail has always been one of the traditional advertising methods in the service trade, and is still being extensively used.

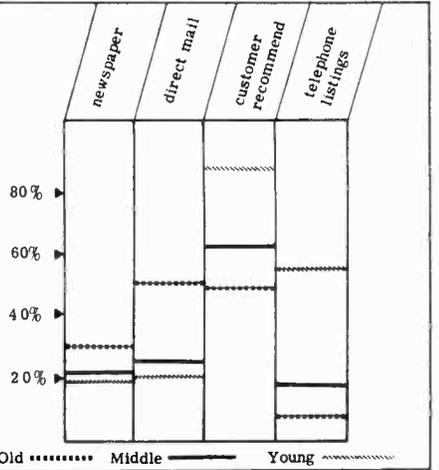
Newspaper advertising took third place, appearing in 27% of the replies. Frankly, we did not expect a result quite that high; and the only



Overall results of survey.



Extents to which large and small businesses use newspaper and direct mail advertising.



How businesses in operation for different lengths of time use various types of advertising

conclusion we can draw from it is again the fact that the technician of yesteryear is becoming more and more the active business man of today. As you will see later, newspaper advertising was considered effective both in cities and in rural areas, so that we may conclude that the emergence of the technician into a business man is general (with the advent of television, this was of course, almost inevitable).

Special services (such as providing a radio on loan while repairing a receiver, for example) was listed by 23% of the respondents. Telephone listing appeared in 20% of the replies; and 15% each found window display and truck lettering to have good drawing power.

All the other advertising methods listed in the responses were given by less than 10% of the respondents. Obviously, they are not generally considered effective. Some of the media in this group included magazine ads, radio spots, billboards, car and bus cards, etc. While these are not effective generally, they are highly useful in specialized cases, and should always be considered possibilities.

Size of Organization

One of the problems which suggested itself in connection with this survey was the question whether the size of the business had any relation to the choice of advertising medium. To get the answer to that question, we broke the respondents into two groups: Those organizations which were one-man shops (called *small*) and those which had more than one person working (called *large*).

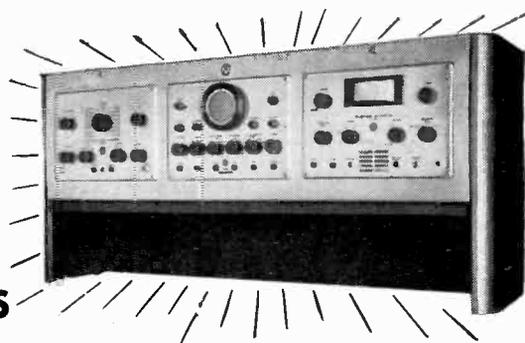
Comparing these two groups we find some interesting differences. Whereas 41% of the *large* organizations found newspaper advertising effective, only 23% of the *small* shops shared that opinion. The difference in preference of advertising media is even more striking when we compare the two types of organization with respect to the use of direct mail. 53% of the *large* firms listed it among successful media, but only 23% of the *small* organizations did so.

Direct mail and newspaper ads may be considered as the more aggressive forms of advertising, and it is apparent that they are used much more by the larger firm than by the smaller

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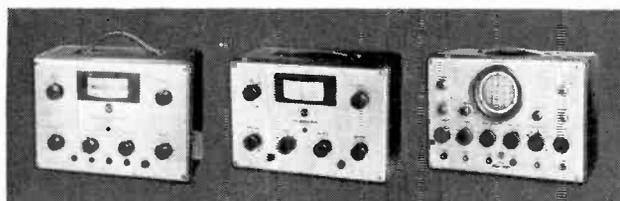
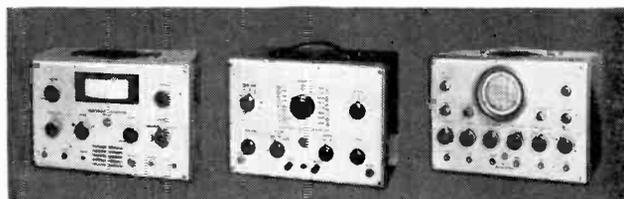
Choose packaged test equipment with matched units

—for every servicing need



FOR TV SERVICING

WR-39A
Television Calibrator
WR-59A
TV Sweep Generator
WO-55A
Oscilloscope

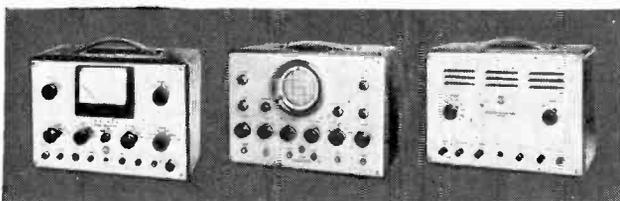
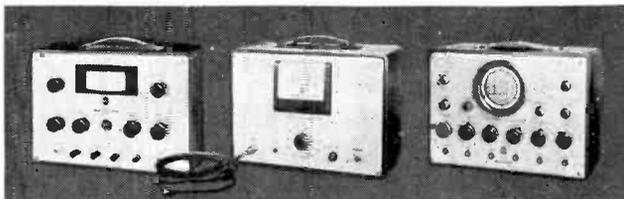


FOR AM-FM SERVICING

WR-53A
FM Sweep Generator
WR-67A
Test Oscillator
WO-55A
Oscilloscope

FOR SOUND (Public Address)

WA-54A
Audio Oscillator
WV-73A
Audio Voltmeter
WO-55A
Oscilloscope



FOR INDUSTRIAL WORK

WV-95A
Master VoltOhmyst®
WO-55A
Oscilloscope
WP-23A
Regulated Power Supply

*Reg. Trade Mark U. S. Pat. Office

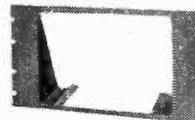
● Here's convenience, utility and appearance never before achieved in the test and measuring equipment field . . . a single, compact, all-steel rack that will accommodate any three of the nine RCA matched instruments.

The RCA WS-17A Test-Equipment Rack provides test and measuring combinations to meet virtually every requirement in the service shop, laboratory or industrial plant. Individual instruments can be quickly removed for use in locations remote from the shop or laboratory.

The nine matched instruments incorporate advanced design features reflecting the wide experience of RCA engineers in the fields of radio, tele-

vision and electronics. Best for the job —they are the best that money can buy.

Where mounting of any RCA matched test instrument in a standard 19-inch relay rack is desired, the WS-18A Rack Adapter Panel is available on separate order.



For full details and technical specifications on the rack and the nine instruments, ask your RCA Test and Measuring Equipment Distributor for Bulletin 2F719—or write RCA, Commercial Engineering, Section 42KY, Harrison, N. J.

Available from your RCA Test and
Measuring Equipment Distributor



RADIO CORPORATION of AMERICA
TEST AND MEASURING EQUIPMENT
HARRISON, N. J.

Electronically Speaking

→ from page 8

demonstration of how switching from station to station on the new sets is not accompanied by loud audio blares. While we were manipulating the controls, he was buttonholed by someone else; and with an apologetic shrug disappeared into the crowd milling about in the hall.

We wandered about and looked the various receivers over. We were a little disturbed when we came across a small set in a white cabinet sitting on a stove. It was the first TV receiver we had seen intended specifically for kitchen use. What disturbed us was the thought of coming home to uncooked dinners because the game went into extra innings.

A few days later, Sylvania introduced its line of telesets at a press showing at their Long Island plant. It was the first line of receivers bearing the Sylvania label.

With it, they introduced something new in the line of service agreements which, for the first time, gives set owners an opportunity to recover a portion of their service contract expenditure in cash, or apply it to a second year contract. It's a fairly simple system; and it may very easily catch on as a merchandising gimmick: Each Sylvania contract holder receives a book of coupons, each coupon being good for one service call. Where a radio or phonograph combination receiver is involved, additional coupons for radio service are issued. For each coupon not used at the termination of the year's contract, a refund is made. While the number of coupons issued does not limit any additional service calls which may be required, Sylvania hopes that the system will work to keep nuisance calls to a minimum.

How to run an association. For all of you who have been interested in how a servicemen's organization is formed and run, Howard Sams' Round Robin of August 1st is a must. It contains, in its entirety, the constitution and the Manual of Procedure of the Radio Electronic Technicians Association of Canada, as well as a suggested examination to

be taken by applicants to membership. Taken together, the material constitutes a blueprint which will serve well those technicians engaged in organizational work.

The information which has been collected by the Sams organization is generally not available to the technician looking for it. Having it presented in this easily available form is an opportunity which does not come around often.

Giddyap. Miami police are modernizing thirteen police horses by equipping them with Motorola's "Handie-Talkie" units. Their purpose is to "put the police horse on an equal footing with the radio squad car." Rumor has it that work is even now progressing on ways and means to equip the horses with carburetors (put them on an even more equal footing) and to teach them to talk so that they can make full use of the miniature two-way radios. At present, unfortunately, mounted policemen still have to work the equipment themselves. The whole thing was probably cooked up by a sentimental desk sergeant who loved horses and didn't want to see them gone.

Strong Speaker. Utah Radio Corporation wanted to prove how strong their speakers really were. They took a 3-incher, placed it face down, and asked a 307-pound man to stand on it. That's a big piece of man for a small speaker and a very small speak-

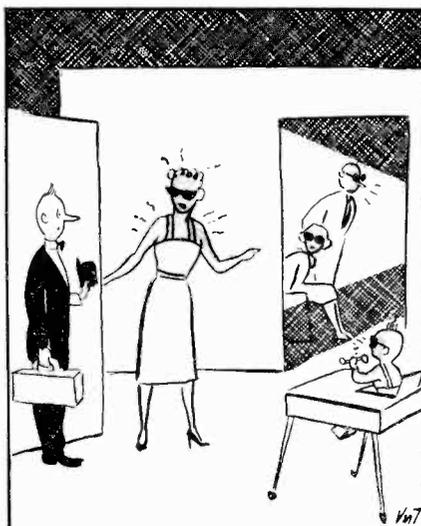
er for such a big man. But the man managed, and the speaker stood up under the weight (they mailed us a photo to prove it), which is certainly an achievement for both.

Refills Make Customers. In connection with a survey we're conducting on the advertising methods used by sales and service organizations, we paid a visit to Rogers Radio Repair around the corner, and had a pleasant chat with the owner. Advertising? He said he wasn't doing any; but by the time we left we had accumulated a few items which we'd like to pass on to you. Roger doesn't advertise in the papers, or even in the classified section of the telephone book. But he has his own methods, call them what you will.

First he has a little Crosley station wagon, completely covered with his name, address, telephone number, and services offered. The info is written in large letters all over the car. It has as much writing on it as a teenager's jalopy, but it is of recent vintage and manages to look much neater. When he drives around in it all over town, people look and stare and remember him.

Then he has some little giveaways which have also proved pretty effective. There is a small 2½ x 4 writing pad (good for keeping grocery lists and stuff like it) which comes in a red imitation leather cover. On it it says: Remember the three R's, ROGER RADIO REPAIR. The interesting part about these pads is that they can be refilled. Now, the pad is certainly a most inexpensive item, yet people keep on coming back for refills. Naturally, when their radios need attention, they know where to go. Roger also gives them an inexpensive ball point pen so they can write on the pad. He's been doing pretty nicely with these techniques.

There's only one trouble which he would like to have solved. People are so attached to their telesets that he can hardly get them out of their houses for servicing; he says his customers get sick if they have to wait three days for the set to be fixed. After they get through pressuring him to get it back pronto, he's ready to take sick himself. How he is going to get the sets out of the home once the good programs start is a problem he'd rather not think about. ♪ ♪ ♪



"I'm afraid you'll just have to show us how to turn down that brightness control again!"

CRO Deflection Systems

→ from page 13

fore the sweep frequency, is determined by the size of C2 and the impedance of V3. In practice, C2 is usually replaced by a number of capacitors, any one of which may be selected. The sweep frequency can thus be varied. Synchronizing signal may be applied to the grid of V2.

Driven sweep operation is possible by application of a sufficiently positive bias to V2 to prevent the continuous sweep. Then a negative potential on the grid of V2, sufficient to momentarily restore the circuit to its normal condition, will initiate the sweep for a single cycle.

X-axis Amplifier

The X-axis amplifier is similar to the Y-axis amplifier described in the previous article. A slight variation in the input stages of the amplifier is worthy of note. The modification includes the addition of a blanking circuit which feeds a pulse to the grid of the cathode-ray tube during the flyback time of the sawtooth generator in order to blank out the fluorescent spot. The operation of this circuit is shown in Fig. 11.

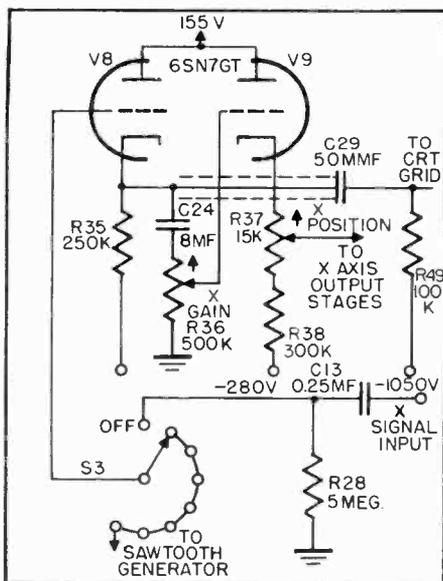
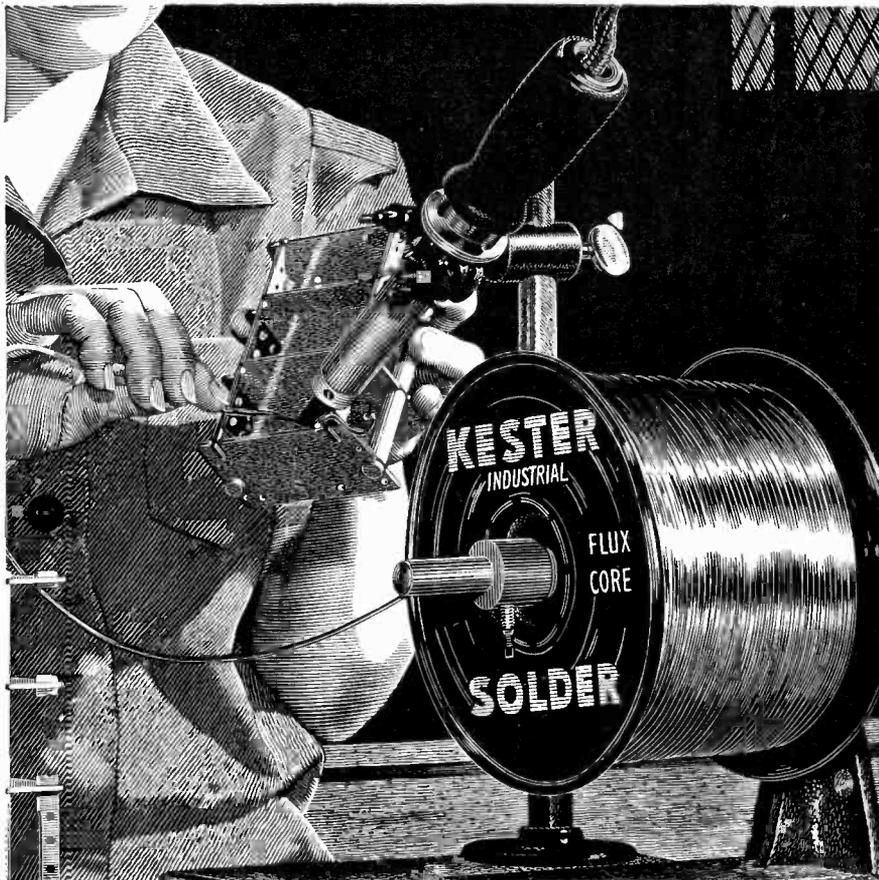


Fig. 11 Schematic diagram of X-axis amplifier: it is similar to vertical amplifier

The X-axis amplifier consists of two cathode followers, V8 and V9. The input to the amplifier is connected to the X SIGNAL INPUT terminal when S3 is in the OFF position and to the output of the sawtooth generator when S3 is in any

→ to following page



KESTER

the Greatest Name in Solder!

THERE is a reason for Kester's tremendous success in the radio and TV fields. A staff of highly-trained technical engineers and a half-century of Kester "know how" are teamed to produce the

finest flux-core solders made.

Use Kester Plastic Rosin-Core Solder for all radio and TV repairs... the solder that is standard for the manufacturer and has been since the early days of radio.

INSIST UPON KESTER FLUX-CORE SOLDERS FROM YOUR JOBBER

Kester Plastic Rosin-Core Solder is available on 1 lb., 5 lb. and 20 lb. Spools, also in the handy "tool-kit" size.



KESTER SOLDER COMPANY

4201 Wrightwood Avenue, Chicago 39, Illinois

FACTORIES ALSO AT NEWARK, NEW JERSEY • BRANTFORD, CANADA



Build YOUR OWN TEST EQUIPMENT

Heathkit

Heathkits are beautiful factory engineered quality service instruments supplied unassembled. The builder not only saves the assembly labor cost but learns a great deal about the construction and features of the instrument. This knowledge aids materially in the use and maintenance of the equipment. Heathkits are ideal for and used by leading universities and schools throughout the United States. Each kit is complete with cabinet, 110V 60 cycle transformer (except Handi-Tester), all tubes, coils assembled and calibrated, panels ready printed, chassis all punched, formed and plated, every part supplied. Each kit is provided with detailed instruction manual for assembly and use. Heathkits provide the perfect solution to the problem of affording complete service equipment on a limited budget. Write for complete catalog.

Heathkit AUDIO GEN KIT \$34.50

Heathkit TELEVISION GENERATOR KIT \$39.50

Heathkit SIGNAL TRACER KIT \$19.50

Heathkit CONDENSER CHECKER KIT \$19.50

NEW Heathkit IMPEDANCE BRIDGE SET \$69.50

Heathkit HANDITESTER KIT \$13.50

Heathkit TUBE CHECKER KIT \$29.50

Heathkit 5" OSCILLOSCOPE KIT \$39.50

Heathkit BATTERY ELIMINATOR KIT \$22.50

Heathkit ELECTRONIC SWITCH KIT \$34.50

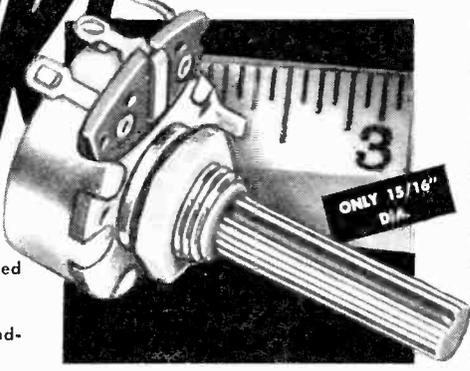
Heathkit R.F. SIGNAL GEN. KIT \$19.50

Heathkit VACUUM TUBE VOLTMETER KIT \$24.50

HEATH COMPANY
BENTON HARBOR, 10 MICHIGAN

EXPORT DEPARTMENT
3 EAST 40th STREET
NEW YORK 16, N.Y.
CABLE - ARLAB - N.Y.

CHECK!



- ★ Smaller — only 15/16" dia.
- ★ With or without switch.
- ★ Features Clarostat stabilized element.
- ★ Tapers. Also with one tap.
- ★ Knurled aluminum shaft, standard.

THE MINIATURE CONTROL THAT "STAYS PUT!"

★ Just the thing for extra-tight spots. Quite a lot smaller than usual carbon controls yet does a full-sized job. And typically Clarostat construction: No-wiggle, no-wobble aluminum shaft; easy-to-solder tinned terminal lugs; velvety-smooth rotation; longest-wearing element; special alloy contact arm; high immunity to humidity; and QUIET! This Clarostat 15/16" control is a honey!

Ask our jobber for
15/16" Clarostat controls.
Try them! Latest catalog on request.

CLAROSTAT





Controls and Resistors

CLAROSTAT MFG. CO., INC. • DOVER, NEW HAMPSHIRE • In Canada: CANADIAN MARCONI CO., LTD
Montreal, P. Q., and branches

CRO Deflection Systems

→ from preceding page

of the other positions. The signal output from V8 is applied through C24 to the voltage divider R36. Resistor R36 is the X GAIN control. It varies the amplitude of the signal applied to the grid of V9. The output of V9 is fed to push-pull deflection amplifiers and thence to the horizontal deflection plates.

When S3 is in a position to connect the amplifier to the sawtooth generator, a sawtooth voltage from the cathode of V8 is fed through C29 to the grid of the cathode-ray tube for blanking out the sweep during the return time. The operation of this circuit is shown in Fig. 12. Capacitor C29 and resistor R49 have a small time constant and constitute a differentiation circuit. A differentiated sawtooth wave is a

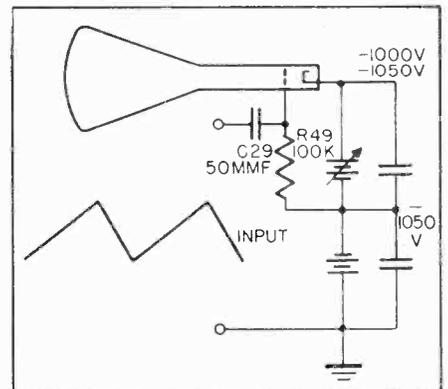


Fig. 12 Schematic diagram of blanking circuit, blanks out sweep during return time

rectangular wave. The linear change of voltage of the sawtooth makes C29 charge with a constant current. This current, flowing through R49, produces a constant voltage drop. When the charging current reverses direction, a constant voltage drop in the opposite direction is produced. During the rapid fall of the sawtooth, a large negative voltage appears across R49 and drives the grid below cutoff during the time that the spot is returning from the right to the left side of the screen.

Requirements for F-M and TV Servicing

For f-m and television servicing, the horizontal deflection system should meet the following requirements:

1. For observing the vertical and horizontal sync and sweep signals in a television receiver, the oscillograph should have a sweep range from about 10 cycles to 30,000 cycles.

2. Recurrent sweeps are adequate.

3. An X-axis amplifier should be provided for coupling the sweep voltage from wobulator to the horizontal deflection plates.

4. The X-axis amplifier should have good low-frequency response in order not to distort the 60-cycle sweep voltage from the wobulator.

5. The sawtooth generator should provide linear sawtooth signals so that the oscillograph does not introduce distortion of the incoming signals when the instrument is used to examine waveforms in the receiver. The linearity of the oscillograph sweep can be checked by applying a sine wave to the Y-axis input terminals and setting the sweep to a low enough frequency to provide several cycles on the screen. In the oscillograms of Fig. 13, A

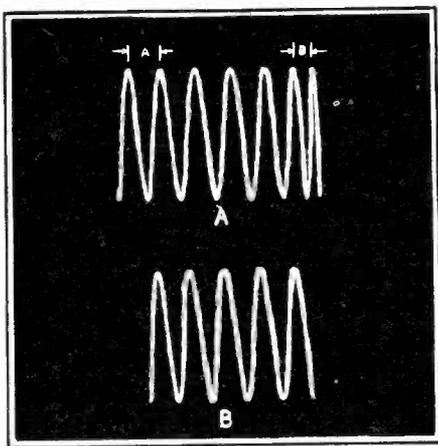


Fig. 13 Top, distortion caused by non-linear sawtooth voltage. Below, same signal plotted on a time base which is linear

represents the appearance of a sine wave signal as plotted on a non-linear time base, while B shows the same sine wave plotted on a linear time base. Note that in A distances A and B, between the first and last peaks, are unequal. In measuring linearity of sweep, not less than five cycles of the sine wave should appear on the screen.

6. The oscillograph should have stable synchronization over the entire range of sweep speeds. This may be checked by feeding signals of varying frequency and amplitude from an oscillator to the oscillograph and operating the sync and sweep speed controls of the instrument.

In the next article we shall complete the discussion of the oscillograph by considering power supply circuits and other features which are important in the selection of the equipment. ✓ ✓ ✓



**BEFORE YOU
ATTEMPT REMOTE
INSTALLATIONS -**

check
with

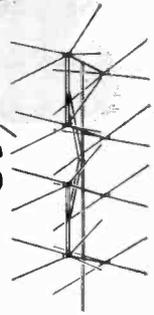
telrex

because

TELREX CONICAL "V" BEAM ANTENNAS

are performance-proved

**Up to 200 miles over land and up to
300 miles over all-water TV paths**



For both remote or high signal areas, Telrex Conical Window Mounts, Stacked Bi-Directionals and Stacked Arrays are the antennas dealers and service men can depend upon for consistently good results. Each type is thoroughly engineered in the laboratory, service-tested in the field and built for long service life. Using Telrex Conical Antennas on every installation is one sure way to better, brighter pictures and a minimum of service call backs. Ask your distributor for catalog or write direct outlining your antenna problems.

**TELREX ANTENNAS COVER CHANNELS 2 TO 13
AND FM—NO HIGH FREQUENCY HEAD NEEDED**

**TELREX
MODEL 1X-BD**

Bi-Directional Hi-Gain
Conical "V" Beam
Broad Band Full Audio
and Video Band Pass
Low Vertical Angle
Non-Varying Center Impedance
2 to 1 Front to Back Ratio
Uses 72, 150 or 300 Ohm
Transmission Lines
Universal Mounting Clamp

TELREX MODEL 2X-BD

Bi-Directional Stacked
Conical "V" Beam
Low Vertical Angle
Extremely High Signal to
Noise Ratio
Constant Center Impedance
Uses 72, 150 or 300 Ohm
Transmission Lines
Universal Mounting Clamp

**FOR THE ULTIMATE IN BI-
DIRECTIONAL GAIN, USE
TELREX MODEL 4X BD.**

TELREX MODEL 4X-TV

2 Bay Uni-Directional
Conical "V" Beam
Broad Band—Full
Audio and Video
Band Pass
Low Vertical Angle,
Minimum Reflections
Maximum Signal
to Noise Ratio
4 to 1 Front to Back
Ratio All Frequencies
Non-Varying Center Impedance
Universal Mounting Clamp

**TELREX
SUPEREX**

With antenna
angle arm adjust-
able through 180°
azimuth arc.
For high signal areas.
Window, wall or attic mounting
with flexible orientation possible. 2-piece
arm is provided. Short arm is useful for parallel-
to-wall orientation. Second arm permits other than
parallel orientation.

ALL TELREX ELEMENTS ARE MADE OF LASTING DURAL

telrex·INC

ASBURY PARK 9, NEW JERSEY

AMERICA'S
OUTSTANDING
TELEVISION
BEAM

FOR
DEMONSTRATING
& TESTING AUTO RADIOS
from AC LINES

ATR

"A" BATTERY ELIMINATORS



for DEMONSTRATING AND TESTING AUTO RADIOS

New Models . . . Designed for testing D. C. Electrical Apparatus on Regular A. C. Lines. Equipped with Full-Wave Dry Disc Type Rectifier, Assuring Noiseless, Interference-Free Operation and Extreme Long Life and Reliability.



AUTO RADIO VIBRATORS

A Complete Line of Vibrators . . . Designed for Use in Standard Vibrator-Operated Auto Radio Receivers. Built with Precision Construction, featuring Ceramic Stack Spacers for Longer Lasting Life.

NEW MODELS NEW DESIGNS
NEW LITERATURE
ATR "A" Battery Eliminator, DC-AC Inverters, Auto Radio Vibrators

See your jobber or write factory

AMERICAN TELEVISION & RADIO Co.

Quality Products Since 1931

SAINT PAUL 1, MINNESOTA-U.S.A.

Video I-F Alignment

→ from page 15

should be checked to make sure that this resistor does not have a high negative voltage across it. If, as in some sets, this resistor has a minus potential across it, it is necessary to make sure the scope or VTVM are not grounded in common with the receiver chassis. Also, care should be taken not to touch the meter case, because shock may result.

When a modulated signal is used for aligning, sound bars will appear on the screen of the picture tube, and these can be used as a further check during the alignment process (see Fig. 2).

Trap Alignment

Regardless of which type i-f is to be aligned, the traps should be aligned first, using a well-calibrated signal generator at the input and a v.t.v.m. across the video detector load resistor. Each trap is adjusted by setting the signal generator to correspond to the particular frequency of the trap, then tuning the trap for minimum output as indicated on the v.t.v.m. The use of an unmodulated signal during this procedure will assure a more accurate adjustment, since the band-width of the signal from any generator is greater during modulation by an audio tone. The traps should be adjusted as accurately as possible, otherwise they may cut the gain of the video i-f band-pass response by riding in on the i-f frequency.

Alignment of Stagger-tuned I.F.'s

Once the traps are adjusted, the same signal generator can be used for alignment of the i-f stages. The signal generator is set to correspond to the frequency of each individual stage, and each stage is then adjusted for maximum output on the v.t.v.m. at the detector load. It will not be necessary to inject the signal directly into, or prior to the circuit under test, unless the stages are badly out of alignment. If the set has not been tampered with, the injection of the signal into the mixer grid will be sufficient. Fig. 3 shows a typical development of a stagger-tuned i-f response curve, with the

heavy lines showing the individually tuned stages, and the dotted line the over-all response.

Thus, during alignment, the first curve (21.8Mc) would be secured by injecting this frequency into the mixer grid and adjusting the corresponding circuit for maximum output at the detector. In similar fashion, all five stages are tuned for maximum, which automatically assures the type of response curve indicated by the dotted line.

Alignment of Overcoupled I.F.'s

For alignment of overcoupled i-f stages, the sweep generator output is coupled to the mixer grid, set to sweep about the i-f frequency, and with the use of a scope at the detector load resistor, the over-all response curve is observed. By use of a marker generator, pips will show up on the response curve, indicating exact location of various frequencies.

If a separate signal generator is used as a marker, it is preferable to inject this in a stage before the sweep generator, so that the two units will not unduly load down the circuit. (Fig. 2.) The marker generator can be attached to the antenna terminals and thus provide adequate isolation between it and the sweep generator. If the sweep generator has provisions for obtaining a portion of the sweep frequency, it can be used to trigger the scope sweep. The sweep frequency is injected into the horizontal input terminals of the scope, with the internal sweep shut off. A sync control on the sweep will aid to give a stationary pattern on the scope screen. Fig. 4 shows the response curve necessary for the i-f stages, with the sound and i-f frequencies varying for particular

→ to page 30

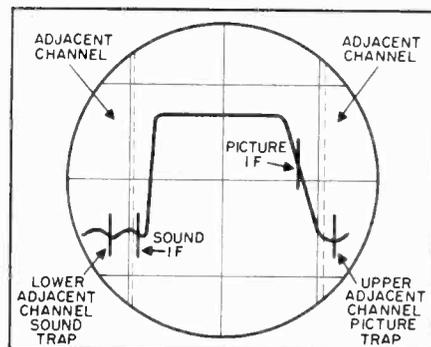


Fig. 3 Typical stagger-tuned response curve. Dotted line shows overall response, solid lines show response for individual stages

RCA launches new Service Campaign

Sales and Service organizations offered campaign material to get 10,000 neglected radios into shop for repair or replacement

WITH an estimated 10 million radio receivers now needing repairs in homes all over the country, the RCA Tube Department has prepared a "Radio Repair and Tune-Up" merchandising campaign for use by radio sales and service organizations. The new RCA campaign is aimed directly at the consumer and strongly slanted to emphasize the fact that, for relatively low cost, the average noisy or inoperative radio can be restored to first class condition.

Purpose of the campaign is to stimulate new business for the radio service dealer by overcoming the average consumer's impression that radio repairs may be too expensive. In addition, the campaign provides the sales and service organization with the ready-made means to merchandise and price its services effectively and professionally.

Built around an eight-point "Radio Repair and Tune-Up Special," the campaign lists eight definite services and advertises the total price. To meet the requirements of individual dealers, provision is made for imprinting prices on the advertising material to order.

Covering all requirements for a comprehensive local promotion, the new campaign ranges from direct-mail to window display material. Included are a colorful five-piece display kit, a three-piece direct mail campaign, a window streamer, newspaper ad mats, and several radio spot announcements.

Pricing Kit

In addition to the new Radio Repair and Tune-Up campaign, a pricing kit has been made available to enable service dealers to price clearly and attractively their window and counter merchandise, such as radios, telesets, and appliances. Consisting of numerals, dollar signs, and plastic bases, each kit contains six sets of numbers and bases. Identification slips are also provided to note such info as model number, terms, etc.

The material for the campaign and the pricing kits are now available from distributors of RCA, RCA Victor, and Cunningham tubes. ✓ ✓ ✓



AMPHENOL **INLINE** ANTENNA

**SINGLE BAY
INLINE
TV ANTENNA**
Model No. 114-005
With Twin-Lead
Model No. 114-009
Without Twin-Lead

**TWO-BAY
INLINE
TV ANTENNA**
Model No. 114-302
No. 114-301 is a conversion
kit which builds a single bay
into a stacked array.

U. S. Patent No. 2474-480

*"Buy Your Eventual
Antenna FIRST"*

PROVED SUPERIORITY OF PERFORMANCE IN LABORATORY MEASUREMENTS AND FIELD TESTS

It's cheaper to provide the Best Picture — that's what people want and expect from their TV sets. Giving them the best, first, saves a lot of call back time.

You're in with an Amphenol **INLINE** Antenna — You're in the good graces of the set owners — you're in at greater profit — you're in for all time. It's too expensive to make installation mistakes — it's unprofitable to have to change antennas as new transmitters are added — or to be called for orienting against ghosts — be right the first time, see that your customers "Buy their Eventual Antenna FIRST".

Leading Distributors Feature the

AMPHENOL **INLINE** ANTENNA

Video I-F Alignment

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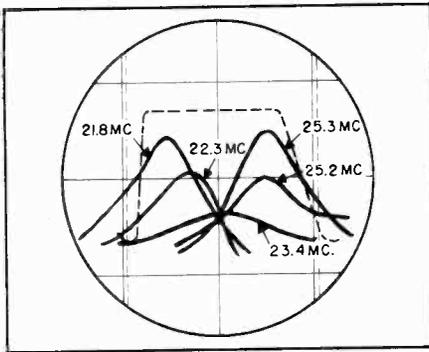


Fig. 4 Typical i-f response curve shown by oscilloscope when using a sweep generator

manufacturers. The picture i-f frequency should be on the slope of the curve as indicated for best response. This is to cut down on gain in this section due to the added gain secured from the vestigial (remnant) of the lower side-band which is transmitted.

As with alignment procedures on a-m and f-m radios, alignment of television i-f's should always be done by using as small a signal from the generator as possible. As the gain of the i-f stages increases during alignment, cut down on the signal output from the generator and not by adjusting the controls of the receiver. If the signal from the generator is too high, over-load occurs, and accurate alignment becomes difficult. Use only a sufficient signal to get the visual indication necessary.

The foregoing procedures summarize the general processes of television alignment, and more detailed, step-by-step information is available in manufacturer's service notes if trouble should be encountered. The serviceman, working on various models should however, have the fundamentals so well grounded that he can align in a minimum of time, and without constant referral to detailed procedures. Only in this way will time be saved—for time means profit to the busy technician. ✓ ✓ ✓

New Column in December
**MERCHANDISING
CORNER**
Don't Miss it!

30

RD-M Survey

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one. While it is true that the expense of newspaper ads makes this form of promotion inaccessible to many a small shop owner, the fact that direct mail is a relatively inexpensive proposition and has been found effective by the larger stores, would indicate that this method of advertising bears investigation by the one-man organization.

Customer recommendations were considered by both *large* and *small* shops as first in importance as effective advertising. Small shops lean more heavily on window display and special services than the larger organizations; and in most other respects the preferences of these two types coincide.

Age of Business

The replies to the questionnaire were also broken down into three groups representing varying lengths of time the respondents had been in business. The three groups consisted of those firms which had been in business for less than 10 years (*young*), those between 10 and 20 (*middle*), and those who had been in business for over 20 years (*old*). We were interested in finding out how length of experience related to choice of advertising media. The assumption was that the longer a firm had been in existence, the wiser would be its selection of promotion media.

We found very interesting correlations. *Old* firms listed **newspaper ads** in 32% of the cases, *middle* shops showed it in 23%, and only 18% of the *young* organizations made it their preference. All three groups have obviously come to realize the importance of newspaper ads, but the longer you are in business, the more you will realize it.

There is a considerably greater difference when it comes to the question of **direct mail**. 53% of the *old* stores listed it among their most successful advertising methods, but only 26% of the *middle* shops, and 21% of the *young* firms did. These results indicate clearly that shops with the greatest number of years of experience behind them found that **direct mail** was a highly effective method of getting in new business.

Another interesting difference is

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TVI Elimination

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To make certain that the interfering signal has come in through the antenna, or that it has not bypassed the front end, remove the local oscillator tube. The interfering signal should disappear. If not, then the interference is being picked up by the i. f. and the frequency of the interfering signal is exactly that indicated on the calibrated scale. One word of caution: It is entirely possible for the local r-f oscillator in the receiver to generate more than one frequency (harmonics), and it is also possible that the interference is beating with a harmonic, and not with the fundamental local oscillator frequency.

Image Frequency

If there is the slightest suspicion that the interfering signal is an 'image' frequency, then the frequency of the image is very easily found. The image frequency is the frequency of the incoming signal plus twice the i-f. For example, the picture carrier for channel 5 is 45.25 Mc. For a Philco receiver, the picture i-f is 26.6 Mc. The image could come in at 45.25 Mc plus 2×26.6 or 98.45 Mc. A very convenient thing to have at hand is a chart detailing the picture carrier frequency for all channels, and the most common picture i-f frequencies are

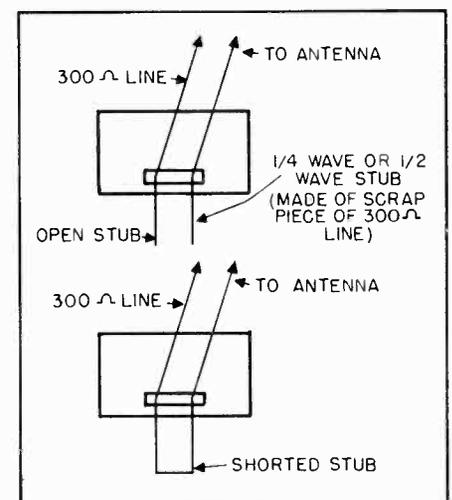


Fig. 4 Some stubs can be used to reduce interference from radio transmitters or image interference from local f-m station

used in the most popular receivers. Calculation of the interfering frequency is then an easy matter.

Remedies

There are a number of cures available when the interference arises from a radio signal. If the interference comes from a neighboring television set re-locate the antenna, make it either higher or lower than other antennas, and use either shielded coax or shielded twin lead. Lead-ins should run down as directly as possible (minimum horizontal runs) and should be twisted about one turn per foot.

Interference from radio transmitters or image interference from local f-m stations can largely be reduced by the use of stubs at the antenna terminals of the receiver, as shown in Fig. 4. Knowing the frequency of the interfering signal makes it an easy matter to calculate the length of the stub. Stubs may be cut to $\frac{1}{2}$ or $\frac{3}{4}$ the wavelength of the interfering signal. To illustrate, let's assume that you have the frequency of the interfering signal to be 100 Mc. Our first step is to calculate the wavelength:

$$\text{Wavelength} = \frac{300}{\text{frequency (in Mc)}}$$

For our sample problem:

$$\text{Wavelength} = \frac{300}{100} = 3 \text{ meters} = 9.83 \text{ ft.}$$

However, this is the length in feet of a full wavelength. A stub that long is inconvenient. A simpler formula would be:

$$L = \frac{4900}{F}$$

where L is the length of the stub (half-wave) directly in inches, and F is the frequency of the interfering signal in megacycles. It is always advisable to make the stub a little longer than required and then remove small amounts until maximum elimination of the interference is noted.

A common method of eliminating this type of interference is through the use of traps, shown in Fig. 5. The antenna wave trap and mixer type wave trap are shown. Traps are usually inserted in the video i-f stages to remove interference caused by audio and video carrier signals from adjacent channels. Where the trouble comes from transmitting stations whose frequencies come right within the range of frequencies of the video section, a high pass filter placed at the antenna input terminals will effect the cure. Most sets have such filters, but if the interfering signal is strong enough, it will ride through to the screen. Place a parallel tuned circuit, resonant at the frequency of the interference, in either side of the transmission line (when using twin lead) or in the hot lead (the underground lead) when using coax. Alternatively, you can place a series circuit right across the input terminals of the receiver. If the interference is due to harmonics of local stations falling in the television channels, an antenna possessing sharp directivity will cure the trouble.

The appearance of the type of interference just discussed may produce slanting dark bars on the screen. Atmospheric noise or random noise produces characteristic light and dark spots known as snow. ✓ ✓ ✓

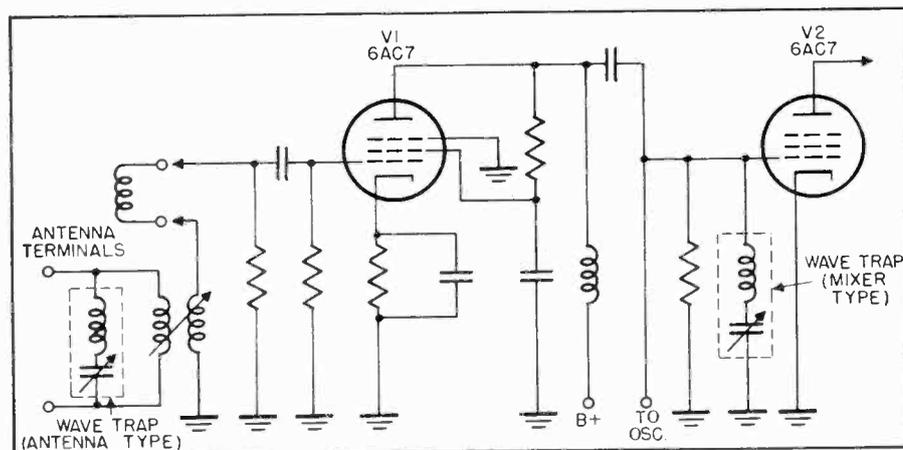
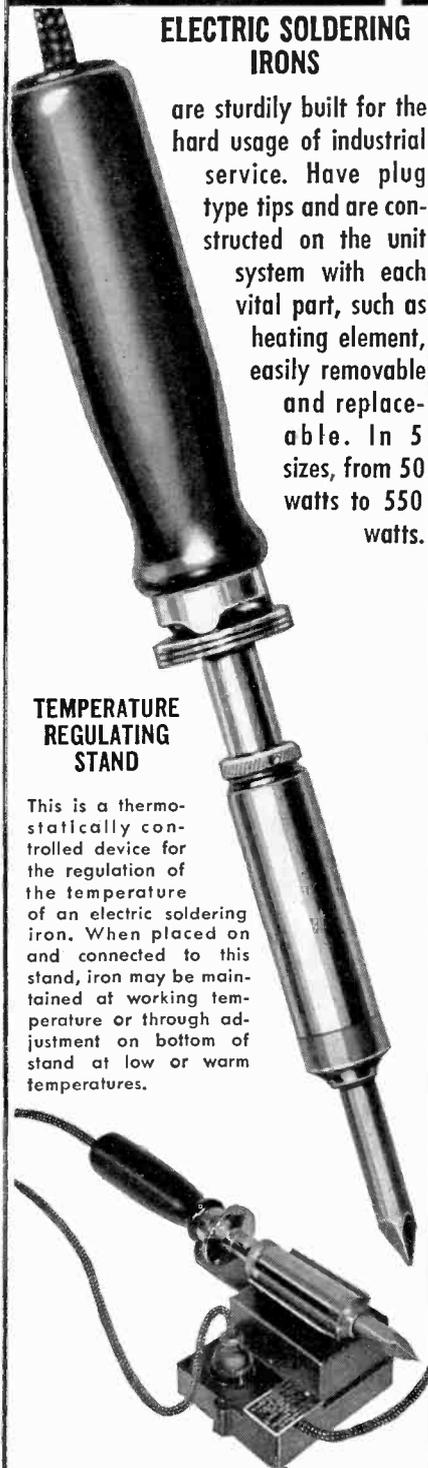


Fig. 5 Wave traps to eliminate interference. Connect antenna terminal type trap right to antenna terminal strip, keep leads as short as possible, tune by adjusting trimmers

American Beauty

ELECTRIC SOLDERING IRONS

are sturdily built for the hard usage of industrial service. Have plug type tips and are constructed on the unit system with each vital part, such as heating element, easily removable and replaceable. In 5 sizes, from 50 watts to 550 watts.



TEMPERATURE REGULATING STAND

This is a thermostatically controlled device for the regulation of the temperature of an electric soldering iron. When placed on and connected to this stand, iron may be maintained at working temperature or through adjustment on bottom of stand at low or warm temperatures.

For descriptive literature write

110-2

**AMERICAN ELECTRICAL
HEATER COMPANY**
DETROIT 2, MICH., U. S. A.

Be Sure...

Rely on these
ERIE RESISTOR
components



Watch for
ERIE CERAMICON listings
in Howard W. Sams
Photofact Folders

Electronics Division
ERIE RESISTOR CORP., ERIE, PA.
LONDON, ENGLAND TORONTO, CANADA

FREE! Send for it NOW!

**ALLIED'S NEW
1950 CATALOG!**

**196 PAGES—
Everything in
Radio and
Electronics**



**GET RADIO'S
LEADING BUYING GUIDE**

Service Technicians and Engineers: ALLIED'S 1950 Buying Guide brings you all the new releases and money-saving values—from the world's largest stocks of test instruments, amplifiers, P.A. systems and equipment, tubes, parts, tools, books and accessories—ready for instant expert shipment. Send today for your FREE new 196-page ALLIED Catalog.

ALLIED RADIO CORP., DEPT. 27-L-9
833 W. Jackson Blvd., Chicago 7, Ill.

Send FREE New ALLIED Catalog.

FREE

Name.....

Address.....

ALLIED RADIO

For Just a Penny

→ from page 20

the names of those who have never bought but whom he hopes to land.

A careful check is maintained by dating the file card whenever a post card is mailed. If four mailings go out to a blue card name without any response, that name is shifted over to the pink card list. If four more mailings fail to produce a sale or an inquiry, the name then goes on a white card. Being an experienced advertiser, he spends the bulk of his penny post card allotment on the hottest prospects—the blue card list. Whenever any card shows a number of mailings without results, it is destroyed.

The amount of money spent on your penny advertisements may vary. You may use a simple message stamped on government cards bought from the post office, or a more elaborate card with illustration. For example, you may buy photographic cards from several national companies that specialize in photographic advertising. These cards are not printed reproductions. Each is an actual photograph. In quantities, they can be purchased for about 2 cents each. (A partial list of firms selling them includes: Copy Art Photographers, Moss Studios, Arrow Photo Service, and Howard Photo Service, all in New York; Kehres Photo Service in Cleveland; and Grogan Photo Company in Danville, Ill.) In addition, many radio manufacturers have offers of postal cards at very low rates. The company charges relatively little for these cards because its name appears on it, and it does get some advertising for itself every time you make a mailing. This is by no means a disadvantage. The appearance of a nationally known company name on a postal card which you mail out will add to your prestige and will often increase the pulling power of your cards.

For a quality look, you can have cards printed on colored stock, and then glue a one-cent stamp to the address side. Specially printed cards can also be of unusual size.

But the simplest, cheapest and most practical penny advertisement you can use is the government postal

card. It is cheapest because for the price of the stamp, you also buy the paper stock and save the time and money otherwise spent affixing stamps.

How to write copy

You can have a message printed, with pictures and text. Or you can do as many highly successful sales and service organizations have done: send a simple typewritten message. This message can be duplicated at very low expense by mimeograph, Ditto, or almost any standard duplicating machine. A public stenographer can handle the job saving you printing costs.

Most penny advertisers have found it a wise practice, however, *not* to use longhand for the message. Longhand, even that of the most legible writer, is never as easy to read as typewriting. If it's hard to read, not many prospects are going to try. That means you'll see lower dollar results.

The advertising message should be kept short, but no important part of the sales talk should be omitted. A postal card has only a limited amount of space and crowding all of this space with copy tends to make the card look illegible. Be terse, but bear down hard on selling your service.

In writing the copy, use a chatty, personalized style. Remember that a penny postal card is like a letter in many respects. It arrives addressed to one person only. So, in your selling, talk to *one* reader only. Make your claims and your selling arguments specific and personal.

For example, instead of saying that "thousands of people" will be satisfied, pleased or even overjoyed, say to the reader that "you" will enjoy these benefits. Talk as you would to a friend—directly and personally.

Don't waste time coming to the point. Say what you want to in the opening sentence. And remember, nothing interests the reader as much as his own personality, welfare, health, wealth and happiness. So when you describe what you have to sell, tell about it in terms of what it will do for the reader.

At the end of the postal card copy, insert what advertising men call an "action hook." This is an appeal to

Eye-Stopper Window Display Announced by Rider

Sales and service technicians are offered novel merchandising idea designed to bring customer into shop

JOHN F. Rider, Inc. has developed a merchandising aid for the sales and service organization which departs from anything connected with radio or television. It's a stamp display.

With dimensions of 14 x 17 inches, the display portrays a genuine stamp and a known forgery, giving the identifying characteristics of the genuine and the means of recognizing the forgery. The photographs of the stamps themselves are about 4 inches high, so that everything can be plainly seen. Two such displays are available each month through Rider jobbers, at no cost to the technician.

The program is aimed to accomplish certain definite goals. The first is to attract attention of the passerby to the window of the store, where it is hoped the owner will place other items of merchandise. Second, the display is intended to make closer contact between the shop and the public. People who are interested in stamp collecting may desire copies of the display. They may ask the shop owner for one. This is face-to-face contact which can be developed into more cordial relations. To satisfy the public's requests, reduced copies of each window display will be furnished to the owner on request. **✓ ✓ ✓**

the reader to act without delay. It is equivalent to asking for the order in person-to-person selling. Any personal sales talk that did not conclude with a request to buy would be doing less than half of its job.

Even if you only say, "do it now," put in that action hook. One good way to make it stick is to make the offer for only a limited time — then the customer has a reason for acting immediately.

Whether you do it simply or whether you devise a special reason for quick action, be sure that the end of you penny advertisement impels the reader to do something about your offer immediately. Make him pick up his phone then and there to give you a ring. Make sure you include your phone number. Make sure, too, that your address is complete. Add a short direction if your shop is located off the beaten path.

Penny postal cards that carry your message to the prospect for a small cent are one of the world's best advertising buys. Many a successful business has been built on penny advertising. **✓ ✓ ✓**

RD&M Survey

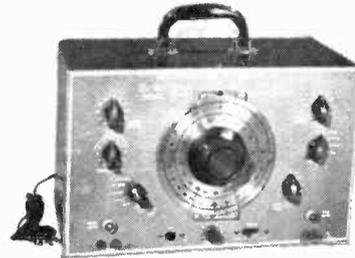
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found in the various estimations which the respective groups placed on the effectiveness of **customer recommendations**. 85% of the *young*, 60% of the *middle* and 51% of the *old* firms included it in their list of most successful advertising media. Apparently, as shops grow in experience, they realize more than the younger firms that reliance on customer recommendations alone is not too effective a promotion policy. Nevertheless, this medium still ranks highest in each group.

It is also worthy of note that there exist differences with respect to **telephone listings**. 57% of the *young* stores, 17% of the *middle* group, and 7% of the *older* firms placed them among their most effective means. This result was also borne out by personal interviews which were made with owners of long established sales and service organizations. On the basis of actual tests made by them, telephone listings were found to have a very small effect on

TV - FM MARKER

SWEEP TEE VEE MODEL TV 75



TV 75 is a sweep generator covering frequencies from 5 to 110 mc and from 150 mc to 270 mc in 4 bands. The sweep width may be varied from 100 KC to 10 mc with adequate linearity in band pass scope checks etc. An accurate marker generator is provided with frequencies from 5 to 250 mc. The marker calibration is read directly on a large colored planetary driven dial and calibrated to an accuracy of 1%. Provisions for using crystal oscillator marker with a switch selecting either of two internal crystals or one external. Blanking enables removal of retrace generally found bothersome in the use of an electro magnetic type of sweep generator. Finished in attractive hammertone grey. Buy it at Your Local Jobber.

\$89.50
NET PRICE

WRITE FOR CATALOGUE 9RM

RADIO CITY PRODUCTS CO., INC.

152 WEST 25th ST



NEW YORK 1, N. Y.

their sales and service volume. Young organizations still place fairly heavy reliance on such listings. It may be assumed, however, that in time they will probably drop most of it.

The results of the survey were broken down into additional subgroups. We were trying to find out whether there were significant differences between advertising methods in urban and rural areas, and for firms which do and those which do not sell TV. It was found that with the single exception of **free shows** (naturally presented mainly by organizations selling TV), there were no significant or conclusive differences between these groups.

Conclusions

The above analysis gives a fair picture of the advertising practices as they appear in the radio sales and service industry today. As time goes by, they may change, but such change will be slow. It is a pretty good assumption that those methods which have been found most successful by our sample, will be generally found to be effective advertising approaches. **✓ ✓ ✓**

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THE RADIO & TELEVISION LIBRARY

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The complete television manual...over 900 pages...over 860 illustrations...in 14 big sections.

Now in this great one volume book—all the essential knowledge of television! Inside the covers of the VIDEO HANDBOOK is presented complete up-to-the-minute information on television arranged for quick reference—in easy to read, non-mathematical style.

The VIDEO HANDBOOK is designed to give you the practical...answers to all your questions on television—the complete, detailed procedures on all phases of television work—step-by-step explanations for everyday problems. This book provides the ready information to make your television education complete.

The VIDEO HANDBOOK will save you time—improve your efficiency and make your work easier. It provides the knowledge that means more profit for you. Every page adds to your background for greater prestige and income. Here is the means for everyone in television—employed and executive—to increase his value to his firm.

This book is more than a source of information and interesting reading—it is an investment in your future in television.

THE RADIO DATA BOOK

the only radio handbook of its kind...over 900 pages...12 sections, each covering a radio subject more completely than any other book!

Used by Engineers, Servicemen, Designers, Laboratory Technicians, Draftsmen, Operators, Inspectors, Amateurs, Experimenters, Research Development, Consultants, Broadcast Technicians, Planners, Installation Men, Military, Marine, Police, Fire, Forestry and Railroad Communications.

ANYONE and everyone in radio and electronics can use this book!

Plan every operation in radio and electronics with the Radio Data Book. This new radio bible will be your lifelong tool...you will use it every day, on the board, at the bench, in the field! Use it for engineering, construction, troubleshooting and testing. The RADIO DATA BOOK will be your invaluable aid in design, experiment and in layout. It will help make your production better, faster and easier. In any and every operation in radio and electronics, you will use the RADIO DATA BOOK!

CONTENTS:

- Section 1. THE 150 BASIC CIRCUITS IN RADIO
- Section 2. COMPLETE TEST EQUIPMENT DATA
- Section 3. TESTING, MEASURING AND ALIGNMENT
- Section 4. ALL ABOUT ANTENNAS
- Section 5. SOUND SYSTEMS
- Section 6. RECORDING
- Section 7. COMPLETE TUBE MANUAL
- Section 8. CHARTS, GRAPHS AND CURVES
- Section 9. CODES, SYMBOLS AND STANDARDS
- Section 10. 50 TESTED CIRCUITS DESIGNED FOR OPTIMUM PERFORMANCE
- Section 11. DICTIONARY OF RADIO AND ELECTRONIC TERMS

THE VIDEO HANDBOOK

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- Section 1. Television: Past, Present & Future
- Section 2. Fundamentals of electronic Television
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- Section 5. Television Antenna Systems
- Section 6. Creating a Television Show
- Section 7. Descriptions of Modern Television Receivers
- Section 8. Installing Television Receivers
- Section 9. Servicing Television Receivers
- Section 10. Television Test Equipment
- Section 11. Building a Television Receiver
- Section 12. Data Section
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MONTCLAIR, N. J.

trade LITERATURE



Bulletin DD337R. A four page illustrated catalog, lists detailed specifications and prices on all Stancor TV components, has been made available. Included are listings for two new horizontal output transformers which have been recently added to the Stancor line. Free on request to G. C. Knoblock, Adv., Mgr., Standard Transformer Corp., 3580 Elston Ave., Chicago 18, Ill.

Dynamotor Catalog No. 649. 24 pages, giving complete mechanical and electrical specifications on all Carter Dynamotors. Performance charts, oscillograph reproductions, and dimensional diagrams. Also published by the company is *Carter Converter Catalog No. 319*, 16 pages, covering the Carter converter line. Both free on request, on company letterhead, to Carter Motor Co., 2644 N. Maplewood Ave., Chicago, Ill.

For TV Technicians. RCA has prepared a handbook on courtesy and proper handling of television customers, containing helpful hints on how to win and hold customer good will. Single copies of "The Care of Television Customers" are available to all radio and television technicians from the RCA Service Co., Camden, N. J.

Speaker Catalog. Cleveland Electronics, has issued a new catalog of its Cletron replacement loudspeaker line, the first complete listing of all Cles-tion speaker types and sizes; contains listing for a-m, f-m, television, auto, and p-a systems. Free copies available by writing to the company at 6611 Euclid Ave., Cleveland 8, Ohio.

Tube Chart. Almost 200 Raytheon special purpose and power tubes with their essential characteristics, are conveniently classified and indexed in this chart. Listings include nearly 50 subminiature tubes. Base diagrams are provided. Free copies obtainable from Radio Receiving Tube Division, Raytheon Mfg. Co., 55 Chapel Street, Newton 58, Mass.

Mallory Catalog #546. The new Mallory catalog contains a number of new features, designed to make its use more convenient, among them: all listings of parts for television application are grouped together, besides being listed under their main classification in the body of the book. The catalog is divided into sections according to major product classification, descriptive information given for each item. List prices appear in a separate, numerical, alphabetical listing.

Vibrator Transformers. A four-page illustrated folder gives the characteristics and dimensions of a new line of vibrator transformers, and includes a handy replacement guide. May be had from Chicago Transformer, 3501 West Addison Street, Chicago 18, Ill.

Soldering Gun Catalog. Four additions to the Weller Soldering Gun line are described in a bulletin recently issued by the company. It shows specifications, tip types, characteristics, and prices. Free from Weller Mfg. Co., 808 Packer Street, Easton, Pa.

What's Television? Crosley has issued a manual which explains in non-technical language how television works. It's called: *What you should know about Television*, and was intended for Crosley dealers and salesmen. You may find some hints in it on how to explain television to a customer in non-technical language. As you no doubt know from experience, this is by no means always an easy task. This booklet, however, does a good job of it, and may have some suggestions for you.

Relay Catalog. Obtainable for the asking is Leach Relay Co. catalog 46A. It's a very easily used book, cross indexed so you can find what you are looking for both by type number and by contact rating. Lists of twenty types of relays. 5915 Avalon Boulevard, Los Angeles 3, Calif.

JOBBER! WHOLESALE! RADIO & TELEVISION TUBES AVAILABLE AT DEFINITELY LOWEST PRICES IN COUNTRY

Following is a list of television tubes available in large quantities. Each tube is individually boxed and tested and also carries a money-back guarantee.

1B3	6X4	6W4
5U4	6BJ6	12AX7
5V4	6BH6	12AU7
6T8	6J6	12BA7
6BA6	6AK5	12AT7
6AU6	6AG5	12S8
6BE6	6BF6	12BF6
6AT6	6BA7	12SN7
6AQ5	6AL5	19T8
6BG6G	6V6	19BG6G
6S8	6SN7	35B5
6C4	6SL7	117Z3

Many other types of radio and television tubes available. Write for complete information.

All inquiries from the State of Indiana should be forwarded to the ESSE RADIO CO., 40 W. South St., Indianapolis 4, Ind.

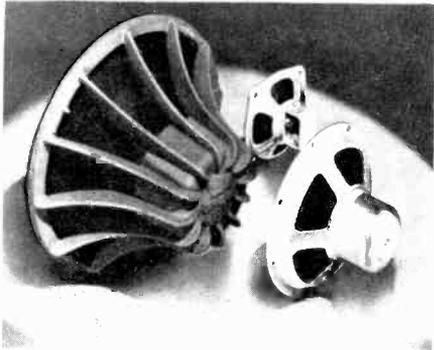
NO RETAIL ORDERS
ACCEPTED

NEW JERSEY RADIO AND TELEVISION TUBE COMPANY

715 ELIZABETH AVENUE
ELIZABETH 4, N. J.
TEL. ELIZABETH 2-5180

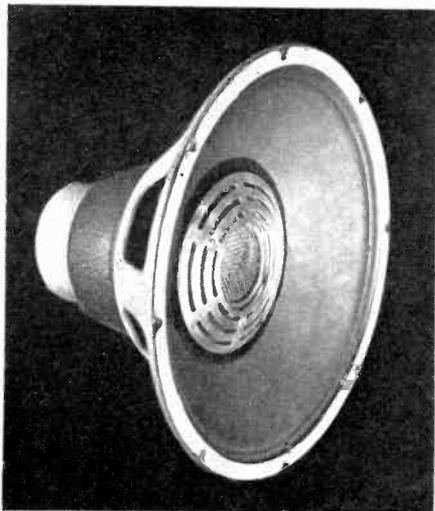
the INDUSTRY *Presents*

SPEAKERS



NEW SPEAKER LINE

The new Hi-Fidelity speaker line introduced by Permoflux ranges from 6" to 15 1/2". The speakers are low-distortion, wide range, single direct radiating, and cover from 40 to 12,000 cycles. According to the manufacturer, the optimum diaphragm material specifications and contours have been determined and combined with special acoustical and mechanical damping to produce smooth diaphragm radiation transition through the extended frequency range. Resonance and performance stability have been obtained through the use of a special edge damping compound formula. For further details, write Permoflux Corp., 4900 West Grand Ave., Chicago, Ill.

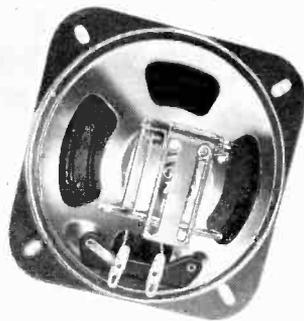


OPTICAL SPEAKER

A new principle in speaker design has been announced by Jensen. It's the application of optical lens prin-

ciples to loudspeaker manufacture, and has been used in the production of its new model H-510 speaker.

The speaker employs a direct radiator low end with a separate high freq. horn and compression driver for the high channel. Presence has been enhanced by attaining a wider angle polar pattern in the extreme high-frequency region, where most simple and subdivided horns become undesirably directional. This was achieved by using the acoustical equivalent of the optical diverging lens. As in optics, the acoustic lens with its off-set circumferential slots and central openings, permits a controlled time delay by progressively increasing the acoustic ray path from the center to the edge of the lens. The result is a spherical wavefront maintained out to very high frequencies. This yields a polar pattern that is approximately uniform over an unusually wide angle. Jensen Mfg. Co., 6601 South Laramie Ave., Chicago, Ill.



FIVE-INCH SPEAKER

A new five-inch PM speaker and universal chassis mounting brackets for all 4, 5, and 5 1/4-inch G-E speakers have been announced. The new speaker is designed specifically for service replacement and is available with two magnet weights, 1.3 and .68 ounces. Both models have VC impedance of 3.2 ohms and a maximum power output of 4 watts. The mounting brackets are designed to reduce installation time and produce better looking jobs. They are supplied with the above speakers without additional cost. Further information is available from G-E Receiver Division, Electronics Park, Syracuse, N. Y.



DUO-CONE SPEAKER

An outstanding event in speaker design development has been RCA's announcement of a new 15-inch speaker which incorporates many features of the well known LC-1-A model, developed by Dr. Olson, shown in photo.

The new speaker, model 515SI, is a duo-cone speaker of the permanent magnet type. It provides high sensitivity between 40 and 12,000 cycles and can handle 25 watts input. Unique features of the speaker are its magnet structure and vibrating system. The latter consists of a dual cone, each section of which is driven by its own voice coil operating in its own air gap. Both air gaps are excited by a single, 2-pound Alnico V magnet. The two cone sections are mounted in a single housing in such a way that the sound pressure from each cone emanates from approximately the same conical surface. Separate voice coils drive each cone section. The small cone section does not vibrate at the lower audio frequencies because its inner suspension is very stiff and its outer suspension to the large cone section is very flexible. Over the range of cross-over frequencies, centered at about 2,000 cycles, both sections vibrate as a single cone. Thus the speaker avoids cross-over interference characteristics and a multi-element cross-over network is not needed. The magnetic structure consists of a single magnet arranged with pole pieces and yoke so that the magnetic paths form a bridge network to provide each air gap with equal flux density. The directivity of the 515SI is approximately uniform over the entire frequency range within a total angle of approximately sixty degrees. The speaker is intended primarily for use in equipment such as high-quality radios and television receivers. Available from RCA parts distributors.

TEST EQUIPMENT



MICROVOLT SIGNAL GENERATOR

Model 292X signal generator is an instrument which, according to the manufacturer, is the only popular priced microvolt generator available to cover both upper channel TV and mobile band frequencies on fundamentals. The range it covers on fundamentals extends from 125 kc to 220 Mc. The major use of the instrument will be in the coverage of mobile band frequencies, but it will also find application in a-m, f-m and television servicing. Its accuracy is 0.05%. Other features include: modulated and unmodulated output from 1 to 100,000 microvolts, cast aluminum attenuator for minimum signal leakage, decibel meter, self-contained crystal for oscillator circuit, and others. For complete info, write H. D. Johnson, Hickok Electrical Instrument Co., 10634 DuPont Ave., Cleveland 8, Ohio.



SIGNAL GENERATOR KIT

A new r-f signal generator in kit form has been developed by EMC. It covers a range from 150 Kc to over 30 Mc on fundamentals, and over 100 Mc on harmonics. Provision is made for external modulation. A feature of the instrument is that all coils not in use are automatically shorted out. It uses an electrostatically shielded transform-

MODEL 209A



HICKOK Volt-Ohm-Capacity MILLIAMMETER

New

- Peak-to-Peak Voltmeter
- 1200 Volt A.C. Range
- Zero-Center D.C. Scale
- Large 9" Meter

THE HICKOK ELECTRICAL INSTRUMENT CO.
10634 DUPONT AVE. • CLEVELAND 8, OHIO

SEE YOUR JOBBER OR WRITE FOR COMPLETE INFORMATION TODAY

Coming ... In Our January Issue ...

The RADIO DISTRIBUTION And MAINTENANCE MODERN BENCH DESIGN FOR 1950!

**BUILD IT YOURSELF!
COMPLETE WORKING PLANS!
COMPLETE LIST OF MATERIALS!
LOW COST!
EASY TO CUT AND ASSEMBLE!**

For efficient service work and for added eye-appeal to your service shop this new modern bench design is a must. RADIO DISTRIBUTION and MAINTENANCE magazine has developed this new design after comprehensive research and time-study into the needs of today's television and radio servicing. The result is an ultra-modern service bench incorporating motion saving features—increased production facilities—efficient tool location—replacement part storage—ample portable test equipment stations—built-in permanent test equipment stations—increased space and working facilities for large television chassis—and many other time-and-money saving features.

This bench is designed for easy construction at low cost and will be a handsome, durable installation for your shop.

So don't miss the January issue—if your subscription is about to run out, renew it! If you are not a subscriber now—send in your order today (see your jobber for special subscription offer and for single copies).

RADIO DISTRIBUTION & MAINTENANCE

Montclair, N. J.

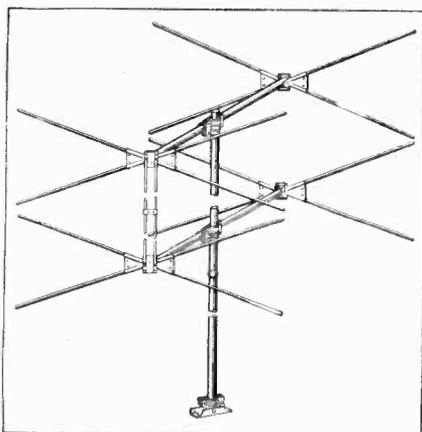
Subscription \$3.00 per year — \$5.00 2 years

er for 115-volt 60-cycle operation. For complete instructions on this model, 500K, including free catalog, write to Electronics Measurements Corporation, 423 Broome Street, New York 13, N. Y.

ANTENNAS

INDOOR TV ANTENNA

There have been many indoor TV antennas, but this one, called Telestar, is different in that there are no adjustments. Instead of the usual adjustable V-shaped antenna, the Telestar has one V-antenna for low band reception and another one for high-band reception. Catalog number 114-024, Phenolic Corp., Chicago 50, Ill.



LAZY-X ANTENNA

This is a modification of the Taco V-type antenna, introduced in 1940. Two reflectors have been introduced for each antenna to increase the front-to-back ratio, and to increase overall gain. For primary service areas, it may be used as a single antenna and for fringe areas as a stacked array. An additional high-band reflector for each antenna will increase gain on channels 11-13. The antenna is designed for receivers having input impedance of 300 ohms. Technical Appliance Corporation, Sherburne, N. Y.

PRE-ASSEMBLED ANTENNA

One man (not two) can install the Ward TVS-47 antenna in from eight to nine minutes. That's what Ward Products Corp. claims; and they have taken films of actual installation work to substantiate the claim. The model consists of a combination low-band stacked folded dipoles and reflectors and high-band stacked folded dipoles and reflectors. The high band section and the low-band section can be oriented independently of each other. The antenna is completely pre-assembled at the factory. Ward Products Corp., 1523 45th Street, Cleveland 3, Ohio.

In Selling TV it's Service that Counts

→ from page 19

days, and the like, will aid in clinching the sale.

The second situation arises when the serviceman initiates the sale. Again, having entrée gives a tremendous advantage. Lou (or his technicians) carries some items in his truck for demonstration purposes, and has sold a number of record player attachments while on service calls. Where there is no phonograph attachment, he mentions the availability of the new RCA 45-rpm, and adds that he happens to have a model in the truck, which he then demonstrates. The selling technique is otherwise the same as when the customer initiates action.

Since the purchase of television receivers involves a major outlay, most people have to be sure of satisfaction before they will buy. Lou has established, through the years, a reputation for good service and integrity in business affairs, so that most customers place explicit trust in his opinion. He has made almost all his t-v receiver sales to old service customers.

He has also found that people who have bought their sets in appliance stores without the provision for proper service sing his praises the loudest. They come into his shop and complain that they bought the receiver from a place either giving no service at all, or else providing service which was both slow and unsatisfactory. Their comments invariably are to the effect that had they known, they would have made their original purchase from Lou. They generally become very faithful customers of his.

Installation Policies

Aside from the fact that he and his staff are excellent technicians, Sound Radio & Electronics features speedy service, almost all calls being attended to as they are received.

Does he write yearly installation and service contracts? In most cases yes. He prefers contracts to other arrangements because they make for more satisfied customers. The client has more faith in buying a receiver when he is assured of prompt service if the need arises.

The contract which is written by the firm is its own, and does not correspond to any form stipulated by a manufacturer. Lou has found the rates of contracts written by the manufacturers too low for profitable business; and he has also found that his customers are willing to pay the higher prices, knowing that the service they will receive will be entirely satisfactory.

The firm's contract covers all complaints, and places no limit on the number of calls. It includes a reorientation of the antenna for specific interference and for the reception from new stations having gone on the air since the original installation. In cases of removal of the owner to a different location (a rare phenomenon these days), and in cases of structural alterations and the like, the firm furnishes the materials and service required at the then prevailing rate and continues the maintenance of the receiver through the unexpired portion of the one-year period. This last provision is particularly good business. The tele-set owner realizes that if he moves and does not have the firm provide re-installation, he will lose the contract. As a result, even those families who leave the neighborhood are encouraged to remain clients of the firm.

Lou's experiences with recall have been encouraging. The times have been very few when he has been called to look at a receiver which was working properly but which the owner just thought he'd get checked because he had a party coming up that evening. It is again confidence in his ability as a technician and integrity as a business man that is responsible for the fact that he has to spend only little of his time in "wild goose chase" calls.

At the expiration of the one-year period he calls up the owner and suggests a renewal of the contract. Most of them renew. Those who have given him particular trouble during the year do not get such a call; and if they come into the store to get a renewal, are generally discouraged from doing so.

Lou averages about 300 installations a year, which is the amount he can comfortably handle with his present facilities. Expansion of the business is entirely dependent on an increase in facilities.

In Radio and Television Tube Sales

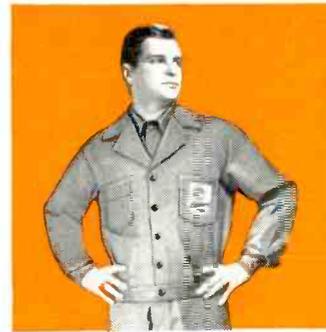
1949 IS A G-E YEAR!



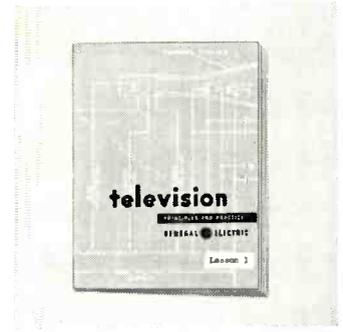
The G-E Pocket Office turns your job-time into more dollars by making cards, forms, and records available in convenient form.



TECHNI-TALK—G. E.'s down-to-earth service magazine edited by practical men for practical men—assists you in building repair business.



G. E.'s new shop garments—smart, serviceable—are a big hit with tube dealers and repairmen everywhere.



The General Electric TV-service course helps you profit from television's great new market for tubes, parts, and service.

and now... **THE HANDY G-E TUBE PULLER!**

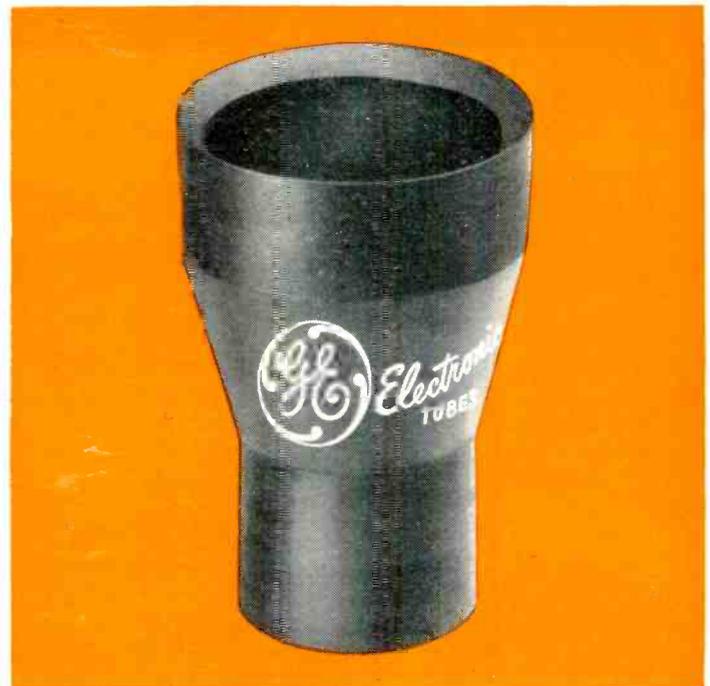


Latest of a series of helps that speed your work, increase your sales, and upgrade your profits, the new G-E tube puller cuts time on the job materially. Now you'll find it quick and easy to remove tubes without the risk of

burns, shock, or cuts from fractured glass.

Regular glass types, metal tubes, 7- and 9-pin miniatures—all yield to this universal device, which smoothly extracts tubes no matter how firmly wedged in their sockets. The puller is made of heavy rubber—your fingers are fully protected and insulated. It's simple to use; long-lived.

Ask your G-E tube distributor about this ingenious tube puller—how to obtain one . . . fast! Inquire, if you haven't before, about the other aids to sales mentioned on this page; also, about the folder describing the many G-E advertising helps that are ready to go to work for you. Stock the tubes that are easy to sell because you get more practical help in selling them . . . G-E tubes! *Electronics Department, General Electric Company, Schenectady 5, N. Y.*



You can put your confidence in—

GENERAL ELECTRIC



181-HA7



Sales Stimulators Like These Are Pulling in Profits for RAYTHEON Bonded ELECTRONIC TECHNICIANS



Wherever Service Dealers are riding the Raytheon "Bond" Wagon, volume and profit are riding high, too. The bigger and better RAYTHEON Bonded ELECTRONIC TECHNICIAN Program has a complete line of brand new displays, decals, mats, mailing pieces, shop and sales aids specially designed to create customer confidence and stimulate sales. Most of these hard-hitting sales tools are yours for the asking — if you can qualify as a RAYTHEON Bonded Technician. The Bond costs you nothing — but it pays big dividends.

Better ask your RAYTHEON TUBE DISTRIBUTOR whether you can ride the "BOND" Wagon to bigger business.

ASK YOUR RAYTHEON TUBE DISTRIBUTOR for this presentation. It gives you the complete "Bonded" story and shows you why you can't afford to pass up this free Raytheon "dividend".



The Raytheon Bantal Tube simplifies your tube stock without loss of sales. Eight fast-moving Bantals replace sixteen equivalent GT and metal types. A new and better tube at no extra cost! Ask your Raytheon Distributor for Raytheon Bantal Tubes.

RAYTHEON
MANUFACTURING COMPANY
Radio Receiving Tube Division.

NEWTON, MASS. • CHICAGO, ILL. • ATLANTA, GA. • LOS ANGELES, CAL.

RADIO RECEIVING TUBES •
CATHODE RAY TUBES • SPECIAL
PURPOSE TUBES • SUBMINIATURE
TUBES • MICROWAVE TUBES