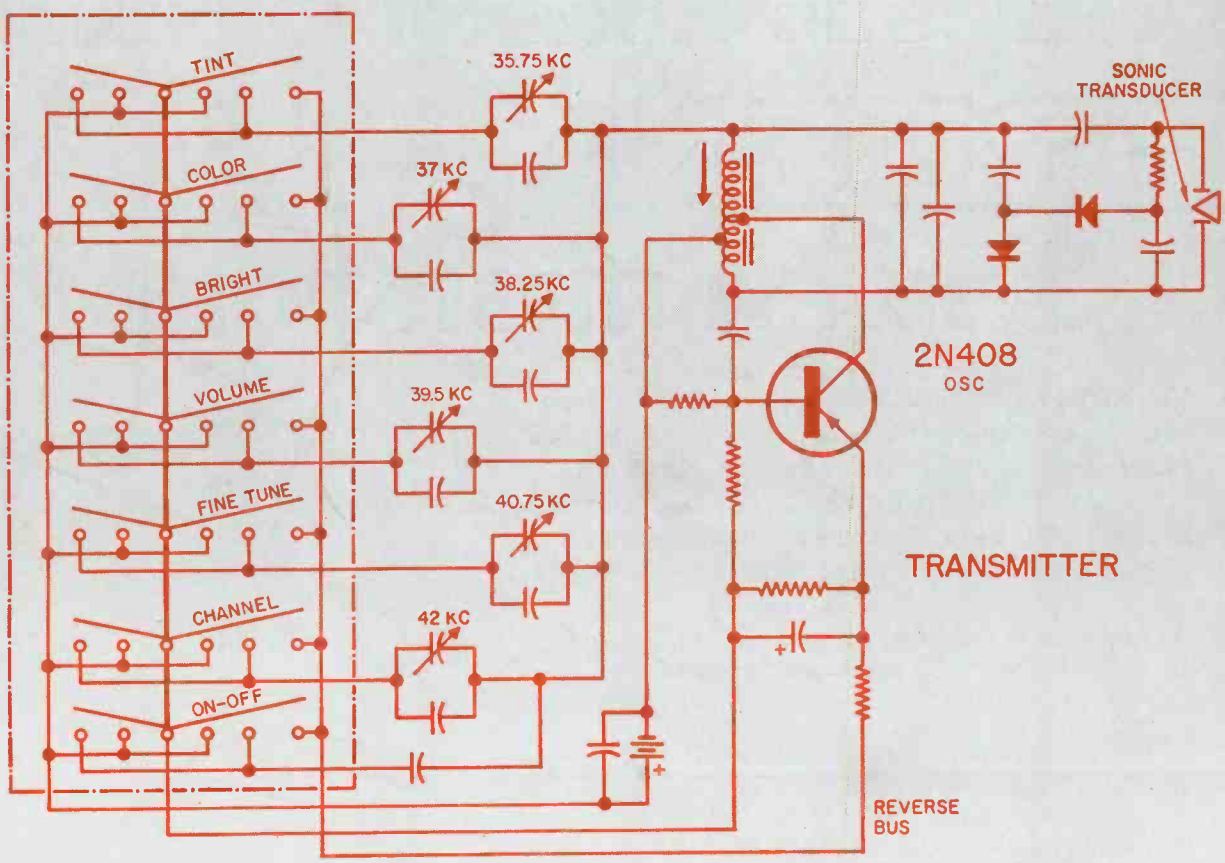
OCTOBER, 1958

COLOR TELEVISION

SERVICE

THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE



Transmitter of wireless pushbutton station for remote control of color TV set.

See circuit analysis, this issue.

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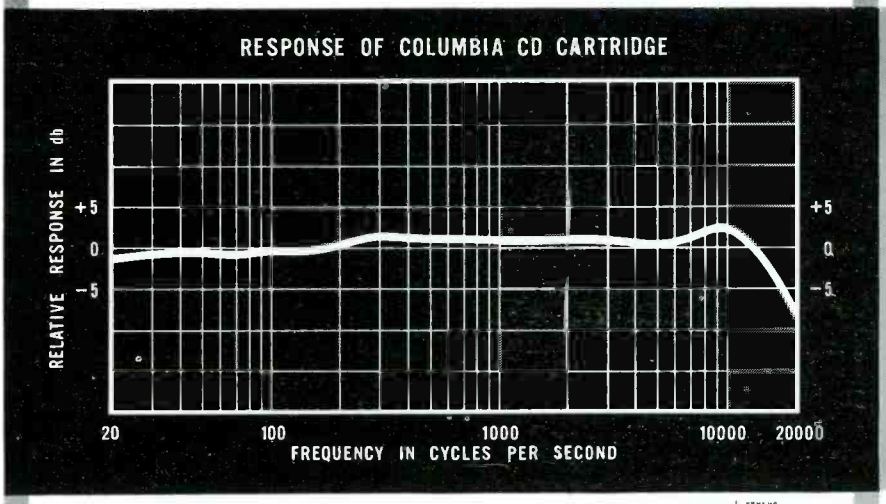

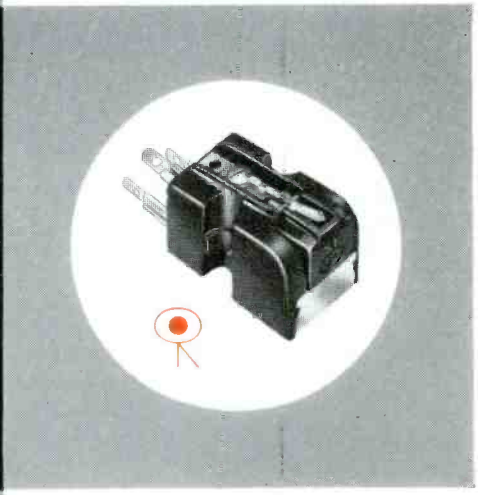

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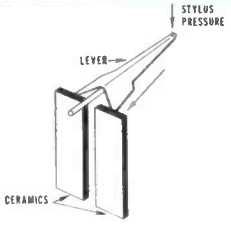

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Vol. 27 No. 10 October, 1958

27th YEAR OF CONTINUOUS PUBLICATION

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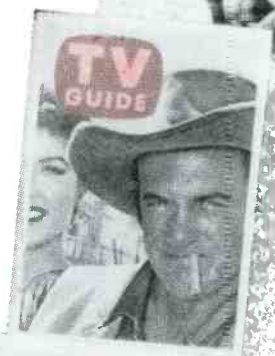

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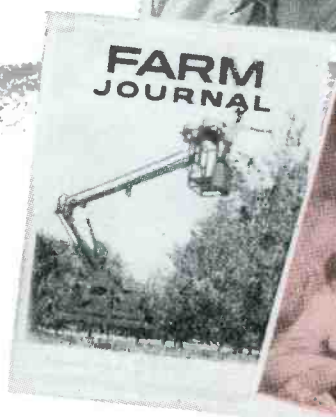

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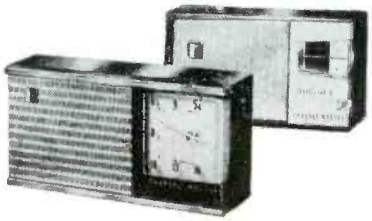

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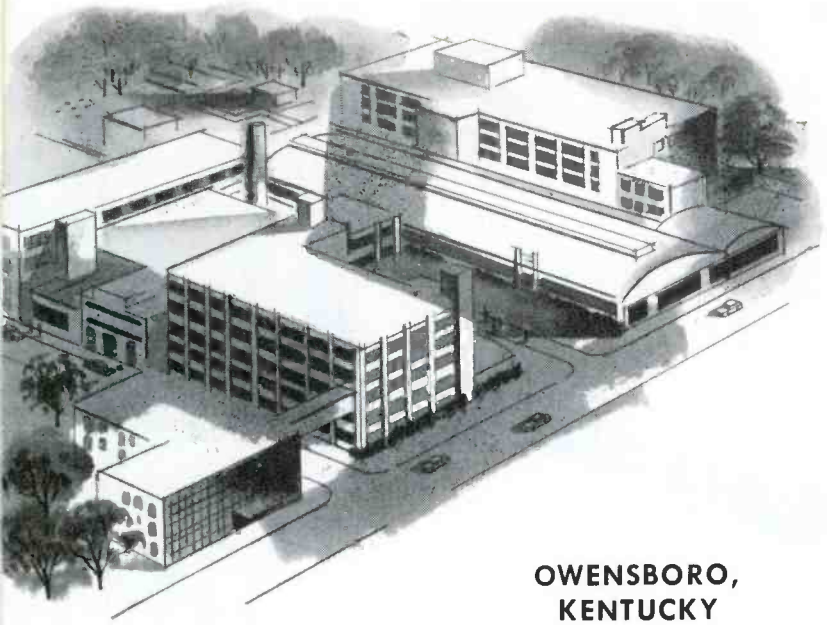

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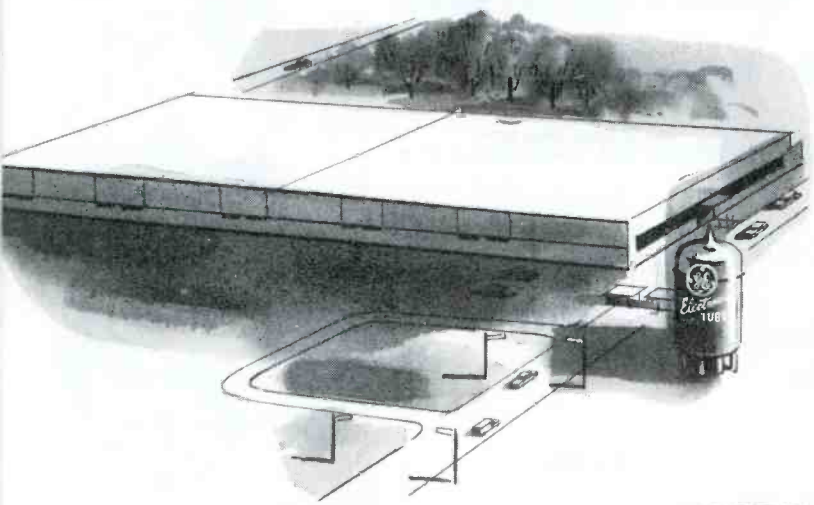

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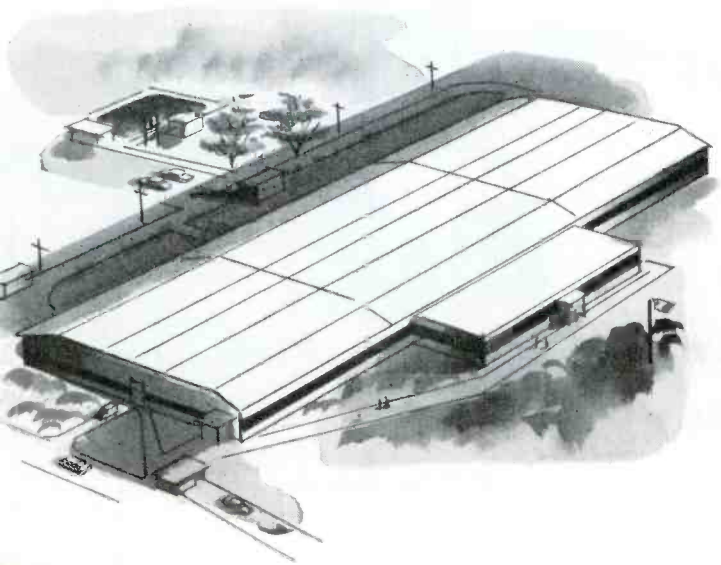

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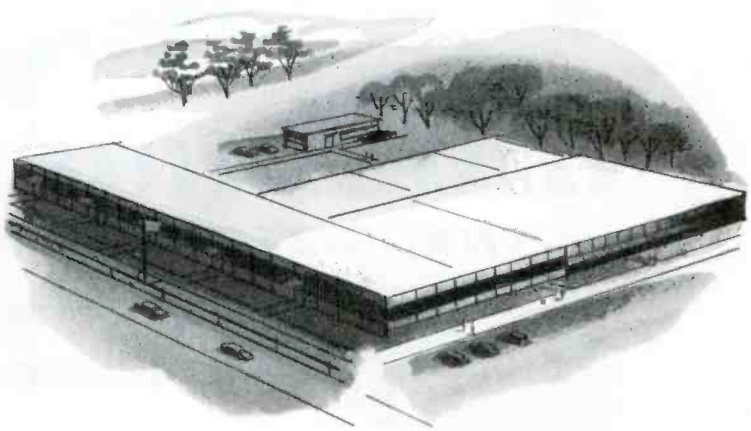

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1K3	4BU8	5V3/5AU4	6BN6	6CL8-A	6SN7-GTB	12BY7-A
1X2-B	4BZ6	5Y3-GT	6BQ6-GA	6CX8	6T8-A	12BQ6-GA
2AF4-A	5AQ5	6AF4	6BQ7-A	6CY5	6U8-A	12DQ6-A
2CY5	5BK7-A	6AF4-A	6BU8	6DN7	6V6-GT	12SN7-GTA
3BN6	5CG8	6AL5	6BZ6	6DQ6-A	7EY6	17AX4-GT
3BU8	5CL8-A	6AQ5-A	6BZ7	6DT6	8CG7	17DQ6-A
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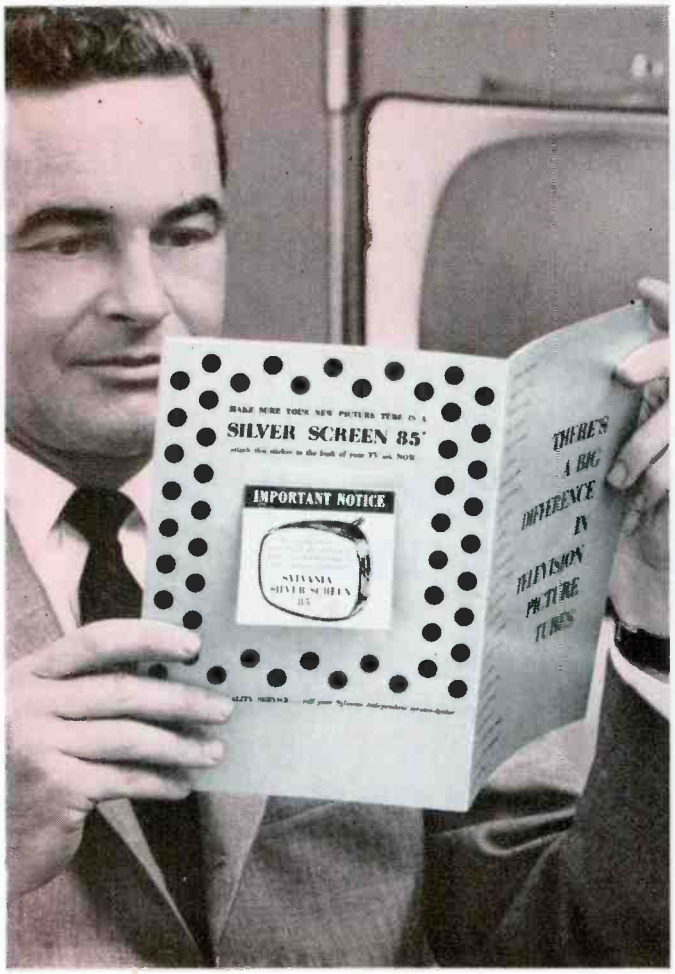

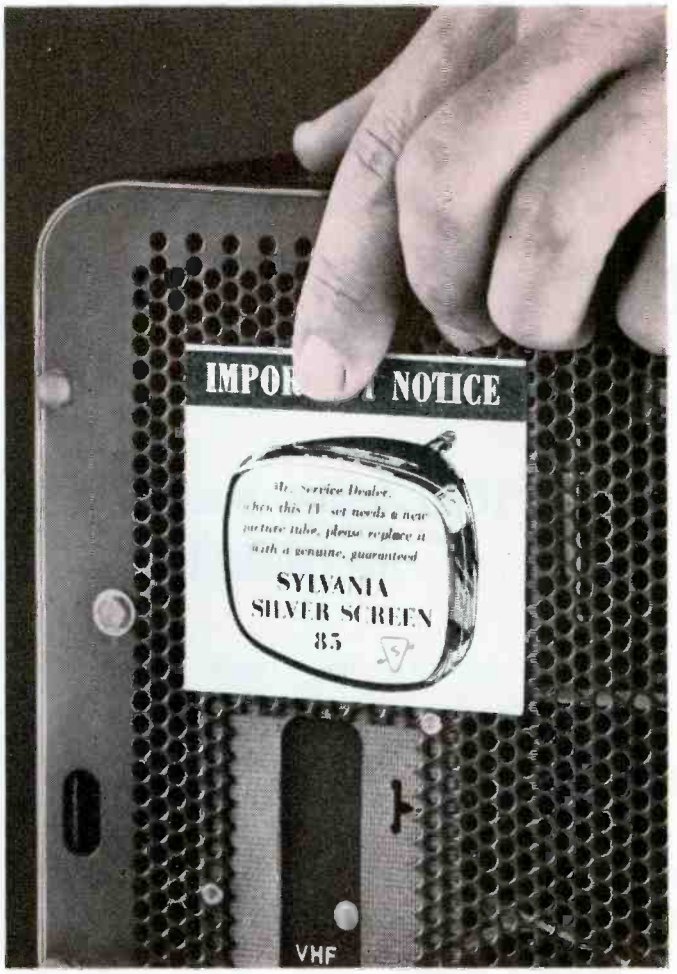

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New consumer booklet from Sylvania helps you

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In layman's language, this booklet details the difference between Silver Screen 85 and cut-rate off-brand tubes. It's chock-full of facts as they were revealed in Sylvania's recent test of a nationwide sample. What's more, there's a handy sticker on the back of each booklet for the customer to attach to the back of his TV set. This is your signal that he's *presold up* to Silver Screen 85.

Get on the bandwagon. Let Sylvania help you sell up. Give each of your customers and prospects a copy of this new booklet. It's available free, complete with mailing envelope, from your Sylvania Distributor. Or write for a sample copy.

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27th YEAR OF CONTINUOUS PUBLICATION

SERVICE

THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE

Memo from the Publisher

FOR OVER A quarter of a century, **Service** has contributed its writings to the electronic maintenance field. We fondly recall the early radios our readers used to repair back in the twenties and thirties. And we have been gratified to see the service technician's scope of activities expand to cover television, hi-fi and industrial electronics.

An industry that has grown as large and as rapidly as electronic service can benefit from a single major publication powerful enough to provide all the services that can help the industry continue its dynamic growth. So with warm recollection of the wonderful years gone by, we are pleased to announce that **Service,** the oldest publication in the field, has been sold to the largest trade magazine now serving the industry, **Electronic Technician**.

This is the last issue **Service** will publish as a separate magazine. From now on it will be integrated as part of **Electronic Technician,** which will continue to serve our subscribers. We are certain that readers will appreciate the many fine editorial features found in **Electronic Technician,** including Circuit Digests, its 16-page monthly section containing the latest radio-TV-audio schematics.

We have enjoyed serving you. Though we will personally be watching from the sidelines, our best wishes will go with the many friends who will go on to make the electronic maintenance industry a great and wonderful undertaking.

Bryan S. Davis

Wireless Wizard Remote Control Units

A circuit analysis of transistorized ultrasonic transmitters which provide armchair tuning for color and B/W sets

by J. A. MAY
RCA Service Co.

[See Front Cover]

ONE OF THE FEATURES of the new Mark series color TV sets is an electronic remote control pushbutton unit* which permits tuning the receiver from anywhere in the room. This wireless armchair control system in incorporated in seven receivers, three color and four black and white.

All but one of these models employ a four-function control unit. This hand-held transistorized control turns the receiver on and off, changes channels and provides a choice of two sound levels from any point in the room without wires or other physical connections. When not in use, the remote control unit may be stored in a recessed compartment in the front of the instrument.

Seven-Function Unit

One model† in the Mark series color receiver line utilizes the new seven-function remote control, which is also completely transistorized. In addition to turning the receiver on and off, controlling the volume and changing channels, this unit also provides for continuous adjustment of *tint, color, brightness* and *fine tuning*. A separate tilt-out panel in the cabinet of the "receiver" permits pressbutton tuning at the set itself. The all-function control unit is shown in Fig. 1 and a schematic diagram appears in Fig. 2.

This all-function remote control unit remotely controls seven different functions in the set. These are all that the consumer needs to operate the set and to tune in a color or black-and-white picture to his satisfaction. The seven functions mentioned above are *Tint, Color, Brightness, Volume, Channel Selection, Fine Tuning* and *On-Off*.

As with the four-function model, the all-function remote control consists of two units, a hand-held transmitter and a receiving unit mounted in the television cabinet. The seven-function remote unit differs from the four-function unit both in operation and in circuitry. A schematic diagram of the all-function remote control appears in Fig. 2.

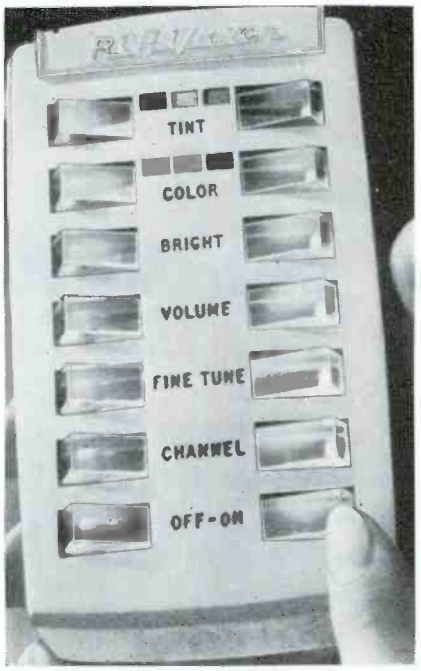


FIG. 1: SEVEN-FUNCTION transistorized remote unit turns color receiver on or off, changes channels, adjusts tint and color controls, selects volume and fine-tunes the set.

One Transistor Used

Only one transistor is used in the seven-function transmitter unit. This is used as a *cw* oscillator which is switched to different frequencies in the 40-kilocycle range. Each frequency represents a control function in one direction. To provide a *reverse*, so that the controls may be operated either clockwise or counter-clockwise, the cw signal is pulsed to supply additional control information. Thus, pressing a button to turn a control *down* causes a cw signal to be transmitted, and pressing the same button to turn the control *up* causes a pulsed signal to be transmitted. As in the four-function unit, the 40-kc signal in the hand-held control unit is applied to a transducer and is picked up by a transducer in the receiving unit.

Pulse Reverses Motor

The receiving unit includes three stages of amplification at 40 kc, AGC stages, and relay control tubes for each of the functions. As each control signal is received, a pre-tuned circuit with a rectifier shunts the signal to the proper relay control tube. The relay control tubes can be individually regulated for sensitivity by potentiometers in their control-grid circuits. In operation, when a control signal is received, a solenoid is actuated to engage a rotating drive gear on a motor shaft. A solenoid is provided for each function. As the motor drive is rotated, a similar rotation of the desired control takes place.

The pulsing action of the signal is used to reverse the motor. Thus, by changing the frequency and pulsing the signals in the transmitter, each of the operating controls in the receiver can be operated from a remote position anywhere in the room. The receiver is also equipped with pressbutton controls mounted on a tilt-out panel in the cabinet. These controls duplicate the action of the remote control unit.

Four-Function Unit

The four-function wireless wizard comprises two units; the transistorized hand-held transmitting unit, and a receiving unit on a separate chassis within the television cabinet. The transmitter produces supersonic frequencies from two transistor oscillators. One oscillator produces a 41-kilocycle signal and the other produces 42 kc, 43 kc or 44 kc, depending upon which of the four press buttons are depressed on the transmitter unit. A block diagram of the four-function remote control unit appears in Fig. 3 on page 36.

These low-frequency signals are

(*Continued on page* 36)

*Wireless wizard developed by RCA.
†Worthington model.

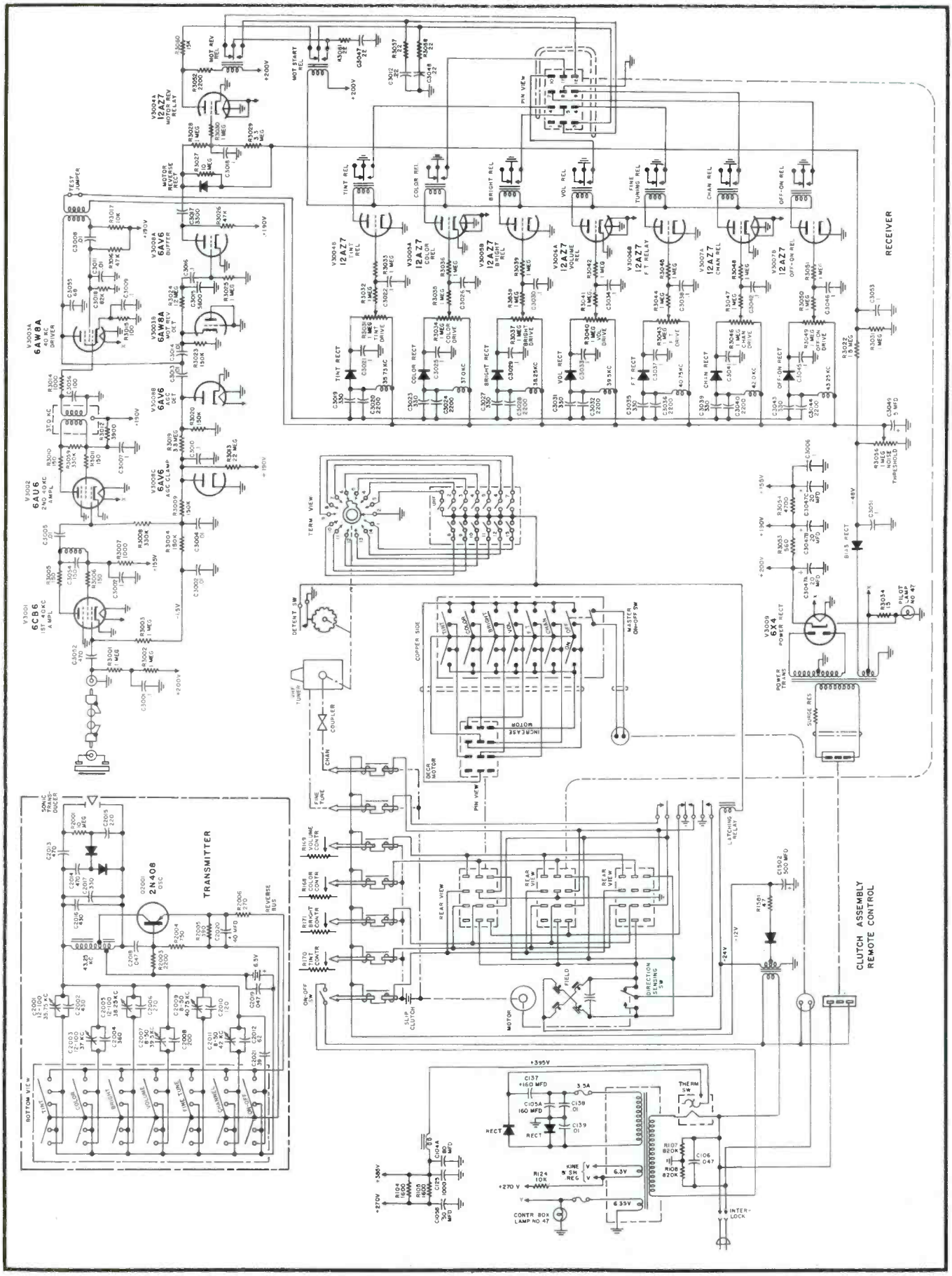


FIG. 2: SCHEMATIC DIAGRAM of all-function remote control transmitter and receiver chassis utilized in RCA Worthington color set.

Superior Service Provides Key To Increased Color Sales in Philadelphia

by JOE WHELAN
General Manager, Gerhard's Inc.

SERVICE MANAGER JOHN DILLON dispatching one of Gerhard's 23 service trucks to a customer in the Philadelphia area.

SINCE SEPTEMBER FIRST there has been a tremendous upsurge in sales of color sets in our store. Our color line this month will account for fully 60 percent of our total TV sales, and there is every indication that this percentage will go even higher in the next few months.

Such an impressive sales record could hardly have been achieved without a well-formulated promotion campaign. But a good sales pitch is only half the battle for us. An equally big factor in winning friends and making sales is the superior color service which we are prepared to give our customers.

From the time the store was first opened in 1945, Gerhard's has stressed the importance of providing first-rate service to back up its sales. Today we employ a staff of 23 Service Men, under the direction of our Service Manager, John Dillon. They all work out of our only store in Glenside, Pa. to provide service to our customers in the North Philadelphia area.

Because of our superior service setup, we are in a position to include installation and 30-day check as part of the sales price of a color set. All our parts are guaranteed for one year, and we make no charge for labor during the first 30 days. After this period, there is a minimum charge of $8.95.

We do not try to talk our color customers into a service contract, but we will provide one if they request it. The contract is made with us rather than with the RCA Service Co. The cost is $89 for the first year and $125 for the second, the same rates as charged by the Service company.

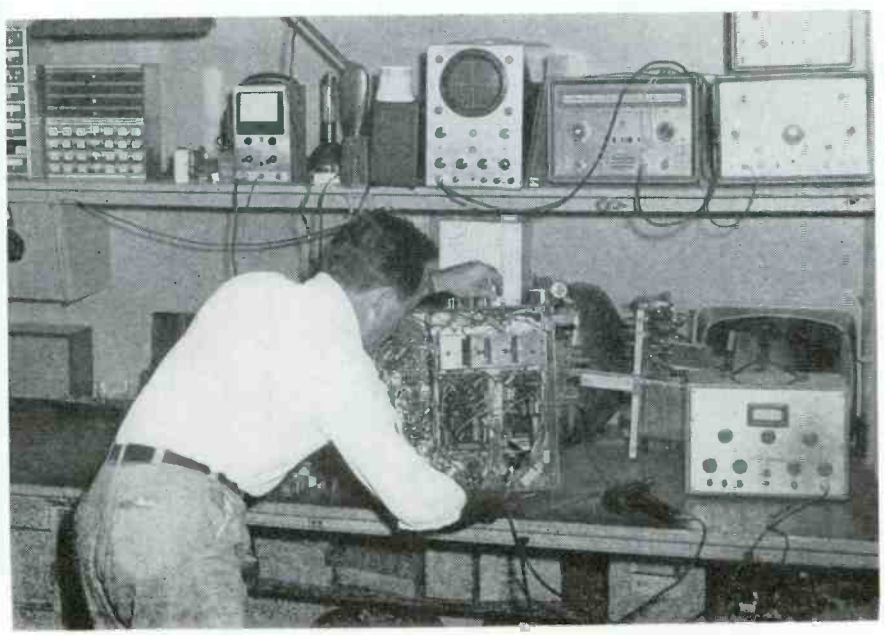
At present we have four key men on our staff who specialize in color work. These men were trained at a special school for color servicing maintained by our distributor, Raymond Rosen, in Philadelphia. These key men are now gradually breaking in the other Service Men in our shop to work on color.

With our trained staff, we are equipped to deliver and set up a color set within one hour. Last month, for instance, someone called our store at 7:00 p.m. and promised to buy a color set if we could install one in his home in time for the Como show. We beat the eight o'clock deadline with minutes to spare, and made ourselves a surprised and delighted customer.

One of the reasons we can operate so fast in both color and B/W is that we have a fleet of 15 trucks. About half of them are equipped with two-way radio, and the rest will be before the end of the year. This makes it possible for us to route our Service Men where they are needed and to handle emergencies as they arise.

I certainly recommend radio-dispatched trucks for use in any large service shop. Since installing our two-way radio system, our men are able to handle 10 to 14 calls a day as compared with the seven or eight they had averaged in the past.

As a former Service Man—I was



ED AYERS servicing a color set in the Service Department at Gerhard's.

Service Manager at Gerhard's before assuming my present position—I don't have to be told how important the servicing factor can be. Neither do my salesmen, most of whom formerly worked in our Service Department. Every floor man knows the inside of a set as well as the outside, and can demonstrate or service a set in the customer's home if he has to. Where can you find a cut-rate dealer or discount house that can offer buyers this kind of service?

When our service men go out on calls they find that tube purity and convergence troubles account for most of the difficulties in color sets. Degaussing for purity and color convergence are difficult and time-consuming jobs which require good men and good equipment. Fortunately we have the men and we have invested about $3,000 in the latest and best type of color test equipment in the past three years.

My men tell me that they find that much less set-up time is required on the new RCA Mark series of color sets and that the purity is better. There will probably be less maintenance all around on these new sets than was required on the old 700 series. Despite these improvements, and others which will come in the future, I still feel that proper color servicing will continue to remain a prime factor in the sale of color TV.

The Service Man's future is in color TV, and if he doesn't learn this work soon he might just as well get into another line. But for those who can master this field, there are tremendous opportunities ahead both in selling and servicing color TV.

JOE WHELAN, general manager of Gerhard's in Philadelphia.

Tube News

Design and Development of 21CYP22 21-Inch Glass Color Picture Tube

By C. P. SMITH, A. M. MORRELL, and R. C. DEMMY

RCA Electron Tube Division

THE RCA 21CYP22 is a 70° shadow-mask color picture tube in an all-glass envelope. In general, it is similar to the 21AXP22-A except for several important design features which have been developed for this new type and the use of a glass rather than a metal envelope.

The over-all length of the 21CYP22 is 25-13/32 inches, which is the same as that of its metal predecessor. The outline drawing and major dimensions are shown in Fig. 1. Comparison of the dimensions of the glass 21CYP22 and the metal 21AXP22-A shows that the major dimensions are the same, and with minor modifications in the mounting system the glass tube may be used as a replacement for the older metal tubes.

The weight of the glass tube is 33½ pounds. Two terminals are provided on the envelope for mounting an external protective resistor to protect the cathode in case of a momentary internal arc.

Envelope Features

The glass envelope used in the 21CYP22 differs from any other envelope used for color-picture tubes to date in that it makes use of a devitrifying frit seal and does not require a reinforcing metal band at the seal edges. As in former color picture tubes, the envelope is made in two parts, the funnel and the panel, and the parts are sealed together during tube fabrication. The devitrifying frit used in this tube is a material unique to glass envelope manufacture and was developed by Corning Glass Works. The important characteristic of this frit is that it is a soft-solder glass until the time of sealing when the glass devitrifies or changes into a ceramic phase.

The shadow mask is one of the critical parts of the color tube. The methods of etching and forming this part to close tolerances are the basis for the high quality of the 21CYP22.

A significant improvement has been obtained by changing the mask material from 0.0075-inch copper-nickel to 0.006-inch cold-rolled steel. In addition to savings in material cost, the steel mask provides several important advantages. Although the steel mask is thinner, it is still considerably stronger than the copper-nickel mask. To eliminate the problem of rusting during tube fabrication and to increase thermal emissivity, the steel mask is steam blackened.

Graded-Hole Feature

In the 21CYP22 significant improvements in light output and contrast have been achieved. The gain in light output was made possible by the use of a graded-hole shadow-mask having apertures that increase gradually in diameter from the outer edge of the mask inward to the center. As a result of this gradation, the mask permits increased light output from the screen.

Another important performance feature of the 21CYP22 is the improvement in contrast. It might be noted that light output and contrast are related features in any picture tube and that a gain in one is as important as a gain in the other. The 21CYP22 incorporates four important design changes that improve contrast. These are the use of tapered apertures in the mask, elimination of faceplate *haze,* introduction of a masking *electron shield,* and higher absorption in the faceplate glass.

In the 21CYP22 the effect of stray electrons has been greatly reduced by the use of conically shaped or tapered apertures. Tapering permits the electron beams to be transmitted through the mask without striking the side wall of the apertures (See Fig. 2).

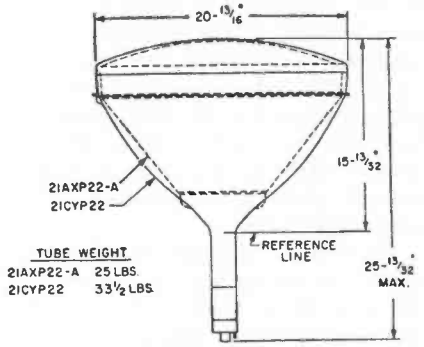


FIG. 1: COMPARISON OF OUTLINE drawing and major dimensions for 21CYP22 and 21AXP22-A color picture tubes.

The degree of taper in the shadow-mask is not the same over the entire mask. It is maximum at the edge and is gradually reduced toward the center. This gradation in taper simplifies mask manufacture while at the same time providing maximum taper where it is needed, that is, near the edge of the mask where the electron beam approaches the mask at the greatest incident angle.

Stray Electrons

Another advantage of the tapered apertures is the fact that more of the beam is allowed to pass through the aperture as compared to a straight-sided aperture wherein upwards of 20 per cent of the beam is blocked by the side wall. Thus, tapering achieves increased light output as well as improved contrast and color saturation.

Another cause of color dilution in former shadow-mask color picture tubes was stray electrons "sneaking" around the mask-frame assembly, bouncing off the panel side wall, and striking the phosphor screen. In the 21CYP22 an electron masking shield is welded to the under side of the frame closing the gap between the frame and the panel side wall. A small clearance is maintained between the glass wall and the outside edge of the shield to accommodate the differ-

ential thermal expansion. The shield is made of thin steel in four sections for ease in manufacture and insertion. An opening in the shield at the top and bottom of the screen permits the required internal electrical connection between funnel and panel.

Faceplate Haze

In the 21AXP22-A a phenomenon which we call faceplate haze is evident. This phenomenon shows up as a tint of specific color when the screen is viewed at wide angles. It was determined that the cause of haze is related to the degrees of optical contact between the phosphor particles and the inner surface of the faceplate. With a high degree of optical contact, light from the phosphors would be internally reflected within the faceplate glass and appear as a haze. The solution in the 21CYP22 was to equalize the optical contact between the phosphors by adding a dispersing agent to the red phosphor slurry to increase its contact so that it would be equal to that of the green and blue phosphors.

An additional aid to contrast has been the increased light absorption of the tube faceplate. Although this change tends to decrease light output slightly, the gain in contrast makes up for the slight loss in light output and gives a substantial improvement under high ambient light.

Improvements have also been made in the design of the 21CYP22 gun. Although the gun is similar to that used in the earlier metal tube, revisions have been made to improve performance. The radial-converging pole-piece assembly shown in Fig. 3 has been revised to provide improved dynamic convergence by means of easing the dynamic convergence adjustments. The shape of the pole-pieces has been redesigned and a magnetic "Y" shield has been introduced between them.

The purpose of the pole-pieces is to couple the externally provided magnetic flux to the associated beam. In guns of earlier construction interaction occurs so that the field applied to the red gun also influences the green and blue beams. The direction and magnitude of this interaction is such that a field about 30 per cent stronger is required to obtain complete dynamic convergence than would be necessary if no interaction existed.

Another advantage of the "Y" shield is reduction of coupling between the deflecting yoke and the internal pole-pieces. Unshielded pole-pieces distort the leakage field from the yoke so as to produce a so-called red-green cross-over pattern. Formerly this effect had been minimized by shields on the back of the deflecting yoke. However, with the introduction of the "Y" shield this effect is reduced to a negligible value and yoke shielding is no longer required for this purpose.

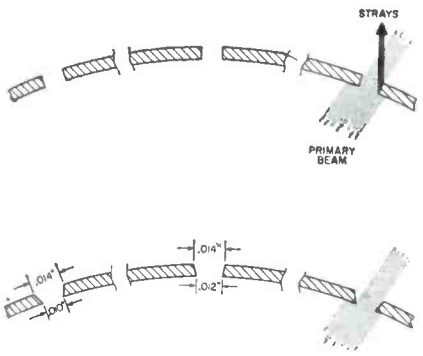


FIG. 2: ADVANTAGES OF TAPERED apertures in reducing stray electrons.

Tube Mounting

The mounting of the 21CYP22 is simplified, compared to the 21AXP22-A, because of the reduced insulation requirements of the glass envelope. As was noted earlier, the over-all dimensions are similar to those of the metal counterpart and hence the 21CYP22 may be used as a replacement for the metal tube. The mounting of this tube is similar to that of any glass black-and-white picture tube.

It is obvious that the magnetic properties of this tube type are different from the metal tube. To minimize the effects of the earth's field, it is recommended that a magnetic shield made of cold-rolled steel be used around the forward portion of the tube. A degaussing operation, which is done when the tube is located in the customer's home, effectively counteracts the earth's magnetic field by setting up an opposing field in the shield as well as in the internal frame and mask of the tube. With this relatively simple shield the effect of the earth's field on the 21CYP22 is not essentially different than on the 21-AXP22-A.

The components used on the 21-CYP22 are similar to those of the metal tube with the exception that the magnetic field equalizer assembly is considerably simplified. In the 21-CYP22, simple snap-on correcting magnets are used. In a majority of cases no magnets are required; however, under adverse field conditions it may be necessary to use several. The components associated with the gun, that is the purifying magnet, the lateral converging magnet, and the radial-converging magnet assembly, are the same as formerly used. The deflecting yoke is similar except for its mounting and the fact that the "Y" shield used in the pole-piece assembly has reduced the need for shielding on the back of the yoke.

The 21CYP22 picture tube gives a brighter picture of better contrast than its metal predecessor, with excellent color purity and screen uniformity. The improvements made include an improved gun and pole-piece assembly, use of a graded-hole shadow-mask, contrast improvement by means of an electron shield, tapered-hole shadow-mask, and increased filtering in the faceplate glass. These design improvements permit superior performance with major simplifications in the tube mounting, receiver circuitry, and set-up technique.

One performance advantage that results from the new design feaures incorporated into the glass tube is ease of picture-tube mounting in receiver. Ease of mounting comes about from the use of a glass envelope which reduces insulation problems. Mounting of the 21CYP22 is essentially the same as with a black-and-white glass picture tube.

Performance Advantages

Another advantage is ease of set-up. The adjustments unique to color tubes, purity set-up and convergence, are simplified in the 21CYP22 because the number of corrections needed to obtain optimum performance are reduced.

Improved gun performance is another advantage. Design changes in the internal convergence pole-piece assembly have reduced beam distortion and interaction between convergence pole-pieces and other neck components.

A final advantage lies in the greater light output and improved contrast of the tube. The increased light output of the 21CYP22 is due to the use of a graded-hole shadow-mask.

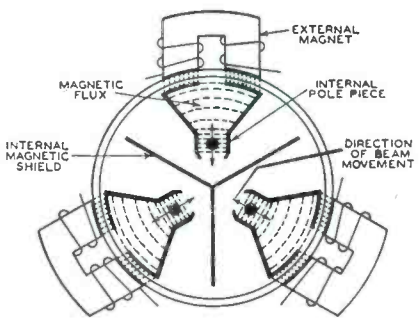


FIG. 3: ASSEMBLY DIAGRAM of radial-converging pole-pieces.

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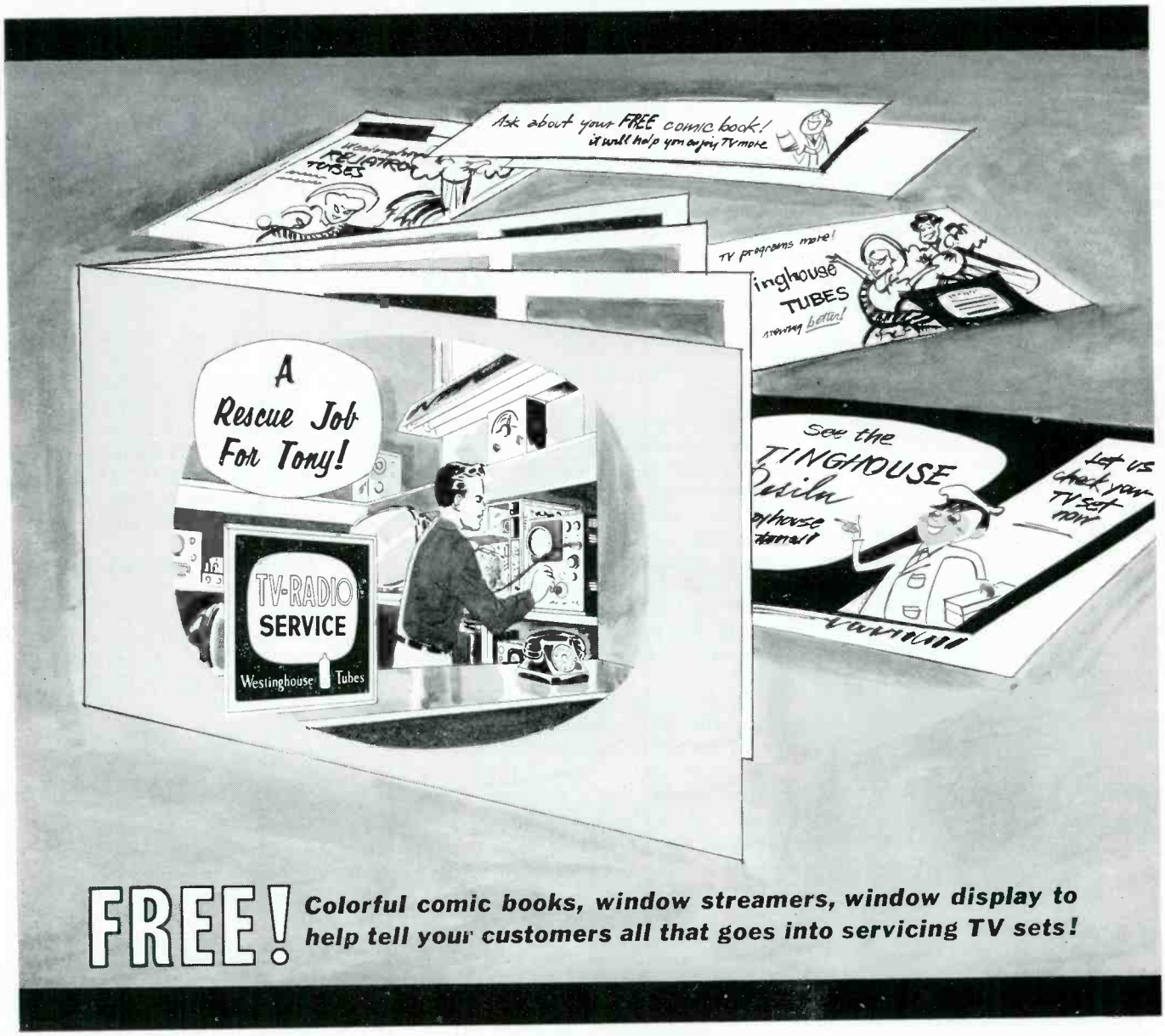

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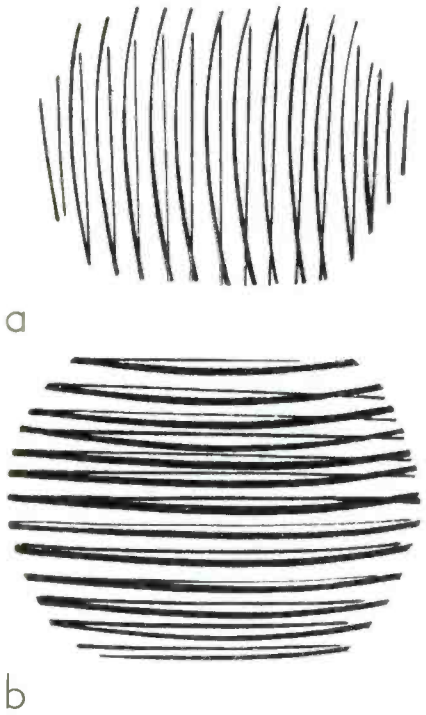


FIG. 1a: MISCONVERGENCE of vertical lines. Misconvergence of horizontal lines appears in Fig. 2b.

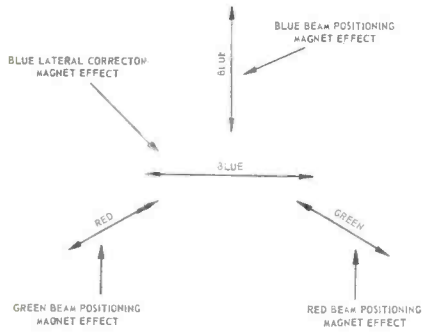


FIG. 2: BEAM MOTIONS caused by adjustment of the beam magnets and blue lateral corrector.

ASIDE FROM TUBE replacement, servicing a color-TV receiver is most often a matter of adjusting convergence. Convergence is a fairly simple job, when it is done systematically and properly.

A color receiver is first set up like a black-and-white receiver. Drive, height, width, linearity, and focus are adjusted. The high voltage is somewhat critical, so this is measured and adjusted (from 19,500 to 25,000 volts, depending on the receiver).

Linearity adjustments are conveniently made with a crosshatch pattern. The same pattern serves also for convergence adjustments.

To make static convergence adjustments, the central portion of the crosshatch pattern is observed first. If misconvergence is seen, as illustrated in Fig. 1, the beam magnets and blue lateral corrector are adjusted to bring the red, blue, and green lines together at center screen.

There are three beam magnets on the neck of the color picture tube. When the small knob is turned, the green beam moves on the screen. The other magnets move the blue and red beams, respectively. The blue beam magnet moves the blue beam up and down only. There is another control which moves the blue beam left and right. It is called the blue lateral corrector.

The direction of color-beam motions, resulting from beam-magnet and blue lateral corrector adjustments, can be seen in Fig. 2. The Service Man should keep these magnet responses in mind. This makes convergence much easier.

Convergence at the top and bottom, and at the left and right hand edges of the picture tube is made with the dynamic convergence controls. There are six dynamic controls. These are the red vertical tilt control, red vertical amplitude control, blue vertical tilt control, blue vertical amplitude control, green vertical tilt control, and green vertical amplitude control.

Each of these controls causes a different motion of the color beams. The motions produced by the vertical tilt controls are seen in Fig. 3. Motions produced by the vertical amplitude controls are shown in Fig. 4.

There are also six horizontal dynamic controls. These are the red horizontal phasing control, red horizontal amplitude control, blue horizontal phasing control, blue horizontal amplitude control, green horizontal phasing control, and blue horizontal amplitude control.

The motions of the color beams caused by adjustment of these controls is depicted in Fig. 5. Systematic adjustment of the convergence controls depends upon a knowledge of the motions of beams caused by the control adjustments.

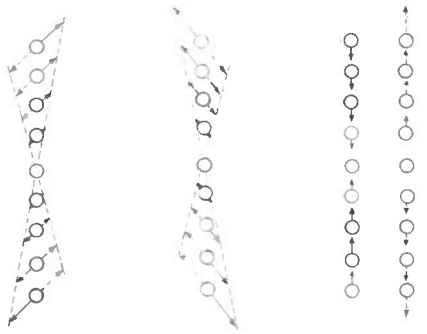


FIG. 3: BEAM MOTIONS caused by adjustment of the vertical tilt controls. Red beam is shown at left, green in center, blue at right.

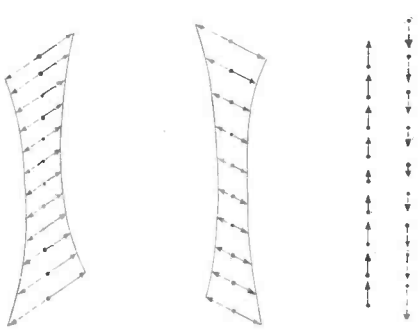


FIG. 4: BEAM MOTIONS caused by adjustment of the vertical amplitude controls. Red beam appears at left, green in center, blue at right.

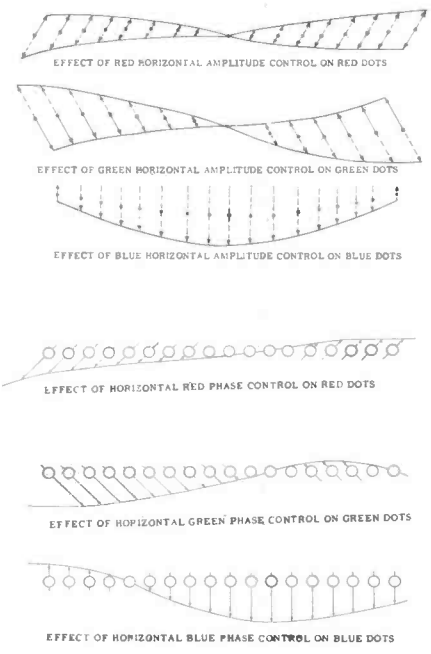


FIG. 5: MOTIONS OF COLOR BEAMS caused by adjustment of horizontal dynamic controls.

Troubleshooting Community TV Systems

by JACK DARR

IN THE FIRST part of this article,* the cases of so-called sync clipping in community-TV systems were actually found to be traceable to receiver circuitry and were remedied by repairing the set. It was also pointed out that in a few cases slight modifications in the design of the set were required. Further examples of these annoying set problems are discussed below.

A resistor defect, although not closely connected with the actual circuit (such as plate load resistors, etc.) was found in an Admiral 21Z1 chassis. A 150,000-ohm resistor (used in a voltage divider network supplying the horizontal oscillator, phase comparer and associated tubes) was found high in value; this caused a sync loss by upsetting the voltage relationships in the circuit.

Moisture leakages through and across imperfectly sealed printed-circuit boards have caused many mysterious troubles in this category. There is always one betraying symptom in such cases; if the chassis is well-dried out, either by operating it until it is heated up or by blowing it dry with a small hair-drier, the trouble disappears. It can often be made to appear by blowing moist breath on the suspected parts of the circuit. This can be cured by washing well with carbon-tetrachloride or other dehydrating agents and spraying a heavy coating of acrylic plastic over the sensitive parts of the circuit. These would be the horizontal phase comparer, sync clipper, sync separator, vertical and horizontal holds, etc.

In addition the sync separator and allied stages, the *noise-gate* and similar stages are often sources of trouble.

*Sync Clipping in Community TV Systems, by Jack Darr, SERVICE, June, 1958.

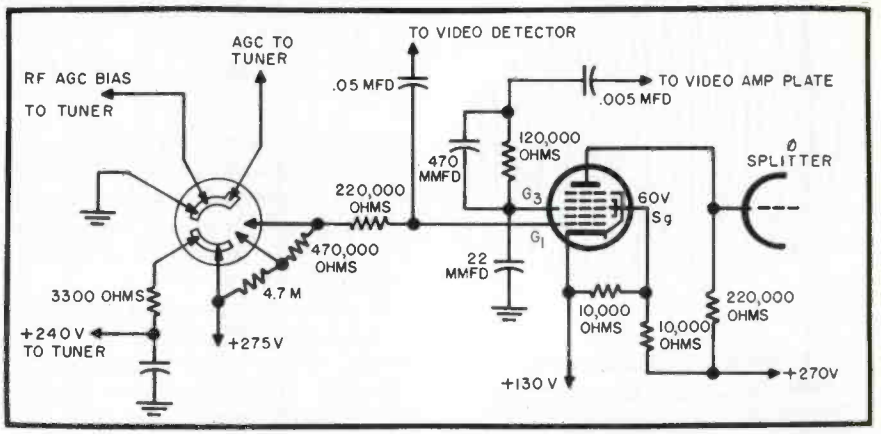


FIG. 2: AGC CIRCUIT modified to provide a constant voltage supply.

As a matter of fact, this complaint is almost always due to customer misadjustment of controls rather than to an actual defect in the set. The major fault here is the location of the control on the front panel where the owner or small children can get at it. Several sets combine this control with a *local-distant* switch, on the same shaft. This can also cause difficulty if the switch is inadvertently turned to *distant* position. This is common in some Dumont, G-E, Truetone, Sears and other chassis.

With the switch in *distant* position, the *agc* is lowered or removed entirely from the *rf* amplifier and first video stages. Therefore, these stages operate at maximum gain. With the high signal level common in community antenna systems, overloading will occur at times causing an apparent loss of sync. Some circuits combine the *local-distant* switch with the noise-canceller.

The noise-canceller circuit will cause loss of sync if improperly adjusted (Fig. 1). Two signals of opposite phase are fed into the input grids of a pentagrid tube (6BE6 in older sets; 6CS6 in later models). For correct operation, a variable-resistor control should be provided so that the level of cancellation may be adjusted. However, this control has probably been the cause of more nuisance calls than all others combined: in its exposed position it is subject to misadjustment by small children or even adults resulting in complete cancellation of sync. In quite a few cases, to avoid future difficulties, the control has been sealed or even taken out of the circuit entirely.

One difficult case was encountered in the GE model G chassis of a few years ago. In this set, the local-distant switch was combined with the noise-canceller, so that the noise cancellation action was increased as the switch was moved to a more sensitive position. On high signal levels this caused partial cancellation of sync, resulting in a very annoying horizontal jitter and continual complaints from the owner. To remedy this, the set was taken to the shop; the noise canceller was removed from the switch, and set permanently in a low position (least cancellation). (Due to the high signal-to-noise ratio on the cable, very little actual noise trouble is encountered.) On one position of the switch, the plate voltage was removed from the tuner *rf* amplifier. This was reconnected so as to only reduce the voltage, not eliminate it entirely. The *agc* circuit was reworked to leave a fair amount of *agc* voltage in the circuit at all times, while providing a small variation in the picture when the switch was operated (Fig. 2).

Another similar case was found on the same chassis. Modification of the switch did not completely cure the trouble, and further steps were taken. Upon investigation, the video *if*'s

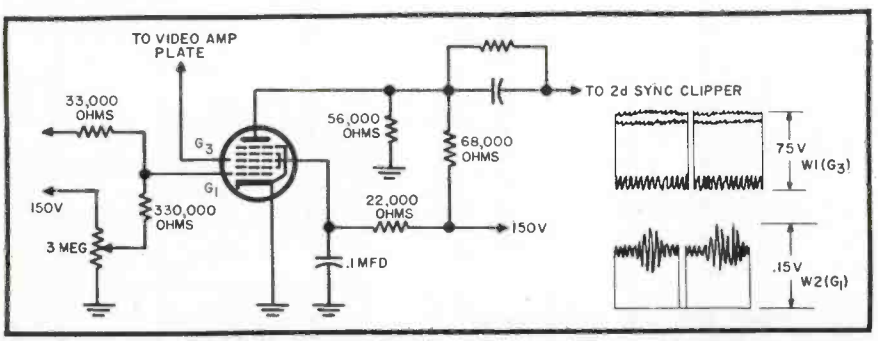


FIG. 1: NOISE CANCELER CIRCUIT (above) will cause loss of sync if not properly adjusted.

were found to be very sharply peaked at the picture end of the bandpass curve, while not quite covering the correct range of frequencies. This set was realigned for a very wide bandpass and comparatively low gain. After this was done an immediate improvement in picture quality resulted, especially in fine details. Since then, this method has been used on quite a number of sets with the same good results. A very sharply peaked video *if* strip will cause clipping at sync frequencies if a high level of signal is applied; with no worry about insufficient signal level, the *if* may be flattened out so as to give around a 4-mc bandpass with a resultant loss of gain but a tremendous gain in the fine high-frequency details.

Troubles similar to these have been found by Service Men working in areas with an extremely high signal level for many years; near powerful transmitters. This type of work is not too familiar to the Service Man in community-TV antenna system area, because his work has been of the *fringe-area* type. He has never had to contend with problems caused by strong signals and will have to reorient his thinking to be aware of them. Once this is done, he will come to recognize them as easily as he does the old troubles caused by too-low signal levels.

Test Equipment

Test equipment used in making tests on the C/T cables was standard: a field-strength meter* with provision for observing the sync pulses on the system, was very helpful. Conventional shop equipment, signal generators, 'scopes and sweep generators, were used in making tests and measurements on TV sets to observe the effects of signal levels.

A series of test runs were made, using receivers of several makes, to check the results of very high signal levels on normally operating receiving equipment. In all cases, it was found that no trouble was caused by very high levels of input signal. As a test, the signal was run up to as much as 100,000 microvolts using additional amplifiers and no bad results were noted. The picture remained clear and steady. Normal levels along the system's cables are maintained between 400-700 microvolts for each of the 5 channels carried.

Although it is customary for some Service Men to blame the transmitting station for troubles which they are un-

(*Continued on page* 21)

*Blonder-Tongue *FSM*-1.

Installing Multi-Speaker Systems In Stadiums and Ball Parks

by L. A. RANDALL
Special Products Div., Stromberg-Carlson Co.

WITH THE WORLD SERIES just ended and the football season going into full stride, Service Men might well be interested in the sound systems which lend so much color to the gridiron classics now being played in ball parks and stadiums all over the land. These installations will be discussed in this concluding part of a series on outdoor sound installations, the first part of which appeared in the August issue of SERVICE.

The multi-speaker type of system is favored by some people, particularly in double-deck stadiums and ball parks where the size of audience can vary greatly from day to day, and the problem of reflected sound from unoccupied seats can present a real problem. Many times, in double-deck stadiums, it is almost impossible to provide coverage at the rear of the seating area from a single group of speakers near the scoreboard. This problem is familiar to many who have tried to provide good coverage in an auditorium having a rear balcony. The same situation exists in grandstands having a roof.

In open stadiums, conventional re-entrant horns are used and are usually located on poles at the rear of the high tier seats, so as not to obstruct the spectators' view. They are usually evenly spaced or grouped to cover a limited area, not over 60-70 feet. Projection of greater distances causes time lag to become noticeable and they are operated at low level, in order that the rate of decay will increase rapidly beyond the primary coverage area.

Very effective coverage of grandstands can be provided in the following manner. Typical construction of a covered grandstand includes a roof, slanted at the same angle as the tier seats. In front of the grandstand, extending toward the playing field, are uncovered box seats. Located beneath the roof, about 10 or 15 feet in from where the roof ends at the box seat area, 360° re-entrant horns are located on 60-80 foot centers, so that each speaker has a primary 30-40 foot circle area of coverage. The speaker is tilted at the same angle as the tier seats. This provides good coverage of the box seat area, as well as the tier seats, at a very fine uniform level of non-annoying coverage.

Usually these speakers are grouped and wired back to 25 or 50-watt power amplifiers, so that the level is easily controlled, according to the number of fans in any given area.

Sound coverage of the grandstand at race tracks is identical to that discussed on stadiums and ball parks. If the survey shows that one group of speakers is practical, the cellular horns can usually be mounted on top of the judges' stand in the inner ring. Again, the 360° re-entrant speakers, located as described under ball parks, may be the ideal solution to the problem. Another popular method is to use dual re-entrant horns, having a dispersion angle of 120° horizontal and 60° vertical. They are uniformly spaced under the outer edge of the grandstand roof and project back into the tier seats. Supplemental coverage must, of course, be provided for the parimutual areas, club house, restaurants, paddock and stables. High quality cone speakers, in attractive baffles which match the decor, or mounted in the ceiling, are recommended for the interior speakers. Usually a separate amplifier is provided to supply music to the restaurant speakers from a record player or wired music line. The output speaker line incorporates a relay, which transfers the speakers from the music system amplifier to the public address system for announcement purposes.

A telephone system with instruments in the judges' stand, control operator's location, photo finishing lab and track official offices is recommended. It should be of the dial type, which provides fast and private communication between any two telephones.

A few basic suggestions, which apply to any system where quality results are desired, can be offered. First, each microphone should have its own pre-amplifier. The varying length of microphone cables can best be compensated for by individual adjustment of the control on the amplifier. A spare pre-amplifier should be provided, which can be substituted whenever required. Line amplifiers should be used for music inputs.

A compressor amplifier is recommended for use in the voice announcement circuits. This amplifier is necessary when programs are transmitted to a broadcast station. Switching facilities should be available for substituting a line amplifier, if necessary.

Caution must be observed to avoid accidently shorting the collector circuit to the chassis, as damage to the transistor may result. Past practices used in radio repair commonly known as *screwdriver testing*, in which the B+ at the plate of the tube is shorted to ground to check for clicks in the speaker, is definitely not recommended. This practice would be comparable to shorting the collector of a transistor to ground which could damage the transistor.

Troubleshooting Community TV

(*Continued from page* 19)

able to locate, very little trouble is found from this source. One case, though, caused quite a bit of difficulty before it was finally pinned down.

Complaints came in regarding sync troubles on the cable. Investigation disclosed that they always concerned one station. All other stations were quite steady but this one rolled and fell out horizontally. Careful tests were made, using a field-strength meter and 'scope to check sync levels on this channel. It was immediately apparent that their sync was generally quite a bit lower than that of other channels.

The chief engineer of the station was contacted and after a discussion the trouble was located. A normal video signal has 75% video and 25% sync, and is regulated by a cathode-ray tube monitor on the station's control console. Miscalibration of this monitor was causing the operators to run the signal at about 90-10%, instead of the proper 75-25%. The telltale symptoms of this condition can be easily checked, especially on a C/T system where comparisons may be made with other channels by flipping the tuner rapidly. The excessive video level will cause the offending station to have a much *blacker* picture than the rest, so that the receiver's contrast control will have to be backed off markedly to obtain a picture with the same contrast as the others. At the same time, this channel will display a much weaker sync level than others, with a tendency to roll or flip easily when compared to the rest.

Color on the Cable

Several years ago, tests were made to determine the suitability of the community antenna cables and amplifiers for the transmission of color signals. These were completely successful. No attenuation of color burst was noted during the tests and color registry was perfect. These tests were continued later on, at the same time the sync troubles were appearing and the lowered amplitude of the station's sync ruined color transmissions. Evidently, the lowered horizontal sync was almost entirely eliminating the color-burst, causing a severe instability of color sync with much trouble from falling out of color, improper hues, and numerous other difficulties. Therefore, if all these defects are noted, check the station signal's sync amplitude before blaming the set.

Understanding the Horizontal Sweep Multivibrator

by FRANK HADRICK
Chief Field Engineer, Simpson Electric Company

THIS ARTICLE IS INTENDED to give the reader a greater understanding of the circuit operation of the cathode-coupled multivibrator employed in many television receivers for developing the horizontal sweep voltage. Many Service Men realize that increased knowledge of various circuit operations can often lend itself toward more effective and efficient troubleshooting.

A simplified schematic of a typical cathode coupled multivibrator is shown in Fig. 1. A free-running condition exists because the voltage produced across the common cathode resistor R_k cannot hold V_1 cut off, and cannot bias V_2 to cutoff.

Bias Voltage Produced

When B plus is applied to the plates, both tubes start conducting. Since the plate current of both tubes flows through R_k, the cathode voltage (common to both tubes) rises above ground, producing a bias voltage which tends to limit the amount of current through the tubes. The current through V_1 reduces the voltage at the plate of V_1. This drop in voltage is coupled through capacitor C_2 to the grid of V_2, further decreasing the current through V_2. This decrease of current decreases the voltage across R_k, so that V_1 plate current increases. This increased current causes the plate voltage of V_1 to drop further and the conduction of V_2 is decreased even more. This action is cumulative, ending when the current in V_2 is reduced to zero (cutoff), and the current through V_1 a maximum. Although this description might give the impression that considerable time is involved, V_2 is actually driven beyond cutoff almost instantaneously. The time pattern is indicated in the waveform analysis of the multivibrator, Fig. 2, at point A of the V_2 grid voltage wave form.

Tube V_2 is held beyond cutoff during the time that C_2 discharges through R_2, R_k, and through V_1. The discharge current through R_2 produces a voltage at the grid of V_2 which is negative with respect to ground. This discharge current would decrease at a nonlinear rate determined by the RC time constant, except for the stabilizing circuit coil L_1 and C_6 which produces a sine wave voltage. This sine wave voltage and the exponental discharge of C_2 are added together and result in a *sine wave* voltage from time A to time B. (See Fig. 2, V_2 grid voltage waveform.)

At time B, the voltage at the grid of V_2 reaches cutoff, and V_2 begins to conduct. The current through V_2 also flows through R_k, increasing the voltage across this resistor. This makes the bias on V_1 more negative, causing less plate current to flow through this tube. As a result of the decrease in V_1 plate current, the voltage at the plate of V_1 increases. This increase in V_1 plate voltage is coupled through C_2 to the grid of V_2 driving it positive and increasing the plate current of V_2 still further.

This action is also rapidly cumulative and results in the current through V_1 decreasing to zero (cutoff) almost instantaneously and the current through V_2 increasing to a maximum. Tube V_1 is cut off by the voltage developed across R_k due to the high plate current of V_2 flowing through it as a result of driving the grid of V_2 positive.

Grid Becomes Positive

At time B, the grid of V_2 is now highly positive, causing the plate current of V_2 to be high, and increasing the cathode voltage very quickly. Grid current is drawn while the grid voltage of V_2 is more positive than the cathode voltage, and capacitor C_2 charges relatively quickly through R_k, R_{gk}, R_3 and the stabilizing circuit. Capacitor C_2 charges between time B and A. As C_2 charges, the bias on V_2 decreases, causing V_2 plate current to decrease, which in turn decreases the cathode voltage.

The grid of V_1 is held constant (no control voltage applied) so that V_1 remains cut off as long as the cathode voltage is positive (relative to ground) by more than cutoff voltage. But when the cathode voltage drops to the cutoff voltage of V_1, the tube conducts and rapidly cuts off V_2 by coupling the large negative-going voltage at the plate of V_1 through C_2 to the grid of V_2. This completes the entire cycle.

Waveshaping Circuit

It should be mentioned that the output voltage waveform at the plate of V_2 would (under these conditions described) resemble a pulse. However, since the familiar sawtooth voltage is necessary for driving the horizontal amplifier, a waveshaping circuit consisting of C_3 and R_5 are connected in the output circuit of V_2 to provide this sawtooth voltage. Capacitor C_3 charges through R_5 and R_4 during the time that V_2 is conducting. The charging path through R_5 and R_4 results in a longer time constant than the discharge path through R_5 and V_2. Because C_3 is directly across the output plate circuit of V_2, the voltage produced by C_3 appears in the output.

Coil L_1 and capacitor C_6 are always associated with this type of circuit. The purpose of this relatively high Q (lightly damped) circuit in the plate of V_1 is to provide a means for accurately *triggering* V_2 into conduction at exactly the end of one horizontal scan line. L_1 and C_6 form a parallel *tank* circuit which resonates near the horizontal scan frequency (15,750 cps.).

The pulse produced by the rapid

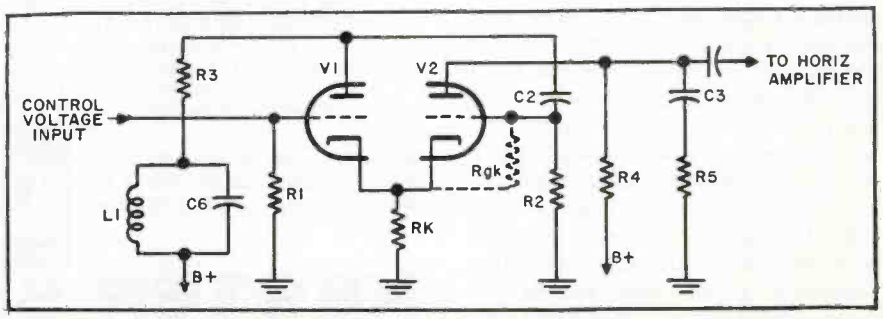


FIG. 1: SCHEMATIC DIAGRAM of typical cathode-coupled, free-running multivibrator.

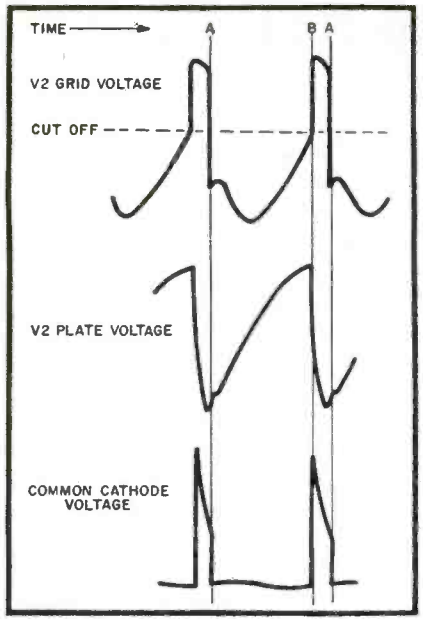


FIG. 2: WAVEFORM ANALYSIS of typical multivibrator. Waveforms above were taken with a Simpson model 458 oscilloscope.

current conduction and cut off of V_1 causes the tank circuit to oscillate or *ring*, producing one cycle of oscillation each time V_1 conducts and cuts off. This sine wave of voltage at the plate of V_1 is coupled to the grid of V_2. This *ring* voltage, as it rises in a positive direction, approaches cut off level of V_2. When it reaches cutoff level (retrace time), tube V_2 quickly starts conducting. Although the discharge time of C_2 would normally determine when V_2 starts conduction, the sine wave voltage *insures* (or stabilizes) the exact time of V_2 conduction.

Without the tank circuit, frequency stability would be affected, since free-running multivibrators have inherently poor frequency stability unless controlled. The exact time when V_1 conducts is determined and controlled by a *control voltage* which in turn is determined by the frequency of the transmitted horizontal sync pulses. This *control voltage* is applied to the grid of V_1 and determines exactly the time V_1 conducts. The oscillator is *forced* into sync with any incoming signal from a TV station.

Troubleshooting Multivibrator

Stability is *primarily* determined by L_1 and R_3, C_6, and R_8. Generally, the tank circuit is adjusted on the weakest station signal to be certain that the oscillator will remain in horizontal sync when switching channels. The oscillator should also have adequate *pull-in* range which can be checked very easily.

Coil L_1 is detuned until a considerable number of horizontal blanking bars are seen slanting across the screen. Then, adjusting coil L_1 slowly in the proper direction, note the number of slanting bars on the screen *just* before the oscillator jumps into sync. Approximately seven to nine bars are normally seen. Excessive *pull-in* range would be indicated by a greater number of bars and insufficient range by a lesser number. In either case, although L_1 and C_6 are good suspects, C_3 and R_5 will also affect stability.

Oscillator Frequency

Insufficient drive or poor linearity can also result if C_3 or R_5 are faulty. It should be mentioned, that although other components affect drive and linearity, this waveshaping network should not be overlooked, particularly in TV receivers without a variable drive control. Remember, the charge and discharge path of C_3 will have great effect upon linearity.

The frequency of the oscillator is again *primarily* determined by the charge and discharge of C_2. Of course, this includes many components in the circuit, which are all dependent on each other. Usually, if frequency is affected, the Service Man may adjust L_1 and never recognize the fact that a component has changed value.

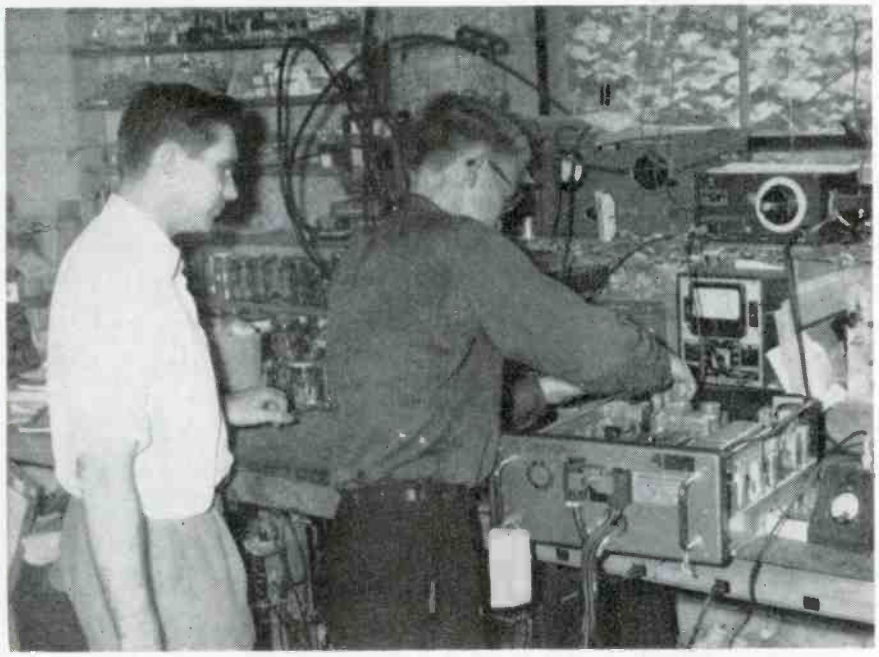
Readjustment of L_1 may do the job very nicely. However, if the components of the oscillator are within tolerance, L_1 can be shorted and the oscillator should remain oscillating at the proper frequency and in sync, for L_1 and C_6 are not involved in the fundamental frequency of the oscillator. However, stability will be affected. Upon shorting L_1, the oscillator may lose sync and if so, can be brought into sync by a slight disturbance in the circuit such as momentarily shorting the control grid or cathode to ground.

Waveforms Pinpoint Trouble

The absence of the so-called *horizontal hold* and *horizontal drive* controls from many late-model TV receivers should present no problem to the Service Man who realizes which components have the same effect. Close examination of the waveforms in this circuit can often pinpoint peculiar troubles. The Service Man who familiarizes himself with these waveforms and realizes which components affect a given waveform will save valuable time in troubleshooting.

Two-Way Servicing in Westchester County

by JEFF TELLET



GEOFFREY TELLET (left) supervises the work of one of his technicians who is checking out a GE mobile unit.

MUCH OF OUR BUSINESS consists of servicing 450-mc mobile gear in which tubes are critical. Before a really critical tube tester was added to our shop equipment, we lost a lot of time putting two-way sets back into top condition. While one tube may cause a failure, we find that often by replacing two or more tubes that are getting low a set snaps back into tip-top shape.

A really critical tube tester, I have found, is the most valuable piece of test equipment in our shop. Since acquiring one of the new card-type tube testers which is fast and measures tube merit in terms of dynamic mutual conductance, we have been able to do a better job for our customers in less time.

Next in importance, I value my frequency meter which is used primarily for checking transmitter frequencies and which doubles as a signal generator for aligning 450-mc band receivers. Our VTVM with its king-size meter is almost indispensable.

In addition to the usual meters and conventional test equipment, the shop is equipped with a professional communications receiver which is a valuable aid in checking spurious emission of marine transmitters. We also use it in conjunction with a signal generator for broadbanding an *if* amplifier, a necessary procedure when replacing a tuneable bandpass filter in a mobile receiver.

Our organization, known as Knollwood Electronic Service Company, specializes in selling and servicing both marine and mobile radio communications equipment. We service all makes and participate in sales of Kaar, GE and RCA equipment.

The shop is located on Main Street in Elmsford, New York, less than 20 miles north of New York City. The shop faces on Route 119, one of the main arteries feeding the New York Thruway and linking that modern artery with the Merritt Parkway which leads to Connecticut.

We make service calls in all parts of Westchester county and in some sections of Rockland county across the Hudson river. Once in a while we go as far as Westport, Connecticut to service marine radio equipment.

Variety of Services

Our mobile radio service customers include industries, merchants, taxicab operators and local government agencies who keep us busy on a year 'round basis. Marine business, of course, is seasonal, and is generally done with individuals in the consumer category. While we service mobile equipment for use in the 25-50 megacycle, 152-162 megacycle and 450-470 megacycle bands, we have become known as specialists in 450-megacycle equipment.

The most common cause of two-way radio malfunction is tube failure. In addition to replacing the tube causing the outage, we usually find two or more tubes which also need replacement to restore adequate performance. Outside of tubes, a blown fuse is the most common symptom. We generally have to replace a vibrator as well as the fuse in correcting this type of difficulty.

Among components, we have found that selenium rectifiers fail most often, sometimes damaging a power transformer at the same time. Heat may be a contributing factor, since we experience an upsurge in failures during the first hot spell in the spring. In some makes of sets, we run into quite a few condenser failures. In some other brands, we are seldom required to replace condensers, even in sets more than ten years old.

I am glad to see that mobile units are getting smaller. The Kaar IMP, for example, fits nicely under the dash without taking up much leg room. When installing larger sets in our trunks, we often encounter trouble in getting cables through from the trunk to the dash control unit.

Demonstrations Helpful

We have found that it is generally necessary to make demonstrations in order to sell mobile equipment. The prospective customer wants to be shown. Anyone interested in going into this business should invest in at least one pair of demonstrator mobile units.

I like this business, perhaps because most of my background is in communications. Before founding Knollwood Electronics four years ago, I was a sales engineer for Radiomarine Corporation of America where I also worked in the service department. During the war I was a ground radio station operator for American Airlines.

I received my formal technical training at Valparaiso Technical Institute where I took a course in radio engineering and at Lafayette College where I studied engineering physics. But, it takes actual experience, as well as knowledge of theory, to be successful in the two-way service business.

Hints on Installing Color TV Receivers

by SOL LIBES

COLOR TELEVISION receiver design has reached the stage where most installations will require no adjustment (with the possible exception of degaussing) to provide good color and monochrome reception. The receiver will operate just as it is taken out of its shipping carton.

However, to provide the best in color, as well as black and white reception, the Service Man who installs the set should check the following six points: Receiver location, purity, convergence, black-and-white balance and tracking, color reception, and customer instruction. Most of these checks should also be performed as part of every service call on a color television receiver. This will reduce servicing time, provide better receiver performance and reduce profitless callbacks.

Receiver Location

For best performance, the color television receiver must be permanently located in one place in the room and left there. This should be made clear to the set owner. The receiver may be moved for cleaning purposes, but should be returned to its original position. Moving the receiver to another room or to another place in the same room may affect receiver performance, especially purity.

Receiver operation is best in a semi-darkened room. No strong natural or artificial light should fall directly on the face of the CRT screen. If necessary, shield the face of the picture tube from all strong sources of light or, if possible, move the light source.

The receiver should be adjusted under the same lighting conditions as will be used during viewing. For example, if the receiver is to be viewed with the room lit by fluorescent lighting, do not adjust the receiver with the room lit by daylight or incandescent light. However, adjustment of black and white balance and tracking should be made in a semi-darkened room.

Black and white reception must be good in order to get good color reception. This point cannot be overemphasized!

Good black and white reception can be obtained only when purity, con-

(*Continued on page 27*)

Make Color Servicing Your Business

by D. H. KUNSMAN
President, RCA Service Company

TODAY WE LIVE in a push-button world that is full of opportunity for the ambitious Service Man who, by the skills and knowledge he possesses, is capable of making a mechanical instrument work after it has ceased to function. More important, people today are perfectly willing to pay for this service. Gone are the days when the driver of a car would "Get Out and Get Under" to make minor repairs and then be on his way again.

The repair of modern equipment, home appliances and entertainment media such as radio and television requires the work of specialists. Nothing is more typical of today's complex home equipment than the color TV receiver. Just as the black-and-white receiver, the radio, and the phonograph required the work of a specialist to repair it, so too color TV will offer a new field of opportunity to those who are in the servicing business.

In every respect, servicing is assuming a larger and more prominent spot in the American home. The family auto boasts a highly complex automatic transmission, refrigerators defrost themselves and the traditional Monday morning washing has resolved itself into a matter of dial setting and a prolonged coffee break for the housewife.

Along with the other advances, the living room is becoming the center for color television. As the home offers more leisure through the benefits of modern appliances, the entertainment media assumes greater importance in the life of every American.

And the era of complex machinery carries with it a certain understanding by every appliance owner that local servicing of equipment is a definite must. Modern living has conditioned the homeowner to the necessities of the service technician.

As the trend to color blossoms, a new field of profits is opening up for the TV repair man. In too many instances the Service Man is led to believe that TV repairing has reached its peak. The fact of the matter is that it has barely begun.

In 1957 the television service business accounted for approximately two and a half billion dollars worth of business. Present forecasting by experts in the field say that by 1975 this two and a half billion dollars will have grown to eight billion annually.

D. H. KUNSMAN, president RCA Service Co.

This is the story on TV servicing only. From practically nothing in 1946 to eight billion dollars in 1975 represents a truly fabulous future.

That future is upon the TV Service Man now. The growth of color TV is definitely under way. This year, in the face of the recent recession, color sales rose while all other figures showed declines in keeping with the business trend.

Keeping close tabs on color TV sales is part of our business. Our surveys indicate that 90 per cent of the color set owners are happy with their purchases. Providing additional information on the color set raised the satisfied customers another nine per cent.

Color TV is your key to future profits. It will spearhead the climb to an eight billion dollar annual servicing business. While your eye to increased profits should entice you to enter the color servicing field, there are other reasons equally important that should prompt your move.

Being able to fix a color receiver will build your prestige as a technician. You will gain new friends and build new business by gaining a reputation for repairing color receivers.

Perhaps the greatest reason for assuming these new responsibilities is neither profits nor prestige, but the driving force that makes all businesses prosper—the desire to operate an aggressive and profitable business.

As any business must, you as a service technician are obliged to keep abreast of the times or find yourself as the blacksmith found himself at the turn of the century—without prospects. You cannot afford to fall behind in this world of advancing technology.

You might ask: "How do I become a color technician?" There are four ways available to every technician. Any, or perhaps all, of these means might be employed to advantage.

First, avail yourself of all the technical material possible. The color set is not so complicated that you cannot understand the simplified material available on the present instruments. The RCA Service Company has this material available for everyone's use. The cost is a matter of a few cents. This material will enable you to become acquainted with the color circuitry and prepare you to take the next step.

Secondly, you can enroll in any of several qualified and accredited schools that offer courses in color TV servicing. An excellent home study course on color TV servicing is available through the RCA Institutes. You will be in a position to service sets when you complete this course.

Thirdly, make it a point to be a color set owner so that you can study the functions of a color TV receiver in action. Invest the money required to own the necessary color servicing equipment. Most of your black-and-white servicing equipment will perform a dual function and be of value to you. Your investment will probably be far less than you may anticipate.

Fourthly, plan to attend the RCA Victor Color Clinics arranged through your local RCA distributor. By contacting the RCA distributor in your locality you can obtain first hand instruction in color TV workshops and seminars.

As a service technician you are essentially a business man. To stay in business and realize your just profits, you must operate that business aggressively. An aggressive Service Man cannot overlook the advantages that color servicing offers him.

Installing Color TV

(*Continued from page 25*)

vergence and black-and-white balance are set correctly. Their misadjustment will be most pronounced during monochrome reception. Therefore these adjustments must be checked during black and white reception.

Purity

To check purity, turn the receiver on and adjust it for normal operation (proper brightness and contrast levels). Select a blank channel so that only a normal white raster with no video content is present on the face of the CRT. If any areas of the screen are colored, or the screen is non-uniform in white, then purity may not have been properly adjusted or degaussing is required. The receiver should be degaussed at this time. In any event this will make purity easier to obtain.

If degaussing has not returned the CRT screen to a uniform white raster, then the purity adjustment procedure should be performed. If the entire screen is uniformly tinted or colored, then black-and-white balance must be reset.

Convergence

Misconvergence will appear as color outlining of objects in a black and white picture. This defect will not be as noticeable in a color picture. The convergence check should be made with a crosshatch pattern on the face of the CRT. This pattern provides the most critical check.

To check convergence, observe the crosshatch pattern on the face of the CRT. If the CRT is properly converged, the pattern will appear as white lines evenly spaced both horizontally and vertically across the entire screen. Some separation of the white lines into the three primary colors (red, green and blue) is normal at the outer edges of the screen. Con-

(*Continued on page 37*)

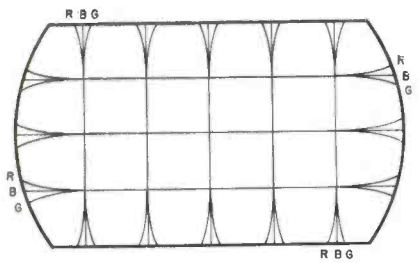


FIG. 1: MISCONVERGENCE resulting from misadjustment of the dynamic convergence adjustments produces this pattern.

Power Supply and Hi-Voltage Modifications Stressed in Latest Color TV Receivers

by W. H. FULROTH
RCA Service Co.

RECENT PRODUCTION CHANGES in color TV receivers have incorporated a number of particularly interesting modifications. These latest changes are perhaps best illustrated in the modified model 800M* color sets which have just been introduced. Service Men with an interest in color should be particularly interested in comparing these modifications, which are intended to improve reliability and performance, with the original model 800*. A circuit analysis and a complete schematic diagram of the earlier model appear in the October 1957 issue of SERVICE.

Modified Power Supply

High-efficiency silicon rectifiers highlight the modification in the power supply. They reduce power requirements of the chassis by as much as 30 watts and are expected to have exceptionally long life. The rectifiers are connected in a voltage doubler circuit as shown in the schematic diagram in Fig. 1. They are designed to readily withstand the necessary limits of the inverse voltage present in the low-voltage supply and furnish a current of approximately 400 milliamperes. When servicing these receivers note that the rectifiers are mounted on the top side of the chroma section of the chassis in a position allowing for adequate heat dissipation and long rectifier life. This provides convenient ac and dc test points, but caution should be exercised when working in this area of the receiver.

The 800M series chassis power supply employs a *tube saver*, which consists of a power surge resistor in the transformer primary circuit and a thermal switch placed in series with the B+ circuit of the receiver. Studies have shown that this device increases the life of the tubes and components of the receiver. When the receiver is turned on, the power surge resistor in the tube saver holds back full power from the circuits until the tube filaments and circuit components have reached operating temperature. The resistance of the power surge resistor varies from approximately 120 ohms, when the circuit is cold, to about 1 ohm when the circuit is hot. It controls the application of voltage to the filament circuits of the receiver during warm-up.

The thermoswitch in the tube saver is actuated by heat generated in the power surge resistor. It closes the B+ circuit only after sufficient time has elapsed to allow the filaments of the tubes to reach operating temperature. The switch closes the B+ circuit in from 15 to 60 seconds depending upon the ambient temperature of the chassis when the set is turned on. A large filter capacitor in the B+ circuit adjacent to the thermoswitch cushions the circuit from the abrupt application of voltage when the switch closes. A 3.5 ampere bayonet-type fuse protects the B+ circuit of the power supply. The fuse is mounted in a holder on the top side apron of the chassis and is readily accessible.

Another significant modification worth particular mention lies in the deflection and high-voltage section of the receiver. A more efficient high-voltage transformer and deflection yoke is used which permits 22,500 volts of properly regulated high voltage to be applied to the color tube during normal operation providing for extra brightness.

Increased Brightness

The new deflecting yoke employed in conjunction with the new horizontal output transformer also aids somewhat in perfecting edge convergence of the color picture tube. It is important, however, to note that the new horizontal output transformer and deflecting yoke are not directly interchangeable with previously used components.

A color temperature of 9300° Kelvin is attained on the color picture tube in the 800M series receivers. The luminance signal distribution in the cathode circuitry of the color picture tube has been modified and the background controls have been connected to the +385 volt supply rather than

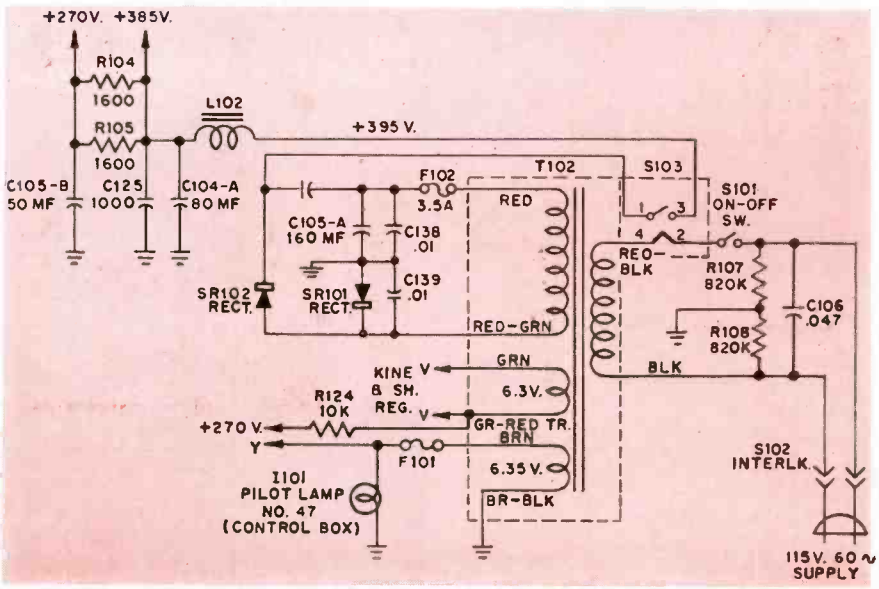


FIG. 1: SCHEMATIC DIAGRAM of low-voltage power supply in RCA CTC7-AA color TV chassis model 800M.

*Manufactured by RCA.

to B boost to improve the ease of tracking adjustment.

In the chroma circuits of the 800M TV receivers, the phase detector and burst amplifier have been modified to provide for increased stability in color signal synchronization. The impedance of the burst detector circuit has been lowered to increase the color-locking range of the receiver on weak burst signals. The ACC (automatic color control) voltage is now derived from the plate of the killer detector which improves the noise immunity of the circuit.

IF Modifications

To provide improved sound rejection, R301 at the input of the picture IF section of the chassis has been changed from a 5100 ohm fixed resistor to a 10 K variable control as shown in Fig. 2. This control is factory adjusted and will not be normally adjusted in the field. When an adjustment must be made, reference should be made to the service data.

The cathode resistor in the second picture IF has been changed in value from 68 to 82 ohms. This provides a degree of picture carrier peaking on weak signals without having to adjust the fine-tuning control which in turn causes loss of color. This change should improve fringe-area color reception.

Sound Modifications

In the sound circuitry the tuning of the quadrature coil has been broadened sufficiently to overcome any tendency for it to drift out of adjustment. A speaker jack, labeled *Stereo Jack*, has been incorporated in the output of the audio transformer to facilitate the use of the speakers in the receiver if desired in a stereo system.

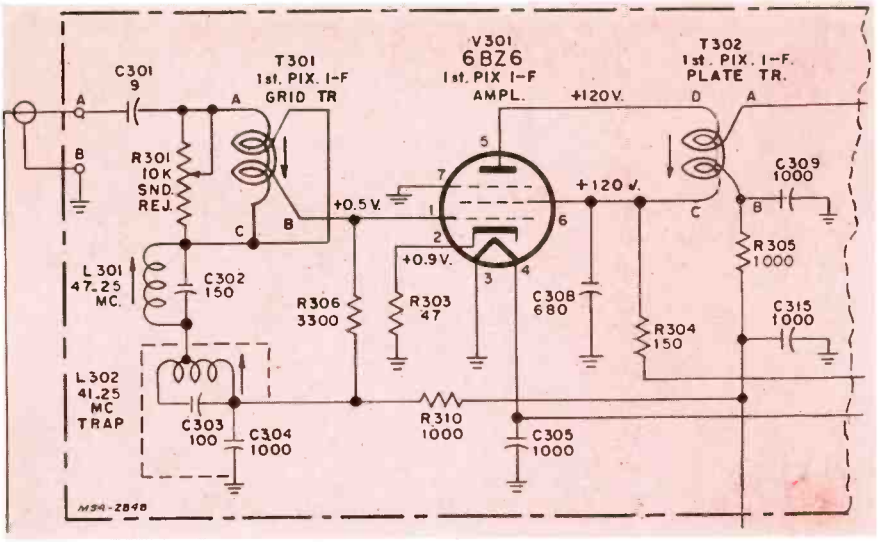


FIG. 2: CIRCUIT DIAGRAM of first IF amplifier section of type CTC7-AA chassis, model 800M series manufactured by RCA.

Some of the new model color receivers will employ one-set VHF electronic fine tuning which provides for automatic fine tuning on all VHF channels after an initial fine tuning adjustment has been made. Fine tuning is accomplished by pressing in on the fine-tuning control and setting it for best picture reception. A small gear and cam assembly, one for each channel, is engaged when the fine tuning control is depressed, allowing the oscillator fine tuning mechanism to be pre-set for each channel to be received. The fine tuning range of the one-set fine tuning control on the color receiver is approximately 1.75 to 2 megacycles.

For further convenience in the operation of the new color receiver, a *pull-push* type *on-off* switch and *stay set* volume control are used. The *on-off* switch shows at a glance when the set is on or off, the knob pulls out for on and pushes in for off. After the *stay set* volume control is pre-set it is not necessary to disturb the volume setting to turn the set off.

Wireless Remote Control

Two types of wireless remote control are offered on the 800M series color receivers, a four-function unit and a seven-function instrument. The four-function control is the same as was used on some models of the 1958 line of black-and-white receivers.

The seven-function instrument will be introduced during the fourth quarter of 1958. This device provides for wireless remote operation of all the operating controls on the color receiver, including *tint, color, brightness, volume, fine-tuning, channel selection* and *off-on*. The unit consists of a very compact, remotely operated, transistorized transmitter that broadcasts supersonic control signals, and a receiving unit mounted on a subchassis within the television receiver cabinet.

All controls except master *on-off, contrast, vertical hold, tone* and *horizontal hold*, are motor driven, using one motor and a solenoid and gear arrangement. For a complete description of the circuitry employed in both the four-function and seven-function remote control units see Wireless Wizard Remote Control Units on page 10.

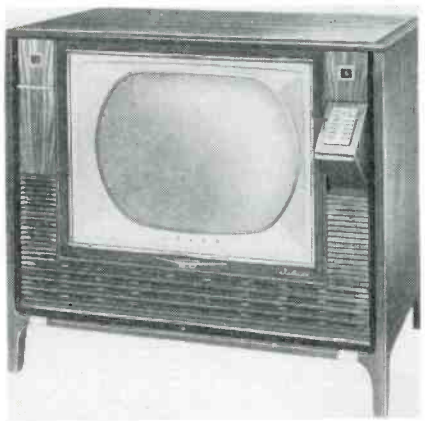


FIG. 3: RCA WORTHINGTON model color TV is equipped with seven-function wireless wizard remote control tuner.

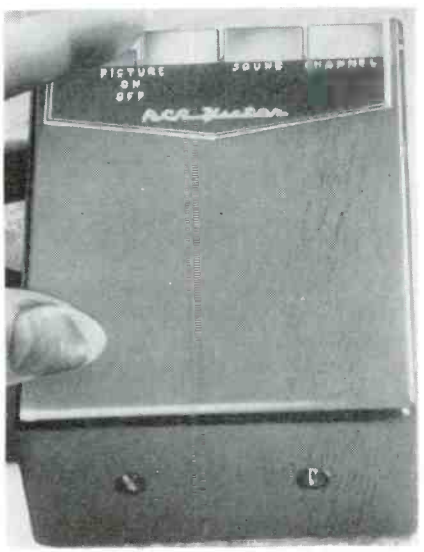


FIG. 4: FOUR-FUNCTION remote control unit turns TV set on or off, changes channels and selects high or low volume from anywhere in the room.

Test Equipment for Color Servicing Varies With Needs of Service Man

by JOHN R. MEAGHER
RCA Electron Tube Division

MANY SERVICE MEN who are planning to get into color TV installation and service work have asked me a number of questions about test equipment for color TV. It is evident from these questions that many technicians plan to get started in a modest way, with a minimum initial investment in new test equipment. These Service Men plan to buy additional instruments as the need arises, and to pay for them out of their earnings on color TV work.

Rather than trying to answer each question separately, I will summarize the essential facts concerning the current usage and the relative need for different types of test equipment in color TV installation and service work. These facts should enable the Service Man to arrive at the answers to most of his questions on this subject.

It is not feasible, however, to make general recommendations on the usefulness of a technician's present test equipment. Such recommendations would have to be tailored to fit the individual. For instance, a Service Man might own a very elementary type of *rainbow* or *color-display* generator, which is usually of little value for adjusting the color circuits in modern color receivers.

Oscilloscope Required

Almost every technician owns an oscilloscope. Unless it has satisfactory frequency response and provision for measuring the amplitude of input signals, however, the Service Man is well-advised to invest in a new, high-quality, wide-band instrument. In the final analysis, a good oscilloscope is one of the most important trouble-shooting aids that any technician can own, being second in importance only to a good VTVM.

The Service Man may have some hobbyist type of test equipment which, although it represents the height of scientific achievement to a hobbyist, is deficient in the very qualities and features that are essential for professional work. The technician should survey his present test equipment and rate each piece as satisfactory, unsatisfactory, or obsolete. This appraisal will usually reveal that, over a period of years, the higher-quality instruments have been the best investments.

Equipment for Installation

In the majority of color installations, the original factory adjustments "stay put," and no readjustments are required. In many installations, however, it is necessary to demagnetize the picture tube by means of a degaussing coil. The receiver should be in its normal operating position in the room when this is done. In some cases it is also necessary to touch up one or more of the *edge* purity magnets.

In a small percentage of cases, the center-converging adjustments and/or the dynamic-converging adjustments must be touched up. These adjustments require the use of a dot-bar-crosshatch generator.

It is rarely necessary to use a color-bar generator when a high-quality modern color receiver is installed, especially if the receiver has been prechecked in the dealer's store. In the absence of color progam signals, or green-stripe color test signals, some technicians use a color-bar generator to make certain that the receiver functions normally on the generator signals.

It is evident from these facts that it is advisable to bring along a dot-bar-crosshatch generator and a degaussing coil when a color TV receiver is installed.

Most legitimate service calls are due to run-of-the-mill troubles in the black-and-white sections of the receiver. Conventional black-and-white TV test equipment may be used in locating these troubles.

In the relatively small percentage of cases where trouble occurs in the color section of the receiver, the fault can almost always be found by applying conventional black-and-white TV trouble-shooting methods, such as tube substitution, voltage measurements, resistance checks, and substitution of suspected components. Certain types of trouble in the color section require the use of a color-bar generator, a wide-band oscilloscope, and/or alignment equipment.

It is evident from these facts that conventional black-and-white TV test equipment can be used for locating

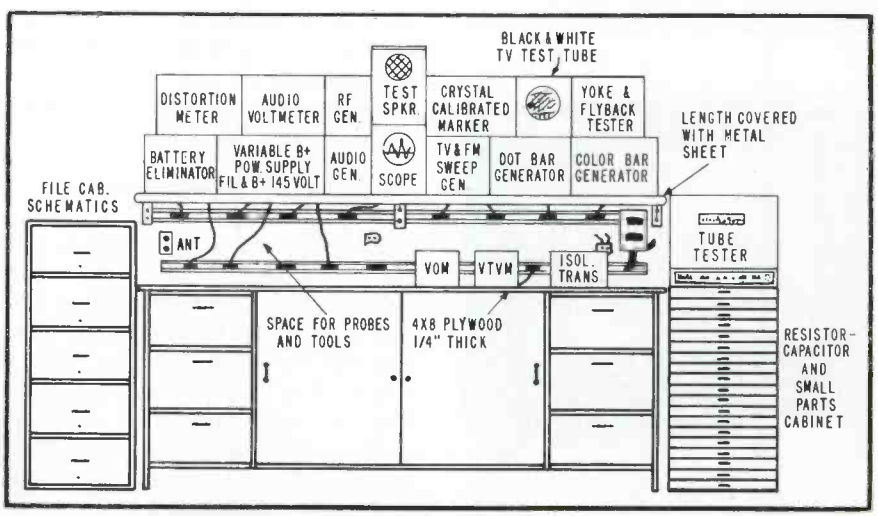


FIG. 1: SUGGESTED BENCH LAYOUT suitable for color and B/W servicing. Bench is approximately 96" long x 48" deep x 38" high and top may be constructed of ¼" plywood.

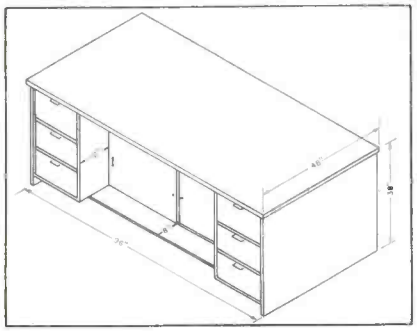


FIG. 2: ISOMETRIC VIEW of suggested bench for test instruments, showing overall dimensions.

the trouble in the majority of color TV service jobs, but certain types of trouble in the color section of the receiver require the use of a color-bar generator, a wide-band oscilloscope, and/or alignment equipment.

Purchasing Sequence

For the information of those Service Men who plan to buy one instrument at a time, purchases should be made in the following sequence: First a stable dot-bar-crosshatch generator,[1] then an accurate and versatile color-bar generator,[2] next a wide-band voltage-calibrated oscilloscope,[3] and finally suitable *rf*, *if*, and video-frequency alignment equipment such as a crystal-calibrated marker generator,[4] sweep generator,[5] marker adder,[6] and multi-marker[7] is also required. It is assumed that the technician owns a suitable VTVM.

Also required are certain accessory items, such as a degaussing coil, a kinescope control-grid switch box, cables for operating the receiver with the chassis removed from the cabinet, and a high-voltage VTVM probe. Further information on test equipment for color TV is contained in Section 10 of the RCA Color Television Pict-O-Guide.

Arranging Test Equipment

Service Men frequently ask for the best way to arrange test equipment on a service bench. There is, of course, no easy answer. Much depends on the Service Man's specialty, the space available and many other factors.

A layout suggested by James Daras of RCA Institutes, suitable for color servicing as well as black-and-white TV and general audio work, is shown in Fig. 1. Overall bench dimensions shown are 96 in. long by 48 in. deep by 38 in. high. A quarter-inch 4 ft. by 8 ft. plywood is recommended for the bench top. To allow leg room, the lower cabinets are recessed 8 inches as shown in Fig. 2.

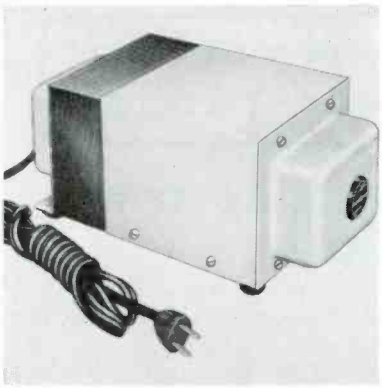
Service Men Win Cars

Eight television Service Men were named last month as winners of MGA sports roadsters in the Mystery Shopper contest sponsored by the RCA Electron Tube Division as part of its program for the 1958 National Television Servicemen's Week.

The winners, announced by Harold Stamm, manager, advertising and sales promotion, are: William Shulman, Huntington Radio and Appliance, 766 Huntington Avenue, Boston, Mass.; A. P. Volpe, A. P. Volpe TV Service Company, 64 Forrest Street, Conshohocken, Pa.; Richard B. Graf, Television Service Company, 112 North Center Street, Statesville, N. C.; Ralph C. Warner, Muskegon Engineers for Television, 855 W. Broadway, Muskegon, Mich.; Maurice G. Goldberg, Beacon Radio and Television Service, 611 University Avenue, St. Paul, Minn.; Mrs. D. V. Stephenson of Stephensons, West Side Square, Butler, Mo.; R. S. McGuire, McGuire's Television Center, 1824 State Line, Texarkana, Ark.; and James M. Dresbach, Sund TV and Radio Company, 128 E. Main Street, Los Gatos, Calif.

[1]*Such as RCA WR-46A.* [2]*RCA WR-61B.* [3]*RCA WO-91A.* [4]*RCA WR-99A,* [5]*RCA WR-69A.* [6]*RCA WR-70A.* [7]*RCA WG-295B.*

Test Equipment for the Service



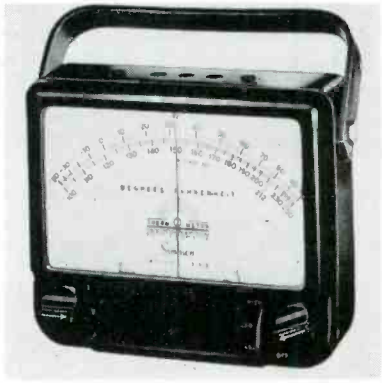
Automatic voltage stabilizer designed to maintain a 118 **v** output through input variations from 95 to 130 **v.** For use with TV sets, amplifiers, hi-fi sets and other equipment, where excessive or low voltage conditions often cause performance troubles. **(Acme Electric Corp., Cuba, N. Y.)**

Battery-driven variable **dc** power source covering the range from 0 to 67.5 **v.** Unit produces negative bias voltages for **agc** troubleshooting, alignment and experimental or laboratory work. Features a two-scale meter for accurate setting and correcting for various load conditions. **(BB-1; Kingston Electronic Corp., Medfield, Mass.)**

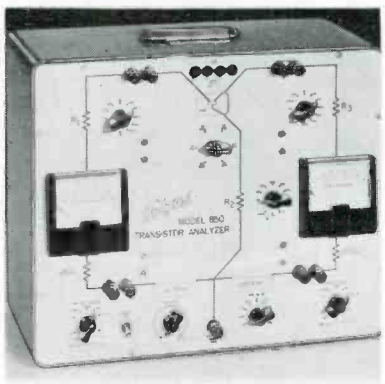
Current checker for horizontal output circuits which can be placed in circuit without disconnecting cathode. Indicates whether cathode current of horizontal output deflection tubes is within manufacturer's recommended limits. **(HC-6; Seco Manufacturing Co., 5015 Penn Ave. S., Minneapolis, Minn.)**

'Scope (in kit form) featuring **dc** coupled amplifiers and CR tube unblanking. A 5ADP2 flat face CR tube is used for accurate readings on an edge-lighted grid screen. A conetic-fernetic CR tube shield prevents trace distortion by stray ac fields. **(OP-1; Heath Co., Benton Harbor 11, Mich.)**

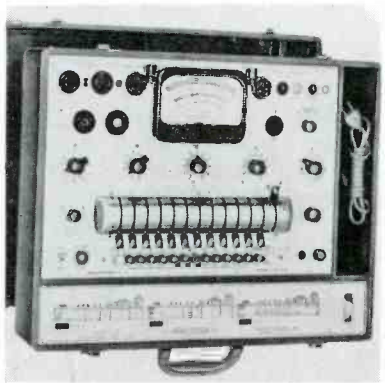
Portable Wheatstone bridge which measures resistors from 100,000 ohms to 1.5 megohms to an accuracy of .1% and up to 10 megohms to an accuracy of .25%. **(1071; Minneapolis-Honeywell Regulator Co., Rubicon Instruments Div., Ridge Ave. and 35th St., Philadelphia 32, Pa.)**



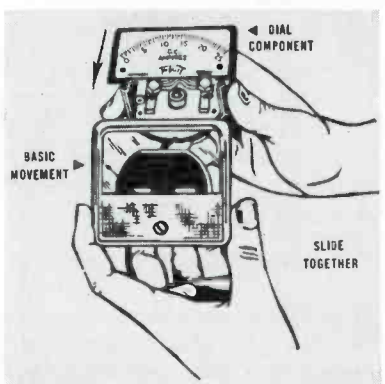
Dual-range **Therm-O-Meter** designed for measuring temperatures of gas, liquid, or solids. Has a low range from —50°F to 100°F; a high range from 100°F to 260°F. Can accommodate three leads simultaneously with separate readings through one selector switch on the front panel. **(389-3L; Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill.)**



Transistor analyzer designed to determine a transistor's ability to function under a specific circuit condition. Checks for collector leakage, C base or C emitter; beta (current) gain; alpha gain; input resistance; output resistance; power gain; and linearity. **(850; The Hickok Electrical Instrument Co., 10521 Dupont Ave., Cleveland 3, Ohio.)**



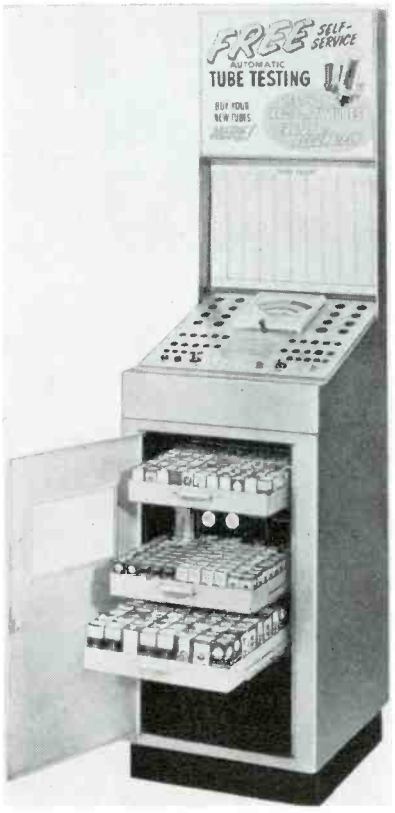
Tube tester which provides direct facilities for comprehensive testing of electronic and TV picture tubes. Three-window, geared roll chart provides convenient reference for all tube and test settings. **(10-40; Precision Apparatus Co., Inc., 70-31 84th St., Glendale, L. I., N. Y.)**



Unimeter which allows combining of any number of dial-component sections with a separate basic movement section. Permits stocking of a minimum number of basic meter movements and a maximum quantity of varied inexpensive dial-components. **(The Triplett Electrical Instrument Co., Bluffton, Ohio.)**

Shop

Direct-reading high-gain portable 'scope. Direct-reading feature allows calibration of scales in volts. Sync signal in excess of 1 v peak automatically triggers the 'scope. Sync light indicates presence or absence of proper level. Single switch flips trace 90° to increase accuracy for voltage measurements giving effective 2½ in. vertical. **(Pocketscope S-17-A; Waterman Products Co., Inc., 2445 Emerald St., Philadelphia 25, Pa.)**

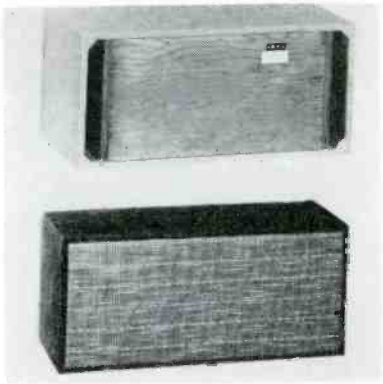


Self-service tube tester designed to check and sell radio and TV tubes in retail outlets. Said to check for quality, shorts and leakage, and gas content of over 600 tube types with just two settings. Storage cabinet with its own lock holds over 400 tubes. Available in both floor and counter models. Each tester comes with a complete plan of operation, advertising material and window streamers. **(SS-1; Century Electronics Co., Inc., 111 Roosevelt Ave., Mineola, N. Y.)**

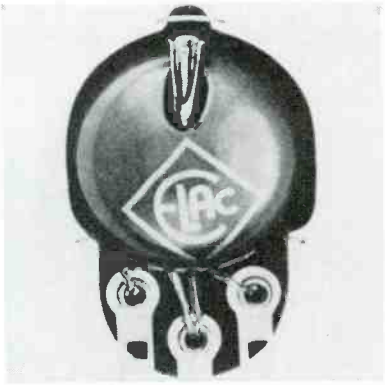
Notice to Subscribers

Effective with this October 1958 issue, **Service** ceases to be published as a separate magazine. Henceforth, **Service** will be incorporated in **Electronic Technician.** As soon as the required work of interfiling subscription lists is completed, **Service** subscribers will start receiving **Electronic Technician** every month for a period equivalent to the dollar value of the unexpired portions of their **Service** subscriptions. **Service** subscribers who are also subscribers to **Electronic Technician** will have their subscription periods extended.

Latest



Small-size forward-front design speaker enclosure suitable for stereo. Unit will accommodate an 8-in. woofer and a tweeter. Two ducted ports improve bass response. Cabinet is covered with ribbed pyroxylin fabric and has a decorator pattern grille cloth. **(TSE-1; Argos Products Co., Genoa, Ill.)**

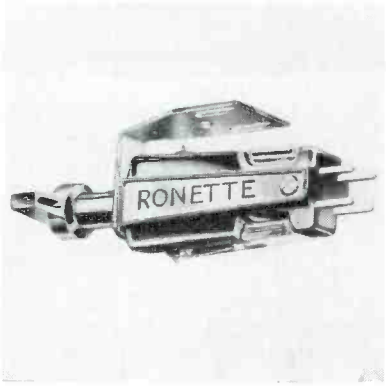


Variable-reluctance stereo cartridge said to fit all standard tone arms and constructed to eliminate hum problem. Mounting bracket provides two cartridge inclination positions. Equipped with a .7 mil diamond. **(Stereotwin 200; Audiogersh Corp., 514 Broadway, New York 12, N. Y.)**

Dual stereo preamp featuring variable crossover and feedback tone controls. Separate low-level input in each channel for magnetic phono, tape head and mike. Separate high-level inputs for AM and FM tuners and FM Multiplex. Auxiliary A and B inputs in each channel. **(HF-85 [kit or wired]; EICO, 33-00 Northern Blvd., Long Island City 1, N. Y.)**

Stereo Sound Equipment

40-watt stereo amplifier with two integrated 20-watt channels. Contains two power amplifiers and two preamplifier control units on a single chassis. (MS-4000; General Electric Co., Specialty Electronic Components Dept., W. Genesee St., Auburn, N. Y.)



Four-terminal dual-element cartridge with recommended tracking pressure of 4 to 6 grams. Frequency response is said to be flat from 20 to 15,000 cycles with a roll-off at 14,000 cycles. (Binofluid; Ronette Acoustical Corp., 190 Earle Ave., Lynbrook, N. Y.)

Dual-channel amplifier-preamplifier featuring 12-watt stereo output; 24-watt monaural output. Separate ganged bass and treble controls, balance control, mode switch, speaker selector switch, contour control, tape output for recording application and rumble filter are included. (Trio-A-224; Harman-Kardon, Inc., 520 Main St., Westbury, N. Y.)

Selector designed to simplify speaker phasing. May also be used to switch monaural and stereo signals; broadcast stereo and stereo tape or disc signals; broadcast stereo, stereotape or disc and monaural signals into the same amplifiers and speakers. (SP-5 Stereo-Phaser Selector; Vidaire Electronics Manufacturing Corp., 44 Church St., Baldwin, N. Y.)

Specially-balanced non-magnetic turntable with heavy-duty 4-pole motor. Turntable shaft runs in self-lubricating bearing with a steel ball pressed into its lower end. 4-speed mechanism is said to give absolutely uniform turntable speed. (Collaro 4TR200; The Rockbar Corp., 650 Halstead Ave., Mamaroneck, N. Y.)

Stereophonic tape deck with no dials or pushbuttons. Two knobs control entire unit. On-off switch and speed control have been combined to neutralize drive mechanism when machine is turned off. (Ekotape 340; Webster Electric Co., Racine, Wis.)

Wireless Wizard Remote Controls

(*Continued from page* 10)

amplified by another transistor and then are transmitted through a transducer unit. Another transducer in the receiving unit picks up the supersonic signals and applies them to the amplifier stages in the receiving unit.

Two Frequencies Used

In operation, when one of the press buttons is pressed down, two frequencies are broadcast and picked up by the receiving unit in the television receiver cabinet. The receiving unit amplifies the received frequencies with a three-stage amplifier having an overall bandpass of four kilocycles. The difference frequency between the two signals transmitted is detected, then amplified by a two-stage low-frequency amplifier. This difference frequency becomes a control signal of approximately 1 kc, 2 kc or 3 kc depending upon which of the higher frequencies (selected by the press buttons on the transmitter) are used in combination with the 41-kc signal.

After the difference frequencies are amplified, three low-frequency rectifiers, each tuned to one of the difference signals, operate relay tubes which control relays to initiate the function for which the respective press buttons were used.

The volume is controlled by switching to a separate pre-set volume control. Channel selection is accomplished by switching to pre-selected channels set-up by a *programmer* switch (a pre-set seeking switch) on the television receiver.

A *local-remote* switch on the bottom rear of the receiving unit permits the use of either remote control or normal manual tuning. The receiver can be tuned normally in either condition. A master *on-off* switch turns on either the remote control receiving unit (if the *local-remote* switch is in the *remote* position) or the television receiver (if the *local-remote* switch is in the *local* position.) If the receiver is turned off by remote control and the *local-remote* switch is in the *remote* position, the receiver can be turned on only by the remote control unit.

Local Operation

With both the four-function and the all-function remote control units, the receivers can be operated at the *local* position whether the remote control unit is used or not.

All functions, for either color or black-and-white can be controlled without moving from your easy chair.

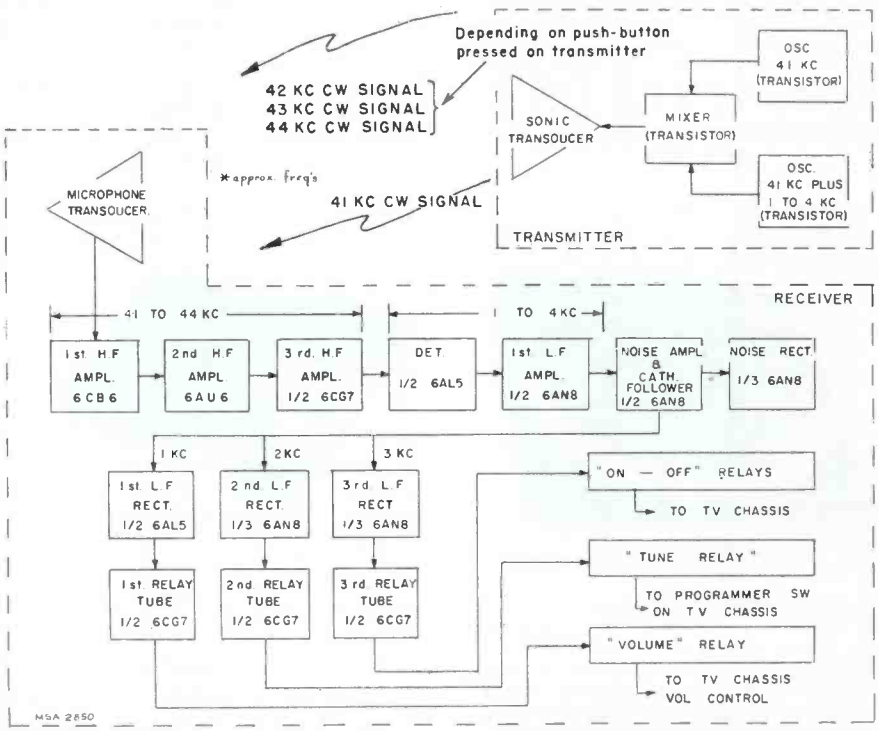


FIG. 3: BLOCK DIAGRAM of four-function wireless wizard remote control unit.

(*Continued from page 27*)

vergence can be considered very good if there is no separation greater than 1/32 inch in 85% or more of the screen, and no separation which is greater than 1/16 inch for the red and green lines and 1/8 inch for the blue lines appears at the outer edges of the screen.

If separation of the lines occurs only at the sides of the pattern, as shown in Fig. 1 on page 27, then only dynamic convergence need be reset.

If separation occurs in only the white vertical lines, then only the vertical dynamic convergence should be retouched. If only the horizontal white lines are separating at their outer edges, then only the horizontal dynamic convergence need be adjusted.

If separation of the lines is present, such that the red, green and blue lines are parallel to each other both horizontally and vertically, as shown in Fig. 2, then only static convergence need be reset. This is done by adjusting the magnets mounted on the neck of the CRT.

B/W Balance and Tracking

If the black and white raster is uniformly tinted or the highlights in the picture are tinted one color and the lowlights are tinted another color, then the CRT grid and screen controls must be reset. First check the room lighting as described under Receiver Location.

To check black-and-white tracking, rotate the brightness and contrast controls through their ranges and observe the raster. If tinting occurs, then the black-and-white balance adjustments should be reset. Better color reproduction will result if the raster is made to have a slight brownish tint.

The Service Man should make arrangements to install the color receiver at a time when a color program is being transmitted. This will make possible a true test of the receiver's color operation. If this is not possible, then a color bar or rainbow signal generator must be used.

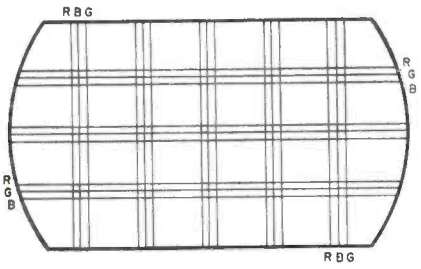


FIG. 2: MISCONVERGENCE DUE TO misadjustment of the static convergence adjustments on the neck of the color picture tube appears on the face of the CRT as shown above.

Connect the generator to the receiver and set the generator and receiver controls for the best color pattern. Adjust the fine tuning control for best color at the point where the 920 kc beat is just eliminated. This is present only if generator has an audio signal.

Adjust the contrast and brightness controls for best reproduction. Set the color saturation control for the proper proportion of color. Adjust the hue control for the correct sequence of colors, as shown in Fig. 3. Check the

(*Continued on page 40*)

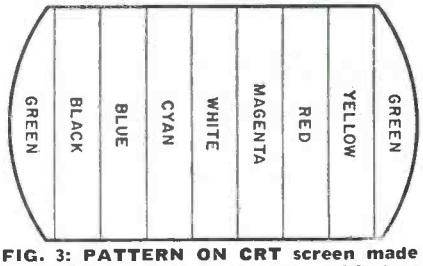


FIG. 3: PATTERN ON CRT screen made by NTSC color bar generator with hue control set for correct color sequence.

BOOKS—CATALOGS

Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill., has released its 452-page 1959 general catalog of electronic parts and equipment, including a complete line of high-fidelity components. The line of 60 Allied Knight-Kit electronic kits is illustrated and described. Industrial equipment includes listing of receiving, cathode-ray and special purpose tubes, transistors, semiconductors and diodes, 2-way radio-telephone systems, sound-powered telephones, intercom units, FM receivers for communications services, photoelectric systems, electric counters, laboratory test equipment, rectifiers, converters, relays, switches, variable voltage and other transformers, fluorescent fixtures and accessories.

* * *

Blonder-Tongue Laboratories, Inc., 9 Alling St., Newark 2, N. J., has announced an illustrated brochure covering both consumer and industrial products. Listed are complete descriptions, specifications and prices of TV amplifiers, installation accessories, UHF-VHF converters, master TV components and systems, and closed circuit TV systems.

* * *

Centralab, A Div. of Globe-Union, Inc., 900 E. Keefe Ave., Milwaukee 1, Wis., has released a revised edition of its 20-page illustrated booklet on the Compentrol volume control for high fidelity which compensates for the Fletcher-Munson effect. Booklet explains the Fletcher-Munson effect, how the Compentrol overcomes it, and contains installation instructions for the unit.

* * *

Cornell-Dubilier Electric Corp., South Plainfield, N. J., has issued a 24-page Capacitor Substitution Cross Index with more than 3,525 listings of preferred twist prongs and tubular electolytics to replace Aerovox, Mallory, Pyramid, Sangamo and Sprague capacitors.

* * *

General Electric Co., Receiving Tube Dept., Owensboro, Ky., has announced a pocket-size receiving tube interchangeability chart listing 122 replacements for 180 popular television and radio types. Available through authorized distributors.

* * *

Ohmite Manufacturing Co., 3699 Howard St., Skokie, Ill., has announced bulletin 153 describing wire-wound power resistors featuring a jacket of silicone-ceramic materials molded around the resistor to provide a uniform, moisture-proof, high insulation resistance covering and other advantages. Lists the variety of resistance tolerances in which these units are furnished, as well as maximum resistance values for each wattage size—3, 5 and 10 watts.

* * *

Oxford Components, Inc., 556 W. Monroe St., Chicago 6, Ill., has published a catalog illustrating and describing new bass reflex cabinetry in actual use. Included are facts about the red mahogany, cherry and blonde oak cabinets with complete descriptions of the specifications. Back page illustrates a 3-speaker system with 3-way crossover network.

Perma-Power Co., 3100 N. Elston Ave., Chicago 18, Ill., has issued catalog B-139 describing the Magneformer, a device for magnetizing or demagnetizing screwdrivers, nut runners, hammers, pliers, small wrenches, probes, tweezers, special instruments and small tools.

* * *

Philco Corp., Accessory Div., Philadelphia 34, Pa., has released a 24-page catalog covering audio products. Included are needles, cartridges, changers, motors, spindles, tone arms and recording tape.

* * *

RCA Service Co., Government Service Dept., Camden 8, N. J., has published a 348-page book, Closed-Circuit Television Systems, covering black-and-white and color closed-circuit TV systems. Explains the fundamentals and techniques of closed-circuit TV and presents characteristics and typical applications of various types of commercial equipment. Contains a wealth of practical details on both color and black-and-white TV to permit engineers and planners to determine in advance the proper equipment and system arrangement to serve specific performance needs—priced at $4.50.

* * *

Sylvania Electric Products, Inc., Towanda, Pa., has issued a technical bulletin. Sylvania CR-405 Phosphor, describing a blend of silver-activated zinc and zinc cadmium sulfides designed especially for use in aluminized picture tubes.

ADVERTISERS IN SERVICE
OCTOBER, 1958

ASSOCIATIONS

NATESA Convention

More than 600 executives of independent TV, radio and home electronics service businesses attended the recent annual convention of the National Alliance of Television & Electronics Service Associations in Chicago. The delegates represented the 112 NATESA affiliated local associations.

New approaches to such problems as captive service, concealed warranty costs, improper wholesale practices, licensing, marketing, advertising, picture tube sales abuses, safety of sets and pay TV received much consideration.

Continuing Friends of Service Management Plaques were awarded to the tube division of CBS, Raytheon and Sylvania and to Howard W. Sams & Co. *Friends of Service Awards* were voted for the first time to Merit Coil & Transformer Corp. and Tung-Sol Electric, Inc. A special citation was voted to TV station WWL, operated by Loyola University of the South in New Orleans, for assistance given to local NATESA affiliates in Louisiana, especially on licensing which resulted in Louisiana becoming the first state to enact a professional TV license.

Lectures on business practices stressed latest techniques for operating businesses in more profitable manner. Discussions on expansion of the manpower pool brought a well developed plan for establishment of an educational college degree for technicians. *Albert C. W. Saunders*, who was reelected to the post of educational director, reported on progress in this direction.

Vincent Lutz of St. Louis was named NATESA president for the coming year. Retained for another year were *Mac Metoyer* of Kansas City as secretary general and *Nelson Burns* of Memphis as treasurer. Other officers elected at the convention were *Bert Bregenzer*, Pittsburgh, Eastern vice president; *Irving Toner*, Buffalo, Eastern secretary; *Cordell Britt*, Nashville, East Central vice president; *Albert Mirus*, Cincinnati, East Central secretary; *Wayne Lemons*, Buffalo, Mo., West Central vice president; *W. E. Johnson*, Beaumont, Tex., West Central secretary; *Winston Haines*, Burlingame, Calif., Western vice president; and *O. W. Andrews*, Denver, Western secretary.

During the convention breakfasts were hosted by the tube divisions of Raytheon and RCA, luncheons by CBS-Hytron and Westinghouse, suppers by Sylvania, brunch by General Electric and the annual cocktail party by Howard W. Sams.

Frank J. Moch was selected to continue as executive director of NATESA for the next two years.

* * *

TSA, Seattle, Wash.

Anthony Savage, Jr., of the King County Prosecutor's Office spoke at a recent meeting of the Television Service Association on the subject of bad checks and displayed many samples of the check passer's art which had been collected locally. He outlined the many ways in which bad checks can be presented, the laws relating to them and the recourses that a business man has in getting redress for a bad check.

Installing Color TV

(*Continued from page* 37)

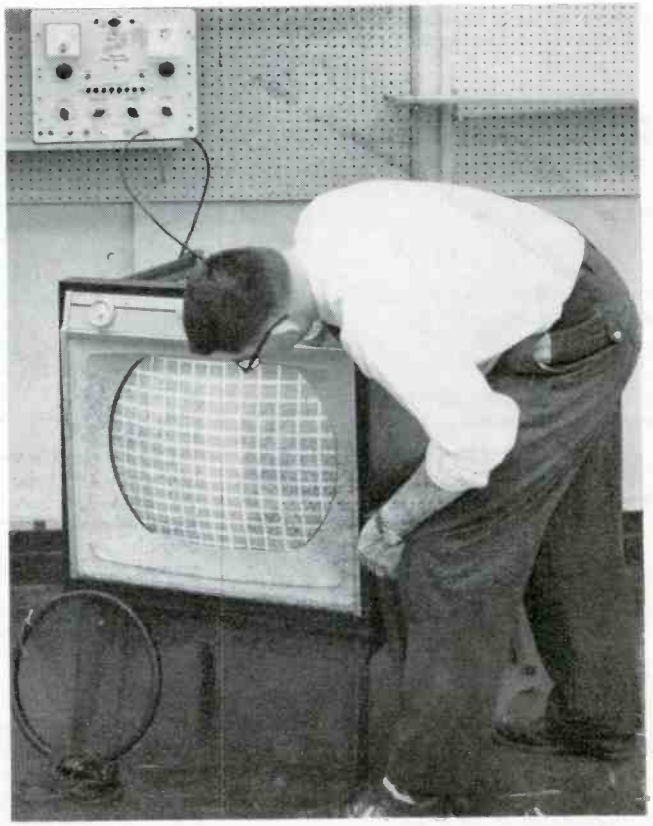
setting of the horizontal hold control. On some receivers it will have a definite effect on color reproduction.

If a color program is being televised, then make the above adjustments using the transmitted signal. This will guarantee correct receiver operation since it provides a complete check of the receiver, antenna and transmission line. If no color is present on the receiver screen but the receiver checked out perfectly with the signal generator, then check for a defective or narrow-band antenna, mismatch in the antenna transmission system or some situation of multipath reception.

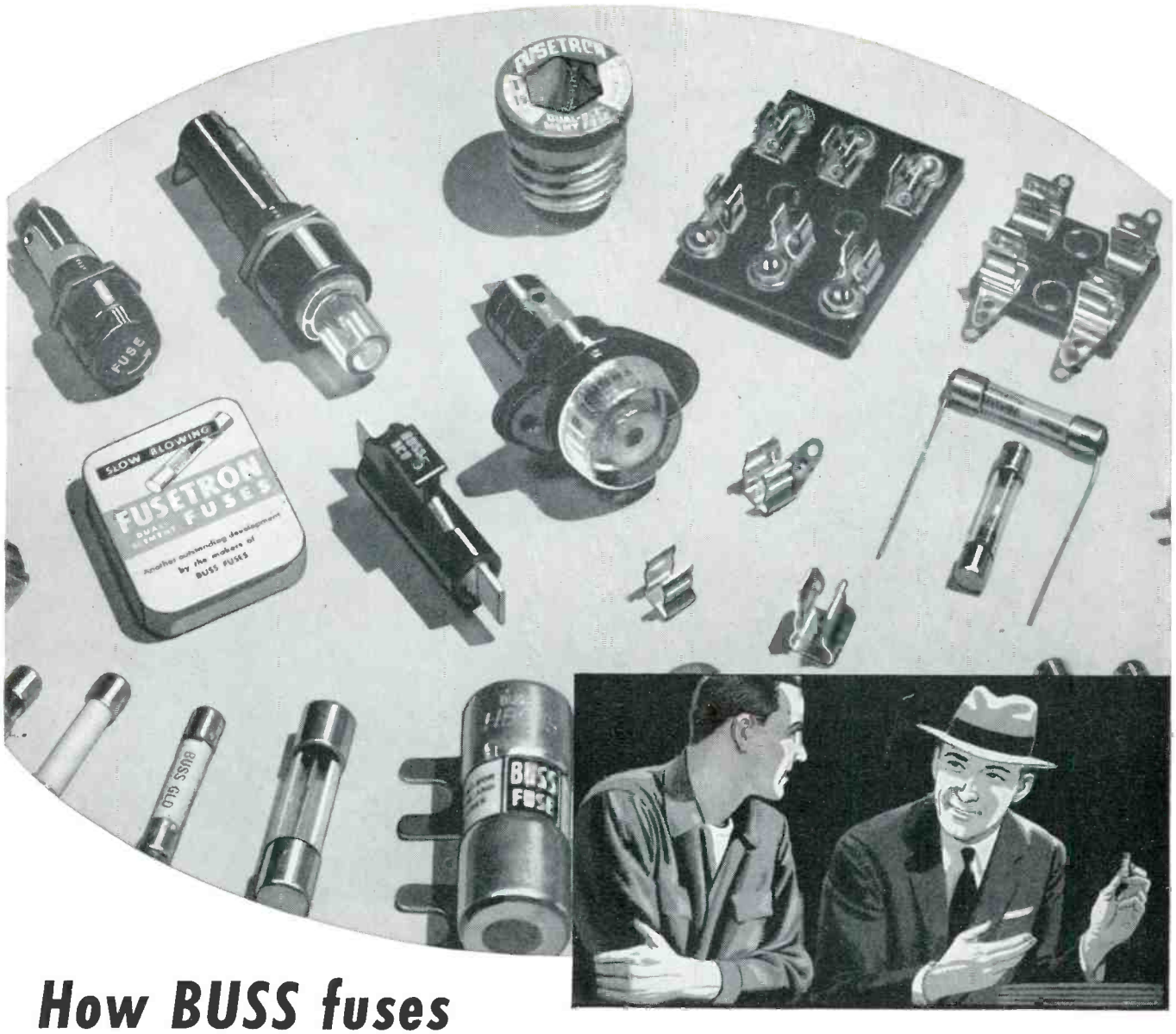
Customer Instruction

The customer should be made throughly familiar with all operating controls for black-and-white reception as well as for color reception. Be sure that the customer knows how to correctly fine-tune the receiver. Call his attention to the 920 kc beat between the sound and chroma signals. Stress the point that best color reception occurs at the point where the beat just disappears.

Explain how the hue control should be adjusted for best flesh tones. Illustrate how the saturation control should be adjusted for a proper amount of color. Emphasize and reemphasize to the customer that under no circumstances should he remove the back cover or manipulate any of the service controls. This could, and in all probability will, lead to a needless call-back.



THE AUTHOR SETTING CONVERGENCE on Westinghouse H-21CT258 21" color television receiver. The top of the cabinet has been removed so that the magnets on the neck of the picture tube can be reached conveniently without removing the chassis from the cabinet. A degaussing coil is resting against the base of the cabinet and a Hickok Model 650C Universal video generator is being used to provide the necessary cross-hatch pattern on the screen of the picture tube.



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Over the past 43 years, millions upon millions of BUSS fuses have provided dependable electrical protection in homes, industries and on farms. As a result, BUSS quality is unquestioned. Furnishing BUSS, the Known brand of fuses, saves you time and helps you build your reputation for service and reliability.

For more information on BUSS and FUSETRON Small Dimension fuses and fuseholders, write for bulletin SFB.

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BUSS MAKES A COMPLETE LINE OF FUSES FOR HOME, FARM, COMMERCIAL, ELECTRONIC, AUTOMOTIVE AND INDUSTRIAL USE.

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...with your purchases of RCA TUBES!

Right now RCA is offering for the first time anywhere, one of the greatest bargains ever presented on this or any other midway! With this exclusive RCA offer, you receive these valuable premiums absolutely free with your purchases of RCA Receiving Tubes!

for only 250 RCA TUBES!

FREE—a $19.95 value—the exclusive RCA TV-TOTER! Saves your time, your energy. Safely handles chassis and sets, upstairs, downstairs, in the shop. Rugged. Lightweight. Absolutely free with your purchase of 250 RCA Receiving Tubes.

for only 750 RCA TUBES!

FREE—a $59.50 value—your choice of a Bulova watch! Choose either the handsome "Pacemaker" for yourself, or the lovely "Nanette" for your lady. Absolutely free with your purchase of 750 RCA Receiving Tubes.

See your authorized RCA tube distributor ...today! This offer is good for a limited time only!

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