RADIO & TELEVISION MAINTENANCE

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APRIL 1950

10c

DuMONT Opens Million-Tubes-A-Year Plant . . . See Story on Page 16

. . . also in this issue: Servicing the Sweep Section Sync Separator Circuits • Picture Tube Holder • Electronically Speaking • Radio Industry Newsletter • The Notebook The Merchandising Corner • Etc.

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March 6, 1950

Mr. John F. Rider
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480 Canal Street
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Dear John:

Too often we are prone to accept many of the good things in our life and work without regard to the pioneering efforts which make them available and an accepted necessity today.

In such a category for the radio and television technician we must classify Rider Manuals and other Rider Radio Service Books. These publications down through the years have been the mainstay in providing the radio service industry in bound and indexed form for easy and quick reference, accurate service and technical information covering the many radio and television receivers currently on the market.

I note in the February issue of Successful Servicing a number of letters attesting to the completeness of your latest Television Manual, Volume No. 3. We have one of these in our office. This has been of considerable assistance to our engineers as well as our own service staff. The styling, size and general makeup of this new manual has been favorably commented upon by all who have had occasion to see and use it.

Under the circumstances I feel compelled to write you, to pass along our opinion and praise for this manual. Such reaction must be universally evident and reaching you from all corners of the nation, especially from those who know and appreciate what Rider Manuals mean to service men everywhere.

Cordially yours,
CAPEHART-FARNSWORTH CORPORATION
F. B. Ostman, Manager
Service Department

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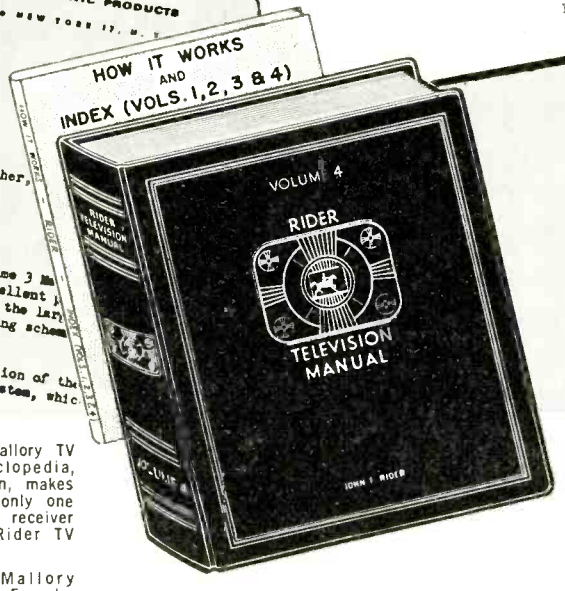

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NOTE: The C-D Capacitor Manual for Radio Servicing, 1948 Edition No. 4, makes reference to only one source of receiver schematics—Rider Manuals.

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RADIO & TELEVISION MAINTENANCE

Volume 6 April, 1950 Number 4

CONTENTS

Radio and Television Maintenance is published monthly by Boland & Boyce, Inc., at 34 No. Crystal St., East Stroudsburg, Pa., U.S.A.; Executive and Editorial Office, 460 Bloomfield Ave., Montclair, N. J. Subscription Rates: In U. S. and U. S. possessions $1.00 per year, single copies 10 cents; In Canada, Mexico, Central and South America: $1.50 per year, single copies 15 cents; In British Empire, $4.00 for 1 year, $7.00 for 2 years, single copies 45 cents; all other foreign countries, $5.00 for 1 year.

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ELECTRONICALLY SPEAKING

BY ISIDOR I. GROSS

Congratulations. Frank Moch, fiery and outspoken president of the Television Installation and Service Association of Chicago, has been elected to office for the third consecutive term. Our congratulations. He's been doing a fine job in the windy city for the past two years (you will recall that he was instrumental in killing an Illinois licensing proposal) and is still going strong. His latest is the sponsorship by his organization of a series of lectures on the technical and business aspects of television, to be presented by the Television Technicians Lecture Bureau. During the sessions on business he hopes to develop a basic system of television sales and service operation; and his plan is to collect the material worked up at those sessions into a guide for action, said guide to be made available to all other service associations in the country. This seems to us a splendid undertaking, and we wish him success.

Newcomer. While on the subject of associations, we had a note from Stanley Curtis, telling us about the formation of the Mohawk Valley Radio and Television Technicians Guild (RTG). About 50 technicians attended the charter meeting, and plans were made to prepare a program of bringing to the membership the most up-to-date methods in radio and television servicing. Stanley Curtis? Why, he's the president.

Distributors, please copy. Philadelphia's Radio Electric Service Co. (RESCO) will again offer a television servicing course to technicians without cost. Last year, a similar course conducted by Art Liebscher, RCA's TV expert, drew over 900 technicians. This year's lectures, also conducted by him, promise to be even better attended. With the number of teleset models increasing rapidly, the technician has the ever present task of keeping up-to-date. Opportunities as those provided by RESCO (and other wholesale distributors throughout the country) are very much appreciated by him. Those distributors who have not yet sponsored such lecture series could render great service to themselves as well as the service industry, by doing so. There are never enough of such lectures available, and their lack is particularly felt by those who are relatively new to the fold and lack experience. How about it?

For the technician. Sylvania is really going all out for the technician this year. By now most of you will have seen ads they're running in Life, Collier's and such magazines. These ads have been very effective and you can tie them in profitably with your own promotion (turn to page 19 for details). They also have various special offers (one of which is advertised on page 31). Their efforts on behalf of the technician deserve high praise; and we are happy to report that the Federation of Radio Servicemen's Association of Pennsylvania has recognized their contribution to the service trade by awarding its annual award for outstanding service to radio and television technicians to Sylvania. They certainly deserve it. (We'll report on the award in greater detail next month).

Service hint. We thought we'd pass on to you an item we had from Sprague's S. L. Chertok. He tells us about a technician in Chicago, name of Richard Wiseman, who has solved the problem of locating a defective capacitor (or other component) which is defective only when the set is heated during actual operation (especially true of "hot-box" ac-dc table models). After removing the chassis from the cabinet, he simply uses a home hair dryer to blow a stream of very warm air on the suspected part, thus quickly simulating the "in-cabinet" condition.

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A sharp-cutoff r-f-amplifier miniature pentode, Type 6CB6 differs from the 6AG5 (among existing similar tubes) by having the suppressor brought out to a separate pin connection, instead of connected internally to the cathode. This improves performance—particularly in the new 40-mc i-f applications—by enabling the TV designer to reduce inter-action effects between input and output circuits. Transconductance of the 6CB6 is higher than the 6AG5 by approximately 1,100 micromhos. Grid-plate capacitance is lower —an especially desirable feature in h-f work.

182-JA3

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PRODUCT OF GENERAL ELECTRIC COMPANY

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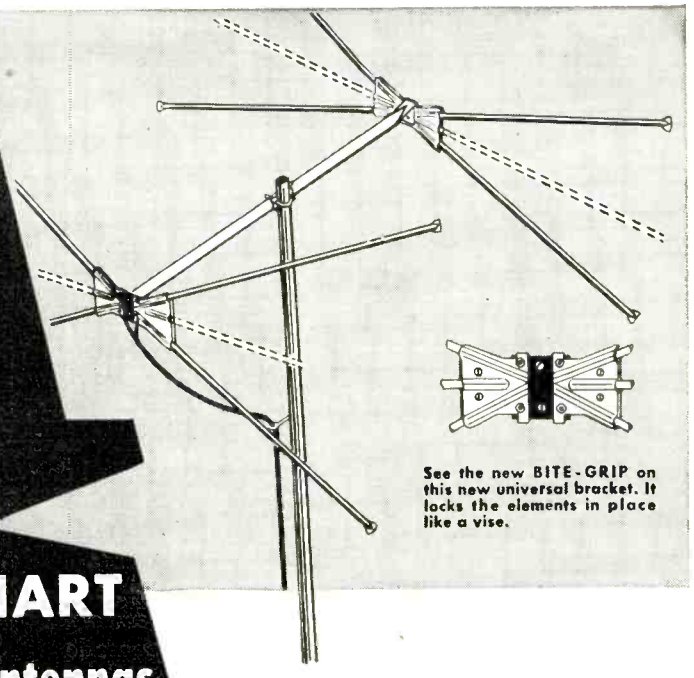

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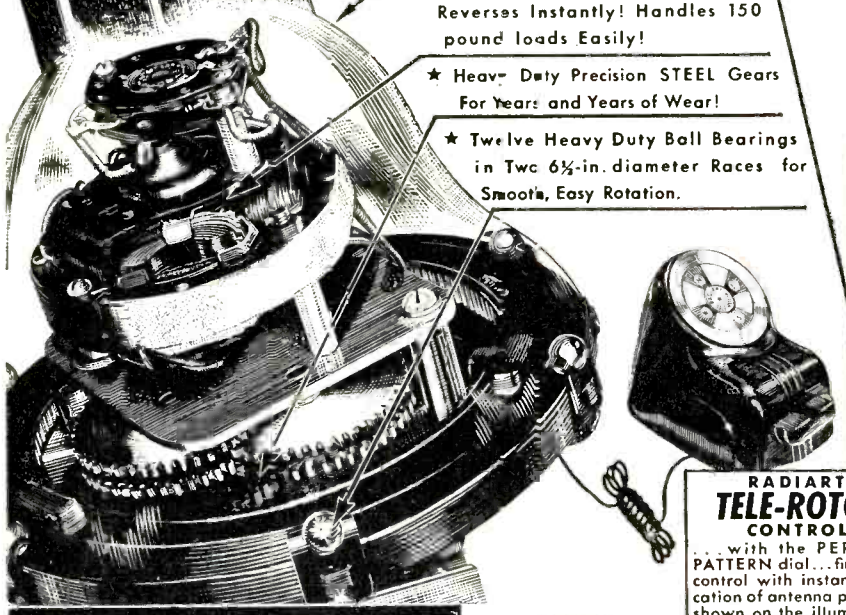

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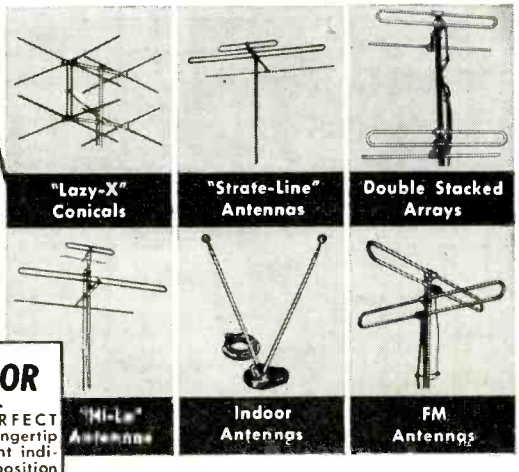

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RADIO INDUSTRY NEWSLETTER

THE MARCH SHOW—As this issue goes to press, the 1950 convention of the Institute of Radio Engineers (IRE) is drawing to a close. The numerous technical papers which were presented and the various new products which were displayed spelled out the future of the electronics field. The subjects discussed at the convention and the new developments unveiled there will have profound effects on the service trade. A detailed report of the meeting will therefore be published in our next issue.

IT'S SPRING, BUT FREEZE PERSISTS—The boom in television receiver production and sales continued, with the first quarter of the year breaking all previous records. Many companies reported new production highs, and most guestimates of teleset output for this year ran over the 4 million figure (but warning signs in the form of widespread price cutting appeared on the horizon). In the meantime, pressure to have the freeze thawed out continued to mount. At the moment, nearly 300 applications for station construction permits were pending, as was the frequency allocation plan proposed by the FCC last year, with no action in prospect for either. From the West Coast, telemaker Hoffman urged the Commission to separate the issues of color and u-h-f and hurry with a decision on the latter. In Washington, as the hearings resumed, the Radio Manufacturers Association (RMA) renewed its effort to have the freeze lifted. With what success remained to be seen.

STILL BOGGED DOWN—After lying dormant for a few weeks, the subject of colorvideo came up again, with Color Television Inc. (CTI) of California making the first official demonstration of its system before the FCC, with inconclusive results. At the same time, both RCA and CBS continued public showings of their colorvideo, and RCA reported continued progress on its single tri-color direct view picture tube, was expected to demonstrate it to the FCC shortly. All things considered, a final solution did not even seem to be in sight; and Dr. DuMont still maintained that color was at least nine years off.

NO TAX! Protests against the 10% excise tax on television receivers, proposed by Secretary of the Treasury Snyder, continued, with all segments of the industry united in their opposition. At hearings of the House Ways and Means Committee in Washington, the National Broadcasters Association (NBA) and RMA, both testified against the proposal, and were joined by numerous groups and individuals representing the radio and television industry. Several servicemen's associations have alerted their members to write or wire their Congressmen, objecting to the proposal. Certainly, the entire service trade has an important stake in this matter, and any technician who has not contacted his Congressman should do so without delay. Imposition of such a tax will mean cold cash out of his pocket. Fight it!

GUARANTEED TUBES—Sylvania announced that all television picture tubes manufactured by them will henceforth carry a one-year guarantee. Any picture tube sold by Sylvania which fails because of defects in materials or workmanship within a year of shipment, will be replaced free of charge. A code date stamped on each tube at the time of shipment will determine whether a tube is within the adjustment period. Previously, Sylvania had a form of warranty which involved pro-rated charges based on tube use. The new plan has been greeted with approval by both the public and the service trade.

ALSO LAST MONTH . . . William Dubilier was awarded the Chevalier Cross of the French Legion of Honor . . . CBS adopted RCA's picture definition method for its color system . . . The American television system was being demonstrated to a group of foreign technicians on two-weeks tour here . . . and 242 students were graduated by RCA Institutes.

Service Technique

Here are tested methods for

SERVICING SWEEP SECTIONS (Electrostatic Deflection)

by Cyrus Glickstein

American Radio Institute

ALL seven-inch sets on the market today use electrostatically deflected picture tubes. In servicing these receivers, it is helpful to know their general characteristics. Practically all newer models use the r-f high voltage supply, although some earlier sets use the 60-cycle high voltage system. The vertical sweep amplifier is connected to a tap or directly into the high voltage bleeder, rather than to low voltage B+ (See Fig. 1 and 2). Most sets use the intercarrier sound system to cut down the number of tubes.

Almost all the seven-inch sets are transformerless, which means that the filaments are in series-parallel across the line. Incidentally, a number of ten-inch receivers using magnetic deflection also are transformerless.

As has been mentioned previously, in servicing transformerless receivers, there is one preliminary operation which precedes the three main steps in troubleshooting: to check the tubes and see if several or all of them are unlit. This usually indicates that a filament is open. When the bad tube is found, either by substitution or by taking out each tube and measuring the filament resistance, a good tube is put in and the set turned on again. When all the filaments are lit, the standard trouble-shooting procedure can then be applied—although in many cases it will no longer be necessary, since the trouble very often is only a bad tube.

Once the filaments are lit, troubles in the sweep circuits will be indicated on the screen by any of the symptoms mentioned in last month's article: horizontal line only, vertical line only, horizontal or vertical non-linearity, fold-over, etc. There is one difference with the smaller sets: failure of the horizontal sawtooth will not cause a blank screen, but merely a vertical line, since the fly-back high voltage system is not used.

The same general techniques as previously described are used for finding the defective stage: a-c voltage readings, using a .1 condenser in series with the hot vtvm lead, on the a-c scale, to check the saw-tooth voltage at various points in the sweep circuit; d-c voltage readings to check for negative voltage on the oscillator grid and in most circuits, on the amplifier grids, to determine the presence of a sawtooth; disturbance tests which use the sound system of the set for an audio signal tracer; and finally signal tracing with a scope.

The sweep systems used in smaller receivers are generally quite similar to those in larger sets, except that multivibrators tend to be used rather than blocking oscillators for saw tooth generators. The output stages are voltage (usually CR coupled) rather than power (transformer coupled) amplifiers.

Some of these troubleshooting methods will now be illustrated.

Case histories

Set: Motorola, chassis TS-18 (see Fig. 1). Transformerless. Picture kept rolling to bottom. Couldn't hold still with any adjustment of the vertical hold control. Sound OK. Vertical oscillator and vertical amplifier tubes changed. No effect. The picture still seemed to roll toward the bottom of the screen. This showed the vertical sawtooth frequency was too high. Incidentally, when the blanking bars (thick black lines between frames) move in the direction of scanning, the frequency is too high. For example, the CRT beam scans from top to bottom. Therefore, if the horizontal bars, and consequently the picture, seem to be moving downward, the sawtooth frequency is too high. The same general principle can be applied to the horizontal circuit, where the beam is scanned from left to right. If the vertical blanking bars slant in the direction of scanning, from the upper left corner to the lower right corner, the frequency of the horizontal circuit is too high. Naturally, in the vertical circuit, when the picture moves up, or in the horizontal circuit, when the slant is from upper right to lower left, the sawtooth frequency is too low.

Evidently the picture rolls when the sawtooth frequency is incorrect. There are three main possibilities for this: (a) it is not possible to get the proper frequency on the oscillator. (b) sync pulses are not coming in correctly to trigger the oscillator, and it therefore drifts. (c) interference is coming in and triggering the oscillator at the wrong times.

A quick test was made to check the first possibility. One end of C68,

- **Check sawtooth voltage at various points in sweep circuit, using .1 condenser in series with hot vtvm lead, a-c scale.**
- **D-C voltage readings to check for negative voltage to determine the presence of a sawtooth.**
- **Disturbance tests, using the sound system of the set for an audio signal tracer.**
- **Signal tracing with the oscilloscope.**

COURTESY MOTOROLA INC.

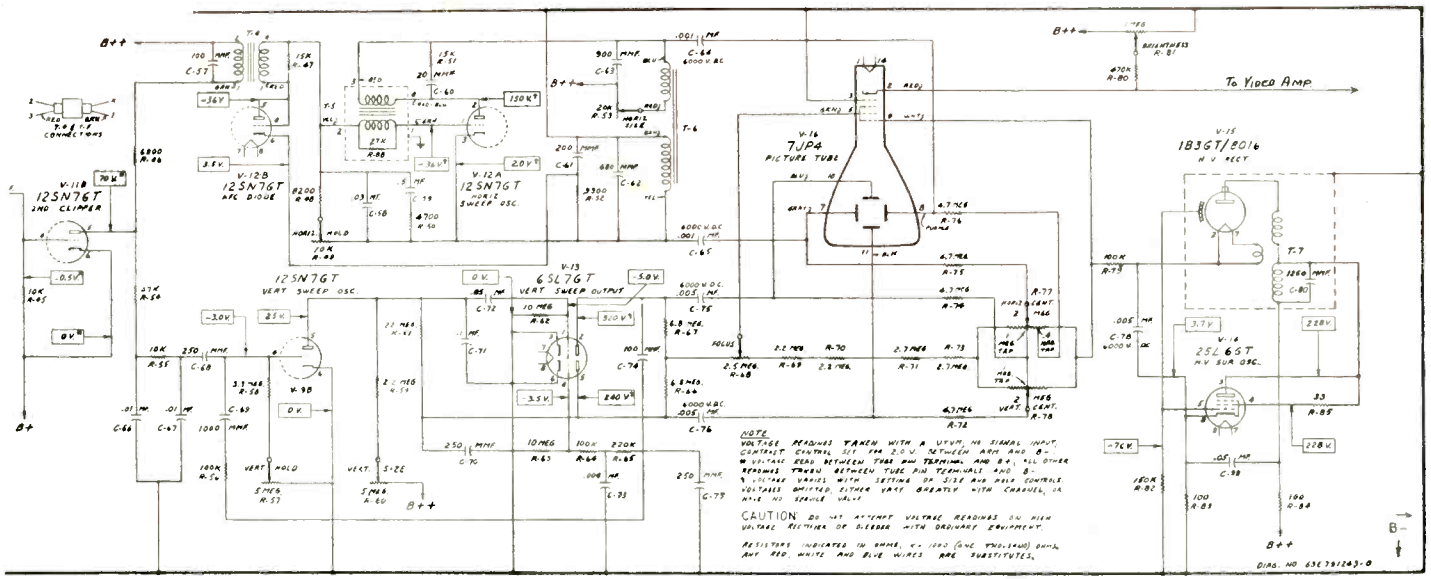

FIG. 1 - SECTION OF MOTOROLA CHASSIS TS-18, SHOWING SWEEP CIRCUITS.

COURTESY SENTINEL RADIO CORP.

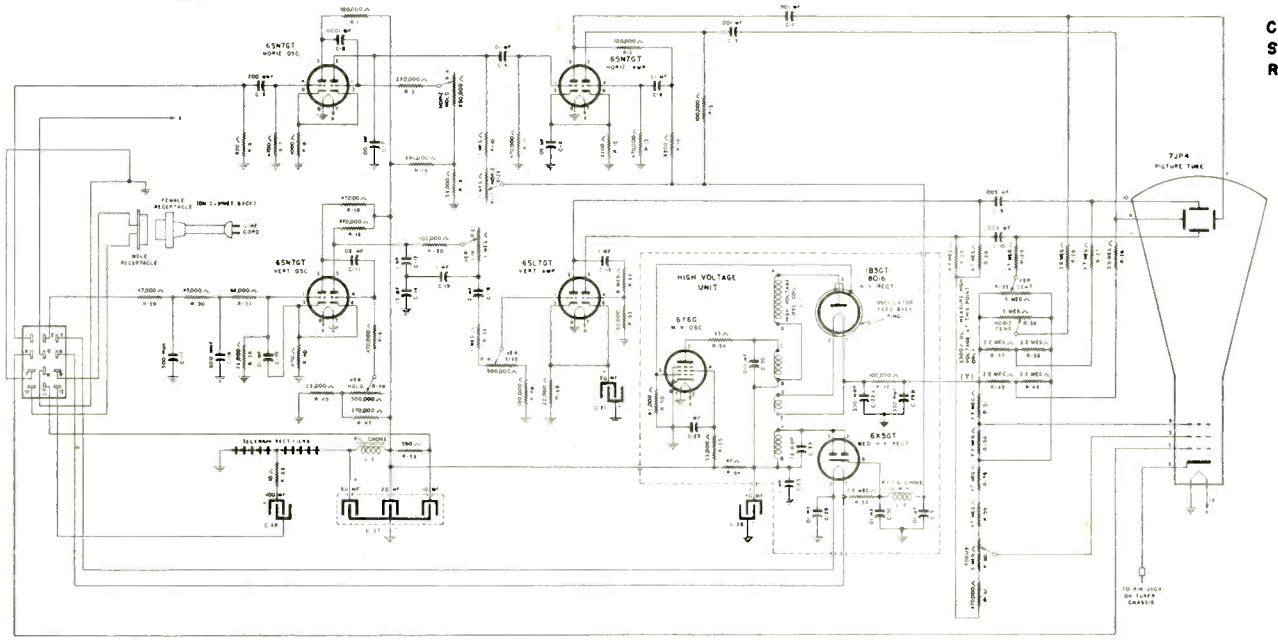

FIG. 2 - SECTION OF SENTINEL MODELS 400-TV & 405-TVM SHOWING SWEEP CIRCUITS.

the condenser coupling sync pulses into the vertical oscillator, was unsoldered. This prevents either sync pulses or other signals from triggering the oscillator. The vertical hold control was then adjusted to see if the picture could be kept fairly still vertically. If it could, then this would indicate the oscillator can reach the correct frequency of 60 cycles by itself. However, no position of the control could bring the picture to a stop, or near stop, pointing to the vertical frequency being off.

Now the frequency of a multivibrator is determined by the following factors: (a) time it takes the sawtooth condenser C71 to charge through R59 and R60, vertical size control, to a high enough voltage to overcome the slowly decreasing negative voltage on the grid and make the tube fire. (b) time it takes coupling condenser C69 to discharge through grid resistor R58 and R57, vertical hold control. (Feedback in this circuit is from the amplifier back to the oscillator.)

When the tube fires, the sawtooth condenser discharges through the tube, which then cuts off and the cycle repeats, at a definite frequency. This frequency can be altered by varying the time it takes to (a) discharge the coupling condenser, (b) charge the sawtooth condenser. Any great change of component value in either the charge path of C71 or the discharge path of C69, which cannot be compensated for by varying the controls, will throw off the frequency. Also, varying the time the sawtooth condenser charges varies the size, and the linearity also, if the condenser is permitted to accumulate too great a charge before being discharged.

Since the frequency was off, a voltage and resistance check was made of the oscillator circuit. There was no definite indication of changed values. Since a change of condenser value would not show up at all in a resistance check and not very clearly in a voltage check, condenser substitution was tried next. One end of the condensers was unsoldered and new ones substituted. Substituting a new condenser for C69, the grid condenser, restored the circuit to correct operation. Evidently, the old one had changed value.

As noted above, the feedback comes from the output of the vertical amplifier tube V13 by way of C74, R65, and C73. This network differentiates the sawtooth wave in the plate of the vertical output tube, pin 2. A differentiated sawtooth is a square wave. Therefore a square wave is fed back toward the grid of V9B through R56, the coupling condenser C69 and the grid resistors R58 and R57. A square wave applied to this network makes C69 discharge exponentially through the grid resistor.

The feedback from the first amplifier section to the second warrants some attention. Intsead of just tapping off a small portion of the output of triode 1 and feeding it to triode 2 by a conventional resistor voltage divider network, the input to tube 2 comes off C73. As mentioned above, this is part of the differentiating net. But the wave across the condenser part of a differentiating network (short time constant) duplicates the shape of the sawtooth input wave across the whole network, but is much smaller in amplitude.

Coupling condenser open

Set: Motorola, chassis: TS-18. Picture had half of normal width. Sound as usual. Horizontal size control adjusted. Could make picture smaller but not larger. Horizontal sweep tube, V12, changed, no effect. Examining the circuit (Fig. 1) it was noted that C62 and C63 are the sawtooth forming condenser in the horizontal sweep circuit, V12-A. They operate in two separate circuits, one for the retrace and the other for the trace. When the tube is conducting it can be considered a wire connecting the bottom part of C62 to the plate side of T5. During the time corresponding to the retrace time of the sawtooth, the tube is conducting. The condensers which were charged positive on top of each and negative on bottom not only discharge to 0 through T5 but recharge to a negative voltage on top in a half cycle of oscillation equal to the retrace time. The tube cuts off. Now, during the trace period, the condensers discharge very slowly to zero through the two windings of T6, which has a higher inductance than T5. The lines of force around T6 then collapse and in doing so continue current flow and the condensers are recharged in the opposite direction in the usual fashion of oscillatory circuits. By the time the trace is completed, the grid voltage has become less negative enough to permit the tube to conduct and the cycle repeats.

A scope was used. In using a scope on transformerless sets, it should be remembered that the chassis is not B— because of Underwriters' requirements. Therefore the scope ground lead should go to B— of the set, not to the chassis, to get

SWEEP CIRCUIT SERVICE NOTES

MOTOROLA, CHASSIS TS-18

NO VERTICAL DEFLECTION

(If there is no high voltage, vert. amp. V13 has no B+)

- Defective vert. osc. tube 12SN7GT-Replace tube.
- Defective V13, 6SL7GT-Replace tube.
- Defective vertical hold or vertical size controls, R57, R60.
- Defective charging condenser C71.
- Defective coupling condenser C72, bet. V. O. and V. A. Pin 1.

SMALL RASTER-VERTICAL

- Defective V13, 6SL7GT.
- Defective vertical size control, R60.
- Insufficient output from V13, 6SL7GT-Replace tube.
- Open coupling condenser C75 or C76, from plates of vertical amplifier.
- Excessive heater voltage on V13, due to shorted ballast R.
- Shorted condenser C77, filters r-f from feedback ckt.

NO HORIZONTAL DEFLECTION

- Defective V12-A, 12SN7GT-Replace tube.
- Defective blocking osc. transformer T5-Check windings.
- Defective horizontal hold or horizontal size control, R49, R53.
- Shorted horizontal sawtooth condensers C62, C63.

SMALL RASTER-HORIZONTAL

- Defective V12-A, 12SN7GT-Replace tube.
- Defective horizontal size control R53
- Open condenser C58, across horiz. hold control and R48.
- Open coupling condensers C64 or C65 (to horizontal deflection plates.
- Low heater voltage on V12, 12SN7GT-Check ballast tube R.

POOR VERTICAL SYNCHRONIZATION

- Check for corona arcing.
- Open C66 or C67, integrating condensers to left of vert. oscillator tube.

VERTICAL JITTERS

- Readjust vertical hold control R57
- Defective C68, coupling condenser to vert. osc.

VERTICAL BARS ON LEFT HALF OF PICTURE

- Defective R88, R51, across windings of horiz. block. transformer T5.

PICTURE SIZE TOO LARGE, HOR. AND VERT., AND BRIGHTNESS LOW

- Check V14, 25L6GT and V15, 1B3GT/8016

FOLDOVER ON LEFT SIDE OF PICTURE

- Horizontal hold control not set correctly.
- C62 or C63 too high in value (horiz. sawtooth conds.)

POOR VERTICAL LINEARITY

- Defective tube V13, 6SL7GT-Replace with RCA
- R61 incorrect value, feedback resistor from pin 5, vert. amp. to pin 5 vert. osc.

POOR HORIZONTAL LINEARITY

- Defective condensers C62, C63.

SENTINEL MODELS 400-405

VERTICAL RASTER TOO SMALL, WITH BRIGHT LINES OR BARS EITHER ON TOP OR BOTTOM, OR BOTH (ALSO MAY OR MAY NOT FOCUS)

- 4. 7 Meg R23 and R24 in plate of vert. amp. either open

proper waveshape information. Hot scope lead was put on the left side of C64. Sawtooth seen on scope. Scope was previously calibrated by putting across a-c line and adjusting sine wave to 10 boxes on screen (110 v times 2.828 equals 300 v. peak-to-peak voltage, approximately). Therefore, each box represents 30 volts. The scope showed a sawtooth of the proper shape and amplitude of 13 boxes (13 x 30 equals 390 volts, which is acceptable according to manufacturers' instruction book). The scope was shifted to left side of C65. The sawtooth is 180° out of phase and amplitude is the same—in other words correct shape and amplitude. Obviously, one of these sawtooth voltages is not getting to the deflection plates of the CRT, indicating a probable opening in one of the coupling condensers. To check this, the high voltage side of the coupling condenser can be unsoldered and the scope put to each unsoldered end to see if the sawtooth is coming through. The scope would not be put directly to the high voltage side of the coupling condenser because of the approximately 6000 v d-c potential on the deflection plates. This could damage the scope.

Another method that would save unsoldering is putting a high voltage coupling condenser of the same capacity (.001 and 6000 v breakdown voltage) in series with the hot scope lead. While the outside paper jacket of the condenser is held carefully in one hand, the other pigtail is touched to the high voltage end of each coupling condenser. This, of course, permits the sawtooth to be coupled to the scope, if present, while blocking out the high d-c voltage. This was done and a sawtooth was seen at the right of C64 but not at the right of C65, showing the last was open, as suspected. This was repaired and width became normal.

Distortion

Set: Sentinel, Model 400-TV. Uses transformer low-voltage supply. Picture was non-linear (egg shaped horizontally). Controls were unable to correct. Changing horizontal osc. and horizontal amplifier tubes did no good (see Fig. 2).

A linear sawtooth is necessary to distribute information evenly from top to bottom, vertically, and from left to right, horizontally, without crowding part of the picture. For example, a non-linear sawtooth horizontally means the beam is pulled across the screen first at a constant speed and then slows down as it reaches the right side (see Fig. 3). The result is more information at the right side of the picture, crowding as indicated in Fig. 4.

Non-linearity which controls cannot correct can result in two ways: (a) non-linear generation of sawtooth—sawtooth condenser charges for too long a portion of its charge curve, (b) linear sawtooth is distorted in process of amplification.

Non-linear generation can be caused by a change of R or C values or a defective part in the charge path (although it may simply be due to making the size bigger than the set design calls for). Distortion after generation can be caused by exactly the same possibilities in the coupling and amplifier circuits.

Scope was used. On both plates of the horizontal amplifier the sawtooth was non-linear, suggesting the signal is coming into the stage already distorted. This was confirmed when the scope was shifted to the grid of the first amplifier, pin #1, and the sawtooth was found to be non-linear. Scope shifted to plate of sawtooth generator, still non-linear. Evidently the distortion was originating in the oscillator stage. To verify this, the amplifier tube was removed (since the set is of the transformer type, it still operated) while watching the scope. Still non-linear. Therefore this was not due to amplifier tube defect loading down oscillator circuit. Grid of amplifier tube was measured for a d-c voltage with vtvm. No positive reading removed the last possibility of a leaky coupling condenser causing the non-linearity and the distortion was now definitely isolated to the oscillator stage. Voltage and resistance checks made. No resistance changes, voltage readings appear normal. C7, sawtooth condenser changed. Picture OK.

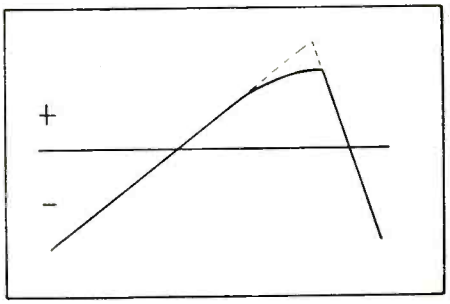

Fig. 3. Non-linear sawtooth, flattened on top. For effect of this, see Fig. 4, below

One of the things making some 7-inch models hard to service is that they become erratic in operation when test instruments are used in the usual way. For example, a scope attached to some points in the sweep circuit of some receivers may cause a change of frequency or intermittent operation. This can usually be avoided by simply putting a high resistance in series with the hot scope lead, from 1 to 5 megohms, to eliminate the loading effect of the scope on high resistance circuits. This will throw off calibration unless the resistance is kept there both for calibration and measurement.

Manufacturers of transformerless sets generally recommend an isolation transformer between the receiver and the a-c line when using test equipment to check the set, to protect the instruments and to minimize hum pickup when using instruments like a scope.

A last precaution: When the vertical sweep output tube is replaced in these receivers, the set should not be turned on for 5 minutes. This will permit all cathodes, especially the high voltage oscillator tube cathode to cool. Otherwise, this last tube will operate and generate high voltage

→ to page 22

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or higher than normal value, Replace with high voltage type R only.

Shorted .1-mf C13 in plate of vert. amp.

Defective 6SN7, vert. osc. tube.

Defective 6SL7, vert. amp. tube.

Shorted 20 mf or 1 mf C21, cathode of vertical amp. Replace with 1 mf 200 v. condenser.

SMALL RASTER-HORIZONTAL

Weak hor. osc. or weak hor. amp. tube.

100,000-ohm R2 and R5 in plate of horizontal amp. open or higher than normal in value. Replace with high voltage type resistor only.

Add 10-mmf condenser in parallel with 72-mmf C24 across medium high voltage winding located on high voltage coil L1 inside shield can.

Open or shorted 10-m mf cond. in parallel with 72-mmf C24.

Open or high resist. 1-meg R10, in plate of hor. osc.

NO RASTER, BUT THIN HORIZONTAL LINE

Improper setting of vert. size control.

Shorted .02-mf 400 v. C11 between pins 2 and 4 on vert. osc.

TO PREVENT PICTURE WIDTH CHANGES WITH INCREASE IN AMBIENT TEMPERATURE

1-meg R-10 in series with horizontal size control replaced with 1-meg 2-watt resistor.

NO RASTER, ONLY THIN VERTICAL LINE

Shorted C6, 600 v. going to pin 4 hor. amp. Always replace with .01-mf 1200 v. condenser.

Defective hor. osc. or hor. amp. tube.

Shorted .0001-mf 500 v. C2 between pins 5 and 1 on hor. osc. Always replace with ceramic 5% zero temp. coefficient.

Let's look at the latest in

SYNC-SEPARATOR CIRCUITS

Discussing some of the most recent improvements in sync-separator circuit designs, as found in such receivers as DuMont, RCA, Motorola. This is another of our features to keep you informed of latest circuit developments

by Martin Clifford
Pierce Radio School

THE purpose of pulses in our existing television system is to make absolutely certain that the modulated electron beam in the picture tube strikes the screen at exactly the right spot at exactly the right time. The horizontal pulses, triggering the horizontal deflection oscillator, force the beam to snap back from the left side of the screen (looking at the screen from the inside) to the right side of the screen, so that the cathode ray beam will be in proper position to sweep out the next line. When the end of the last line has been reached, vertical pulses operating the vertical deflection system bring the beam back to the top of the screen, to the original starting point.

The vertical and horizontal pulses are transmitted together with the video information, forming a composite signal. At the receiver, the process of removing the sync pulses from the composite video signal is variously referred to as sync separation, pulse separation, sync segregation, or clipping. Technically speaking, the term clipping should be reserved for the process of removing noise or hum voltages from the sync pulse *after* the pulses have been separated from the video signal. Segregation techniques vary, but before we go over some of these, let's take a look at the composite video signal forming a portion of Fig. 1. As far as the amplitude of the signal is concerned, only 25% of the signal is reserved for the vertical and horizontal pulses. The job of the sync or pulse separator is to make use of the 25%, or pulse portion, of the signal and to discard the rest. The sync separator stage may be located anywhere after the picture second detector stage (the video detector) and before the cathode ray tube. In order to build up the sync pulse to as large an amplitude as possible, most manufacturers insert their sync separators after the video amplifier stage or stages.

The sync separator may be any vacuum tube diode, triode, or pentode. A number of diode separators are shown in Fig. 1. The first diode, 1A, will conduct when the plate is made sufficiently positive. Conduction through the tube causes C1 to charge. When the signal voltage on the plate of the tube decreases sufficiently, the tube will stop conducting and C1 will then discharge through R1, making the plate end of R1 negative and the ground end positive. Values of R and C are chosen so that the bias is maintained until the arrival of the next pulse. The highly positive pulse overcomes the bias and permits the tube to conduct again. Since the video portion of the composite signal cannot make the tube conduct, only the pulse waveshape, and not the video, will appear in the output.

Diode separators

The situation is similar in Fig. 1B, except that cathode bias is used instead of grid leak bias, as in Fig. 1A.

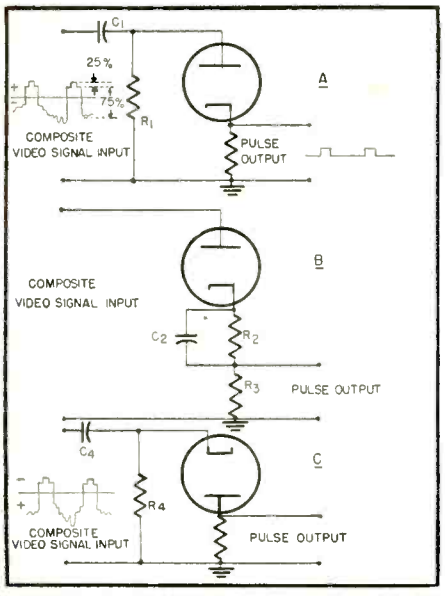


Fig. 1 Three types of diode clippers and the video signals appearing at their inputs

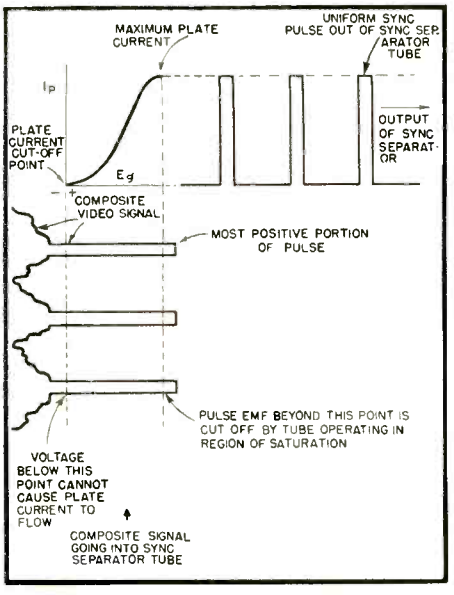


Fig. 2 Graph illustrating the variations of plate current with grid voltage changes

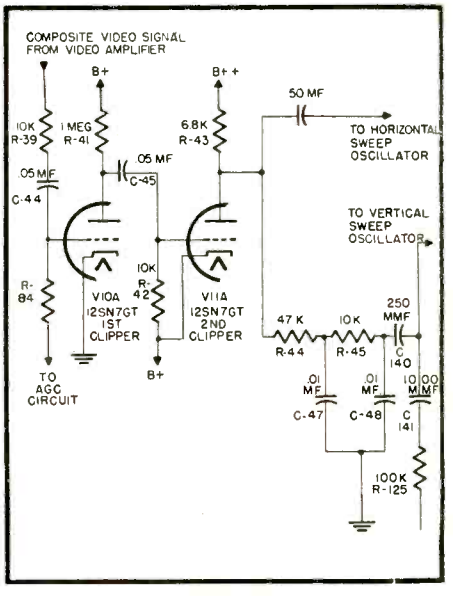


Fig. 3 Some Motorola receivers contain this dual triode which acts as a double clipper

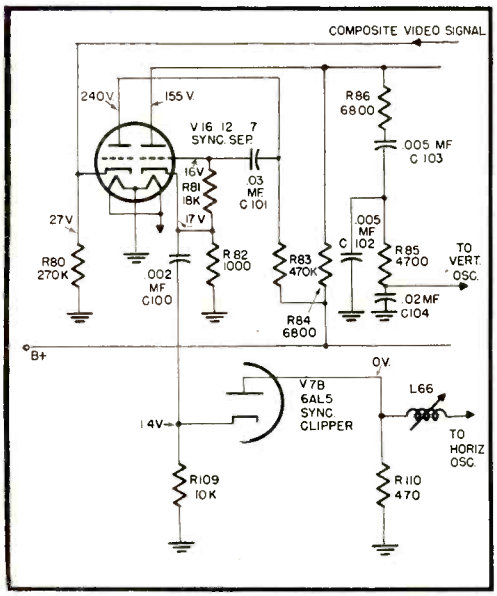


Fig. 4 Duo-triode sync separator and diode sync clipper found in some Motorola sets

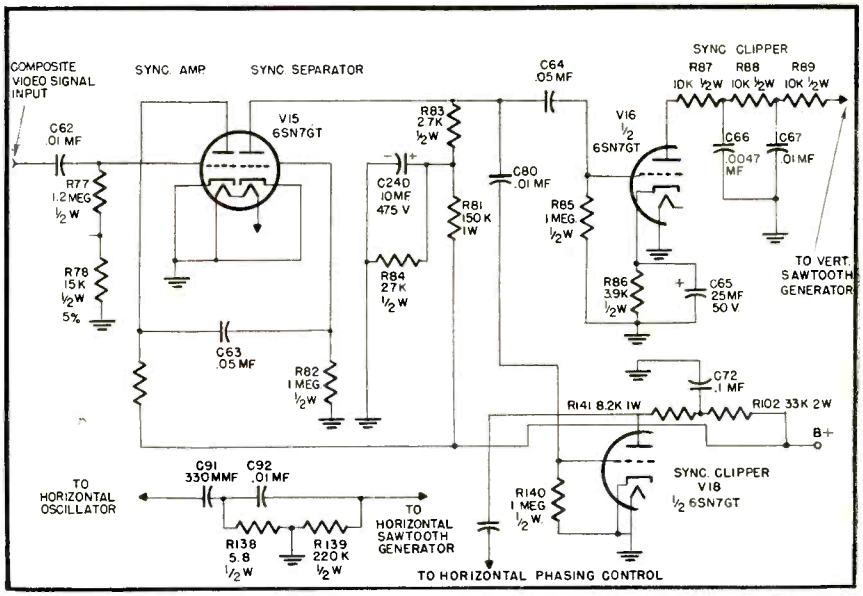


Fig. 5 Four triodes serve as sync amplifier, separator, and clipper (DuMont). This design assures sufficiently high amplitude, freedom from noise and hum

Values of R2 and C2 are chosen so that the tube is biased beyond cutoff for any signal except the strongly positive pulses. R3 must not be shunted by a capacitor in order not to bypass the pulse current. The pulse current, flowing through R3, forms the output pulse voltage.

In Fig. 1C, the diode has been inverted due to the fact that the applied sync pulses are negative. The entire tube behavior is reversed. The bias developed by C4 and R4 places a positive charge on the cathode and a negative charge on the plate, preventing conduction until a strongly negative sync pulse is placed on the cathode. It should be noted that there is no phase inversion of the signal when using diodes.

The pulses can be separated from the video signal and amplified at the same time through the use of one or more triodes. The technique of triode segregation may be more quickly understood by examining its basic principle of operation. Fig. 2 shows a graph of the variation of plate current with grid voltage. Note that there are two parts of the composite video signal which have no effect on the plate current (hence the signal output) of the triode. The first part is that portion of the composite signal below the plate current cut-off point. The second part is that value of positive pulse voltage which will produce plate current saturation. Any positive pulse voltage above that required to give plate current saturation will be cut off. The effect of cut-off and saturation is to give a pulse of uniform amplitude in the plate output circuit.

In Fig. 3 we have a dual triode, 12SN7, acting as a double clipper. The composite video signal is fed into the control grid of the first triode section through R39 and C44. In the absence of any signal voltage, the input triode has zero bias. In this particular instance, the signal voltage fed to the control grid must be positive. With the application of signal voltage of this polarity, the grid draws current. The coupling capacitor C44 becomes negatively charged, producing a d-c bias voltage across resistor R84. The time constant of this R-C circuit is such that the video portion of the signal cannot have any effect on the plate current. However, the positive amplitude of the sync pulses is sufficient to overcome the negative bias. The amplified, and inverted sync pulses appear across the plate load resistor R41, and are coupled to the grid of the second half of the duo-triode, through the .05 mf coupling capacitor C45 and the grid return resistor of the second triode R42. The second triode is also used as a clipper, in order to maintain picture synchronization in the event of a weak or poor signal.

The second clipper is useful in that it helps to square off the sync pulses by clipping any irregularities in the signal waveform, and also by removing noise peaks. When R42 does not conduct, equal values of B plus voltage are applied to the control grid and cathode of the second half of the 12SN7. The tube thus has zero bias in the absence of signal input. The pulses always go negative beyond cutoff, resulting in clipping of any pulse envelope variation.

Duo-triode sync separators

A combination duo-triode sync separator and diode sync clipper is shown in Fig. 4. The composite signal is fed into the cathode section of the first triode. The dual triode, 12AU7, acts as a resistance-coupled amplifier, separating and amplifying the pulses. Triode sync separation is the same as that previously described, except that cathode injection requires the use of a negative signal voltage. To remove any noise modulation, the signal is shaped once again through the use of one-half of a 6AL5 duo-diode. Only negative pulses at the cathode of that tube can cause plate current flow through the tube.

In Fig. 5 four triodes are used as sync amplifier, separator, and clipper. This combination is used to make certain that the sync pulses are of sufficient amplitude, free of noise, and without hum. It also removes the possibility that random pulses will trigger the horizontal and vertical oscillators. Thorough locking of the picture is thus assured even under poor receiving conditions.

The signal, consisting of horizontal and vertical pulses, plus whatever

→ to page 29

For increased efficiency and safety build this

Universal PICTURE TUBE HOLDER

Easily constructed, this tube holder will accommodate all types and size tubes. It will increase the safety of your shop and will add to the efficiency of your operation.

By The Staff of
Radio & Television Maintenance

ONE of the problems with which the television technician has to cope is that of storing the picture tube while the receiver is being serviced. No commercial unit of the universal type is available, and most technicians today place the tube on a cloth, face down, on the floor and leave it there until it can be replaced in the receiver.

While this method of temporary storage has more or less served its purpose, it entails a number of disadvantages which make it not altogether satisfactory. The most important of these is the danger of scratching the face of the tube. Another is the fact that people may unwittingly bump into the tube sitting on the floor, causing occasional breakage.

In order to overcome the disadvantages of current picture tube storage usage, we designed the holder described below. It is easily constructable. It requires a minimum of material to build. It increases considerably the safety with which tubes can be temporarily stored. It is of universal design, that is, it will serve all currently available picture tubes, from the seven to the twenty incher. It is large enough to accommodate all reasonably increased size tubes of the future.

Various basic positions of storage were tried: the tube was stored horizontally, with the neck pointing down, and with the neck pointing up; and it was found that because of the center of gravity of the tube, a holder which would have the tube rest on its face would be the safest. The size of the holder was made large enough to hold tubes up to 28 inches in diameter, and it was lined with foam rubber on the inside for increased cushioning effect. For best results, the tube holder should be kept on a table located away from areas of main activity.

Step by step instructions for building the holder follow:

Construction

1. Cut all lumber to the proper sizes, as shown on the cutting diagram at right.

2. Attach short cushion base braces (detail #2) to bottom (detail #1) as indicated on the diagram, using ¾" No. 8 flathead woodscrews, from the bottom up, two for each brace (use the above screws in all cases unless otherwise specified). In addition to screwing the pieces together, use wood glue for all steps in this construction for additional binding.

3. Attach long cushion base braces (detail #4) to sides (detail #3) along the top edge, using three screws for each brace, fastened from the outside in.

4. Fasten the four sides (#3) to the bottom (#1) by means of iron angle braces, two for each side, using ⅜" #6 flathead woodscrews from the inside out. The sides rest on the bottom.

5. Attach four cushion bases (detail #5) to braces #2 and #4, as shown in the illustration. Use two screws from the top down for each short brace, and three screws from the top down for each long brace. Note that the four cushion bases do not meet at the four corners of the holder. This does not affect the efficiency of the holder, but makes the cutting job easier.

6. The framework of the tube holder is now completed. In order to have the tube face rest on an elastic surface so that it will not become scratched, the cushion bases have next to be covered with foam rubber. Cut the foam rubber to a size slightly larger than the cushion bases, and fasten each segment to the cushion bases by means of rubber cement. Use one-inch foam rubber, and glue the smooth side to the cushion base. Have the sides with the holes face out. Foam rubber can be obtained from most surplus stores. If you cannot locate one, look in your telephone directory under "Rubber—Sponge." If the pieces of foam rubber overlap at the edges, trim to make a smooth fit. However, the joint does not have to be perfect.

7. To complete the holder, attach plain cabinet drawer handles to sides of holder, for ease in moving it about.

This completes the construction of the picture tube holder. It should now be sanded on all outside surfaces, and painted with two coats of paint.

Most service work is done without removal of the tube, and without the need for such a holder. But on those occasions where tube removal is necessary, the holder will provide for a safe storage place. If only one tube is out of a set at a time, one holder is sufficient. For larger organizations, or for those shops where work is being done on more than one receiver at the same time, it is recommended that additional holders be constructed to fill all possible needs.

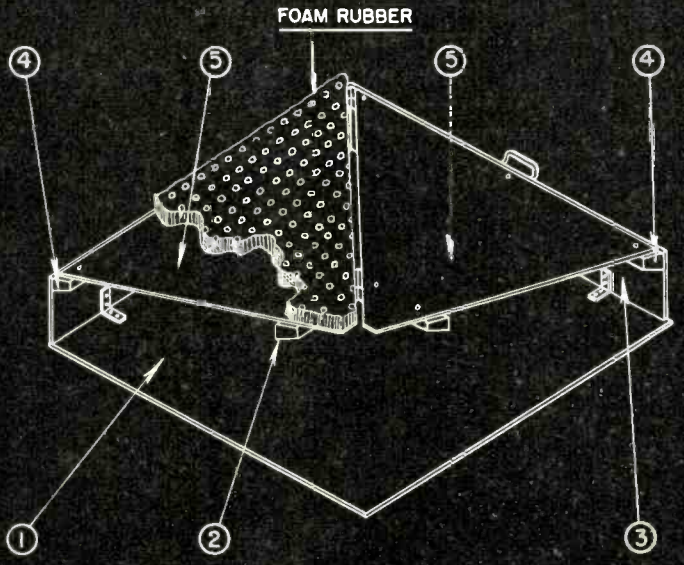
RADIO & TELEVISION MAINTENANCE MAGAZINE APRIL 1950

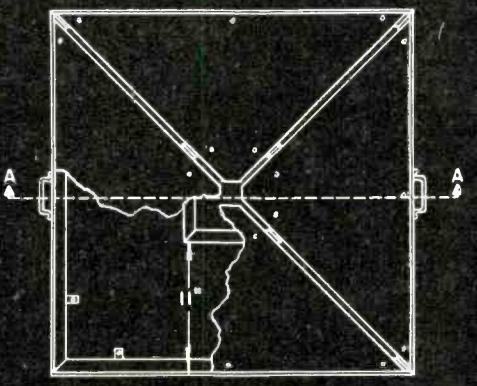
PICTURE TUBE HOLDER

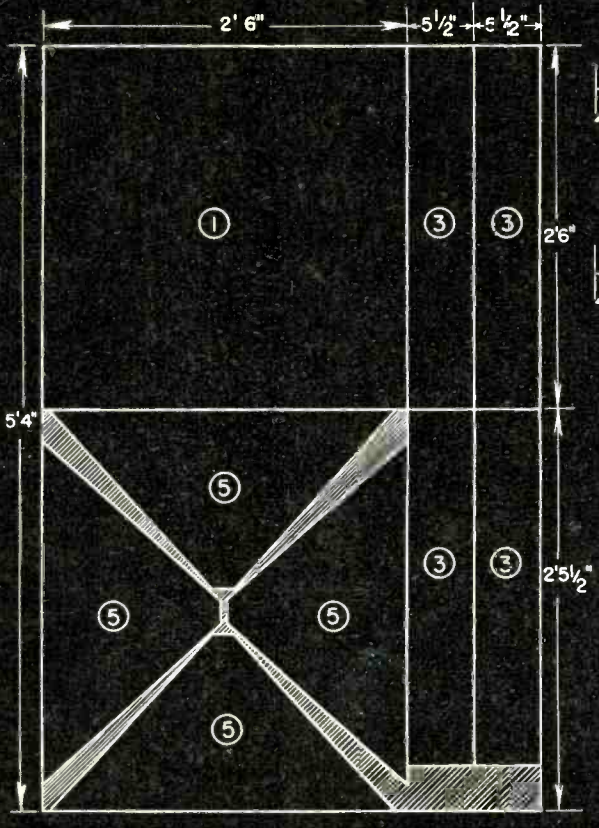
PARTS LIST			
DET. NO.	NAME	MATERIAL	QTY
1	Bottom	¼" plywood	1
2	Short cushion base braces	1" white pine	4
3	Sides	¼" plywood	4
4	Long cushion base braces	1" white pine	4
5	Cushion bases	¼" plywood	4

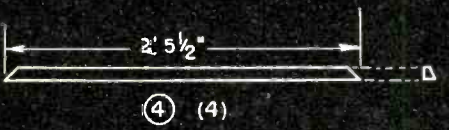
MATERIALS TO BE PURCHASED		
QTY	MATERIAL	DET. NO.
1 sh	5'4"×3½'×¼" plywood	1, 3, 5
12½'	1×1 White pine	2, 4
1 sh	2'9"×2'9"×1 foam rubber	
8	Angle iron braces, 3/4"×2"×1/16"	
32	3/4" No. 8 flathead wood-screws	
32	3/8" No6 flathead wood - screws	
2	Drawer handles w/screws	

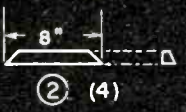
SECTION "AA"

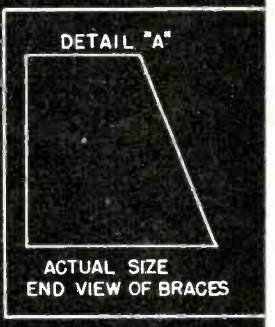


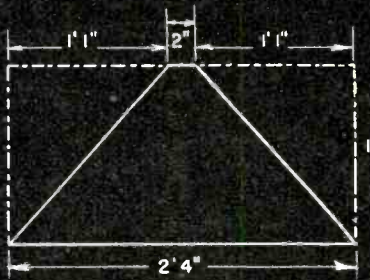












CUTTING PATTERN FOR NO. 5

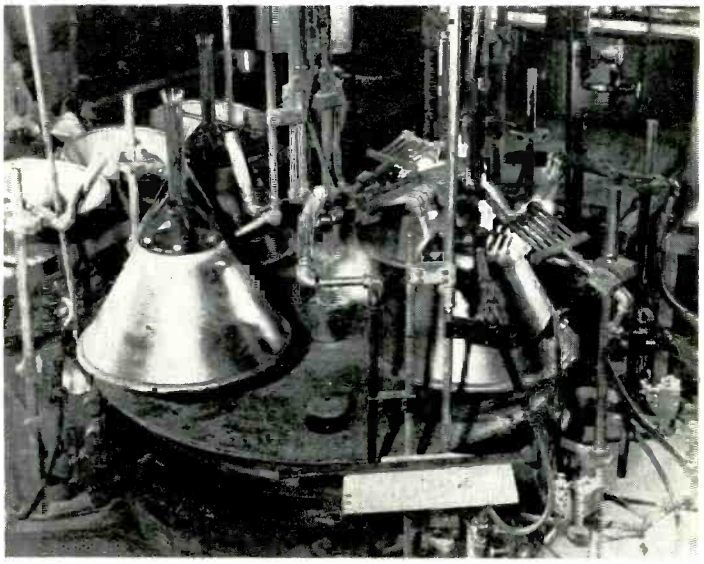
SCALE
(EXCEPT FOR DETAIL "A")

TV is BIG Business: DuMont opens new

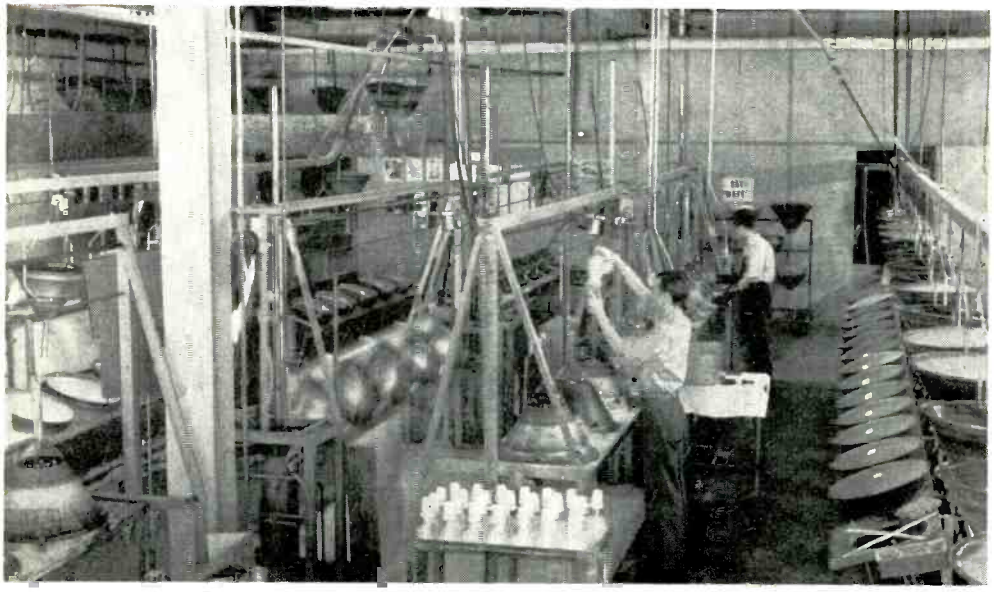
MILLION-TUBE-A-YEAR-PLANT

Phenomenal growth of TV continues unabated. Current multi-billion dollar TV business already eclipsing previous record radio production volume. Will soon be one of country's top industries, rivaling — if not exceeding — the automobile industry. Service technicians will share this progress

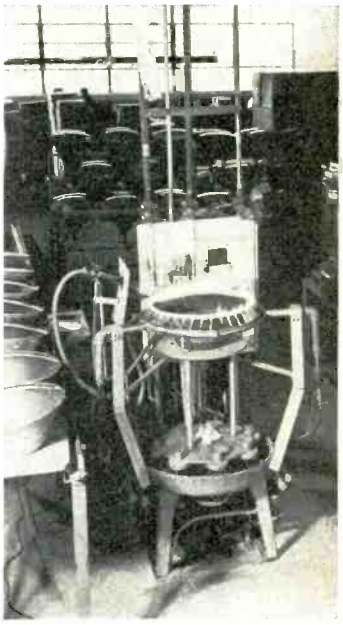
Dedication of DuMont's new plant at Allwood, N. J., which will be devoted exclusively to the production of television picture tubes, marks another milestone in the continued progress of TV. Equipped with the latest production machinery, it is expected to turn out $25,000,000 worth of picture tubes a year. Add to this the record volume produced by the other manufacturers, and you will get an idea of the size to which television has grown in little over three years. Soon there will be as many telesets in this country as there are cars, each containing about five times as many parts as the average a-m set; and radio, which had been considered of major proportions until recently, will appear small. If you still have any doubts as to the magnitude of TV and its future, remember that it is already running at a level higher than that of the automobile industry in the twenties. For the technician this means prosperous days ahead.



In the pictures that follow, the essential steps in the production of picture tubes are illustrated. At left, one of the first operations is executed: sealing metal cone to glass neck. These tubes are of the short-neck, metal variety. Dr. DuMont foresees larger direct view tubes. He considers a 4 x 5 ft tube very likely.



Depositing screen material on face of tubes. After screen has been deposited, solution is decanted. The tubes just left of center, appearing somewhat blurred, are in the process of being decanted. Both natural glass and dark faced tubes are produced, although DuMont receivers do not use the dark-faced variety.



Here is one of the most difficult problems in the early stages of metal tube production: sealing glass face plate to metal cone. The machine is completely automatic, heats the glass to 2200° F.

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Jensen

Model H-510

COAXIAL 2-WAY SPEAKER

For thrilling life-like reproduction . . . For truly satisfying listening pleasure . . . For a host of history-making features that mean higher performance . . . new flexibility and convenience—be sure to hear and see the Jensen H-510. You'll know why wise listeners tell us it's the best at any price!

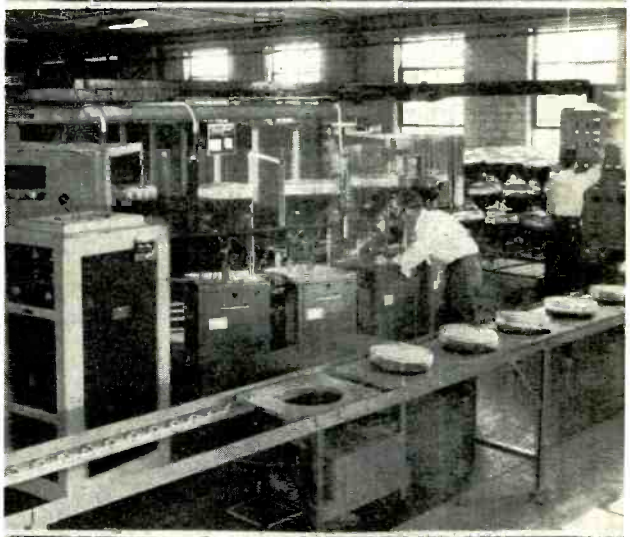
*The Genuine Jensen Wide-Range Series includes a distinguished group of new coaxial and single-unit speakers—a complete range of sizes, ratings and prices. Ask for Data Sheet 152.

"---best---at any Price!"

JENSEN MANUFACTURING COMPANY DIVISION OF THE MUTER COMPANY
6637 South Laramie Avenue, Chicago 38, Illinois • *In Canada: Copper Wire Products, Ltd., 351 Carlaw, Toronto*

Applying Dixona coating to inside of funnel and neck of DuMont 19AP4. The dixonac drying conveyor at right of center is in motion. This operation is performed manually.

Inspecting cathode and grids. The microscope measures the spacing between cathode and grid. Assembly of the bent electron gun involves such delicate operations that only women are employed in this section of the plant.



Basing and aging processes at DuMont's Allwood plant. Oven conveyor, on the right, cements base to the neck of the tube. Tubes are aged on conveyor at left while operated at normal potentials.

Railroad exhaust. A nearly perfect vacuum is obtained as each tube passes through the various evacuation processes automatically. The tubes pass high-temperature ovens to drive all the gases out of the tube material.

Wins 30% more business with SYLVANIA DEALER CAMPAIGN

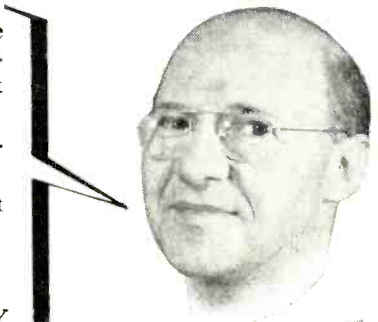
"Last summer we obtained your coordinated campaign and mailed the postal cards to just certain sections. Then we kept track of service business, and found we received 30% more from the sections which got the cards.

"We're convinced . . . your campaign is the best insurance against a summer slump in service business.

"This year, May, June, July, and August are going to be our big profit months."

Albert Gale

Gale Radio and Television Lab., New Rochelle, N. Y.



1—Displays
2—Window Streamers
3—Post Cards
4—Ad Mats
5—Radio Spots

You, too, will cash in BIG with this powerful, new summer campaign

Right now is the time to send for the new, complete advertising campaign that's bound to bring *you* extra business . . . all through May, June, July, and August.

Look at all the colorful, sales-making material you get! Everything from large 3-dimensional window- and counter-displays, to complete newspaper ad mats and postal cards. Even radio spot announcements to be broadcast over your local station. It's all yours...and it's all FREE...you pay only the postage on the postal cards, 1¢ for each card.

Written and designed to tie in with Sylvania's big national magazine advertising which your customers will see in the Saturday Evening Post, Collier's, Look, Life and other publications.

So, don't delay! Mail the coupon for full details TODAY!

RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES, SIGN TUBING; LIGHT BULBS; PHOTOLAMPS

SYLVANIA ELECTRIC

Sylvania Electric Products Inc.
Advertising Dept. R-1104A, Emporium, Pa.

Please send me full information about the May-June-July-August Service Dealer Campaign.

Name _____

Company _____

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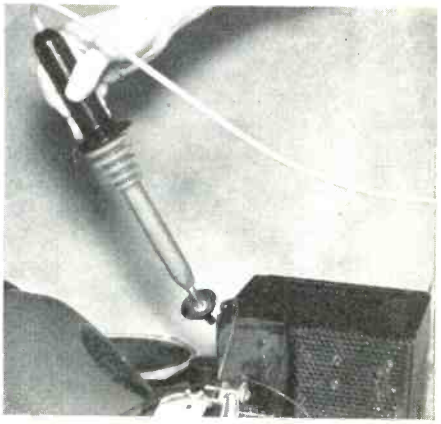
City _____ *Zone* ____ *State* _____

The INDUSTRY Presents

HI VOLT PROBES

RCA has developed two new high-voltage probes for use with all popular voltmeters. Both are identical, except for their connectors. WG-289 is designed for use with electronic voltmeters, WG-290 for use with non-electronic voltmeters. Five types of multiplier resistors are separately available to adapt the probes to various makes of voltmeter. The probes are particularly useful in



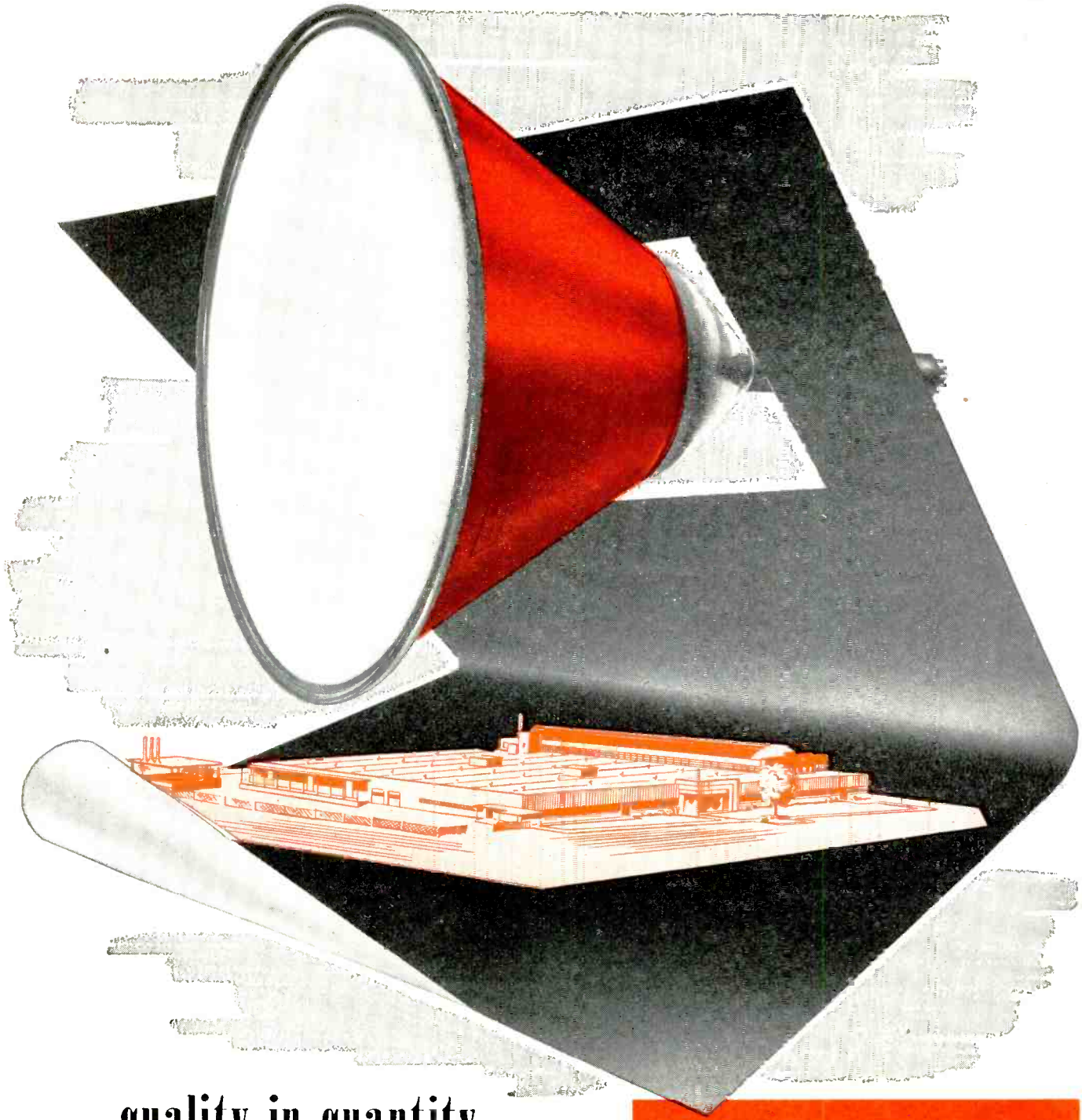
measuring d-c output voltage of pulse-operated and r-f power supplies. For example, if the probe is used with a 100-volt VoltOhmyst meter scale to measure 10,000 volts, the effective resistance of the meter across the voltage source is more than 100,000 ohms per volt deflection. This is especially important where measurement of B plus voltages must be made without loading the circuit. The probes have complete safety features. RCA, Camden, N. J.

SIGNAL TRACER

EICO's new signal tracer, model 145, is designed for audible signal

tracing of r-f, i-f, f-m, audio and video circuits. It has a self-contained test

→ to page 22



quality in quantity

The first *commercially-feasible* cathode-ray tube established Du Mont supremacy. That pioneering skill was available and ready when TV became a household word. • And now, with millions of TV sets in daily use, more millions to be kept going, Du Mont craftsmanship is multiplied many fold by the miracle of mechanization. The new Du Mont Allwood Tube Plant packs 200,000 square feet with the outstanding array of automatic equipment, elaborate conveyors and critical test positions. • Meaning that, regardless what your initial equipment or tube replacement needs may be, you can continue to count on Du Mont for the finest TV tubes—TELETRONS*—in the most popular 12″, 12½″, 15″, 16″ and 19″ types. • Literature on request.

FIRST WITH THE FINEST IN T-V TUBES

DU MONT

Teletrons

ALLEN B. DU MONT LABORATORIES, INC.,
Tube Division, Clifton, N. J.

*Trade-mark.

Troubleshooting Sweep Circuits

→ from page 11

before the vertical output tube draws current. Therefore, since the vertical amplifier tube is actually the bottom resistor of the high voltage bleeder, no current through the bleeder means full 6000 v. at the plates or the vertical amplifier. Result: high voltage flashover and possible breakdown of tube, resistors, and condensers in that circuit. ✓ ✓ ✓

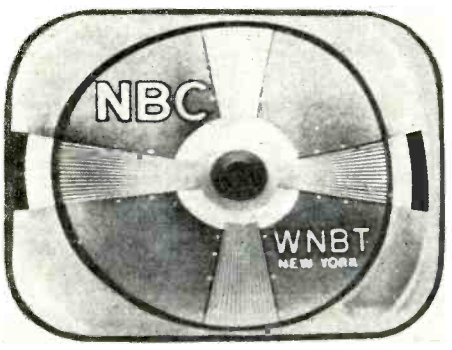


Fig. 4. How non-linear sawtooth affects picture by crowding the lines on one side

→ from page 20

speaker which may be used for amplifier or speaker testing. The instrument may also be used as an emergency or substitute amplifier. Frequency response to over 200 Mc. Also supplied with the instrument is the model P76 pencil type high frequency probe. Available in kit form or fully wired and tested. **Electronic Instrument Co., 276 Newport St., Brooklyn 12, N. Y.**

TUBE TESTER

Two new models have been announced by Sylvania, 220 (portable) and 219 (counter type). These tube testers are designed for radio, TV, mobile transmitting and industrial electron tubes. They include an exclusive ohmmeter type test for shorts and leakage, and direct meter readings for all other tests. In the shorts

and leakage test, about 55 volts are applied through a high resistance to prevent damage to tubes. For other tests, emission and transconductance are examined simultaneously under dynamic conditions. Gas test is also provided. 12 sockets provide for 4, 5, 6, 7, 8, and 9 pin tubes, octals, lock-in, miniature, subminiature, acorn, and hearing aid types, mobile and ruggedized tubes and pilot lamps. Facilities for unannounced tubes are included. Control switches are located in the same left-to-right sequence as listed on the roller chart which is provided with instrument, and switch positions are numbered to correspond to the pins of the tube under test. **Sylvania Electric Products Inc., 500 Fifth Ave., N. Y. 18.**

SCOPE

A new oscillograph, featuring a high voltage CRT, has been brought out by DuMont—Type 250-AH. Recurrent, single, or driven sweep durations are continuously available from 5 to 10 microseconds. Z-axis input is provided for intensity modulation. The

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trade LITERATURE

New Books

Rider Manual Volume 20, *(John F. Rider Publisher, Inc. 1776 pp, $18.00)*

Television Components Handbook, *(Philco, 160, $2.50)*

Radio Operating Questions and Answers, *by* J. L. HORNUNG, *(McGraw-Hill Book Co., 10th edition, 588 pp, $5.00)*

Transformer Principles and Practice, *by* J. B. GIBBS *(McGraw-Hill Book Company, 2nd edition, 232 pp, $3.50)*

Dial Cord Stringing Guide, *(Sams, pp. 96, $1.00)*

Television Tube Location Guide, *(Sams, pp. 220, $1.50)*

Reviews

Basic Television, Principles & Practice, *by* BERNARD GROB, *(McGraw-Hill, pp. 569, $6.50)*

The first book in McGraw-Hill's Television Series is intended for the technician who is familiar with basic radio circuits and who is now entering the field of television. It is a complete course with emphasis on receiver design and function, suitable for class-room use, and based on the author's experience in teaching the subject.

Following the first part of the book in which the author describes the overall operation of the entire television system, camera tubes, and complete details of the video signal, he proceeds directly to the receiver and presents a quite detailed and complete analysis of its various sections. For the purpose of the technician, this portion of the book is exhaustive.

The volume also contains a chapter on antennas and on servicing. The former is rather meager. You will find that no representative picture of available antennas is given, and some of the outstanding types are not referred to. Antenna installation instructions are also somewhat sketchy. The chapter on servicing is general, rather than specific. While it lists in table form a fairly complete set of troubles and right next to each trouble an analysis of its cause, it does not furnish any specific remedies, except perhaps in an inferential way.

Also presented in the book is a chapter on f-m; and at the end we have sections on television broadcasting, color TV and, for the physics-minded reader, a chapter on light. Review questions are listed at the end of each chapter. Photographs and diagrams are used throughout to good effect.

Catalogs & Pamphlets

Tube Complement Book. Sylvania has announced a new 56-page book, listing by make and model the number and type of receiving and picture tubes used in more than 620 telesets. It also contains a chart showing the percentage of each of the 136 receiving tube types used in TV receivers distributed by 85 manufacturers. This reference list will help the technician greatly in intelligent stocking for future replacement. Also of valuable aid will be a list of 80 TV set manufacturers and their addresses which has been included. This list can be used in securing more servicing information on a particular set. Another section of the book describes modifications required, if any, for 120 picture tube replacements. This is a book you shouldn't miss. Get it through authorized Sylvania Distributors.

Rider Manual in Production. Rider's TV Manual IV is now in production. It'll be again 12" x 15" (as TV Manual, Vol. III was) and will have the equivalent of 2300 pages, filed in their proper places. Factory authorized data of more than 70 manufacturers will be represented. The manual will cover direct view and projection receivers, boosters, tuners, kits, test patterns, waveforms, schematics, voltages, parts lists, alignment

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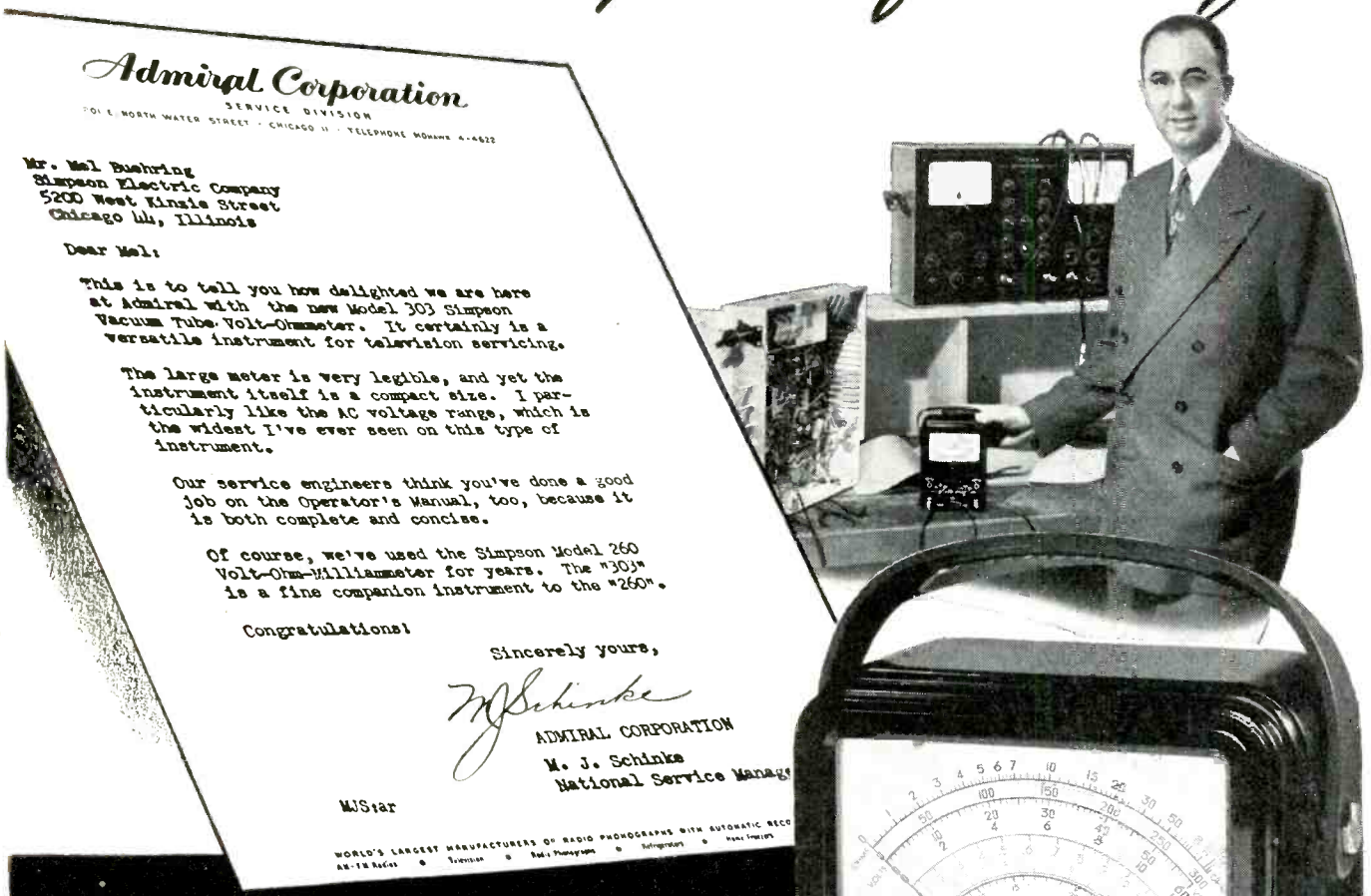
..this letter speaks for itself!



Admiral Corporation
SERVICE DIVISION
[illegible] NORTH WATER STREET · CHICAGO [illegible] · TELEPHONE [illegible]

Mr. Mal Buehring
Simpson Electric Company
5200 West Kinzie Street
Chicago 44, Illinois

Dear Mal:

This is to tell you how delighted we are here at Admiral with the new Model 303 Simpson Vacuum Tube Volt-Ohmmeter. It certainly is a versatile instrument for television servicing.

The large meter is very legible, and yet the instrument itself is a compact size. I particularly like the AC voltage range, which is the widest I've ever seen on this type of instrument.

Our service engineers think you've done a good job on the Operator's Manual, too, because it is both complete and concise.

Of course, we've used the Simpson Model 260 Volt-Ohm-Milliammeter for years. The "303" is a fine companion instrument to the "260".

Congratulations!

Sincerely yours,

ADMIRAL CORPORATION
M. J. Schinke
National Service Manager

MJStar

WORLD'S LARGEST MANUFACTURERS OF RADIO PHONOGRAPHS WITH AUTOMATIC RECO
AIR-TO Radios · Television · Radio-Phonographs · Refrigerators · Home Freezers

Model 303
VACUUM TUBE VOLT-OHMMETER

SPECIFICATIONS

DC Voltage
Ranges 1.2, 12, 60, 300, 1200 (30,000 with Accessory High Voltage Probe)
Input Resistance 10 megohms for all ranges
DC Probe with one megohm isolating resistor Polarity reversing switch

Ohms *Ranges 1000 (10 ohms center)*
100,000 (1000 ohms center)
1 megohm (10,000 ohms center)
10 megohms (100,000 ohms center)
1000 megohms (10 megohms center)

AC Voltage
Ranges 1.2, 12, 60, 300, 1200
Impedance (with cable) approx. 200 mmf shunted by 275,000 ohms

AF Voltage
Ranges 1.2, 12, 60
Frequency Response Flat to 100,000 cycles

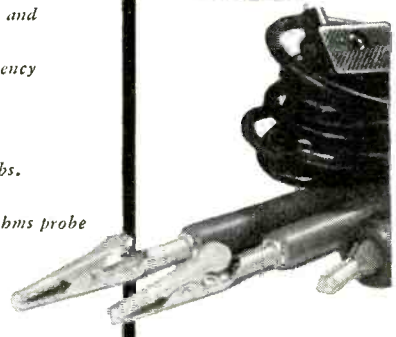
Decibels
Ranges −20 to +3, −10 to +23, +4 to +37, +18 to +51, +30 to +63
Zero Power Level 1 M. W., 600 ohms

Galvanometer
Zero center for FM discriminator alignment and other galvanometer applications

R. F. Voltage
(Signal tracing with Accessory High Frequency Crystal Probe)
Range 20 volts maximum
Frequency Flat 20 KC to 100 M.C.
105-125 V. 60 cycles

Size
5¼"x7"x3⅛" (bakelite case). Weight: 4 lbs. Shipping Wt.: 6½ lbs.

Dealer's Net Price
Model 303, including DCV Probe, ACV—Ohms probe and Ground Lead—$58.75;
Accessory High Frequency Probe, $7.50;
Accessory High Voltage Probe, $14.85
Also available with roll top case, Model 303RT—$64.75



Simpson ELECTRIC COMPANY
5200 WEST KINZIE STREET, CHICAGO 44, ILLINOIS • IN CANADA: BACH-SIMPSON, LTD., LONDON, ONTARIO
Phone: COlumbus 1-1221

MERCHANDISING CORNER

by Victor M. Turner

Don't let them guess.

Putting the prices on your merchandise is as important to your display as color, layout, and lighting.

People will come into your shop more readily for a displayed item if the price is clearly marked. Many of them will not enter the store to inquire about a price. In their minds they have often decided that it will be too high. On the other hand, people will make "impulse" purchases on well-displayed items on which the price appears plainly.

Make it easy for your prospective customers to see the products and the prices, and they will buy more.

This applies to repair work as well as product sales. Wherever possible, list and display your prices for service work. This is not as simple as placing a tag on a receiver which is for sale, but where you can standardize and advertise repair jobs, do so. List the charge for replacing components—prices of the components—the fee for inspecting the radio—and so on. It will mean more and better customers for your service work. Incidentally, most of the large manufacturers have charts which show the various prices they think should be charged for different service jobs.

In a booklet put out by RCA on promoting a sales campaign, figures from an actual study were presented to prove this policy; and they are very convincing.

A study was made in ten cities and people indicated that:

85% want prices on each item in windows.
85% want prices in printed advertisements.
87% want prices on counter display merchandise.
50% *won't ask* the price for fear it will be too high.
80% make impulse purchases when an article is clearly priced.
72% won't enter a store to ask the price — even when they want or need the item.
77% would have bought had they known the price.

No argument against those figures, is there?

In the same booklet, RCA announced a pricing kit for radio sales and service shops. This includes bases in which numbers, dollar signs, etc. may be inserted and interchanged. For further information on this contact your RCA distributor.

More Television Potential

As television spreads further over the country, more fringe areas and districts heretofore out of range are enjoying good reception through new antenna developments, more technical proficiency on the part of installation personnel and, in many cases, by simply spreading the word that good reception is available in unpredictable or doubtful areas.

One case illustrating this point occurred recently in a mountainous section in Pennsylvania. Many residents in the neighborhood were under the impression that TV was not for them because they knew of numerous cases where TV set owners were not getting satisfactory results. A young technician in the town decided the best way to correct this impression was to *show them*. He set up a TV receiver in his store window and by proper selection of antenna and installation, set it to working perfectly for the benefit of all passers-by. This simple thing has changed the situation in the town completely, and people now realize that careful and intelligent installation will provide them with good TV. Receiver sales increased over 300% and the enterprising technician has been kept busy as never before selling, installing and servicing.

This is a good example of the power of product display, and also that a simple, straightforward advertising message can produce results. Obviously other men in town may have known that proper installation would have done the trick—but they did not recognize the basic fact that the potential customer did not know it.

Industry Presents

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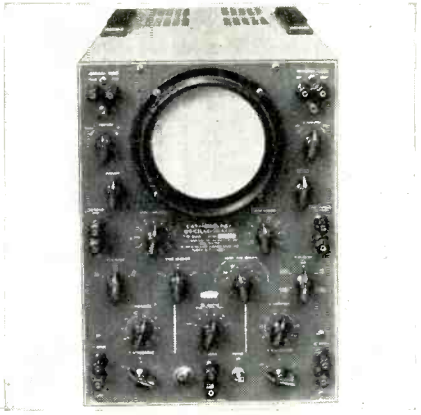
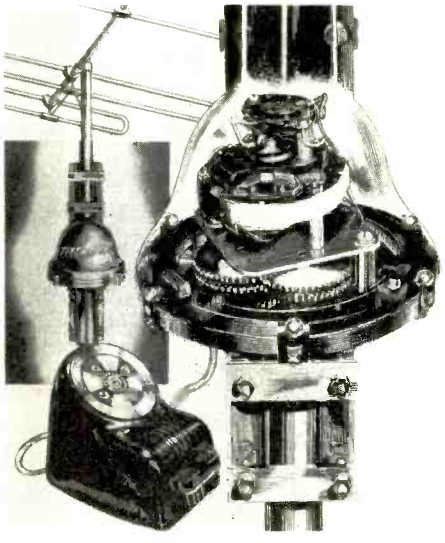
cathode-ray tube used is the DuMont type 5RP-A, for which the overall accelerating potential is 13,500 volts. Frequency response of d-c amplifiers is uniform within 10% to 200 kc, that of the a-c amplifiers uniform within



10% from 5 to 200,000 cps. A low voltage version of the instrument is also available as type 250-A. Accelerating potential for the 5CP-A used in this type is 3,000 volts. Detailed information is available from **DuMont Labs, Instrument Div., Clifton, N. J.**

ANTENNA ROTATOR

An antenna rotator called "Tele-Rotor" has been added to Radiart's TV antenna line. This rotator will handle loads up to 150 pounds with ease. It has streamlined, weatherproof housing, and its motor reverses in-



stantly. Smooth rotation is assured by 12 heavy-duty ball bearings in two oversize 6½-inch diameter races. The basic design accommodates any type mounting, mast, tower, or platform. The rotator will handle any size mast from ⅞ to 2 inches in diameter. Complete details available from **Radiart Corp., 3571 W. 62 St., Cleveland, Ohio.**

Trade Lit.

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procedures, etc. etc. Included also will be cumulative index covering Vol. I through IV, and the traditional "How It Works" book. It's scheduled for May publication.

Antenna Bulletin. This important engineering bulletin explains and gives detailed drawings of the proper procedure in stacking high-band antennas. Dimensions and proper phasing of antennas are covered, both for two-stacked and four-stacked arrays. The material has been worked out by Taco engineers and is authoritative. Get the bulletin by writing to Technical Appliance Corp., Sherburne, N. Y. Ask for Bulletin 58.

Ham News. G-E's "Ham News" is now available by subscription ($1 per year) for those who find it difficult to obtain each issue from their distributor. As in the past, they can still be picked up free of charge at G-E tube distributors' headquarters. But if you can't make it there regularly, you can pick up subscription blanks at your G-E tube distributor and make sure that you get each copy.

Replacement Guide. Merit Transformer Corp. has released its 1950 TV replacement guide. It lists about 400 popular telesets made by 60 manufacturers and provides a quick method of determining replacement parts. It'll prove valuable in your work, and we suggest you write for it. It's free. You may also wish to inquire about their new line of chokes, coils, and transformers. Their address: 4425 N. Clark Street, Chicago 40, Ill.

Mike Bulletin. Electro-Voice has issued bulletin 154, describing its new Mercury Model 911 Crystal, and Model 611 Dynamic mikes. Gives complete technical data and list prices for both models. For free copy of bulletin 154, write to Electro-Voice, Inc., Buchanan, Mich.

Catalog Supplement. To keep its catalog up to date, Allied has issued supplement 122, a 46-page booklet listing the new products released by the manufacturers since publication of its last catalog. Available free of charge from Allied Radio, 833 W. Jackson Blvd., Chicago 7, Ill.

Sync Separator Circuits

→ from page 13

noise or signal variations may have come along, is fed into the separator control grid through the .05 coupling capacitor C63 and 1 megohm resistor R82. In many receivers the vertical and horizontal pulses in the plate circuit of this tube would then be separated further by low and high pass filters (integrating and differentiating networks) and then used to trigger the sweep oscillators. However, in this instance still more separation and pulse shaping is used, since a sync clipper precedes the integrating network. The output of still another triode sync clipper supplies pulses which are fed into the horizontal afc system.

The sync pulses applied to the control grid of the 6SN7 are negative. The signal at the grid is sufficient to drive the tube beyond cut-off and the signal is clipped again. The triode performs a number of important functions. It inverts the pulse signals into the proper polarity for triggering the sweep oscillators. In addition, the clipping action removes all amplitude variations between sync pulses due to noise or hum.

Some manufacturers favor the use of pentodes for sync segregation. The network shown in Fig. 6 uses two pentodes and a triode for sync separation. The first sync amplifier is a 6SK7 having a remote cut-off characteristic. The signal is fed into this amplifier with the sync pulse in the negative direction. The tube amplifies the signal much more than any noise voltage, thus improving the signal to noise ratio.

One question that often bothers service technicians is why some telesets have such elaborate sync amplifier, separator and clipping circuits, sometimes involving as many as four extra tubes. Aside from the obvious necessity of having the pulses free of human noise, these amplifier, separator and clipping circuits supply a pulse of constant amplitude, regardless of the original value of the composite video signal. This provides for a very high order of picture stability during reception of fairly weak signals. The pulse amplitude is completely independent of the strength of the incoming signal.

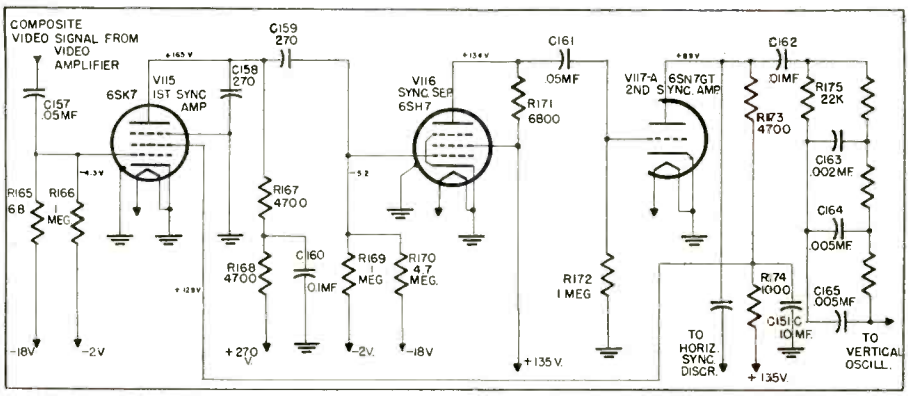


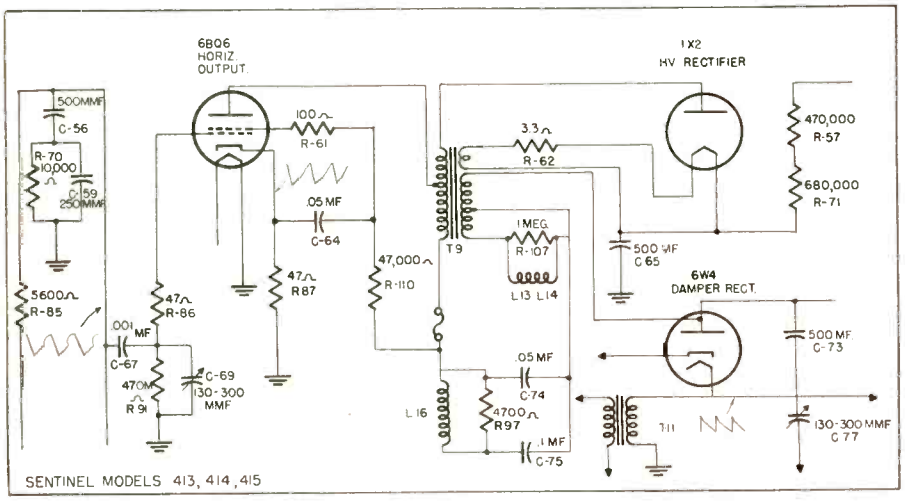
Fig. 6 RCA and Ansley receivers use the network shown above, using two pentodes and a triode for sync separation, clipping action removes amplitude variations

THE Notebook

SENTINEL Models 414,413,415: Horizontal Raster too Small

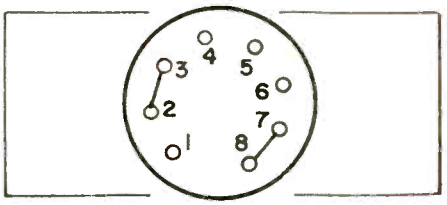
Check for: width control improperly adjusted, located on back of chassis. Open 500 mmf condenser (C73) connected in series with width control. Width control will have no effect on picture size. Defective 6BQ6 horizontal output tube located inside the shield compartment. Defective 1X2 high voltage rectifier tube located inside shield compartment. Weak 6W4 damper rectifier tube located inside shield compartment. Improper adjustment of drive control. CAUTION! DO NOT touch this control without first reading the service manual instructions for adjustment of the horizontal drive control given on the same page with deflection, focus, and ion trap adjustments. Leaky .05 mf condenser (C74) connected to horizontal linearity coil L16. Shorted .1 mf condenser (C75) connected to horizontal linearity coil L16. Open 250 mmf condenser C59 located in discharge circuit of horizontal oscillator.

Sentinel
Service Bulletin



GENERAL ELECTRIC: Models 818,12K1: Adapter plug for servicing.

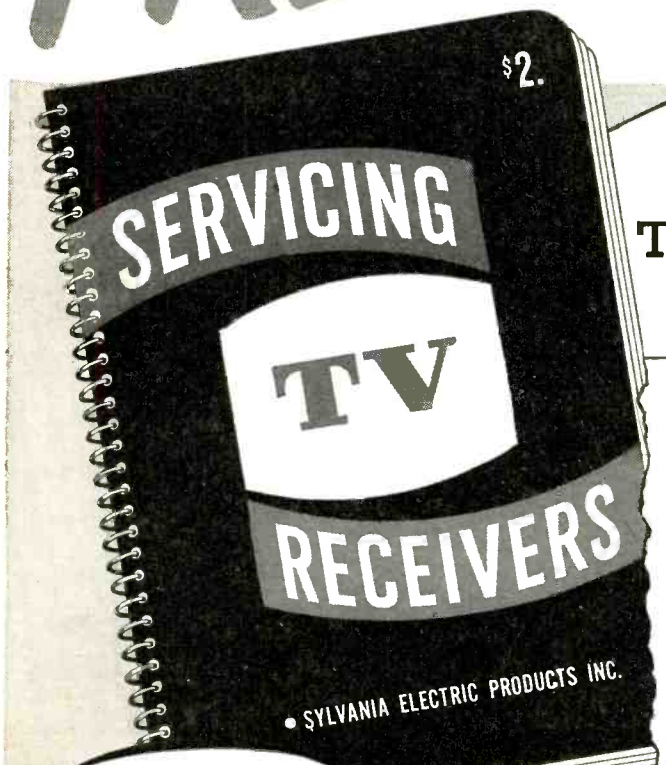
An adapter plug may be made which makes it unnecessary to remove the television chassis when service has to be rendered on the radio chassis only of Models 818 and 12K1. A standard octal tube base is wired as shown in the accompanying sketch. A jumper is connected between pins #7-#8 and also between pins #2-#3. This plug is then inserted into the J-4 socket on the radio chassis to re-instate audio continuity and to energize the tube filaments when the radio is separated from the TV chassis. A-C power is furnished either at pin #3-#4 of P3, or with a suitable plug in receptacle J-2. *Precaution:* When using the latter point for connection, it requires a male pin jack which makes the pins "hot" at 110 volts. The plug shown here may also be used when servicing the TV chassis separated from the radio chassis. When this plug is inserted into the octal socket J5 on the TV chassis, it permits application of power to the TV chassis for alignment or trouble-shooting purposes.



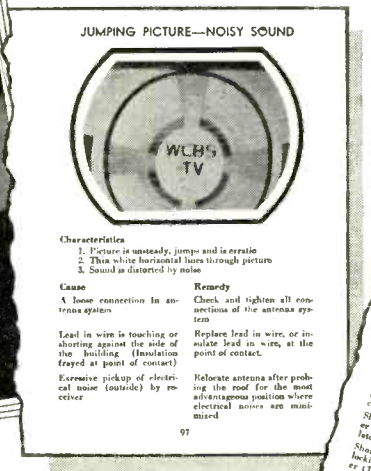
General Electric
Radio Service Bulletin

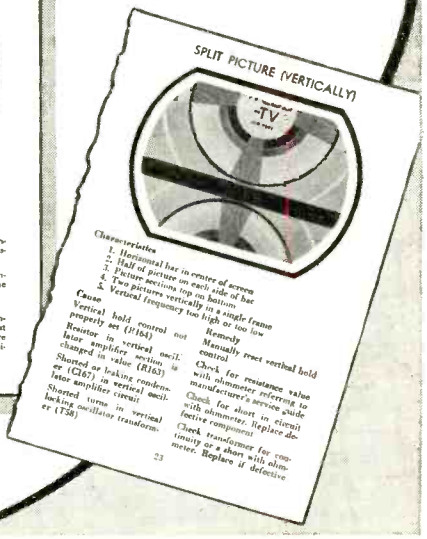
FREE

with purchase of 100 Sylvania Receiving Tubes... or 3 Sylvania TV Picture Tubes



The clearest and most complete Television Servicing Book ever printed





Here are 2 sample pages from "Servicing Television Receivers." Note the easy-to-read type arrangement and the simplified photographic instructions.

FREE

during April, May, June, July and August

HERE at last is a guidebook to help simplify TV set service for you. You'll be amazed how it will enable you to quickly identify trouble . . . solve tricky problems.

Contains more than 100 pages with scores of actual photographs and easy-to-read diagrams, to help you increase and improve your TV set repair business.

Not for sale . . . it's FREE!

This valuable book is yours absolutely free, from your regular Sylvania distributor, with your order of 100 Sylvania receiving tubes . . . or just 3 TV Sylvania picture tubes. Spirally bound with a sturdy board cover to stay open and lie flat on your bench.

NOTE: This important booklet offer is open for a limited time only. So don't delay. Send your order for the tubes you need today to your Sylvania distributor and he'll mail this free, helpful guidebook to you immediately.

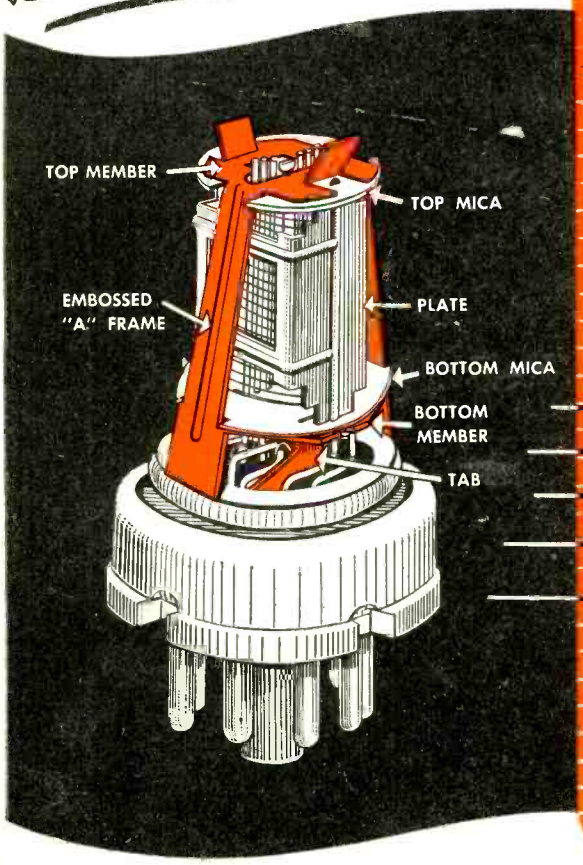
Quickly answers scores of questions

- Shows more than 80 actual photos of screen test patterns. Shows how to identify trouble by pattern behavior.
- Gives simple, concise instructions for making repairs, proper adjustments.
- Contains complete circuit diagrams of typical television receiver.
- Explains latest television developments such as "Intercarrier sound."
- Tells about television test equipment and what each instrument will do.
- Provides a practical dictionary of television set trouble.

SYLVANIA ELECTRIC

RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES, SIGN TUBING; LIGHT BULBS; PHOTOLAMPS

Built for Service ... SINCE 1915



The inside story of Cunningham quality

2. How the Cunningham "A" Frame Minimizes Vibration. The unflagging search for ways to make Cunningham tubes ever better accounts for their *first-line* quality. A case in point is the RCA-developed "A" frame construction used in 6 of the metal-type r-f amplifier tubes.

The "A" frame—shown in color—consists of a top member, two vertical members, and a bottom cross member. The ribbed uprights are welded to the cross member; the feet of the uprights are welded to the grounded metal header. In effect a truss, this rigid "A" frame acts as the supporting member for the tube elements. Its increased resistance to vibration reduces the possibility of electrode displacement due to wear on the holes in the mica spacers . . . and thereby plays an important role in reducing microphonics and maintaining uniform tube characteristics.

In addition to imparting rigidity to the tube elements, the top and bottom members of the "A" frame serve as shields. The two ears on the top member add to its effectiveness in reducing grid-to-plate capacitance; the tab on the lower member—which extends down to the stem—provides additional shielding between grid and plate leads.

• • •

The "A" frame construction is but one of many improvements that contribute to the dependability and long life of Cunningham tubes. Its use explains why more and more servicemen are placing their confidence in Cunningham.

ALWAYS KEEP IN TOUCH WITH YOUR CUNNINGHAM DISTRIBUTOR

RCA **RADIO CORPORATION of AMERICA**

ELECTRON TUBES **HARRISON, N. J.**