ELECTRONIC SERVICING

APRIL
1957
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- Color Bar Generator
- Chrysler Auto Radio
- New Transistor Schematics
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FEATURE ARTICLES

CIRCUIT AND SERVICE FORUM

DEPARTMENTS

THIS MONTH'S FRONT COVER

Automation has entered the baseball picture now that the Kansas City Athletics are using a traffic radar set (portable Admiral Radarscope) at spring training camp to check the speed of their pitchers.

COWAN PUBLISHING CORP., 300 West 43rd Street, New York 36, N.Y.

BASIC METHODS OF

AUTOMATIC ELECTRONIC CONTROL

IN LIQUID LEVEL MEASUREMENTS & CONTROL

by MURRAY BARLOWE

THE maintenance of electronic devices used in industry is definitely within the capabilities of the alert service technician who is well grounded in electronic fundamentals. The basic electronic building blocks such as resistors, capacitors, inductors, and vacuum tubes, operate in exactly the same way in an automatic electronic control, as they do in a radio or television receiver. As a matter of fact, the circuitry that the service technician tackles in his daily routine work are in most instances *much* more complex that what he would find in the average industrial electronic control unit. Since cost is not as great a factor in the industrial electronic field as it is in the highly competitive television business, you will find that industrial electronic equipment uses simple straightforward circuitry, rather than the complex circuits designed by cost-conscious engineers.

Automatic control as such, is not new. The very process of life is dependent upon many delicate and complicated automatic control systems. The process whereby the human body automatically maintains its temperature at approximately 98.6 degrees Fahrenheit is an excellent example of an automatic control system in nature.

One of man's early attempts at automatic control is probably best illustrated by James Watt's invention of the flyball governor back in 1788. He needed a method of controlling the speed of his steam engine. The principle of operation of the flyball governor clearly illustrates the basic elements of most modern control systems. Referring to *Fig. 1,* we notice that the vertical shaft of a governor is driven by an engine. As the entire assembly revolves, the flyball weights A and B are moved outward from the shaft by centrifugal force. The higher the speed, the further out the weights move. In so doing, assembly C is moved down on the shaft. This downward motion which has a direct relationship to the speed of the engine, is mechanically coupled to lever D, which is connected to the steam valve, or throttle, of the engine. An increase in speed will then automatically operate the valve to slow down the engine. On the other hand, a decrease in speed will reduce the centrifugal force. The weights will then drop down toward the shaft assembly, C will move up, and lever D will open the valve to cause the engine to speed up again. Thus the steam engine becomes "self regulating" or automatically controlled.

Let's break down the elements of this simple control system in the manner shown in *Fig. 2.* In any control system we must have a "sensing" device, to sense or measure the "variable" which we are trying to control. In our mechanical flyball governor the weights "sense" the changes in speed and convert them into an up and down motion. The system of levers mechanically "amplifies" or modifies this motion and then activates the "correction" element, in this case the steam valve. And so we have completed our control loop.

A simple automatic electrical control system which we come in contact with daily is the control of the heating system in our homes. A temperature sensitive piece of metal constructed in the form of a switch (thermostat) serves as the sensing element. It converts changes in temperature into electrical information. The electrical impulse activates a relay, valve, or motor to increase or decrease the amount of heat in the house.

In industry it is often desirable to automatically control the level of materials in tanks, furnaces, etc. Before the level can be controlled it has to be detected, or "sensed." Quite often a simple mechanical float assembly can be used, such as the ball type float used to maintain the level of water in the tank of a toilet reservoir. When the level falls below a predetermined point the float drops, opening a valve until a desired water level is re-established.

In many cases, a purely mechanical system is not practical. Temperatures, pressures and contents of storage tanks may prevent or complicate the use of floats and mechanical linkages through the walls of the tanks.

One such problem encountered by the writer required that the level of molten glass be maintained in a furnace with burning gases moving across the surface of the molten glass at high pressures. The primary problem was to devise a sensing device to determine the actual level of the glass.

Obviously a simple float arrangement would not work. This was a problem that lent itself to electronic sensing. A system of probes was devised and a novel circuit developed whereby the level could be maintained within very close limits.

There are many ways that the level of liquids and other substances can be detected electronically. One of the simplest which would be suitable for conductive liquids (most liquids and molten solids are conductive) would be to mount a probe from the top of a tank (*Fig. 3a.*). The bottom tip of the probe would be set at the level to be maintained. If the tank is metal, a second connection can be made directly to the tank. When a meter and a source of voltage are then connected to these two points, a current will flow when the tip of the probe touches the liquid. If the tank is non-conductive, two probes (*Fig. 3b*) could be mounted side by side; or a metal plate as shown in the bottom figure, could be put into the tank.

To provide more than just an indication, a relay would be substituted for the meter. The relay in turn could actuate an electric valve to turn the flow of liquid on or off. If it is desired to sense the level of the liquid without actually coming in contact with its surface (as with highly corrosive acids) it is possible to use the capacity formed by a metal plate suspended above the liquid and the surface of the liquid itself (*Fig. 4*). The capacitance thus developed could be part of the tuned circuit of an oscillator and the plate current of the oscillator would then be a function of this capacitance.

As the level of the liquid rises, the capacitance between the metal plate and the surface of the liquid, increases. A relay in the plate circuit of the oscillator could be set so that it would pull in when the current reaches a pre-determined level.

A pair of parallel probes (*Fig. 5*) could be used in place of the metal plate. The probes would then form a capacitor in parallel with the tuned circuit of an oscillator. The capacitance of the condenser thus formed is determined by, (a) the area of the probes, (b) the space between the probes, and, (c) *the dielectric constant of the surrounding medium.*

The electrostatic field set up by the capacitor is concentrated between the probes, but it also extends out into the

[*Continued on page* 52]

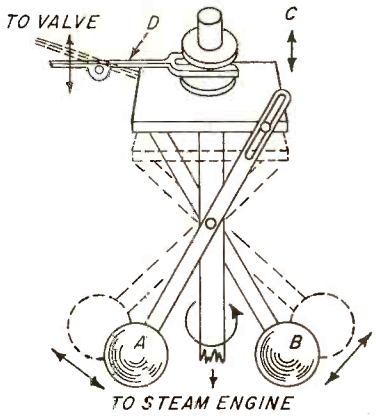


Fig. 1—Control of engine speed by governor action.

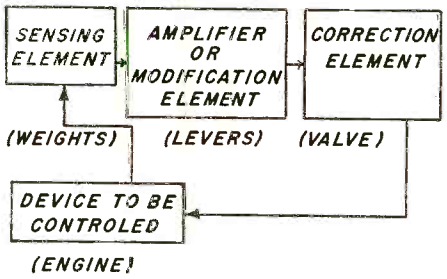
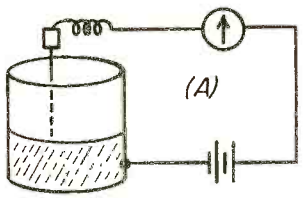
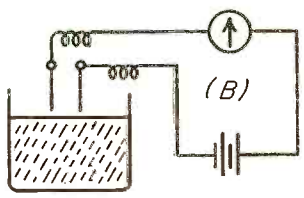


Fig. 2—Basic elements of an automatic control system.





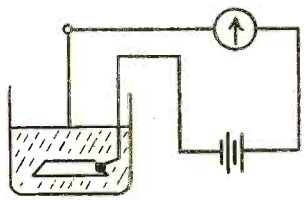


Fig. 3—Three probe arrangements for sensing liquid levels.

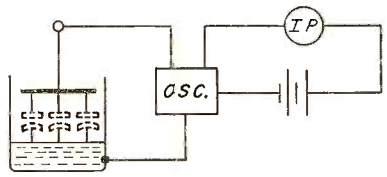


Fig. 4—Capacitance used to avoid contact with the liquid.

Using the Color Bar

The Color Bar Generator is an essential piece of test equipment in the servicing of color receivers. This article discusses some of the features of this instrument which will assist the serviceman in its use.

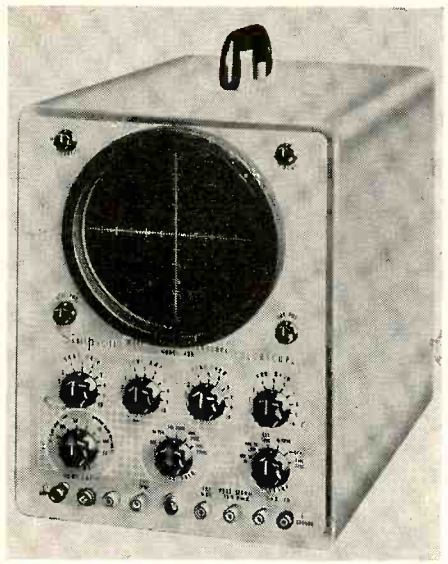


Fig. 1-A—Typical color bar generator and wide band oscilloscope are shown above.

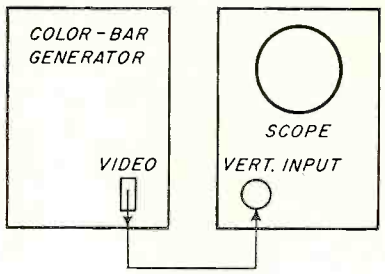


Fig. 1a—Block diagram illustrating how color bar pattern is applied directly to scope.

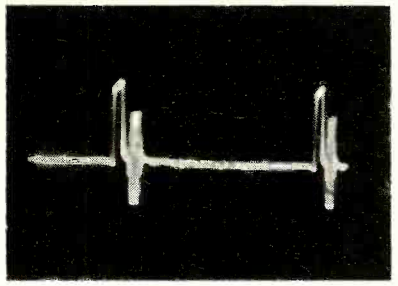


Fig. 2—Display of sync and burst signals with the appropriate setting of the selector switch.

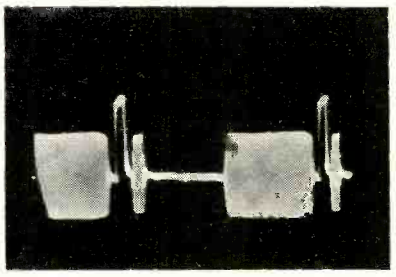


Fig. 3—The addition of the R-Y signal to the sync and burst signals produces above pattern.

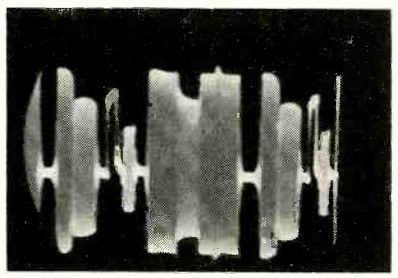


Fig. 4—Pattern produced by the simultaneous display of several color bars plus sync and burst.

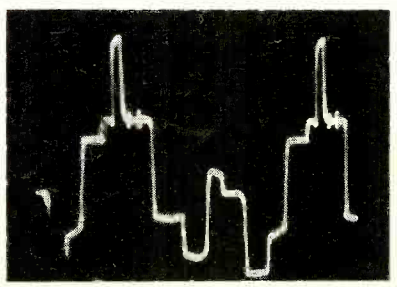


Fig. 5—Appearance of the Y signal in the absence of chroma.

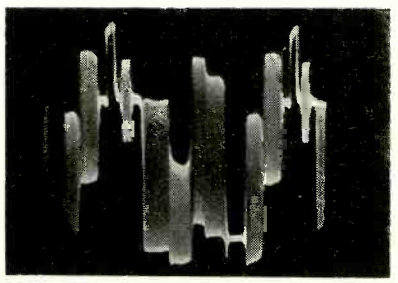


Fig. 6a—Chroma added to Y gives the complete color signal.

TELEVISION service technicians are confronted with the operation of several new instruments, with the advent of color television. Chief among these are the white-dot generator and the color-bar generator. The color-bar generator, (used with the wide-band scope) is little understood at the present time, and it is the purpose of this article to describe and illustrate its operation.

Fig. 1 shows the external appearance of an NTSC color-bar generator and a wide-band scope, used in color-TV service work. To start with, it is helpful to apply the output from the color-bar generator directly to the vertical-input terminals of the scope, as shown in *Fig. 1A*.

Components of the Complete Color Signal

Fig. 2 shows the display of sync and burst which is obtained when the selector switch is set to the appropriate position. Sync and burst are actually obtained in *all* chroma positions, although the accompanying chroma waveforms differ from one setting to the next. *Fig. 3* shows the sync and burst with accompanying R-Y chroma when the selector switch is set to (R-Y).

The color burst (*Fig. 2*) consists of 8 or 9 cycles of a 3.579545-*mc* voltage, commonly referred to as 3.58 *mc*. The burst is located on the back porch of the horizontal blanking pulse. The (*R-Y*) bar signal seen in *Fig. 3* also has a frequency of 3.58 *mc,* but its *phase* differs from that of burst. The chroma bar is a signal voltage, which is *phased* to correspond to the (R-Y) specification, namely 90° out of phase with the burst.

Several chroma bars can be switched in simultaneously from the generator, as shown in *Fig. 4*. Each of the bars differs in phase from the next, and represent signals such as the (R-Y), (B-Y), I, Q, etc. Note that all the chroma bars so far illustrated are centered on the black level. For this reason, they are *incomplete* color signals, but are provided because they serve extremely useful purposes in testing individual chroma circuits in color TV receivers.

The next step in building up the complete color signal is the addition of the Y (or brightness) signal, shown in *Fig.*

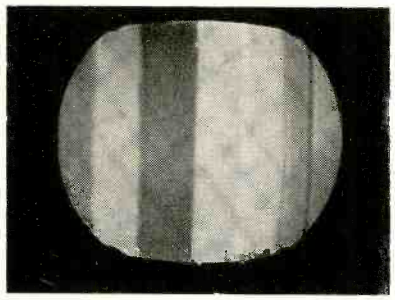


Fig. 6b—Bar pattern corresponding to color signal of Fig. 6a.

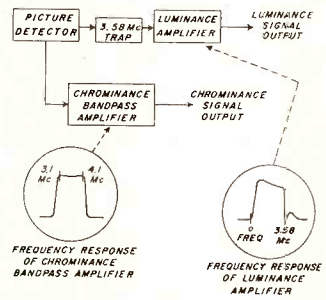


Fig. 7—Separation of luminance and chrominance signals.

Generator

by ROBERT G. MIDDLETON
Chief Field Engineer, Simpson Electric Co.

5. This is the component of a color signal to which a black-and-white TV receiver responds. Color reception is dependent upon reception of both the chroma signal and the Y signal. The Y signal fundamentally represents brightness levels of the video signal, and in the absence of the Y signal the matrices in the receiver do not respond normally, and true colors are not obtained.

When the chroma signals are added to the Y signal, a complete color signal is obtained, as illustrated in *Fig. 6A*. When this complete color signal is applied to the circuits of a color TV receiver, fully saturated true colors are obtained. The bar pattern displayed on the screen of the color picture tube is equivalent in all essential respects to that of a color test pattern transmitted by a color TV broadcast station. (See *Fig. 6B*.)

Separation of the luminance and chrominance signals proceeds in a color TV receiver as illustrated in *Fig. 7*. When individual Y chroma outputs are available from a color-bar generator, it is evident that the technician can make quick and decisive tests of the operation of the two principal receiver sections.

Vectorscope Analysis

Another very useful application of the color-bar generator and wide-band scope is the *vectorscope* application, for checking the phase relationships in the receiver circuits. To make this check, the output from the (R-Y) detector is applied to the vertical-input terminals of the scope, and the output from the

[*Continued on page 53*]

THE WORK BENCH

Unusual Service Problems And Their Solutions

This Month's Problem: Composite Sync Amplifiers

by PAUL GOLDBERG
Service Manager

THIS installment is devoted to composite sync amplifier problems. Knowledge of the receiver circuitry, skill in utilizing the scope, manufacturer's service notes with waveforms in the proper places, are tremendous aids in solving problems of this type.

Dumont RA 340

The receiver was turned on and it was observed that the picture was rolling vertically and tearing horizontally. This was a composite sync problem. The picture did not overload on any channel. Thus we discounted an *agc* problem. V212B, the 1st sync clipper. V213B, the 2nd sync clipper, and V205A the noise inverter, were replaced individually but had no effect. At this point, the diagram was consulted. In order that V212B conduct only on sync information, the proper bias is automatically applied to the grid of V212B, pin 7, by the action of capacitor *C269*, and resistor *R293*. On the positive peaks of signal voltage, the grid of V212B will draw current, charging capacitor *C269*. This charge leaks off between pulses through *R293* making the average grid potential negative. With the proper design values in the plate, grid, and cathode of V212 B, the bias will hold the tube at cut off until a signal at a higher level than the blanking pulse comes along. The output will then consist only of sync information. V213B performs the dual function of a 2nd sync clipper and a phase splitter. Negative going sync pulses are fed to the grid, pin 7, of V213B. The tube is operated at plate current saturation due to positive grid bias applied through *R276*. The negative sync pulse takes the tube out of saturation into reduced conduction and finally cut off. This achieves both positive and negative clipping with additional amplification. Horizontal sync pulses are fed to the horizontal phase detector from the plate and cathode. Vertical sync pulses also are fed to the vertical integrator from the plate of V213A. With these facts in mind, the scope was set up and a waveform check was made at pin 7 of V212-B. The waveform was normal (see *Fig. 1*). Next a waveform check was made at pin 6 of V212B. It was noted

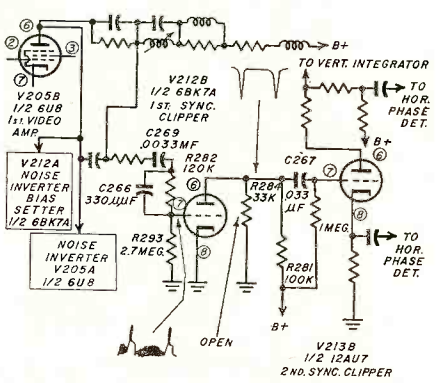


Fig. 1—Portion of DuMont RA-340 where defect caused loss of sync.

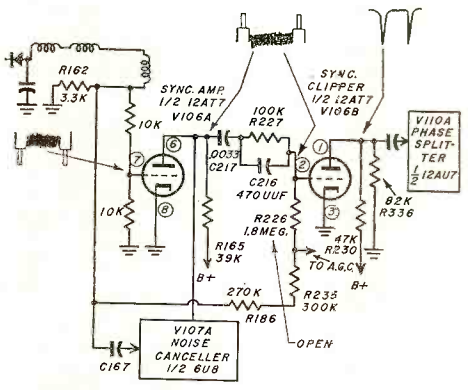


Fig. 2—Loss of sync caused by open grid resistor in GE 21C40.

that video information accompanied the sync pulses in this waveform. In other words, this tube was not completely separating the sync pulses from the video information. A voltage reading was next taken at pin 6 of V212B. Here, instead of +30 volts, the meter read approximately +60 volts. A resistance check was next made on *R281* and *R284*. *R281* checked satisfactorily, but *R284*, a 33K resistor, was found to be open. A new 33K resistor was installed and the receiver functioned properly.

With *R284* open, the plate voltage went up causing the cut off point to move to a new and more negative location on the tube's characteristic curve. This allowed video information to come through to trigger the horizontal and vertical oscillators.

GE 21C40 "O" Line

The receiver was turned on and it was observed that there was no horizontal or vertical hold. There was a small *agc* problem involved here, since the receiver did overload on some channels. V106, a 12AT7 acting as a sync clipper and amplifier and V107A, a 6U8 used as a noise canceller were replaced individually, but had no effect. This therefore, was a composite sync problem where the receiver utilizes V106A as a sync amplifier, and composite sync trouble was suspected. The composite sync system functions in this manner. A portion of the detected signal from the video detector is directly coupled to the sync amplifier, V106A. After amplification, this signal is in turn fed to the sync clipper. Tied directly to the sync amplifier plate, is the noise canceller V107A. A negative signal is fed to the cathode of the noise canceller through *C167* from the detector. Noise bursts exceeding the sync tip level, reduce the sync amplifier output (which is fed to the clipper) in such a way, that neither sync nor noise will be found in the output of the clipper. The inertia of the *afc* system maintains proper horizontal sweep synchronization. From the sync amplifier V106A, the amplified signal is fed to the grid of the sync clipper V106B. The composite video appearing on the grid of the clipper tube, V106B, causes this clipper to draw

[*Continued on page* 50]

THE ANSWERMAN

Inquiries Sent To The Answerman Will Be Acknowledged Only If Accompanied By Radio-TV Service Firm Letterheads.

BY ELECTRONIC SERVICING TECHNICAL STAFF

Answerman:

I have a Crosley chassis 484 which has not as good vertical linearity as I would like to see. I have checked everything and can't seem to find anything wrong. Can you suggest something that will improve the vertical linearity in this receiver. Although it is not objectionable to the customer I do know that it is not perfect and would like to make it better.

C. W.
Chicago, Ill.

Crosley Television Service information has made available a circuit improvement for this receiver that will improve the vertical linearity in those receivers in which this is found to be desirable. The changes involve the removal of resistor *R181,* the addition of *R186* and the changing of *R180* from *5.6 K* to *10 K* ohms. These circuit changes have been incorporated in chassis coded E or later and are shown in *Fig. 1.*

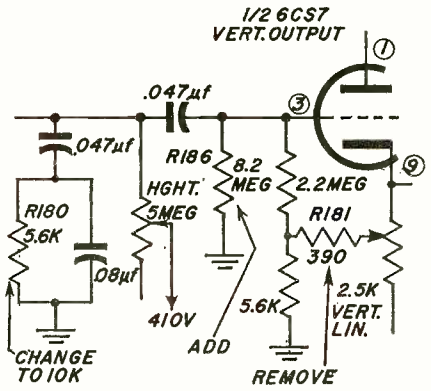


Fig. 1—Changes to improve vertical linearity in Crosley chassis.

Dear Answerman:

I have a case of vertical stretching in the upper portion of a GE "S" model. I have tried such things as vertical output transformer, output tube, etc., and have not been able to correct it. What might be the least suspected cause of this type of condition?

E. G.
Philadelphia, Pa.

There is one component in TV receivers employing vertical retrace suppression that often causes this type of trouble. This is the coupling condenser *C212,* shown in *Fig. 2.* This condenser frequently shorts and produces the effect of stretching as noted in this case. It is suggested that the replacement condenser have a higher voltage rating than the defective one removed.

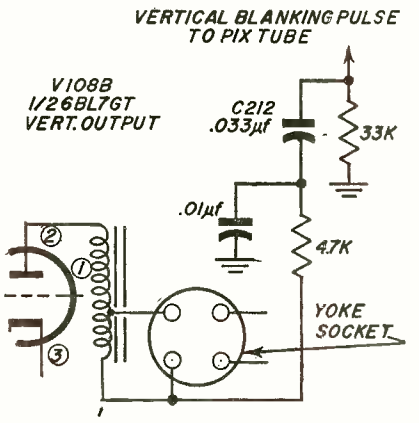


Fig. 2—Vertical stretching may be caused by defective C212.

Mr. Answerman:

I have a TV set that exhibits poor interlace. I doubt that the set ever had a normal presentation as far as interlace is concerned but since it otherwise works very well I would like to correct this condition. Pairing of the horizontal lines is common in about all positions of the vertical hold control. What is the best approach in overcoming this problem?

A. L.
Columbus, Ohio

Line pairing or poor interlace is usually due to the presence of a horizontal deflection pulse finding its way into the vertical oscillator grid circuit. What occurs is that some radiated or coupled pulse from the horizontal deflection system prematurely triggers the vertical oscillator and prevents the vertical sweep from starting the second field slightly below the first. The result is that the lines are paired instead of interleaved. To correct for this condition first investigate the integrating network for changes in capacitance or resistance. The addition of filtering into the circuit might be considered so as to remove the undesirable horizontal pulses if they exist there. Another possible cause is that the leads from the vertical hold control may have induced in them the horizontal deflection pulses which disturb the vertical oscillator circuit. The best approach to the problem is to determine the manner in which the horizontal pulses are reaching the vertical circuit. This is done experimentally. Some receivers, because of their component layout and the close proximity of the horizontal deflection circuitry to the vertical circuit, inherently exhibit poor interlace and might possibly require extensive redesign to be fully corrected. ■ ■

Equalization in Hi Fi Systems

by LAWRENCE FIELDING

Frequency response equalization is further considered in relation to presence controls, de-emphasis circuitry, loudspeaker padding, and rumble and record scratch filters, showing their effects.

PART 2

In the previous issue, part one of this series discussed the record and tape playback preamplifier, the RIAA and older AES playback response curves, and delved into bass boost circuits. Part two will explain other conditions affecting hi-fi reproduction such as rumble, unbalance between woofer and tweeter speakers, etc.

Presence Controls

A presence control is something the "purists" resent, but which many hi-fi fans find quite interesting. It is nothing more than a low-Q resonant circuit inserted at some point in the preamplifier to give a gentle "bump" to the response curve of the system at frequencies between about 2000 and 4500 *cps*. This is nothing more than a little trick used by "pop" recording manufacturers for years to make singing vocalists seem to stand out from the accompanying orchestra. Since the circuit is usually passive, nothing much can go wrong with it. We mention it here simply so that you won't be surprised, when taking the response measurement of a pramplifier equipped with this gimmick, to find a 5 or 6 *db* rise at some mid-frequency for no apparent reason. The effect is usually adjustable by means of a potentiometer and can be cancelled out for program material that does not warrant this "refinement."

Record Scratch Filters

These circuits, sometimes built right into preamplifiers and sometimes sold as separate equipment, are a worthwhile addition to a hi fii system, particularly if the proud possessor owns many older, 78 *rpm* recordings. The principle here is to retain as much of the music as possible while filtering out the maximum amount of surface noise. The problem is not as difficult as it would seem if you bear in mind the fact that most older, "scratchier" records had very little musical content above 5000 *cps* and that record scratch, as such, consists of frequencies above this point. The reason this filtering cannot be done with conventional tone controls is that their rate of cut (or slope) is too gradual, and for reasonable attentuation of scratch frequencies they would necessarily take a big bite out of the music portion of the spectrum as well. Scratch filters, on the other hand, are composed of both inductances and capacitors and can provide attenuation rates of as much as 18 *db* per octave, as shown in the comparison graph of *Fig. 7*. The shaded portion illustrates how much useful spectrum would have to be sacrificed to achieve equal attenuation at 10 *kc* using only tone controls. The biggest trouble encountered with scratch filters of this type involves hum. Because large inductances are usually present in the circuit, hum pick-up is apt to take place. Many users of such filters have them inserted in the chain at a point of too low a signal level. Thus the hum is particularly annoying. A quick cure involves nothing more than re-locating the filter *electrically*. For example, if a separate scratch filter is interposed between a preamplifier and an amplifier and the hum level seems too high, the chances are that the amplifier has too much gain and the preamplifier not enough. By increasing the volume setting of the preamplifier and correspondingly decreasing the input level adjustment of the power amplifier you can, in effect, improve the signal-to-hum level to a satisfactory point. Remember, doubling the voltage level *into* the filter will improve its signal to hum ratio by two to one (6 *db*). Do not carry this procedure to extremes because many preamplifiers begin to show signs of distortion when driven to levels exceeding 1 or 2 volts.

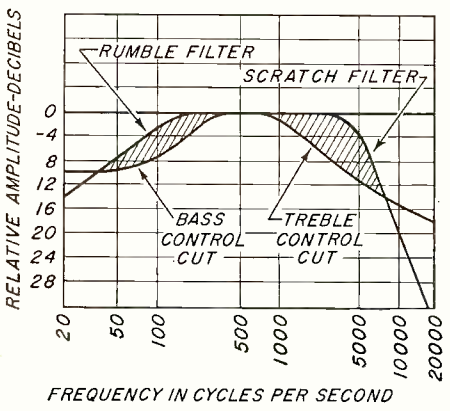


Fig. 7—Effect on audio response curve of filters and controls.

FM De-Emphasis characteristics

If a customer complains that his FM reception has suddenly become shrill and "hissy" the chances are that the de-emphasis capacitor has opened up. Just as in record making, FM broadcasters deliberately introduce a substantial amount of pre-emphasis before transmission. The receiver, on the other hand, is designed to attenuate the highs and restore normal balance (at the same time suppressing unwanted hiss and noise, as in record playback). The amount of de-emphasis agreed upon by the industry is an attenuation of 11 *db* at 8200 *cps*. Of course, this cannot be readily checked without *rf*, FM generators, but the components used to accomplish this de-emphasis are easily found and measured. The network used consists of a series resistor and a shunt capacitor to ground, immediately following the FM discriminator or ratio detector. The product of the two values (R in ohms times C in farads) is called the time constant and should equal about 75 x 10^{-6} (.000075). Thus, a 75 K resistor and a 1000 $\mu\mu fd$ shunt capacitor would comprise a proper combination for correct *fm* de-emphasis. In this instance, a shift in value of the 75K because of heat, or an open 1000 $\mu\mu fd$ capacitor would result in completely unbalanced and unnatural sounding FM reception.

Loudspeaker Padding

Many hi fi enthusiasts, in their quest for perfect sound, have assembled two-way and three-way loudspeaker systems which have anything but flat response. That is not to say that any one of their speaker selections was a poor choice. The fact is, the acoustic efficiency of loudspeakers varies greatly between units of different manufacture and occasionally, even between units bearing the same model number. It is not uncommon to find speaker efficiencies as low as 1% or as high as 15%.

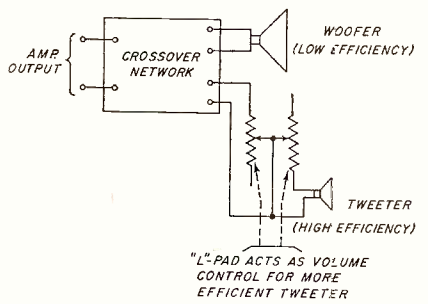


Fig. 8—An L pad for balancing the tweeter and woofer speaker outputs.

We will go into this subject in much more detail in the future. For the moment, however, it can be readily seen that if a "woofer" (low frequency speaker) having an efficiency of 1% is teamed up with a "tweeter" (high frequency speaker) having an efficiency of 5%, the result will be an overabundance of "highs." The easiest way to solve this one is to install a "pad" in the circuit of the overly efficient component as shown in *Fig. 8*. This device, technically termed an L pad, acts just like a volume control and enables the user to balance the output of the more efficient component against that of the less efficient one. The pad is usually mounted at the speaker to minimize extra stringing of wires around the room. Actual adjustment of the pad cannot, of course, be done with instruments and is a subjective matter between your customer and yourself. It is usually better to rely on your customer's judgment here, because he is the one who is most familiar with the sound of his system. Once adjusted, no further attention need be given to this control unless some major refurnishing or re-layout of the room furnishings takes place.

Turntable Rumble Filters

Like their "scratch filter" counterparts, rumble filters serve to reduce or eliminate this low frequency disturbance caused by somewhat inferior record changers or turntables. Rumble troubles usually lie in a band of frequencies between 10 and 60 *cps*. While it is true that the lower end of this band is inaudible anyway, the presence of such frequencies can, nevertheless, cause an annoying form of distortion. If the speaker cone is caused to move back and forth by a large amount at say, 10 *cps*., it means that portions of the regular program content are superimposed upon the speaker cone when it is in a highly distended position. Under these circumstances, the stretched cone will reproduce even the mid frquencies with distortion and reduced efficiency. The overall effect is not immediately apparent, but becomes annoying after extended listening. The best way to check for rumble is to gently touch the speaker cone with your fingertips (either from

[*Continued on page* 56]

Test Equipment

TRANSISTOR TESTER KIT

by the Technical Staff of KIT-TRONICS

THE KIT-TRONICS Model TT-2 Transistor Tester is a new high precision unit for testing PNP and NPN transistors and semi-conductors. It is available either in kit form or wired and tested. The TT-2 measures basic parameters of the transistor under test. As such, it corresponds to a mutual conductance tube tester as contrasted to the cheaper emission type of tube tester. It features a 4½" rectangular meter with a 2% movement and 1% precision components. It is housed in a molded phenolic case and is completely self contained and self calibrating.

It permits the serviceman to test a transistor without charts, and even without knowing in advance whether the transistor is NPN or PNP. The tester will determine the polarity of the transistor without damaging it.

The development laboratory and university laboratory will appreciate the quick and accurate tests provided by the tester. The audio fan will be especially well pleased with the feature which permits him to match like or unlike (i.e. NPN-NPN and PNP-PNP or NPN-PNP) pairs in push-pull applications, for both gain and leakage.

Ranges include current gain BETA 0-100 and 0-300, an expanded ALPHA scale 0.50 to 0.99 and Leakage I_{bo}.

Circuit Description

The tester operates the transistor under test as a *dc* amplifier in a common-emitter configuration.

The function is first set to switch select circuits for testing the transistor leakage I_{bo} between the emitter and the collector, as shown in *Fig. 1.* This position also provides for testing the transistor for short or open, and for measuring the front-to-back ratio of xtal diodes by using the TYPE switch to reverse polarity.

Next the selector switch is set to the CAL position and the calibration circuits are brought in to operation. A precise one microampere reference bias is placed on the base of the transistor under test, using 1% components. (*see Fig. 2*)

The selector switch is then turned to position BETA-300 and the base current is automatically increased by exactly 3.333 microamps, (*Fig. 3*). An increase of 1 *ma* in the collector current would correspond to a current gain of exactly 300. The function is linear and the meter BETA scale is calibrated from 0 to 300.

If the transistor under test is found to have a BETA of 100 or less, the selector switch is advanced to the BETA-100 position. Here the base current is automatically increased to a value exactly 10 microamps above the reference bias. A collector current of 1 *ma* would correspond to a current gain

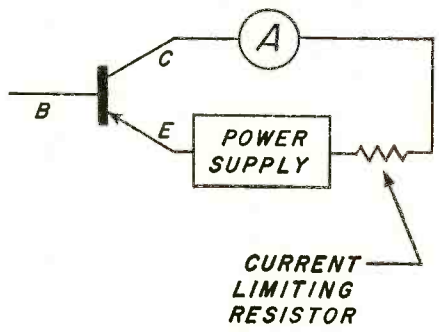


Fig. 1—Simplified circuit used for testing emitter to cathode leakage.

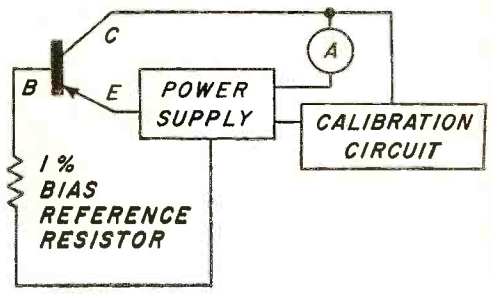


Fig. 2—Simplified circuit for calibrating the tester (CAL position).

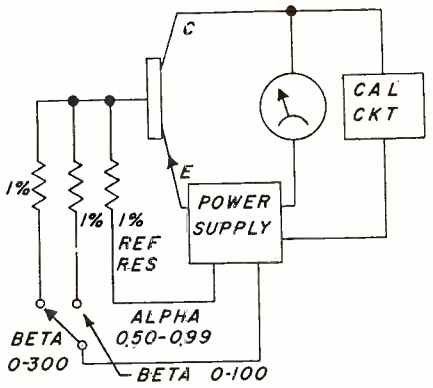


Fig. 3—Position BETA-300 for determining current gain of transistors.

of 100 and the BETA scale is therefore calibrated from 0 to 100.

The measurement of ALPHA, strictly speaking, requires operating the transistor in a common-base configuration. The direct measurement of ALPHA in such a circuit is not very practical since the range of interest (0.9 to 0.9999) is compressed into the upper ten percent of a linear meter scale. Fortunately ALPHA is equal to BETA/(1 + BETA) and the ALPHA range of interest can be displayed on most of the meter scale, using a logarithmic calibration. Accordingly the meter is calibrated to indicate ALPHA from 0.5 to 0.99, corresponding approximately to the BETA range 0-100. Values of BETA greater than 100, i.e. 100 to 300 on the BETA-300 range, correspond to values of ALPHA greater than 0.99. For example, a BETA of 200 corresponds to an ALPHA of about 0.995, a BETA of 250 to an ALPHA

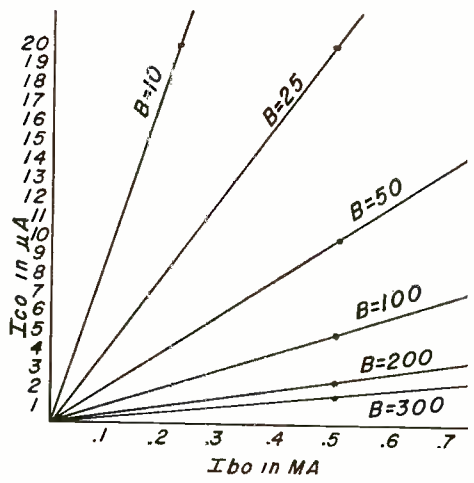


Fig. 4—Base collector leakage is read directly from above curves.

of about 0.996 and a BETA of 300 to an ALPHA of almost 0.996677.

The other important parameter of leakage I_{co}, the base collector leakage, can be read directly from the curves of *Fig. 4* after I_{bo} and BETA have been measured.

General purpose consumer equipment such as hearing aids, portable radios and auto receivers are using transistors having BETA in the 20 to 100 range. A few types with BETA above 100 have been introduced. One Transitron unit has a design center BETA of 180. After a little experience the service engineer will know the approximate gain required for the several popular transistor circuits in radio receivers and industrial applications.

SIMPSON MODEL 382 HORIZONTAL SYSTEM ANALYZER

by R. Patejunas and P. DePaolo

THE Model 382 contains two separate circuits to perform its functions as a Horizontal System Analyzer and Capacitor Tester. With the function switch in the "SHORTS" position, the circuits are arranged to test horizontal systems, flyback transformers and yokes for shorted turns. The other positions of this switch are for checking continuity and for measuring capacitance.

Short Tests

A 6K6 tube is used in a self rectifying oscillator circuit similar to that of a grid dip meter but used in a manner which causes the meter indication to be largely a function of the "Q" of the external device attached to the test leads. When a component or group of components (a horizontal system) is connected to the test leads, and either one or more of the components is shorted or contains shorted turns, power is drawn from the oscillator and feedback from the plate circuit to the grid circuit is reduced. This reduction in the energy fed to the grid reduces the grid current and the microammeter which is measuring the grid current drops down scale. This is only true if shorts are present in the component (yoke, or flyback transformer) or group of components being tested. (See *Fig. 5*).

It should be pointed out that there may be cases where very high "Q" components are tested. This applies in particular to a high efficiency deflection system and its component parts (yokes and flyback transformer). The Model 382 is adjusted so that the pointer is set to the ADJUST mark on the meter. The clip leads are then connected to the yoke or flyback transformer and the meter actually goes up scale or even "off" scale. This is completely normal

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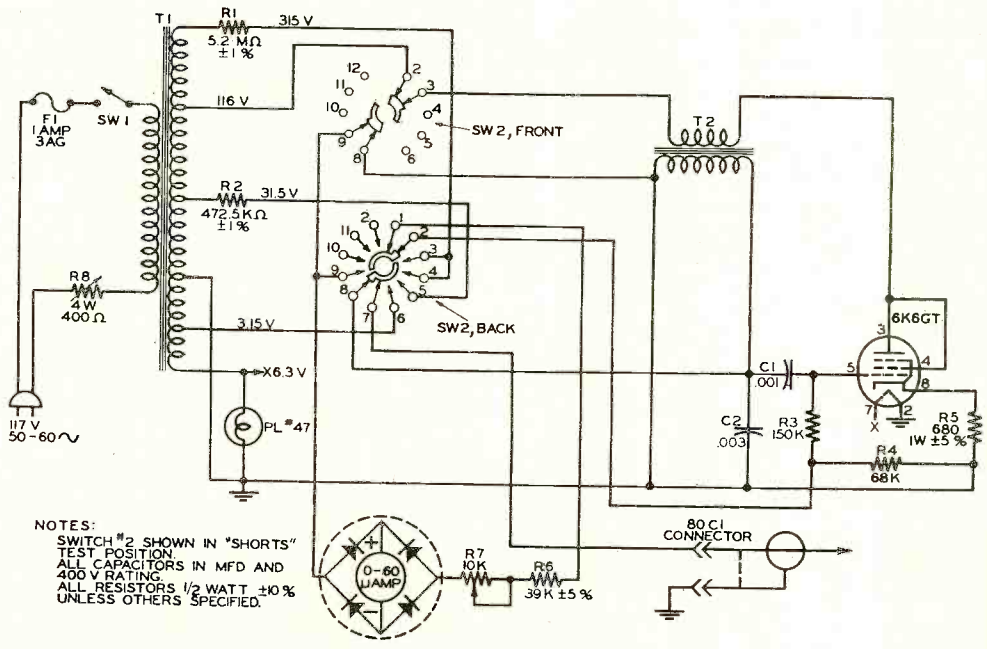


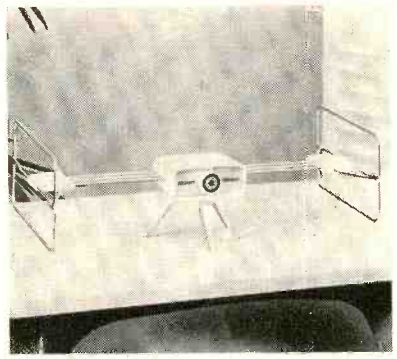
Fig. 5—Schematic diagram of Simpson Model 382 Horizontal System Analyzer.

ELECTRONIC SERVICING

NEW ANTENNAS

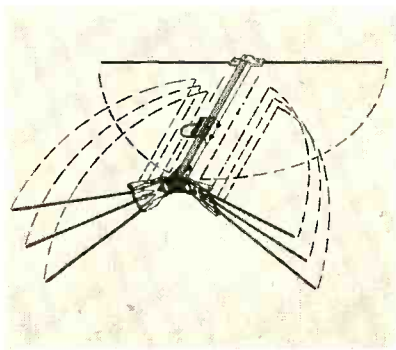
CHANNEL MASTER "SHOWMAN"

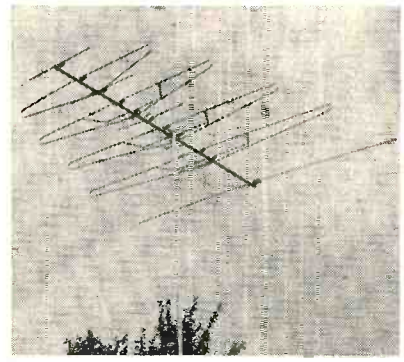
Channel Master Corp. announced a radically new indoor antenna, the Showman. The Showman is specifically designed to overcome the principal consumer objections to "rabbit ear" antennas, which may be unsightly with clumsy maneuverability. It is smartly styled in the latest fashion mode. A wide range of elegant color combinations offers the consumer an opportunity to match the antenna with their specific decor.



TELREX "QUICKIE"

Telrex Labs. announced its new high-performance "Conical-V-Beam" designed for the replacement-market as a low-priced, good-quality, durable, simple-to-install TV antenna. As its name implies "Quickie" is easy to assemble and quickly installed. This low-price, all-aluminum conical is rugged in design and has no plastic substitutes. Butterfly clamps are all-aluminum. The elements are doweled tubular, and position automatically.



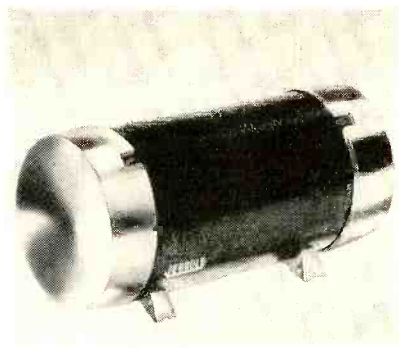


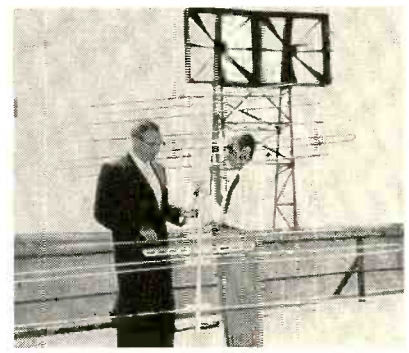
TV ANTENNA

The Trio Manufacturing Company announces the introduction of their new 1957 Zephyr Royal TV antenna which incorporates a new antenna development known as the "Wing" director. The "Wing" director is designed to enhance the power and sensitivity of the "Wing" dipole—a Trio innovation last year. The Zephyr Royal is manufactured by Trio Manufacturing Company, Griggsville, Illinois.

JERROLD "TRAP-EASE"

The Jerrold "Trap-Ease" is a tunable "deep-notch" antenna trap (greater than 50 db) that permits TV viewers to remove "beat" or "herringbone" patterns caused by strong adjacent channel sound or video carriers. Trap-ease works with any TV receiver and any 300-ohm antenna that would normally bring in pictures from the distant stations if the interfering adjacent channel were not on. Regular reception is not affected by the unit.



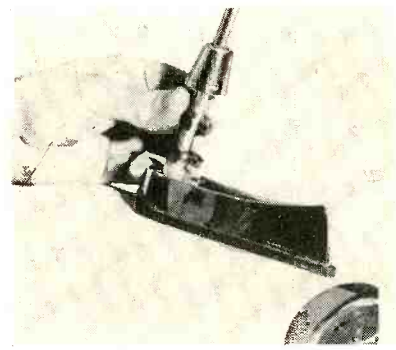


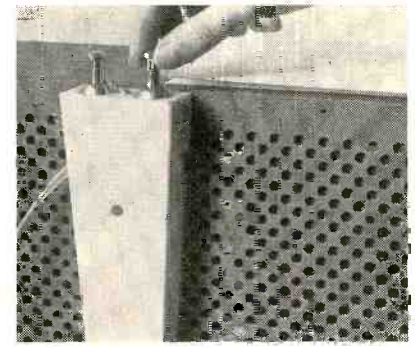
WALSCO FRINGE ANTENNA

Impressive performance reports from Walsco engineers are focusing attention on Walsco Electronics Corporation's latest entry in the super-fringe antenna field, the new "Super Wizard." Successfully completing a series of severe tests in extremely remote fringe areas, the developers claim it to be the first major antenna to overcome the reception problems of difficult locations once considered impossible for good reception.

SNYDER'S "ELDORADO"

A high-style advance-engineered auto radio antenna which can be easily adjusted to fit the lines of any automobile and which is designed either for fender mount or twin rear-deck installation, is on the market under the name of the "Eldorado," a product of Snyder Mfg. Co. The "Eldorado," a gleaming triple-chrome plated antenna with a die-cast base assembly and super-mount fits snugly either on a front fender or on rear decks.



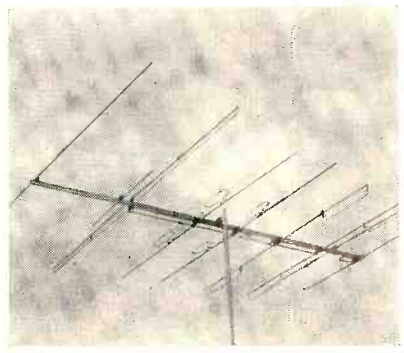


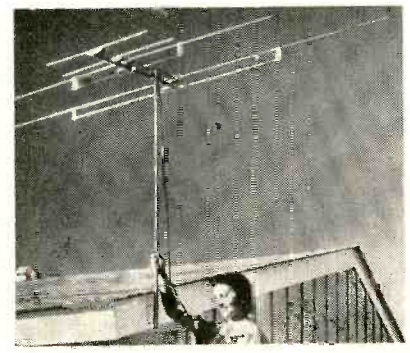
JFD SNORKEL-TENNA

A new miniature television antenna was announced by JFD Manufacturing for improving reception of portable, table and console television receivers. Featuring 4, 5 or 6 telescoping sections the Snorkel-Tenna measures as little as 7¾" tip to tip when closed. Encased in a sturdy colorful injection-molded high-impact styrene housing, the Snorkel-Tenna mounts permanently to the back of any TV receiver in a matter of minutes.

TACO "EXTRA-GAIN" ANTENNAS

Taco distributors are introducing the new Topliner antenna made by Technical Appliance Corporation. The antennas represent a complete departure from previous broad-band antennas, with resulting higher gain and better all-around electrical characteristics. One outstanding feature is the streamlined, compact design that not only looks better when installed, but also has a very definite mechanical advantage in minimizing wind resistance.





WINEGARD COLOR BEAM

A new "install-it-yourself" outdoor TV antenna manufactured by Winegard is completely assembled, attractively packaged, and ready for customer installation. The Color Beam comes with lead-in clip, insulators and all other necessary parts all attached—nothing to assemble—nothing to put together. Designed to meet the technical demands of color reception, the Winegard Color Beam is guaranteed to improve black and white pictures.

SERVICING 1957 EMERSON

The second portion of this illuminating discussion on servicing Emerson TV receivers considers the circuitry of the noise inverter, picture stabilizer and amplified pulsed agc stages.

PART 2

Radio Section of Port-O-Rama Models

Power for the radio is derived from the TV receiver's power supply when the function switch is turned to radio. The radio chassis consists of a 6BE6 converter, a 6BA6 as an *if* amplifier, a crystal detector, and uses the audio portion of the TV receiver. When in the radio position, the function switch removes the B supply from the sweep circuits and connects the *rf* radio antenna coil to one side of the self contained, telescopic, four section antenna. This arrangement not only provides adequate signal pick up but reduces power consumption and eliminates a possible source of internal interference.

Deluxe Series

All of the models in the Deluxe series are 21″ receivers incorporating a full power transformer chassis (5U4GB rectifier tube and parallel connected filaments), and the new Standard Coil Neutrode type tuner for superior signal to noise ratio and trouble free operation.

Picture Stabilizer Control and I.F. Noise Inversion

A noise inverter is generally used to provide maximum sync protection in electrically noisy, weak signal areas. This is accomplished by cancelling out all noise pulses which are of greater amplitude and in the same polarity as sync pulses.

Figure 5 shows an *if* type noise inverter circuit used by Emerson. A manually operated picture stabilizer control not only sets the proper level of noise inversion for various areas but also limits the peaks of the noise pulses as described earlier (Part one.) (*Fig. 3* picture stabilier control). The operation of the noise inverter circuit is as follows. The screen circuit of V-3 is not fully by-passed due to the relatively low value of capacitor *C-2* (68$\mu\mu$f). The screen circuit therefore, acts as a video detector. V-3 is neutralized by *C-1* rather than by the choice of a proper screen by-pass condenser as used for the 1st two *if* stages. With approximately 150 volts applied to the screen, the curve of screen current versus grid voltage is such that very little video information is detected, but all noise pulses (which are of the same polarity and greater in amplitude than the sync pulses) are greatly amplified. This results in a noise pulse to video information ratio at the screen grid of approximately seventeen to one. These detected noise pulses, which are of *negative* polarity, are fed through *resistor R-1* to one side of the picture stabilizer control (*R-2*) while regularly detected video information containing noise pulses of positive polarity are fed through *R-5* to the other side of the picture stabilizer control. These noise pulses subtract within the picture stabilizer control with the result that all noise pulses which originally were of the same polarity as the sync but of greater amplitude are now reduced, eliminated, or even made negative going depending on the setting of the picture stabilizer control. By reducing or eliminating these high level noise pulses, the sync separator tube will be able to function properly resulting in very stable sync performance. The wave shapes indicated in *Fig. 5* are exaggerated for clarity and would not actually appear on an oscilloscope unless the output from the video amplifier were disconnected when viewing the screen waveshape, and the output of the V-3 screen circuit were disconnected when looking at the video amplifier's contribution to the picture stabilizer control.

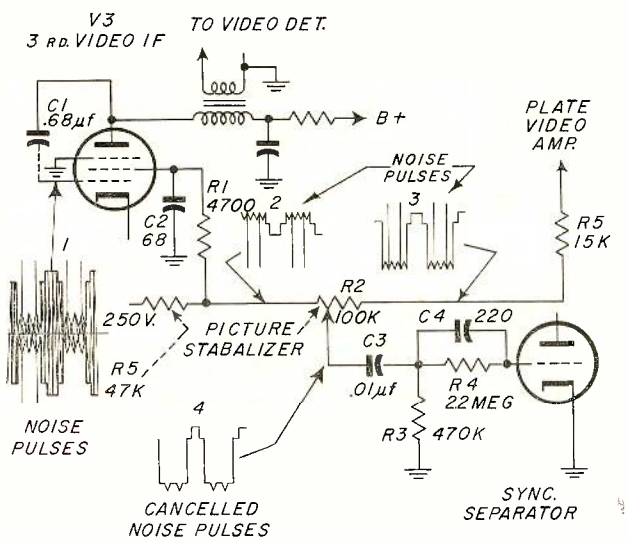


Fig. 5—Noise Inverter and picture stabilizer control circuitry.

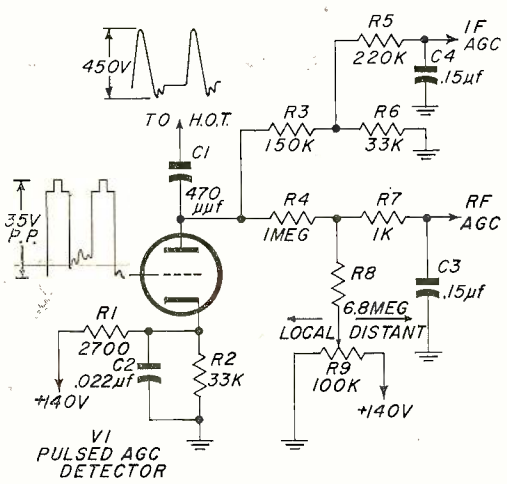


Fig. 6—Emerson Amplified, pulsed agc system with local-distance control.

Eldorado Series

There are six models in the Eldorado series, three of which are UHF-VHF receivers. This series was designed for superior operation in all signal areas (very strong signal areas, extremely weak electrically noisy signal areas, and areas with adjacent channel interference problems). To accomplish this end, a great deal of emphasis was placed in the design of the pulsed amplified *agc* circuit, the automatic noise inverter, the sync amplifier and separator circuits, the horizontal *afc* system, and the *if* system. The Eldorado models incorporate a die cast front which not only acts as the mask but also as the picture tube and chassis support. Because of this self contained construction, these models can easily be used for all sorts of custom installation.

The complete chassis assembly (picture tube and die cast front) are easily removed from the cabinet as a single unit. When out of the cabinet, many more components are accessible for replacement purposes without having to remove the chassis section or the picture tube from the rest of the assembly.

Amplified Pulsed AGC Circuit

An effective *agc* circuit is one which automatically adjusts the gain of the receiver to maintain uniform contrast over wide variations in received signal strength. To do this, the *agc* voltage

RECEIVERS

by **HAROLD BERNSTEIN**
Service Manager,
Emerson Radio Phonograph Corp.

should be able to vary from a few tenths of a volt negative to about sixteen volts negative and be dependent only on the strength of the actual incoming signal and not noise. A straight amplified *agc* system can provide the necessary wide variation in voltage, but since a pulsed amplified system samples *only* the horizontal sync pulse amplitude, it is not as affected by noise or the type of picture information being transmitted and is therefore superior to the ordinary non-keyed *agc*. The pulsed amplified *agc* circuit used in these receivers is shown in *Fig. 6*. A horizontal fly-back pulse is fed from the horizontal output transformer to the plate of the pulsed *agc* detector through capacitor *C-1*. The cathode voltage, and therefore the grid to cathode bias, of V-1 is set by the ratio of resistors *R-1* and *R-2* and is designed to keep the tube cut off during the absence of the fly back pulse on the plate. The fly-back pulse at the plate and the sync pulse at the grid will be applied at the same time. During this time V-1 can conduct and *C-1* will charge to a value depending on the amplitude of the sync pulse and that of the fly-back pulse. Since the amplitude of the fly-back pulse remains constant, the charge on *C-1* will depend only on the amplitude of the sync pulse, which is directly related to the received *rf* signal strength. During video time there is no horizontal fly-back pulse present on the plate of the *agc* detector and therefore the tube will not conduct. Noise pulses during this time, or changes in picture content cannot affect the *agc* voltage. During tube cut off *C-1* discharges through resistors *R-3* and *R-6*, developing the *agc* voltage. Almost all

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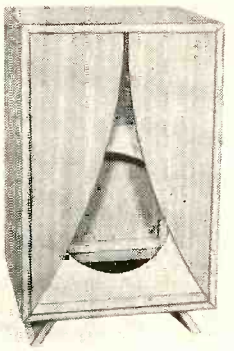
ELECTRONIC SERVICING

Hi-Fi — P.A. — AUDIO

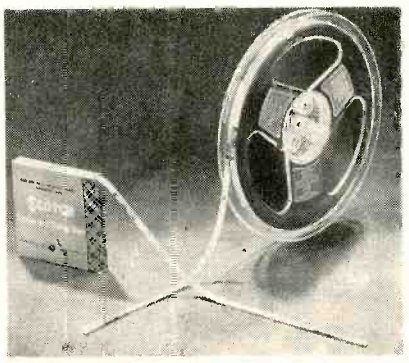


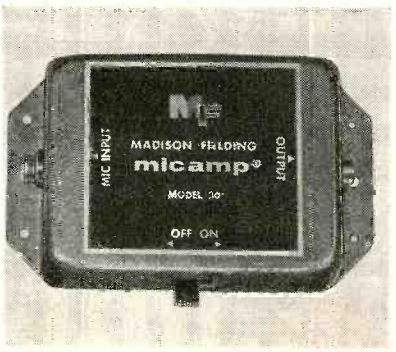
TRANSDUCER ENCLOSURES

A completely new '57 series of Karlson Transducer enclosures, including kits and asembled unfinished models with hardwood exteriors capable of fine furniture finish, has been announced by Karlson Associates, Inc., of Brooklyn, N. Y. All the enclosures in this new series offer improvements in performance based on the establishment of new testing techniques aided by an entirely new type of microphone which permits precision measurements.

MAGNETIC TAPE PLASTIC LEADER

A new plastic leader and timing tape featuring a special anti-static coating and a 50% increase in strength has been introduced by Minnesota Mining and Manufacturing Co., St. Paul, Minn., for use with magnetic tape. To be spliced to the beginning and end of a reel of magnetic tape, the new non-magnetic tape provides a tough protective leader that makes for easier tape thread-up and prevents damage to the recorded material.



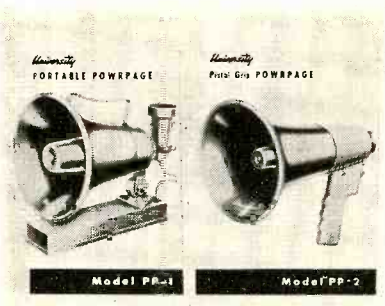


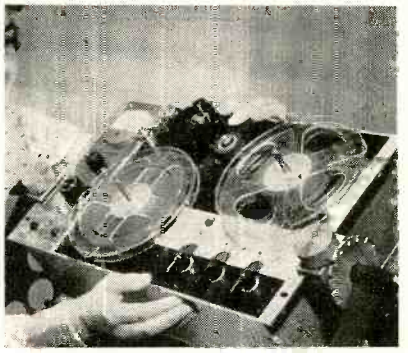
MICAMP MATCHING AMPLIFIER

The Micamp announced by Madison Fielding Corp., of Brooklyn, N. Y., will find application in Hi-Fi systems where the problem of matching a low-impedance output to a high impedance amplifier has hitherto been resolved by a transformer. In addition to providing a 30 db gain from input to output there is an absolute zero in hum. Micamp permits the use of high quality, low impedance mikes with tape recorders and high fidelity systems.

ELECTRIC MEGAPHONE SYSTEMS

University Loudspeakers, Inc., White Plains, New York, announces two new self-contained systems for soundcasting, embodying advanced design and exclusive features to produce compact, efficient and lightweight units. The two models, Portable Powerpage (PP-1) and Pistolgrip Powerpage (PP-2) fill practical applications of outdoor and indoor soundcasting for self-contained equipment. Both PP-1 and PP-2 are powered by flashlight cells.



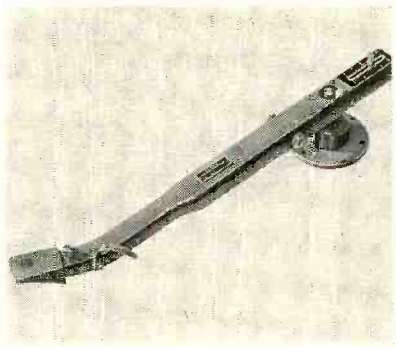


TRANSISTORIZED TAPE RECORDER

Transistorized hi-fi magnetic tape recorder for home-assembled music systems and industrial sound systems has been placed on the market by the Radio Corporation of America. RCA-developed instrument SRT-2 shown in the display rack is a tape recorder-reproducer chassis incorporating such design advances as transistors, printed circuitry, and electrodynamic operation which eliminates parts formerly required to change speed and direction.

60 WATT HI-FI AMPLIFIER KIT

Featuring the ACRO TO-330 output transformer, the new HF60 power amplifier is the latest in the EICO line of 52 instruments and HI-FI in kit and wired form designed and manufactured by Electronic Instrument Co. of Brooklyn. The circuit comprises an EF86 low-noise voltage amplifier direct-coupled to a 6SN7GTB cathode-coupled phase inverter which drives a pair of ultra-linear connected push-pull EL34 output tubes.

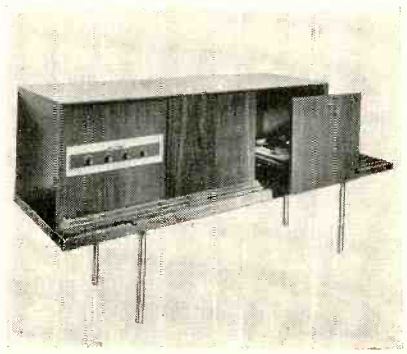


TONE ARM KIT

The Audak Company announces that a tone-arm has been successfully engineered specially for a do-it-yourself kit. This new Audax kit consists of only 3 basic parts which anyone can assemble in about 10 minutes into a complete professional tone-arm which exactly duplicates the Audax transcription arm. Simplicity of design eliminates spurious responses. The arm weight is supported on a needle-point. Hence the name "compass-pivoted" arm.

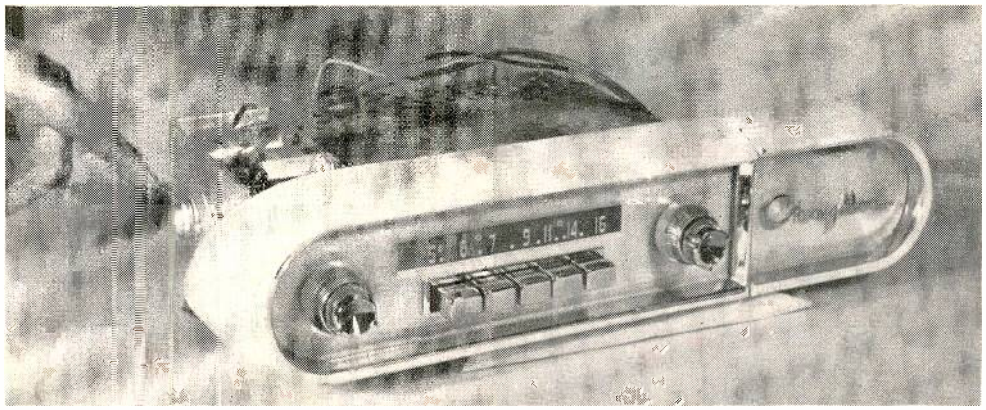
FM/AM TUNER-PREAMPLIFIER

Bogen FM/AM tuner-preamplifier Model R775 provides ease and accurate FM tuning through the Bogen Auto-Lock Tuning Circuit according to Bogen. This unit makes precise adjustments for accurate reception and then locks into position. No station "drift" is claimed, or the chance of a strong broadcast signal dominating the *a.f.* control because it does not operate until a station is selected. FM sensitivity is 2 microvolts for 30 db of quieting.



NEW EQUIPMENT CONSOLE

Electro-Voice, Inc., Michigan announces a newly designed equipment console and bench. The Model 890 console enclosure measures 54" x 16" with a depth of 17¼". The center storage compartment will accommodate any size line amplifier. The front panel of the compartment can be removed for conversion to record storage or for installation of an 8" speaker enclosure. The record changer drawer slides forward at a convenient operating height.



Philco auto radio Model C-5705 used in Chrysler cars.

Auto Radios for 1957—Chrysler

The advent of transistorization and 12 volt plate supplied tubes have brought on new problems of servicing and maintaining auto radios of this type.

THE 1957 Chrysler auto radios are partially transistorized. Model C-5705 is a five tube plus transistor set, push button and manually tuned with a printed wiring chassis. Models C-5707 and C-5709 are six tube plus transistor sets with a push button and search tuning. All sets have a rear speaker socket and panel fader control while the search tuner sets also include a foot switch jack and phono socket.

All the power to these receivers, including the plate and screen circuits, is supplied directly by the car battery. This of course makes the vibrator unnecessary, and is made possible by utilizing newly developed tubes especially designed to operate at very low plate and screen voltages.

Receiver Removal

Removal of these receivers is accomplished simply in the following manner:

1. Disconnect the three connecting leads, being careful when removing the speaker clips to grasp the fibre terminal strip firmly while pulling evenly on the zipcord leads. These new type terminals are very tight fastening and the fibre strips, as always, are very thin and breakable.
2. Removal of one bottom screw under the dash, two long Phillips screws through the bottom of the front panel and two screws behind the dash and on either side, loosens the set.
3. Carefully lift the front escutcheon to clear the top of the heater control panel and pull outward, clearing the set through the front of the dash.

Note: It is recommended that where it is found too difficult to get at the screw concealed by the wiper motor that the glove box be removed to facilitate handling of the set.

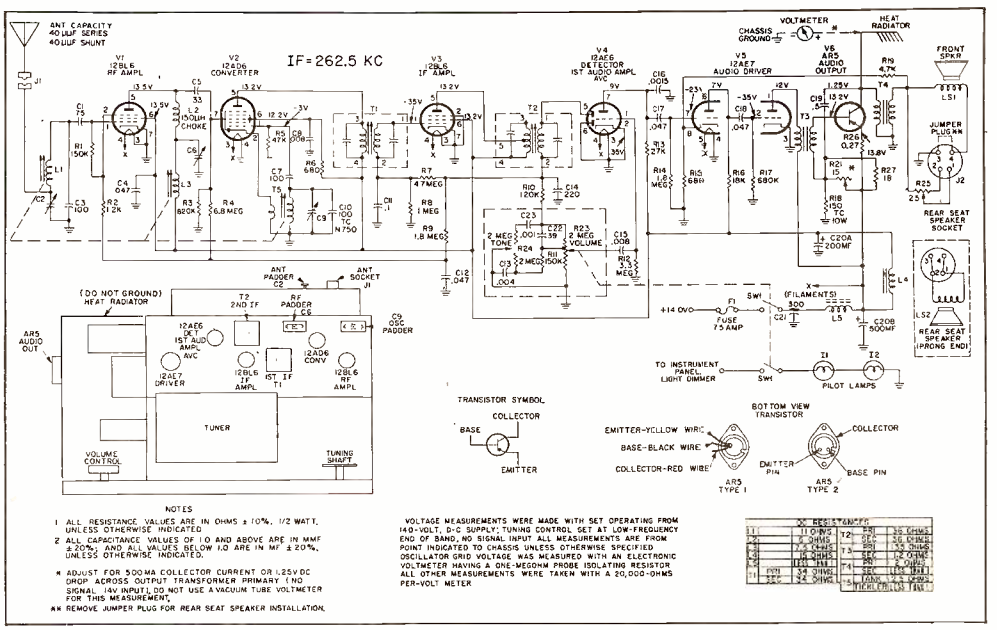
Trouble Shooting

It is important at all times with all auto transistor sets that the battery polarity be observed, either in the car or on the test bench. The "A" lead or fuse lead *must be positive* and the chassis *must be negative*. Never connect the negative lead to the aluminum frame holding the transistor which is called the "heat sink". This heat dissipator is "above ground" in this set and while the connection to ground will not damage the transistor, no output will be heard.

In all cases, it is well to remember that the transistor itself is a fairly rugged component but mishandling or failure of an associated part may cause its failure. Therefore the set must never be operated without a speaker and checking of parts cannot be accomplished by grounding of terminals as in previous all-tube sets. Never substitute or clip on parts with the power on since the normally small voltages and currents used must operate within close tolerances for safe operation of the transistor.

When no audio is heard, it is best to check the transistor and its circuit components before replacing. The commonest intermittent items to check for causes of transistor failure are the speaker fader control and the transistor bias control. A fair indication of transistor operation is a heavy thud heard from the loudspeaker when the power switch is turned on. Also heard is a hissing, similar to an *fm* carrier, when no sta-

[*Continued on next page*]



Schematic diagram of Philco Model C5705 (Mopar 847).

AUTO RADIOS [*from preceding page*]

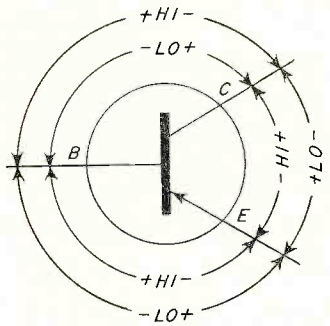


Fig. 1—Resistance check guide for PNP transistors.

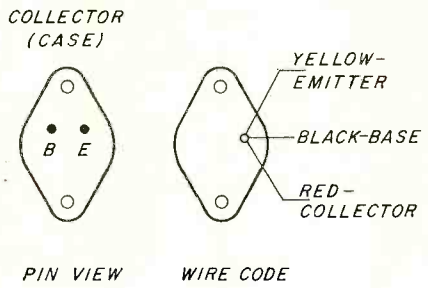


Fig. 2—Base and wire connections used in two types of Philco transistors.

tion is tuned in.

Power transistors can be rough-checked by battery operated ohmmeter resistance readings, as indicated in Fig. 1. *It is of utmost importance that the polarity of the ohmmeter leads be known, and that the proper polarity be observed in applying these leads to the transistor.* The resistance in the conduction direction is very low compared to the resistance in the nonconducting direction. Low readings are 10 to 100 ohms and high readings are 100,000 to 10 megohms. Checks which show lower readings than these indicate faulty, shorting transistors.

When making the bias adjustment after replacing the transistor, always use a fibre tool. Shorting the base of the transistor, which is connected to the control rotor, to ground, will destroy the transistor. Before applying power, center the control rotor and connect a *dc* voltmeter from the heat sink to chassis. With power on, adjust model C-5705 for 500 ma. or models C-5707 and 5709 for .75 volt bias. Another method is to connect a *dc* ammeter in the collector circuit and adjust model C-5705 for 500 ma. or models C-5707 and 5709 for 750 ma. current.

There are two types of transistors used, as indicated in *Fig. 2,* and either may be substituted for replacement. Philco numbers are AR5 and AR6, with either pin type connections or color coded wire leads. Where a wire lead unit is replacing a pin type simply follow the yellow and black color coding and solder the red lead to a convenient tie point riveted to the heat sink. In reverse, the pin type can be used with terminal jacks from a miniature tube socket. When inserted, these jacks must be insulated by a fibre strip to prevent shorting to the heat sink. In every case, be absolutely sure that the transistor body or collector is securely fastened flush with the heat sink and both bolts tight with lock washers.

Important Note—Never use other than battery-operated meters and equipment in the transistor circuit. When soldering is necessary, power must be disconnected from the set. Care must be exercised when soldering both on printed circuit panels and transistor connections, since excessive heat may spoil internal contacts.

The tube circuits can be checked in the usual manner in all but the driver stage. Tubes can be clicked on the grid terminals or removed temporarily for checking. The driver stage, however, must not be disturbed with power on since changes of current will affect the transistor. Substitution of the tube or its associated parts must be done with the power off.

Microphonics in most instances is not due to a faulty driver tube. It has been found that the output required of this tube to drive the transistor, necessitates such close spacing between tube elements, that excessive vibration will cause microphonics. In view of this tapping of the chassis instead of the driver tube would be the better check.

Where the customer complaint is of excessive hum and distortion, it is best to check the bias adjustment and the filter condensers before condemning the transistor. Filters can be jumped across

[*Continued on page* 55]

Mfr.: Admiral **Chassis No.** 14YP3B

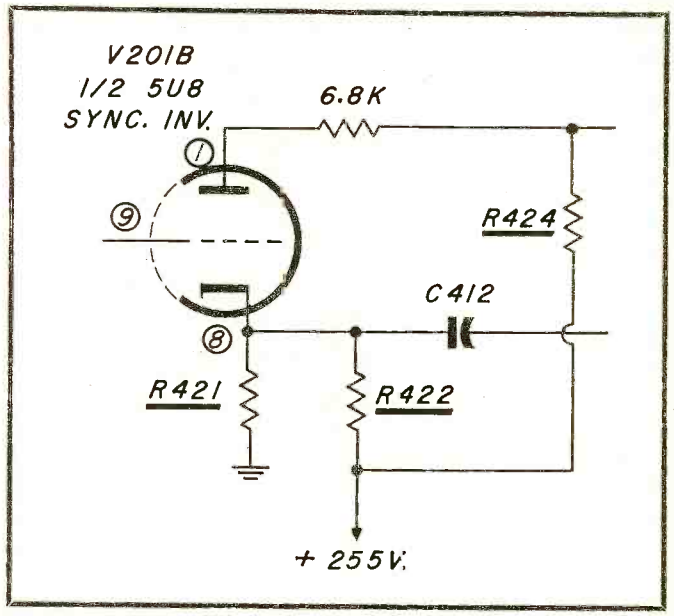
Card No.: AD-14Y-1

Section Affected: Pix.

Symptoms: Sync instability.

Reason for Change: To improve circuit operation under high contrast levels.

What To Do:
Replace: *R421* and *R424* (4,700 ohms) with 3,300 ohms. *R422* (39K ohms) with 47K ohms. This change was included in run 10 through run 12.



Mfr.: Admiral **Chassis No.** 14YP3B

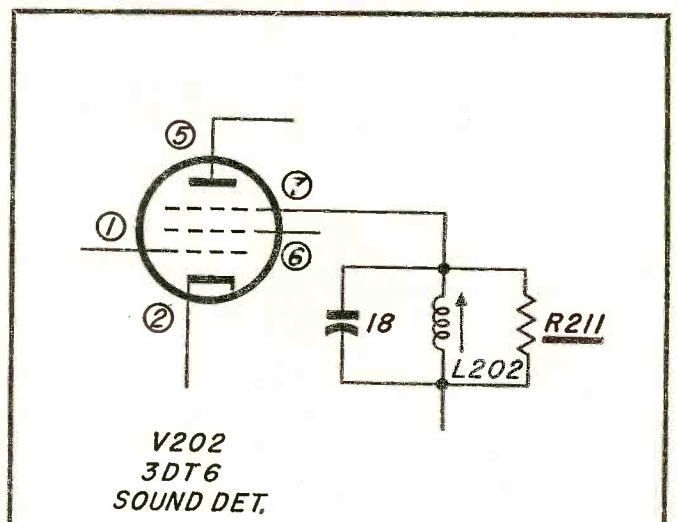
Card No.: AD-14Y-2

Section Affected: Pix.

Symptoms: Audio distortion.

Cause: Drift, especially during warm-up time.

What To Do:
Add: *R211* (100K ohms) across quadrature coil *L202*. This change was included in run 10 through run 12.



Mfr.: Admiral **Chassis No.** 14YP3B

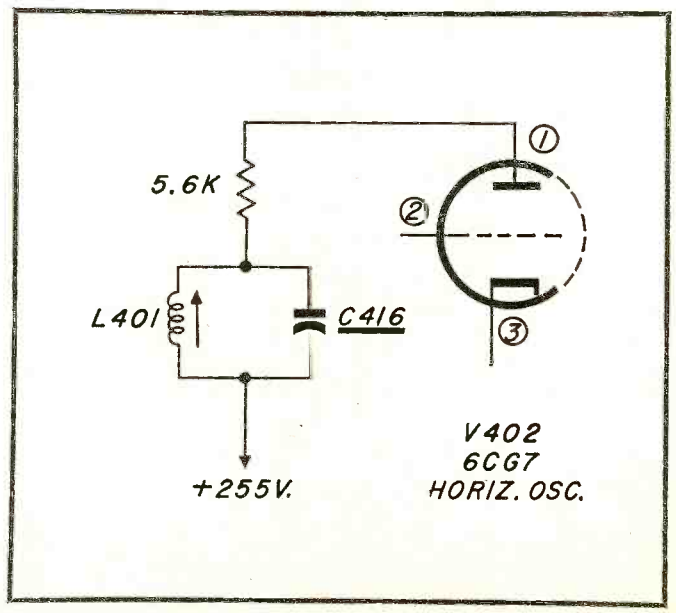
Card No.: AD-14Y-3

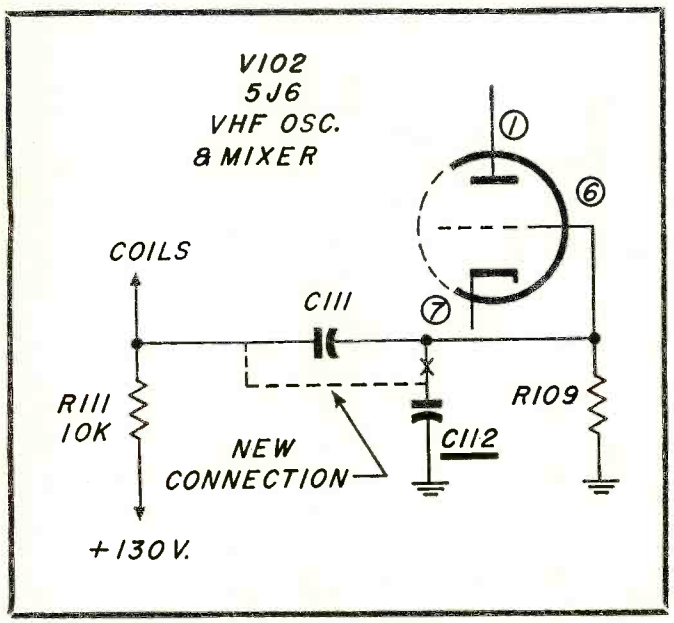
Section Affected: Pix.

Symptoms: Horizontal sync instability.

Reason for Change: To prevent frequency drift due to change in capacitance of circuit component.

What To Do:
Replace: *C416* (.0039 μf) paper tubular type with a mica type. Admiral part number 65B21-392. This change was included in run 10 through run 12.





Mfr.: Admiral **Chassis No.** 14YP3B

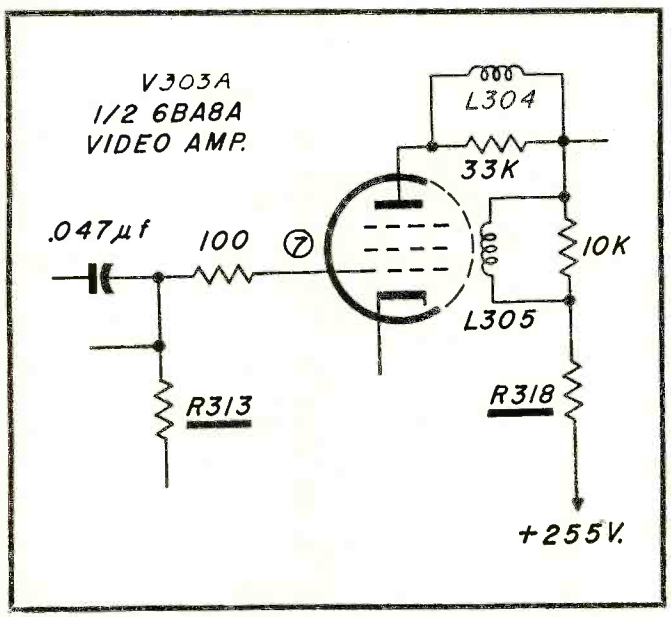
Card No.: AD-14Y-4

Section Affected: Pix and sound.

Symptoms: No picture and sound due to local oscillator not operating.

Cause: Under low line voltage conditions oscillator circuit may cease oscillating due to lowered transconductance.

What To Do:
Change: *C112* (5 $\mu\mu f$) from junction of *C111* and *R109* to junction of *C111* and *R111*. This change was included in run 10 through run 12.



Mfr.: Admiral **Chassis No.** 14YP3B

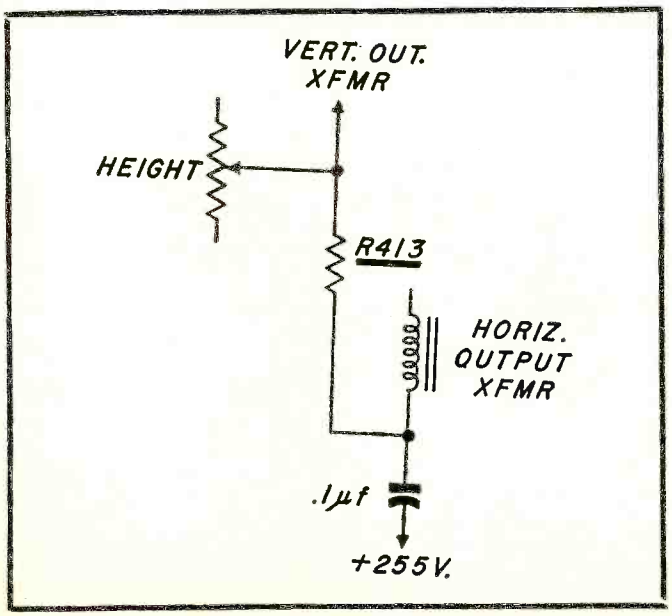
Card No.: AD-14Y-5

Section Affected: Pix.

Symptoms: Picture turns negative or has silvery appearance at high contrast levels.

Cause: Video amplifier grid and plate resistors may have changed value.

What To Do:
Check: *R313* (1.3 megohms). *R318* (6.8K ohms, 2 watts).
Also picture tube.



Mfr.: Admiral **Chassis No.** 14YP3B

Card No.: AD-14Y-6

Section Affected: Pix and raster.

Symptoms: Insufficient height.

Cause: Resistor increased in value.

What To Do:
Replace: *R413* (6800 ohms, 1 watt).

Mfr.: Philco **Chassis No.** 7E10 and 7E11

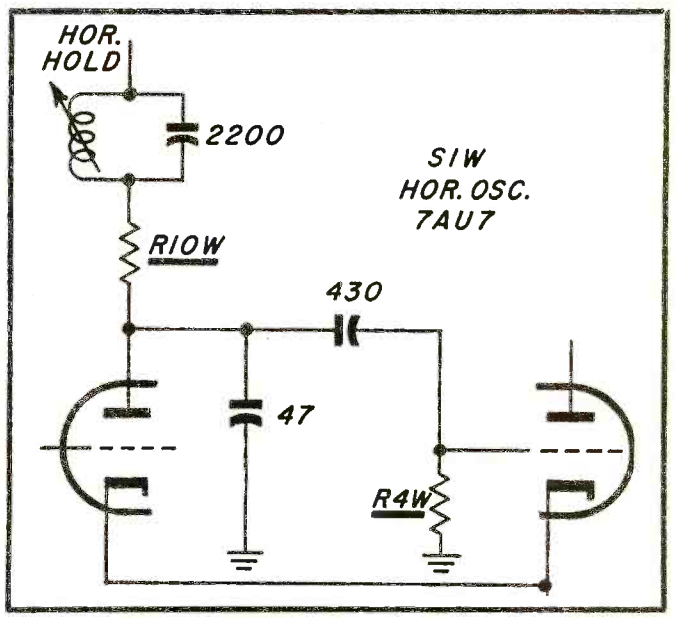
Card No.: PH-7E-1

Section Affected: Pix.

Symptoms: Critical horizontal sync.

Reason for Change: To improve horizontal oscillator performance.

What To Do:
Replace: *R10W* (15K) with 10K, ½ W.
R4 (130K) with 150K, ½ W.



Mfr.: Philco **Chassis No.** 7E10 and 7E11

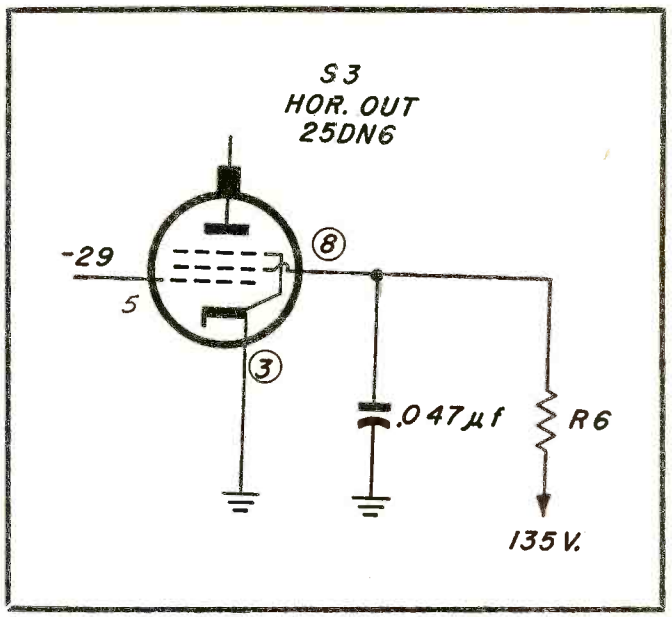
Card No.: PH-7E-2

Section Affected: Pix and raster.

Symptoms: Insufficient width.

Cause: Low screen voltage under low line voltage conditions.

What To Do:
Replace: *R6* (1500 ohms) with 1200 ohm resistor.



Mfr.: Philco **Chassis No.** 7E10 and 7E11

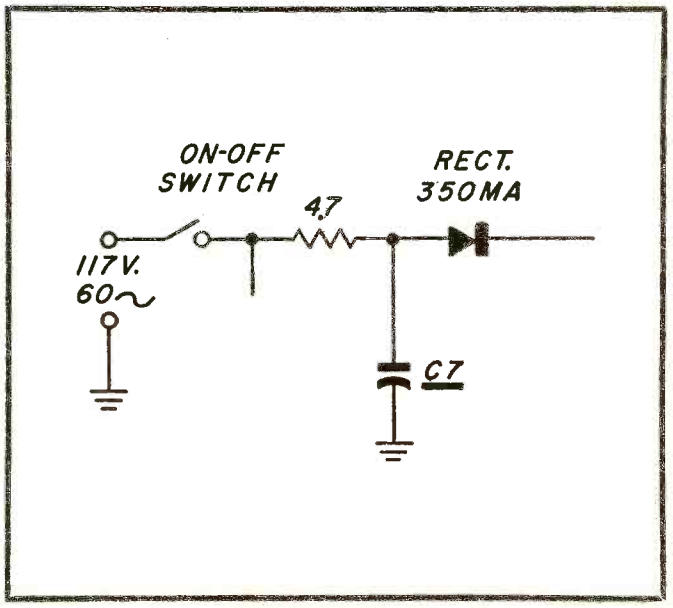
Card No.: PH-7E-3

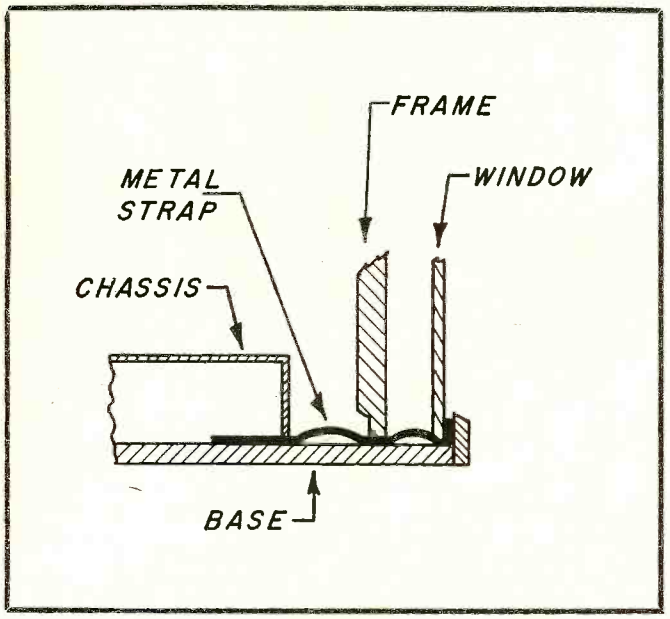
Section Affected: Nearby radios are interfered with.

Symptoms: Tunable whistle in audio output of radio.

Cause: Horizontal deflection voltages are not filtered and prevented from being present on power lines.

What To Do:
Change: *C7* (.047 μf) to .1 μf.





Mfr.: Philco **Chassis No.** 7E10 and 7E11

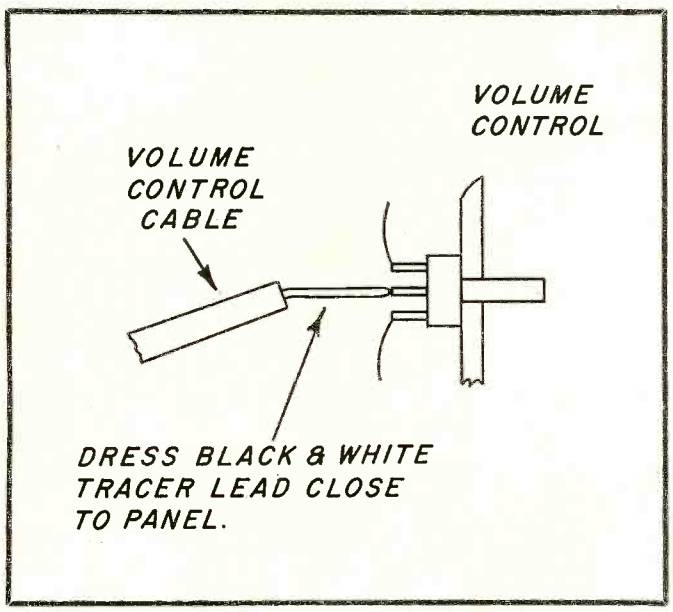
Card No.: PH-7E-4

Section Affected: "Popping" noise.

Symptoms: The most probable cause is a poor ground connection from the chassis to metal window frame.

Cause: When the metal ground strap makes a poor contact between chassis, frame and window a static charge is built up on the metal frame and window which causes the popping sound when it breaks across the air gap or poor connection.

What To Do:
Check: Grounding metal strap beneath the bottom rail of the metal frame and the window. The weight of the window will generally cause good connection and hold the strap in place. The other end of the strap should be connected to the chassis by its pressure as it rests on the end.



Mfr.: Philco **Chassis No.** 7E10 and 7E11

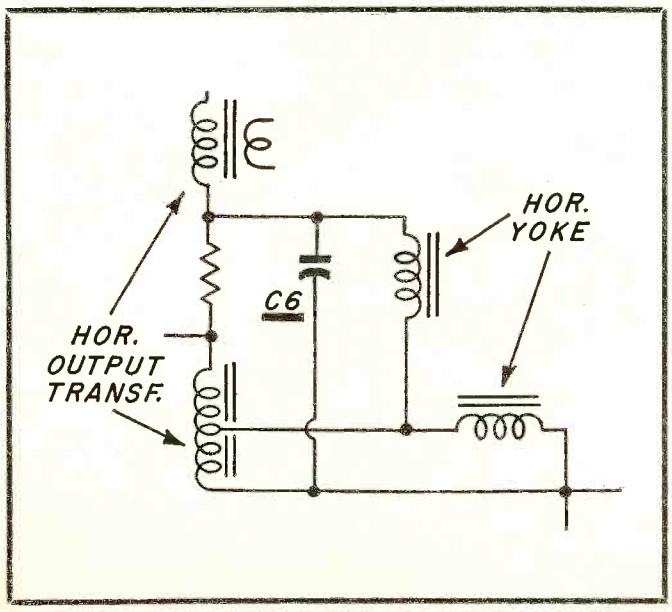
Card No.: PH-7E-5

Section Affected: Sound.

Symptoms: "Squeal."

Cause: Feedback in the audio amplifier grid circuit.

What To Do:
Check: Lead dress of inner conductor of the volume control cable conecting the grid of the 5T8 audio amplifier tube to the volume control. Position inner conductor of the cable (black and white tracer) as close to the surface of the panel as possible. In addition to this, tilt the audio couplet, 30-6023, toward the 5T8 tube socket as far as possible.



Mfr.: Philco **Chassis No.** 7E10 and 7E11

Card No.: PH-7E-6

Section Affected: Pix and raster.

Symptoms: No raster or high voltage.

Cause: Shorted horizontal damping condenser across yoke.

What To Do:
Replace: *C6* (82 μf, 3KV ceramic disc type), Philco part number 30-1246-4.

SELL SERVICE

WITH EFFECTIVE ADVERTISING

PART 1

By M. E. WIRT

You are a professional television technician. You probably spent some time in an accredited school learning your profession, have studied many hours on your own time to keep up with the almost daily advances made in television, and are equipped by knowledge, skill, and experience to repair any make or model of television receiver with a minimum of delay and "out of use" time.

Now—you know this, we know this, and probably a few of the customers whose sets you have repaired know this, but who else knows it? Probably darn few, if you don't advertise, or don't advertise properly. It is the purpose of this article to show you some of the more effective ways to sell your service through advertising, and every one of them has proven its merit in actual use. So don't just read them and forget them—apply them!

The first thing to bear in mind is that you must, in some way, "individualize" your advertisement. It is necessary to see that *your* particular advertisement stands out from the many who will be using the same basic style or format. Don't just head up your advertisement in the newspaper, for example, with something like "TELEVISION SERVICE" or "RADIO AND TV SERVICE." Look at the rest of the ads; they say substantially the same thing, and if a potential customer is searching for TELEVISION SERVICE, why repeat the original heading? The name of your concern might be something like UNITED TELEVISION SERVICE or BILL JONES TV SERVICE. But whatever it is, the thing to push is *your* name, the name of the man in charge of your service department, or the name of the man who does the actual bench work.

The next thing to do is to make your advertisement DIFFERENT. The old saying that "brevity is the soul of wit" can also be applied to advertising, but remember that the DIFFERENT advertisement catches the eye. Don't let your ad follow the same lines as all the rest. Use a little imagination in not only the composition of your ad, but also in the way in which it is displayed or presented. Not only that, but don't tie yourself down to only one form of advertising. Many ways of advertising are available to you, among them being newspaper, (probably the most effective for service if used consistently), radio, television, direct mail, circulars, envelope stuffers, handbills, and the telephone directory "Yellow Pages." Last, and best of all, is word-of-mouth advertising, and this is entirely dependent on your service quality.

So now you've made your advertisement both *personal* and *different*. What's next? Let's try TRUTH. You wouldn't want to make a statement that wasn't true concerning some phase of your work or a repair job you have done; the same sense of ethics won't let your advertisement mislead anyone, even by implication. Don't use "half-truthful" statements that may be taken more than one way. It isn't fair to the customer to make them believe one thing when you mean another, and it isn't worthwhile "sales-wise." You may fool them once—but if they feel they've been "had," never again.

There is another facet of advertising which is sometimes used, sometimes unused, and sometimes mis-used, but

[*Continued on page* 51]

trade

Over 8.4 million radios, excluding automobile receivers were shipped to dealers during 1956, RETMA reported—an increase of more than 1.3 million over the number of receivers shipped in 1955. During December, 1,544,987 radios went into the hands of dealers, compared with 797,011 radios sent to dealers in November and 1,273,181 units shipped in December 1955.

Nearly 7.1 million television receivers were shipped to dealers during 1956 to become the fourth highest year on record. During the last year, 7,028,456 TV set moved into the hands of dealers, RETMA reported, compared with the all-time high of 7,421,978 in 1955, and 7,161,362 and 7,078,000 in 1954 and 1950, respectively.

• • •

Bill Ashby, well-known expert and lecturer on TV servicing, is again on an extended tour of the country with his Radio-TV Clinic. Underwritten by the Cornell-Dubilier Electric Corporation and sponsored by local Parts Distributors, the Clinic is scheduled for most of the major cities in the U. S.

Servicemen who have already attended Clinic meetings have found them unusually helpful. The Clinic features Bill Ashby's famous "Chalk Talk"—a unique blackboard presentation, based on the use of cartoons and sketches that simplify complex problems. The "Chalk Talk" is followed by a question and answer period that gives every serviceman the opportunity of asking the questions that so often go unanswered at meetings of this sort.

• • •

Multi-Tron Laboratory, this week unveiled the first basic design change in Cathode Ray Tubes since the introduction of electrostatic focusing and deflection. The new tube, called the "Pure Signal" Tube, is of "multiple beam" design, and it is claimed, takes a signal directly from the crystal detector, completely eliminating the necessity for the video amplification circuitry section in any current TV chassis. According to a statement by Nicholas Glyptis, President and Research Director of Multi-tron, and his staff, this "Pure Signal" tube opens the way for full utilization of transistors, as this tube can be transistor driven.

• • •

A new line of electronic test instruments in kit form has been launched by the Paco Electronics Company, Inc., a newly formed division of the Precision Apparatus Company, now celebrating its 25th anniversary. The PACO kits were unveiled for the first time at the New York Radio Engineering Show. They are expected to find wide application in radio and TV servicing, hi-fi custom-building and service, electronic hobbies and amateur radio, science education and technical schools, as well as industrial testing and quality control.

• • •

David T. Siegel, 125 Beach Road, Glencoe, Illinois, died suddenly in Palm Beach, Florida, Friday, March 8. Mr. Siegel, prominent in the electrical and electronic industries, was the founder and president of the Ohmite Manufacturing Company, Skokie, Illinois. The firm manufactures resistance products and other electrical components.

Throughout the rapid growth of the firm, which was founded in 1925, Mr. Siegel was closely associated with all phases of the business. However, he never lost sight of the fact that people were important and he was always in the forefront with progressive employee relations and modern facilities.

• • •

The Delco Radio Division of General Motors announces the introduction of an all-transistor automobile radio in the Cadillac El Dorado Brougham, Cadillac's new luxury model.

The announcement was made in connection with the annual convention of the Institute of Radio Engineers (IRE) now being held in New York.

Using 13 transistors and three germanium diodes, the advanced set requires approximately 90 per cent less current to operate than a conventional car radio and has an improved reliability factor of at least 50 to 1, according to Delco Radio engineers.

Manual, push button and Wonder Bar tuning are provided as well as a two speaker fader system and an electric antenna which automatically extends when the radio is turned on and retracts completely when the radio is turned off.

The advanced design makes the best use of automatic gain control to provide reception almost completely free of fading problems.

• • •

Norman A. Triplett, Executive Vice Pesident of Triplett Electrical Instrument Company, Bluffton, Ohio, announces effective immediately, Norm Edin-

flashes

ger will assume the responsibilities of marketing service manager for Triplett. Mr. Edinger is well qualified to fill this recently created position having spent fifteen years in various phases of the Triplett operation. In announcing the appointment, Mr. Triplett pointed out, "This is only one more step in our program to provide a more personalized liaison between our customers and our factory operation."

• • •

A testimonial dinner for Julius Finkel, president of JFD Electronics, Inc., in honor of his 70th birthday, was held at the Hotel Commodore in New York City on March 30, 1957. Proceeds from the dinner will be used for the establishment of the Julius Finkel Free Loan Fund in Israel. A highlight of the dinner was the presentation to Mr. Finkel of a scroll signed by all of his employees.

• • •

A unique program of advertising and promotion for the Snyder "Imperial" 10-D single-mast indoor TV antenna has been evolved in this area by Snyder Mfg. Co., Alma Radio Co., Snyder distributor and all the department stores. Tentatively, the plans revolve around initial exclusives to the department stores in the Philadelphia area for an unspecified limited period of time and guaranteed sales by the manufacturer. In addition, the initial announcement of the marketing of the antenna broke here on March 17th over the signatures of all the department stores for the first time in retail history in the Philadelphia area, Mr. Snyder disclosed. Heretofore, he said, the department stores have never joined in sponsoring any one product or line of products in joint advertising.

• • •

CBS-Hytron will continue and expand its aggressive support of independent radio-television service dealers across the nation in its 1957 sales promotion program, according to an announcement by John H. Hauser, Distributor Sales Manager, issued from the company's executive offices in Danvers, Mass.

At a recent sales conference with its national sales force, CBS-Hytron, the electron tube and semiconductor manufacturing division of Columbia Broadcasting System, Inc., set up a new approach to the problem of giving effective support to the independent radio-television service industry. The 1957 CBS-Hytron program calls for extensive national advertising augmented by concentrated local promotion aimed at attracting business into the shops of independent service dealers.

• • •

Military secrecy has been lifted from a new electron tube that adds might to radio's muscles, allowing these electronic devices to see targets more clearly and farther away. Developed by Raytheon Manufacturing Company under sponsorship of the Army Signal Corps Engineering Laboratories, Fort Monmouth, N. J., the new tube's peak power is equal to that needed to light a city of 200,000 people. Called an "amplitron." the new tube effectively "beefs up" the radar's performance by amplifying or boosting the energy output of the basic signal as much as 8 to 14 times. When added to the air traffic control radars now being built by Raytheon for the Civil Aeronautics Administration, the effective range of these sets will be increased from 200 miles to about 350.

• • •

The inclusion of a new permanent dealer aid, the Select-A-File, in RCA's 1957 Spring portable radio battery promotion kit, was announced by L. J. Battaglia, Manager, Marketing Department, RCA Components Division.

"Designed to support the RCA dealer in his biggest battery market year," said Mr. Battaglia, "the Select-a-File is a complete, illustrated, up-to-date source of battery replacement information for practically every portable radio currently in use. Contained in a sturdy steel file box, a data card carries a photograph of a portable together with the manufacturer's name and model, plus the recommended RCA battery complement.

• • •

P. R. Mallory & Co. Inc., of Indianapolis announced the unification of its battery activities into a single operation—the Mallory Battery Company. This Company is a division of P. R. Mallory & Co. Inc., with headquarters in Cleveland, Ohio. Officers of the new Company are Fielder Israel, President; Carl Rudiger, Vice President; Walter Onorato, chairman of the Management Committee, and Ray Stone, Comptroller.

The company produces unique mercury batteries, conventional zinc-carbon batteries and a new line of solid state batteries.

CONTACT

This section of ELECTRONIC SERVICING serves as liaison office between 1) Manufacturers of Electronic devices who seek qualified service firms capable of acting as their branch service depots, and 2) Technically qualified, financially sound Service Firms or Independent Radio-TV Servicemen who seek to be appointed as Factory-Trained Branch Service Agencies for Electronic Equipments Manufacturers in the areas where they are situated.

Advertising run in this section costs $15.00 per column inch.

QUALIFIED STAFF OF TECHNICIANS AVAILABLE

All types of Television Service and parts depot including any electronic equipment. Presently doing factory service and parts depot. Indianapolis, Indiana firm.

BOX 1407, ELECTRONIC SERVICING

SHREVEPORT, LOUISIANA SERVICE FIRM SEEKS CONTRACT JOBS TO SERVICE:

Box 1301, ELECTRONIC SERVICING

Three competent technicians with many years' experience in electronics are prepared to accept service contracts and assembly work in light electronic equipment. We have 2400 feet of space available for immediate expansion of our operation.

Newburgh, N. Y. Firm

Box 1302, ELECTRONIC SERVICING

OFFICE, CHIEF SIGNAL OFFICER
CIVILIAN PERSONNEL BRANCH

Room 2C200, The Pentagon
Washington 25, D. C.

OPPORTUNITIES FOR OVERSEA ASSIGNMENT

Item No.	Position Title	Grade	Salary	Location	Allowances	Housing	Qualification Requirements
3	Electronic Engineer	GS-855 - 11	$6390 p.a.	Verdun, France	10 per cent differential. $2000 p.a. when with dependents, $1500 p.a. when without dependents.	Gov't family quarters not available. Concurrent travel of dependents may be authorized depending upon size of family.	Male only. Degree in electrical engineering plus 2½ years of progressive professional experience which must include at least 1 year of specialized experience in the branch of engineering for which applicant is being considered.
5	Supervisory Electronic Engineer (Wire Comm)	GS-855 - 12	$7570 p.a.	Japan	No differential authorized. Quarters allowance of $2800 p.a. when with dependents, $2100 p.a. without dependents.	Gov't housing authorized on a waiting time basis.	Degree in electrical engineering plus 3½ years of progressive professional experience which must include at least one year of specialized experience in the branch of engineering for which applicant is being considered.
6	Equipment Specialist	GS-1670-12	$7570 p.a.	Japan	Same as above.	Same as above.	Total of 7 years experience, 2½ years of which must include composing and organizing written info concerning maintenance and operation of radio, radar, electronic instruments, photographic equipment power units, public address and recording systems, etc.

NOTE:

Civil Service status not required for positions in Alaska.

KOREA—Family quarters unavailable. Dependent travel not authorized. Male only. Separation allowance authorized for eligibile civilian employees.

OKINAWA—Requests for concurrent travel from Continental United States at GS-9 and above may be applied for on an individual basis.

Further information may be obtained by contacting Office, Chief Signal Office. Civilian Personnel Branch, Room 2C200, The Pentagon, Washington 25, D.C. You may call Mr. Albert G. Crosetto, telephone number LIberty 5-6700, Extension 52525 or Code 131, Extension 52525.

Dated
2-19-57

In addition to these vacancies, there are openings in Washington and in the vicinity of Winchester, Virginia, for teletype installers, repairers and operators, communication code clerks, relay equipment operators, micro-wave technicians, electronic engineers and electronic equipment installers and repairers.

RIDER SPEAKS

JOHN F. RIDER

WERE it not true that many publishers release books and magazines which can be beneficial to the home electronics equipment servicing industry, we would never dare write this piece. But since there *are* many, we feel that we can take the chance and not be accused of using these columns for personal gain.

There are many services available in this nation, but we doubt if any of them are as subject to continuous change in technology as is the servicing industry, which has been maintaining the public's electronic equipment. There just doesn't seem to be any limit to the rate at which new ideas appear on the scene and new brain children make these ideas practical realities.

To keep abreast of these technological advances imposes an added burden to those already being carried by the men engaged in this work. But there is nothing that can be done to circumvent it; it just happens to be the nature of the business. Experience is a very wonderful thing, but the skill accrued from experience in electronic technology alone does not appear to be the complete answer.

We recognize that the experienced TV technician would be more successful, generally, in the servicing of television receivers than the average electronics engineer with a formal degree, but without experience. Time is money in this business and it is doubtful whether the average engineer without extensive familiarity with a television receiver could make his theoretical background compensate for the tricks of the trade which the practiced technician has gathered.

Granting all this to be true, does it permit setting a limit on how much theoretical knowledge need be possessed by the service technician? Does the service technician gain anything by imposing a limitation on his theoretical background just because he has the practical experience? Or is it to his distinct advantage to possess the broadest possible theoretical base too? This doesn't necessarily imply engineering schooling. As we see it, it means recognition of the tremendous scope of the activity of which he is part; seeing the great expanse of the horizon of possibilities, and trying to do something about it.

It is said that only death and taxes are certain. No one knows what fate has in store, nor what twisting paths opportunity will present. To be ready for these opportunities cannot help but be important to every one. We hear and read of many forecasts. Each is more glowing than the other in what electronics will do for mankind. Everything within the province of the servicing industry is part of the electronics industry. Being the kind of activity in which there seems to be no leveling off point in the progress being made every days, it seems only natural to want to take a bigger bite of everything that is available and becomes available. Practical experience alone doesn't make this possible; knowledge of theory is needed also.

One of the baffling things we have heard for many years from many practicing service technicians is that they had *no time to read*. We acknowledge that servicing is a hard task master. The hours are long and many jobs can be irritating. But to go along with this attitude means a self-imposed limitation on the future—on the potential of one's self. Whatever may be the direction a service technician would want to take in the electronics field — whether in or outside the servicing industry — a grounding in electronic theory will help to climb many of the rungs on the ladder upward.

This has become a scientific world with electronics in the forefront. The engineer has come into his own. Maybe everyone cannot be an engineer, but a strong mixture of theory and practice offers tremendous possibilities, even without a formal college degree. The engineer fresh out of school is shy experience. It takes years to get it. The service technician has had the years of experience. He already has that theoretical background which served as the base for the service activity. To solidify this, and to broaden it, is not only advantageous in the expansion of one's servicing effort as it may be dictated by the future, but it also makes possible changing the direction in which one wants to go, if it is to his advantage.

Let's summarize. Time for reading technical books and magazines should be found. We realize that servicing is almost a world of its own—but the barriers should be taken down. Admittedly, it isn't easy to acquire technical knowledge after a hard day's work, but the effort will pay off. The servicing industry is faced with immediate problems, but they should not be a deterrent to nourishing the mind. They should not be a block to progress. ■■

WORKBENCH

[*from page* 7]

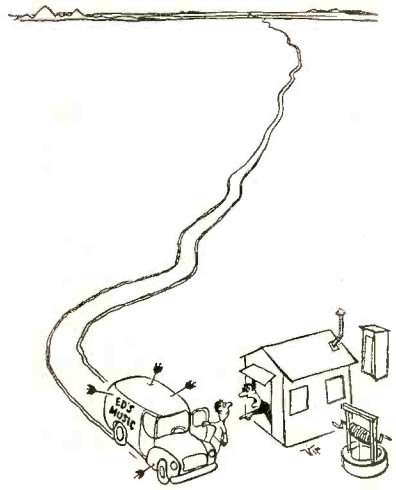
grid current which charges *C217* and *C216*. This negative charge sets the operating bias in such a manner that the tube is beyond cut off and passes only the most positive portions (sync pulses). The charge on *C217* and *C216* leaks off through resistors *R226, R235* and *R186* towards a minimum reference voltage developed by the video detector, Y151. Thus, the clipper bias voltage which varies with changes in received signal strength is also used to control *rf* and *if* gain. From V106B the signal is fed to the phase splitter, V110A, and then to the oscillator circuit.

With these facts in mind, check was made at pin 7 of V106A. Here

"Watch, Ma, I'm going to wake Daddy up by remote control!"

the waveform checked normal (see *Fig* 2). A waveform check was next taken at pin 6 of V106A. The wave form here was also correct. At pin 2 of V106B, the waveform also checked correctly. However, at pin 1 of V106B, the waveform was abnormal. It was observed that video information accompanied the sync pulses in this waveform. V106B was therefore not separating the sync pulses from the video information. A voltage check was then made from the plate, pin 1, to ground and measured correctly at about 140 volts. The voltage was close enough to be satisfactory. Next, resistance checks were made across *R227, R236, R228* and *R226*. All measured correctly except *R226*. This resistor which should have measured 1.8 megs was found to have a value of 1.8K!! *R226* was replaced with the proper value and the receiver then functioned properly.

The extremely low value of *R226* caused too rapid a condenser discharge in the grid leak action. This in turn lowered the bias on the clipper tube to a point where the picture information rode through and incorrectly triggered the horizontal and vertical oscillators. This was apparently a manufacturing defect, since the complaint dated back to the original purchase. ■■



"Listen! If you don't have JENSEN NEEDLES, just forget I called!"

SELL SERVICE

[*from page* 45]

properly used it can pay off in advertising impact. It takes a deft hand and an honest-to-goodness feeling for it, but used sparingly and at appropriate intervals, HUMOR can reap rich dividends for you. Humor in advertising, without ruining the entire effect of the ad or cheapening it, is a little hard to achieve. But everyone can occasionally come up with a humorous twist on an old subject, and the time to use it in your advertising is while it is fresh and new. If your advertisement does nothing more than pay for itself within a reasonable length of time after use, it has more than done its job. Its long range effects are greatest; each customer attracted to your service is a potential future customer if your service is as good as your advertising.

The "reasonable length of time" mentioned in the previous paragraph is essentially dependent on how frequently you advertise, and this brings us to another point in making your service advertising pay—REPETITION. You may have a real honey of an advertisement; the display may be perfect or its presentation everything you could desire; but if it is used only once and then withdrawn, you have lost the value of the basic block upon which all forms of advertising rest. As applied to service advertising, it is this: If your name is displayed often enough, attractively enough, and effectively enough, the first thing that will pop up into the public's mind when something happens to its TV set will be *your* name.

We now have five points to remember in designing and using your service advertisements to secure the maximum in pulling power: first, PERSONALIZE it, second, make it DIFFERENT, third, be TRUTHFUL, fourth, use a little HUMOR occasionally, and fifth and just as important, REPEAT on a regular schedule. A small advertisement which includes the first four points listed, and which is used consistently, is a great deal more effective than one large ad used only once or twice, regardless how well designed the large ad may be. Save the "one-shot" to use with "leaders" and specials only. ■■

ELECTRONIC CONTROL

[*from page* 3]

area surrounding the probes. As the level of the liquid rises, it displaces the air immediately below the probes. The liquid has a different dielectric constant than the air it displaces. As a result the probes "sense" the change in level as a change in capacitance.

Another method of sensing the level of a liquid is through the use of a thermistor. A thermistor is a temperature sensitive semi-conductor. In other words, it is a resistor, the resistance of which varies with temperature. A TV technician will recognize a similar device, the "Globar" used in many of the G.E. series string television sets.

If we were to connect a thermistor in series with a light bulb and a battery as shown in *Fig. 6,* the bulb would light for a certain low value of the thermistor determined by the temperature. As the battery current flows through the circuit, it heats the thermistor which drops in resistance and allows enough current to flow to light the bulb. When the

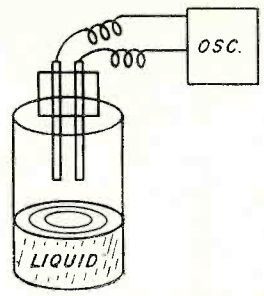


Fig. 5—Capacity as "senser."

level of the liquid rises to the point where the thermistor is submerged, its temperature drops to the reduced temperature of the liquid. As a result the resistance increases sharply and the light goes out. The light bulb then indicates when the liquid has reached a predetermined level. A relay could be substituted for the light bulb which in turn could operate a valve to control the level of the liquid.

There are other devices for sensing liquid levels, such as photo-electric cells

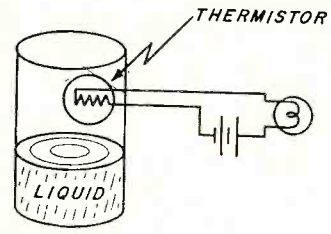


Fig. 6—Control by thermistor.

(*Fig. 7*) and float-operated switches and potentiometers. Many of these sensing devices can be adapted to operate either when a liquid reaches a predetermined level or to continuously indicate the level.

Half the task of maintaining these controls is accomplished if we understand their basic principles of operation.

The procedure in servicing these systems consists primarily of isolating the defective component; then either replacing or repairing it. The same techniques and instruments are used in measuring voltage, current, resistance, capacitance, inductance, etc., as are used in radio and TV. ■■

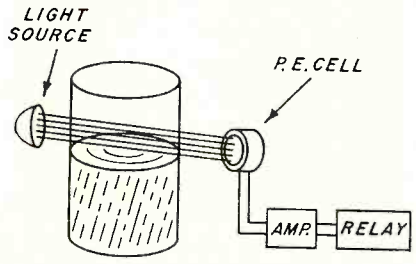


Fig. 7—Control by photo-cell.

COLOR BAR GENERATOR

[*from page 5*]

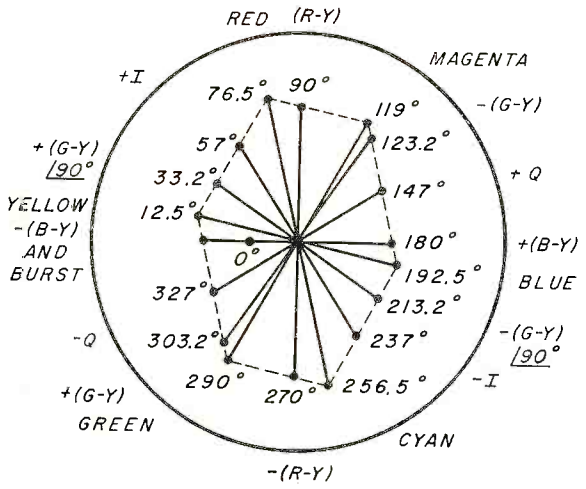


Fig. 8—Vectorscope pattern for normally operating receiver.

(B-Y) detector is applied to the horizontal-input terminals of the scope.

A color-bar signal is used to drive the color TV receiver, and the resulting scope pattern shows how the receiver is processing the various phases of the color signal, as depicted in *Fig. 8*. Misadjustment of the quadrature transformer, misalignment of the signal circuits, or faulty operation of a color detector shows up in the vectorscope pattern as a departure from the pattern shown in *Fig. 8*.

Checking the Delay Line

An essential component in the Y channel is the delay line, the operation of which is accurately checked with the aid of a color-bar signal. *Fig. 9* shows the principle of operation of a delay line (which delays the Y signal by approximately 0.9 microsecond). The result of a short in the delay line is illustrated in *Fig. 10*.

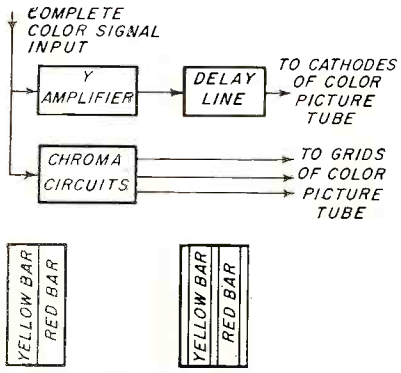


Fig. 9—Block diagram illustrating delay line functioning.

It is evident that the color-bar generator and wide-band scope are now essential equipment items on every color service bench. To these basic instruments, the technician may also wish to add others such as special purpose test probes, capacitance and inductance meters, color-filter cards, and a low-power microscope. However, the color-bar generator and wide-band scope are fundamental test instruments which are the foundation of color TV service work. ■ ■

Fig. 10a—Color bar display for a normally operating delay line.

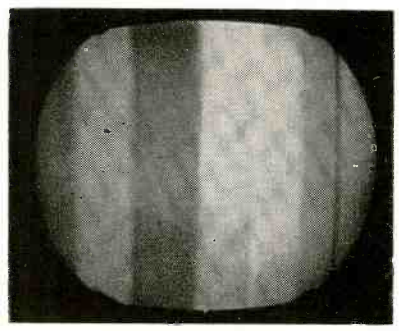


Fig. 10b—Color bar display when a short exists in the delay line.

TEST EQUIPMENT

[*from page* 16]

and is due to the fact that not only is the power drawn from the circuit quite low, but the over-all conditions for oscillation are improved, the feedback ratio is increased, more rectified grid current is obtained and the meter goes up scale. However, if this same component is defective (shorted) it will cause the meter reading to drop into the REPLACE region.

Vertical windings may be tested for shorted turns in a manner similar to that used with the horizontal deflection coils. However, in this case it is imperative that any resistors or capacitors across or in series with the coils be removed.

Continuity Tests

When components in the horizontal system (except capacitors) are suspected as "open," the Model 382 is used in the "CONTINUITY" position. Switching to this position converts the instrument to a simple *ac* operated ohmmeter. The magnitude of the *ac* voltage is varied by means of the "METER ADJUST" control on the front panel.

Capacitance Measurement

The Model 382 may be used to measure capacitance values from 10 $\mu\mu$f to 0.1 μf in three ranges, with an accuracy of $\pm$ 5 degrees of arc on the meter. In this application, the Model 382 once again becomes an *ac* ohmmeter. It utilizes a variable source of *ac* voltage, an *ac* micro-ammeter and a precision multiplier resistor. All of these com-

Simpson Model 382 Horizontal System Analyzer.

ponents are essentially in series with the test leads.

Features

Summarizing the Model 382 Horizontal System Analyzer can be used to test most of the individual components TV set, "in circuit." It can be used to test most of the individual components of the horizontal system, namely, the flyback transformer, the yoke, and the associated capacitors. It can also be used to measure other capacitors in the TV set, radio set, audio amplifier, etc. which fall within its capacitance range. ■■

AUTO RADIOS

[*from page* 39]

for checking, but remember, *do not use the heat sink as a ground.*

Push buttons are of the mechanical type, pull-push lockup. It is advisable to double-check these setups since a poor setting may sound hashy to the customer.

Dial or manual tuning slippage may occur sometimes when too much lubricant is used on the clutch assembly spindle. This may soften the clutch faces enough to become tacky and bind. Careful use of carbon-tet can remove the tackiness and allow a clean separation of the clutch faces. ■■

EMERSON

[*from page* 19]

of the *agc* voltage (providing no delay is applied) is applied to the tuner (*rf*) while only about one fifth of this voltage is applied to the *if*. The time constant of *C-1*, *R-3*, and *R-6* is relatively fast allowing the *agc* voltage to follow rapid variations in signal strength. This is most noticeable in the reduction of airplane flutter. Variable tuner *agc* delay is provided by the local-distant potentiometer (*R-9*). In most areas, this control is set for maximum tuner delay (distant) for best gain and signal to noise ratio. To eliminate tuner overload in very strong signal areas, the control should be set for maximum *agc* (local-minimum delay). The use of a potentiometer allows for optimum adjustment of delay. ■■

EQUALIZATION IN HI-FI

[*from page* 13]

the front or from the back). If a relatively slow back and forth vibration is felt, you can be sure that several watts of low frquency rumble are present, even though it cannot be heard because it is outside the human range of audibility. A rumble filter does to the low frequencies what a scratch filter does for the highs. It cuts sharply, at a predetermined frequency of, say 30 *cps*, so that anything below that frequency is sharply attentuated. Since very little music or program material goes down that low, virtually no difference in sound will be experienced by the insertion of such filtering action. A simple circuit for the elimination of rumble is shown in *Fig. 9* and can be installed at the input of just about any power amplifier with good results. Because of the values chosen no insertion loss will take place with this circuit. Make all ground connections at the input jack, if possible, to prevent the possibility of any increase in hum. The values chosen will give a sharp cut-off below about 30 *cps*. For a higher frequency of cutoff choose lower values of *C1* and *C2*. For even lower cut-off points, choose larger values of *C1* and *C2*.

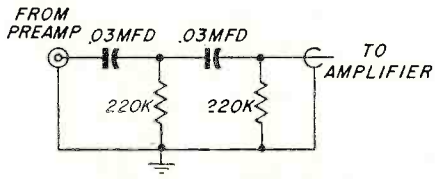


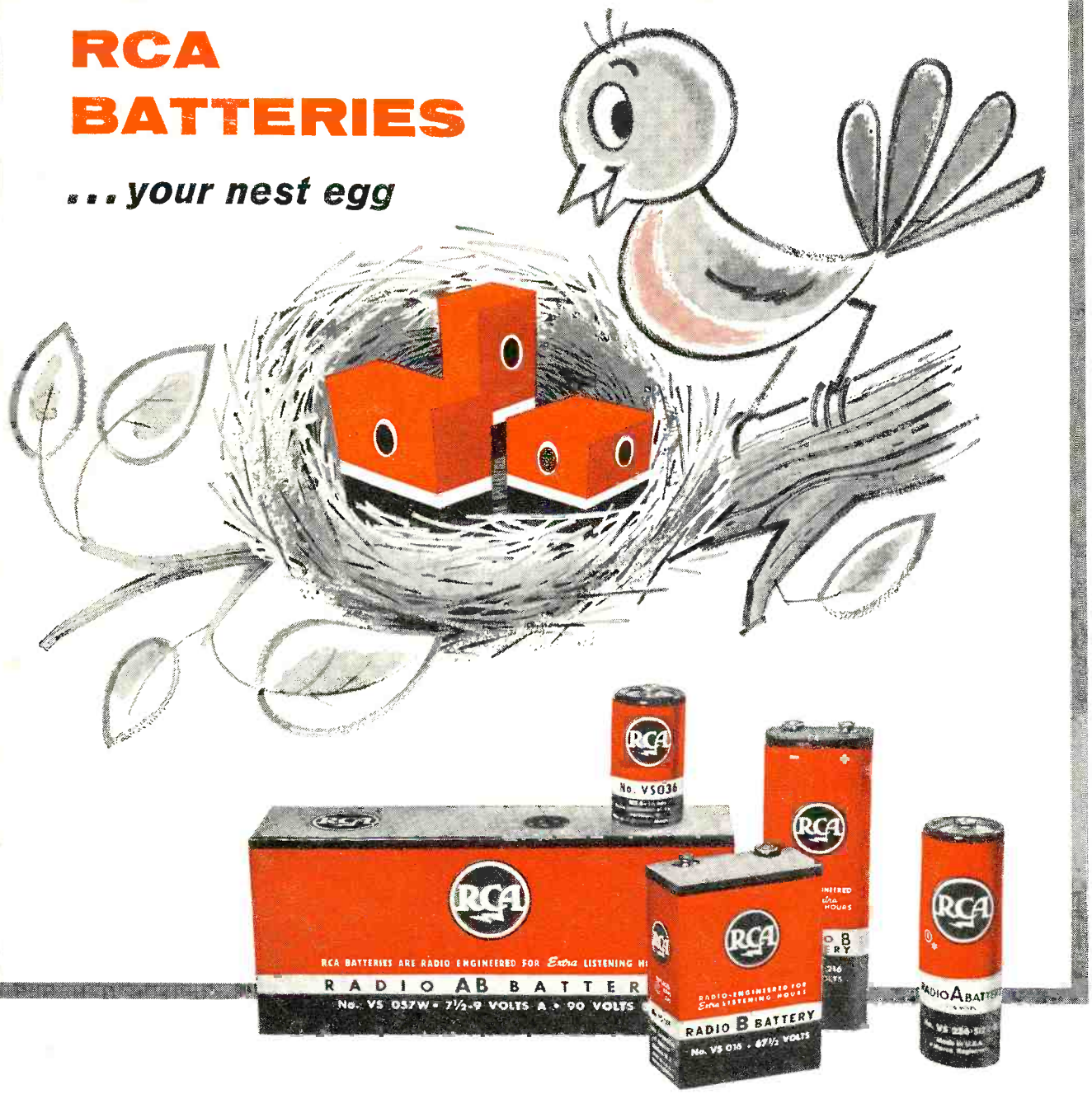
Fig. 9—Rumble filter for the elimination of frequencies below 30 cps.

In the next installment of this series, we shall begin outlining the layout and servicing procedures recommended for basic power amplifiers. We shall also touch upon the very controversial subject of "how much audio power is required in Hi-Fi amplifiers." In addition, we shall present some simple rules with which you can check the adequacy of a given system or make recommendations to customers planning to buy an amplifier. ■

Advertisers Index

RCA BATTERIES

...your nest egg



...for profits all year long!

Customer acceptance of RCA quality assures you of profit making battery sales all year long. And, there's an RCA Battery to serve virtually every customer's need. This includes batteries for the new transistor-powered portables as well as for industrial and general use. Order your nest egg of RCA batteries *TODAY* for profit making sales all year long!

RADIO CORPORATION of AMERICA

COMPONENTS DIVISION — CAMDEN, N. J.

CONSUMER • INDUSTRIAL • GENERAL • RCA IS YOUR BEST BATTERY BUY!

ELECTRONIC SERVICING

COWAN PUBLISHING CORP., 300 West 43rd Street, New York 36, N.Y.