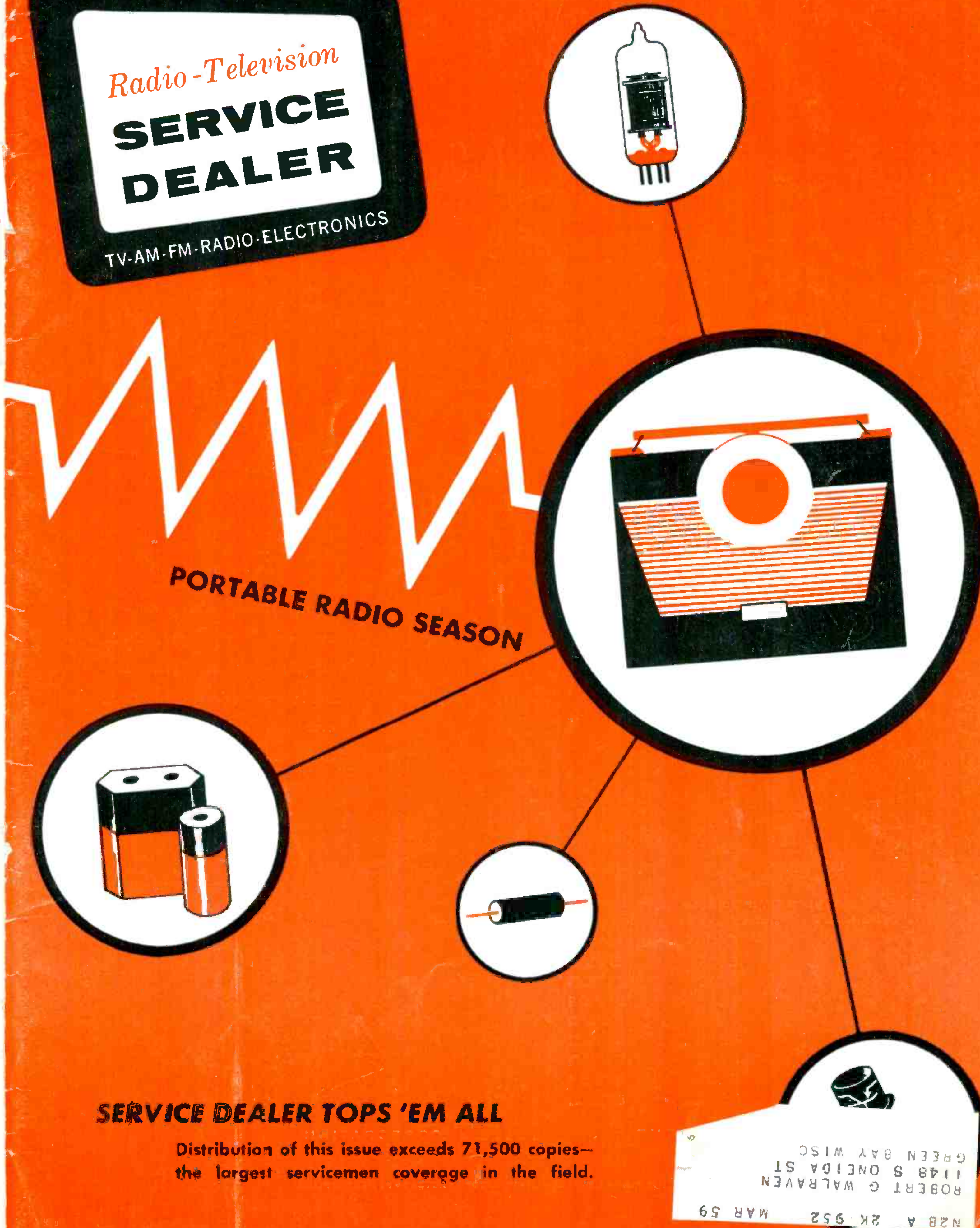
JUNE, 1955

Radio-Television SERVICE DEALER

TV-AM-FM-RADIO-ELECTRONICS



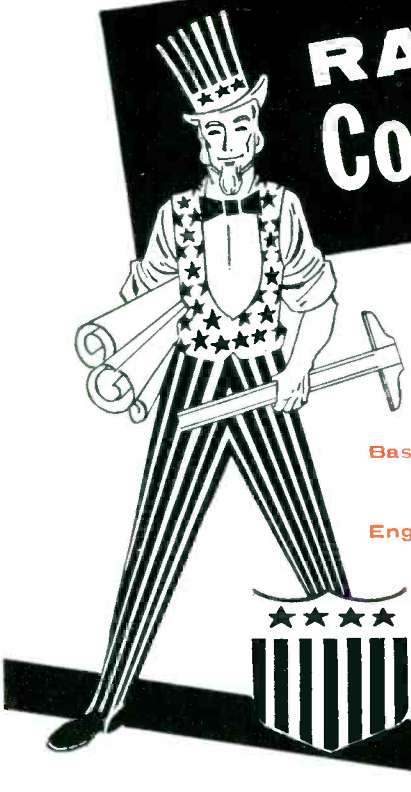
PORTABLE RADIO SEASON

SERVICE DEALER TOPS 'EM ALL

Distribution of this issue exceeds 71,500 copies—the largest servicemen coverage in the field.

a complete NEW line!

RADIART SEAL·VENT Communication Vibrators



Based On Rigid U. S. Government Engineering Specifications

NOW... RADIART makes available to commercial users of communications equipment, a new line of vibrators based upon experience of producing over 2 million similar units to the exacting requirements of U. S. Signal Corps Specifications.

These Eight Types Offer Complete Replacement for ORIGINAL Communication Equipment:

Old No.	New No.
5515	**5715**
5518	**5718**
★	**5721**
★	**5722**
5605	**5805**
5620	**5820**
5621	**5821**
5622	**5822**

It's ready now! The new 1955 Radiart Vibrator Replacement Guide

SUBSIDIARY OF

THE **RADIART** CORPORATION
CLEVELAND 13, OHIO

TV ANTENNAS • AUTO AERIALS • VIBRATORS • ROTORS • POWER SUPPLIES

TUNG-SOL "Magic Mirror" ALUMINIZED PICTURE TUBE

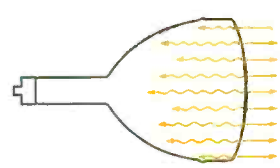
BRIGHTER-SHARPER
MORE DETAIL
MORE CONTRAST

The "Magic-Mirror" Aluminized Picture Tube creates the brightest, most realistic TV picture you can bring into the homes of your customers. The "Magic-Mirror" tube effectively utilizes *all* the light generated by the phosphor screen.

Tung-Sol has developed a unique "fogging" method of backing up the phosphor screen with a mirror-like aluminum reflector. This reflector prevents light radiating uselessly back into the tube. It brings out all the detail of which the receiver circuit is capable. So smooth and true is the Tung-Sol aluminum reflector that mottling, streaks, swirls, "blue-edge", "yellow-center" and other objectionable irregularities are eliminated.

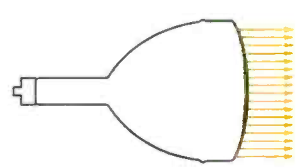
Tung-Sol pin-point-focused electron gun assures a steady, brilliant picture—free from alternate fading and overlighting. Tung-Sol's exacting standards of quality control, manufacture and testing further guarantee the high uniformity and maximum performance of the "Magic-Mirror" TV Picture Tube.

For further details, including Tung-Sol's sales aids and advertising support, call your Tung-Sol supplier today.



ORDINARY TUBE—Only *half* the light produced by the phosphor screen is utilized in the picture. Other half radiates wastefully back into tube.

RESULT—A light background within the tube which reduces picture contrast.



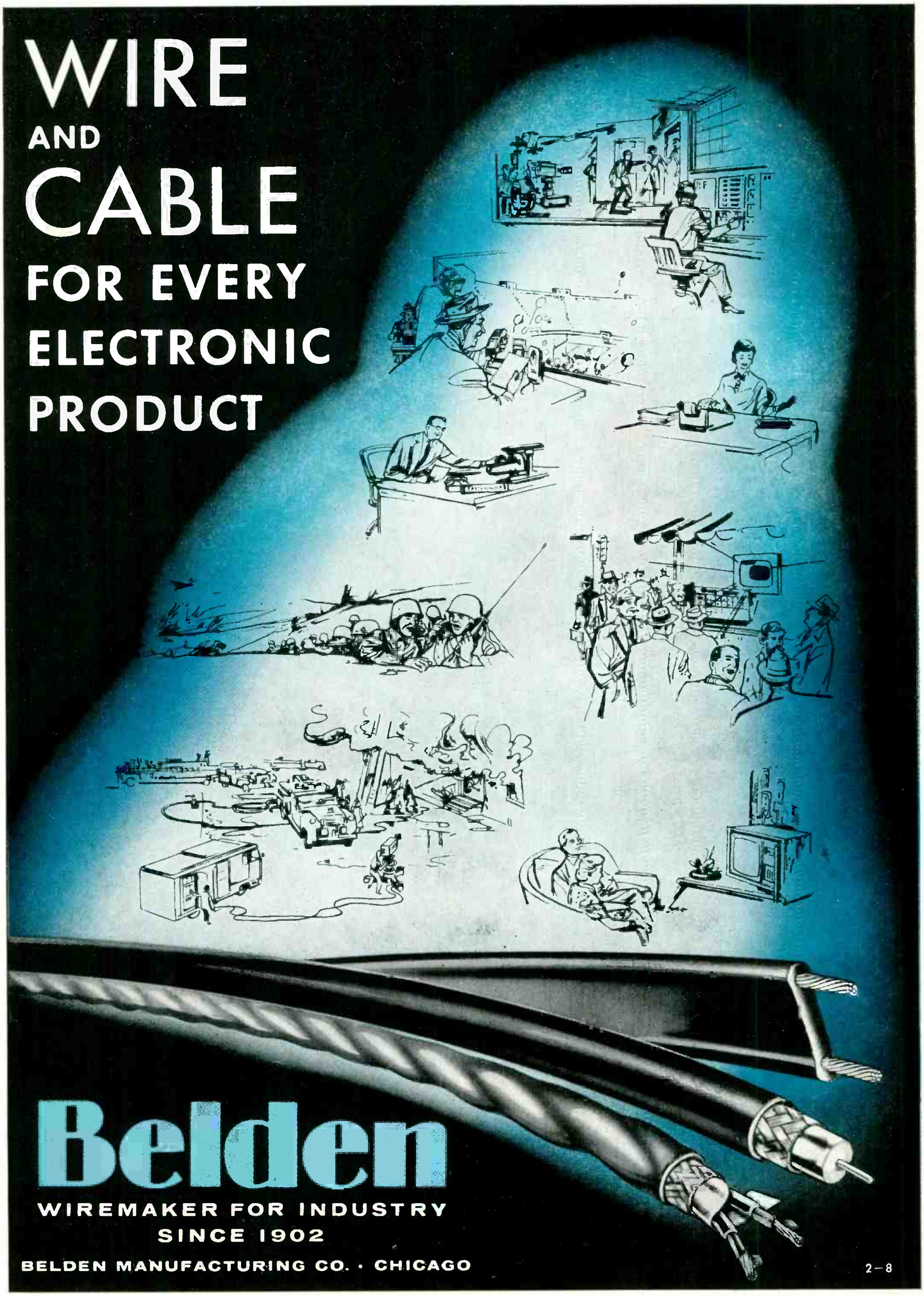
MAGIC-MIRROR ALUMINIZED TUBE — Aluminized reflector allows electron beam through. Blocks wasted light from backing up into tube. Reflects *all* the light into picture.

RESULT—Pronounced increase in contrast to make a bright, clear, more realistic picture.

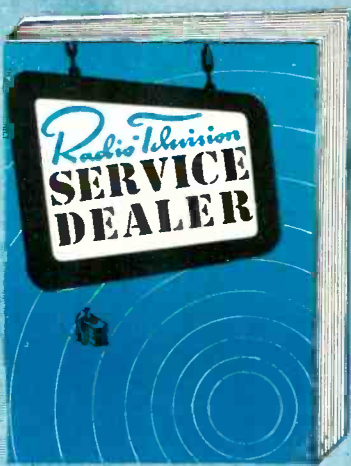
TUNG-SOL ELECTRIC INC., Newark 4, N. J.

Sales Offices: Atlanta, Chicago, Columbus, Culver City (Los Angeles), Dallas, Denver, Detroit, Montreal (Canada), Newark, Seattle.

Tung-Sol makes All-Glass Sealed Beam Lamps, Miniature Lamps, Signal Flashers, Aluminized Picture Tubes, Radio, TV and Special Purpose Electron Tubes and Semiconductor Products.



WIRE
AND
CABLE
FOR EVERY
ELECTRONIC
PRODUCT
Belden
WIREMAKER FOR INDUSTRY
SINCE 1902
BELDEN MANUFACTURING CO. · CHICAGO
2-8



EVERY SERVICE FIRM OWNER IN THE U.S.A.
Receives SERVICE DEALER Monthly
Distribution of this Issue over 71,500

Member BPA—Circulation Statement sent on request

COWAN PUBLISHING CORP., 67 West 44th Street, New York 36, N. Y.

VOL. 16, NO. 6 JUNE, 1955

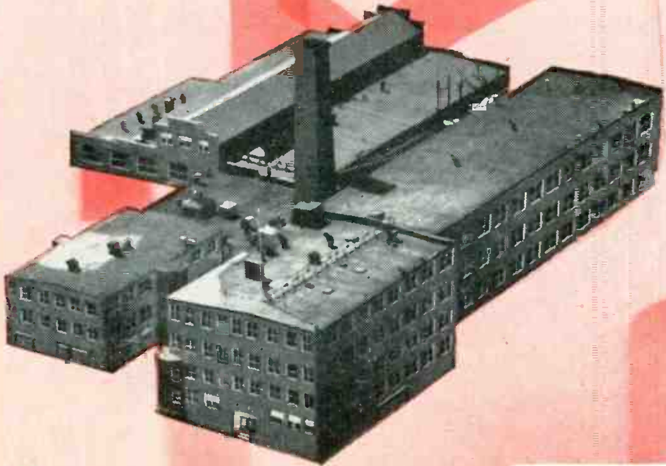
FEATURE ARTICLES

CIRCUIT AND SERVICE FORUM

DEPARTMENTS

RADIO-TELEVISION SERVICE DEALER is published monthly by Cowan Pub. Corp., 67 West 44th St., New York 36, N. Y. Subscription price: $1.00 per year in the United States, & U.S. Poss. Elsewhere $1 per year additional. Single Copies 25c. Second Class mail privileges authorized at New York, N.Y.

POSTMASTER: SEND FORM 3579 TO RADIO-TELEVISION SERVICE DEALER, 67 WEST 44th ST., NEW YORK 36, N. Y.



Raytheon's Receiving Tube Plant No. 1 — Newton, Mass.

Raytheon's Microwave and Power Tube Plant No. 1
Waltham, Mass.

RAYTHEON LEADS THE WAY
In TUBES and SEMICONDUCTORS

Here are a few reasons why:

RAYTHEON employs 18,000 people. Approximately 10,000 of them work in Raytheon's modern tube and semiconductor manufacturing plants.

RAYTHEON has more than 1,000,000 square feet devoted exclusively to the manufacture of Raytheon quality tubes and semiconductors.

RAYTHEON employs over 500 engineers and scientists who work exclusively in the electron tube and semiconductor fields.

RAYTHEON has had 33 years' experience in the manufacture of electron tubes.

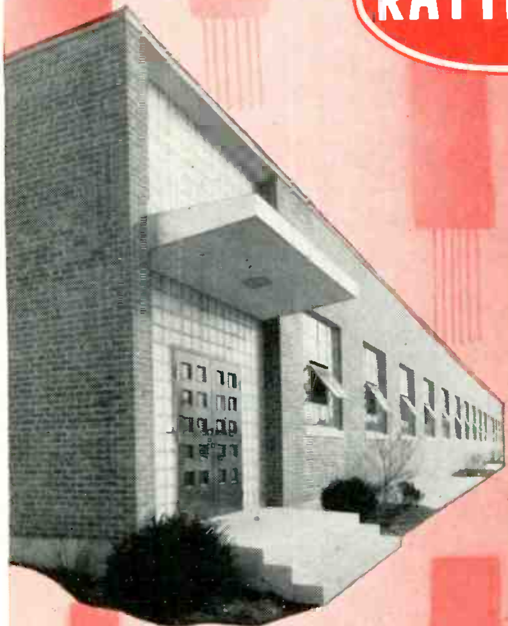
RAYTHEON has made tubes of every type of construction — Standard Glass, "G", GT, Bantal, Lock In, Metal, Miniature and Subminiature Tubes.

RAYTHEON Receiving and Cathode Ray Tube Operations have produced more than a third of a billion tubes and semiconductors.

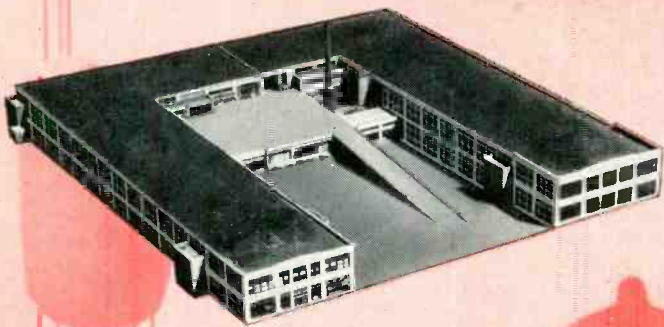
RAYTHEON perfected the first practical rectifier tube types (BA and BH) to eliminate the need for "B" batteries to operate home radios. This revolutionized the design of home radio sets. Raytheon later developed the cold cathode rectifier tube for auto radios and has produced more of these tubes than all other companies combined.

RAYTHEON developed the famous 4-pillar construction that strengthened internal structure resulting in sturdier tube design.

RAYTHEON developed and was first to mass-produce the octal button stem receiving tube — today's most imitated construction for premium TV performance. Raytheon was first to make millions of these tubes as far back as 1946. These tubes featured a planar button stem and 8 straight leads (8-pillar) which go directly into a standard octal base. Raytheon's Patent Numbers 2310237, 2321600 and 2340879 apply to this invention.



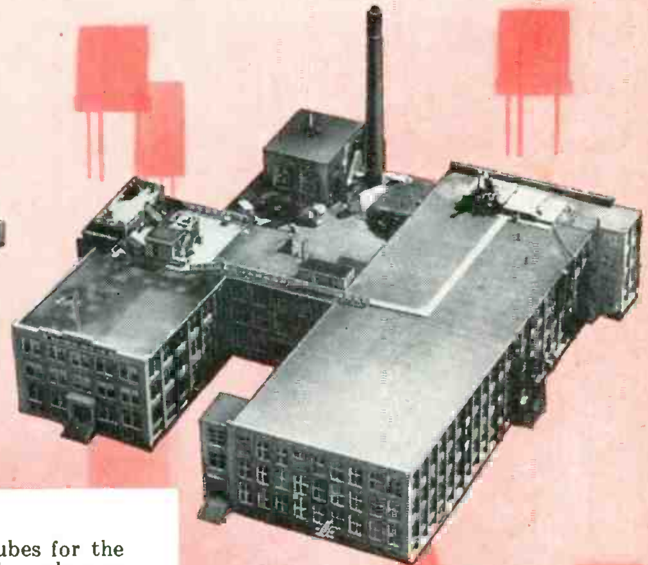
Raytheon's Research Center
Waltham, Mass.



Raytheon's Semiconductor Plant No. 2
and Raytheon's Special Tube Plant No. 2
Boston, Mass.

Raytheon's Cathode Ray Tube Plant
Quincy, Mass.

Raytheon's Receiving Tube Plant
No. 2 — Quincy, Mass.



Raytheon's Semiconductor Plant
Newton, Mass.
(Being Assigned to Semiconductor
Division starting Dec. 1, 1955)

RAYTHEON developed and first mass-produced subminiature tubes for the hearing aid industry — the forerunners of the fuse tubes which made possible the famous proximity fuses of World War II. There are more commercial Raytheon subminiature tubes in use today than all other makes combined.

RAYTHEON developed a method of mass producing magnetrons (the power tube that is the heart of radar) early in World War II, that broke a serious bottleneck, and continues to produce more magnetrons than all other manufacturers combined.

RAYTHEON is the largest producer of klystrons and has manufactured more than all other companies combined.

RAYTHEON was the first commercial producer of Transistors — the "mighty mite" — a Raytheon achievement that revolutionized the hearing aid industry.

RAYTHEON first commercially produced fusion-alloy RF Transistors, expected to revolutionize the portable radio, auto radio and computer industries.

RAYTHEON has produced many more transistors than all other manufacturers combined — nearly 2,000,000 in use.

TODAY, RAYTHEON makes Receiving and Picture Tubes, Reliable Miniature and Subminiature Tubes, Semiconductor Diodes and Transistors, Nucleonic Tubes and Microwave Tubes.

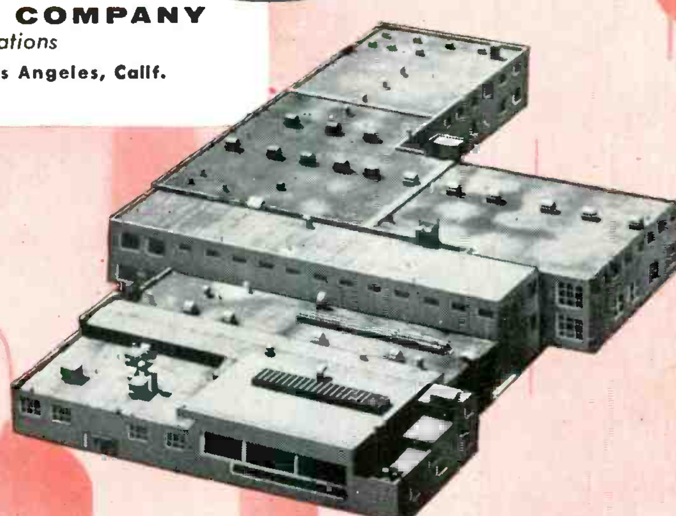
These facts and figures show why you can use Raytheon Television and Radio Tubes with complete confidence that they are Right . . . for Sound and Sight — Right for you and your customers, too.

Raytheon's Microwave and
Power Tube Plant No. 2
Waltham, Mass.

A Company second to none in
Excellence in Electronics

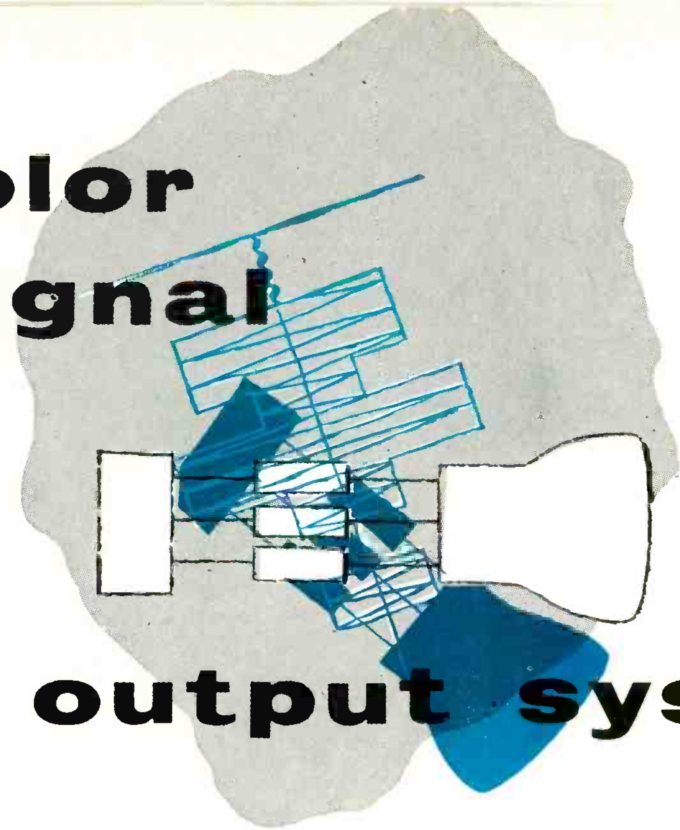
RAYTHEON

RAYTHEON MANUFACTURING COMPANY
Receiving and Cathode Ray Tube Operations
Newton, Mass. • Chicago, Ill. • Atlanta, Ga. • Los Angeles, Calif.



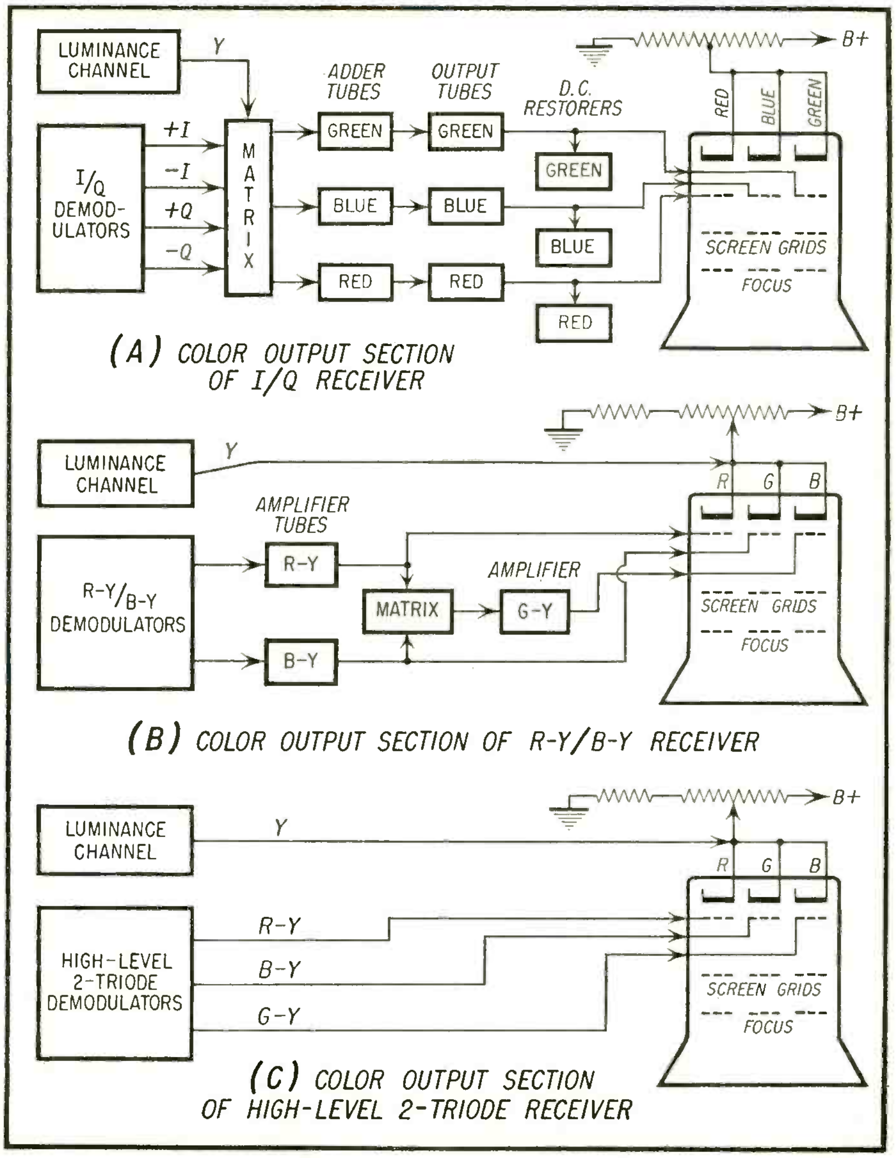
Raytheon's Special Tube Plant No. 1
Newton, Mass.

color signal output systems



by
Bob Dargan
and
Sam Marshall

Fig. 1 — Simplified block diagrams of color output sections of I/Q, R-Y/B-Y, and High-Level 2-triode receivers.



IN the previous section, dealing with demodulation, it was pointed out that the two basic commercial systems of demodulation used at present are the I/Q, and the B-Y/R-Y. The B-Y/R-Y system can be further categorized into two distinct types, one type employing low-level and the other type high-level demodulation. These separate systems determine the manner in which the demodulated color information is processed in the color output stages for application to the picture tube.

In *Fig. 1* are shown the simplified block diagrams of the color output sections for the three systems used. These will all be analyzed in detail. However, a brief comparison of the three block diagrams will first be made; this for the purpose of emphasizing the basic function of all color output sections this function being to provide the correct red, green, and blue signal voltages to the picture tube grids.

The demodulated output of an I/Q receiver as shown in *Fig. 1A* provides positive and negative values of I and Q.

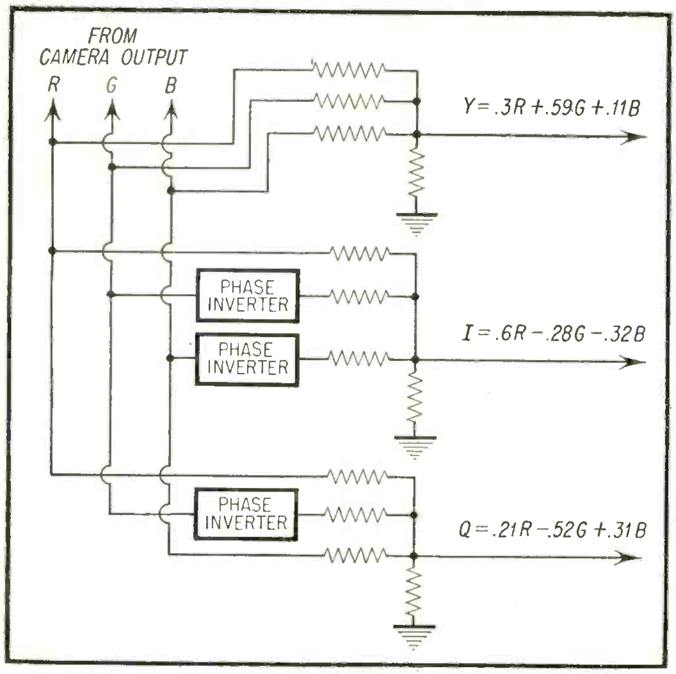


Fig. 2—Circuit diagram (partial) of typical matrix network employed at transmitter end of color system. Note use of phase inverters for –G and –B.

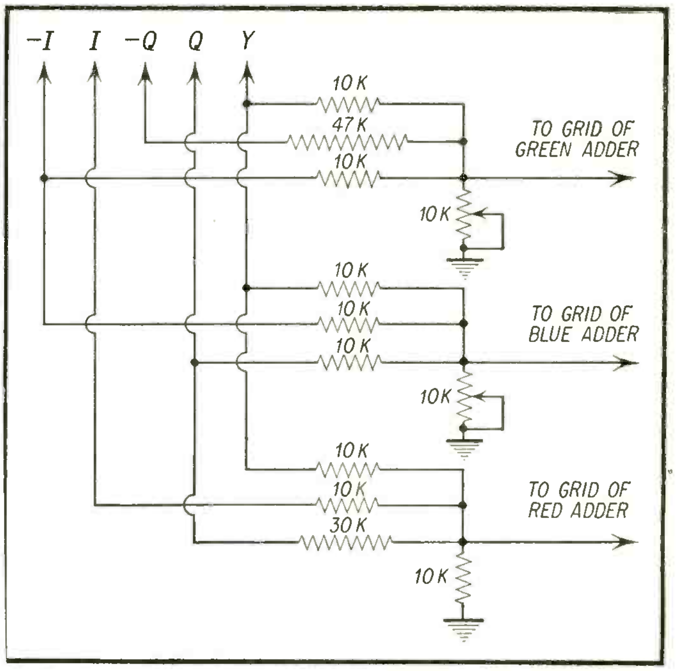


Fig. 3—Partial circuit diagram of matrix network employed in typical I/Q receiver. Note fixed value of red gain control as compared to variable B and G.

To obtain the red, green, and blue signals, certain percentages of the positive and negative quantities of I and Q are added to the Y signal in a matrix and applied to the individual red, green and blue adder tubes. The outputs of the adder tubes are then fed into individual color amplifier tubes and thence into the respective color grids of the picture tube. Inasmuch as present day I/Q circuitry involves capacitive coupling between the plates of the output tubes and the picture tube grids, *dc* restorers are necessary.

In the R-Y/B-Y block diagram of *Fig. 1B* we are provided with individual R-Y and B-Y signals at the output of the demodulators. These signals are then combined in a matrix network to provide a G-Y signal. Then all three signals are individually fed into their respective red, green and blue grids. At the same time the Y signal is fed into the cathodes of each tube thereby resulting in an addition of the luminous and color difference signals directly in the tube iteslf. This adition results in the production of the desired primary color signal between grid and cathode of each gun. In comparison with the I/Q system where nine tube functions (4 tubes) are employed, the R-Y/B-Y system employs only three tube functions (2 tubes); also no *dc* restorers are required.

Proceeding to the high level demodulator of *Fig. 1C* we observe the all three color-difference signals are directly obtained at its output. These signals are fed directly into their respective color grids where they are added to the Y signal fed into the cathode, and produce the correct primary color signals between grid and cathode. There is no need in this system for matrixing to produce G-Y as in the R-Y-B-Y demodulator because the high level demodulator provides this signal directly. Neither is there any need for amplification of the color-difference signals at the demodulator output because of its inherent high signal output; high enough to drive the grids of the picture tube directly. Notice that compared to the I/Q system with its nine tube functions and the R-Y/B-Y system with its three tube functions, no tubes are required in the high level output section. Also, no *dc* restorers are required.

Up to this point the discussion relative to the color signals applied to the picture tube grids has been of a general nature. We shall now proceed to analyze each system separately from the point of view of specific relative color signal requirements and the control voltages on the various tube elements required to produce a proper color and B&W picture.

I/Q Output Circuit

In one of the early installments it was pointed out that the I, Q and Y signals are developed at the transmitter by combining certain proportions of the compensated red, green and blue camera output signals in a voltage divider or matrix network as shown in *Fig.* 2. These proportions are as follows:

$$Y = .3R + .59G + .11B$$
$$I = .6R - .28G - .32B$$
$$Q = .21R - .52G + .31B$$

By a reciprocal process, in an I/Q receiver the individual color signals are recovered from the Y, I, and Q signals by combining certain proportions of Y, I and Q in a matrix network as shown in *Fig.* 3. These proportions are as follows:

$$R = .96I + .62Q + Y$$
$$G = -.28I - .64Q + Y$$
$$B = -1.1I + 1.7Q + Y$$

As an example of the manner in which the matrix performs its task in a receiver a partial simplified circuit of the green signal portion of a matrix is shown in *Fig.* 4. The matrix resistors are proportioned so that the following relative Y, I and Q signal values appear at the grid of the green adder: 100% Y, 28% of –I, and 64% of –Q. These values provide us with a pure green signal.

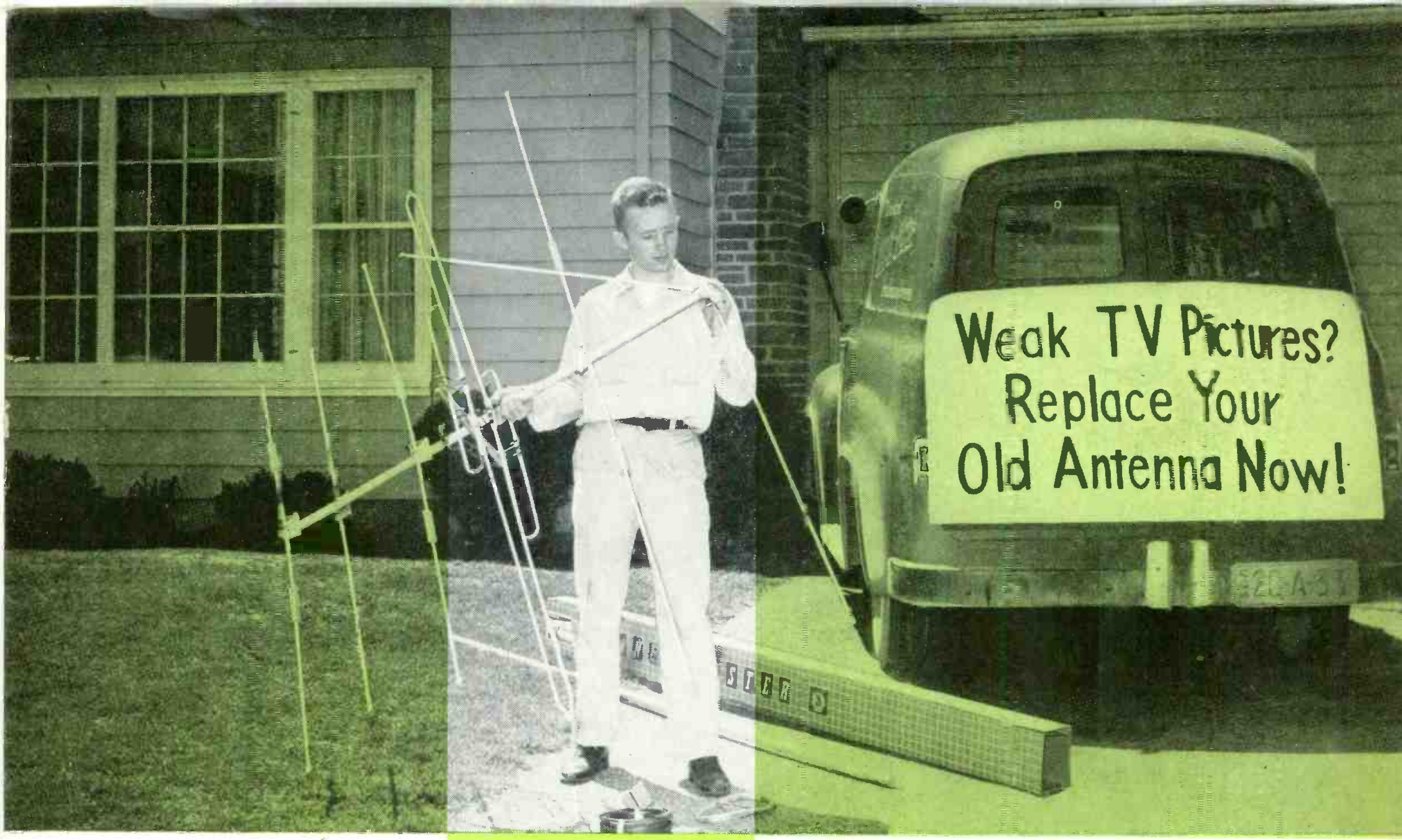
In a similar manner the matrix resistors for the blue section are proportioned so that the following relative Y, I, and Q signal values appear at the grid of the blue adder:
100% Y, 110% of –I, and 170% of Q
These values provide us with a pure blue signal.

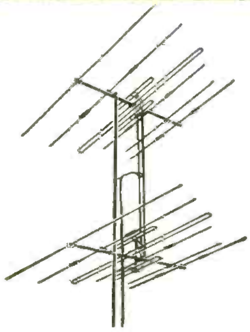
Finally the matrix resistors for the red section are proportioned so that the following relative Y, I and Q signal values appear at the grid of the red adder:

100% Y, 96% I, and 62% Q

These values provide us with a pure red signal.

In the typical matrix network shown in *Fig.* 3 it will be observed that gain controls are provided in the green and





NEW! Narrow-space stacking!

Channel Master's RAINBOW and SUPER RAINBOW can now be stacked only 60" apart. These new, extremely efficient, 2-stage, impedance-matching stacking rods permit easier installations with an absolute minimum sacrifice of gain.

model no. 331-7

Champion Rainbow
330 series
Super Rainbow
331 series
Challenger Rainbow
332 series

Warm weather is profit weather!

The weather's warmer! Days are longer! *This* is the time of year to go after that gold mine in your own backyard: the replacement of the antennas in your area that are damaged, worn, and obsolete.

Channel Master's RAINBOW is the favorite replacement antenna of America's TV installation men — and here's why:

- There's a RAINBOW model for every installation . . . for every signal area . . . for every budget.
- Regardless of competitive claims—Channel Master's RAINBOW antennas are *still* the most powerful antenna series available today! Advanced engineering and the exclusive Tri-Pole make the difference!
- Featuring the fastest and strongest of all preassemblies: trigger-fast "Snap-Lock" action, Channel Master's fabulous preassembly that *snaps* open, *locks* open, without hardware or tightening.
- All-aluminum construction. Rugged, durable, reinforced at all stress points.

Today's greatest all-channel antenna value — bar none!

*Patent No. 2,691,730
Other Patents Pending

CHANNEL MASTER'S RAINBOW*

the ideal replacement antenna

FIRST IN PREASSEMBLED ANTENNAS

CHANNEL MASTER CORP.

ELLENVILLE, N. Y.

The World's Largest Manufacturer of Television Antennas

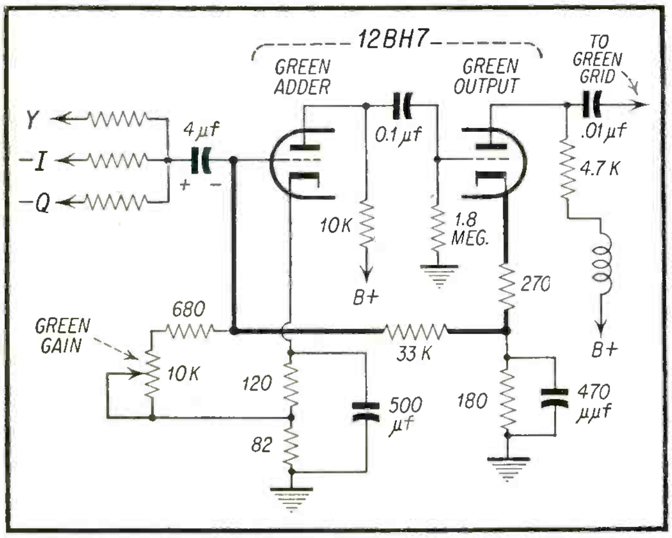


Fig. 6—Partial schematic of CBS-Columbia Model 205 color TV receiver showing green adder and green output stage. Heavy lines indicate feedback loop.

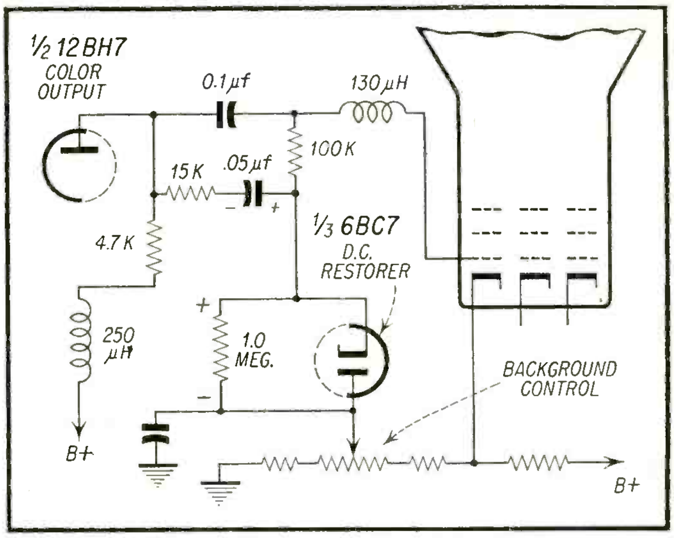


Fig. 7—Partial schematic of either green or blue output stages employed in CBS-Columbia Model 205 color TV receiver. Separate background controls are used.

blue sections only, the grid load resistance in the red section having a fixed value. This enables a greater signal drive to be placed on the red grid with respect to the blue and green grids, and a greater green signal as compared to the blue grid. This is made necessary

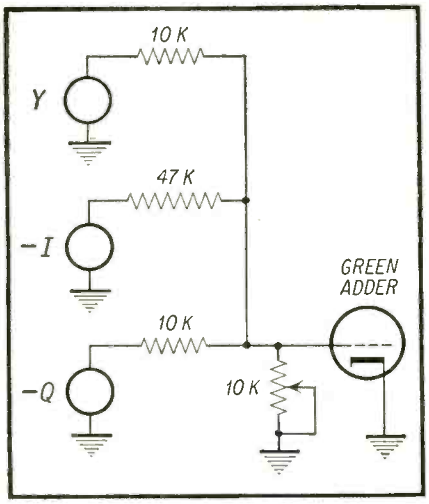


Fig. 4—Partial simplified schematic of green matrix and adder.

by the unequal phosphor efficiencies of the picture tube; these efficiencies being aprpoximately in the order of 1: 0.8: 0.3 for the blue, green and red phosphors respectively as shown in *Fig.* 5. Following the matrix and adder functions all primary color signals must be amplified so that sufficient drive voltage is made at the grids of the picture tube. A typical circuit following a matrix color section such as green, blue and red is shown in *Fig.* 6. Here we see a partial schematic of the CBS-Columbia Model 205 I/Q Receiver indicating the green adder and amplifier circuitry. This circuitry is duplicated in the blue and red sections except for a fixed 10K resistor instead of a variable one as discussed previously. Circuit stability is obtained by providing controlled degeneration via the feedback loop shown in heavy lines in the figure. Additional degeneration and stability is effected by bringing the grid return of the adder tube to an unbypassed tap on the cathode resistor as shown.

DC restoration is necessary in color receivers because of the wide range of video voltages present in color scenes. This means the inclusion of a *dc* restorer for each output stage for a total of three. The primary function of a *dc* restorer is to establish a reference operating bias so that the blanking level of the sync pulses results in beam cut-off. Under these conditions the sync pulses extend into the region beyond cut-off, and the signal itself extends into the region where beam current flows.

A circuit of this type is shown in *Fig.* 7. Initially, during a scene of certain brightness with a given *dc* component (amplitude between blanking and average signal level) the first negative going sync pulses drives the diode plate positive causing a voltage equal to the *dc* component to appear across the .05 *μf* condenser with the polarity developed as shown. During subsequent horizontal lines the capacitor voltage being equal and opposite to the *dc* component prevents any further conduction of the diode. During this time the capacitor discharges through the 1 meg resistance in accordance with a suitable value of time constant which is about three vertical frames.

By adjusting the background control correct light values for a particular scene are obtained on the picture tube. Now if the average brightness of the scene increases, the *dc* component increases, the drive on the diode plate increases and the *dc* voltage recovered by the restorer is applied as an additional positive bias to the grid of the picture tube, thereby resulting in an

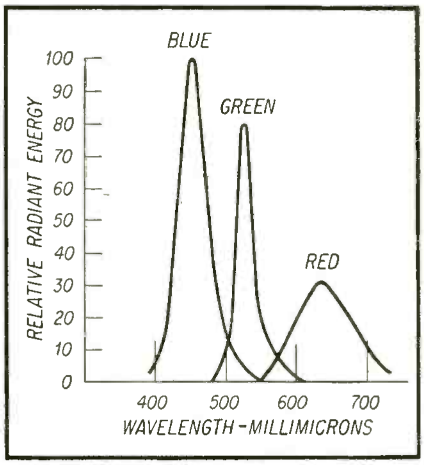
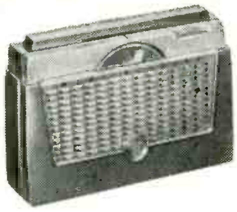


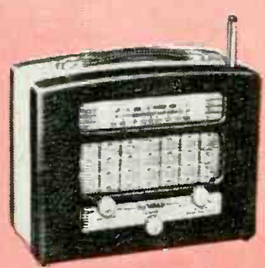
Fig. 5—Light emission characteristics of phosphors for equal excitation of these phosphors.

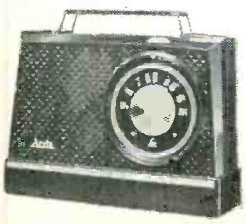
increase in brightness. Similarly a scene with reduced brightness ultimately causes the grid to go less positive with a resultant decrease in brightness. Thus, the action of the *dc* restorer clamps the black level (blanking) of the signal at picture tube cutoff for all variations in average brightness levels of the scene. The cut off value of each gun of the picture tube is adjusted independent of the restorer action by the individual background controls of the blue and green guns and by a master background control for the red gun.

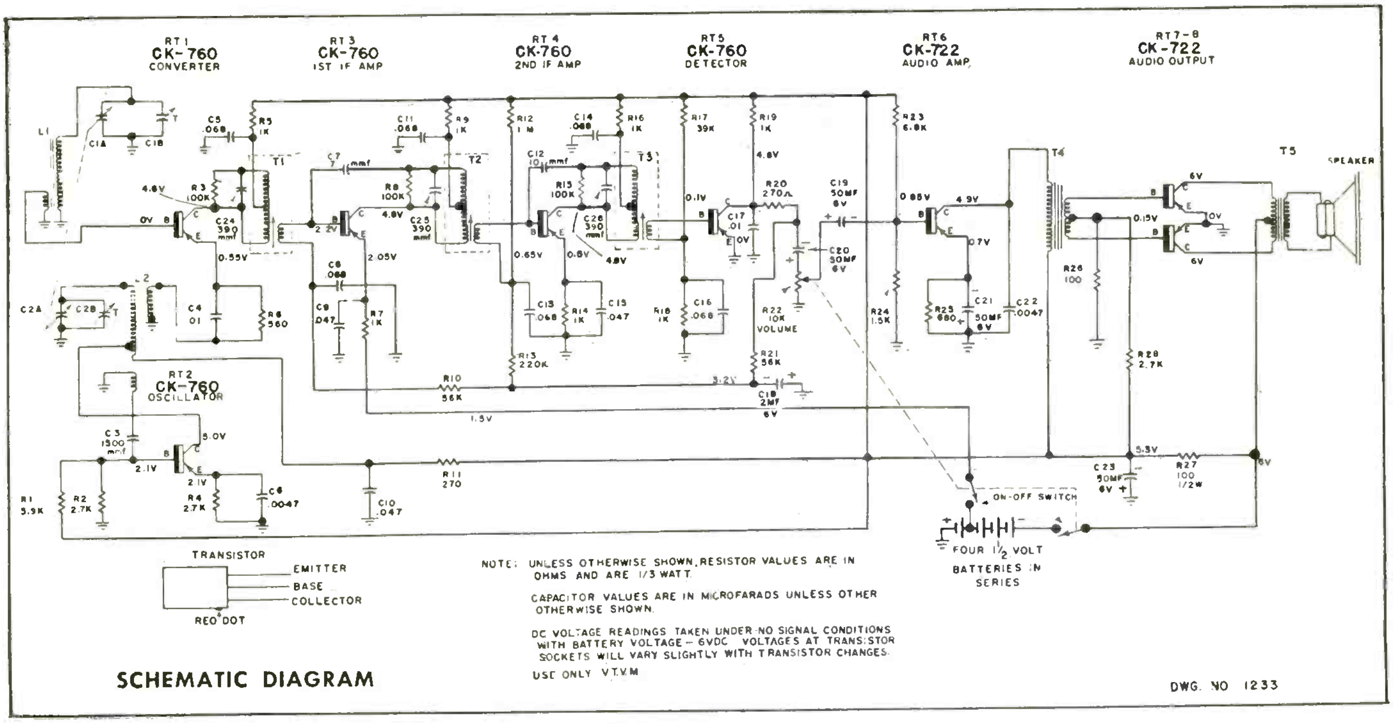
[*To Be Continued*]

a roundup of 1955









SCHEMATIC DIAGRAM

portable receivers

by **Sol Heller**

IT'S summer time again—the season when home radio service drops off, and portable set repairs pick up. This is a good time to look into circuitry and other features of current models, note what has changed — and what hasn't—and to prime ourselves for profitable service on these receivers.

The most significant development in the portable radio field is transistorization. The first portable using an all-transistor set-up was the Regency Model TR-1 (described in the Dec. '54 issue of RADIO-TELEVISION SERVICE DEALER). Now Raytheon is producing one. Since the transistorized portable is very much more economical to maintain than the conventional tube type, it is not at all unlikely that it will supersede the tube type within a few years.

Some idea of why the tube-using portable may be on the way out is obtained from a comparison of maintenance costs. Raytheon, points out that its transistorized T-radio shown above will operate for one year at a cost of about sixty cents, compared with an upkeep of from $15 to $35 on portables using vacuum tubes.

Four conventional, one-cell flashlight batteries provide all the power needed for one full year of T-radio operation. A single set of mercuric oxide batteries will power the set for two and a half years. The eight transistors have an indefinite life and will not, under normal circumstances, need replacement. They can't burn out or disintegrate, and are not readily damaged or broken. Since the transistors use only tiny currents and very low voltages, the shock hazard to user and serviceman is practically eliminated.

To check a transistor, Raytheon recommends substitution of another equivalent unit. To facilitate the correct insertion of the transistor in its socket, a red dot is provided on the transistor. This dot must line up with a dimple on the socket.

Substitution of a transistor in the *if* or *rf* sections of the receiver—particularly the *rf*—may necessitate a slight realignment. When a defective component (i.e., a bad condenser, resistor, etc.) which is connected to a transistor socket must be replaced, the transistor should be removed from the socket before soldering operations are performed. The reason is, excessive heat may damage the transistor.

If resistance tests are to be made in the transistorized receiver, remove all the transistors first, to eliminate the shunting effect of these units, and to prevent the masking of short-circuits and resistance changes. Battery substitutions are recommended in the T-radio when the sound seems muffled or distorted, as well as lower than normal in volume. Replacement of all four batteries even when only one has been found weak is recommended.

The alignment procedure for Raytheon's transistorized portable differs in a number of respects from the procedure used in tube-type sets. Details of the alignment may therefore interest servicemen. The preliminary steps are as follows: *1*—Turn volume control *off*. 2—Connect an output meter with an impedance of 15 ohms in place of the speaker. 3—Turn the volume control up fully clockwise. 4—Use a signal generator output of 100 microvolts, with a 30% modulation at 400 cycles. 5—Both knobs of the receiver must be in place. The alignment procedure itself is given in *Fig. 2*.

One of the new features in Zenith portables (Models R600 and R600L, chassis 6R40 and 6R41) is the use of a thermal regulator tube—the 50A1—in series with the tube filaments (see *Fig. 3*). The 50A1 functions as an automatic rheostat, keeping the current in the tube filaments constant in the face of supply voltage changes. Since portable tubes—particularly the converter—are extremely sensitive to such fluctuations in voltage, use of the thermal regulator may be expected to minimize fading and operation over part of broadcast band only—symptoms that reduced line voltage and aging of the selenium rectifier tend to produce. (Other troubles may, of course, produce the same symptoms.) The tendency of increases in line voltage to reduce tube life by increasing the filament voltages will also be counteracted.

A number of G.E. and Stromberg-Carlson portables—and possibly other makes as well—are using a battery-saver

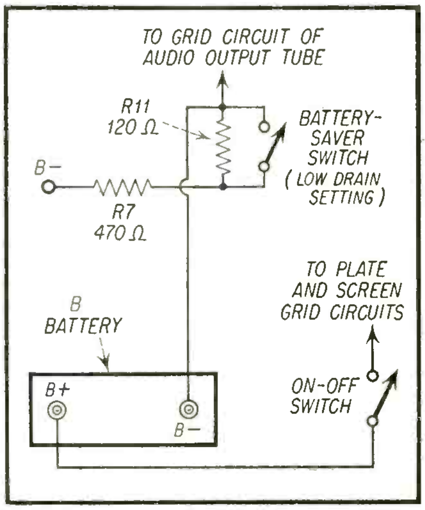


Fig. 4—Partial schematic of G.E. "Battery Saver" circuit.

switch circuit (see *Fig. 4*). This circuit contains a switch and a resistor. In areas where the signal strength is good,

	SIGNAL GENERATOR				OUTPUT METER	GANGED CAPACITY	ADJUST FOR MAXIMUM OUTPUT IN METER.
	FREQUENCY	COUPLING CAPACITY	CONNECTION TO RADIO	GROUND SIDE			
I.F.	455KC	.5MF.	to Base of RT1	To Chassis	Connected in place of speaker		Top cores of T3, T2 & T1
	Repeat above step two or three times for best results, keeping generator output in all cases as low as possible as to prevent overloading of audio.						
Osc.	1620KC	.5MF.	To base of RT1	To Chassis	Connected in place of speaker	Open Gang (Fully clockwise)	Adjust C 2B
	Caution: Too high an input from signal generator may cause setting of trimmer on a spurious response.						
Ant.	1400KC.	Connect 3 turn loop to generator and place near loop on receiver.			Connected in place of speaker	Ganged Condenser should be rocked.	Adjust C 1B
	Check for alignment and dial calibration at 1000 KC and 600KC.						

Fig. 2—Alignment procedure for Raytheon transistor radio.

the switch is moved to its low position. At this setting, the resistor is in series with the B battery, and reduces the latter's drain. The B voltages go down a bit, but the battery's life tends to be prolonged. In areas where the signal strength is not as good, the switch is set to *high*, at which setting the resistor is shorted out, full drain is restored, and higher B voltages are developed.

Circuitry and components used in current portables are pretty well standardized; a number of differences, however, are worth calling attention to. With respect to antennas, the built-in loop is employed most often. A photo of such a loop in a personal-type set is shown in the Olympic. On portables providing short-wave reception, a telescopic-type antenna (Fada) may be provided. Small "ferrite-rod" or "stick-loop" antenna units are used in some portables. One advantage provided by a "stick-loop" is its elimination of electrostatic interference pick-up. A portion of the circuit associated with one of these iron-core units is shown in *Fig. 5*.

Some Zenith portables (Model T505, chassis 5L41 for instance) use a "wavemagnet" type antenna. In strong signal areas, the wavemagnet unit can be left in place on the cabinet. In localities where the signal strength is low, or where greater sensitivity or selectivity is required for one or more stations, the wavemagnet may be pulled out from

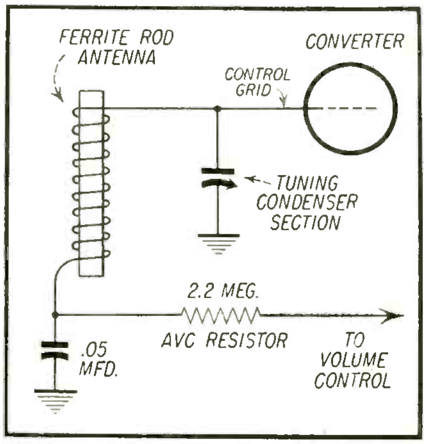


Fig. 5—Partial schematic of Fada stick-loop antenna unit.

the cabinet till it makes an angle of 30 degrees with the latter. Zenith warns against attempting to tilt the magnet any further than this with respect to the cabinet.

In steel building (as well as on trains, boats, planes, etc.) the wavemagnet is placed on the glass of an outer window, for best reception. Suction cups and an extension cable have been attached to the wavemagnet to facilitate such placement. The suction cups should be moistened before being attached to a window. The wavemagnet may be readily lifted out, if it is first opened to an angle of 30° from the cabinet.

Some preliminary movement of the unit on the window glass, to locate the position where reception is optimum, may be necessary. The best location is generally the center of the window. The wavemagnet must be kept away from any line-carrying wires (such as lamp cords, etc.) to avoid pickup of electrical interference or noise.

Most current portable radios use a selenium rectifier type power supply for

[Continued on page 55]

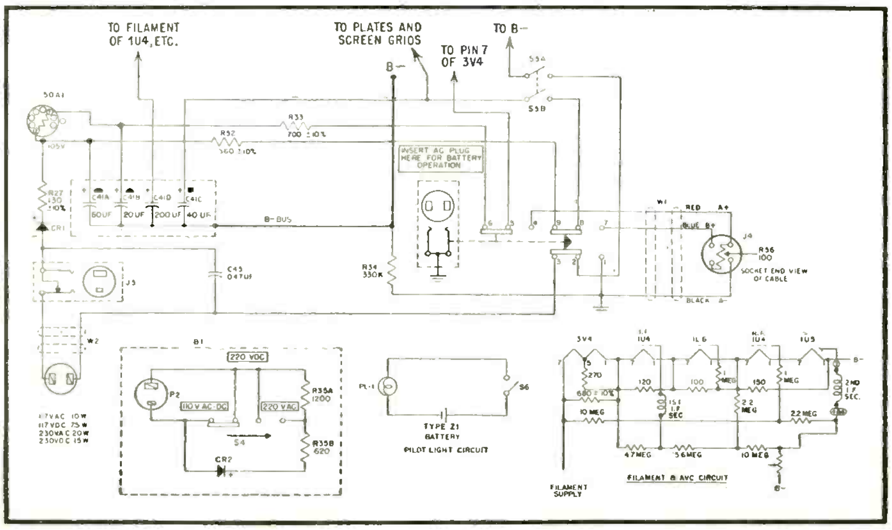


Fig. 3—Partial schematic of Zenith Ch. 6R40, 6R41 portable.

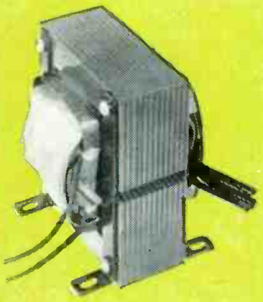
MERIT

THE most complete replacement line

a transformer or coil for every TV-radio need.

Power transformers

P-3059 *this and 57 others.*



Vertical output transformers

A-3035 *with 6 companion types*

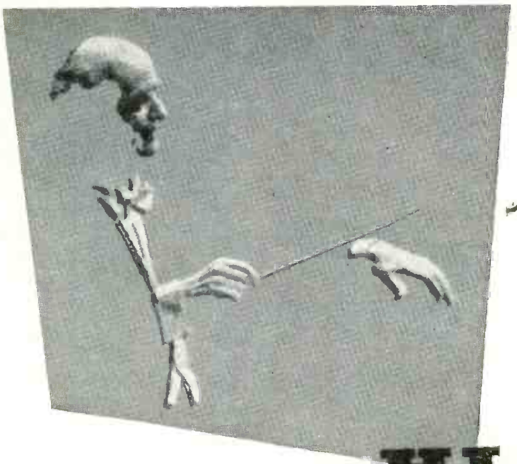
Line voltage regulators

P-3138 *and* **P-3139**

MERIT

COIL AND TRANSFORMER CORPORATION

4427 N. Clark Street, Chicago, Ill.



Electrostatic Speakers in new HI-FI Units

by **Steve Travis**

PHILCO'S new electrostatic speaker (*Fig. 1*) incorporated in the 1955 line of Philco phonographs and radio-phonograph combinations, marks the first time a high-frequency speaker based on the electrostatic principle has been generally available to the public. The new speaker unit combines high efficiency, low distortion and freedom from directional effects. It covers the frequency range from 7000 cycles per second to well beyond the upper limit of audibility.

An urgent need for such a speaker has arisen from steady improvement in the high-frequency performance of microphones, phonograph pickups, amplifiers and phonograph records. So great has been the advance in these components that in recent months the weak link in high-quality sound-reproducing systems has been the high-frequency loudspeaker.

High-frequency speakers previously available fall in two classes: the horn-loaded tweeter and the cone tweeter. The horn-loaded unit is expensive and, in many cases, has only fair efficiency and exhibits transient distortion. The cone tweeter is of more reasonable cost, but often suffers from severe distortion due to the phenomenon known as "cone breakup" which results from the cone being driven from its center. Finally many cone tweeters tend to radiate sound in a narrow beam which restricts the high-frequency sounds to listeners sitting directly in front of the speaker.

For some time it has been known that the answer to the problem of distortion due to cone breakup lay in some form of electrostatic speaker, in which the sound producing membrane is driven uniformly over its entire surface. But early attempts to produce a suitable electrostatic speaker failed due to the lack of a suitable membrane material and the lack of rugged and reliable mechanical design which could be produced at low cost. Improvement in plastic membranes removed the first difficulty and ingenious mechanical design solved the second.

Construction of the Electrostatic Speaker

Because this speaker operates on the principle of a condenser it has also been called a condenser speaker. To understand its operation it is desirable to examine the construction of the speaker.

Fig. 2 shows a cross section of the electrostatic speaker which consists of a rigid aluminum frame that is used as one plate in the condenser action. This frame is also employed in the mounting of the speaker to the cabinet. The outer surface of the frame is semi-circular in nature as shown but it is actually composed of 16 flat longitudinal segments. Each of these segments are perforated with very small holes to prevent back pressure which would introduce distortion in the audio output. The 16 segments might be thought of as 16 small high frequency speakers in a half circle. Thus, directional characteristics are of little concern since 180 degree sound distribution is made available as shown in *Fig.* 3. Also, it might be noted that baffling is unimportant and all that is necessary is some means of protecting the speaker from damage to possible tearing or bumping.

From *Fig.* 2 it can be seen that the semi-circular rigid form has stretched on it a thin sheet of polyester film. This polyester film performs the function of the dielectric. On the outer side of the polyester sheet a thin layer of pure gold is deposited. This vapor gold film is the other plate of the condenser and it is connected to terminals for wiring into the electrical circuit.

The polyester material is of great im-

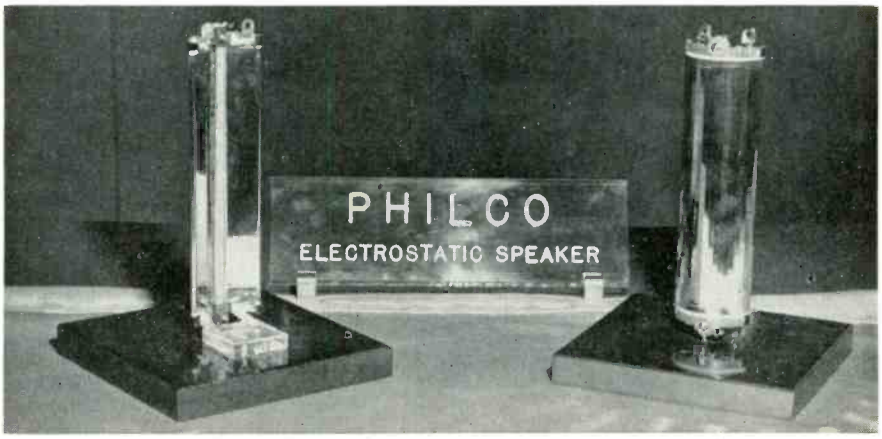
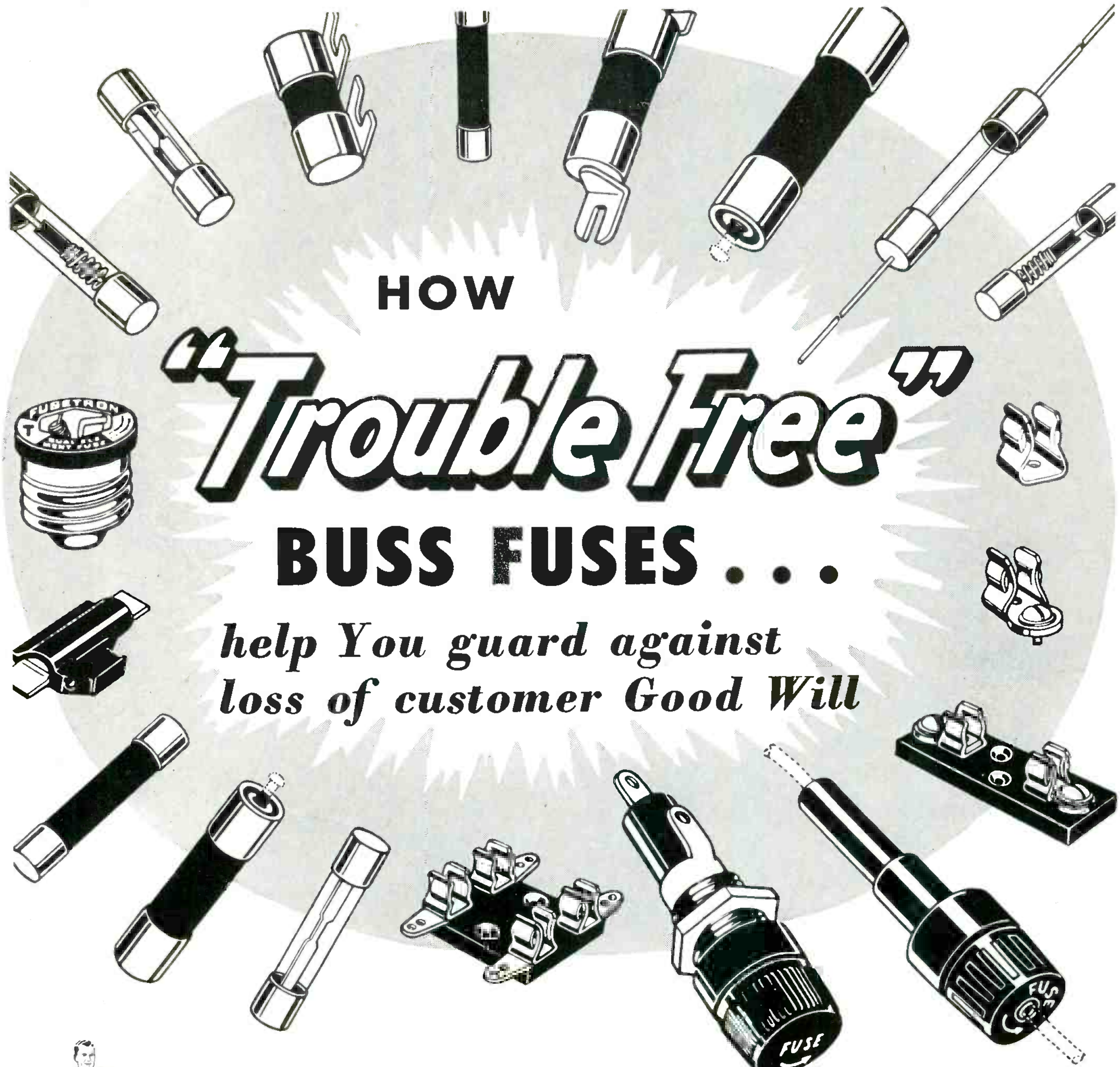


Fig. 1—Front and back views of electrostatic speaker.



portance in the speaker design. It has great tensile strength and is not affected by dampness or other atmospheric conditions to any significant degree. Thus, its important characteristic is that it will not shrink or stretch. With its layer of gold, the diaphragm is so thin that light can be seen through it. This sheen, then, provides a diaphragm with the characteristics of having practically no mass. Therefore, the gold plated polyester possesses excellent transient response characteristics since it is completely controlled by the audio voltages and momentum of the sheet

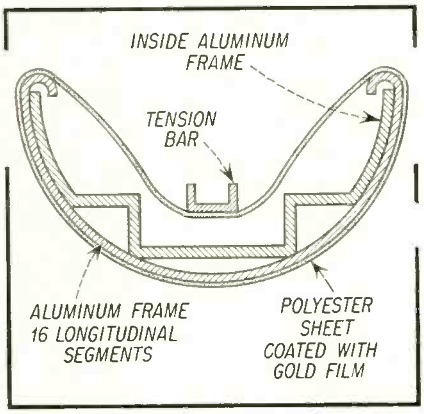


Fig. 2—Cross-section of electrostatic loudspeaker.

or diaphragm does not enter into its operation to introduce distortion.

Theory of Operation

As has been pointed out, the frame is used for mounting purposes and is grounded to the chassis. The other plate of this condenser speaker is the gold layer on the polyester material. To this gold film is applied a polarizing potential as shown in *Fig. 4*. The application of this voltage establishes a static or polarizing potential between

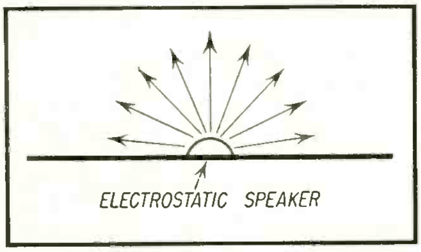


Fig. 3—Spatial audio paths from an electrostatic speaker.

the two elements of the speaker. In other words, it provides an axis about which the audio signals will swing. This sets up a strain or an electrostatic field between the two plates. Since it is a *dc* voltage that is applied one side must be positive and the other side negative as shown in *Fig. 5*.

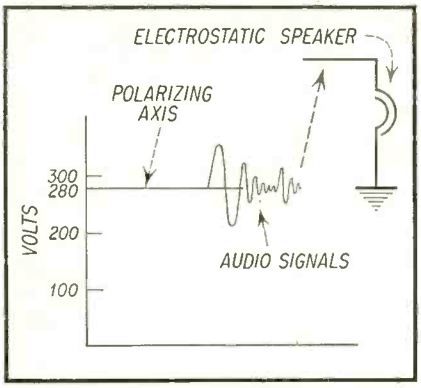


Fig. 4—Polarizing axis around which audio signal swings.

It is about the polarizing potential of 280 volts that the audio signal will vary. The audio voltage fed to the gold layer produces a corresponding change in the electrostatic field shown in *Fig. 5*. As the signal varies about its polarizing axis an increasing or decreasing attraction is developed between the two plates, the movable layer on the polyester film and the grounded frame. The polyester on which the gold layer has been placed is pulled in and pushed away from the frame in accordance with the audio voltages reproducing a movement of air about the speaker and thus the audio signals.

In *Fig. 6* is shown the manner in which the electrostatic speaker circuit is connected into an audio output system. Of course, the high audio frequencies must be present, supplied by the audio output tube plate circuit for these signals to be reproduced by the electrostatic speaker.

Examining *Fig. 6* it can be seen that the polarizing voltage is obtained at the plate of the audio output stage and is applied to the gold layer of the electrostatic speaker through a 4.7 megohm resistor. The other circuit arrangement can be considered as a high pass filter which attenuates the low frequency signals from the electrostatic speaker. If

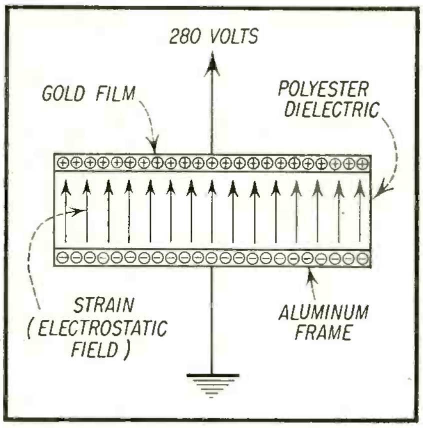


Fig. 5—Condenser action of electrostatic speaker.

this filter were not employed the large voltage swings of the low frequency signals would most probably tear the polyester material apart. High frequency audio signals do not have amplitudes anywhere near as large as the low frequency signals. Also, the high pass filter blocks the audio signals below

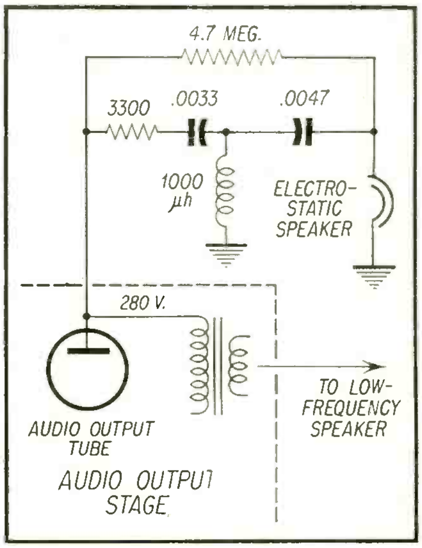


Fig. 6—How electrostatic speaker is connected to output tube.

7,000 cycles per second because the electrostatic speaker can not reproduce them without distortion.

The extent of frequency coverage by the electrostatic speaker is from about 7,000 cycles to beyond 20,000 cycles per second. When this unit is coupled with a good woofer, audio frequencies from 20 cycles to beyond the range of hearing are possible as shown in *Fig. 7*.

This new tweeter speaker provides a relatively inexpensive means of ob-

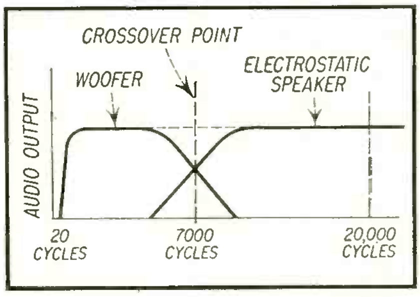


Fig. 7—Combined audio response of woofer and electrostatic unit.

taining high fidelity when it is connected into a circuit in which the high frequency audio signals are present to be reproduced.

The speaker develops no transient oscillations or peaks in frequency response due to natural resonance as frequently happens with other types of more expensive tweeters.

Black and White TV • Color TV • Transistor Radios • AM Radios

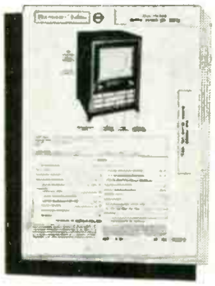
WHAT'S YOUR SERVICE PROBLEM?

FM Radios • Amplifiers and Tuners • Auto Radios • Record Changers

PHOTOFACT HELPS YOU SOLVE IT

FASTER, EASIER, BETTER, MORE PROFITABLY!

THE WORLD'S FINEST SERVICE DATA



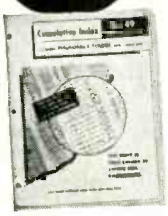
PHOTOFACT Service Data is the *only* service information based upon first-hand examination of the actual production-run receivers and equipment. It is authentic, uniform data developed through actual study and analysis by service engineers in the Howard W. Sams Laboratories. PHOTOFACT is the *only data* prepared from the practical point of view of the Service Technician.

Thousands of Service Technicians use PHOTOFACT daily for time-saving, profit-boosting service operations. If you've never used PHOTOFACT, you've never realized your full earning power—you've never given such complete customer satisfaction. So get the proof for yourself. Try PHOTOFACT—use it on any job. Your Parts Distributor has the Folder Sets you need for any of the 17,000 TV and radio receivers, changers, recorders, etc., covered in PHOTOFACT. Once you use this great service, we know you'll want the complete PHOTOFACT Library.

ONLY $25 DOWN

Puts a Photofact Service Data Library in Your Shop. Ask Your Photofact Distributor—He Has the Full Easy-Pay Details.

FREE PHOTOFACT CUMULATIVE INDEX



Send for it! Your guide to virtually any model ever to come into your shop; helps you locate the proper PHOTOFACT Folder you need to solve any service problem on any model. Once you have the make and chassis number, it takes just 60 seconds to find the applicable PHOTOFACT Folder. Send coupon now for your FREE copy of the valuable Cumulative Index to all PHOTOFACT Folders.

THESE GREAT FEATURES ARE EXCLUSIVE IN PHOTOFACT—THEY HELP YOU EARN MORE DAILY, HELP INSURE CUSTOMER SATISFACTION

FULL SCHEMATIC COVERAGE

1. Famous "Standard Notation" uniform symbols are used in every schematic.
2. The same standard, uniform layout is used for each schematic.
3. Diagrams are clear, large, easy to read, easy to handle.
4. Wave forms are shown right on the TV schematics for quick analysis by 'scope.
5. Voltages appear on the schematics for speedy voltage analysis.
6. Transformer lead color-coding is indicated on the schematic.
7. Transformer winding resistances appear on the schematic.
8. Schematics are keyed to photos and parts lists.

FULL PHOTOGRAPHIC COVERAGE

9. Exclusive photo coverage of all chassis views is provided for each receiver.
10. All parts are numbered and keyed to the schematic and parts lists.
11. Photo coverage provides quicker parts identifications and location.

ALIGNMENT INSTRUCTIONS

12. Complete, detailed alignment data is standard and uniformly presented in all Folders.
13. Alignment frequencies are shown on radio photos adjacent to adjustment number—adjustments are keyed to schematic and photos.

TUBE PLACEMENT CHARTS

14. Top and bottom views are shown. Top view is positioned as chassis would be viewed from back of cabinet.
15. Blank pin or locating key on each tube is shown on placement chart.
16. Tube charts include fuse location for quick service reference.

TUBE FAILURE CHECK CHARTS

17. Shows common trouble symptoms and indicates tubes generally responsible for such troubles.
18. Series filament strings are schematically presented for quick reference.

COMPLETE PARTS LISTS

19. A complete and detailed parts list is given for each receiver.
20. Proper replacement parts are listed, together with installation notes where required.
21. All parts are keyed to the photos and schematics for quick reference.

FIELD SERVICE NOTES

22. Each Folder includes time-saving tips for servicing in the customer's home.
23. Valuable hints are given for quick access to pertinent adjustments.
24. Tips on safety glass removal and cleaning.

TROUBLE-SHOOTING AIDS

25. Includes advice for localizing commonly recurring troubles.
26. Gives useful description of any new or unusual circuits employed in the receiver.
27. Includes hints and advice for each specific chassis.

OUTSTANDING GENERAL FEATURES

28. Each and every PHOTOFACT Folder, regardless of receiver manufacturer, is presented in a standard, *uniform* layout.
29. PHOTOFACT is a *current* service—you don't have to wait a year or longer for the data you need. PHOTOFACT keeps right up with receiver production.
30. PHOTOFACT gives you *complete* coverage on TV, Radio, Amplifiers, Tuners, Phonos, Changers.
31. PHOTOFACT maintains an inquiry service bureau for the benefit of its customers.

HOWARD W. SAMS & CO., INC.

Howard W. Sams & Co., Inc., Dept. 4-F5
2201 E. 46th St., Indianapolis 5, Ind.

☐ Send FREE Photofact Cumulative Index.

Name..................................

Address..................................

City.................Zone...State.......

HELPS YOU EARN MORE DAILY

EDITORIAL...

by S. R. COWAN
PUBLISHER

An Outrage

Recently, several Brooklyn, New York service dealers sent us an advertisement they had clipped from a local newspaper. It is an absolutely outrageous example of the unfair competition to which they are subject, and which is unpardonable if tolerated by RETMA members who recognize the offender and sell him, or other firms like his, as a distributor. That advertisement is reproduced for your examination.

D A. Urges 'Fixit-Yourselt' Plan to Curb TV Repair Abuses

DON'T SPEND UNNECESSARY MONEY
(We all work too hard for it these days.)
YOU CAN NOW FIX YOUR OWN TV SET YOURSELF
IT'S EASY

Nine out of ten cases your TV set is not working because of faulty tubes. We will check them for you FREE of charge; and if any are bad we will sell them to you for 50% off the regular selling price.

If your antenna is bad, YOU can replace it for as low as $3.95 depending on your location. We will give you FREE instructions on how to install it YOURSELF.

$3.95

If your set needs parts, we will tell you what parts are defective and show you how to replace them YOURSELF.

You can now replace your old PICTURE TUBE yourself for as low as $12.00 depending on its size. We will give you all the instructions and technical advice FREE of charge.

$12 UP

If you feel you are unable to remove your tubes yourself, bring down your entire set and we will BENCH CHECK it for you FREE OF CHARGE.

CONCORD ELECTRONICS CORP.
Wholesale Distributors of Electronic Parts
246 East 98th St., Bklyn. (Off Kings Highway)
HYacinth 8-2859-1871 For your convenience we are open 9 to 9, 6 days a week.

Having read the advertisement, don't you concur? This sort of "distributor" typifies what is wrong with the present system of manufacturer recognition.

Correction

In the May 1955 issue of Radio Television Service Dealer, the by-line for the article on the new EICO #232 Peak-to-Peak Vacuum Tube Voltmeter should have read as follows:

by the Engineering Department of Electronic Instrument Co., Inc., Brooklyn, N. Y.

Transistorization

Some months ago we were apprised of, but held to secrecy about, a new line of auto radios that would be tubeless, using transistors in their stead. Now it is public knowledge that Philco produces these receivers and they are used in the new line of Chrysler cars.

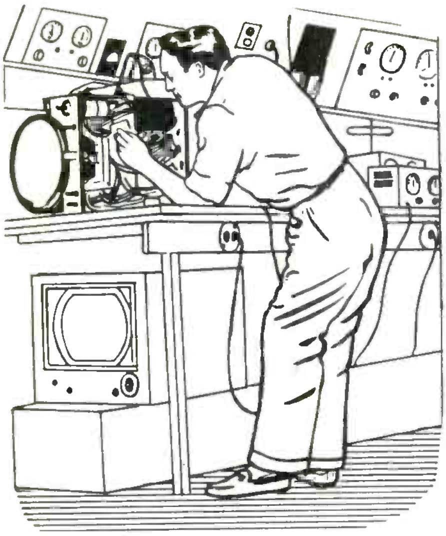
Basic features include low power supply drain, (about 85% less than is required for conventional radio tube models); immediate operation, (no lag needed to heat tubes); elimination of vibrators; more compactness, simplicity of installation, and fewer components making the chassis easier to service.

It is believed that momentarily there will be another and newer version of transistorized auto radio released. This one will be "dual duty-dual powered." By that we mean that the receiver can be used in its slot in the dashboard of the automobile, and it also can be removed instantly by the car owner for carrying as a portable. When in the car power will be derived from the car battery—when removed to use as a portable, the power will be furnished by an in-built lightweight dry battery.

Printed Circuitry and Transistors

Radio receivers, TV sets and even test instruments are now being produced, all having either printed, etched or dipped solder circuits. The makers concur that at present there is no noticeable saving in production costs of such processed circuits as compared to the conventional wired schematic types. But the big advantage lies in uniformity of high production standards by eliminating potential human error.

One big problem facing service dealers nowadays is this: "How will our income be affected by the ever-increased use of transistors, it being a known fact that transistors have much longer life than tubes?" Well, the outlook is not at all as dark as one might suppose. In the main, components will continue to break down, even those in printed circuits, and when they do the service dealer will be called upon to do the job of repair. But as the methods of replacing defective components are different in printed circuits, as contrasted with conventional wired circuitry, then the manner of determining labor and parts charges must be changed by the service dealer. Stated another way—henceforth, when you deal with and service a printed circuit receiver, perhaps you'd better have a proper price scale arranged for that sort of job. Servicing printed circuit and transistorized units requires completely new know-how and techniques—therefore such work must have a labor price scale accordingly pre-arranged.



The Work Bench

by PAUL GOLDBERG

This Month:

VIDEO AMPLIFIER PROBLEMS

VIDEO problems can be solved with greater ease with the use of an RF signal generator and an oscilloscope. This installment is devoted to two such problems where these instruments come into use.

Westinghouse 2150-101

The receiver was turned on and it was observed that the picture had very low video gain. There was no snow in the picture, the sound was good and all stations, though weak, were receivable. Thus because there was no snow and the sound was good the tuner was eliminated as a possibility of causing the trouble. The *if* tubes were all replaced individually without effect. See *Fig. 1*.

Studying the diagram it was noted that the sound was taken off at the video detector (1N34) load resistor *R319*. It didn't seem plausible that the 1N34 could produce good sound and weak picture. Thus, we moved to the 6AH6 video circuit in order to discover the trouble. The 6AH6 was replaced but had no effect.

The oscilloscope was now set up and a wave form was first taken at the control grid of the 6AH6, pin #1. The wave form was correct. A wave form was next taken at the plate pin #5 of the 6AH6. Here there was an increase in the wave form voltage of about ten times that of the grid voltage. This wave form voltage also seemed correct. A wave form was next taken directly at the cathode of the C.R.T. Here the wave form voltage dropped to about ¼ the wave form voltage at the plate of the 6AH6. Here was our trouble. Because the 6AH6 seemed to me amplifing properly, no voltage checks were made. However, resistance checks were made immediately of *R326* and *R332*. These resistors nevertheless, checked correctly. It seemed that the only possibility left was C322, .1 μf. A .1 μf condenser was now connected in parallel with C322 and immediately the video gain jumped up to normal. Thus, C322, .1 μf was open. A new condenser was installed and the receiver functioned properly.

One can easily see that C322 offers a short circuit to the video frequencies across *R326*. With C322 open, the voltage drop across *R326*, 100K will reduce the input voltage to the C.R.T. cathode considerably.

DuMont RA 109

The receiver was turned on and a very bad smear was observed in the picture. It was deduced that this smear was due to excessive low frequency response. Tubes rarely cause this type of trouble. However, just to be sure, the 6AL5, 6BA6, and 6AQ5 were replaced but without effect. Occasionally, *rf* or *if* misalignment causes this type of trouble but studying the picture quality

[*Continued on page 50*]

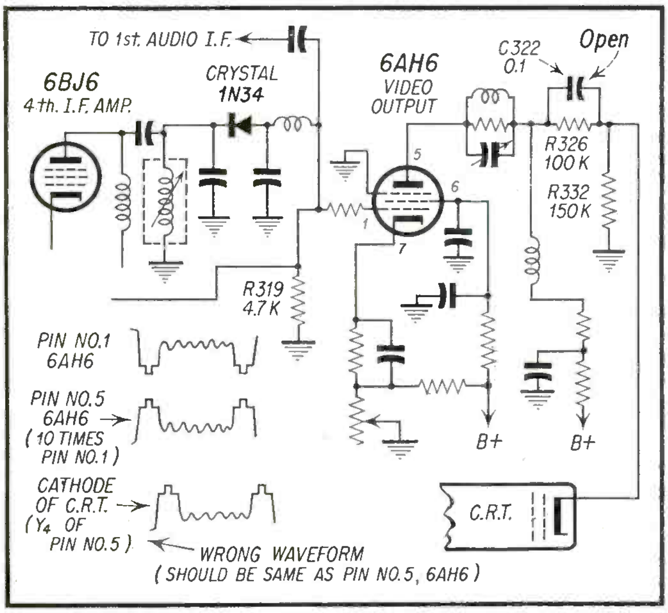


Fig. 1. — Partial schematic of Westinghouse 2150-101 receiver.

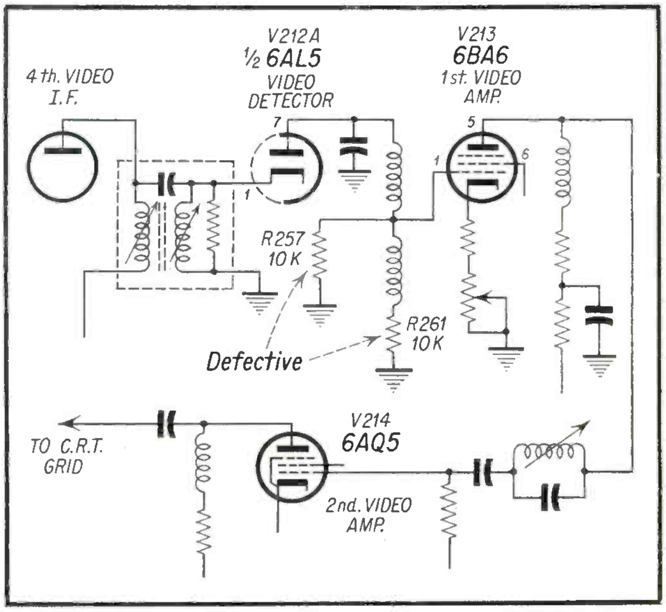
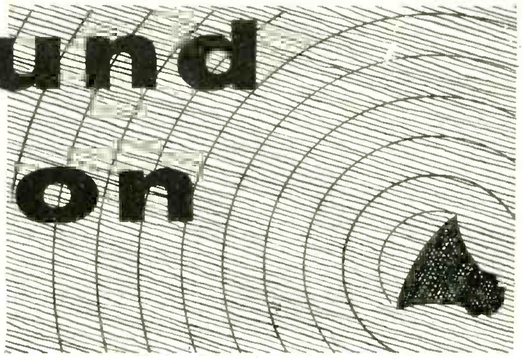


Fig. 2. — Partial schematic of DuMont RA-109 receiver.



compound diffraction

Projection Speakers

by **Charles Eastman**

Many of the illustrations in this article have been reproduced from the original appearing in "The Public Address Handbook for the Compound Diffraction Projector," published by Electro-Voice, Inc., by courtesy of Electro-Voice, Inc.

THE compound diffraction projector loudspeaker is a comparatively new type which has appeared on the P.A. market in recent years. Its use is becoming more and more widespread. It is the purpose of this article to discuss the construction, operation and characteristics of this type of speaker. In discussing any speaker used in the P.A. field, the important factors to be considered are its efficiency, its dispersion, its frequency response, and its distortion.

The design of this speaker is based on a principle long known and used in the field of optics, namely, the principle of diffraction. Applied to sound the principle states, in effect, that if a sound wave is made to pass through a "slit" or rectangular opening, where the width of the opening is shorter than the wave length of the sound, the sound will spread out from this opening as if the opening were the source of the sound rather than the original vibrating body. The spread would be in direction of the width of the rectangular opening. Fig. 1 is a sketch illustrating such a rectangular opening, and the dispersion of the emerging sound waves. The application of this principle to loudspeaker design has resulted in a marked improvement in the angular dispersion of sound, particularly at the higher frequencies.

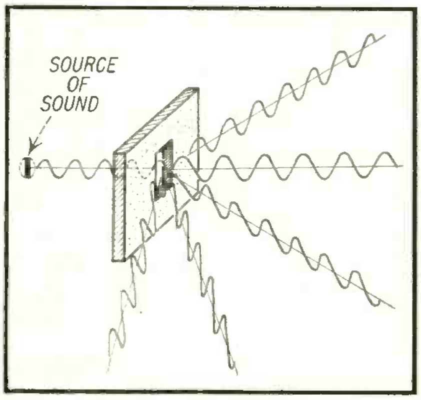


Fig. 1—The diffraction of sound. Dispersion takes place when the incident waves pass through the rectangular opening.

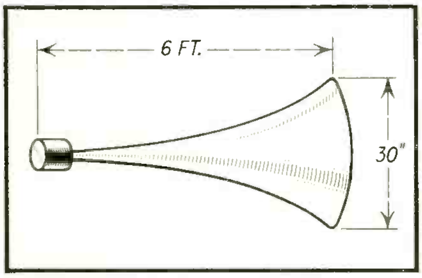


Fig. 2—Straight trumpet. A typical horn of this type has a low frequency cut-off of 115 cps, but concentrates the high frequencies into a narrow band.

Efficiency

The efficiency of a loudspeaker is a measure of how much of the electrical energy fed to it is converted into useful sound energy. The efficiency of a speaker is not an important factor in home amplifiers, since a very small amount of power can produce an uncomfortably loud sound in one's living room. Not so however in P.A. systems where the sound must reach out and cover large areas. Any substantial increase in the efficiency of the speaker for P.A. installations pays off in smaller and less expensive amplifiers.

It has been found that a horn of one type or another is the most efficient means yet developed for coupling the vibrations of a diaphragm to the atmosphere. Thus speakers have gone through a process of evolution from the early straight trumpet shown in *Fig.* 2, to the present day multicellular horns and reentrant horns shown in *Figs.* 3 and 4, and finally to the horn used in the compound diffraction projector shown in *Fig.* 5.

Dispersion

The geometry of the horn used in the compound diffraction projector, as previously explained, results in an unusually wide dispersion angle. *Fig. 6* is a polar diagram which illustrates this point. The solid lines in this diagram represent the response of the CDP for the frequencies indicated. For comparison purposes, the dotted lines show the polar patterns at the same frequencies

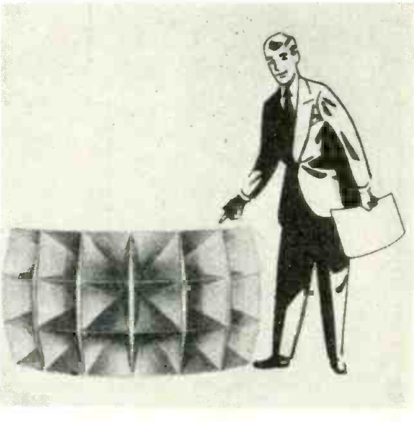


Fig. 3—Typical cellular horn covering 60° x 120° angle. Horn is normally crossed over at 400 cps to protect driver units from excessive bass excursions and has a 250 cps cut-off.

Fig. 4—Typical reentrant trumpet with 20" bell diameter.

but using a reentrant horn. These are the conditions when the CDP is mounted in a vertical position. If the CDP is mounted horizontally, the polar distribution is somewhat narrowed. As will be shown later there are occasions when this narrower distribution is desirable. A typical CDP has a dispersion of 120° when mounted vertically and 90° when mounted horizontally. A glance at *Fig. 5* will show that in this CDP two horns are mounted coaxially. The crossover point of these two horns is at 1000 *cps.* The smaller high frequency horn can be rotated within the larger horn. Thus there are four distinct ways in which the horns may be oriented. These are,

1. Both horns vertical.
2. Both horns horizontal.
3. High frequency horn horizontal and low frequency horn vertical.
4. High frequency horn vertical and low frequency horn horizontal.

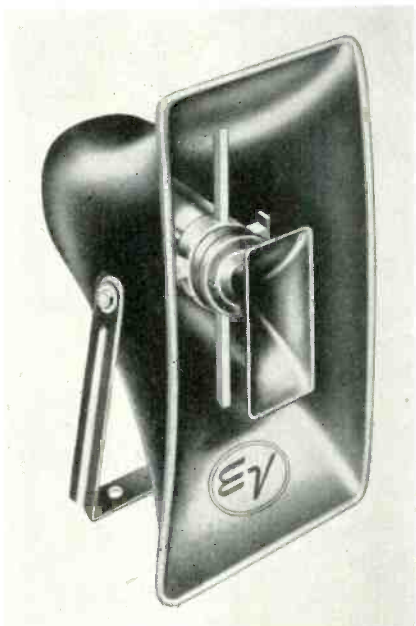


Fig. 5—Horn used in compound diffraction projector.

Each of these orientations has its own characteristic polar distribution. One of the main advantages of this versatility lies in the control it gives over feedback. In many cases, for example, feedback peaks occur at frequencies over 1000 *cps.* By properly orienting the high frequency horn, it is often possible to reduce the feedback condition considerably. Another advantage lies in the ability to adjust the speakers to the audience it is desired to reach. In most cases, the audience is widespread, and the horns would be adjusted for maximum dispersion. There are instances, however, where the audience would be concentrated along the axis of the horn, and in these cases a narrower polar distribution would reach out further.

Frequency Response

The basic straight trumpet is no longer widely used. The reason for this lies primarily in its large size. However, since the multicellular horn and the re-

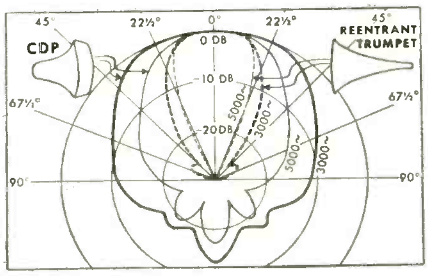


Fig. 6—Distribution at important high frequencies in a compound diffraction projector. The dispersion of a 20" bell reentrant horn is shown with dotted lines.

entrant trumpet are derived from this basic straight horn, the same basic factors govern the dispersion and the frequency response of all three. These factors are:

1. A good low frequency response requires a horn with a large mouth.
2. A horn with a large mouth concentrates the higher frequencies in a narrow beam along the axis.

In addition, good low frequency response calls for a driver unit with a larger throat than that required for good high frequency response. It can be seen then, that a single horn cannot accomplish both good response at the low frequencies and good dispersion at the higher frequencies. One attempt to remedy this situation is by the use of a combination of a large woofer horn for the lows and multicellular horns for the highs.

Each cell of the multicellular horn acts like straight trumpet with a small mouth, thus providing improved dispersion for high frequencies. The multicellular horn simply combines a number of these cells, each with a slightly different orientation, to obtain the desired dispersion. The low frequency response however is poor, necessitating the use of a separate woofer. Such an arrangement however is bulky and expensive.

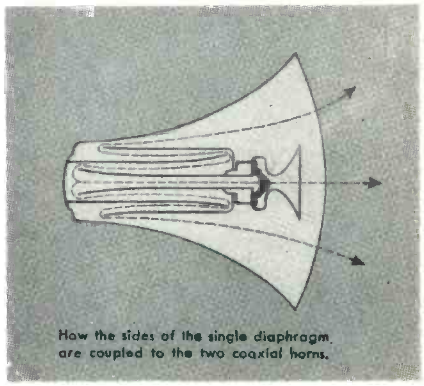


Fig. 7—Two horns of different sizes are driven by a common diaphragm as shown above.

In addition, the high frequency response is impaired by the constriction formed at the throats of the cells.

The CDP illustrated in *Fig. 5* is a coaxial speaker assembly, expressly designed for high quality speech and music reproduction. It has a flat response within ± 5 db from 175 to 10,000 cps. It does this by making use of two horns of different sizes, driven by a common diaphragm, as shown in *Fig. 7*. The large horn is especially designed for the propagation of the low frequencies, while the small horn, inside the mouth of the large horn is designed primarily

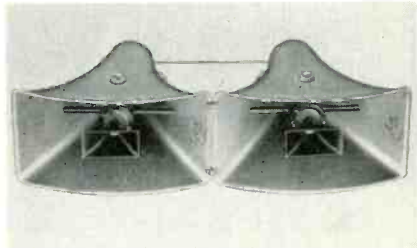


Fig. 8—Horizontal placement of multiple CDP's for increased power handling and augmented bass capacity. Horns may be stacked vertically as well as horizontally.

for the high frequencies. The crossover frequency is at 1000 cps. The throat of each horn is designed for optimum operation at the frequencies to be handled by each.

When CDP's are stacked, a further improvement of low frequency response is obtained, as described below. When a single CDP is mounted in a corner, the walls act as an extension of the horn

[*Continued on page 50*]

Association News

National Alliance of TV & Electronic Service Association

Business idea of the month: Spruce up your shop. Discussed also is the evil of low-fee service calls. Taken to task are those operators who are advertising bargain rates and thereby injuring other technicians, the public and themselves.

NATESA lauds the proposed RETMA program for upgrading TV technicians. However, they take issue with the manufacturers' group on its allegation that "the independent service industry has not rendered good and proper service." Finally, NATESA believes that what is needed now is the launching of an "accreditation program."

Utah Association of Radio & TV Servicemen

From NATESA Scope: The state licensing bill which was sponsored by this group passed in the Senate by a 20 to 1 margin and in the House by a 39 to 17 margin, only to be vetoed by the Governor. He gave as his reason the fact that he felt that authority was already vested in cities and counties to control TV service.

Philadelphia Radio Servicemen's Association

Radio and television servicemen of the Hazleton area have begun organizing a servicemen's association for the mutual exchange of information.

A program committee has been set up to plan meetings at which representatives of various electronics manufacturers will lecture on latest developments in equipment.

Named to a membership committee were Bernard Pora, of Pora's Radio City; Paul Gombeda of Residential Radio & Electric Service; Joseph Gans, of Gans Television; George Sabol, of Sabol TV; Robert Pensock, of S. J. Pensock Co.; Paul Wensko, of Wensko TV Service; and Dominic Cerrito, of Cerrito Radio & Television.

Federation of Radio Servicemen's Association of Pa.

In a letter addressed to the FCC, Washington, D. C., FRSAP expresses its concern with regard to the possibility that manufacturers of subscription television units will probably insist that they control and monopolize the installation, maintenance, and servicing of such units. If this is allowed subscription television will completely eliminate the established servicing agencies of independent radio and television shop owners from subscription television. FRSAP therefore petitioned the FCC to issue rules and regulations which will prohibit manufacturers from such practices.

Television Service Dealers Association of Philadelphia

TSDA has gone on record protesting Philco's advent into TV servicing; also requesting FCC action on Subscription TV to protect independent service shop owners.

Syracuse Television Technicians Assoc. (NY)

Advises members to "Police" wholesalers who sell retail and let them know feelings of service technicians on this subject.

Milwaukee Association of Radio & TV Services

From NATESA Scope: The election of officers was held at the February meeting of the Milwaukee Association of Radio & Television Services. Nor-

[*Continued on page 44*]

H.F. OSCILLATOR ALIGNMENT

If the 6U8 oscillator tube is replaced, the different inter-electrode capacitance of the new tube may change the oscillator frequency enough to require re-alignment of the H.F. oscillator.

Alignment of the VHF oscillator on the high band (channels 7—13) is accomplished from the top of the tuner by adjusting the brass slug (L102) shown as A21 on Fig. 1.

Alignment of the VHF oscillator on the low band (channels 2—6) is accomplished from the top of the tuner by adjusting the brass slug (L101) shown as A20 on Fig. 1.

These slugs can be adjusted without removing the chassis from the cabinet. The adjustment procedure is as follows:

(1) Rotate the fine tuning control to the middle of its range by rotating it until the slot in the shaft is straight up and down.

(2) Set the channel selector to the highest channel in the high band (7 to 13) operating in your locality.

(3) Using a non-metallic alignment tool, (see Fig. 3) peak the high band adjustment slug L102 (A21 in Fig. 1) for best picture detail and sound quality.

(4) Set the channel selector to the highest channel in the low band (2—6) operating in your locality.

(5) Peak the low band adjustment slug L101 (A20 in Fig. 1) for best picture detail and sound quality.

(6) Check the previously made adjustments and if tuning has changed repeat the above procedure.

Fig. 3 Alignment Tool —Hi-Low Band Adjustment

Fig. 4 Alignment Tool for T100

SERVICE

The frequencies at which the UHF tuner operates are extremely high; therefore, it is necessary that the utmost care be taken to safeguard against upsetting the delicate adjustments of the tuner. It is recommended that only minor repairs be made to the tuner such as loose or dirty contacts, replacement of tubes or crystal in case of low UHF tuner sensitivity. The tuner should be returned to the factory for alignment and major repairs.

Replacing a tube with a new one, may detune the tuner. If this occurs a number of tubes should be tried until the most satisfactory substitute for the original is found.

The V-14130-1 tuner is composed of two separate and independant units. When it is necessary to replace the tuner only the defective section should be replaced.

NOTE: If the crystal in the UHF section is defective it should be replaced instead of replacing the complete UHF section. Replacement crystals are stocked as Part No. V-8634-2.

UHF TUNING MECHANISM

The UHF section of the tuner is tuned by means of a 3 gang tuning capacitor, which is driven by a specially designed gear and worm drive mechanism. The gearing arrangement is so constructed that the coarse and fine tuning can be accomplished by a single knob. The tuning shaft is coupled to a bevel gear which forms a gear and worm drive arrangement that produces slow rotation for fine tuning. After rotating the shaft approximately one turn, a pin engages the large driving shaft and the two shafts are coupled directly together for coarse tuning. The re-engage the fine tuning arrangement, it is only necessary to reverse the direction of rotation. The three gang tuning shaft is fully closed when the fine tuning shaft is fully clockwise.

PRODUCTION CHANGES

1. Deflection Yoke

To improve neutralization in the V-12118-4 yoke assembly (assembly contains V-14658-2 yoke), Capacitor C439 is changed from 51 mmf. to 47 mmf. part number V-9792-10470J.

2. Tuner B+ Voltage

To reduce hum modulation and increase the filtering of the low B+ applied to the tuner. The low B+ voltage applied to the tuner is now taken off point D of the candohm resistor (R454) instead of point C (See Fig. 1)

3. Horizontal Output Tube

In later production of the V-2213 or V-2323 chassis the horizontal output tube has been replaced by a 6BQ6GA or 6CU6 tube. Both tubes are directly interchangeable.

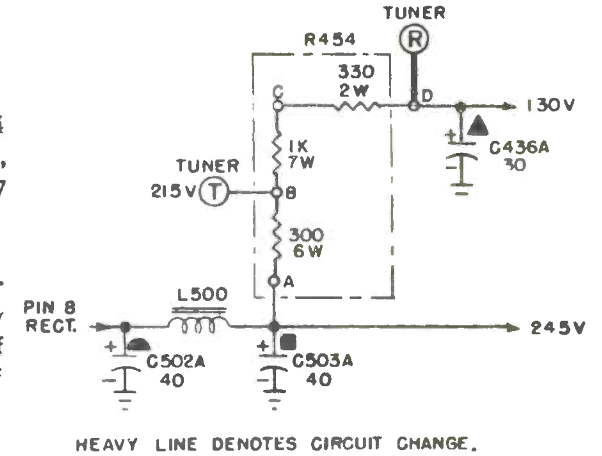


FIG. 1 Low Voltage Distribution

RF TUNER ASSEMBLY INFORMATION

In later production of the V-2313 chassis a V-14170-2 (Code 294) RF tuner is used. The basic V-2313 and V-2323 service manual covers service information on the V-14170-2 (Code 305) RF tuner. To avoid confusion when identifying the V-14170-2 tuner the following information may be useful.

The V-14170-2 tuner used in the V-2313 chassis is being supplied by two different manufacturers. Each manufacturer identifies their tuner by a code number, Code 305 (Standard Coil) and Code 294 (G.I.). The two variations of the V-14170-2 tuner are interchangeable with respect to electrical characteristics and physical mounting. It should be noted that the two tuners are not alike schematically or mechanically, therefore, care should be taken when servicing a V-14170-2 tuner that the proper schematic diagram and exploded view be used. A schematic diagram, exploded view, electrical and mechanical parts list for the V-14170-2 (Code 294) will be found in this supplement. The basic V-2313 and V-2323 service manual contains the alignment, adjustment and other service information that is common to both tuners (Code 305 and Code 294).

In models using chassis assemblies V-2323-101, V-2323-201 and V-2323-301 a combination VHF-UHF all channel tuner, Part No. V-14130-1 is used. This supplement contains all the necessary service and alignment information pertaining to the V-14130-1 tuner.

TUNER REPLACEMENT

The following information describes the dismantling of the UHF tuner from the VHF tuner.

(1) Remove the two screws (top and bottom) which hold the VHF unit to the UHF unit.

(2) To dismantly the UHF tuner from the VHF tuner, pull the UHF unit forward, the outer shaft will slide forward over the inner shaft.

(3) To replace UHF unit reverse the above procedure.

OVERALL ALIGNMENT INFORMATION

When aligning a V-2323 chassis using a V-14130-1 combination tuner, sections 5, 6, 7 and 8 of the common IF alignment chart of the basic V-2313 and V-2323 service manual should be changed to read as follows.

5.	44 mc. sweep to 1st IF grid	Detune T100 before Adjusting T300	Pri. of T300 for Max. response and Sec. of T300 for symmetrical curve.
6.	44 mc. sweep to 1st IF grid		T100 for "suck-out" at 44 mc. (center of curve) See Fig. 5C. Use alignment tool as shown in Fig. 4 in this supplement.
7.	Replace the RF Amplifier Tube		
8.	213 mc. sweep to antenna terminals through network.	Set fine tuning to mid-range. (Slot in fine tuning shaft straight up and down.)	L300 for symmetrical curve and L301 for min. 41.25 mc. marker amplitude. See Fig. 5D.

ALIGNMENT CHARTS

COMMON I-F SECTION

Rotate the channel selector to channel 13.

Connect the oscilloscope to the video test terminal, point "B" on Fig. 6, through the decoupling network shown in Fig. 2.

Connect a 9 volt bias battery to the AGC line, point "A" on Fig. 13.

Couple the marker generator output to the sweep generator output. In the steps that follow, use the marker to check the response curve at the frequencies indicated on Fig. 5.

Step	Alignment Signal	Remarks	Adjust –
1.	Remove the RF amplifier tube.		
2.	44 mc. sweep to 3rd IF grid	Connect detuning clips to 1st & 2nd IF plates	Pri. of T302 for max. response and sec. of T302 for symmetrical curve shown in Fig. 5A.
3.	47.25 mc. amplitude modulated to 1st IF grid	Use sufficient signal to produce sine wave response on oscilloscope.	L302 for min. response
4.	44 mc. sweep to 2nd IF grid	Connect detuning clip to 1st IF plate	Pri. of T301 for max. response and sec. of T301 for symmetrical curve shown in Fig. 5B.
5.	44 mc. sweep to 1st IF grid	Detune L103 before adjusting T300	Pri. of T300 for max. response and sec. of T300 for symmetrical curve
6.	44 mc. sweep to 1st IF grid		L103 for "suck-out" at 44 mc. (center of curve), See Fig. 5C.
7.	Replace the RF amplifier tube		
8.	213 mc. sweep to antenna terminals through network.	Fine tuning set to mid-range	L300 for symmetrical curve and L301 for min. 41.25 mc. marker amplitude. See Fig. 5D.

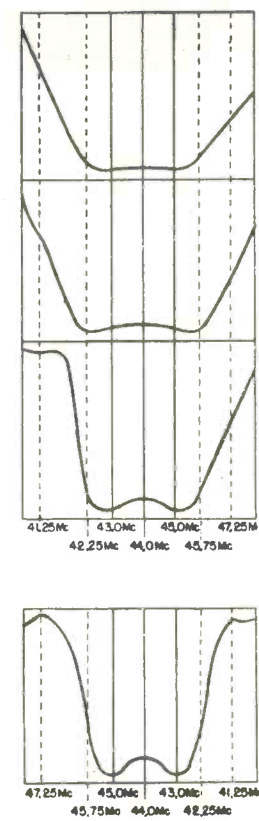


Fig. 5 – Response Curves at Various Stages of Alignment

SOUND I-F SECTION AND 4.5 MC. TRAP

Connect the signal generator to the video test terminal (Point "B" on Fig.6) through a .001 mfd. capacitor.

Step	Signal Gen. Frequency	VTVM Connections	Remarks	Adjust –
1.	4.5 mc. unmodulated	RF probe to point "C" (see Fig. 13) and common lead to chassis.	Use strong signal from generator	L303 for minimum voltage
2.	4.5 Mc. FM 7.5 Kc. Dev.	Across volume control	Use strong signal from generator	L202 for maximum output
3.	Same as step 2	Same as step 2	Use weakest signal from generator.	L200, L201 and L202 for maximum output
4.	4.5 Mc. AM 30% Mod.	Same as step 2	Start with weak signal increase as adjustment is made.	Quieting control for dip to zero.

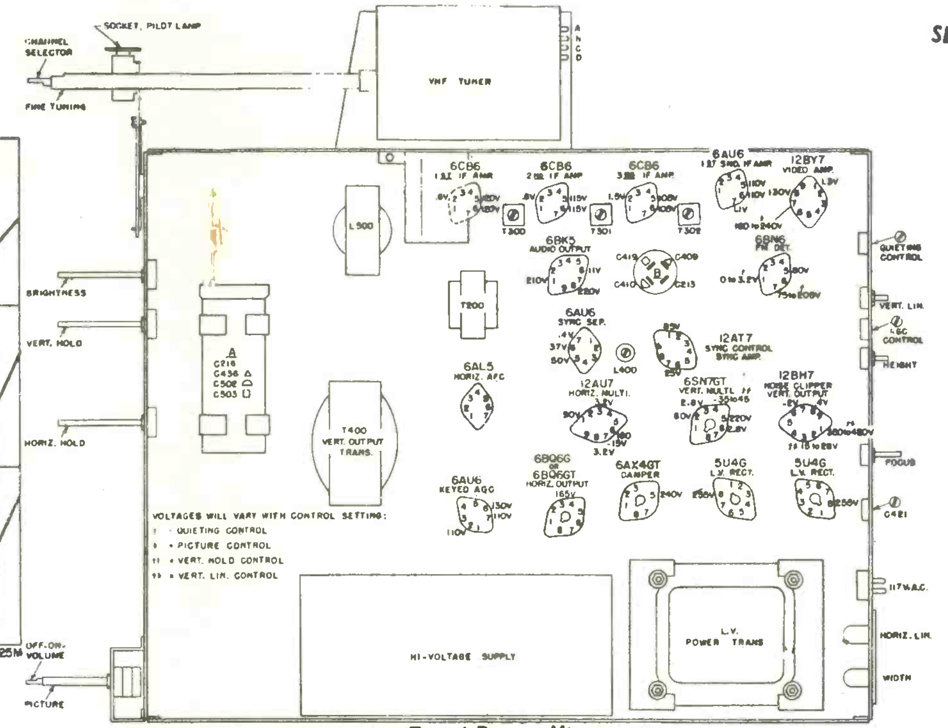


Fig. 4 Bottom View

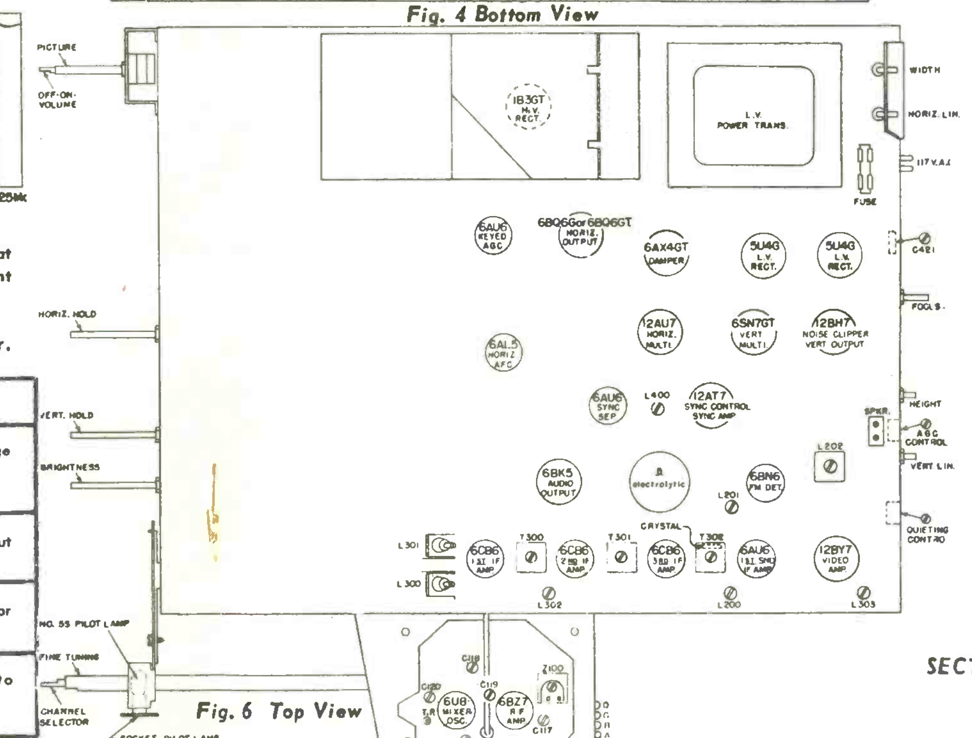


Fig. 6 Top View

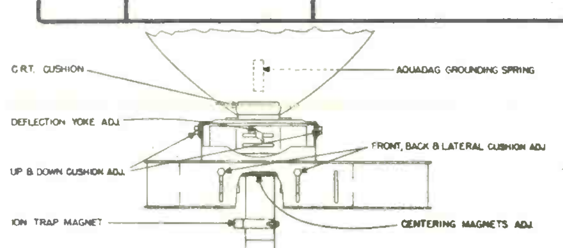


Fig. 1 CRT Adjustments

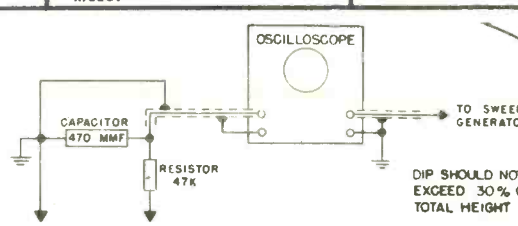


Fig. 2. Oscilloscope Connections

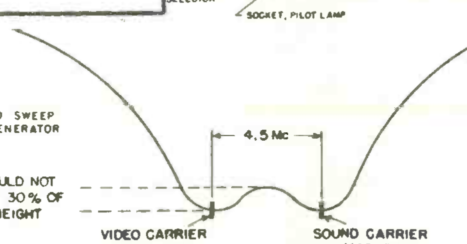


Fig. 9 RF Mixer Response Curve

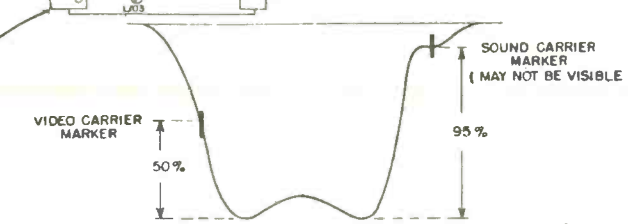


Fig. 11 Overall Response Curve

CHASSIS PARTS

SECTION 2 – SOUND I–F AND AUDIO

Ref. No.	Part No.
C200	V-9926-3
C202	V-9044-1
C206	V-9044-1
C213B	V-11535-1
C216A	V-9891
L200	V-9882-5
L201	V-9882-2
L202	V-11396-1
L203	V-9915-2
R202	V-11345-2
✓ R206	V-9877-10
T200	V-14080-2

SECTION 3 – VIDEO

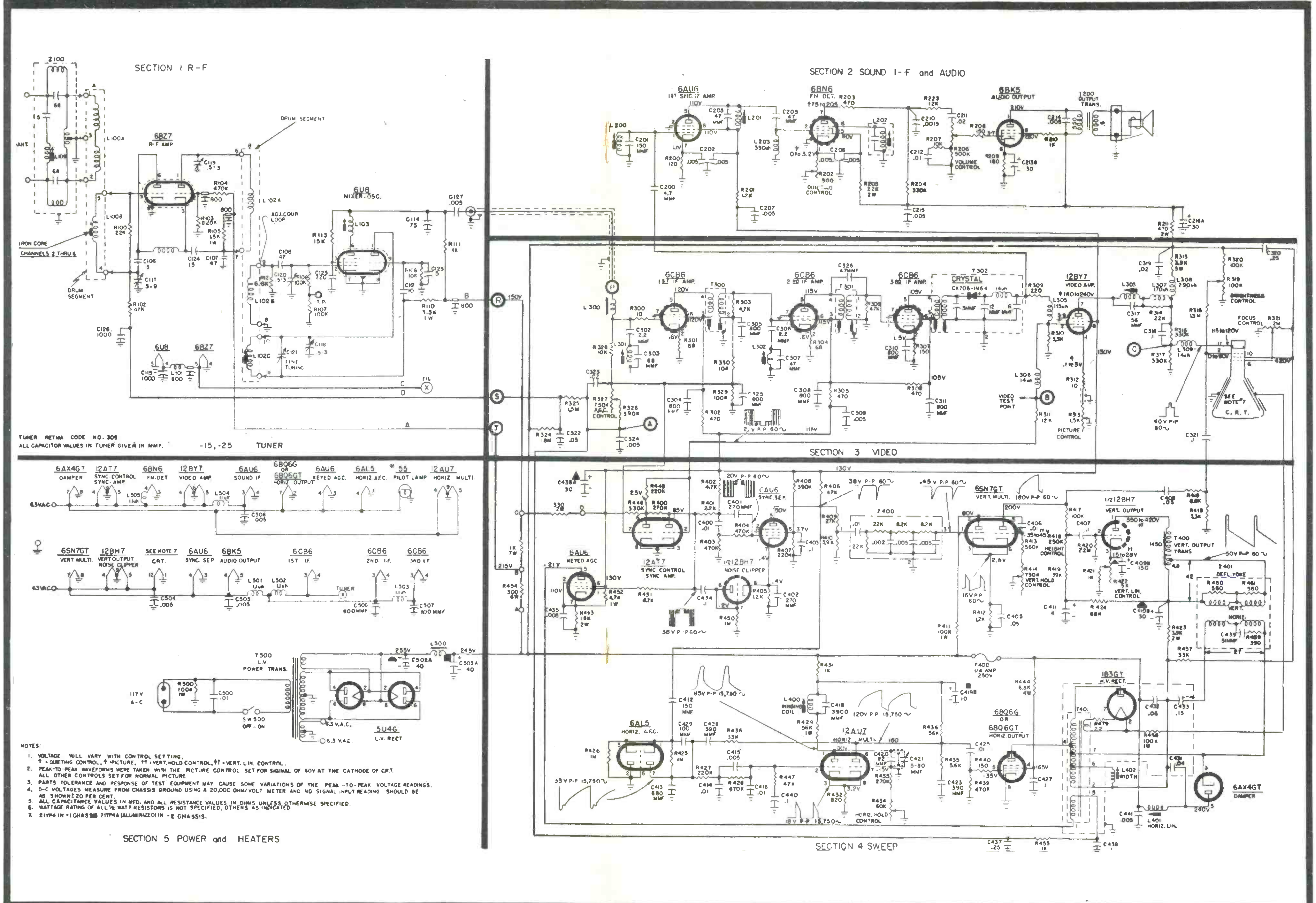
Ref. No.	Part No.
C302	V-8963-2296
C306	V-8963-2298
C312	V-8659
C326	V-8963-4788
	V-10916-1
L300	V-9882-8
L301	V-11973-1
L302	V-11973-1
L303	V-9882-9
L304	V-4886-1
L305	V-5902-5
L306	V-4886-1
✓ L307	V-9915-7
✓ L308	V-9915-8
L309	V-4886-1
R303	V-9927-2
R306	V-9927-2
✓ R313	V-9877-10
R315	V-5924-3
R319	V-11536-2
✓ R321	V-12709-3
R327	V-12272-1
R328	V-9927-10
T300	V-9879
T301	V-9879
T302	V-12128-1

SECTION 4 – SWEEP

Ref. No.	Part No.
C409B	V-11535-1
C410B	V-11535-1
C411	V-4885
C419B	V-11535-1
C421	V-11228-2
C436A	V-9891
C439	V-9792-10510J
C439	V-9792-10430J
F400	V-6171-6
L400	V-6764
✓ L401	V-14601-1
✓ L402	V-14602-1
R414	V-11539-2
✓ R418	V-12709-2
✓ R422	V-12709-1
R434	V-11538-3
R444	V-12171-2
✓ R454	V-14556-1
✓ R458	V-9927-18

SECTION 5 – POWER AND FILAMENT

Ref. No.	Part No.
C500	V-5040-15
C502A	V-9891-1
T400	V-10909-2
✓ T401	V-14346-1
Z400	V-11192-1
Z401	V-12218-3
L500	V-6471-3
L501	V-4886-2
L502	V-4886-2
L503	V-4886-2
L504	V-4886-2
L505	V-4886-2
R500	V-9927-12
✓ T500	V-12605-1


SECTION 1 R-F
TUNER RETMA CODE NO. 305
ALL CAPACITOR VALUES IN TUNER GIVEN IN MMF.
TUNER
SECTION 2 SOUND I-F and AUDIO
SECTION 3 VIDEO
SECTION 4 SWEEP
NOTES:
1. VOLTAGE WILL VARY WITH CONTROL SETTING.
† = QUIETING CONTROL, † = PICTURE, †† = VERT. HOLD CONTROL, †† = VERT. LIN. CONTROL.
2. PEAK-TO-PEAK WAVEFORMS WERE TAKEN WITH THE PICTURE CONTROL SET FOR SIGNAL OF 60V AT THE CATHODE OF C.R.T. ALL OTHER CONTROLS SET FOR NORMAL PICTURE.
3. PARTS TOLERANCE AND RESPONSE OF TEST EQUIPMENT MAY CAUSE SOME VARIATIONS OF THE PEAK-TO-PEAK VOLTAGE READINGS.
4. D-C VOLTAGES MEASURE FROM CHASSIS GROUND USING A 20,000 OHM/VOLT METER AND NO SIGNAL INPUT READING SHOULD BE AS SHOWN ± 20 PER CENT.
5. ALL CAPACITANCE VALUES IN MFD. AND ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.
6. WATTAGE RATING OF ALL ½ WATT RESISTORS IS NOT SPECIFIED, OTHERS AS INDICATED.
7. 21YP4 IN -1 CHASSIS 21YP4A (ALUMINIZED) IN -2 CHASSIS.
SECTION 5 POWER and HEATERS

An exclusive service of Cowan Publishing Corp. by special arrangement with John F. Rider, Publisher

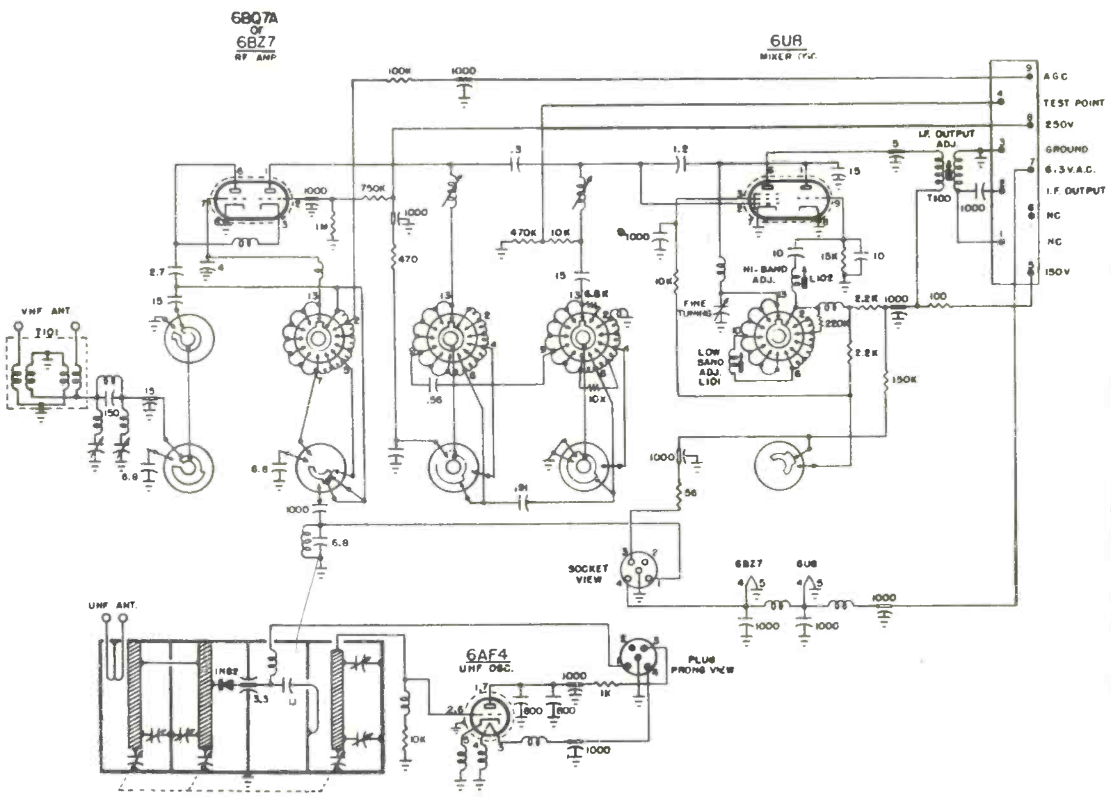


Fig. 2 V-14130-1 Schematic Diagram

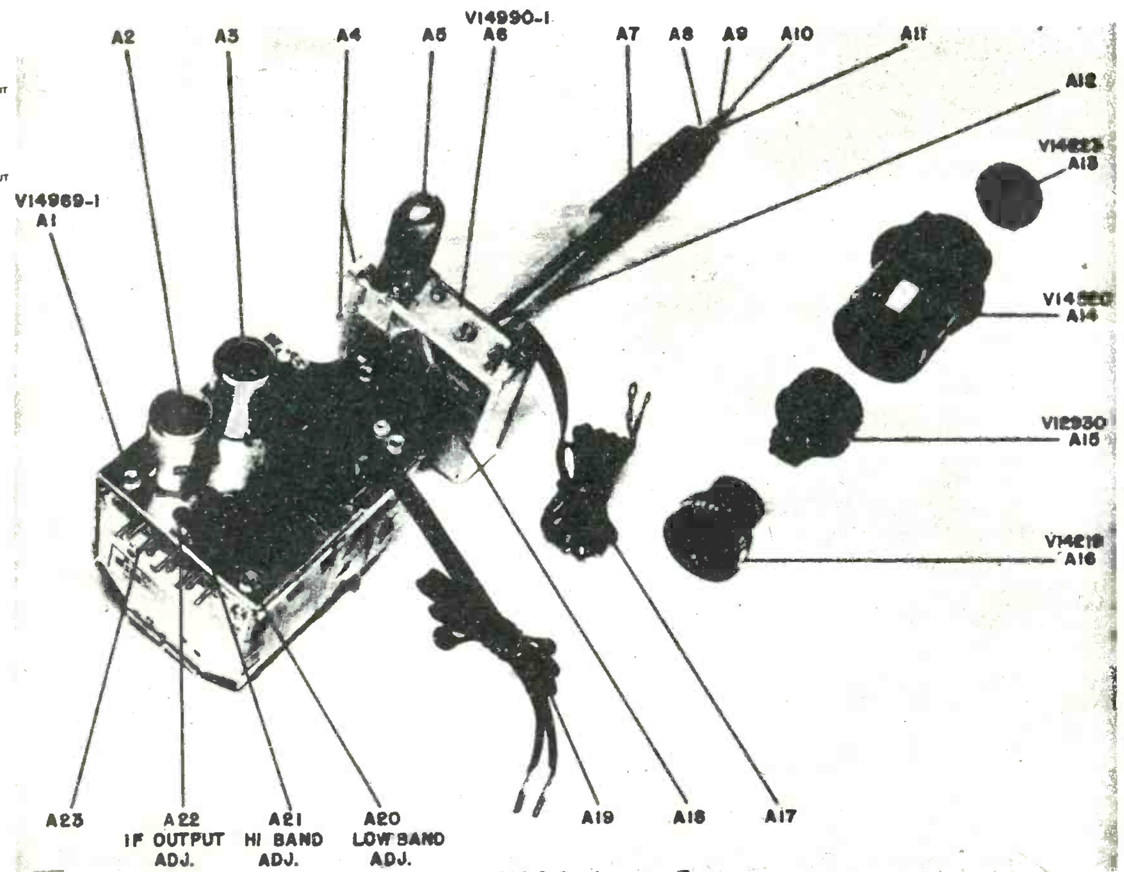


Fig. 1 V-14130-1 Combination Tuner

IDENTIFICATION OF VHF–UHF TUNER COMBINATION V-14130-1

A1 VHF tuner, complete V-14989-1
A2 6U8 VHF Mixer–Osc. tube
A3 6BQ7A VHF RF Amplifier tube
A4 UHF Tracking adjustments (factory set)
A5 6AF4, UHF Osc. tube
A6 UHF Tuner complete V-14990-1
A7 Shaft, UHF Dial Knob 14–83
A8 Shaft, UHF Channel selector – Fine tuning
A9 Shaft, VHF Channel selector 2–13 and UHF window
A10 Shaft, VHF fine tuning knob
A11 "C" washer with stop
A12 Gear and worm drive assy.
A13 VHF fine tuning knob V-14223
A14 VHF Channel selector knob with UHF window V-14520
A15 UHF fine and coarse tuning knob V-12930-1
A16 UHF dial knob 14–83 V-14219
A17 UHF antenna lead-in
A18 Socket, connects UHF tuner electrically
A19 VHF antenna lead-in
A20 Low-band oscillator adjustment (1–6)
A21 High-band oscillator adjustment
A22 IF output adjustment (44 mc.)
A23 Terminal, connection points

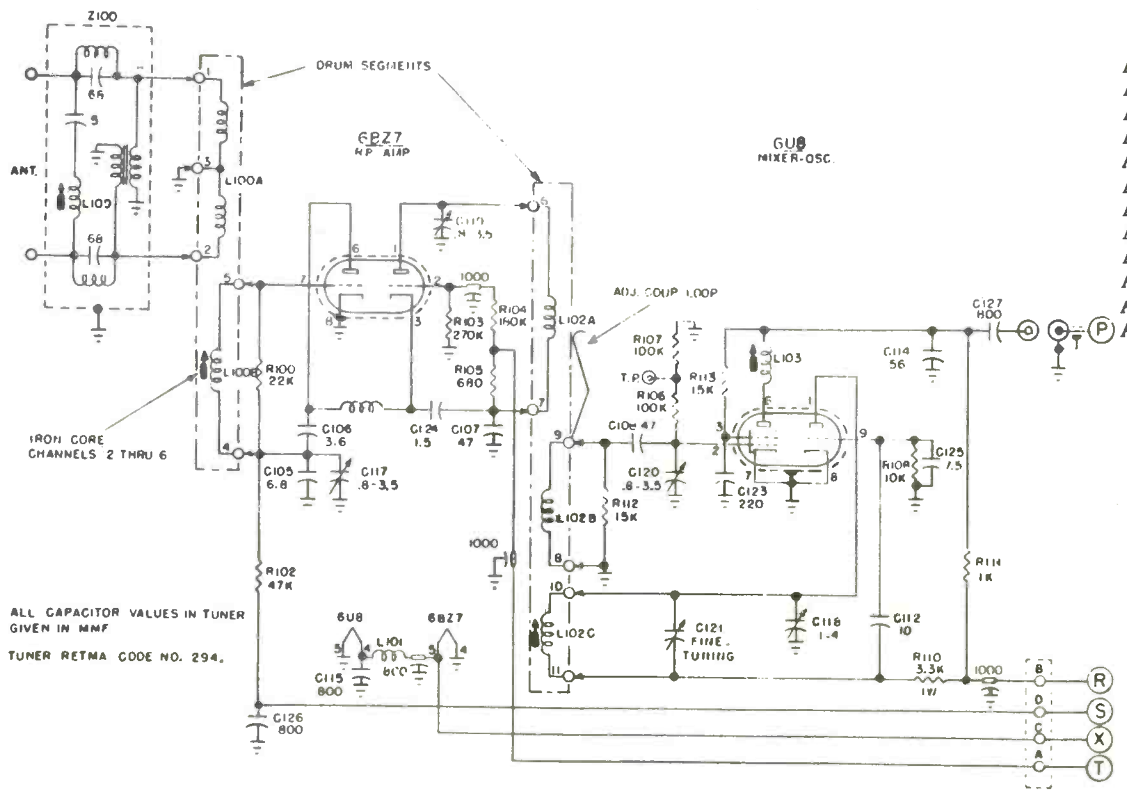


FIG. 2 V-14170-2 Schematic Diagram (Code 294)

V-14130-1 VHF–UHF COMBINATION TUNER REPLACEMENT PARTS

	Ref. No.	Part No.
✓	T100	V-8806-1
✓	T101	V-8621-2
✓		V-8634-2

V-14170-2 PARTS LIST

Ref. No.	Part No.
C105	V-8774
C106	V-8775
C107	V-8661
C108	V-8755
C112	V-8746
C114	V-8776
C115	V-8777
C117	V-8778
C118	V-8779
C119	V-8778
C120	V-8778
C123	V-8748
C124	V-8749
C125	V-8780
C126	V-8777
C127	V-8777
L101	V-8757
L103	V-8781
Z100	V-8732

Channel	Sweep Generator Center Frequency 12 mc. Sweep	Marker Generator Frequency	
		Pix	Sound
2	57 mc.	55.25	59.75
3	63 mc.	61.25	65.75
4	69 mc.	67.25	71.75
5	79 mc.	77.25	81.75
6	85 mc.	83.25	87.75
7	177 mc.	175.25	179.75
8	183 mc.	181.25	185.75
9	189 mc.	187.25	191.75
10	195 mc.	193.25	197.75
11	201 mc.	199.25	203.75
12	207 mc.	205.25	209.75
13	213 mc.	211.25	215.75

Mfr: Philco **Chassis No.** TV-350

Card No. PH 350-1

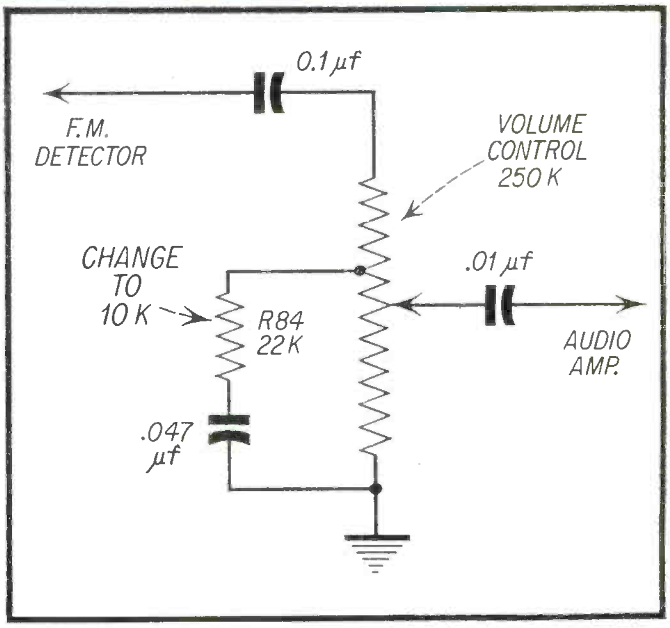
Section Affected: Sound

Symptoms: Insufficient bass quality

Reason for Change: Circuit improvement

What to Do:

Change: *R84* from 22K to 10K



Mfr: Philco **Chassis No.** TV-350

Card No. PH 350-2

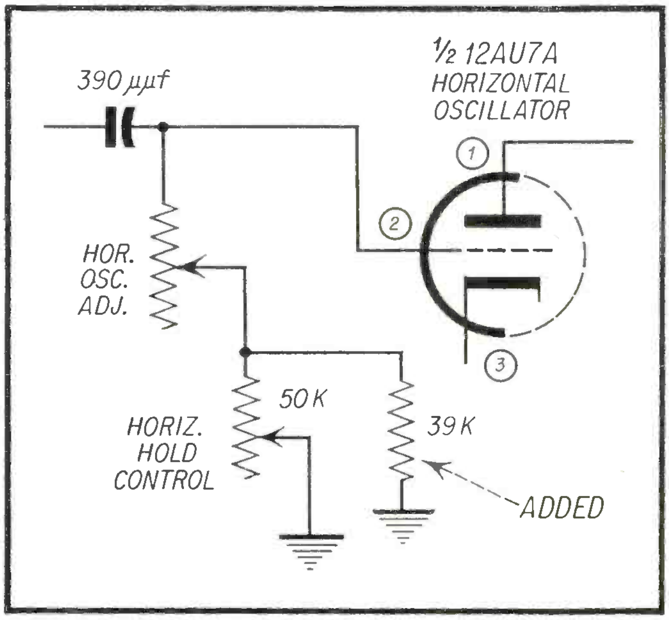
Section Affected: Sync

Symptoms: Insufficient horizontal hold range

Reason for Change: Circuit improvement

What to Do:

Add: 39K resistor across horizontal hold control



Mfr: Philco **Chassis No.** TV-350

Card No. PH 350-3

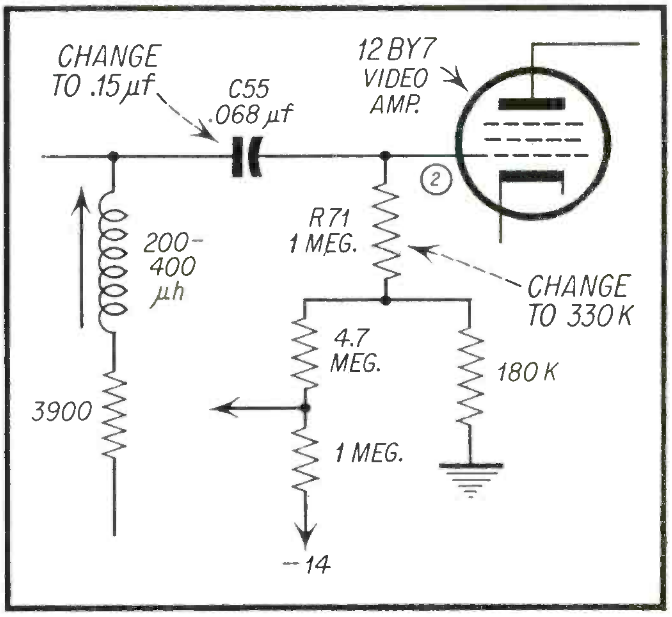
Section Affected: Sync

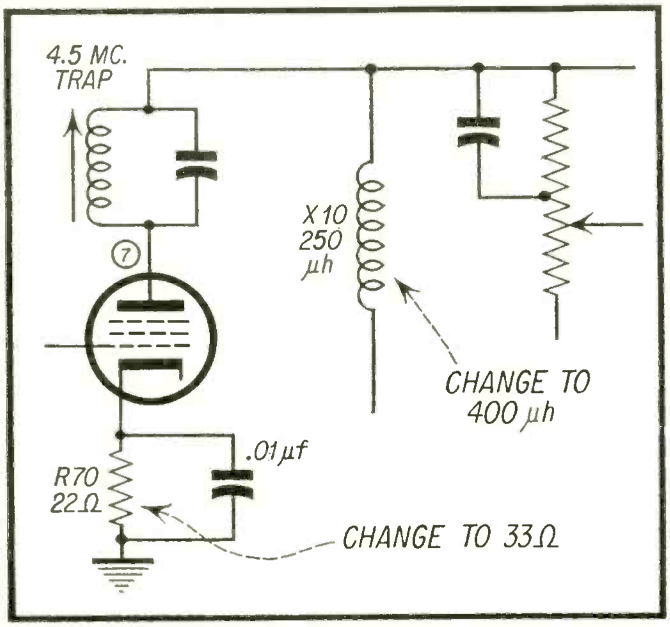
Symptoms: Poor vertical lock-in on sub-standard signal

Reason for Change: Circuit improvement

What to Do:

Change: C55 from .068 µf to .15 µf
R71 from 1 meg to 330K





Card No. PH 350-4

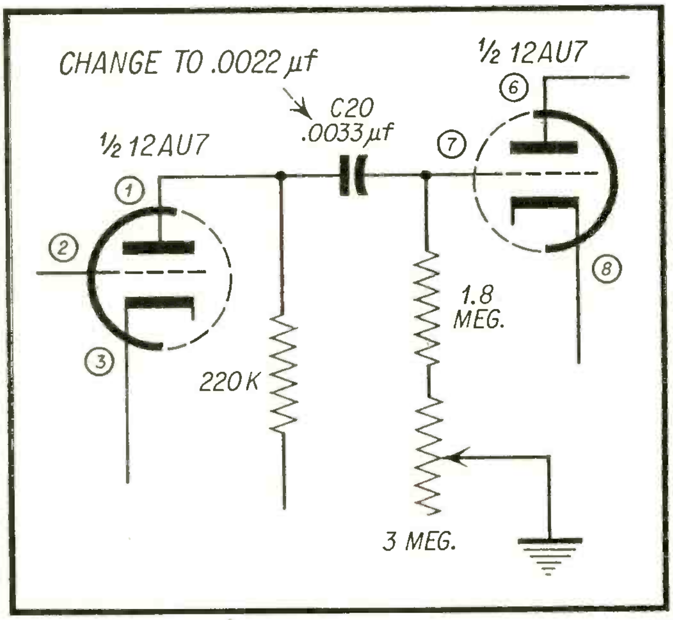
Section Affected: Pix

Symptoms: Trailing white edges in pix

Reason for Change: To reduce transients

What to Do:

Change: *X10* from 250 *µh* to 400 *µh*
R70 from 22 to 33 ohms



Mfr: Philco **Chassis No.** TV-350

Card No. PH 350-5

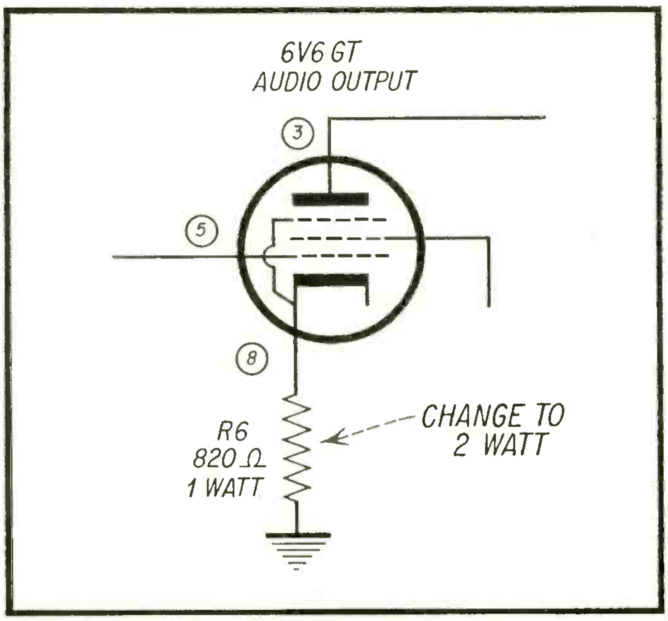
Section Affected: Sync

Symptoms: Vertical instability

Reason for Change: Component failure

What to Do:

Replace: *C20* with .0022*µf*, 10%



Mfr: Philco **Chassis No.** TV-350

Card No. PH 350-6

Section Affected: Sound

Symptoms: No audio

Cause: Component failure

What to Do:

Replace: *R6* (820 ohms). Use two watt resistor

Mfr: Philco **Chassis No.** TV-300

Card No: PH300-1

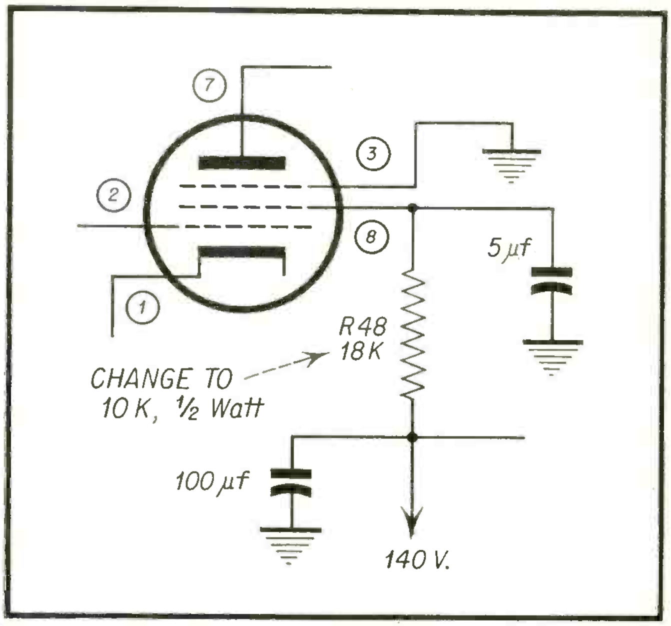
Section Affected: Pix

Symptons: Weak Picture

Reason for Change: To increase output signal

What to Do:

Change: *R48* from 18K to 10K, ½ watt



Mfr: Philco **Chassis No.** TV-300

Card No: PH300-2

Section Affected: Pix

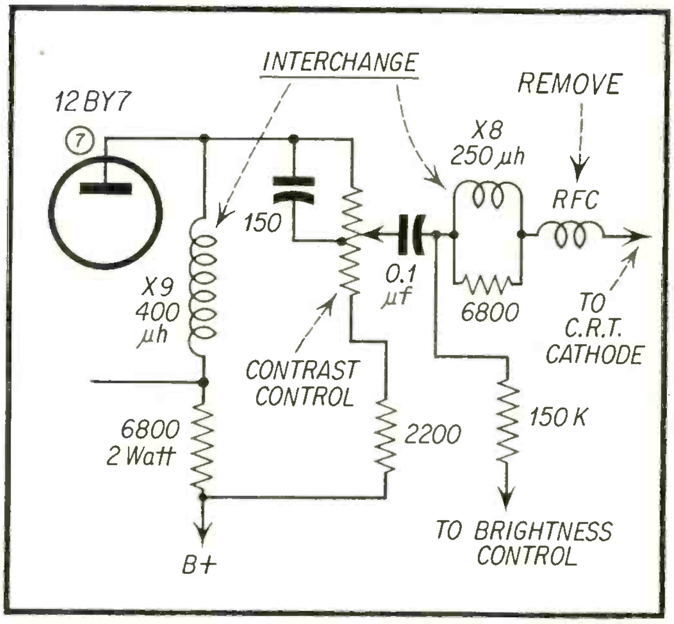
Symptoms: Poor picture detail

Reason for Change: To increase high frequency response

What to Do:

Interchange: *X8* with *X9*

Remove: *RF* choke, connecting junction of *X9* and 6.8K resistor to CRT cathode.



Mfr: Philco **Chassis No.** TV-300

Card No: PH300-3

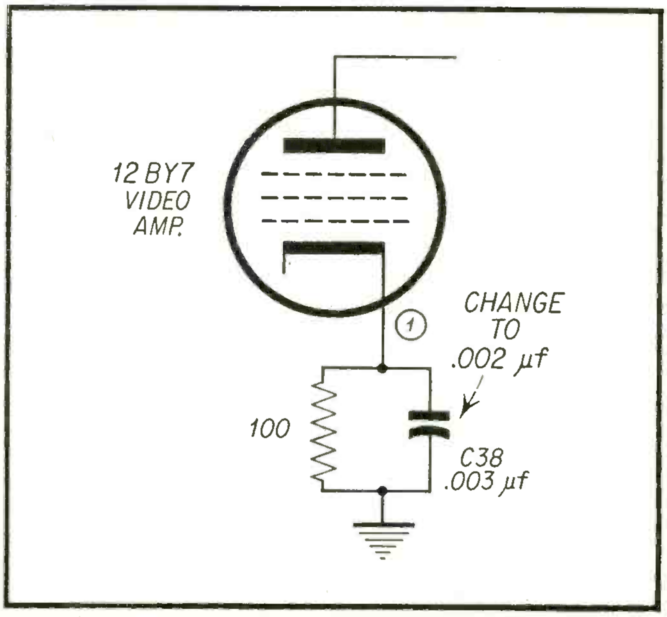
Section Affected: Pix

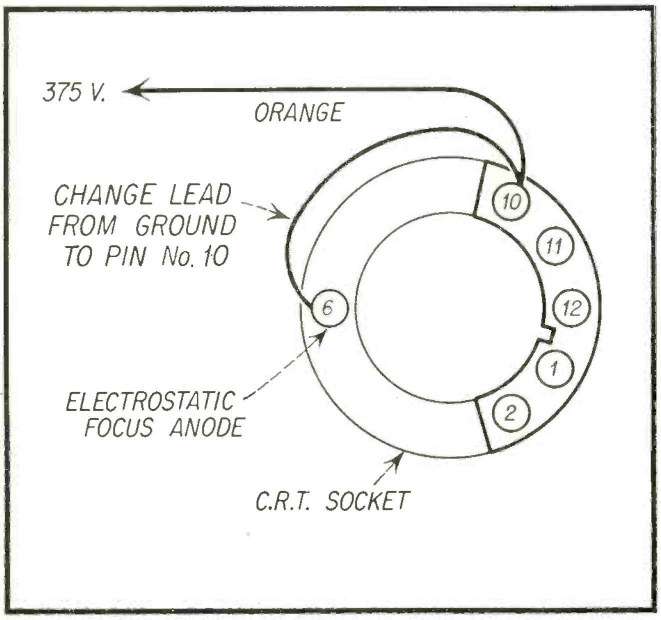
Symptoms: Trailing white edges in pix

Reason for Change: To reduce transients

What to Do:

Change: *C38* from .003 *uf* to .002 *uf*





Mfr: Philco **Chassis No.** TV-300

Card No: PH300-4

Section Affected: Pix

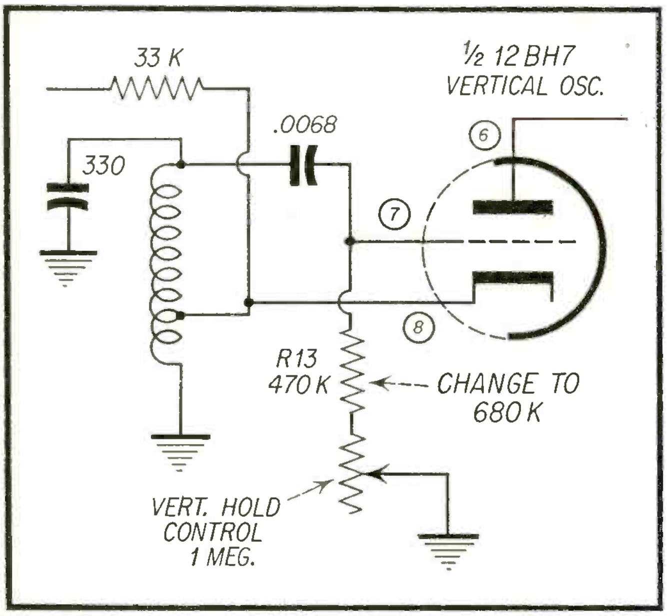
Symptoms: Poor focus

Reason for Change: To improve electrostatic focus picture tube operation

What to Do:

Change: Focus anode lead from ground to a convenient 260 Volt B plus point in chassis.

Further improvement can be obtained by connecting focus anode lead to accelerating anode of picture tube at pin 10 of CRT socket.



Mfr: Philco **Chassis No.** TV-300

Card No: PH300-5

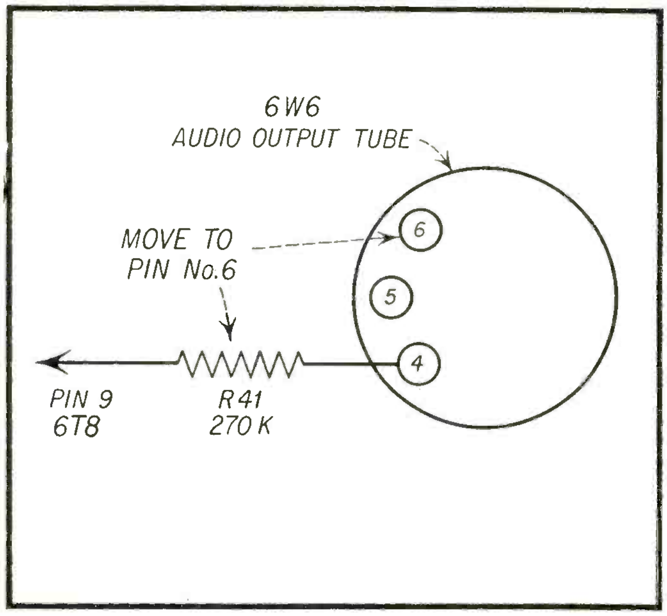
Section Affected: Sync

Symptoms: Vertical Hold not in center of control range

Reason for Change: To improve circuit operation.

What to Do:

Change: *R13* from 470K to 680K



Mfr: Philco **Chassis No.** TV-300

Card No: PH300-6

Section Affected: Sound

Symptoms: Buzz in Audio

Reason for Change: Circuit improvement

What to Do:

Move: *R41*, 270K resistor from pin 4 to pin 6 of 6W6 audio output tube.

Circuit Analysis

by Radio Television
Service Dealer
Technical Staff

***This Month's Circuit—
Noise Control Circuit:
Emerson Ch. 120174B***

THE term "signal to noise ratio" is used over and over again in discussing the reception of radio and TV signals. In essence this ratio is a number that compares the strength of the desired signal to that of undesired noise signals from various sources such as atmospheric static and electrical machinery of different types. Thus a signal to noise ratio of 10 to 1 means that the signal is ten times as strong as the noise. A 1 to 1 ratio means that the signal and the noise are equal in amplitude.

In the reception of TV signals the presence of noise signals of appreciable strength compared to the desired TV signal (low signal to noise ratio) shows up in two important ways. These are:

1. Unstable picture synchronization. The picture rolls or tears or does both. Thus, when the noise signal becomes larger than the sync pulses, the operation of the sync clipper is upset. This will be described in detail later.

2. Poor picture quality. When the noise signal is due primarily to atmospheric noise (static), it shows up in the picture as snow. When the interference is from man-made sources such as vacuum cleaners, ignition systems, etc., the effect on the screen in most cases might be described as short horizontal light and dark lines racing across the screen.

Noise control circuits are designed to minimize these undesirable effects of noise. Since the noise signal produces the two different types of symptoms mentioned above, it might be expected that two general types of noise control circuits are used, one for each of the symptoms mentioned. Such is actually the case. One type is designed to stabilize synchronization, while the other produces better picture quality.

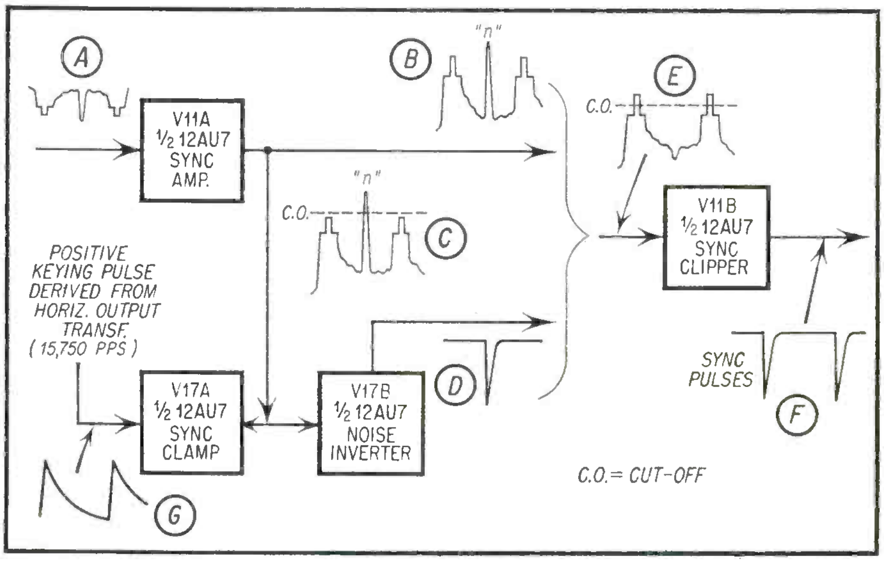


Fig. 1—Block diagram of Noise Cancellation circuit used in Emerson Chassis 120174B. This circuit is designed to improve synch stability in fringe areas where low signal to noise ratios are encountered.

Block Analysis

Figure 1 is a block diagram of a commonly used circuit for improving sync stability in fringe areas, where low signal to noise ratios are encountered. (Emerson Chassis 120174B). Let us examine the function and waveforms associated with each of the stages involved.

1. Sync Amplifier—This is a conventional sync amplifier stage. It receives a negative going composite video signal from the video detector as shown at "A". Suppose that a noise pulse is superimposed on the video information as indicated at "n" of this waveform. At the output of this stage, there appears an amplified and inverted replica of the input signal, as indicated at "B". This signal is fed simultaneously to the sync clipper, the noise inverter, and the sync clamper stages.

2. Noise Inverter—The noise inverter receives the signal described above as an input. Its function is to produce only the noise signal at its output, and to produce this noise signal in the *negative* phase. Thus the name "inverter." This is accomplished by setting the bias of the stage at such a point that all portions of the incoming signal are cut off except those which are above the level of the sync pulse tips. Since the interfering noise pulses are usually greater in amplitude than the sync pulses, they will be the only portions of the signal capable of producing an output signal in this stage. Thus, the only effective portion of the input signal is shown by the shaded portion of waveform "C" in *Fig. 1*. The noise inverter stage then amplifies and inverts this pulse of noise, producing an output consisting of *only* the noise and in the negative phase. This negative noise pulse, shown as waveform "D" in *Fig. 1*, is then fed into the input of the sync clipper stage along with the "B" signal from the sync amplifier.

3. Sync Clipper—The only essential difference between the sync clipper used here and the conventional sync clipper is found in the input signal received by this stage. The ordinary sync clipper would receive an input signal similar to "B" of *Fig. 1*. It would be automatically biased, to allow only those portions of the signal above the blanking level to pass through.

The sync clipper nearly always uses a grid condenser and grid leak resistor for producing a negative bias nearly equal in value to the peak of the incoming sync pulse. As a result of the greater peak value of the noise pulse, the sync clipper is biased sufficiently negative to drive the sync pulses into the cutoff region. The tube remains cut off until the grid condenser has time to discharge sufficiently. During this time however, the sync pulses are lost at the output and synchronization of the picture is temporarily lost.

The input signal to *this* sync clipper stage, however, consists of the combination of "B" and "D". The *negative* noise pulse at "D", having been amplified by the noise inverter stage, and occurring at the same instant as the *positive* noise pulse in "B" completely cancels this noise pulse and results in the waveform shown at "E". It will be observed that the noise pulse is no longer present. As a mater of fact, the slight dip in the waveform at the point where the noise pulse previously appeared, shows that negative pulse from the inverter was even stronger than the original noise pulse. This assures complete elimination of the noise pulse from the combined signal entering the clipper. The stage is biased to allow conduction only above the dotted line in wave form "E", thus producing an output containing sync pulses only. The noise pulses can no longer block the tube, and this, you will remember was the objective of the circuit.

4. The Sync Clamper — Since the strength of the signal picked up by the receiver may vary over a wide range of values, there is a danger that the sync pulses would rise above the cutoff level indicated in waveform "C". If this were to happen the sync pulses would also cause the noise inverter to conduct, producing amplified negative sync pulses at the output. If this were allowed to happen, the sync pulses at the input to the sync clipper would be cancelled out by the same process previously described for the noise pulse. It is the function of this clamping circuit to prevent such an occurrence. The clamping tube is biased beyond cutoff. A positive pulse of voltage at the horizontal sweep frequency, waveform "G" in *Fig. 1*, is derived from the horizontal output transformer and fed to the control grid. At the same time that this positive pulse appears at the grid, the sync pulse portion of the composite video signal appears at the plate. This combination

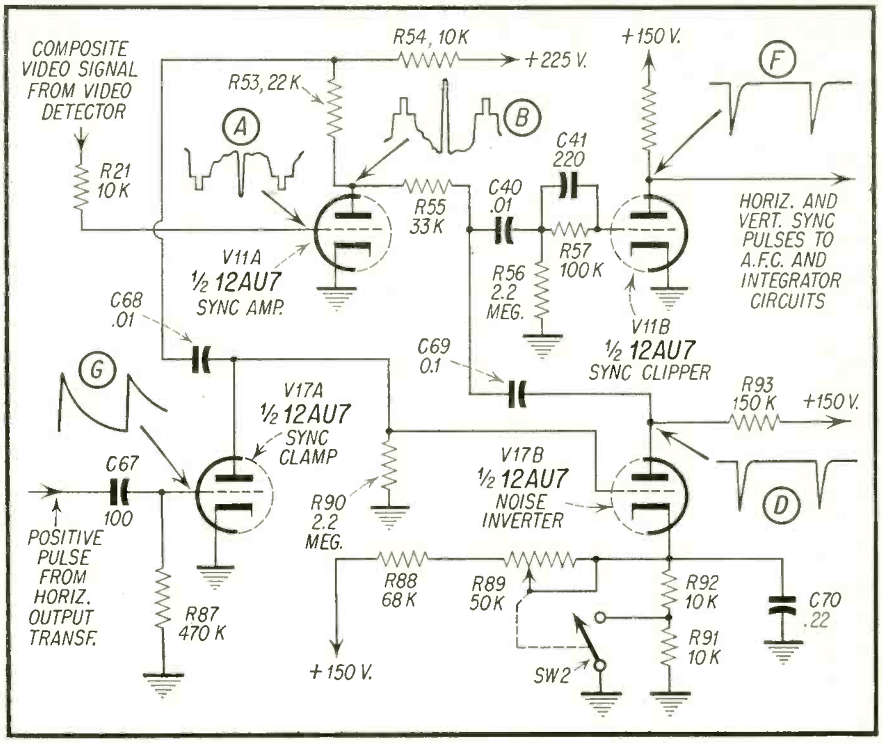


Fig. 2—Partial schematic of Emerson Chassis 120174 B illustrating Noise Cancellation Circuit. Waveforms are shown for each signal.

causes the tube to conduct at the time of the sync pulse but at no other time. The circuit is designed to clamp the level of the sync pulse tips at approximately zero volts. Since the noise inverter is biased beyond cutoff, this zero level will not be sufficient to cause conduction in the noise inverter, so that sync pulses are effectively eliminated from noise inverter output. The noise pulses do get through since the clamping tube is cut off between sync pulses.

Circuit Analysis

A thorough understanding of the analysis by blocks which we have just completed should help greatly in understanding the circuit analysis which follows. *Fig. 2* is a schematic showing the stages and components in the circuit under discussion.

The Sync Amplifier—The negative going composite video signal is taken directly from the video detector load resistor (not shown here) and coupled to the grid of V11 A via *R21* which acts as isolating resistor. This resistor prevents V11 A from affecting the signal across the video detector load resistor. V11 A amplifies the composite video signal and simultaneously inverts it. We now have an amplified positive going signal at the plate of V11A. *C-40* couple this signal to the sync clipper, V11 B. *R53* and *R54* make up a voltage divider for the signal at the plate. Thus a portion of this signal (waveform B) is fed to the plate of V17A, the sync clamper, as well as to the grid of V17B, the noise inverter. The signal reaches these points via *C68*, and has the same waveform as that shown at "B".

The Noise Inverter. Before describing the operation of this circuit it should be pointed out that in strong signal areas the noise inverter should be made inoperative, since if this is not done unstable synchronization of the picture may result. Because the signal to noise ratio is high in these areas, the noise circuits are not necessary, so no harm is done by making them inoperative.

The "Fringe Compensator Control" (*R89*) and the switch SW-2, which is linked to this control, supply the means for making the noise inverter inoperative. With the switch closed as shown in *Fig. 2*, the noise inverter is in operating condition. *R88*, *R89*, and *R92* form a voltage divider across the 150 volt section of the B+ power supply. *R91* is out of the picture since it is shorted by the switch. The cathode receives a positive voltage equal to the voltage across *R92*. This voltage may be varied by changing the setting of *R89*. When *R89*, is turned to the OFF position, the switch opens and *R89* is shorted out. The opening of the switch adds *R91* to the voltage divider, thus increasing the positive voltage on the cathode. The shorting of *R89* has the same effect, since a larger portion of the 150 volts will appear across *R92* and *R91* than did before. These two actions combined are sufficient to drive the noise inverter well beyond cutoff. (A high posi-

[*Continued on page 44*]

TV FIELD SERVICE
Pre-published from Rider "TV Field Service Manual"
by Rider & Alsberg

GENERAL ELECTRIC

Model No.
17C127, 17T15-17,
21C114-C115, C116, C117, C119
21C120-C121
21T10-T11-T12-T14-T15-T19
("F" Series Chassis)

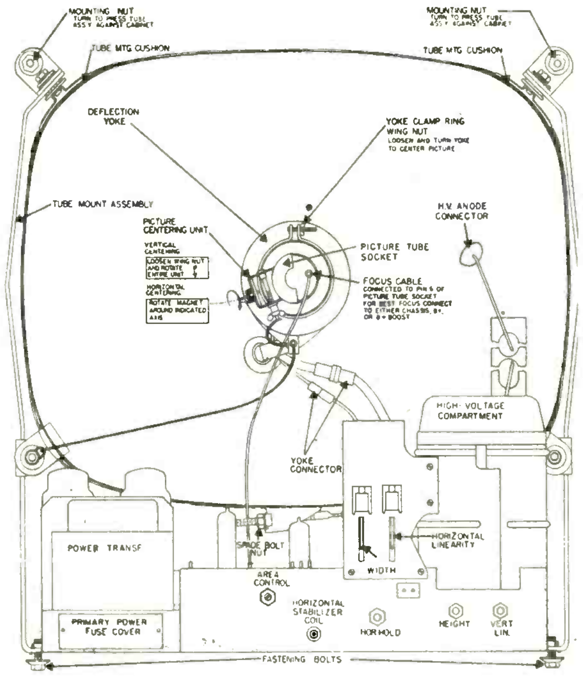
TUBE LIST

SYMBOL	TYPE	CIRCUIT FUNCTION
V101	6BC5	R-F Amp
V102	6J6	Converter-Oscillator
V102	12AT7	Converter-Oscillator
V103	6CB6	1st Video I-F Amp
V104	6CB6	2nd Video I-F Amp
V105	6CB6	3rd Video I-F Amp
V106	12AT7	Sync Amp & Noise Canceller
V107	12AT7	Sync Clipper & Horiz Phase Detector
V108	6AG7	Video Amp, first production
	6CL6	Mid & late production
V109		Picture Tube
	17QP4	17" Models
	21EP4-A	21" Models
	21JP4	
	21Z4147	
	21FP4-A	Model 21T15A
	21EP4-B	Model 21T19 & late
	21ZP4-B	Prod. 21T10
V110	6J5	Vertical Oscillator
V111	6AH4-GT	Vertical Output
V112	12AU7	Horiz Oscillator
V113	6BQ6	Horiz Output
V114	1B3-GT	High-voltage Rectifier
V115	6AX4	Damper
V116	6CB6	Audio I-F Amplifier
V117	6AU6	Audio I-F Limiter
V118	6T8	Ratio Detector & Audio Amp
V119	6V6-GT	Audio Output
V120	5U4-G	Power Rectifier
V121	5U4-G	Power Rectifier
Y151	RED-003	Crystal Diode

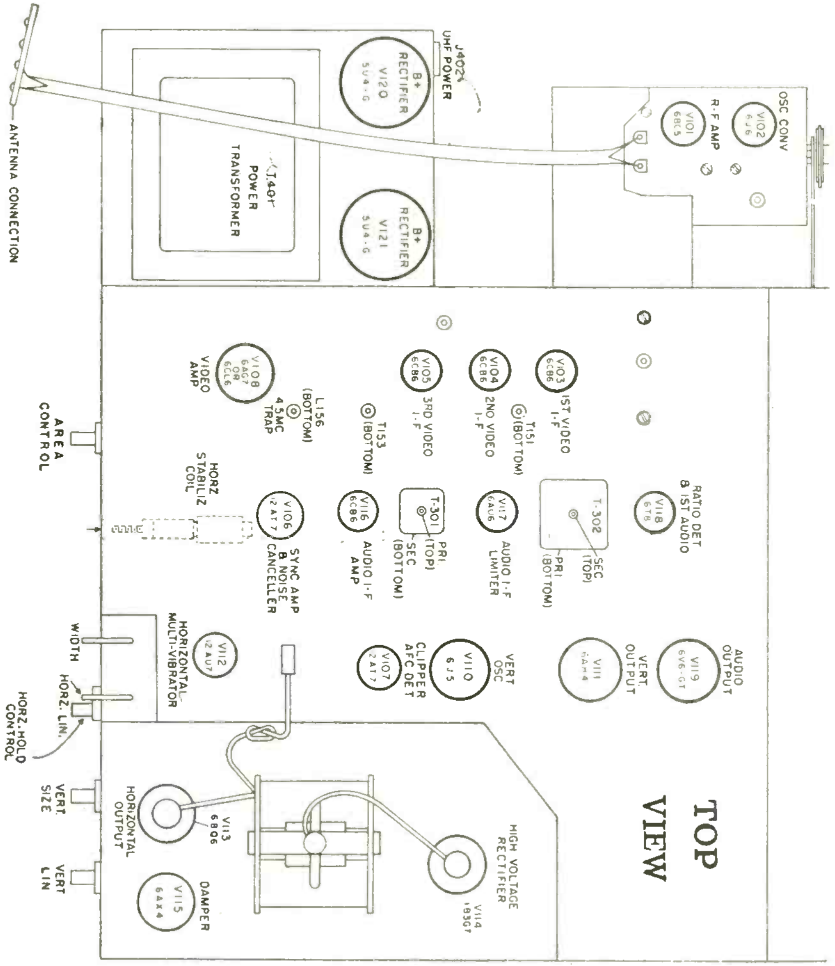
KEY VOLTAGES

B+, plate of damper, V115 pin 5 260 vdc
Boosted B+, cath. of damper, V115 pin 3 500 vdc
Plate of VERT. OSC., V110 pin 3 27 vdc
Plate of Vert. Out., V111 pin 5 235 vdc
Plate(s) of Hor. Osc., V112 pin 1 190 vdc; pin 6 165 vdc
Grid of Hor. Out., V113 pin 5 –17 vdc

(All voltages are measured with a 20,000 ohms per volt meter connected between the tube pins and chassis.)



REAR CONTROLS
ELECTROSTATIC PICTURE TUBE



ADJUSTMENTS

ELECTRICAL INSTALLATION ADJUSTMENTS

It is recommended that the receiver be permitted to operate for at least 15 minutes before the final raster adjustments are made.

HORIZONTAL STABILIZER COIL—The coil should be adjusted so that the horizontal sync will remain locked over the entire range of the horizontal hold control. Also, the "pull-in" range of sync should be evenly distributed on each end of the horizontal hold control range. This may be checked by switching off and on a station and observing the "pull-in" ability at different settings of the control.

In order to adjust the coil properly follow the given procedure:

1. Remove tube V106. Tune in a very weak television signal.
2. Short circuit terminals of stabilizer coil.
3. Adjust horizontal hold control to bring received picture closely into sync.
4. Remove short circuit from across terminals of stabilizer coil.
5. Tune the stabilizer coil to bring picture back into a closely synced condition. The stabilizer coil will tune to two positions which will bring the picture into sync. The correct position is the one with the core almost all the way into the coil.
6. Replace tube V106; check lock-in ability of horizontal sync on available channels.

It is absolutely essential that the stabilizer coil and the horizontal hold control be correctly adjusted, and once adjusted, be left alone.

It should be noted that in some receivers the stabilizer coil has been relocated and is available at the top rear of the chassis

OVERLOAD PROTECTION:—A slow-blow 4-ampere fuse, F401, is incorporated in this receiver to protect the power supply rectifiers from overload. Should the receiver fail to operate, the fuse should be checked and the cause of the overload remedied. This fuse is located in the power supply compartment.

TO REMOVE PICTURE TUBE

Electrostatic Picture Tubes

MODELS 17T15, 21T10-T11-T12

1. Remove chassis.
2. Lay cabinet, face down, on a soft non-scratching surface.
3. Remove ion trap.
4. Loosen the two focus unit securing nuts and slide out focus unit.
5. Loosen the two nuts holding focus unit disc and remove disc.
6. Loosen clamp ring mounting screw and slide out deflection yoke.
7. Loosen the focus picture tube rod nuts and swing the rods out of the picture tube holder slots and remove holder and rods.
8. Loosen the two bolts fastening the tube mount assembly to the bottom of the cabinet and remove the two tube mount fastening nuts.
9. Carefully slide tube with tube mount assembly out of the cabinet and lay the assembly on a nonscratching surface with picture tube face down.
10. Loosen the hex nut on the spade bolt.
11. Lift picture tube out of the strap assembly.

Internal Magnetic Focus Units (IMF)

MODEL 21T10

1. Remove chassis.
2. Lay cabinet, face down, on a soft non-scratching surface.
3. Remove the ground clip on focus unit, loosen focus unit using nut and slide out assemhly.
4. Remove the ground lead from the yoke assembly, loosen the yoke wing nut and slide out deflection yoke.
5. Loosen the two bolts fastening the tube mount assembly to the bottom of the cabinet and remove the two mounting nuts at the top of the tube mount.
6. Carefully slide tube with tube mount assembly out of the cabinet and lay assembly on a nonscratching surface with picture tube face down z
7. Loosen the hex nut on the spade bolt.
8. Lift picture tube out of the strap assembly.
9. Be sure to use for replacement the picture tube 21FP4A.

A. External Magnetic Focus Tubes
Models 17T7, 17C127, 21C115-C116-C117-C119-C120-C121, 21T14-T15-T19

1. Remove chassis.
2. Lay cabinet, face down, on a soft non-scratching surface.
3. Remove ion trap.
4. Loosen the two focus unit securing nuts and slide out focus unit.
5. Loosen the two nuts holding focus unit disc and remove disc.
6. Loosen clamp ring mounting screw and slide out deflection yoke.
7. Loosen the four picture tube rod nuts and swing the rods out of the picture tube holder slots, unhook them, and remove picture tube holder.
8. Remove the two Phillips screws holding mask to cabinet, and tilt tube slightly so that the mask will slide out the top rail and remove assembly from cabinet.
9. Carefully lay the assembly with the picture tube, face down, on a nonscratching surface. Loosen the picture tube strap by unscrewing the hex nut on the spade bolt.
10. Remove picture tube from the strap assembly.

PICTURE CENTERING: — Centering is achieved by rotating the two adjustment arms, see Fig. 9, either individually or both together, depending on the degree of centering required.

FOCUS:—Loosen wing nut of focus unit and move unit forward and backward until good focus is achieved and retighten wing nut. For final adjustment insert screw driver in slot of focus adjustment, see Fig. 8, and slowly turn for best focus.

GENERAL ELECTRIC TROUBLE SHOOTING CHART

SMEARED PIX
- Tuner fine tuning
- Contrast con.
- V103, V104, V105, V108
- Check Vid. Det. and Amp. peaking coils
- Check Vid. Det. xtal V151
- IF and RF alignment

POOR PIX DETAIL
- Tuner fine tuning
- Focus con.
- V103, V104, V105, V109
- Check Vid. Det. and Amp. peaking coils
- IF and RF alignment

ENGRAVED EFFECT IN PIX
- Tuner fine tuning
- Contrast con.
- V102, V103, V104, V105, V108, V109
- Check Vid. Det. xtal Y151
- Check Vid Det. and Amp. peaking coils

VERT. BARS
- Hor. Drive con.
- V113, V115
- Check 240μμf cap. connected to hor. out. trans. terminals 1 and 2
- Defl. yoke ringing

PIX BENDING
- Hor. Hold and Stabilizing con.
- V106, V107, V112, V113
- Check 0.001 μf cap. connected to pin 2 of V112
- Check 0.001 μf cap. connected to pin 6 of V107

WEAK OR NO PIX—SOUND WEAK—RASTER OK
- Tuner fine tuning
- V101, V102, V103, V104, V105, V106
- Check Vid. Det. xtal Y151
- RF and IF alignment

INSUFFICIENT BRIGHTNESS
- Ion trap
- Brightness and Hor. Drive con.
- V109, V112, V113, V114, V115, V120, V121
- Low line voltage

EXCESSIVE RASTER (PIX SIZE)
- Hor. Drive con, Size
- Hor. and Vert. con.
- V109, V113, V114
- Check 15k Ω res. and 0.1 μf cap. connected to pin 4 of V113

WEAK PIX—SOUND AND RASTER OK
- Tuner fine tuning
- Contrast con.
- V103, V104, V105, V108
- Area con.
- Check Vid. Det. xtal V151

INSUFFICIENT RASTER WIDTH
- Hor. Drive and Size con.
- V112, V113, V115, V120, V121
- Check 560 μμf and 0.01 μf cap. connected to pin 6 of V112
- Hor. Out. trans.
- Low line votlage

INSUFFICIENT RASTER HEIGHT
- Vert. Size and Lin. con.
- V110, V111, V120, V121
- Check 0.022 μf caps. connected to pin 1 of V111
- Vert. Out trans.
- Low line voltage

NO. VERT. DEFL.
- V110, V111
- Check 0.022 μf caps. connected to pin 1 of V11
- Check 0.001 μf cap. connected to pin 5 of V110
- Vert. Defl. coils (yoke)
- Vert. Out. trans.

NO VERT. SYNC.—HOR. SYNC. OK
- Vert. Hold con.
- V107, V110, V111
- Check 0.001 μf cap. connected to pin 5 of V110
- Check 0.022 μf cap. connected to pin 1 of V111

NO HOR. OR VERT. SYNC.—PIX SIGNAL OK
- V106, V107
- Check 0.01 μf cap. connected to pin 2 of V106

NO HOR. SYNC.—VERT. SYNC. OK
- Hor. Hold and Stabilizing con.
- V107, V112
- Check 560 μμf cap. to pin 7 of V112

NO SOUND—PIX OK
- Tuner fine tuning
- Vol. con.
- Speaker (open voice coil or defective connection)
- Sound and Vid. IF alignment L156, T301
- Det. alignment T302
- V116, V117, V118, V119

NOISY SOUND—PIX OK
- Vol. con.
- V116, V117, V118, V119
- Check sound system for loose connections
- Speaker
- Sound IF and Det. alignment L156, T301 and T302

SYNC. BUZZ IN SOUND
- Tuner fine tuning
- Check Vid. Det. xtal Y1
- V116, V117, V118
- Sound IF and Det. alignment L156, T301 and T302

a new high in VTVM COMPACTNESS

by **James P. Connor**

THE Precision Model 88 VTVM is a compact unit which, among its many other features, fits conveniently into many tube carriers. This convenience contributes to more effective home servicing of TV receivers. A view of the front panel of the instrument on *Fig. 1* reveals many valuable test functions and ranges. These provide the service technician with a powerful and versatile tool in his daily tasks.

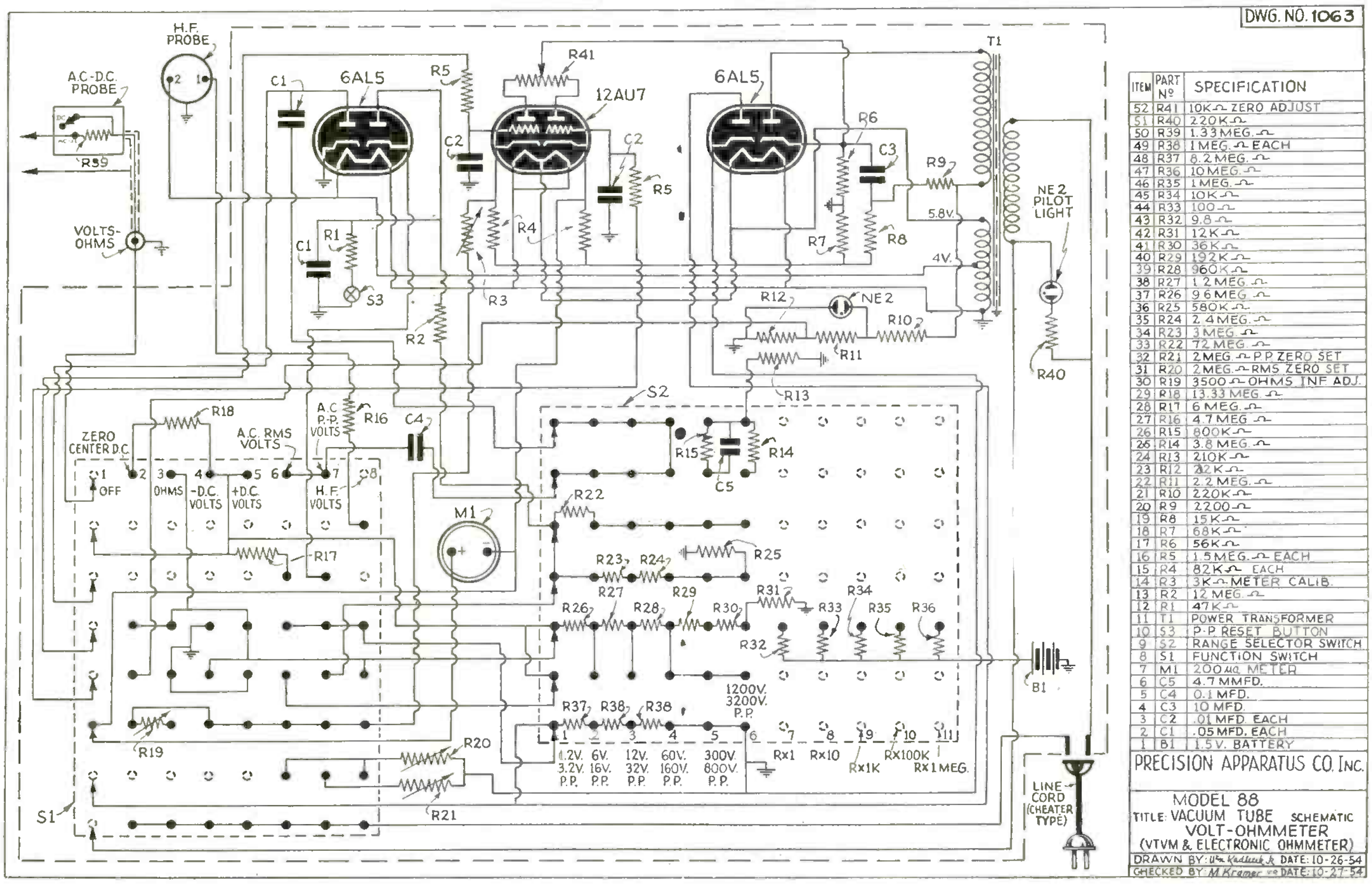
Zero Center Measurements

One of the features of this instrument is a voltage regulated true zero-center range and scale. *Fig. 1* above illustrates the zero center scale on the face of the meter and a special zero center function switch which brings the pointer to the middle of the scale for this purpose. Six overlapping ranges from 0- 1.2 V and 1200 V, are provided for this function. Thus, in one operation, both magnitude and polarity measurements may be made with no reversal of the test prods. This feature is invaluable in tests involving FM discriminator adjustments, bias measurements and "blind tests" where polarity and voltage are unknown factors.

Peak to Peak Measurements

A special circuit for peak to peak measurement is also provided. This feature on the part of a VTVM in present TV servicing techniques is highly desirable. Notice that a special position

[*Continued on page* 53]

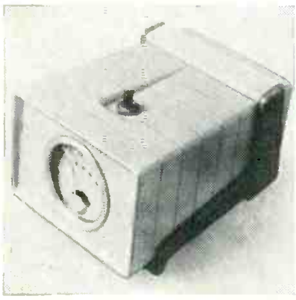


ITEM	PART Nº	SPECIFICATION
52	R41	10KΩ ZERO ADJUST
51	R40	220KΩ
50	R39	1.33 MEG. Ω
49	R38	1 MEG. Ω EACH
48	R37	8.2 MEG. Ω
47	R36	10 MEG. Ω
46	R35	1 MEG. Ω
45	R34	10KΩ
44	R33	100Ω
43	R32	9.8Ω
42	R31	12KΩ
41	R30	36KΩ
40	R29	192KΩ
39	R28	960KΩ
38	R27	1.2 MEG. Ω
37	R26	9.6 MEG. Ω
36	R25	580KΩ
35	R24	2.4 MEG. Ω
34	R23	3 MEG. Ω
33	R22	72 MEG. Ω
32	R21	2 MEG. Ω P.P. ZERO SET
31	R20	2 MEG. Ω RMS ZERO SET
30	R19	3500Ω OHMS INF. ADJ.
29	R18	13.33 MEG. Ω
28	R17	6 MEG. Ω
27	R16	4.7 MEG Ω
26	R15	800KΩ
26	R14	3.8 MEG. Ω
24	R13	210KΩ
23	R12	22KΩ
22	R11	2.2 MEG. Ω
21	R10	220KΩ
20	R9	2200Ω
19	R8	15KΩ
18	R7	68KΩ
17	R6	56KΩ
16	R5	1.5 MEG. Ω EACH
15	R4	82KΩ EACH
14	R3	3KΩ METER CALIB.
13	R2	12 MEG. Ω
12	R1	47KΩ
11	T1	POWER TRANSFORMER
10	S3	P-P RESET BUTTON
9	S2	RANGE SELECTOR SWITCH
8	S1	FUNCTION SWITCH
7	M1	200μa METER
6	C5	4.7 MMFD.
5	C4	0.1 MFD.
4	C3	10 MFD.
3	C2	.01 MFD. EACH
2	C1	.05 MFD. EACH
1	B1	1.5V. BATTERY

Fig. 3—Circuit diagram of Precision Model 88 VTVM

NEW products

for better sales and service

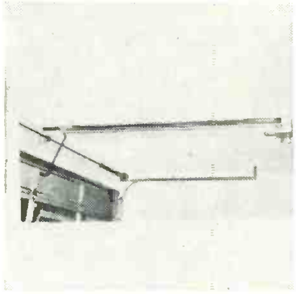


Crown Rotator

The latest addition to the Crown Line of antenna rotators, the CAR-6-B, will be sold as a deluxe unit in addition to their standard CAR-6-A model. Features: low, modern, design, two-tone styling, finger-tip control, constant directional indication, and illuminated dial. For additional information write: Crown Controls Company, Inc., New Bremen, Ohio.

Alliance Lift-A-Door

The Alliance Manufacturing Company has announced a new radio-controlled garage door opener. Genie Model A is the completely automatic, radio-controlled model which opens and closes the door, turns the light on and off, locks and unlocks the door. It is operated from the dash of the car and set with an individual transmitter.

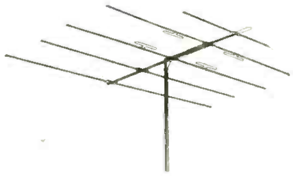


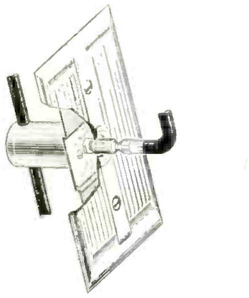
Du Mont Mobile Radio Tester

Compact and versatile Du Mont test meter for rapid servicing and tuning of two-way mobile radio equipment. This unit, designated as the Du Mont Test Meter Type 5819-A, permits speedy and convenient testing of two-way mobile radio equipment. The meter also may be used in testing base station transmitters and receivers, and any *dc* equipment within meter ranges. For details, write: Mobile Communications Department, Du Mont Laboratories, Inc., 1500 Main Ave., Clifton, N. J.

Trio Array

A new antenna, the TRIO "99" for Channels 2-13, has been announced by the Trio Mfg. Co. of Griggsville, Ill., which uses two dual purpose active elements each consisting of three half waves in phase on the high channels and, at the same time, a single half wave on the low channels. To this is added a combination of three parasitic elements on the low channels and five on the highs, yielding high forward gain and maximum side-rear rejection as a result of more critical element lengths and spacing.





Blonder-Tongue Tapoffs

Blonder-Tongue Laboratories has added two new spliceless tapoffs to its "Masterline" series of TV distribution equipment. The Model MTO-11 tapoff for Community systems and the Model MTO-59 for indoor use both feature air dielectric insulation to minimize shunt capacitance. They provide uniform 17 db RF isolation, and positive electrical protection thru a spring contact resistor-capacitor network. For info write: Blonder-Tongue Labs, Inc., 526 North Ave., Westfield, N. J.

Beaver Lab's Lubricant

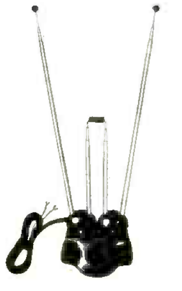
Formulated for the electronic and electro-mechanical industries by Beaver Laboratories, 86-51 Palo Alto Street, Hollis 23, New York, "contact's" super-capillary penetrating action forces it into inaccessible places where it instantly cleans and deposits a coating of "duralube"—a hard-bonded dry lubricant which resists corrosives, heat and cold. "CONTACT" leaves no gummy deposit and does not effect resistance, capacitance or inductance.

EICO Capacitor Substitution Box

The Electronic Instrument Co., Inc., 84 Withers St., Brooklyn 11, N. Y., has produced a capacitor substitution box especially designed to help the technician do a faster and more efficient job in radio-electronics servicing, the new EICO Capacitance Substitution Box enables rapid substitution of a wide range of RETMA capacitance values in an operating circuit to determine the value needed for optimum performance.

RMS Indoor Antenna

Radio Merchandise Sales, Inc., 2016 Bronxdale Ave., Bronx 62, N. Y., announced the release of their latest indoor TV Antenna Model B-29. Model B-29 features the famous RMS 6 position selector switch. In addition, this latest RMS innovation incorporates an adjustable 3-section telescoping phasing bar. This added feature enables the viewer to "fine tune" his antenna for peak performance.

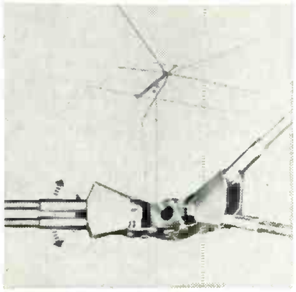


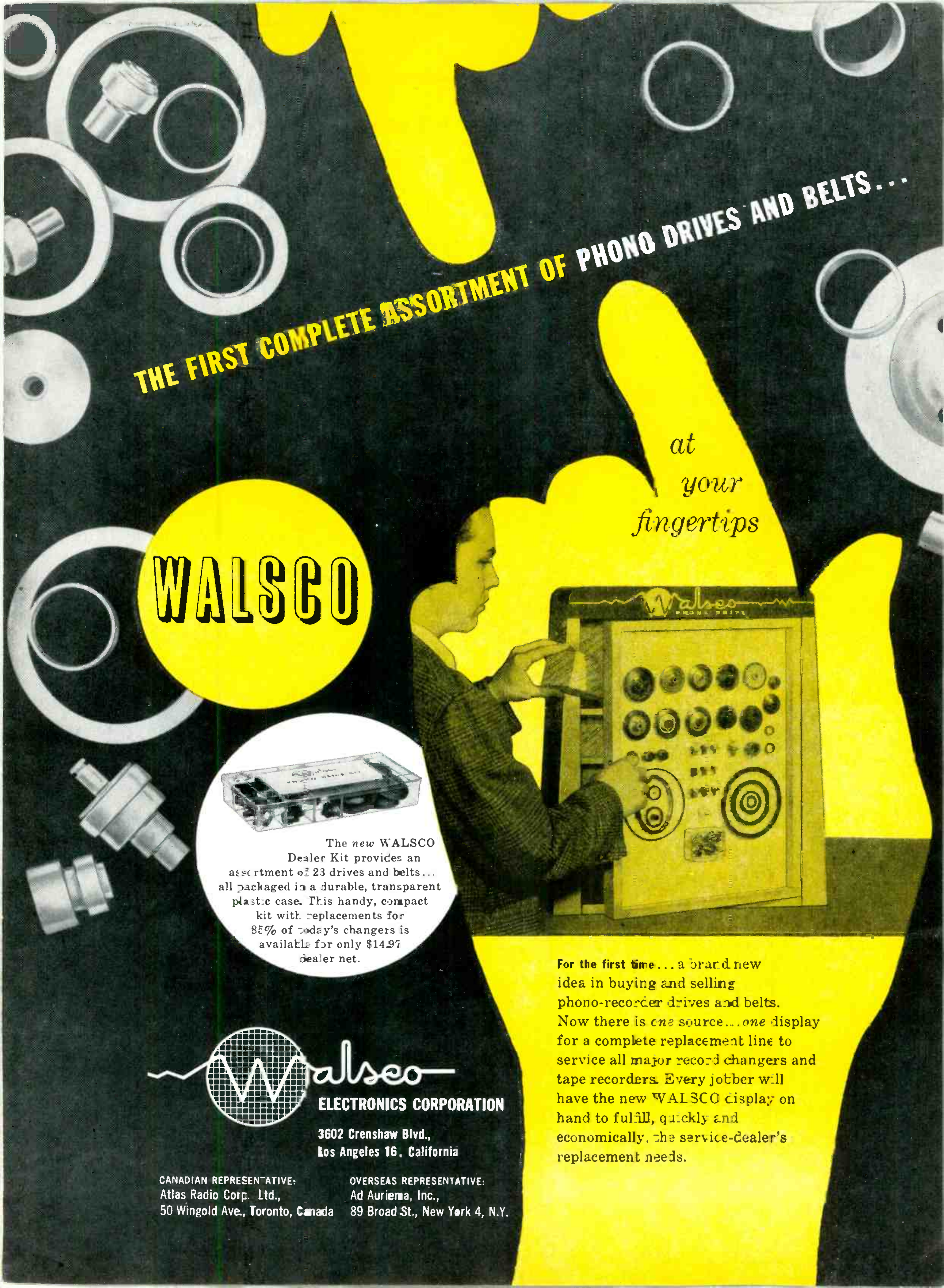
Superex Filta-Coupler

By combining a High Pass interference eliminator with a 2 set coupler in Filta-Coupler, perfect reception for 2 TV sets is assured. This concept provides for 2 set operation from one antenna, and eliminates outside interference from both sets. Another feature is the freedom from interset interference. For info, write Superex, 23 Atherton St., Yonkers, N.Y.

Channel Master "Maverick"

Channel Master Corp., Ellenville, N. Y., has announced its "Maverick" antenna line, two complete series of conicals in both preassembled and non-assembled versions. The "Maverick 300" series, comprising 12 different models, is "Super-sembled." There is no hardware to be tightened. Every element merely swings open and automatically locks into position.




THE FIRST COMPLETE ASSORTMENT OF PHONO DRIVES AND BELTS...
at your fingertips
WALSCO
The new WALSCO Dealer Kit provides an assortment of 23 drives and belts... all packaged in a durable, transparent plastic case. This handy, compact kit with replacements for 85% of today's changers is available for only $14.97 dealer net.
For the first time... a brand new idea in buying and selling phono-recorder drives and belts. Now there is one source... one display for a complete replacement line to service all major record changers and tape recorders. Every jobber will have the new WALSCO display on hand to fulfill, quickly and economically, the service-dealer's replacement needs.
Walsco
ELECTRONICS CORPORATION
3602 Crenshaw Blvd.,
Los Angeles 16, California
CANADIAN REPRESENTATIVE:
Atlas Radio Corp. Ltd.,
50 Wingold Ave., Toronto, Canada
OVERSEAS REPRESENTATIVE:
Ad Auriema, Inc.,
89 Broad St., New York 4, N.Y.

CIRCUIT ANALYSIS

[from page 38]

tive voltage on the cathode, you will remember has the same effect as a high negative bias on the grid). Thus the stage is made inoperative, which was the desired objective for strong signal areas.

In fringe areas, where the action of this circuit is desired, *R89* is turned to the ON position. This closes the switch, decreases the positive cathode voltage and allows *R89* to adjust this voltage. *Fig.* 3 indicates the waveform of the signal fed to the grid of the noise inverter. As previously mentioned, it is a positive going signal having the same waveform as that of "B" at the output of the sync amplified, since it receives the signal from this stage via C68.

Reference to *Fig.* 3 indicates that the cutoff voltage is at a fixed level as shown by the dotted line. Adjusting *R89* changes the value of the cathode voltage which adds to the signal input, and thus can move this signal above or below the cutoff line. *R89* is adjusted to bring the sync tips slightly below cutoff. In practice this is done simply by turning the control to the position of best sync stability. It can be seen, then, that only the shaded portion of the noise pulse shown in *Fig.* 3 will bring the tube out of cutoff. This shaded portion then is amplified and inverted by the tube resulting in a negative going pulse at the output.

[To Be Continued]

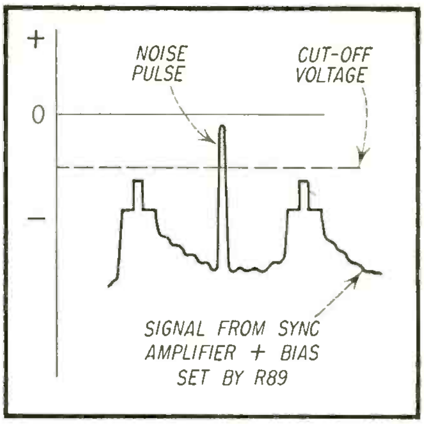


Fig. 3—Signal and bias at input of Noise Inverter

ASSOCIATION NEWS

[from page 24]

bert Kluhsman was elected President for the new year. Other officers are as follows: Vice President, W. Gregg; Secretary, Mrs. Betty Dobbertin; Treasurer, J. Hall; Board of Directors, D. H. Goodearle and Ken Peters.

Radio TV Association of Kalamazoo, Michigan Inc.

Minimum insurance requirement necessary for the protection of the shop owner as well as his liability to the customer were discussed at the last meeting of RTA of Kalamazoo. These basic coverages are:

1. Car or truck public liability and property damage.
2. Operational liability (state controlled).
3. Liability as regards public.
   a) Injury while in store or shop (personal)
   b) While on customers premises: Damage to walls, woodwork, floor covering, etc., covered by Compre. General Liability Policy. Damage to *EQUIPMENT CALLED TO SERVICE NOT COVERED.*
4. Fire insurance on your shop and/or equipment.
   a) If, for instance, a fire is caused by a piece of your equipment, for example, a soldering iron, *you* forgot to unplug, and in the resulting fire *YOUR NEIGHBOR'S PROPERTY IS DAMAGED, YOU ARE LIABLE.*
5. Motor cargo coverage, set pickup and delivery, etc.

Federal

THE SELENIUM RECTIFIER WITH THE GREATEST

Manufacturer Acceptance

When you replace with Federal Selenium Rectifiers you give your radio-TV customers PERFORMANCE that builds *lasting* good will—and PROFITS!

And HERE'S why— point by point:

- **LONGER LIFE** . . . 5,000 hours life expectancy in approved applications.
- **HIGHER OUTPUT VOLTAGE** . . . 3 to 6½ higher B+ output volts than competitive selenium rectifiers in conventional doubler circuits.
- **LOWER TEMPERATURE RISE** . . . 2° C to 10° C lower average operating temperature than competitive selenium rectifiers.
- **SUPERIOR HUMIDITY RESISTANCE** . . . passes 1,000-hour life test in 95% relative humidity at 40° C.
- **PROVEN MECHANICAL CONSTRUCTION** . . . brass eyelet or aluminum stud construction used exclusively. Patented "dead-center" construction allows stack to be tightened until rigid, without affecting the pressure-sensitive selenium characteristic.
- **UNDERWRITERS LABORATORY ACCEPTANCE FOR 85° C OPERATION** . . . Federal's popular radio-TV types have been tested and accepted by UL for operation at cell temperatures of 85° C.
- **CONSERVATIVE RATINGS** . . . rectifiers offered to the industry are rated only after exhaustive temperature rise and aging tests on minimal grade units to insure full value and satisfaction.
- **MORE UNIFORM QUALITY** . . . Federal rectifiers are automatically 100% tested and inspected to meet standard forward and reverse current specifications, as well as for dielectric strength.
- **LARGEST PLANT CAPACITY** . . . production facilities to satisfy any quantity requirement.
- **MORE ENGINEERING KNOW-HOW** . . . the research and design facilities of the world-wide, American-owned International Telephone and Telegraph Corporation assure continued product leadership.

See your Federal Distributor today!

Federal

FEDERAL TELEPHONE & RADIO FTR

A DIVISION OF IT&T

Federal Telephone and Radio Company

A Division of INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

COMPONENTS DIVISION • 100 KINGSLAND ROAD • CLIFTON, N. J.

In Canada: Standard Telephones and Cables Mfg. Co. (Canada) Ltd., Montreal, P. Q.
Export Distributors: International Standard Electric Corp., 67 Broad St., New York

Dear Answer Man:

I just serviced a Truetone chassis 21T2A in which I found a weak 6BZ7 *rf* amplifier tube. I replaced this tube but the picture is not what it should be. It gives the impression that the receiver is out of alignment or has insufficient bandpass in the *if* strip. Since the picture did not have the detail that it should I checked all tubes and voltages and found nothing wrong. The *if* alignment does not seem to have been disturbed; in fact I used my sweep generator and scope to verify that it was correct. The video amplifier circuits also checked out and the audio is normal.

Do you have any idea what might be at fault?

T.F.
Washington, D. C.

In checking the schematic for the Truetone chassis 21T2A it was noted that the *rf* amplifier tube employed is designated as 6BK7. Now, this tube is very similar to the 6BZ7 and 6BQ7 tubes except for interelectrode capacitances. This difference in internal capacitances of *rf* amplifier tubes can be significant especially for the high channels. The *rf* amplifier stages are adjusted with the internal capacitances of the tube as an integral part of the tuned circuits. Changing the *rf* amplifier tube to a 6BZ7 tube, as has been done in this case, will certainly cause difficulties in certain receivers. Manufacturers of TV receivers have emphatically stated that this changing of *rf* amplifier tubes will not give good results in many cases. Technicians have been getting away with this substitution but it does not permit a receiver that has been aligned for a 6BK7 tube to present the best performance it is capable of.

Dear Answer Man:

I replaced a 24 inch picture tube recently and within a month the new tube failed. I now have to go back and change this tube without being able to collect for this additional labor involved in transporting the tube to the manufacturer, obtaining a new one and reinstalling it in the customer's set. I know the manufacturer will replace the under warranty but why should I have to do this without some recompensation since it has come about through no fault of mine?

W. S.
Chicago, Ill.

Just about everyone in the service industry is fully aware of the loss that is sustained when this type of failure occurs. However, although it is little help or satisfaction, it might be pointed out that the same loss is borne by the refrigeration service business as well as air conditioning service business where a hermetically sealed unit is replaced only to have the replacement one go bad.

One of the ways a serviceman can help ward off this type of loss is to make sure that his service charges are sufficient to cover his 90 day guarantee period on parts and labor that he usually extends, and should rightfully extend.

Concerning picture tubes there is one point that has been sadly neglected by technicians. This is the adjustment of the ion trap magnetic.

In replacing picture tubes the adjustment of the ion trap magnetic is extremely important. This is particularly true if there is the slightest corner or neck shadow on the picture tube or raster that is not due to the positioning of the yoke. If the ion trap magnet has not been correctly adjusted, the electron beam will impinge upon the electron gun aperture. The bombardment of the aperture will produce gas that is harmful to the picture tube. This is particularly aggravated when the brightness control is turned on full to produce sufficient brightness when the ion trap magnet adjustment is actually at fault. Picture tubes have been permanently damaged in a very short period of time due to this condition.

In the adjustment of the ion trap magnet it should always be set at the point that provides maximum brightness. During the setting the brightness control should *not* be set to the fully clockwise (maximum brightness) position. Sometimes there are two positions where the magnet will produce what appears to be the maximum illumination. Select the position for the magnet that is nearest to the base of the tube. An important point to be recognized is that the magnet should *not* be repositioned to remove a neck shadow if the brightness is thereby decreased.

Perhaps one of the most important points regarding this is that the adjustment be performed immediately with the turning on of the receiver as it is possible during this period to render the tube worthless.

Dear Answer Man:

I service a number of receivers in an extreme fringe area and the pictures have considerable snow. I was wondering if there is anything that I can do to make the snow less pronounced?

S. B.
San Diego, Cal.

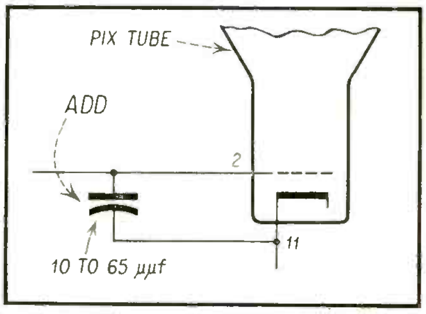


Fig. 1—Snow reduction

In these signal areas where the signal is extremely weak the snow can be reduced by placing a small capacitor,
[*Continued on page 50*]

More Ranges - More Visibility - More V.O.M.

the PRECISION MODEL 120

Gives You What You Want in a

HIGH SENSITIVITY MULTI-RANGE TEST SET

20,000 OHMS PER VOLT D.C.
5,000 OHMS PER VOLT A.C.

- MORE RANGES — The '120' gives you 44 . . . which start lower and go higher . . . to outrange any professional V.O.M. of similar size or type.
- AN EXTRA-LOW RESISTANCE RANGE — The '120' gives you a 2-ohm center scale range, powered by long-lived, internal 1.5 volt battery source.
- AN EXTRA-LOW VOLTAGE RANGE — The '120' gives you 1.2 volts full scale, A.C. and D.C.
- AN EXTENDED LOW CURRENT RANGE — The '120' gives you a 60 microampere first D.C. current range.
- A LARGER AND EASIER READING SCALE FACE — The '120' gives you a new, extra-large 5¼" meter with full 4¾" extra-wide window.
- SIMPLE, POSITIVE RANGE SELECTION — The '120' gives you an 18-position, positive-detenting, master range selector with low resistance, dependable, silver-plated contacts.
- RUGGED, POSITIVE CONTACT JACKS and PLUGS — The '120' gives you specially designed, low resistance, solid brass, banana type plugs and jacks.

Compare These Wide-Spread Ranges and Special Features:

★ **8 DC VOLTAGE RANGES:** 20,000 ohms per volt. 0-1.2-3-12-60-300-600-1200-6000 volts.

★ **8 AC VOLTAGE RANGES:** 5,000 ohms per volt. 0-1.2-3-12-60-300-600-1200-6000 volts.

★ **8 AC OUTPUT RANGES:** same as AC volt ranges. With built-in 600 volts blocking capacitor.

★ **7 DC CURRENT RANGES:** 0-60-300 Microamperes. 0-1.2-12-120-600 Ma. 0-12 Amperes.

★ **5 RESISTANCE RANGES:** self-contained batteries. 0-200-2000-200,000 ohms. 0-2-20-megohms.

★ **8 DECIBEL RANGES:** from – 20 to +77 DB. 0 DB = 1 Milliwatt, 600 ohms.

★ **EXTRA LARGE 5¼" RUGGED 'PACE' METER:** 40 microamperes sensitivity, 2% accuracy.

★ **1% MULTIPLIERS and SHUNTS:** wire-wound and high stability deposited-film types employed throughout.

★ **ONLY 2 PLUG-JACKS SERVE ALL STANDARD RANGES:** separately identified and isolated jacks provide for extra-high ranges.

★ **"TRANSIT" SAFETY POSITION:** on master range selector protects meter during transportation and storage.

★ **CUSTOM-MOLDED PHENOLIC CASE and PANEL:** set a new standard for compact, efficient, laboratory instrument styling. Deeply engraved panel characters afford maximum legibility throughout the life of the instrument.

MODEL 120: complete with internal ohmmeter batteries, banana-plug test leads and operating manual. Over-all case dimensions: 5⅜ x 7 x 3⅛"........................ **Net Price: $39.95**

WILL COLOR TELEVISION MAKE PRESENT TEST EQUIPMENT OBSOLETE?

THE ANSWER IS NO! It will create even more uses for your PRECISION instruments! Color servicing will merely add one or two special-purpose units . . . which PRECISION will produce when field requirements are clearly defined.

As for V.O.M.'s — a volt is a volt, an ohm is an ohm and a mil is a mil . . . in color TV, monochrome or plain ordinary radio!

PRECISION Apparatus Company, Inc.
70-31 84th Street, Glendale 27, L. I., N. Y.
EXPORT: 458 BROADWAY, N. Y. 13, N. Y., U. S. A. Cables: Morhanex
CANADA: Atlas Radio Corp. Ltd., 560 King St. West, Toronto, 2B

SPECIAL OFFER TO OUR READERS!

By special arrangement with John F. Rider Publisher, Inc., RADIO-TV SERVICE DEALER now brings you a COMPLETE diagram service to help you do a faster, easier servicing job!

ALL COMPLETE!

ALL FACTORY PREPARED!

ALL FACTORY AUTHORIZED!

- ✓ **Just $1.25 for COMPLETE SERVICING INFORMATION on *any* TV receiver . . . any year, any make, any model . . . from 1946 on!**
- ✓ **Just 75¢ for COMPLETE SERVICING INFORMATION on *any* radio . . . any year, any make, any model . . . from 1941 on!**

TAKE ADVANTAGE OF THIS SPECIAL OFFER . . . MAIL THE COUPON TODAY!

Radio-TV Service Dealer, 67 W. 44 Street, New York 36, N. Y.

Please RUSH me the following diagrams:

RADIO DIAGRAMS @ 75¢ EACH		
CHASSIS #	MAKE	MODEL #

TV DIAGRAMS @ $1.25 EACH		
CHASSIS #	MAKE	MODEL #

MAKE ALL CHECKS & MONEY ORDERS PAYABLE TO Radio-TV Service Dealer

(For all New York City orders, please submit additional 3% sales tax.)

Name ....

Address ....

City .... State ....

TRADE LITERATURE

(Catalogues)

A completely new type of parts and accessories catalog is currently being offered all Philco dealers and servicemen. It contains current information on all products, including over 24,000 Philco service parts and universal replacement parts, as well as other make electronic and appliance products, has been catalogued by part number for convenience in ordering. Newly developed technical material on standard and special parts based on field experience and laboratory information is incorporated to provide valuable library reference.

The 25-page catalog #55A illustrates and describes the entire RMS line of antennas and accessories. It incorporates list prices with each item shown, groups the entire line into various sections for ease in ordering, and is completely indexed. Conveniently 3-hole punched for ease in inserting into binders, this catalog is available by writing Catalog Division, Radio Merchandise Sales, Inc., 2016 Bronxdale Avenue, New York 62, New York.

A 72-page catalog is offered by Guardian Electric Mfg. Co., covering the company's complete line of basic type relays. Each relay is fully described as to physical and electrical characteristics, also complete operating data and suggested applications are included. A free copy is obtainable by writing to Guardian Electric Mfg. Co., 1621 W. Walnut Street, Chicago 12, Illinois.

Allied Radio Corporation, Chicago, announces the release of a 68-page booklet (#144) which combines an illustrated information section explaining high fidelity, with listings of hi-fi music systems and separate components. Called, This Is High Fidelity, it provides an introduction to high fidelity in the opening pages. Written in non-technical language, it explains the functions of the basic units used in home high-fidelity music systems, and is available without charge from Allied Radio Corporation, 100 N. Western Avenue, Chicago 80, Illinois.

This multicolored catalog, available without charge from South River Metal Products Co., Inc., South River, N. J., illustrates the newly expanded line of antenna mountings and accessories, and illustrates the manner in which the mountings and accessories are used by the service-installation man. It describes in detail the quality construction of each bracket and accessory, and lists the prices, standard packaging, and weight on the page the item appears.

The Cardwell Electronics Productions Corp. catalog 823 on the line of fixed and variable Air Capacitors. This catalog gives mechanical and electrical specifications on all standard models as well as information on "special items" available on your request. For your copy write the Allen D. Cardwell Co Electronics Products Corp., Plainville, Conn.

General Transistor Corp., 95-18 Sutphin Blvd., Jamaica 35, N. Y., has just released their catalog of diffused p-n-p junction transistors, which illustrates General Transistor's double sealing process—(1) encapsulated in plastic and (2) hermetically sealed in a can. It also includes absolute maximum transistor ratings and characteristics.

The Columbia Wire & Supply Co. announces a supplement to their Catalog #104, illustrating Permaline TV transmission line: Permaline Rotor Cables; Permaline Intercom and Telephone wire for outdoor use; a new hook-up wire display; new connectors, cords, cables, etc. For your copy write to Columbia Wire & Supply Company, 2850 Irving Park Road, Chicago 18, Illinois.

it takes BOTH HALVES to do the job

SERVICE FIRMS

A Service Firm is one that does servicing only—no retailing

Only "Service Dealer" magazine reaches *all* the owners or managers of the nation's 30,000 service firms.

SERVICE DEALERS

A Service Dealer is a Retail Firm that operates its own radio-TV service department

Only "Service Dealer" magazine reaches all the owners or managers of the nation's 24,000 Service Dealer firms.

Electronic Parts Distributors' sales volume will exceed $1,333,-000,000 this year. Distributors say that the Nation's 30,000 professional Service Firms will account for 50.1%—or $667,833,000—and that Service Dealers will account for 38.6%—or $514,538,000—of that total dollar volume. All others, such as industrials, part-time servicemen, hobbyists, hams, etc., will account for the 11.3%, or $150,629,000 balance.

You can readily see that the vital bulk of distributors' business is done with professional Service Firms and established Service Dealers. Manufacturers cannot afford to advertise in a magazine that does not reach the executives of BOTH GROUPS. Only one magazine *does* reach BOTH GROUPS' executives—that magazine is "SERVICE DEALER."

Scan "Service Dealer's" latest audited circulation figures. Compare them with other magazines' latest audited circulation statements. You'll see that our coverage in the Service field is 25,000 greater every month than our nearest competitor's. And our advertising rates are 33% lower.

Radio-Television
SERVICE
DEALER

A copy of "Radio-TV Service Dealer's" latest BPA Circulation Audit Report will be sent upon request.

COMPACT VTVM

[from page 41]

of the function switch in combination with a separate set of scale reading provide for these measurements. Due to the time constant characteristics of the peak to peak circuit a special P-P reset button is provided for rapid "Zero" return of the pointer. Six peak to peak ranges, from 0 to 3.2 V and 3200 V *ac* are provided.

High Frequency Measurements

Provisions for high frequency (to 300 *mc*) measurements with an effective input capacitance of 5 *μμf* are available in conjunction with a high frequency probe and socket (*Fig. 1*). This probe shown in *Fig. 2*, contains a 9002 tube in a self shielding diode circuit.

Fig. 2—High Frequency Probe used in conjunction with compact VTVM provides measurements with an effective input capacitance of 5 uuf at frequencies up to 300 mc, making it an excellent device for RF signal tracing.

It is an invaluable accessory in servicing signal tracing *rf* or *if* circuits inasmuch as it converts the Model 88 a high frequency *rf* voltmeter with the following probe ranges: O-1.2-6-12-60-300 V *rms*.

Other Measurements

Other conventional functions ranges on this instrument are as follows:

DC VTVM: 0 to 1.2 V through to 1200 V in six overlapping ranges.

Ohmmeter: 0-1000 megohms in 5 ranges. Center scale reading of R X 1 scale is 10 ohms.

AC VTVM: 0 to 1.2 V through to 1200 V in six ranges.

Input Characteristics

The input characteristics of this instrument on the *ac rms* VTVM ranges are as follows:

Up to 160 V range; 6 megs, 90 *μμf*
Up to 800 V range: 1 meg, 70 *μμf*
Up to 3200 V range: 4 meg, 67 *μμf*

For the peak-to-peak function the input characteristics are as follows:

Up to 160 V range: 6 megs, 90 *μμf*
Up to 800 V range: 1 meg, 70 *μμf*

[Continued on page 55]

the greatest value ever offered in a

Tube Tester . . .

to meet all of today's tube testing needs plus tomorrow's color television tubes

Model 327-P

Tests all new series tubes.

A BRAND NEW TESTER that is ideal for the test bench and small and light for easy portability to take on the job. A new approach in the development of a tube tester. Streamlined to meet all of today's requirements for accuracy, speed, compactness yet with more testing performance than other more costly testers. Tests all tubes in all current radio anl television receivers, tests all tubes in color TV receivers; will check transmitting, hearing aid, ballast, gaseous rectifiers, and tuning indicator types.

A new approach to tube testing data permits easy and rapid insertion of new information when available. Data is also given on current color TV tubes. It will check CR Picture Tubes both black and white and color by use of CR adapter cable (available at slight additional cost). Black and white picture tubes can readily be reactivated with this tester.

In solid oak carrying case with slip-hinge cover. Size 9½" x 11" x 5½". Weight: 9½ lbs. For 105-125 volt, 50-60 cycle operation. $51.95 Net

Picture Tube adapter cable—Will permit checking and reactivation of all magnetic, deflection types while in the set or carton.

PTA-1 for Blk/Wht Picture Tubes $3.95 Net

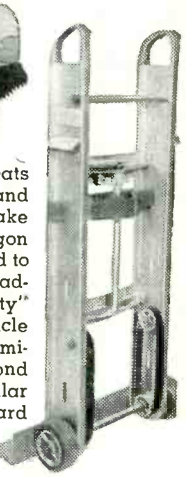
PTA-2 for 3 Gun Color Picture Tubes $9.95 Net

456 Tube Adapter for use in checking old type 4, 5, 6 pin tubes $2.85 Net

RADIO CITY PRODUCTS CO. Inc.

Centre & Glendale Sts. Easton, Pa.

The NEW YEATS "Shorty"
STATION WAGON & PANEL PICK-UP APPLIANCE DOLLY



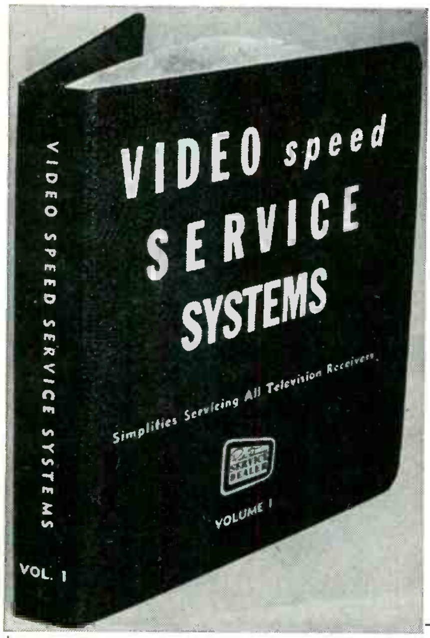
Only 47" tall, this new Yeats dolly is designed for TV and appliance men who make deliveries by station wagon or panel delivery. No need to detach appliance for loading . . . the YEATS "Shorty" will slide into your vehicle with ease. Has same aluminum alloy frame, 30 second strap ratchet and caterpillar step glide as the standard size YEATS dolly! See your dealer today!

YEATS "Everlast" COVERS & PADS

SEND postcard for full information on our complete line TODAY!

YEATS appliance dolly sales co.

2133 N. 12th St. Milwaukee 5, Wis.



FOR GREATER PROFITS

SPEED UP YOUR SERVICING with THIS NEW BOOK

which shows you how to take care of and repair in the quickest possible time:

- Common troubles characteristic of certain receivers
- "Bugs" which might take you hours to find
- Factory and field service changes

SET UP SO THAT YOU CAN MAKE THESE REPAIRS IN THE SHOP OR IN THE FIELD WITHOUT REFERENCE TO ANY OTHER SOURCE.

Contains over 600 Service Items representing over 1000 of the most-serviced Television models now in use. Over 25 different manufacturers' lines are covered.

$4.95 postpaid

(Add 3% Sales Tax in New York City)

DISTRIBUTORS—ORDER YOUR SUPPLY NOW!

Service Dealers—get your copy of VSSS from your Distributor. If he can't supply you, order direct by mail from us.

Video Speed Servicing Systems IS GUARANTEED to Simplify Servicing All TV sets. A number of new Data Items are published in every issue of "Radio-Television Service Dealer" as a regular monthly feature.

---- TEAR OFF AND MAIL NOW ----

RADIO-TELEVISION SERVICE DEALER, 67 West 44th Street, New York 36, N. Y.

Please send me post-paid VIDEO SPEED SERVICING SYSTEMS Volume 1. Enclosed herewith is my ☐ check ☐ money order for $________ for ________ copies at $4.95 each. (Add 3% Sales Tax in New York City)

Name ....

Address ....

City .... Zone .... State ....

Up to 3200 V range: 4 meg, 67 μμf

A circuit diagram of the instrument is shown in *Fig.* 3.

PORTABLES

[from page 14]

powered operation; a very small number use a tube rectifier. The basic advantages of the selenium type supply are instantaneous receiver operation (compared to the short delay while a tube heats up); greater ruggedness; and cooler operation.

A rather unique form of inverse feedback is used in Zenith chassis 4T42 and other portables to improve fidelity. A special winding on the output transformer is inductively coupled to the voice coil, and feeds back an out-of-phase signal to the volume control (see *Fig. 6*). If the output transformer becomes defective, an identical replacement unit becomes necessary. The windings of the replacement output transformer must be connected in the proper polarity (as indicated by the color coding) to avoid regenerative (instead of degenerative) feedback.

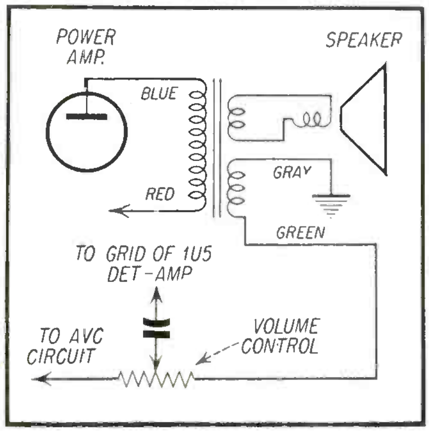


Fig. 6—Inverse feedback winding used on Zenith Ch. 4T42 output transformer.

Westinghouse and Emerson, among others, are using printed-circuit couplates in the audio section of some of their portable receviers. Service on these sets will probably necessitate the use of a schematic in most cases, to identify the terminals of the different reistors and condensers in the couplates.

If you find worn-out batteries in a portable, remove them. (It is assumed that the customer is using his set on electric operation only, and doesn't want the batteries replaced.) Worn-out batteries tend to swell, and sometimes to leak with resultant damage to the receiver. The batteries should also be removed (or the customer warned to do so) if the set is not going to be used on battery setting for an extended period.

Advertising Index

MOVING?

Please Mail Us Your Change of Address Today

Also include old address and code line, if possible. Thanks.

RADIO-TELEVISION SERVICE DEALER
67 West 44 St., New York 36, N. Y.

SELL THE HUGE DO-IT-YOURSELF MARKET

WITH Snyder PHILADELPHIA Directronic® TV 'TENNA KITS

$24.75 LIST LESS 'XTRA DISCOUNTS

K-80

NO MOTORS OR MOVING PARTS

NO ELECTRIC POWER

NO ROOF ORIENTATION

NO GHOSTS

SNYDER

SNYDER MFG. CO., PHILADELPHIA 40, U. S. A.
BELLEVUE TUBE MILL, INC., PHILADELPHIA
SNYDER ANTENN-GINEERS, LTD., TORONTO 14, CANADA
WORLD EXPORT: ROBURN AGENCIES, INC., N. Y.
VAN DER HOUT ASSOC., LTD., TORONTO 14, CANADA

Battery Business is REPEAT Business!

. . . if YOU keep repeating, *"Does your Portable need new Batteries?"*

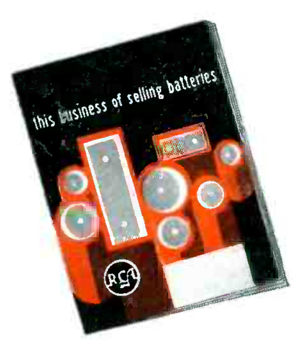
Every time you ring up a sale for anything, always ask that question. Every time you make a service call, always ask that question. You'll be surprised at the battery business that's yours for the "asking."

There are over 15 million portables in this country, and whether they're in use or on the shelf, the batteries run down. Here's a big market full of repeat business potential. Here's a growing market to which you can sell fresh, full-powered RCA Batteries time and time again during the course of a season.

You can depend on RCA Batteries to give your customers the kind of product performance that keeps them coming back for repeat business throughout the year. RCA Batteries are radio-engineered for extra listening hours . . . manufactured to the highest performance standards of the greatest name in radio.

Your RCA Distributor is ready now to supply you with fast-moving RCA Radio Batteries for every leading portable radio. Stock-up now. Then use RCA's potent selling aids . . . mention batteries during every sale and service call . . . and you'll be in this business of selling batteries —RCA Batteries—in a big way, profitably.

FREE! "This Business of Selling Batteries." It's loaded with hot selling tips and promotional ideas. Ask your distributor or write RCA Commercial Engineering, Section E42N, Harrison, N. J.



RADIO CORPORATION of AMERICA

RADIO BATTERIES **HARRISON, N.J.**