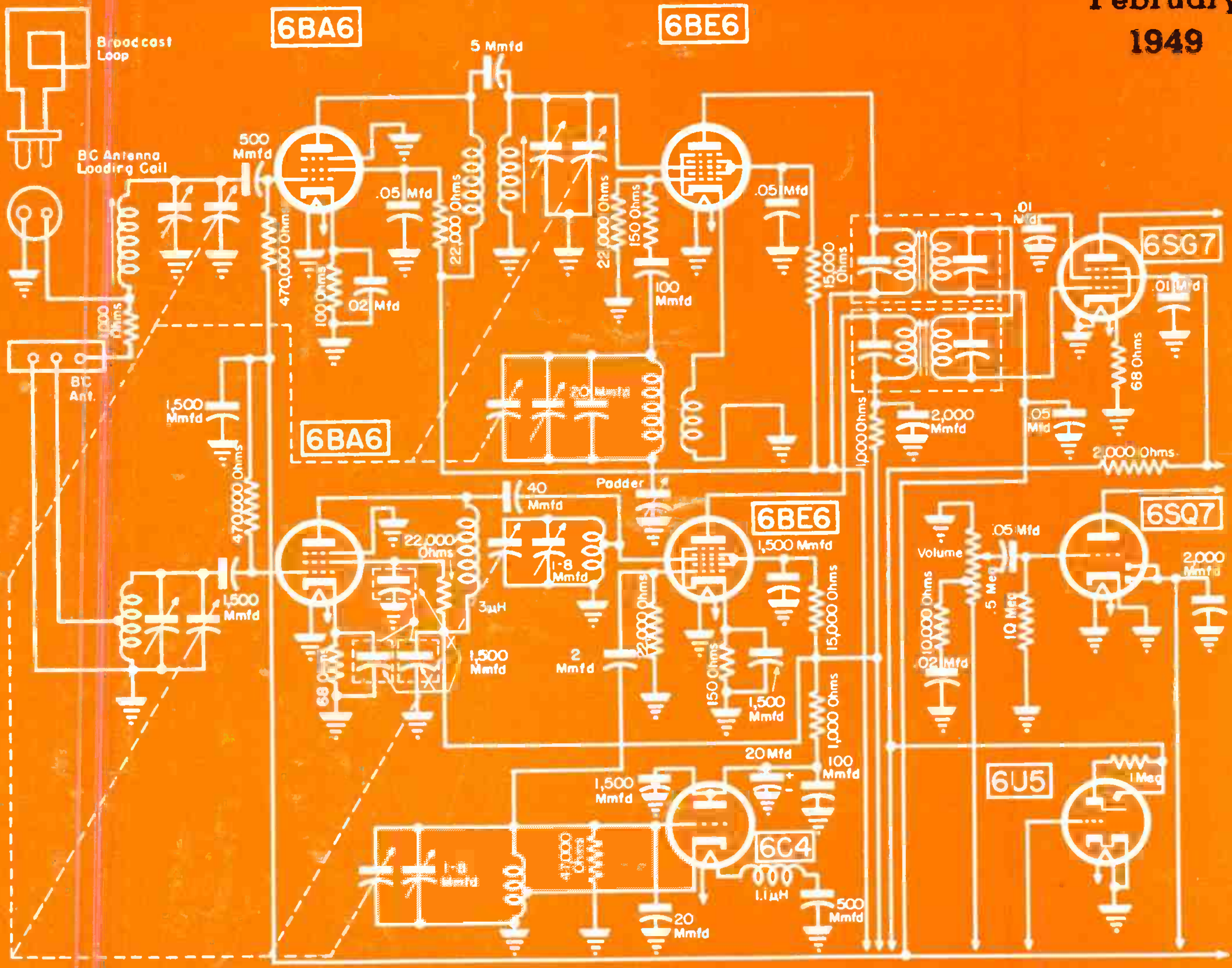
RADIO · TELEVISION · ELECTRONIC

SERVICE

February
1949



The rf, converter, mixer, oscillator, if, first af and tuning indicator stages of a 10-tube AM/FM tuner.

(See page 2)

THE TECHNICAL JOURNAL OF THE RADIO TRADE

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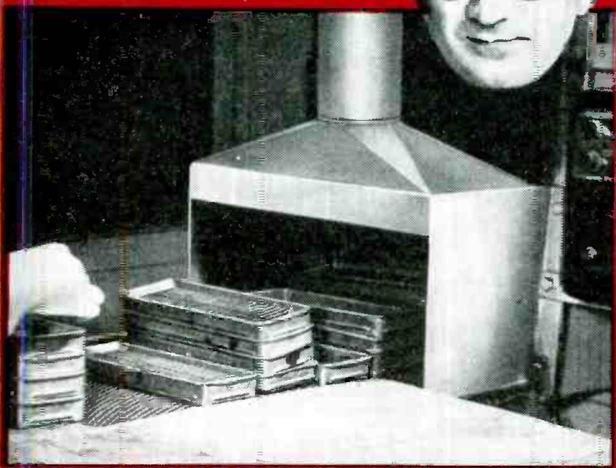

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The Serviceman's Tube

Vol. 18, No. 2

RADIO · TELEVISION · ELECTRONIC
SERVICE

February, 1949

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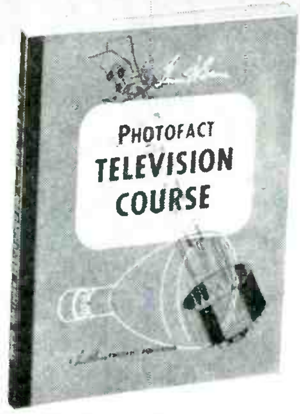

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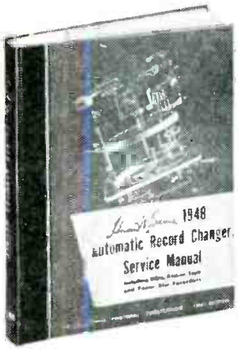

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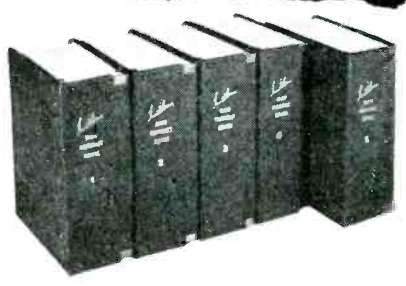

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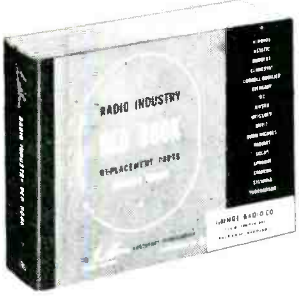

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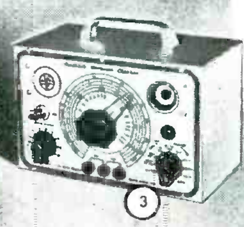

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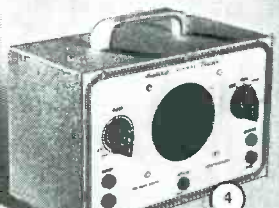

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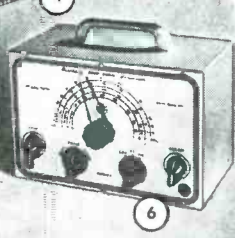

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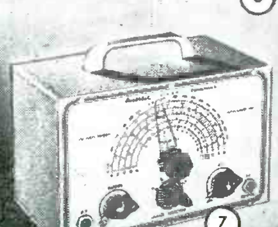

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Every shop needs a good signal generator. The Heathkit fulfills every servicing need, fundamentals from 150 Kc. to 30 megacycles with strong harmonics over 100 megacycles covering the new television and FM bands. 110V. 60 cycle transformer operated power supply.

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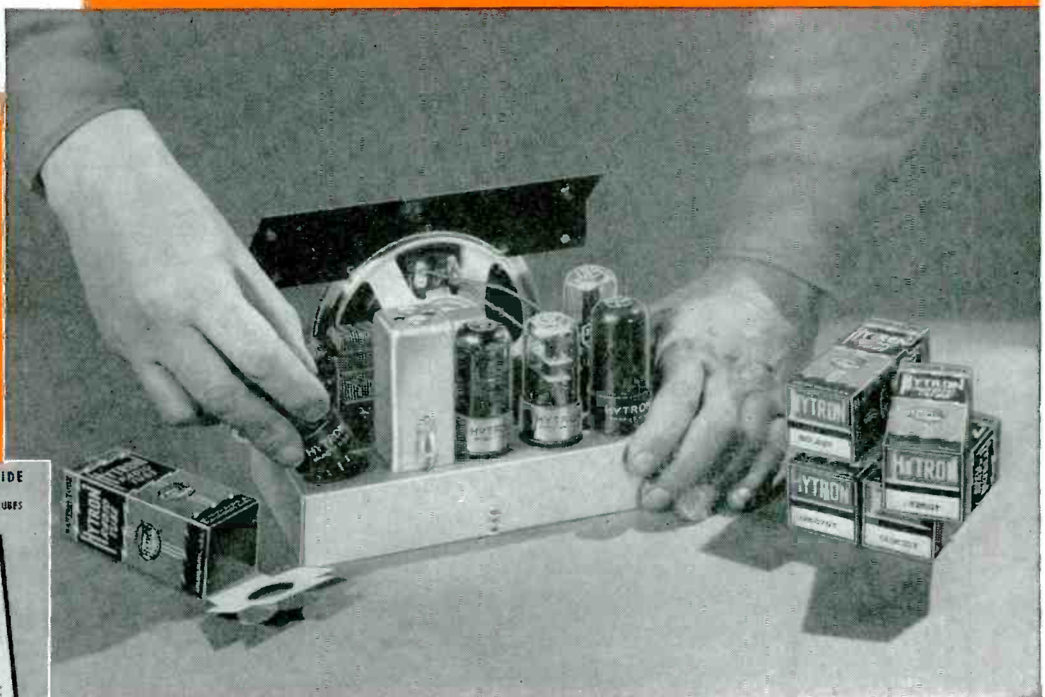

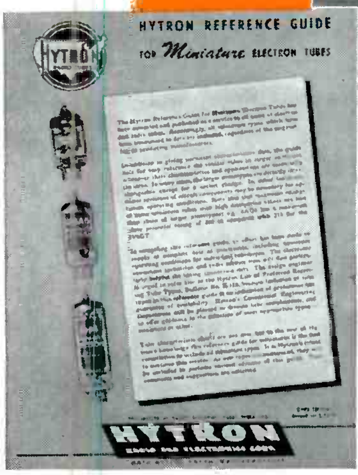

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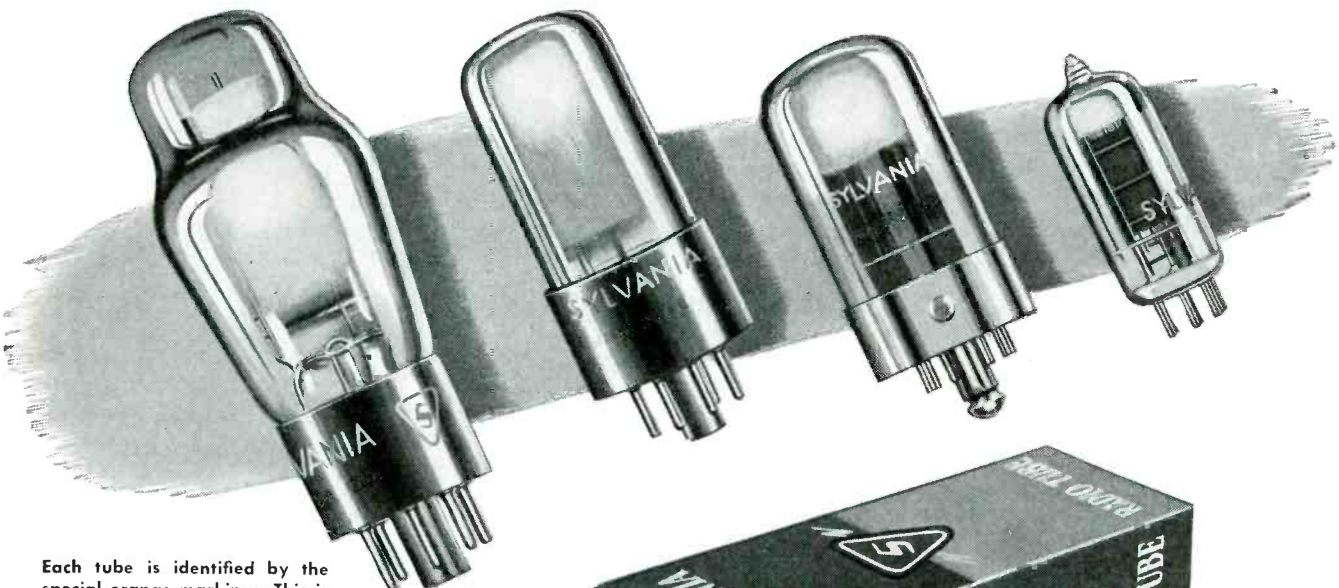
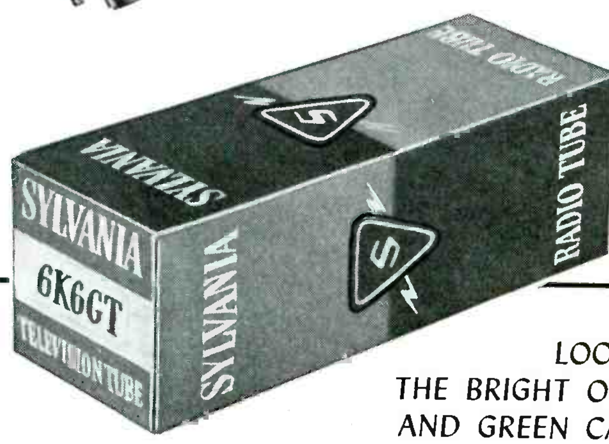


Each tube is identified by the special orange markings. This is your assurance of the higher quality demanded by television.



Now, when you replace worn-out receiving tubes in your customers' television sets, give them the finest in television reception with these new receiving tubes *specially processed* by Sylvania for the extra-tough requirements of television service.

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They are not just good tubes, they are *superior* tubes . . . results of Sylvania's years of experience in the electronics field. Be sure you have a ready supply for increased television tube replacement business. See your Sylvania Distributor today! Sylvania Electric Products Inc., Radio Tube Division, Emporium, Pa.

LOOK FOR THE BRIGHT ORANGE AND GREEN CARTON

Replace worn tubes with these specially processed Sylvania tubes made to pass television's rigid requirements.

AVAILABLE NOW IN THE FOLLOWING TYPES

1B3GT	6J6	7F7
6AG5	6K6GT	7H7
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	7C5	

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

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Compensation for Your Knowledge

TV AND FM with its varied installation and servicing problems, have once again demonstrated the value of *know-how* and particularly its use. How often a Service Man, who because of a lack of familiarity with a receiver, or the required test unit, or the necessary installation equipment, will begin to set up a stream of excuses and apologies for his failure to get that income and also the respect of his customers which he feels he so richly deserves.

At a recent service meeting, when a speaker, representing a service company, pointed out that his group were able to ask for and receive quite a sum for a certain type of installation which would guarantee interference-free reception in a certain type of area, a Service Man arose and, quite disturbed, claimed that a large company could demand a substantial fee for such services, but a small independent could not begin to make such claims, since the customer would not only feel he is being overcharged, but in doubt over the maintenance of a guarantee offer. And in addition, this Service Man also felt that the customer would go next door and get a better price. In reply, the company representative pointed out that if the Service Man knew his business, thoroughly understood the problems, and believed in himself and his knowledge, these fears could be dismissed. For, continued our speaker, whether you are an independent operator or associated with a service company, that *know-how* is still the answer to getting what you deserve.

Continuing, we were told that there is no need to worry about the fellow next door if you have the ability based on experience and study, since the fellow next door, armed with the same ability, will feel as you do and make the same charges or perhaps more, for he may feel his time is even more valuable to him. And then, we were told, if competition insists on price cutting, you can be sure that these competitors don't know the answers and you'll be called in to remedy the errors introduced by this price-cutting competitor.

An independent Service Man, who has been eminently successful as a TV installer and Service Man supplemented our speaker's remarks, saying that many Service Men are quickly realizing that those *sure-we'll-do-it-for-less* fellows are no competition and actually, these operators are rapidly disappearing from the problem scene. We were then told about two other extremely important factors in servicing and installation which must not be overlooked in this return-for-your-effort picture, and these were appearance and conduct. Unfortunately, too many Service Men seem to forget that they are visiting homes and not factories, and have to dress and act accordingly. Whether the call involves outdoor or indoor work, it is essential that the Service Man should not present himself in factory or mechanic's garb. With this uninviting appearance he will be received accordingly, and receive, probably, a mechanic's fee. His dress can be simple but neat, we were told, similar to that worn by the telephone repair man. If heavy indoor or outdoor work is required, a lab jacket or overalls can be slipped on. In addition, conversation should be on a level which will gain the respect of the customer.

This Service Man then stated that the latter two points are too often assumed to be mere trivialities and completely discounted. The results of this indifference are well-known, he said, adding up to a lack of work, loss of income, the eventual loss of confidence and very lean of acceptance. We were then told that many service companies conduct weekly sessions in which these factors are stressed. Service Men who attend these meetings are told that conduct and apparel rules *must* be followed.

At many other service meetings, the subject of professional conduct and apparel has been a featured topic. During a talk at a recent meeting of the Federation of Radio Servicemen of Pennsylvania in Harrisburg, during which James M. Skinner, vice president in charge of service and parts at Philco, received an award for "outstanding contribution to progress of radio service in '48", Skinner strongly emphasized the importance of personal appearance, conduct and the application of *know-how* in the home.

Here is cash register advice, which demands attention, and when followed will cause a merry jingle and a healthy black set of figures in the books.

Those TV Antennas

THE VARIETY OF UNUSUAL POSSIBILITIES which exist in the TV antenna installation business were effectively highlighted by Charley Golenpaul, jobber sales manager of Aerovox, during a recent service meeting talk.

"Television antenna work is quite a business," Golenpaul said, "since there is not only the sale of the antenna which is involved, but the labor.

"The variety of antenna installations ranging from the simplest single dipole to the elaborate stacked arrays and reflectors, and again from a direct mounting on the roof peak, to a lofty mast supported by a chimney mount, means that Service Men can meet just about every purse and purpose.

"Even after the installation has been made, service organizations are in for still more business. When additional TV stations come on the air in their territory, wide-awake Service Men go after their previous installations and suggest improvements to bring in the new programs, such as supplementary antennas, realignment of existing antennas, the use of boosters, etc. Amazing as it may seem, there seems to be no limit to what the TV enthusiast will spend to enjoy the best in television."

TV in '49

FROM BURTON BROWNE of Chicago has come an excellent slogan for '49 which, expressed in an effective symbol declares that *"1949 is TV Year."*

We agree with you Burt, for '49 is certainly a TV year.—L. W.

VIEWING AREAS Of TV

Lucid Analysis Reveals Why the Rectangular Viewing Area Shape Was Selected Initially for Picture Tubes, Advantages of Its Application and How It Compares With Other Types of Viewing Area Shapes In Use Today.

by
ROBERT P. WAKEMAN

Research Division

Allen B. DuMont Laboratories

EARLY WORKERS in television spent considerable time studying the possible shapes and aspect ratios for the most desirable presentation of the picture. The examples set by many of the world's great paintings, by motion pictures and by the simple fact that most of man's activities occur in a horizontal area, all influenced the final choice of a rectangular picture having a width-to-height ratio (aspect ratio) greater than unity. Many ratios were suggested based on scientific, pseudo-scientific, and even practical reasons. Most of these lie between the limits of 1.2 and 1.8 and, *golden ratios* and *dynamic symmetry* notwithstanding, it is probable that the public would enjoy television equally well with most of the suggested aspect ratios. It was, however, necessary to standardize so that a given receiver would be able to reproduce pictures from all transmitters with equal efficiency. The aspect ratio finally chosen was 4:3 with the long side horizontal.

This standardization still left considerable leeway for the receiver manufacturer. To date, at least, most TV receivers have employed picture tubes having circular screens and there appears to be considerable difference of opinion as to the most satisfactory manner for presenting a rectangular picture on such a screen.

Typical Viewing Areas

Fig. 1 illustrates the viewing areas most commonly seen. Type *a* is usually employed on monitoring equipment in the studio where size is immaterial, but it is necessary to examine all parts of the picture. Types *b*, *c* and *d* are representative of viewing areas on commercial receivers. In this drawing the white area is that actually devoted to the picture. The black area is that portion of the tube not used and the shaded area is that portion of the picture which is transmitted but not seen at the receiver because the beam is off the screen when it is being reproduced. The sketches *a'*, *b'*, *c'* and *d'* show the effect on the picture in each of the four cases.

The Rectangular Picture

A study of Fig. 1 indicates that it is desirable to sacrifice part of the picture in the interest of enlarging the remainder and using a greater percentage of the tube area. The extent to which this procedure should be carried has rightly been left to the manufacturer by the standards committees. However, it is felt that the consequences of enlarging the picture on a given tube should be quantitatively appreciated by the industry and the public.

The condition shown in Fig. 1*a* occurs when the height of the picture is 0.6 that of the *useable* diameter of the picture tube. Fig. 1*d* shows the condition when the picture height is equal to the usable tube diameter. Within these limits the actual area occupied by the picture is given by the expressions:

$$A = \frac{D^2}{4}\left\{\begin{matrix}\pi - 2(\cos^{-1} a \\ + \cos^{-1} 4/3\, a \\ - a\sqrt{1-a^2} \\ - 4/9\, a \\ \sqrt{9-16a^2})\end{matrix}\right\} \text{ for } 0.6 \leqq a \leqq 0.75$$

$$A = \frac{D^2}{4}\left\{\begin{matrix}\pi - 2\,(\cos^{-1} a \\ - a\sqrt{1-a^2})\end{matrix}\right\} \text{ for } 0.75 \leqq a \leqq 1.00$$

where: $a = \frac{h}{D}$

h = Picture height

D = Useable diameter of tube

The percentage of the transmitted picture, which is actually seen, is:

$$\%\ \text{pix} = \frac{A}{\frac{4}{3} a^2 D^2} \times 100$$

and the percentage of the useable area of the tube which is employed is:

$$\%\ \text{tube} = \frac{A}{\frac{\pi}{4} D^2} \times 100$$

Fig. 1 indicates that as a $\left(\frac{\textit{Height of Picture}}{\textit{Useable diameter of tube}}\right)$ is increased, the percentage of the picture actually seen is decreased, whereas the percentage of the useable tube area is increased.

Viewing Area Conditions

Fig. 2 illustrates the relation between these three quantites with a taken as the independent variable. Thus, when $a = 0.6$, the entire picture is viewed, but only 61% of the tube is used and when $a = 1.0$, the entire tube is used but we see only 59% of the picture. Since the percentage of picture seen decreases very slowly at first, while the percentage of tube used increases quite rapidly, it would appear to be good economics to make a somewhat greater than 0.6. It should be noted that the small percentage of the transmitted intelligence which is lost by this procedure is of relatively little importance, since the center of interest in a picture is usual-

Receivers

ly concentrated near the center of the screen and we are merely clipping the corners. If overdone, however, it may be very annoying, especially when trying to read titles.

Compromise Conditions

The third curve on Fig. 2 is the product of the two percentages, and the maximum may be a possible criterion for a good compromise. This maximum indicates that we should use about 83% of the tube and see about 92% of the picture. This corresponds to an *a* of 0.73. In *b′* and *c′* of Fig. 1 can be seen the effect of having *a* equal to 0.70 and 0.75, respectively. It might be noted here that the use of a mask having rounded corners with radii equal to one-fourth the picture height (RMA standard) will not eclipse any more of the picture in these three cases. This is not true, of course, in the case of Fig. 1*a′*.

The Square Picture

One other possible compromise should be mentioned at this point. At the receiver, the vertical sweep amplitude may be made equal to that of the horizontal sweep. This converts the 4:3 aspect ratio to a square picture which may be made to employ the entire area of the picture tube and reproduce 78% of the transmitted picture. Obviously, in addition to losing a sizeable portion of the transmitted information, this procedure results in nullifying the standard 4:3 aspect ratio as set forth by the RMA and adopted by the FCC, as well as producing a vertical elongation of all objects in the scene.

Table 1

Nominal diameter ..	7	10	12	15	20
Useable diameter ..	6¼	9¼	11	14	18¾
Pix area when 100% of pix is viewed ..	19	41	58	94	168
Pix area when 95% of pix is viewed ..	24	53	75	121	218
Pix area when 90% of pix is viewed ..	26	56	80	129	232

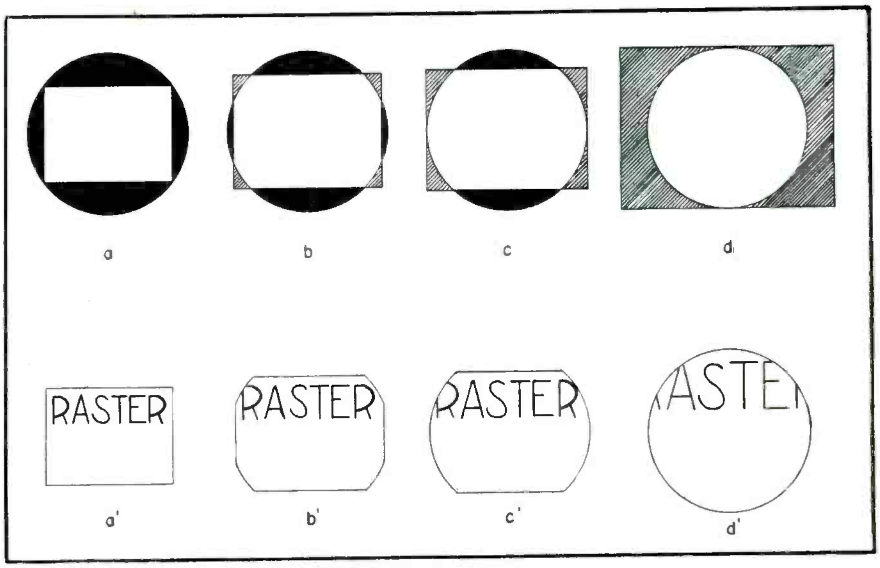


Fig. 1. Viewing areas most commonly seen on picture tubes. The illustration in *a* is that of the viewing screen on monitor equipment, while in *b*, *c*, and *d* appear the viewing areas on typical commercial TV receivers. In *a′*, *b′*, *c′* and *d′* appear the effects on the picture in each of the four types of areas illustrated in *a*, *b*, *c* and *d*.

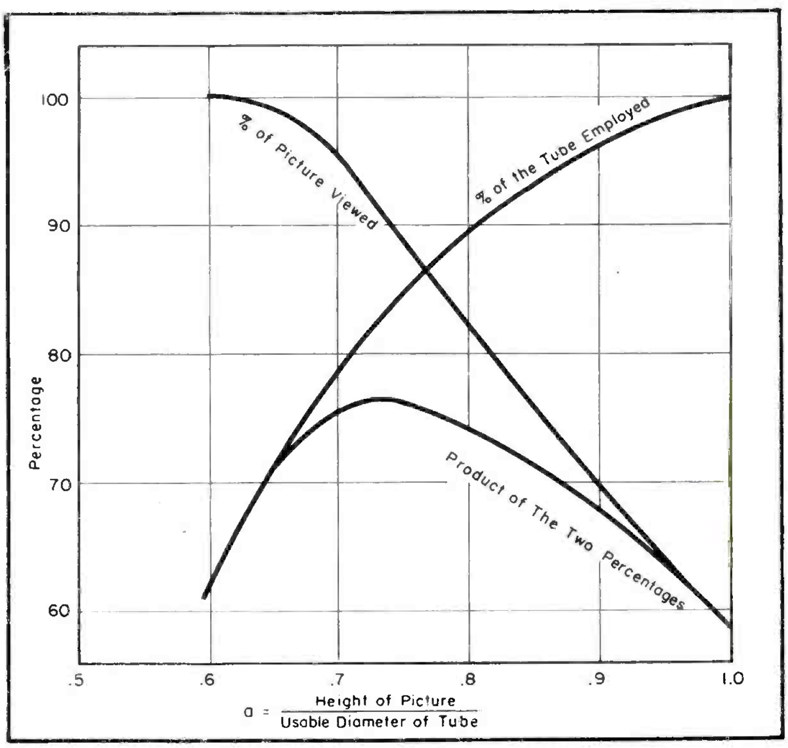
Useable Diameter/Area

Throughout this discussion the terms *useable diameter* and *useable area* have been employed. Table 1 shows the *useable diameters* of five standard tubes together with the area in square inches which may be obtained when various percentages of the transmitted picture are actually viewed; the useable diameters were obtained from manufacturer's specifications and laboratory measurements.

Best Picture Areas

The majority of television receivers now on the market employ picture areas close to that indicated as optimum by the curves in Fig. 2. It is believed that a continuance of this policy will promote the greatest public acceptance of television.

Fig. 2. The relation between percentage of picture viewed, percentage of tube employed and the product of the two percentages is illustrated here.



TV Antenna Installation Tricks of the Trade

by **IRA KAMEN**

Manager, Television Antenna Dept.
Commercial Radio Sound Corp.
New York City

In many TV installations it is necessary to incorporate *antenna installation devices* to improve picture fidelity. These devices, which feature unique circuitry, perform specific functions in the antenna system.

One type device, an *attenuation pad* (Fig. 1), is used to reduce the signal level at the input of the TV receiver and thus:

(*1*) Prevent a strong TV signal from overloading the receiver input and producing crossmodulation. Crossmodulation, which manifests itself by one TV pattern appearing behind another, is most common between adjacent channels, i.e., *2* and *4*, *4* and *5*, *7* and *9*, *8* and *10*, *9* and *11*, *10* and *12*, and *11* and *13*.

(*2*) Reduce the TV signal level input so that the contrast control on the TV receiver has a practical range of adjustment. Strong TV signals (more than 20 millvolts) may make the contrast control so sensitive, that in 10° to 45° of manual adjustment the picture can be overcontrasted (turned black) by the person operating the contrast control. In this instance, the attenuation of the pad has to be increased until a contrast control adjustment of 100° (approximately ⅓ rotation of the control) can be realized before the picture is overcontrasted.

(*3*) Minimize effect of a reflection which cannot be eliminated by other means. Often when the TV signal is of reasonable strength, it is possible to attenuate the direct signal to a point where the reflected signal is below the noise level and the direct signal is still of usable strength.

The attenuation pad shown in Fig. 1 may introduce an impedance mismatch of 1.25:1 as the resistor marked x is set at its minium and maximum values. However, this mismatch is of no consequence in power loss and standing-wave-ratio. In fact, this pad provides a better match over the entire TV band (54-216mc) than the average TV receiver and will often compensate for the deficiencies of a TV receiver whose input impedance may vary considerably with frequency.

Three design factors were considered in the evolution of this circuit:

(*1*) Only one resistor needs adjustment for a large range of attenuation settings.

(*2*) A simple assembly can be made on a bakelite plate which enables quick change of the single resistor (x) which is varied in steps to obtain the desired attenuation level.

(*3*) Resistors of low value and which are subject to a minimum variation with frequency are employed. Higher resistor values have been known to vary in resistance as much as 25% when required to pass 200 mc currents.

This flexible pad, with its slight mismatch, can be used in even the most critical attenuation adjustments. To assemble theoretical attenuation pads which provide a perfect match at various attenuation steps is impractical as the calculated values are usually not as manufactured and would therefore have to be calibrated. The Service Man would require an expensive set of low tolerance resistors, as in optimum design all values of the *H* pad would require change as the attenuation steps increase. The casualty value of resistors which are assembled and dissembled is also very high. In a series of carefully scrutinized antenna tests no practical differences were noted for all attenuation values between the perfectly matched attenuation pad and the pad shown in Fig. 1.

Fig. 2 shows another type of attenuation pad which can be used to adjust the TV signal level between a 72-ohm coaxial line and a 72-ohm receiver. By keeping the series resistor, x, to a minimum of 100 ohms it is *not possible* for the TV receiver load in parallel with the 85-ohm resistor to effect a serious mismatch on the coaxial cable termination.

This unit can also be neatly assembled on a bakelite plate for adjustment of TV signal levels.

Since the input impedance of the pads shown in Figs. 1 and 2 approximates the impedance of the transmission lines, at the termination end, all the signal from the antenna is absorbed and little energy is reflected back up the antenna lines.

In many installations in primary signal areas, only one or two stations of a total of four or six in the area may require attenuation. Therefore it may be necessary to provide a selector switch which will enable the user to insert attenuation on the channels where the signal strength is excessive and remove the attenuation on those channels where the TV signals are of a satisfactory level.

A two-gang, double-pole, three-position switch can be used to connect

How to Construct Attenuation Pads for 72 and 300-Ohm Lines, Connect Two TV Receivers to Single and Dual Arrays, Use Jumper Link Assemblies to Permit Use of Folded Dipoles or Broadband Straight Dipoles With 300 or 72-Ohm Lines, Apply Divider and Decoupling Networks Which Permit Use of Single Line With HF And LF Antennas, etc.

attenuation pads to the receiver; Fig. 3. Such an arrangement provides, in switch position *1*, connection of the 300-ohm transmission line directly to the 300-ohm input of the receiver; in position *2*, insertion of an attenuation pad (type shown in Fig. 1) between the 300-ohm transmission line and the receiver; and in position *3*, the insertion of another pad with a different level of attenuation between the transmission line and the receiver.

Before assembling the transmission line and the pads on this type of switch a careful check should be made of the quality of the pictures without the switch in the circuit. The addition of the switch between the transmission line and the TV receiver should not affect the picture quality on any channel.

Fig. 4 shows another type of switch application using a coaxial switch for connecting the pads described in Fig. 2 between a coaxial line and a 72-ohm receiver. The circuit shown functions in the same 1, 2, 3 sequence described for the two-gang 300-ohm transmission line selector switch.

In some of the larger private dwellings it is common for two TV receivers to be permanently installed in the different sections of the home. It is really not necessary to install a separate antenna for the second receiver when the coaxial cable or transmission line from each TV receiver can be paralleled across the antenna terminals as shown in Fig. 5. The fact that both transmission lines are properly terminated by the receiver minimum loss input pad (Fig. 2) assures complete absorption of the incoming signals and therefore reflections cannot pass up one transmission line and down the other.

This parallel arrangement shown in Fig. 5 may not be satisfactory under the following conditions:

(1) In fringe areas where the slight loss due to paralleling lines or use of pads will drop the picture into the *snow.*

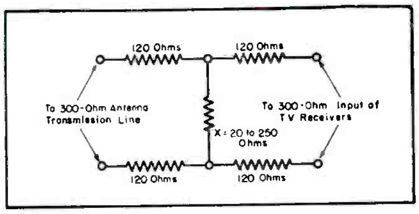


Fig. 1. Flexible pad for adjusting signal level between 300-ohm transmission line and 300-ohm receiver input.

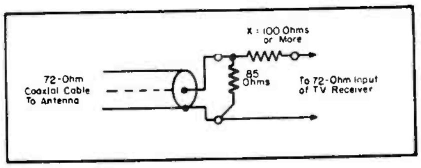


Fig. 2. Simple pad for adjustment of signal level betwee 72-ohm coaxial line and a receiver with a 72-ohm unbalanced input.

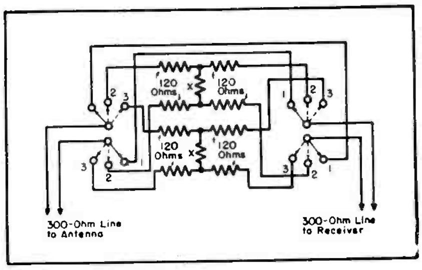


Fig. 3. A two-gang double-pole three-position selector-switch arrangement which permits insertion of pads in 300-ohm lines in those channels where the TV signals are too strong.

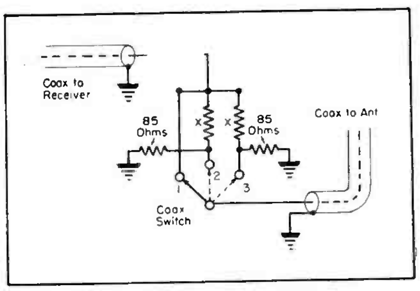


Fig. 4. Coaxial switch circuits which adds circuit attenuation on those TV channels where the TV signals are too strong.

(2) When both receivers are going to be operated simultaneously on different TV channels, in which the re radiation from one receiver tuned to channel *2, 3, 7, 8* or *9* may interfere with reception on another TV receiver tuned to channel *5, 6, 11, 12* or *13,* respectively.[1] In a majority of instances a home owner would prefer to tolerate this interference on *one channel* during the periods in which both receivers are going to be operated simultaneously, rather than have two antenna arrays on his rooftop. It is also possible that separate antennas may not solve this interference problem for when two antennas are installed adjacent to each other on a chimney stack the cross channel interference radiation may be as prevalent as when the transmission lines are coupled directly together on a single antenna. Two antennas will only solve the interference problem when they can be located far enough from each other and adjusted so that energy reradiated from the antenna connected to receiver *1* will not mar the pictures on receiver *2* to an objectionable degree.

In many complex areas, on multiple dwelling roofs, it is necessary to install two antennas to provide all channel reception. If the two antennas are judiciously located so that each antenna covers the specific channels, as indicated in Fig. 6, it is possible to parallel two receivers on the two arrays (to be located as far apart as possible) for interference-free reception. To keep both transmission lines terminated properly as the antenna selector switches are thrown from one

(*Continued on page 29*)

[1]Ira Kamen, SERVICE; October, 1948. This article offers a complete analysis of this type of interference and shows a couple of patterns which indicate the manifestations of this interference.

Fig. 5. How to parallel coax lines to secure simultaneous operation of two receivers from a single antenna.

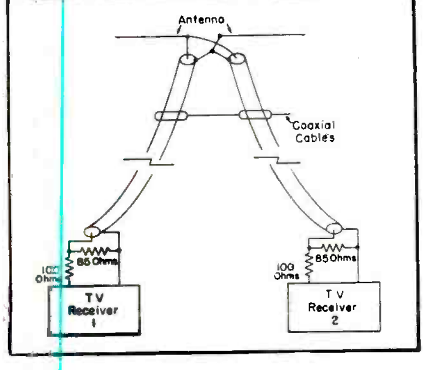


Fig. 6. Paralleling coax line for simultaneous operation of two receivers from two antennas for all-channel interference-free reception.

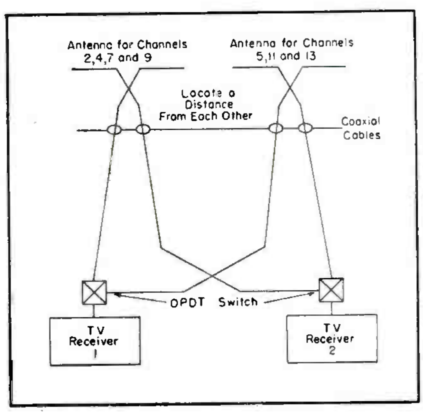
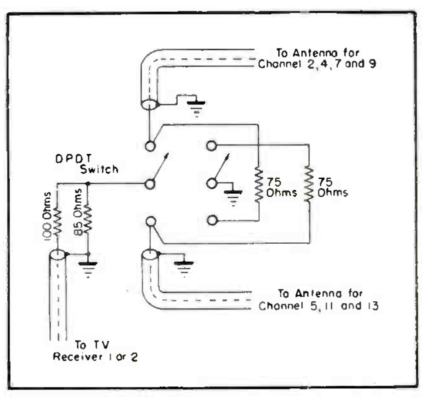


Fig. 7. Circuit of double-pole double-throw switch arrangement, used in the Fig. 7 setup in the selection of either antenna, which maintains the load on the unused coax line.



Horizontal AFC System in

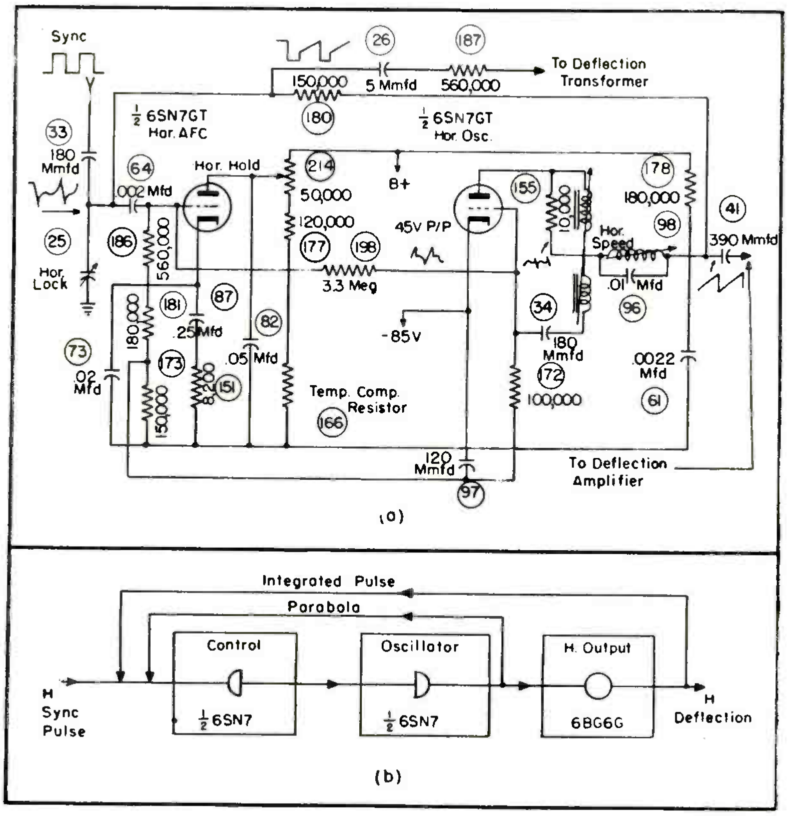


Fig. 1. Basic circuit of the Magnavox horizontal *afc* system.

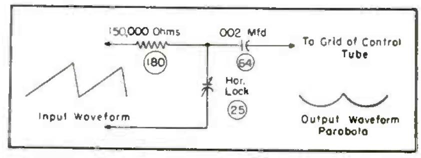
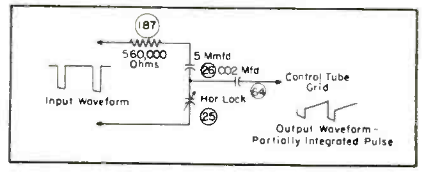


Fig. 2. The parabola circuit.

Fig. 3. Integrated deflection pulse circuit.



MOST TELEVISION RECEIVERS, presently manufactured, employ some means of frequency stabilization in the horizontal deflection oscillator, as a means of improving immunity to received noise (interference) impulses which tend to momentarily disrupt horizontal synchronization.

In the Magnavox receiver the stabilization method (Fig. 1) employs a control tube, ½ 6SN7, which serves to control the frequency of the oscillator; a horizontal oscillator of the blocking type, ½ 6SN7; and a 6BG6G horizontal deflection amplifier, not specifically pertinent to the present discussion, except that its output pulse is fed back to the control tube.

Basic Considerations

Fundamental (non-synchronized) frequency of a blocking oscillator may be controlled over a limited range, by varying its *dc* grid bias. Such a variable is applied to the oscillator tube, as frequency control, the control potential being derived from the control circuit, which is in part a function of frequency difference between the incoming sync pulses and the oscillator.

The width of the sync pulses changes with this frequency difference, as they appear at the control grid of the control tube. Under such a change in pulse duration, the average plate current is also changed. Plate current passing through the cathode resistor provides a *dc* potential which is an automatic variable under frequency-shift of the oscillator, and which serves to re-establish correct frequency.

The Control Tube Circuit

Applied to the control tube grid is a complex waveform consisting of a parabola, a partially integrated pulse from the horizontal deflection yoke, and the sync pulse from the sync amplifiers. These are derived in the following manner:

(*a*) ***Parabola***—Across a .0022 mfd capacitor (*61*) appears a sawtooth of potential, produced by pulse-output of the blocking oscillator across the capacitor. This is taken off by a 150,000-ohm resistor (*180*) to appear across the variable *horizontal lock* (*25*). These two components form an integrating circuit, making a parabola from the sawtooth.

(*b*) ***Integrated Deflection Pulse***—At the output of the horizontal deflection transformer appears a pulse of negative polarity, which is the normal deflection pulse applied to the deflection yoke. This is applied to the same control grid of the control tube, through resistor *187* (560,000 ohms) and a 5-mmfd capacitor (*26*) which form an integrating network. Such a series *rc* network is recognized as a so-called *peaking* circuit employed in some deflection systems to form a combined sawtooth-plus-pulse waveform from a simple pulse. It partially integrates the deflection pulse.

(*c*) ***Sync Pulse***—Also applied to the control tube grid is the positive sync pulse.

(*d*) ***The Combined Waveform***—These three components are applied to the grid, across the horizontal lock capacitor, a variable. They add to form the composite (combined) waveform; Fig. 4. This is a simple addition, a function of their respective instantaneous amplitudes *and their phase relationships.* Phase between the parabola and the integrated deflection pulse is always a constant, since they both are derived directly from the horizontal oscillator. Between these and the sync pulse, however, the phase varies as there is tendency for frequency difference between the oscillator and the incoming sync pulses. Therefore, the composite waveform

Magnavox TV Receivers

Basic Considerations . . . Control Tube Circuits Used . . . Sync Pulse Action . . . How the Horizontal Hold Control Works . . . Cathode Circuit Design . . . Oscillator Circuit Performance . . . Coil Design . . . Sawtooth Formation.

changes as such frequency-shift occurs, as illustrated in Fig. 4.

This complex waveform appears across the *horizontal lock* capacitor, and the potential developed is a variable; given increase in capacity, potential is reduced and decrease of capacity leads to increased control grid potential.

Effect of the Signal

The control tube operates at low plate potential (between 100 and 130 volts), its *dc* grid bias being around minus 10 volts. Initial bias is supplied by the negative oscillator grid, through a 3.3-megohm resistor. With such low plate potential, plate current cutoff is reached by a modestly negative grid, and the applied *ac* grid signal produced plate-current flow only over its most-positive portion, thereby selecting the sync pulse which is now a variable in width; Fig. 5.

Furthermore, if plate current flows over only a portion of the cycle, its average value is a function of the relative time duration; the average value over the complete cycle is less when the pulse is of short duration than

by J. F. BIGELOW

Director of Service Training
The Magnavox Company

when it is long. The illustration shown is exaggerated, but illustrates the principle. Then, as pulse width varies with frequency-drift of the horizontal oscillator, a change in potential appearing across the cathode resistor results. Through a voltage-divider network consisting of resistors *181* (180,000 ohms) and *173* (100,000 ohms), this change is applied to the grid circuit of the oscillator by connection of the oscillator's grid resistor to the network.

Horizontal Hold Control

The *horizontal hold* control varies the plate-cathode potential between 100 and 130 volts. Thus, it changes the tube's plate current-grid voltage characteristics so that, with given grid bias, slightly more or less of the peak signal input amplitude appears in the plate circuit. Thus, the average plate current undergoes change, which is reflected into the oscillator grid circuit; this control over narrow limits, oscillator frequency.

As correction to thermal drift in the overall circuit, plate voltage at this tube section is also changed by a resistor, *166* (30,000 to 38,000 ohms) having a high negative temperature coefficient. This resistor is physically located about one-half inch above a power resistor so that as the instrument warms, thermal drift of the oscillator is compensated. In practice, thermal drift is evidenced by change in horizontal positioning of the picture, necessitating re-adjustment of the *hold* control; if serious, it may be impossible to re-establish the picture by means of this control.

Cathode Circuit

To obtain an average from the pulses of plate current, it is necessary to use a rather large capacity, serving as a filter across the cathode resistor. More positive sync of the oscillator will be had, however, if there is a

(*Continued on page* 31)

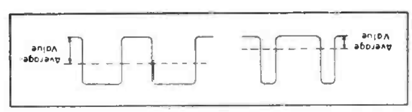


Fig. 5. Effect of the signal; low plate potential prompts a plate current cutoff, caused by a modestly negative grid. The applied *ac* grid signal produces plate current flow only over its most positive portion, thereby selecting sync pulse which is now variable in width.

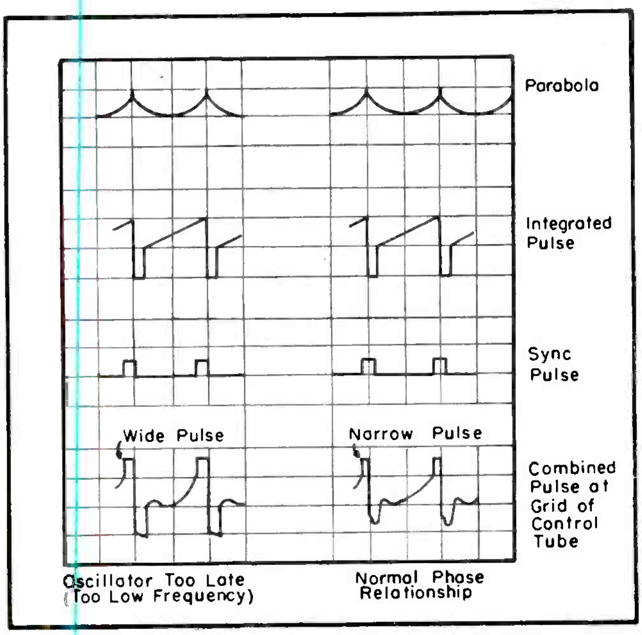
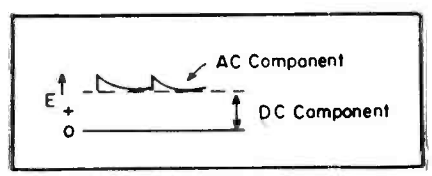


Fig. 4. Composite wave form which results when the three components (parabola, partially integrated pulse, and sync pulse) are applied to the grid across the variable horizontal lock capacitor.

Fig. 6. Pulse component, integrated to be nearly a sawtooth.



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AM/FM Tuner and AF Amplifier

[*See Front Cover*]

The front end of an AM/FM tuner (Espey 513) diagrammed on the cover this month features an *rf* tuning unit designed around miniature tubes, miniature *rf chokes,* and special ceramic capacitors. The AM and FM tuning circuits are completely independent of each other since separate tubes and separate tuning gang sections are employed. For instance, the variable capacitor consists of a multiple six-gang unit with three sets of AM and three sets of FM rotor and stator plates.

For AM, a low-impedance type loop antenna is used. It was selected since its placement in the cabinet is not critical.

A 6BA6 is used in a tuned *rf* amplifier. This tube feeds a 6BE6 converter through tuned interstage *rf* transformers for increased gain and selectivity. Iron-core miniature 455-kc *if* transformers are used, a 6SG7 serving as an *if* amplifier. The detector is a 6J5 connected as a diode. The detected audio is fed through a printed circuit diode filter network into the audio section of the bandswitch.

The FM antenna input is designed for 300-ohm transmission line. A folded dipole antenna, suitable for attaching to the rear of the cabinet is supplied. This antenna may be replaced with a standard 300-ohm FM dipole.

A 6BA6 serves as a tuned *rf* amplifier stage. A 6BE6 is the mixer tube, and the grid circuit of this tube is tuned. A signal from a separate 6C4 local oscillator is injected into grid *1* of the 6BE6 *mixer* through a small ceramic capacitor. The local oscillator is drift compensated by means of ceramic temperature compensating capacitors.

The 6SG7 *if* tube is also used as the FM *if* amplifier with a separate miniature 10.7-mc iron-core transformer feeding a 6SH7 ratio detector driver tube. The ratio detector transformer is a slug tuned unit wound on special ceramic forms. A 6AL5 double diode is used as the detector. Disc type ceramic capacitors are used for bypassing the FM *if* circuits.

The FM audio line has a standard de-emphasis network to equalize the audio frequency response. Both the AM and FM have individual *avc* systems, which operate a 6U5 tuning indicator tube on both bands.

A 6SQ7 is used as the first audio amplifier; this is the only audio tube on the 513 chassis. The bass and treble controls are in the grid and plate circuits of this tube. The bass control circuit is a high pass filter with variable cut-off frequency, while the treble control is a variable high-frequency audio attenuator network.

A phono input socket is wired in for use with a record player.

Voltages for powering a phono pick-up preamp are present at a *Utility Socket* on the top of the chassis.

A power supply for this model uses two 5Y3GT rectifiers.

Audio Section

The audio section has a 6J5 feeding another 6J5 used as a self-balancing phase inverter.

Four 6V6GTs are used in a push-pull parallel output circuit to drive a multi-tap output transformer. Inverse feedback voltage is taken from the secondary of this transformer and applied to the cathode circuit of a 6J5.

Output impedances of *4, 8, 15, 250* and *500* ohms are available at the output transformer secondary.

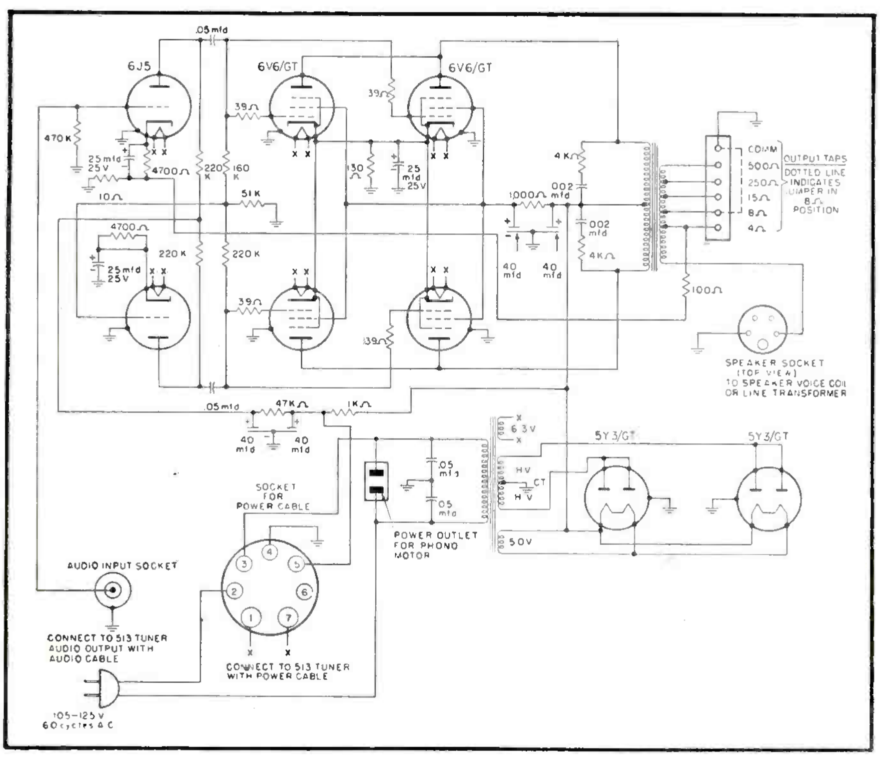
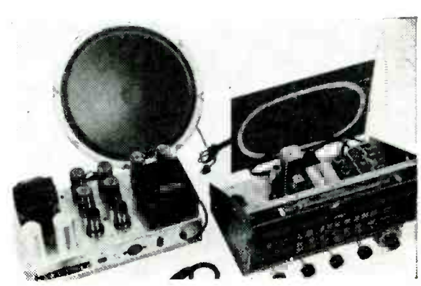
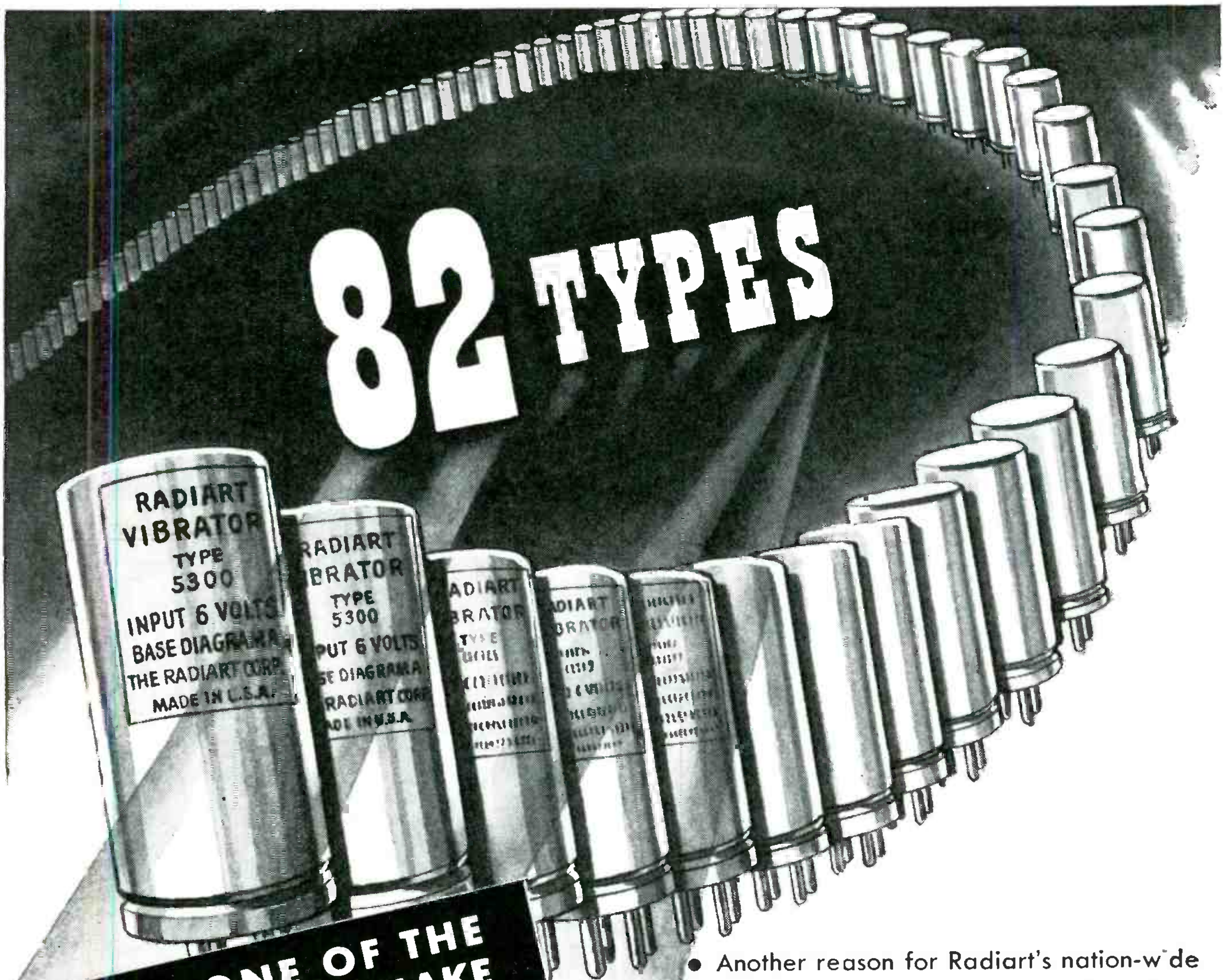


Fig. 1. Circuit of the audio amplifier designed for the tuner.

Fig. 2. View of the amplifier and tuner.





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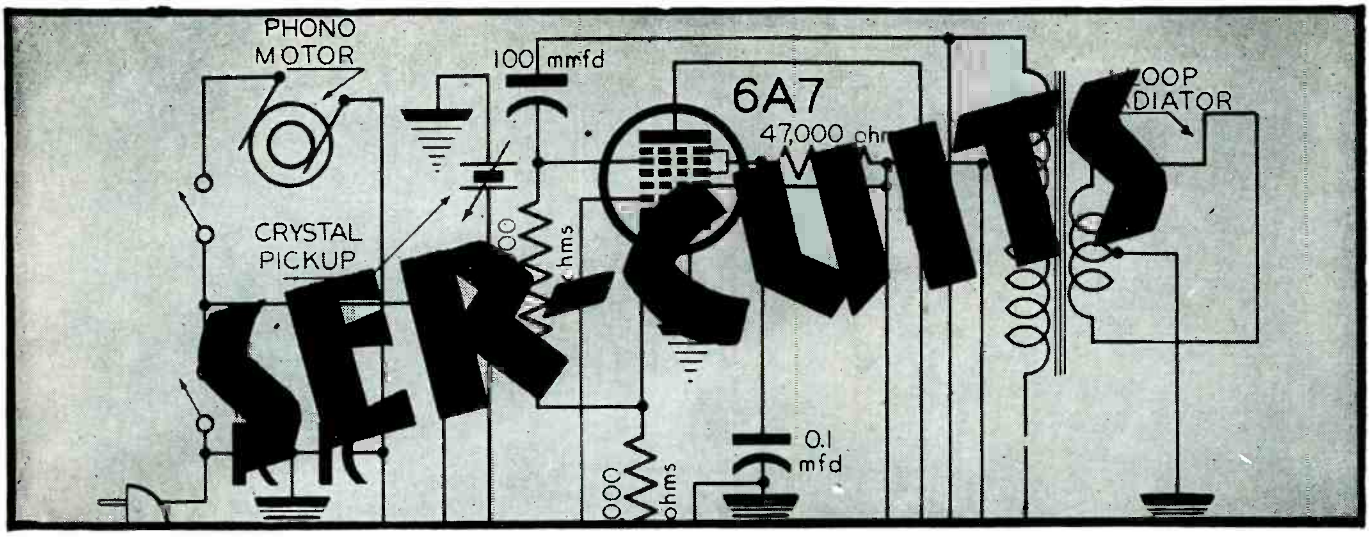

Circuit Features of the Sparton Indirect Viewing TV Models

INDIRECT viewing with a special type of mirror in the lid of the cabinet is being featured in several types of TV receivers. In one model, the Sparton series 4939TV/4940TV/4941TV, twenty-eight tubes are used, and the picture tube is a 10″ 10BP4.

The mirror used is of special design. Unlike other mirrors, this type is silvered on the top side instead of the back and does not have the glass for protection, but a plastic safety shield is provided.

In this model, Fig. 1, the *rf* tuner is a separate sub-assembly of the receiver. It contains the *rf* amplifier, converter, local oscillator, fine tuning control, station selector switch, input transformers, *rf* amplifier coils, oscillator coils and the individual tuning adjustments for the transformers and coils. It amplifies the selected *rf* signal and provides at the converter plate a picture *if* carrier of 26.25 mc and a sound *if* carrier of 21.75 mc.

In the *rf* amplifier, T_1 to T_9 together with incremental inductances L_2, L_3 and L_4 are input transformers tuned to channels *2* to *13*. The secondary of each of these transformers forms a parallel resonant circuit with the input capacity of the 6BH6 *rf* amplifier. The inductances of the secondaries of transformers T_1 through T_5, tuned to channels *2* to *6* are adjusted by means of individual slugs placed within these coils. Incremental inductances L_2, L_3 and L_4 are added in series with the slug-tuned secondaries of transformers T_6, T_7 and T_8, tuned to channels *8, 10* and *12* to form tuned circuits for channels *7, 9* and *11*. Thus the secondary of T_6 tuned to channel *8* with an added series inductance L_2 forms the tuned circuit for channel *7* and so on with channels *9-10* and *11-12*. The secondary of transformer T_9 is slug tuned for channel *13*. On channels *7* through *13* 15-mmfd capacitors (C_1, C_2, C_3, C_4) are placed in series with the secondaries of transformers T_6 through T_9. In this way, the effective shunt capacity with which these coils resonate is decreased and the use of larger inductance values is permitted.

Converter

Each of the inductances, L_5 through L_{16}, forms a tuned pi-network with the input capacity of the 6AG5 converter and the output capacity of the 6BH6. These resonant circuits are tuned to channels *2* to *13* and couple *rf* energy to the grid of the 6AG5. Since the oscillator output and the *rf* signal are both fed to the grid of the 6AG5 the heterodyne products (*if* frequencies) appear at the converter plate.

The inductance of coils L_5 through L_9, tuned to channels *2* through *6*, is adjustable by means of individual slugs placed within these coils. Incremental inductances are added to the slug tuned coils for channels *8, 10* and *12* to form tuned circuits for channels *7, 9* and *11*. L_{16} is slug tuned to channel *13*.

In the plate of the converter there are three tuned circuits:

(*1*) L_{34} with C_{12} forms a parallel resonant circuit tuned to 27.75 mc which acts as a series trap presenting a high impedance to the *if* frequency of the adjacent channel sound carrier.

(*2*) L_{35} with C_{118} forms a parallel resonant circuit tuned to 94 mc, which acts as a series trap preventing the oscillator injection voltage from developing bias on the grid of the 6BH6 (V_4), the first video *if* stage.

(*3*) L_{36} in conjunction with the output capacity of the 6AG5 converter and the input capacity of V_4 forms a parallel resonant circuit tuned to 22.4 mc, which is the first stage of a stagger tuned video *if* system.

RF Oscillator

The local oscillator is a conventional Colpitts system. The inductances, L_{17} through L_{28}, together with the incremental inductances L_{23}, L_{25} and L_{27}, form the oscillator tank circuits and are tuned to channels *2* to *13*. Fine tuning is accomplished by means of a .5 to 1.5-mmfd variable (C_{121}), which has a capacity range sufficient to produce a ±300 kc variation in oscillator output frequency on channel *2* and a variation of approximately ±2 mc on channel *13*. The output of the oscillator is coupled to the grid of the converter by means of a 1.5-mmfd capacitor, C_{10}. The oscillator operates at a frequency above that of the received signal.

Sound IF and Ratio Detector

The sound and picture *if* signals are common to the first and second pix *if*

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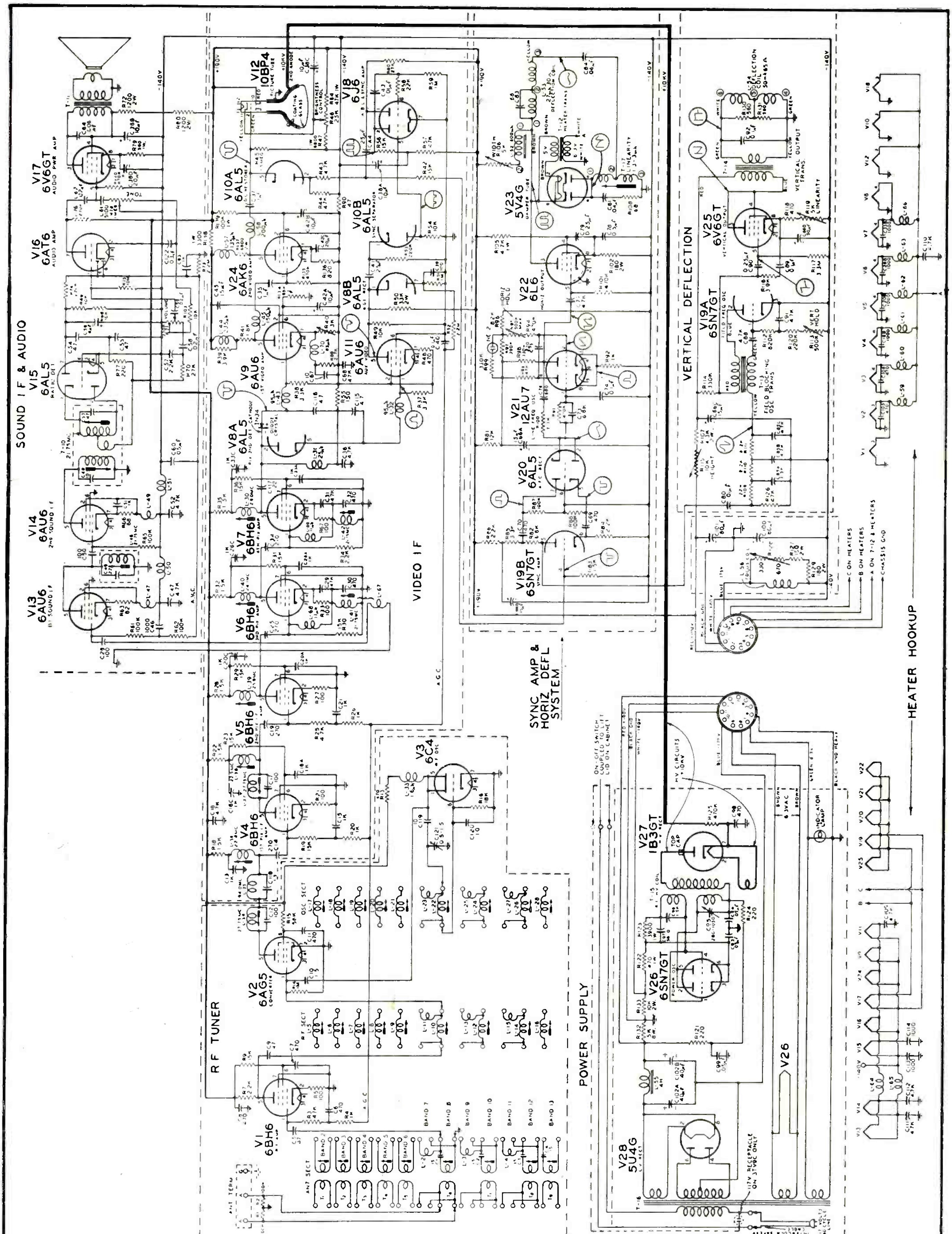
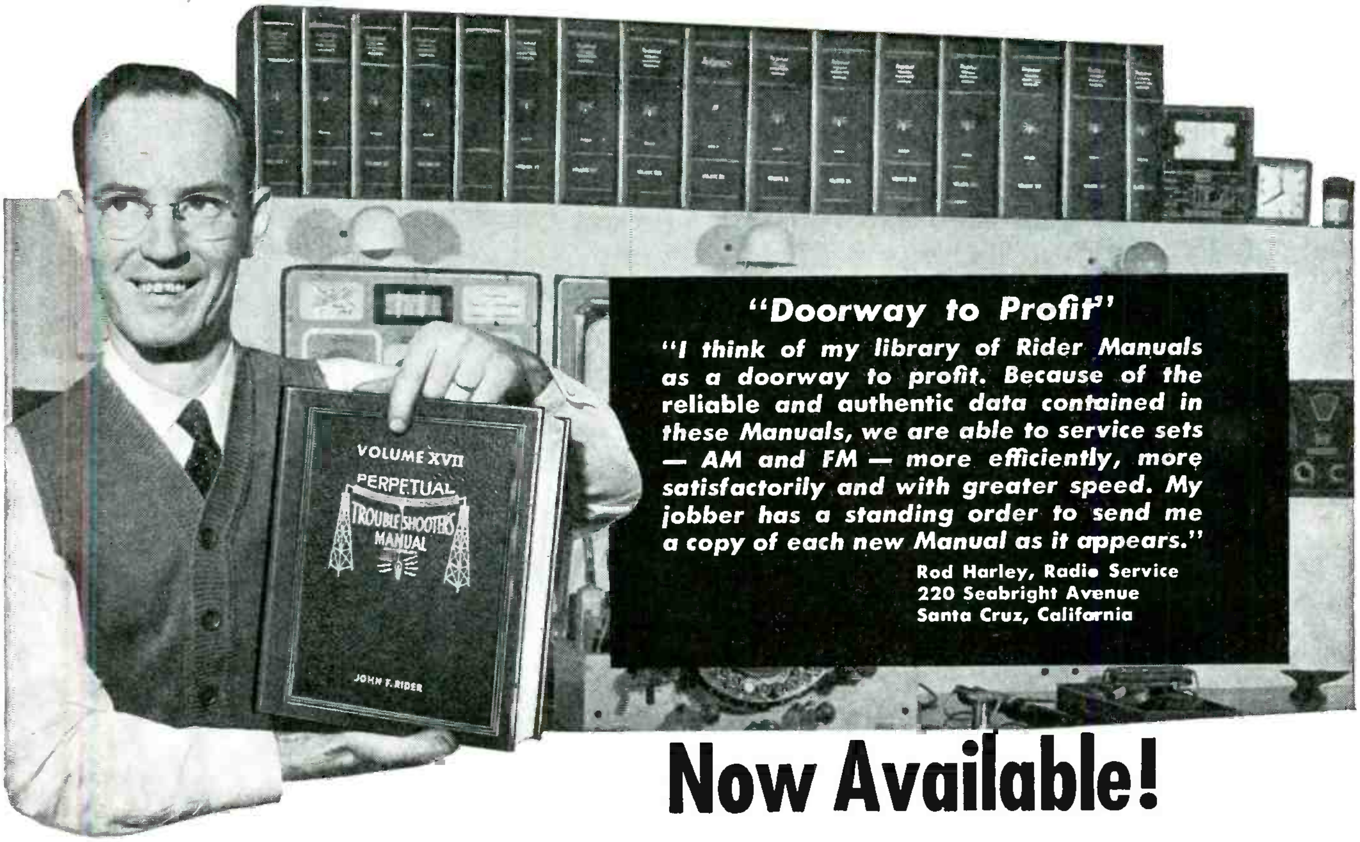


Fig. 1. Schematic of the Sparton TV chassis.

stages using 6BH6s. At the output of the third 6BH6 pix stage, sound energy is taken off by means of L_{67}, the sound take off loop, which is inductively coupled to L_{41}, a 21.75-mc cathode trap. This energy is fed to the first sound *if* stage. Two stages of

(*Continued on page* 40)



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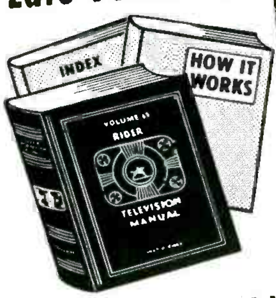

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ANOTHER NOTE: The C-D Capacitor Manual for Radio Servicing, 1948 edition No. 4, makes reference to only one source of receiver schematics—Rider Manuals.

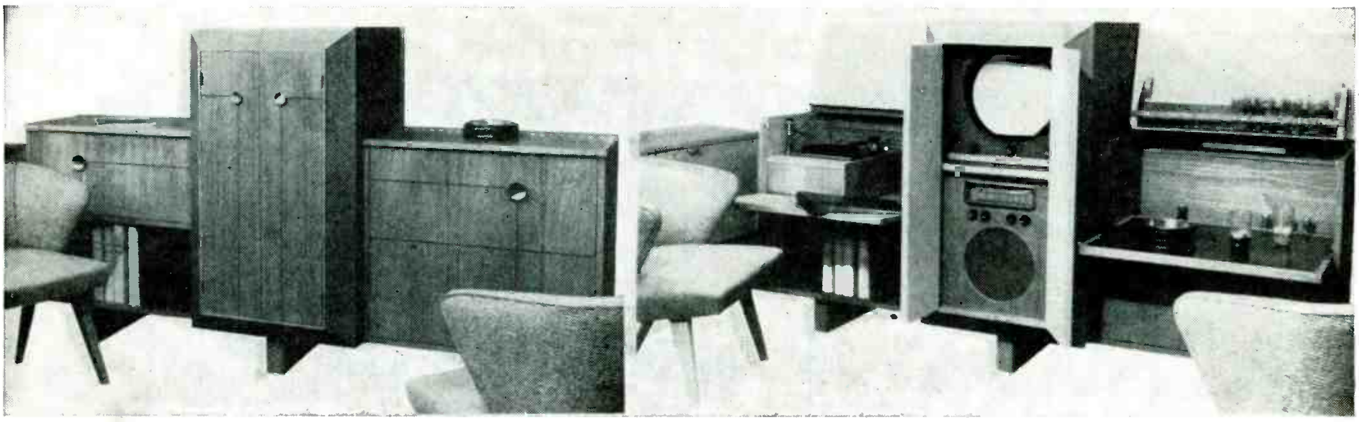


Fig. 1*

Custom-Built Cabinets

by MARTIN W. ELLIOTT

CUSTOM-BUILT CABINETRY is rapidly becoming a major factor in the TV shop, affording the Service Man an unusual opportunity to develop a new and extremely profitable department.

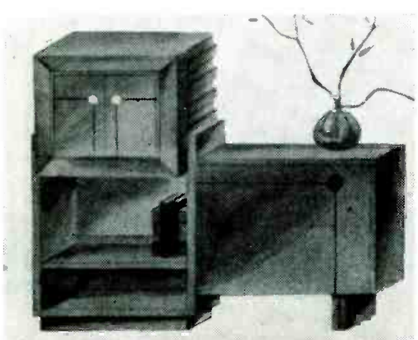
The cabinets, in the main, include basic designs which are adaptable to many types of rooms with a variety of interior decorations. To facilitate the sale of such cabinets, one manufacturer[1] has prepared a brochure which not only illustrates the types which are available, but the actual woods in which the cabinets can be supplied.

Cabinet Flexibility

The custom-built cabinet, which is particularly applicable to kit-made receivers, is quite flexible in its application since it can be made to accommodate all of the equipment or parts of the setup. In one case, as shown in Fig. 1, provisions were made for not only mounting the television and radio receivers, but phonograph albums and a bar, too. This design can readily be applied to accommodate books or a desk, as well as the radio and TV equipment, or the side sections can be omitted and a TV and radio housing used only for the television and radio receiver.

[1]Transvision, Inc.

Fig. 2*



Combination Setup

In Fig. 2 appears another approach to the custom-built cabinet idea with provision in this case for a television and radio receiver in the left-hand column and phonograph in the right.

Provisions for Shelves

In Fig. 3 appears still another type of custom-made cabinet in which numerous shelves are a featured item. Often there is a need for extra shelf space for dishes, books, record albums or even a portable phono unit and the flexible shelf arrangement is an extremely handy and useful provision in such instances.

Speakers and Amplifiers

The custom-made cabinets have their advantages, too, in serving as housings for separate speakers and amplifiers which is an extremely effective high-fidelity accessory in any installation.

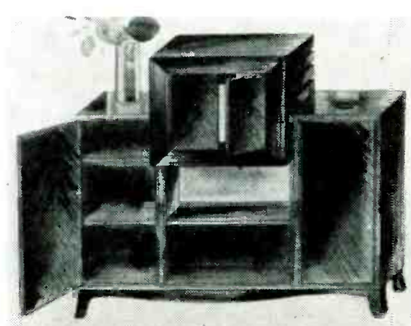
*Courtesy Transvision, Inc.

Sectional Cabinets

Sectional type cabinets have been found very effective in custom-built installations, serving to set up a moderate priced package where cost is a factor. In many designs the sectional theme has been planned so that each unit has its own integral purpose and yet when matched with other sections provides an interesting ensemble of cabinetry.

With the advent of remote controlled TV, the increased use of separate speaker systems and the desire to employ cabinetry which harmonizes with the design of the room, the custom-built idea has become an item which merits the attention of every Service Man.

Fig. 3*

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ASSOCIATIONS

TEN YEARS AGO
From the Association News Page of SERVICE, February, 1939

THE FT. WAYNE, Indiana, and St. Joseph, Missouri, associations joined RSA. . . . Officers of the Ft. Wayne Chapter were Henry A. Schryver, president, and E. Moenning, secretary and treasurer. The St. Joseph Chapter was under the direction of Cleo Blodgett. E. R. Sullwold was secretary and Russell Goerhe, treasurer. . . . At a meeting of 200 members of the Toledo, Ohio, group, it was decided to become affiliated with RSA. . . . The service group in Pekin, Illinois, began taking the necessary steps to join the RSA. . . . The inter-chapter renewal dues contest, with a copy of Rider's Volume IX as the prize, was drawing to a close. . . . A 100% renewal in membership was achieved by 12 chapters: Houston, Texas; Alton, Illinois: Binghamton, New York; Danville, Ill.; Duluth, Minn.; Freeport, Ill.; Holyoke, Mass.; Jamestown, N. Y.; Nashville, Tenn.; Oklahoma City, Okla.; Peoria, Ill., and Steubenville, Ohio.

John F. Rider congratulating Max Leibowitz upon his reelection as president of the Associated Radio-Television Servicemen of New York. Looking on (left to right) are Harry Weigand, who was re-elected vice president. Noel Payne who was named corresponding secretary and Arthur Silverberg who was rechosen for the post of recording secretary.

PRSMA

AT A RECENT MEETING of the Philadelphia Radio Servicemen's Association, Dave Krantz was elected president. Dick Devaney was elected vice president; Stanley Myers, treasurer; John Zagury, corresponding secretary, and Frank Gerhard, Sr., recording secretary.

An extensive membership drive has been planned by PRSMA under the direction of Paul Lau. As a part of this program and also to continue to familiarize the public with its activities, PRSMA has renewed its mutual cooperative broadcasting contract with KYW.

An educational, advertising and entertainment program is also being planned. To assist in this expanded program, nine new members have been added to the advisory board.

FRSAP

AT AN ELECTION of officers for the Federation of Radio Servicemen's Associations of Pennsylvania, at the William Penn Hotel in Harrisburg, Pa., Dave Krantz was elected chairman. Robert Reidy of the Lehigh Valley Radio Servicemen's Association was elected vice chairman, and John Rader of the Reading Radio Servicemen's Association was named secretary and treasurer.

During the election meeting, officers of the Mid-State Radio Servicemen's Association of Harrisburg presented a complete analysis of the results of their recent preventive maintenance program which, it was learned, was extremely successful.

AR-TSNY

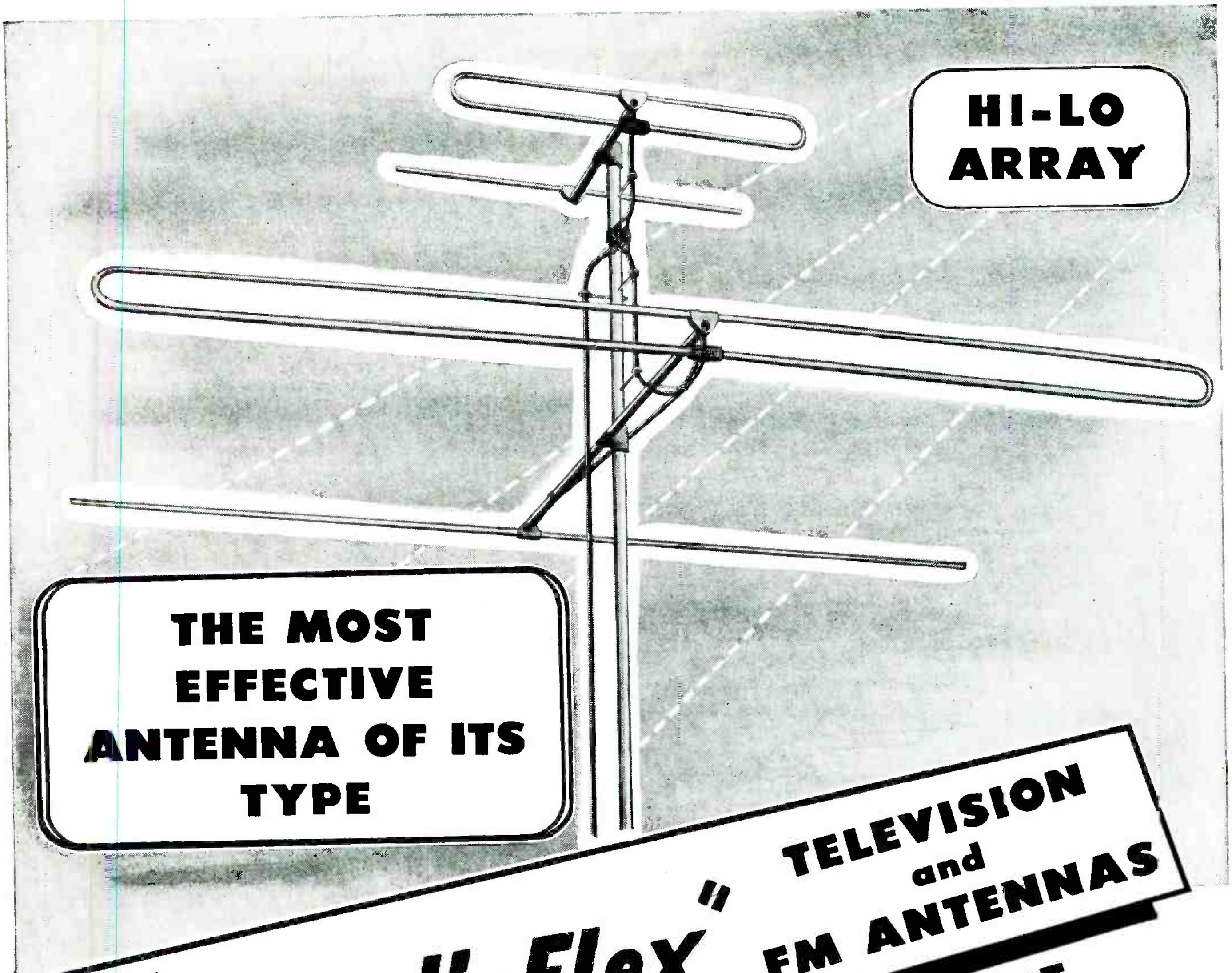
THE RESULTS OF THE ANNUAL ELECTION of the Associated Radio-Televi-

(*Continued on page 28*)

Officers of PRSMA and of the Federation of Radio Servicemen's Associations of Pennsylvania who attended a recent TV lecture by Al Saunders in Philadelphia, left to right: Dave Krantz, Dick Devaney, Saunders, Larry Oebbecke and Stanley W. Myers.

(Photo courtesy Paul H. Wendel of Howard Sams)

Dr. Victor Wouk, chief engineer of Beta Electronics Company, who spoke on TV power supplies at a recent meeting of AR-TSNY.



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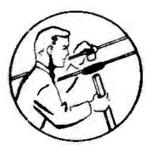

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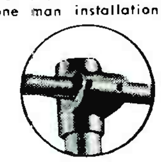

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Association News

(*Continued from page 26*)

sion Servicemen of New York were announced at a meeting in the Central Commercial High School Auditorium, New York City, with John F. Rider introducing the officers and members of the board. Max Leibowitz was re-elected president; Harry Weigand, vice president; Jack Edel, treasurer; Arthur Silverberg, recording secretary, and Noel Payne, corresponding secretary.

Reelected to the board of directors were Kurt Goldbeck, Henry Levine, Ed Malone, Sam Marshall and Richard Pratt. Newly elected to the board were David C. Becker, Louis Bennett, Al Bogert, John Bradley, Abe Kaminsky, John Maccherone and Joseph Wolk.

John Rider praised the officers and members of the association for their excellent work in overcoming obstacles during the early days of organization, and rapid growth. At the present time membership is well over 500, and it appears as if this will be doubled before the year is over.

TV Power Supply Talk

Dr. Victor Wouk, chief engineer of Beta Electronics, presented an extremely interesting talk at the meeting on high and low-voltage powered supplies for TV. He described power supply systems used in typical receivers today. Covering the design of high-voltage power supplies, Dr. Wouk revealed the reasons for choice of high or low voltages and their relation to light output. In an interesting discussion of the *rf* power supply system, advantages and disadvantages were analyzed. It was learned, for instance, that with the *rf* power supply it is possible to secure a high voltage by resonating a high Q circuit, rather than depending upon high ratio of turns, as in a 60-cycle transformer, and thus an air-core coil with a high Q can be used. In this system it is possible to use small capacitors reducing the shock hazard. Covering the *rf* supply disadvantages, Dr. Wouk said that the *rf* supply does introduce interference, if careful shielding is not provided, since the *rf* oscillator transmits quite a few watts of power which may effect the video circuits. The *rf* power supply is also generally limited to about 10 kv, since at very high voltages corona is generated on the thin wires required for the high Q coil. Often, to overcome this, several voltage multiplication stages are used. Described also were pulsed power supplies and fly-back circuits.

TV Tricks of Trade

(*Continued from page* 13)

position to the other, it is necessary to employ 72-ohm dummy loads, as shown in Fig. 8, to absorb the antenna signals on the transmission lines which are not terminated with the TV receiver inputs.

One of the simplest devices for making an antenna flexible in application for the installer is the antenna assembly shown in Fig. 8. By means of the adjustment of jumper links, a folded dipole array (*a*) can be converted to a broadband straight dipole (*b*) as required for connection to 300-ohm transmission line or 72-ohm coaxial cable.

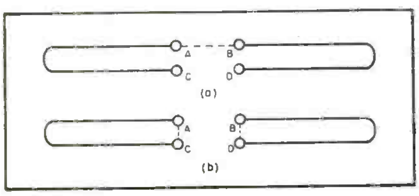
The dipole shown in (*b*) has a broadband characteristic since each straight dipole is a half section of the folded dipole (*a*) and therefore the straight dipole effectively has a larger cross-sectional area than a simple straight tubular rod. It is a theoretical fact that the resistance of an antenna element increases more rapidly than its inductance as its cross-sectional area increases; and since antenna Q = inductance/resistance, it is apparent that the antenna in (*b*) has a relatively low Q characteristic and thus a broadband response. This broadband response with one pair of antenna elements is usually effective for channels *2* to *6* or *7* to *13* but not for both TV bands.

In Figs. 9 (a)[2] and (b)[3] are diagrammed two antenna networks which can be used with composite high and low-frequency arrays to avoid the use of a separate transmission line for each array. These networks minimize interaction between the high and low-frequency arrays. The high and low-frequency arrays are usually independently rotated for best TV signals regardless of direction as the networks are so designed that they do not affect the pick-up pattern of either array. These networks function with antennas of either the folded or straight dipole type.

The divider network shown in (*a*) traps any high-frequency signals, in-

(*Continued on page* 30)

Fig. 8. A dual-purpose antenna array which permits the installation of 300 or 72-ohm transmission lines by the adjustment of jumper links. The arrangement shown in (*a*) is for a 300-ohm impedance at the terminals *C* and *D*. In (*b*) we have a jumper link setup for a 72-ohm impedance at terminals *C* and *D*. (*Courtesy Vertrod*)



TV Tricks of The Trade

(*Continued from page 29*)

tercepted by the low-frequency array, and prevents such signals from entering the common transmission line circuited to the receiver.

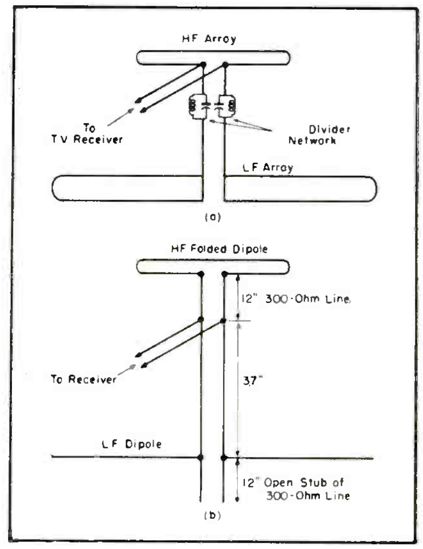
The decoupling network shown in (*b*) has a 12½" stub filter on the low-frequency array which acts to attenuate the high-frequency signals induced into the low-frequency array. The splice connection 12" down from the high-frequency array provides for the most efficient transfer of TV signals, intercepted by both arrays, to the common receiver transmission line.

The networks shown in Figs. 9 (*a*) and (*b*) filter the low-frequency array of high-channel signals because the low-frequency quarter-wave elements are efficient at their three-quarter wavelength which is in the upper TV band (174-216 mc) and therefore will pick up considerable signal on those channels for which it is not adjusted. The high-frequency channel signals picked up by the low-frequency elements may have out-of-phase reflections with respect to the TV signals on the high-frequency elements, and unless the networks filter out the high-frequency signals on the low frequency rods, the high-frequency channel pictures may be marred unnecessarily by reflections.[4]

[2]AAK.
[3]RCA.

[4]Ira Kamen, SERVICE; August, 1948. This article describes the tests which must be made to determine the feasibility of combining high- and low-frequency arrays without special networks.

Fig. 9. Divider (*a*) and decoupling network (*b*) arrangements used to isolate a high and low-frequency antenna array for connection to a common transmission line. In the arrangement shown in (*b*) the 37" of 300-ohm line must be run on an angle so that the vertical distance between the high and low-frequency array is not more than 33". Open stub in (*b*) should be 12½" long.



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DAVE TURNER LENDS A HAND

David Turner, chairman of the board of the Turner Company, Cedar Rapids, Iowa, at one of the "Keep the Pot Boiling" Salvation Army stands erected during the recent drive to aid the needy, prior to the holiday season. Mr. Turner was one of the originators of the plan.

Horizontal AFC

(*Continued from page* 15)

small component of the sync pulse applied to the oscillator grid, superimposed upon the *dc* control potential.

There are two considerations *working against* each other: A large capacitor averages the pulses and removes from the developed potential incoming signal components, which are in addition to the true sync pulse; it is possible that a little more than strictly the peaks of control tube signal, the variable-width sync pulses will be passed. These are undesirables in the cathode circuit. It also removes the sync-pulse component, desired for more positive sync.

As a solution, the cathode circuit consists of two parts, one having long time constant, and one of short time constant. Resistors *181* (180,000 ohms) and *173* (100,000 ohms) are large with respect to *151* (8,200 ohms). The latter, then, may be disregarded as far as low-frequency components of signal (plate current) are concerned, and the .25 mfd capacitor plus 280,000 ohms of resistance affords a long time constant.

Fast response is achieved by a combination of .02 mfd and 8,200 ohms (the .25 mfd unit is electrically a short-circuit to high-frequency signals). An integrating network (same as the *peaking circuits*) resistor *151* and capacitor *81* provides the desired pulse component, integrated to be nearly a sawtooth; Fig. 6.

The Oscillator Circuit

Basic Operation: Using the second section of the 6SN7 tube, the oscillator of the blocking type operates as follows: Oscillation is caused by coupling between plate and grid circuits, through an iron-slug transformer. When oscillation occurs, a magnetic flux is built up in the transformer and the grid is driven toward the positive. Plate current is increasing. As the grid goes positive, grid-current flows and power is taken from the circuit, being absorbed in the grid-coupling capacitor. The rate of rise of magnetic flux falls off.

With decreasing flux, the polarity of potential across the coil reverses, becoming less positive at the grid. Plate current is thus falling to add further to the rate of magnetic field decay; the action is cumulative and the grid is driven highly negative, to complete plate current cutoff. Then, the tube is idle until the high negative potential placed upon the grid coupling

(*Continued on page* 32)

Horizontal AFC

(*Continued from page* 31)

capacitor leaks off through the grid resistor. When the tube again becomes conductive, plate current rises and the action is repeated. There are, therefore, pulses of plate current, during the time when the grid is not highly negative. At the grid, we see a sawtooth of potential, superimposed upon which is a positive pulse; Fig. 7.

In this illustration, at (*a*), the high negative grid potential is leaking off the grid resistor; (*b*), the tube begins to conduct and the grid is driven positive; (*c*), the grid is driven sharply, highly negative.

Therefore, the time constant of the grid-coupling capacitor and grid resistor determines how long will be required for the charge to leak off, and the fundamental frequency of the oscillator. Changing either affords frequency-control. Thus, the 100,000-ohm grid resistor is a special unit having zero temperature coefficient, for stability over thermal change.

Synchronization

As the grid becomes less negative, we may inject a positive pulse which causes the tube to become conductive slightly ahead of the time that it would otherwise conduct. The pulse would therefore *trip* the oscillator prematurely and so control frequency. This would be a *sync* pulse. On the other hand, we may vary, by means external to the oscillator, the *dc* grid bias which, together with the negative grid potential developed across the grid resistor, determines how far negative the grid will go. For example, assume that the grid resistor is connected to a positive potential with respect to the cathode, rather than directly to the cathode. The grid will not be driven as far negative with respect to its cathode and it will require less time for the tube to become conductive after the plate current cutoff. The frequency is therefore subject to any potential applied, externally, as bias. This, plus a sync-pulse component, is the principle of the *afc circuit*.

The Oscillator Coil

It is the purpose of the oscillator coil to afford regeneration. The circuit tends to oscillate at a frequency determined by the coil's resonant frequency, but is stopped by a high negative potential at the grid. There is, however, one-half circle of oscillation. It is necessary that the grid be driven negative very rapidly, for this half-cycle corresponds to the retrace time in scanning. Should the antiresonant frequency of the tuned circuit be low, the one-half cycle of oscillation would be long and beam-retrace in scanning would be excessively long. The circuit is therefore tuned to approximately 70 *kc*, so that one-half cycle corresponds to the retrace time[1] in

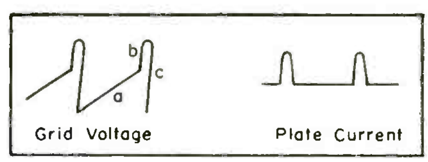


Fig. 7. Sawtooth of potential at grid superimposed upon which is a positive pulse: *a*, high negative grid potential is leaking off grid resistor; *b*, tube begins to conduct and grid is driven positive; *c*, grid is driven sharply, highly negative.

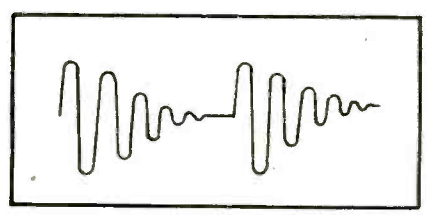


Fig. 8. Output wave form of series of damped oscillations which result when 10,000-ohm damping resistor is removed.

scanning. This is controlled by slug-adjustment.

There are in the plate circuit, pulses of current which tend to shock-excite the resonant circuit. A 10,000-ohm resistor across one section of the coil damps out such oscillation. If the resistor be removed, the output waveform is that of a series of damped oscillations and the scanning of the tube will follow a like pattern across the screen (the scanning spot will oscillate back and forth, instead of travelling with a linear motion); Fig. 8.

Manual Frequency Control

Between the coil and the output circuit is an antiresonant circuit. This, too, is shock-excited and oscillates at its resonant frequency. Since it is in series with the plate supply ($B+$), its oscillation waveform is superimposed upon the supply potential. By varying its resonant frequency, control of the blocking oscillator frequency operates in the following manner:

Suppose that the oscillator grid is negative, the negative charge is leaking off and the tube will soon become conductive. If, at that time, a higher positive potential is placed upon the plate, the tube will no longer be at a condition of current cutoff, and it will be tripped into oscillation. Approximately a sine wave of potential is superimposed upon the *dc* supply potential, the result of shocked-oscillation of the manual frequency-control antiresonant circuit. It does not *alone* trip the synchronized oscillator; it is not *the* element which precisely determines oscillation time, but it does influence the circuit to the extent that it prepares the plate circuit to be tripped by the sync-component applied to the grid. The nearly sine wave is rather broad and not suitable to be a fine, deciding element in frequency control. The manual frequency control elements form a circuit which is predominently capacitive, of low Q and therefore quite stable.

Forming the Sawtooth

Thus far, we have assumed constant potential from one plate supply, and

(*Continued on page* 39)

[1]Time between horizontal scans is 1/15,750 or about 63 microseconds. Retrace time is approximately 7% of this, or 4.4 microseconds. Since $f = 1/t$, $f = 1/4.4 \times 10^{-6} = .15 \times 10^{-6} = 150$ kc. Thus, one full cycle occurs in 4.4 microseconds at 150 kc. Since we wish to accomplish ½ cycle in that time, frequency must be halved, resulting in 75 kc (approx.).

Servicing Helps

by P. M. RANDOLPH

Selecting Coax Cables . . . Preamp Equalization

Service Notes on Philco, Crosley, Silvertone and G. E. Models.

In an antenna installation coaxial cable acts as the transfer device between the antenna and the television receiver. In selecting the coaxial cable required for a job the TV installer must take into consideration three fundamental points:

(1) The approximate amount of attenuation that can be tolerated at the highest frequency TV channel.

(2) The potential difficulties of mechanically installing the coaxial cable selected.

(3) The customer's acceptance of the coaxial cable (especially the larger cables) that must be run on or through the customer's premises.

Either 75- or 53-ohm coaxial cable may be installed for connection to 75-ohm TV receivers. A 170-ohm resistor across the 75-ohm input of a receiver will make a near perfect

Table A

Cable Type	Attenuation* in db Per 100' (Mc) 40	100	200	1,000	Nominal Impedance	Outside Diameter	Application Data
RG5/U	1.6	2.65	3.85	9.6	52.5	.332	Flexible low loss cable used in master antenna systems. Also used in individual installations where low loss cable is required and RG8/U is not acceptable to the customer because of large outside diameter.[1]
RG8/U	1.2	2.1	3.3	8.5	52	.405	Tough low-loss cable used in master antenna systems. Used also in individual installations where there is no objection to large diameter cable.[1]
RG11/U	1.1	1.9	2.85	7.7	75	.405	Tough low-loss cable used in individual installations in fringe areas for direct connection to 75-ohm TV receivers.
RG17/U	.46	.85	1.3	4	52	.870	Lowest-loss cable used in fringe areas where several hundred feet of cable must be run between an antenna tower and a TV receiver.[1]
RG58/U	2.3	4.1	6.2	17	53.5	.195	High-loss coaxial cable used in primary signal areas where an extremely flexible coaxial cable is required.[1]
RG59/U	2.2	3.75	5.6	14.3	73	.242	High-loss coaxial cable used in primary signal areas for direct connection to a 75-ohm TV receiver.

[1]Coaxial cable connects to 300-ohm TV receiver input through a trifilar matching transformer; RCA MI-6876-2. (See March, 1948, issue of SERVICE.)
*Attenuation data courtesy Amphenol.

match to the 73-ohm coaxial cable. The 53-ohm cable is preferred where a match must be made through a 50/300-ohm trifilar transformer. The 75-ohm cable may also be connected through the transformer with only minor losses.

To facilitate the selection of coaxial cables in accordance with above fundamentals a table of types of coax and related data has been prepared; table *A*.

*Preamp Equalization**

IN THE DISCUSSION of preamp equalization last month, it was pointed out that if required, a low-frequency response can be maintained ±2 db from 1,000 cycles to 50 cycles by changing the value of the 2,700-ohm resistor, R_{104}, feeding the second, 6SC7 to 12,000 ohms and the value of the .01-mfd capacitor, C_{108}, in series with this resistor to .03 mfd. This type of equalization provides a rise of 2 to 2.5 db at 300 cycles and a drop of 1 to 2 db at 50 cycles. Alternately, two compensation stages can be incorporated as shown at Fig. 1.

This effectively provides the full 6 db/octave and will produce an output curve which is flat within ±1 db from 1,000 to 50 cycles. It is questionable whether or not the added parts required for Fig. 1 are justifiable since the improvement on the overall curve is only ±1 db over the circuit shown as Fig. 2.

The insertion loss with either of the changes made will, of course, be increased, and additional gain is required after the preamplifier.

The high-frequency response of the cartridge when operating into the preamp-equalizer has been designed to be the most generally satisfactory. The 6,800-ohm resistor, R_{101}, in Fig. 3, limits the response to compensate for the pre-emphasis shown above the high-frequency cross-over point in Fig. 4. With the recordings now being made by one manufacturer the response at 10,000 cycles with the 6,800-ohm R_{101} will be up several db, and those of other manufacturers will range above and below this point. The normal variations which will be encountered from recording to recording should not be objectionable. Some recordings will sound more brilliant than others, but tone controls on the receiver should take care of this. If less needle scratch is desired R_{101} can be reduced to as low as 2,000 ohms, particularly in

*From notes prepared by N. S. Cromwell, G. E.

(*Continued on page 36*)

Servicing Helps

(*Continued from page 35*)

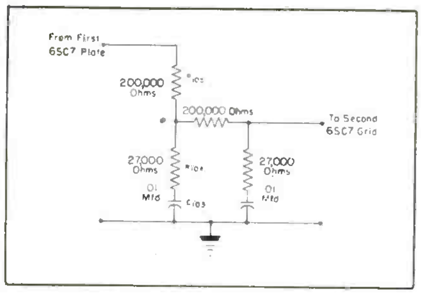


Fig. 1. Alternate *lf* compensation circuit.

Fig. 2. The *lf* compensation circuit of the preamp shown in Fig. 3.

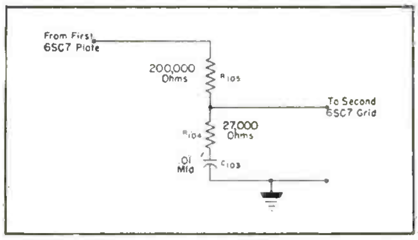


table model sets. Conversely, R_{101} may be increased in value to 33,000 ohms, or omitted entirely for increased high-frequency response.

If still more high-frequency response is required, peaking can be added as shown in Fig. 5.

The amount of high-frequency response provided by this circuit should be necessary only to make up for deficiencies in the amplifying system following the preamp, room acoustics, or the hearing ability of the user. Elimination of R_{101} and addition of a 470-mfd capacitor across the 200,000 ohm resistor, R_{105}, will increase the 10,000 cycle over-all response about 15-20 db. This is far in excess of any normal requirements.

It can be seen that modification of the preamp-equalizer to suit individual

Fig. 4. Velocity characteristic of average present day recordings.

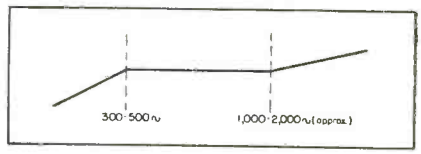
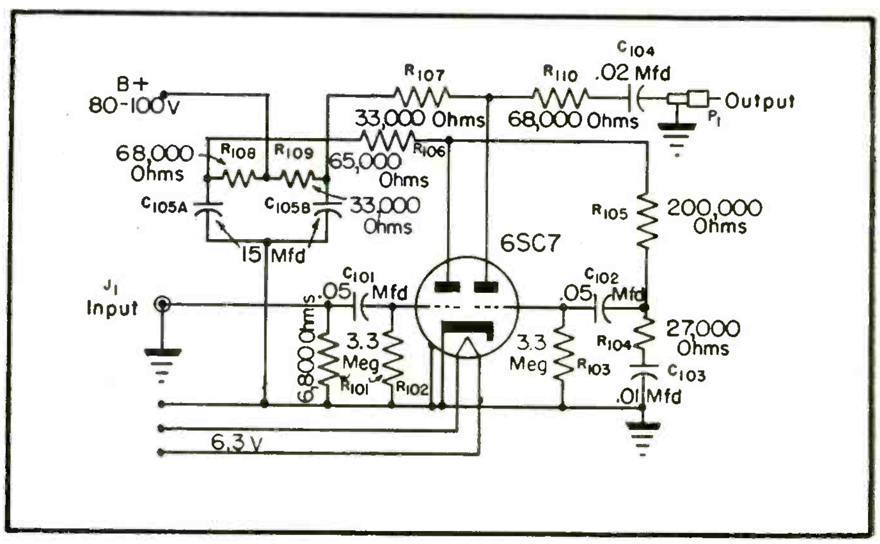


Fig. 3. Schematic of preamp equalizer; G.E. SPX-001.



requirements is a relatively simple matter. Actually, the response as designed into the preamp is the best for the majority of applications.

A curve of the actual velocity response of the variable-reluctance cartridge is shown as Fig. 6. This curve cannot be traced from any of the popular and commercially available frequency records, since these records have frequency characteristics which cause incorrect test results.

If the zero db axis is shifted down 1 db, it can be seen that the curve is within ±1 db of the ideal velocity response curve. The *flat* response and the absence of resonant peaks are the factors which allow equalization of the curve with simple circuits to suit the requirements of varied applications.

There are many other types of circuits which can be used to vary the response so that portions of the curve can be boosted or attenuated for special requirements. A sharp cut-off above 10,000 cycles is highly recommended for all applications and recordings, since little or nothing is lost in musical quality and much is to be gained in the elimination of noise components and high-frequency distortion from the recordings. A sharp cut-off at 5,000 to 7,000 cycles will improve the reproduction of many recordings greatly, and the musical quality will still be enjoyable.

Compensation circuits for other types of cartridge must be removed from the receiver or amplifier with which the variable reluctance cartridge is to be used. Such circuits will in-

(*Continued on page* 38)

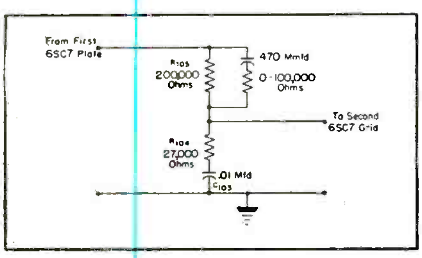
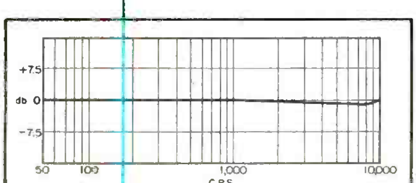


Fig. 5. *Hf* peaking circuit developed for the preamp.

Fig. 6. Actual velocity response of the G.E. RPX-010 variable reluctance cartridge.



Servicing Helps

(*Continued from page 37*)

crease or attenuate portions of the response curve. All necessary compensation is done within the preamp-equalizer, with the exception of the bass boost required within the amplifier or receiver to compensate for the deficiency of the human ear at lower volume levels. This latter compensation should be coupled to the volume control circuit for proper operation and is provided in most receivers built in the last 10 years or more.

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Service Notes

Philco 48-1270*[1]*: Extreme weakness on radio, on all positions; phono okeh. The 100,000-ohm resistor, R_{308}, in the screen circuit on the second *if* amplifier tube is undoubtedly defective. This *matchstick* unit is located close to the rear of the chassis, connected to pin *3* on the 7B7 socket. When it opens up entirely, screen voltage is removed. Bypass capacitor can be checked too for leakage.

Crosley 66TA: Resistors smoking, coils melting, etc., and not a sound from speaker. Look for short in small trimmer, *62* on schematic, which tunes the *rf* plate circuit. This will cause resistors *1* and *5* (3,300 and 1,000 ohms) to burn up. This condition could damage the *rf* interstage transformer. To remedy, the capacitor and resistor are disconnected from the right side of trimmer assembly and the assembly is turned upside down. An extra piece of thin mica, salvaged from the defunct *if* transformer is inserted between trimmer blades, and the unit reassembled.

Silvertone 101.802-1: This battery set may have no volume at all or be very weak. An open plate load resistor (1-megohm) in 1LD5 plate circuit is usually the trouble. It would be also wise to check the 3.3-megohm screen resistor on the same tube.

Philco CR-4, CR-6: Intermittent operation after first two weeks or so of use. The antenna trimmer, located on side of cabinet, is the trouble in most cases. This unit is in series with the antenna, and shorting either end will cause cut out and popping noises. The problem can be solved by bending connecting lugs to clear bracket, and inserting extra mica between blades if necessary. It's also wise to check the very small leads to oscillator coil. Often the plastic-covered wire on these coils will short to grounded lugs or adjacent wires, if overheated during assembly.

G. E. 250, 260*[2]*: No reception. Flexible bands which connect the antenna in the lid with the terminals on the chassis may be broken. To remedy solder the ends together, being careful that they do not touch the case as the cover is opened.

Often in these models the quality will become fuzzy. In every case this trouble was traced to the bias cells. In use these will become loose and even drop out of their holders completely. If the holders are bent straighten them out so that they will have plenty of tension on the cells. The front panel must be removed to get at these cells.

Intermittent reception is another complaint with these sets. On two occasions this was found to be caused by the leads from the bypass capacitor mounted across the 1LC6 *rf* tube socket shorting to the socket lugs. To get at the chassis to make this repair it is necessary to remove the front panel, push button escutcheons, dial escutcheon, lid arms, and the right end panel. The latter is removed after

[1]From notes supplied by Jack Darr.

[2]From notes supplied by John Findarle.

taking off three speed nuts used to hold it in place.

Silvertone 1670-U: If this set develops intermittent reception the .5-megohm *avc* resistors should be checked for poor connections in the end terminals. These loosen with age and replacing them cures up the intermittent condition.

If the same set has poor tone, sensitivity, etc., an alignment job will do wonders.

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Horizontal AFC

(*Continued from page* 33)

pulse waveform of output potential. This is not exactly true, for we need a sawtooth potential. This is obtained simply by connecting a .0022-mfd capacitor (*61*) across the output; a sawtooth is produced from a pulse. During the time that the tube is non-conductive, the capacitor is charging through a 120,000-ohm resistor (*178*). When the tube conducts, the capacitor discharges through the tube plate circuit. There is, as potential across the capacitor, a slow charging and a rapid discharging to produce the sawtooth waveform of potential required.

A study of the foregoing indicates that almost any component in the overall circuit is capable of some measure of frequency-control, and therefore is instrumental in thermal or aging-drift of the oscillator. Fortunately, the effects of all circuit elements do not cause drift in a single direction, and near cancellation is had, along with the control-tube plate resistor of high negative temperature coefficient.

The only component necessitating special attention to placement in the chassis are that resistor and the oscillator coil which is placed away from heat-radiating components.

The variable *horizontal lock* capacitor control permits the injection of increased control-tube signal in the event of high noise level, or weak signal, causing a decrease in capacity.

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Next Month

THE CONCLUDING installment of the Lester L. Libby series on the alignment of the Bendix TV receiver will be presented in the March issue.

Donald Phillips will also continue his discussions of TV production changes in the March issue of SERVICE. In this issue will also appear an article on TV sync and inter-sync systems by Edward M. Noll.

Ser-Cuits

(*Continued from page 22*)

sound *if* amplification are employed. These two stages are operated with their plates grounded while their cathodes are returned to the –140-volt buss. Thus, these two tubes form part of the divider system that splits the B voltage. Inductors L_{47} and L_{49} are 1" pieces of straight, tinned copper wire. They are employed in the cathode circuits of V_{13} and V_{14} to provide a decreased input conductance at the grids of these stages at 21.75 mc.

T_{10} in conjunction with a 6AL5 (V_{15}) forms a conventional ratio detector system that operates on a center frequency of 21.75 mc and has a peak bandwidth of approximately 500 kc.

Traps

Since the *if* frequency of the adjacent channel sound carrier and the *if* frequency of the received channel sound carrier are quite close to the frequencies passed by the picture *if* system, some means of attenuating these sound carriers must be provided in the picture *if*. Otherwise the carriers would pass through to the pix detector where they would be demodulated and passed on to the picture tube grid as video information. Once there, these signals would appear as interference in the observed picture.

Incidentally with the *rf* oscillator operating above the channel being received the *if* relation of the pix to sound carriers is the reverse of their *rf* relation.

To prevent this interference, trap circuits L_{34}, L_{37}, L_{41} and L_{42} are provided. L_{34} and L_{37} function as series traps in the plate circuits of V_2 and V_4 and are tuned to 27.75 mc, the *if* frequency of the adjacent channel sound carrier. The combined trapping action of these two stages is sufficient to keep the sound interference from this source at a negligible value. L_{41} and L_{42} are tuned traps inserted in the cathode circuits of the third and fourth pix amplifier. These traps are tuned to 21.75 mc, the sound *if* frequency. At this frequency, the voltage developed across these traps will function as a degenerative voltage opposing the 21.75 mc sound *if* signal at the grids of the respective stages. The combined attenuation offered by the pix amplifier stages is sufficient to suppress the 21.75 mc sound carrier before it reaches the pix detector. Inductors L_{89} and L_{90} are used to stabilize the pix amplifier stages.

Two detectors are employed at the output of the pix *if* system. One, a 1N34 crystal diode, is connected in the conventional manner to provide an output signal of negative polarity across its output load, while the other, a 6AL5 (V_{8A}), is connected to give an output signal of positive polarity across its load.

The video amplifier is a conventional two-stage system that is fed by the output of the 1N34 crystal detector. The frequency response of the amplifier extends to 4 mc while the overall voltage gain from the input grid to the output plate is approximately 60 times. The gain of the amplifier is variable by means of a 3,000-ohm unit (R_{40}), the picture control, in the cathode circuit of the 6AU6 first video stage, V_9.

The video signal at the picture tube grid must be of such polarity that the sync and blanking pulses will drive the grid in the negative direction. For this reason, with the two-stage video amplifier, it is necessary for the output of the pix second detector, the 1N34 crystal diode, to be of the same polarity as that of the video signal required at the kinescope grid. With this arrangement, sync pulses drive the grid of the first video amplifier stage in the negative direction. This stage, V_9, is so designed that with normal signal input at its grid the tube works over most of its operating range. However, any large noise pulses above sync level will drive the grid beyond cutoff. This results in a desirable peak noise limiting action by the video amplifier that effectively improves the overall signal-to-noise ratio of the receiver.

Horizontal Deflection Circuits

The horizontal deflection and *afc* circuits in this set depart considerably from the conventional systems. The primary function of these circuits, as in other receivers, is to provide a stable, linear, deflection current in the horizontal yoke. Performance of this action results in framing the received picture in the horizontal direction.

The horizontal oscillator, V_{21}, is a conventional cathode coupled multivibrator. In actual operation the frequency of the oscillator is set near line speed by means of a horizontal hold control, R_{95}. The oscillator is then locked in sync by means of a *dc* control voltage which is applied to the grid (pin 7) of one of its triode sections. This control or *afc* voltage acts to speed up or slow down the oscillator until it operates at horizontal sweep frequency. The *afc* voltage is developed by a horizontal *afc* rectifier, V_{20}, and is the resultant of the phase error between the incoming horizontal sync pulses and the output of the horizontal oscillator which is coupled back to the rectifier by means of a 680-mmfd capacitor (C_{76}) and 3,300-ohm resistor (R_{100}).

The peaked sawtooth voltage used to drive the horizontal output stage is developed by the charge-discharge action of capacitor C_{76} and the peaking resistor R_{100}. A neon bulb (NE-2) acts as a regulator for the voltages applied to the multivibrator and as a result provides for increased stability of oscillator operation.

Horizontal Output

Most present-day receivers that employ magnetic deflection systems utilize transformer coupling between the horizontal output stage and the deflection yoke. In this receiver, however, no output transformer is used and the horizontal deflection yoke is directly connected to the plate of the output stage. Due to this fact, and to provide proper loading for the output stage, the inductance of the yoke is made quite high as compared to that of yokes used in conventional transformer cou-

(*Continued on page 42*)

Ser-Cuits

(*Continued from page* 41)

pled systems. Since horizontal retrace time is a function of the resonant frequency of the yoke and its associated circuit it is necessary to keep the shunt capacity across the yoke at a minimum value. However, due to the polarity of the deflection voltage, it is necessary to connect the filament of the damper tube directly to the plate of the output stage. This places the capacity of the damper tube filament transformer directly across the yoke. For this reason transformer T_{10} was specially designed for low capacity between the damper tube filament winding and the rest of the assembly.

The majority of the output stage plate current is supplied through the damper while the remainder comes through a 5,000-ohm control (R_{106}) in series with a shunt feed choke, L_{52}. Since the inductance of L_{52} is large (as compared to that of the yoke) it presents a high impedance in the B+ line to the deflection voltage developed by the 6L6 output tube, V_{22}, and thus prevents the B supply from loading down the output stage.

Picture width is controlled by means of R_{106} which varies the plate voltage (and thereby the output) of the horizontal stage. Small improvements in trace linearity are affected by means of the variable linearity control system placed in the plate circuit of the damper.

The Damper Circuit

When the plate current of the output stage is cut off by the negative portion of the voltage applied to its grid, the magnetic field in the deflection coil begins to collapse at a rate determined by the resonant frequency of the system. If permitted to go unchecked the circuit would oscillate. However, since this condition is undesirable, a damper stage, V_{26}, is placed across the horizontal yoke to prevent these oscillations. This stage is so arranged that a half cycle of oscillation (retrace) is permitted. At the end of the half cycle the damper conducts and causes the oscillatory currents in the yoke to decay in a linear manner and at a rate suitable for the visible trace. Very shortly after decay starts, the output stage begins to conduct and this additional current in conjunction with the decay current in the yoke produces an essentially linear trace motion of the electron beam.

Low Voltage Power Supply

A single 5U4G rectifier supplies approximately 330 volts *dc* at 220 ma to the receiver. A pair of 40-mfd capacitors, $C_{102A/B}$ together with filter choke L_{55} form a pi-type filter system for the supply. Additional 80-mfd filters are placed in the receiver chassis.

A unique system of *dc* voltage division and distribution is utilized.

The divider system is so arranged that the receiver chassis is 140 volts positive in respect to the minus leg of the supply; the total current requirements of the receiver are supplied through the focus coil system. The over-all design of the receiver circuits is such that the current requirements on the power supply are at a minimum for the number of tubes involved.

High Voltage Supply

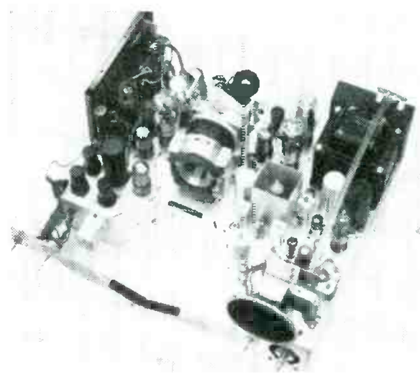
An *rf* 10 *kv* high voltage supply system is utilized to provide the second anode potential for the kinescope. A twin triode with both sections connected in parallel functions as the *rf* oscillator. The voltage developed by the oscillator in its plate tank is stepped up in the secondary of the *rf* transformer, T_{15}, and applied to the high voltage rectifier. The operating frequency of the oscillator is approximately 190 kc.

New TV Parts . . . Accessories

PHILMORE TV KITS

A 30-tube TV kit, model P 30, featuring a 12-channel tuner, and assembled and prealigned picture and *if* sound stage units, has been announced by the Philmore Manufacturing Co., Inc., 113 University Place, N. Y. 3, N. Y.

Kit, supplied with several large blueprints detailing top and bottom wiring, uses the basic RCA 630TS circuit. Supplied with a 10" picture, the receiver can be modified to use a 12" or 16" type tube.



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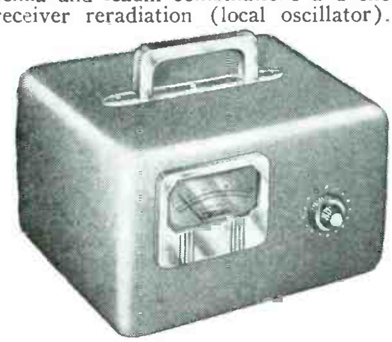
TRANSVISION TV FIELD STRENGTH METER

A TV field strength meter, FSM-1, has been announced by Transvision, Inc., New Rochelle, N. Y.

Meter consists of a high-gain receiver with a calibrated meter to indicate a signal level. Each unit is individually calibrated. Said to be capable of measuring field strength from 50 to 50,000 microvolts at 300-ohm input terminals.

The instrument can also be used to measure losses or gain of various antenna and leadin combinations and check receiver reradiation (local oscillator).



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MUELLER CLAMPIPE

A stand-off insulator for TV and FM antenna leadins, *Tenna-Clampipe*, that clamps onto the antenna mast or any other handy support, has been announced by the Mueller Electric Co., 1583 E. 31st St., Cleveland 14, Ohio.

Clampipe is an assembly of the Mueller ground clamp and a screw-eye with a plastic, insulating grommet. All metal parts are weather-proofed.

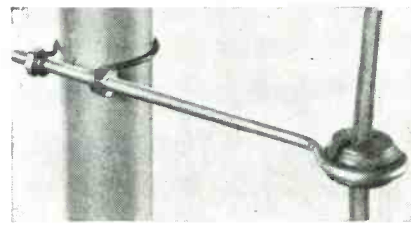
Offered in two types, for flat twin-lead and other for round cable.

TURN TO NEXT PAGE

JFD MAST LEADIN SUPPORTS

An assortment of mast-clamp screw eye polyethylene stand-offs for use in securing twin lead or RG type lines to masts or elements from ½" to 2" in diameter, has been announced by the JFD Manufacturing Co., Inc., 4117 Ft. Hamilton Parkway, Brooklyn 19, N. Y.

Screw eye lengths available are: 3½", 5½", 7½", 12". Tempered spring steel mast clamps sizes are: ½", ¾", 1", 1½", 1¾" and 2".



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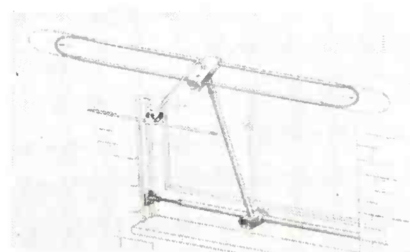
DELSON WINDOW TV ANTENNA

A window antenna for TV and FM, the *Jiffy-Tenna,* of hard-drawn lightweight aluminum tubing with lucite insulation, has been announced by Delson Manufacturing Co., 126 11th Ave., New York 11, N. Y.

Can be adjusted to serve as a tunable folded dipole antenna. Has a sliding trombone feature. Dipole ends can be removed to provide single dipole and reflector on the low bands.



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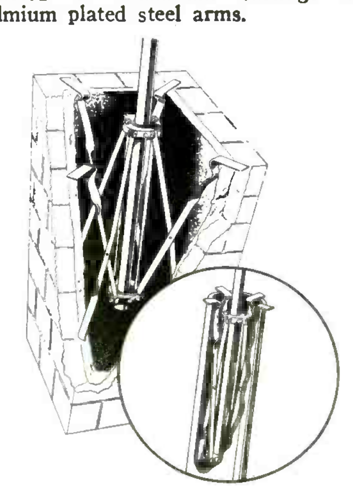
VEE-D-X CHIMNEY-VENT PIPE TV MOUNT

A chimney and vent pipe TV antenna mount which mounts inside the chimney or vent pipe, and can fit into openings, round, square, rectangular or oval, from 4" to 22", has been announced by the LaPointe-Plascomold Corp., Unionville, Conn. Will accommodate masts of 1", 1⅛" and 1¼" diameter.

Has 8 points of bearing. Unit is constructed of aluminum castings with cadmium plated steel arms.



CHICAGO ISOLATION TRANSFORMERS

Three isolation transformers, with 50, 150, and 250-*va* capacities respectively, have been announced by Chicago Transformer Division, Essex Wire Corp., 3501 W. Addison St., Chicago 18, Ill.

Transformers are suitable either for adjusting high or low line voltages to operate radio, TV, and other equipment on a normal 115 volts, or promoting safer servicing or experimental work on electronic gear by isolating chassis grounds from line grounds. Particularly useful in eliminating shock hazard on *ac/dc* TV sets. Besides providing a standard 115 volts, the secondaries of these transformers will also supply 125 or 105 volts for use in locating faulty set components.

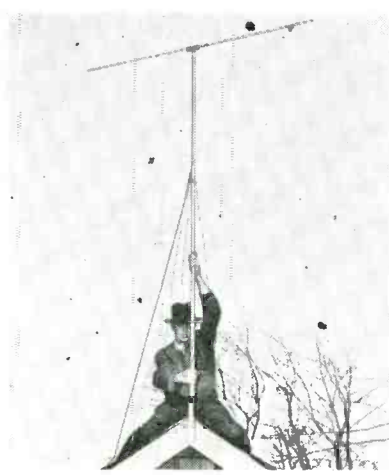
The units are mounted in compound-filled drawn steel cases, and have a 7′ cord with male plug on primary, female plug on secondary.

* * *

TOWERS TV-FM MAST

A tubular, high-tensile, lightweight, alloy-steel mast with a universal mount for TV and FM antennas has been announced by the Towers Corp., 3332 E. 55th St., Cleveland 4, Ohio. Mast is five feet long and can be built to any height with five-foot extensions. Mast and extensions have telescoping ends for joining.

Masts are packed individually with guy-wire ring and heavy cotter pin. An 11″ base is packed separately; antenna mounting block is packed individually, complete with hardware. Mast and extensions are furnished in either 1″ or 1¼″ diameters, in either irco-sealed aluminum finish or baked black enamel. Hardware is zinc-plated.



New Instruments . . . Components . . . Accessories

RCA MINIATURE TESTPOINT ADAPTER

A *miniature* test-point adapter, which permits tube-base tests to be made on the tube side of the radio chassis, has been announced by the RCA Tube Department.

Adapter which accommodates all types of 7-pin miniature tubes, is placed in the tube socket and the tube in turn is plugged into the adapter.

* * *

NEWCOMB PHONO AMPLIFIER

A 10-watt phono amplifier, P-10, has been announced by Newcomb Audio Products Co., 6824 Lexington Ave., Hollywood 38, Calif.

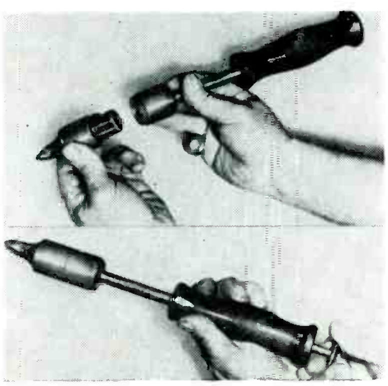
Power output is said to be 10 watts at less than 5%, over 9 watts at 50 cycles at less than 5%, over 90% of rated output at less than 2%. Frequency response: ± 1 db, 30 to 15,000 cycles. Input impedance, ½ meg; gain, 75 db. Bass tone control range 0 to + 16 db. Treble tone control range — 25 db to + 15 db. Output impedances: 4, 8, and 16 ohms to octal socket. Tubes: One 6SC7, one 6SF5, two 6V6GT and one 6X5GT.

KEMODE SOLDERING IRON

A no-flame, no-electric *quick-shot* soldering iron, which uses a cartridge for instantaneous working-temperature heating of the tip, that is retained for six to eight minutes, has been announced by the Kemode Manufacturing Co., Inc., 161 W. 18th St., N. Y. 11, N. Y.

Available with six types of tip sizes: pyramid (⅜" and ⅝"); chisel (⅜" and ⅝"); heavy duty (1" and 1⅛".)

In operation, a cartridge is inserted in tip, and a spring plunger in handle is pulled to activate the cartridge.



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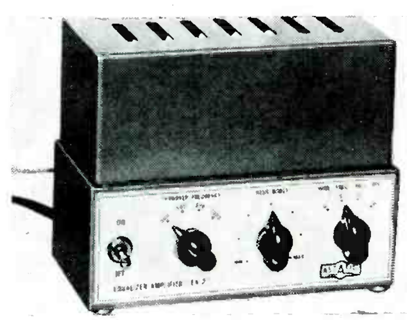
DUOTONE MICROGROOVE CUTTING NEEDLES

A microgroove cutting sapphire needle has been announced by The Duotone Company, N. Y. C.

ASTATIC EQUALIZER AMPLIFIER

Equalizer-amplifiers, the EA series, for use with the Astatic magneto-induction pickup cartridge, have been announced by the Astatic Corp., Conneaut, Ohio.

One model, EA-1, is for installation in receiver sets and audio amplifiers and provides the necessary equalization and preamplification and bass boost. Another model, EA-2, is self-powered and provides adjustable *bass-boost*, treble roll-off, and selection of *turnover frequency*. A third unit, EA-3, is also a self-powered unit, providing *bass-boost* and *equalization*.



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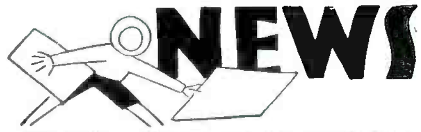
E-V TORQUE DRIVE KIT

A sales and service kit of *torque drive* crystal pickup cartridges has been announced by Electro-Voice, Inc., Buchanan, Michigan.

Each kit contains 6 assorted cartridges with replaceable needles (which it is said can be used to replace any one of over 150 standard type cartridges); 4 extra needles and needle holders, and consumer pamphlet. Available in kit *A* (osmium-tip) and kit *B* (sapphire-tip).



RCA PROMOTES ELLIOTT, TEEGARDEN, BAKER AND ORTH

Joseph B. Elliott is now vice president in charge of all RCA Victor consumer products, and L. W. Teegarden has been appointed in charge of all RCA technical products.

Henry G. Baker has become general manager of the Home Instrument Dept., and Richard T. Orth has been named general manager of the Tube Dept.

* * *

CUNNINGHAM NOW SYLVANIA AD AND SALES PROMOTION DIRECTOR

Terry P. Cunningham has been named director of advertising and sales promotion for Sylvania Electric Products Inc. Cunningham will direct advertising and sales promotion for the lighting fixtures, lamp, radio tube and electronics divisions and the Wabash Corp.

* * *

C-D BUYS RADIART

Cornell-Dubilier has purchased from Maguire Industries, Inc., all of the stock of Radiart Corp., Cleveland, Ohio, manufacturers of auto radio vibrators and TV and automobile antennas.

New officers of the Radiart are: Octave Blake, president; L. K. Wildberg, vice president; Verne Mitchell, vice president, and C. A. Staub, treasurer and assistant secretary.

* * *

FRANK LESTER JOINS INSULINE

Frank Lester has been named chief engineer of the Insuline Corporation of America, 36-02 35th Ave., L. I. City, N. Y. Lester was formerly chief engineer for Electronic Corp. of America and Radio Wire & Television Inc.

* * *

HARRY SMITH HYTRON CONTEST GRAND PRIZE WINNER

Harry L. Smith, 25-56 Steinway Street, Long Island City, New York, who won the first prize at the start of the Hytron contest in May, was recently named winner of the grand prize, $200 worth of U. S. Savings Bonds.

Harry L. Smith receiving the Savings Bonds from Bruce A. Coffin, president of Hytron Radio & Electronics Corp., while Everett Boise, Hytron's commercial engineer in the New York area, looks on.

JOTS AND FLASHES

FIVE RULES for visual comfort in viewing television were issued recently by the American Optometric Association: (*1*) receiver should be properly installed with particular attention to the antenna; (*2*) in tuning, tone setting should be adjusted before turning the picture up to the desired brilliance, and a comfortable balance between steadiness of image and brilliance selected since an unsteady image or too much light results in visual discomfort; intense darkness and bright light in a room with a television receiver should be avoided, a mild, indirect light being preferable (if the room is totally dark there will be too much contrast between the bright screen and its surroundings and if there are bright lights, they will distract; (4) sun glasses should not be worn for televiewing because they adapt vision to unnatural conditions; (5) excessively long periods of close concentration on the screen should be avoided. . . . A three-speed record player which features two pickup arms, one for conventional records and the other for two speeds for 33⅓ and 45 rpm has been developed by Scott Radio Laboratories, Inc., Chicago. . . . Publication of the *Aerovox Research Worker* has been resumed, and will appear soon . . . The annual get-together of *Radio's Old Timers* will be held in the South Ballroom of the Hotel Stevens on Monday, May 16, during the Radio Parts Show in Chicago. John O. Olsen, 1456 Waterbury Road, Cleveland 7, Ohio, is president of the group . . . Stewart-Warner Radio and TV set distribution and production will be handled by a newly created division, the Stewart-Warner Electric Division, which Sam Insull, Jr., will head and Edward L. Taylor will be general sales manager. . . . Henry C. L. Johnson is now with Benton & Bowles as account executive for the electronics group of Crosley. . . . The Video Corporation of America recently appointed five new distributors for their line: Milmar Sales Co., Chicago, Illinois; H. A. Gilliam Co., Houston, Texas; Stan-Burn Radio Electronics, Brooklyn, New York; Regal Radio, Inc., New York City; L. Zelkin, Beverly Hill, Calif, and Commercial Television Corp., Pittsburgh, Pa. . . . William W. Boyne is now general manager of Zenith Radio Corp., New York. . . . Samuel Olchak has been named commercial service manager of Air King Products, Brooklyn. . . . Henry P. Segel is now New England representative for Permoflux. William S. Lee and Paul H. Sweitzer will cover Michigan and Indiana, Illinois (except the Chicago metropolitan area), and western Kentucky, respectively, for Permoflux. . . . W. C. Johnson is now vice president in charge of sales of Admiral Corporation, Chicago. . . . C. S. Craigmile has been elected president of Belden Manufacturing Company, Chicago, succeeding Whipple Jacobs, who resigned to become president of Phelps-Dodge Copper Corporation. Arthur L. Wanner is now vice president and treasurer of Belden. . . . Col. Webster F. Soules, Electro-Voice sales manager recently participated in a month of active service at the Ft. Monmouth Signal Corps Laboratories, New Jersey. . . . The Wheeler Insulated Wire Company, Inc. has moved its plant from Bridgeport to Waterbury, Connecticut.

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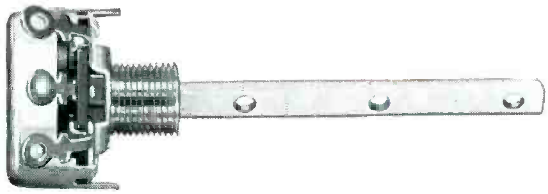

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