JANUARY 1955

Radio-Television SERVICE DEALER

TV - AM - FM - SOUND

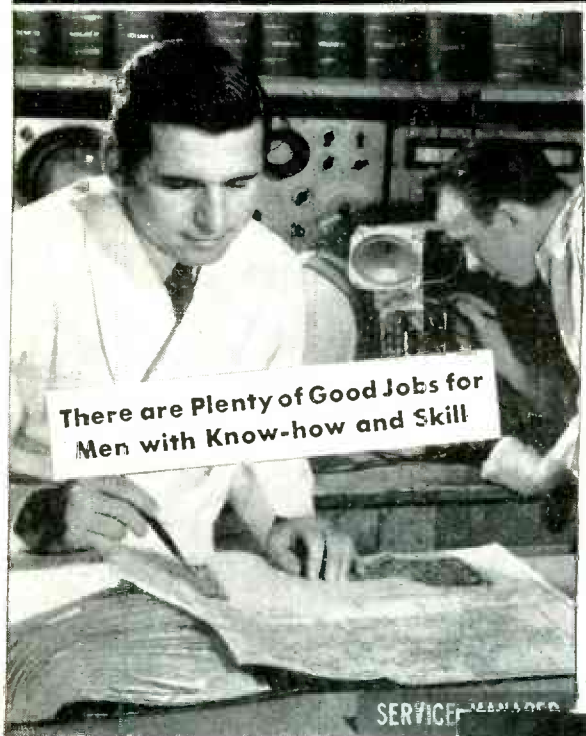
Includes 3 Sections

1. VIDEO SPEED SERVICING SYSTEMS
2. TV FIELD SERVICE DATA SHEETS
3. COMPLETE TV SERVICE INFORMATION SHEETS

The Professional Radio-TVman's Magazine

Reaching Every Radio TV Service Firm Owner in the U.S.A.

Learn to Service TV Sets- *any make or model-Quickly*



New ALL PRACTICE Method trains you at home to become a Professional TV Serviceman

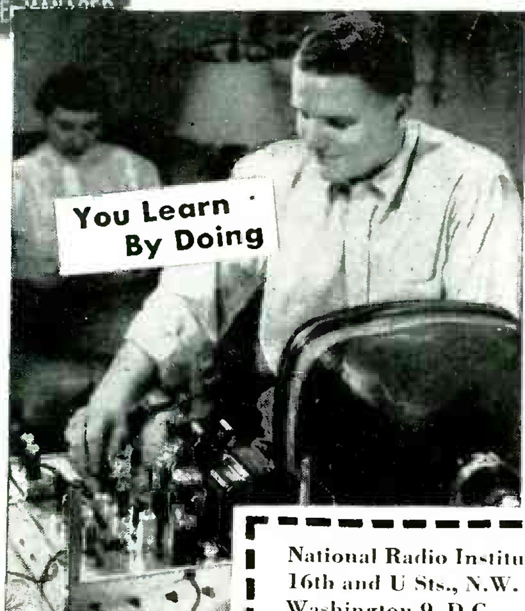
You learn the time saving techniques, methods used by top TV Servicemen

This is 100% learn-by-doing, practical training. NRI supplies all necessary equipment, all tubes, including a 17-inch picture tube; and comprehensive manuals covering a thoroughly planned program of practice. You learn how experts diagnose TV receiver defects quickly. You easily learn the causes of defects—audio and video—and how to fix them accurately.

You get actual experience aligning TV receivers, isolating complaints from scope patterns, eliminating interference, using germanium crystals to rectify the TV picture signal, adjusting the ion trap and hundreds of other valuable Professional techniques.

17" Picture Tube, Components for a TV Receiver, Scope, Signal Generator, HF Probe—all included in introductory price under $200-Easy Terms

If you want to go places in TV servicing, you will act quickly to find out what you get, what you practice, what you learn and how NRI's new course in Professional Television Servicing will help you advance through better technical knowledge and training. See pictures of equipment supplied, read what you practice in book offered FREE to ambitious men with some knowledge of Radio or TV fundamentals. Find out about this ALL PRACTICE Professional TV Servicing Course now.



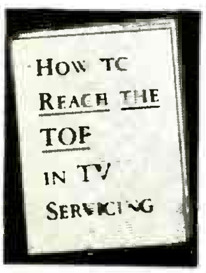
UHF and COLOR Create Growing Opportunities

To cash in on the present UHF and the coming COLOR TV boom you'll need the kind of knowledge and experience NRI's Course gives. You'll get practice installing front-end channel selector strips in modern UHF-VHF receivers. You learn UHF servicing problems and their solution. Mail the coupon now. Discover how NRI's new course in PROFESSIONAL TELEVISION SERVICING meets the needs of the man who wants to get ahead in TV Servicing.

Not for Beginners

If you have some knowledge of Radio-TV fundamentals, or have had some Radio Shop experience or some Radio school training, this course IS FOR YOU. Mail coupon today.

MAIL NOW



COUPON BRINGS IMPORTANT
BOOK FREE

Get this book and judge for yourself how this course will further your ambition to reach the top in TV Servicing or help to build a more secure business of your own in TV. Many of tomorrow's top TV Servicemen . . . men who can service any make, any model, UHF, VHF or Color TV . . . will be graduates of this training. Mail the coupon now. There is no obligation.

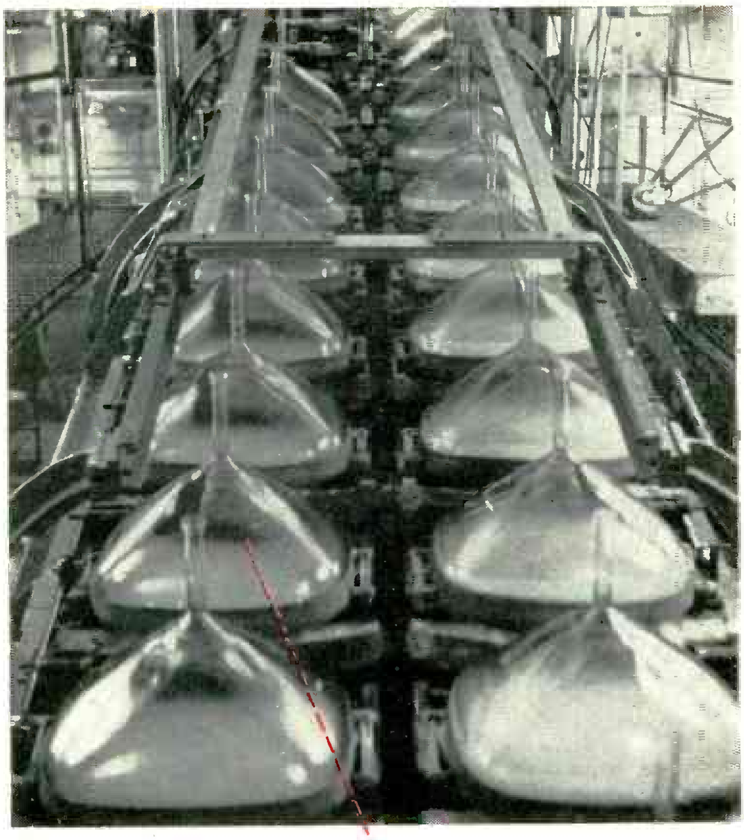
National Radio Institute, Dept. 5AF4T
16th and U Sts., N.W.
Washington 9, D.C.

Please send my FREE copy of "How to Reach the Top in TV Servicing." I understand no salesman will call.

Name.. Age..........

Address..

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

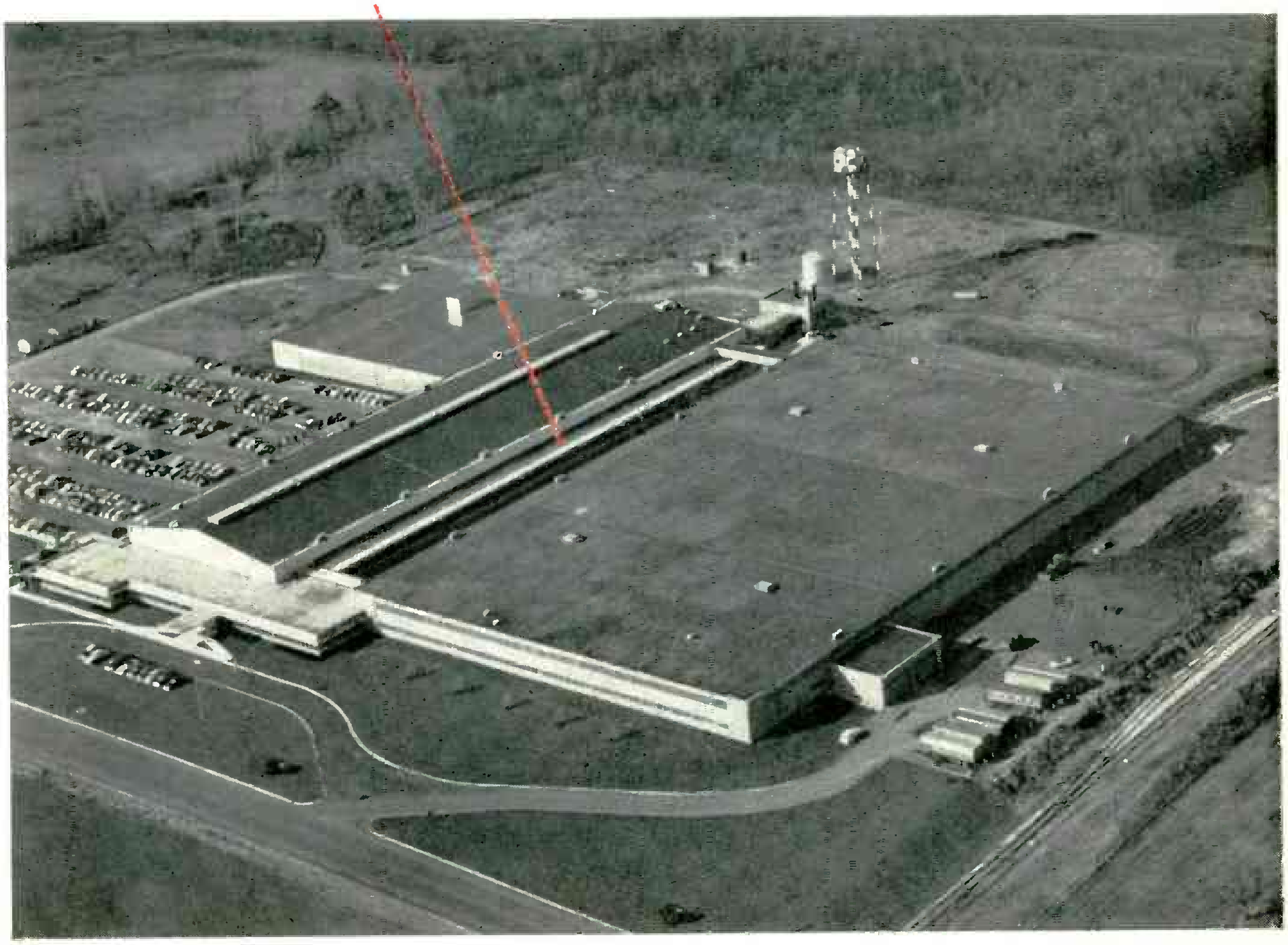


From ZERO to CAPACITY PRODUCTION IN THREE MONTHS!

The same "advanced-engineering" that produced the CBS-Colortron and the Mirror-Back picture tube also engineered and built this modern CBS-Hytron plant at Kalamazoo, Michigan. The same drive typical of CBS-Hytron activity brought this complex industrial operation up to capacity production just three short months after first shipments began. For the ability to keep pace with your demands . . . for premium quality in TV picture tubes, look to the fastest-growing, most modern and forward-thinking company in the industry — CBS-Hytron.

CBS-HYTRON
Main Office: Danvers, Massachusetts
A Division of Columbia Broadcasting System, Inc.

A member of the CBS family: CBS Radio • CBS Television • Columbia Records • CBS Laboratories • CBS-Columbia • CBS International • and CBS-Hytron



EVERY SERVICE FIRM OWNER IN THE U.S.A.
Receives SERVICE DEALER Monthly
Distribution of this Issue over 67,500

Member BPA —Circulation Statement sent on request

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

VOL. 16, NO. 1 JANUARY, 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 for 2 years in the United States, & U.S. Poss. Elsewhere $1 per year additional. Single Copies 25c. Reentered as second class matter Sept. 25, 1950 at the Post Office at New York, N. Y. under the Act of Mar. 3, 1879.

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

EDITORIAL...

by S. R. COWAN
PUBLISHER

Crack-down On Gyps

Newspapers in many key cities have of late been carrying more and more stories about the arrest of local "gyp" service firm operators. In *some* respects this is good news indeed! These operators should be eliminated from our field by any drastic method needed to be effective. They must be eradicated fast.

But, by the same token, we regret it is necessary that such happenings should be reported so frequently in the public press because every such incident reflects damagingly and hurts the service profession as a whole. Good servicemen never get a good publicity release to offset the adverse publicity of the small minority of villains.

Gyp practices of a few irresponsibles in the service field *more than any other factor* have caused law-makers to believe that licensing and police regulations with teeth and penalties for violators are the *only* solution to the problem.

The two leading opponents to promulgation of License Bills for radio-TV servicemen, strangely enough, are RETMA and NEDA—both of which are merely distant and very self-preserving cousins to the service profession. (Remember when some set-makers advertised "our TV sets need no outdoor aerial"—and the public wouldn't accept the serviceman's diagnosis that in that particular case the set-maker was misleading the set owner? And, remember, during the war days, when tubes were only available on priority to servicemen, when certain distributors diverted those scarce tubes to service departments of their own which they suddenly set up in order to make an extra buck?)

These two organizations, RETMA and NEDA, have taken the stand that to improve the quality of servicing and to induce more qualified men to come into the service field no restrictions whatever should be imposed. (But, do distributors confine trade discounts solely to professional servicemen —or can any Tom, Dick and Harry buy their parts over-the-counter for the same reduced price that professional servicemen must pay?) We could write a book explaining in detail why we believe these two fine organizations are "out of line" in adamantly opposing License Bills. We believe these organizations hold their respective views opposing licensing primarily for selfish and unwarranted reasons to which servicemen themselves should not be bound. In fact, the majority of servicemen and most set-owners themselves want and need properly promulgated License Laws. For that reason we advocate licensing.

Specialized Test Equipment

The peculiar and complex problems relative to servicing many TV receivers and their components happily has stimulated much ingenious thinking on the part of test equipment manufacturers.

Consequently, in this issue we are privileged to publish no less than three original articles, each describing a new piece of test equipment that is now available to the service profession. Each of the instruments respectively does a specialized job which actual experience proves the need for.

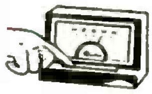
In the months ahead we plan to continue this educational programming, describing the design, characteristics and applications of new test equipment as it is put upon the market. Paramount in our selection of articles to be published are these factors: 1)—will the instrument in question efficiently, accurately and properly do the job or jobs it is purported to do? —and, 2)—does the instrument, by its functional capacity, justify being purchased? —or 3)—stated another way, will the investment a serviceman makes in any given instrument come back to him in a relatively short time?

As we have said frequently, there are only a certain limited number of working hours per week available to any serviceman. Thus every available minute must be used to optimum advantage. If the outlay of $50, $200 or even $500 for an instrument will result in a serviceman being enabled to do his tasks more easily, more efficiently and in less time —quite obviously investing in such an instrument is worthwhile regardless of the cash outlay required. Amortization of any investment is proper business thinking.

Too many service firms now are using old, obsolete test equipment. Too many are working with inferior instruments that are so badly off calibration or accuracy as to be worse than having no instrument at all. Too many service firms do not now have enough test equipment available for their expanded staff of employed technicians, and as a result, whether they realize it or not, pay the severe penalty of losing many hours daily by having workmen wasting "idle time"—hours that shop owners pay salaries for and lose income from.

Progressive service firm operators know they can't afford to lose minutes and money that way but sad to say, they sometimes cogitate much too long about the purchase of new or additional test equipment and keep piling lost minutes on lost minutes. So, let's modify the old adage and say: "He who hesitates loses!"

ENGINEERED FOR SALES

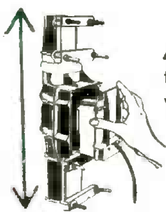


SMARTLY STYLED CONSOLE WITH PIANO TUNING

The striking control console is designed for beauty of design as well as ease of operation. Actuates the rotator with the slightest touch. Available in mahogany or ivory cabinet.

STOP WATCH TUNING ACCURACY

Pinpoint control system is unsurpassed in consistent accuracy of indication. Stops antenna instantly within ½ degree of desired position. No drift or ambiguity.



POWERFUL INLINE DESIGN

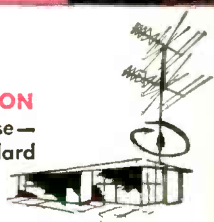
Supports direct deadweight load of largest stacked array. Resists downthrust and bending moment. Built-in thrust bearings. No extra parts to buy. No breakable offset bearings.

REPLACEABLE FACTORY SEALED CARTRIDGE UNIT

Sealed power drive unit eliminates the former need of dismantling the antenna when servicing. Simply loosen 3 screws to remove the sealed unit.

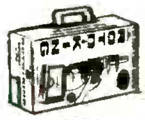
BALANCED POWER

Close tolerance 3200:1 reverted gear drive (within .002 in. tolerance) efficiently transmits 100% of developed power. No inherently weak worm gears.



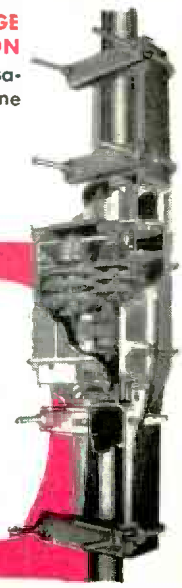
390 DEGREE ROTATION

390 degrees—the broadest traverse range now in use—speeds and simplifies station selection beyond standard 360 degree revolution.



COLORFUL "CARRY-ALL" CARTON

Safely protects Roto-King en-route . . . eases on-the-job carrying of units . . . comes in handy in the shop or around the home. A JFD merchandising extra at no extra cost.



AUTOMATIC VOLTAGE COMPENSATION

Advanced circuitry achieves automatic voltage compensation for stability and exactness of indication despite line voltage fluctuations.

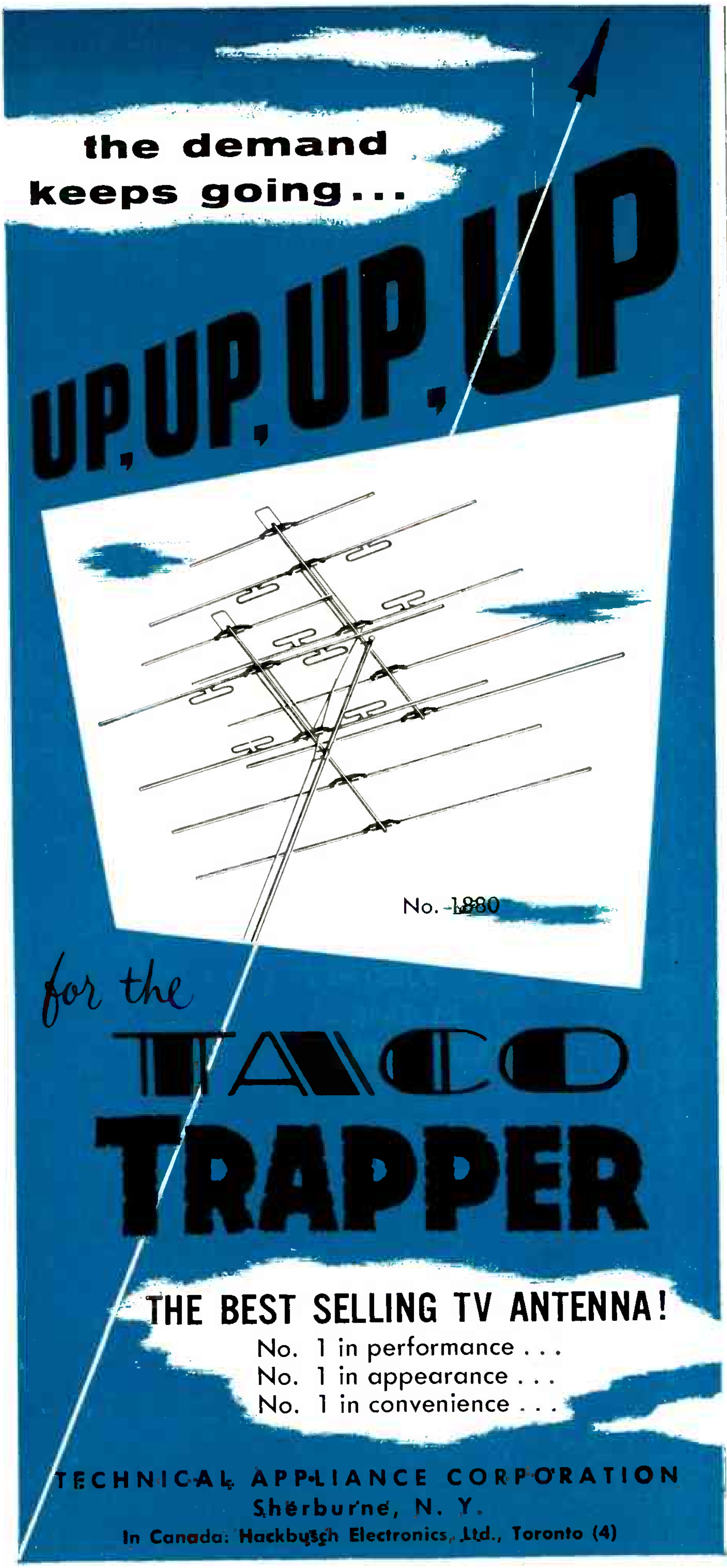
ROTO-KING IS LIKE A DIRECT LINE TO EVERY TV STATION IN YOUR AREA.

Write for 8-page *Roto-King engineering* brochure No. 288.

Model	List
RT100-M *Mahogany*	**$44.95**
RT100-IV *Ivory*	**$44.95**

Look to JFD for Engineering Leadership!

JFD MANUFACTURING CO., INC.
6101 16th AVENUE, BROOKLYN 4, N. Y.
INTERNATIONAL DIVISION: 15 Moore Street, New York 4, U.S.A.



ASSOCIATION NEWS

RTG—Long Island

Motorola's new 19 inch color receiver recently made its debut on L. I. at one of the regular Guild Technical meetings, at the Irish American hall in Mineola. The lecture included a presentation of the first 19 inch color set to be offered to the public.

The program was opened by a few well chosen words by Mr. Paul Lewis, Vice President of Motorola N. Y. who promises continued effort on the part of Motorola to keep the serviceman well informed on the advancement of color TV and its problems.

LIETA—New York

The Long Island Electronic Technicians Assn., Inc., BOOTH No. 20, TENT 'B' (The Long Island Lighting Company Tent) at the Mineola Fair and Industrial Exposition, Roosevelt Raceway, N. Y. The Fair ran from October 9th thru October 17th from 12 Noon to 11 PM. Picture shows mem-

bers, Harold F. MacFarland, William A. Carey (Assn. President) and Napoleon Revels giving out the LIETA FAIR certificate. This was a cooperative advertising venture (the certificate) on the part of sixteen of our members who operate their own businesses.

RTTA—Penn.

The Southern Pennsylvania Radio-Television Technicians Association met at C. A. P. headquarters Mon., Oct. 18th, with brief business session, Pres. Joseph Hauser presiding. Following the confab refreshments were served to the members and their friends. They then were guests of the new WGAL-TV transmitter and that station's latest telecasting facilities.

[*Continued on page 41*]

RAYTHEON

Makes Long Lasting Aluminized Picture Tubes

With RAYTHEON LUMILAC

Exclusive Aluminizing Lacquer

Now you can get all the benefits of aluminized picture tubes — sharper picture, superior contrast, high light output — and *excellent picture tube life!*

Raytheon aluminized picture tubes are processed with the purest aluminum *plus* LUMILAC — a lacquer especially blended and used exclusively by Raytheon.

This lacquer produces an extra smooth unbroken surface for the aluminized coating, yet leaves no gas-producing residues which could impair cathode emission and hence shorten tube life.

Next time you replace a picture tube try a Raytheon LUMILAC Aluminized Picture Tube. You'll be delighted with its performance in any set — amazed at how it will improve the picture of a low cost, low voltage range TV receiver. And so will your customer. Ask your Raytheon Tube Distributor for Raytheon Aluminized Picture Tubes with LUMILAC. Like all Raytheon Picture Tubes they are Right for Sight, Right for You and Always New.

RAYTHEON ®

Excellence in Electronics

RAYTHEON MANUFACTURING COMPANY

Receiving and Cathode Ray Tube Operations

Newton, Mass., Chicago, Ill., Atlanta, Ga., Los Angeles, Calif.

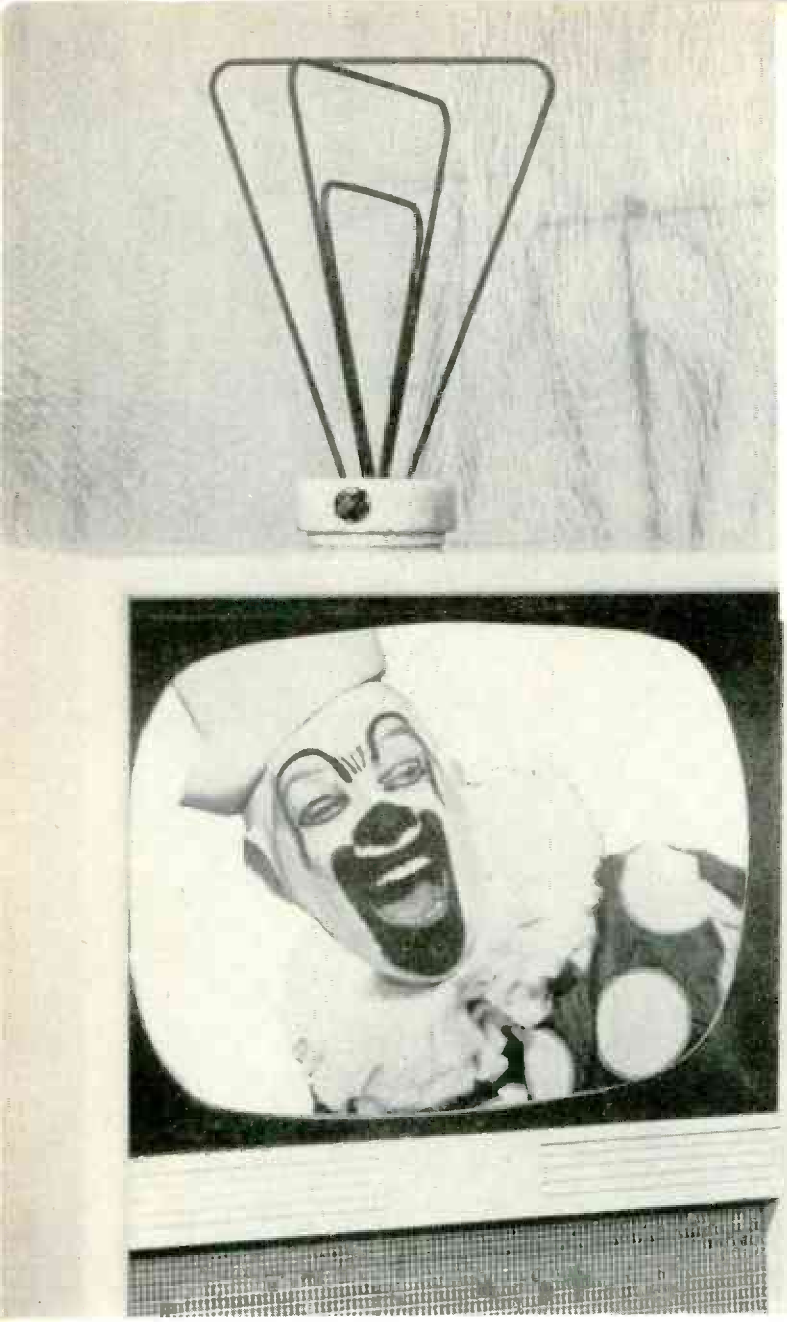
RAYTHEON *MAKES* ALL THESE:

RECEIVING AND PICTURE TUBES · RELIABLE SUBMINIATURE AND MINIATURE TUBES · SEMICONDUCTOR DIODES AND TRANSISTORS · NUCLEONIC TUBES · MICROWAVE TUBES

SPECIAL REPORT

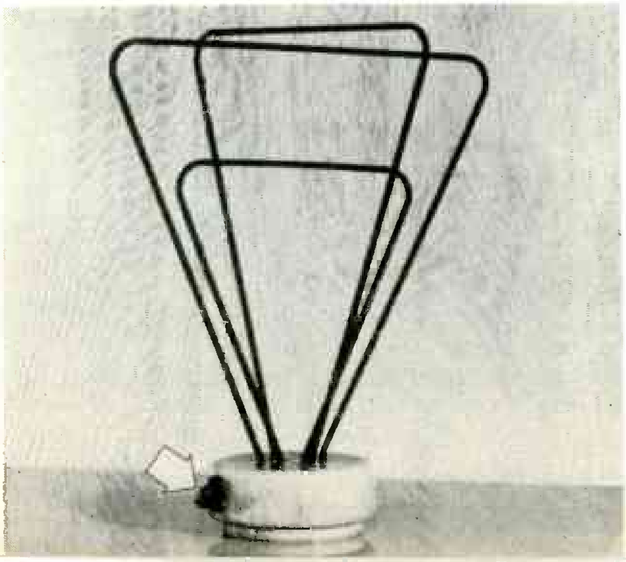
Introducing the WALSCO Star...*

FIRST INDOOR ANTENNA TO BE COMPARED WITH OUTDOOR INSTALLATIONS



Attractive, compact in design...the new Walsco *Star* doesn't stick out like a sore thumb. Smart styling and distinctive colors (chartreuse, sand, green) are being recommended by interior decorators. No ugly rods to manipulate. Proven comparable in performance to a good *outdoor* antenna in most metropolitan and suburban areas.

Electronic tuner selects right combination of elements automatically for crystal-clear picture reception. Receives VHF and UHF stations in opposite directions or on widely separated channels. The Walsco *Star* is the most advanced indoor antenna ever built.



Los Angeles...A new standard in the design and performance of indoor antennas can be found in two new models recently introduced by Walsco. This is the first indoor antenna with a built-in, electronic rotating and tuning control that changes its directivity. Without moving, twisting or pulling, the new Walsco *Star* can be positioned perfectly by a simple turn of the control. Ghosts and interference are reduced or eliminated completely...and the correct combination of elements provides perfect reception on each channel.

The sharp, clear performance of the Walsco *Star* has made it the only indoor antenna that can, in most cases, be compared with a good *outdoor* installation. It was designed specifically for outstanding VHF and UHF reception in metropolitan and suburban areas. List price is $12.95. The Walsco *Starlet* (without tuning control), for use in strong signal areas, lists for $10.95. Available at jobbers everywhere in 3 smart, decorator colors.

Walsco Electronics Corporation, 3602 Crenshaw Blvd., Los Angeles 16, California.

**Patent Applied For*

CHROMINANCE Systems in Color TV Receivers

by BOB DARGAN
and SAM MARSHALL

Discussion of signal processing of chrominance signal in Q and I receiver.

Part 2

IN THE previous sections a generalized discussion of an I/Q chrominance system was discussed. This was more or less of an analysis of the various stages involved. At this point a more critical analysis of the system is in order, and to do this we will analyze the progress of a color signal from the time it appears at the output of the camera tube to the time it is seen on the screen of a picture tube. In order to make the numerical values easy to work with we will make the assumption that the signal voltages corresponding to saturated colors which are developed at the output of the color camera are 1 volt for each tube, and that a corresponding voltage of 1 volt is developed at the grid of each corresponding color gun of the picture tube.

Color-Signal Relationship Table

For ready reference we have set aside the important color signal relationships as shown in Table 1. These have already been derived in previous chapters, and we shall use them often as we trace the signal in its progress through the transmitter and the receiver.

Color Signal Analysis

To begin with, we will assume a hypothetical transmitter (*Fig.* 5) in which the R-Y/B-Y* signals are supposedly developed in a separate section, following which the I/Q signals are derived from them. This type of analysis is in effect the equivalent to that

* In order to simplify the presentation of this material the symbols R, G, B, I, Q, etc. will be used instead of E_R, E_G, E_B, E_I, E_Q, etc.

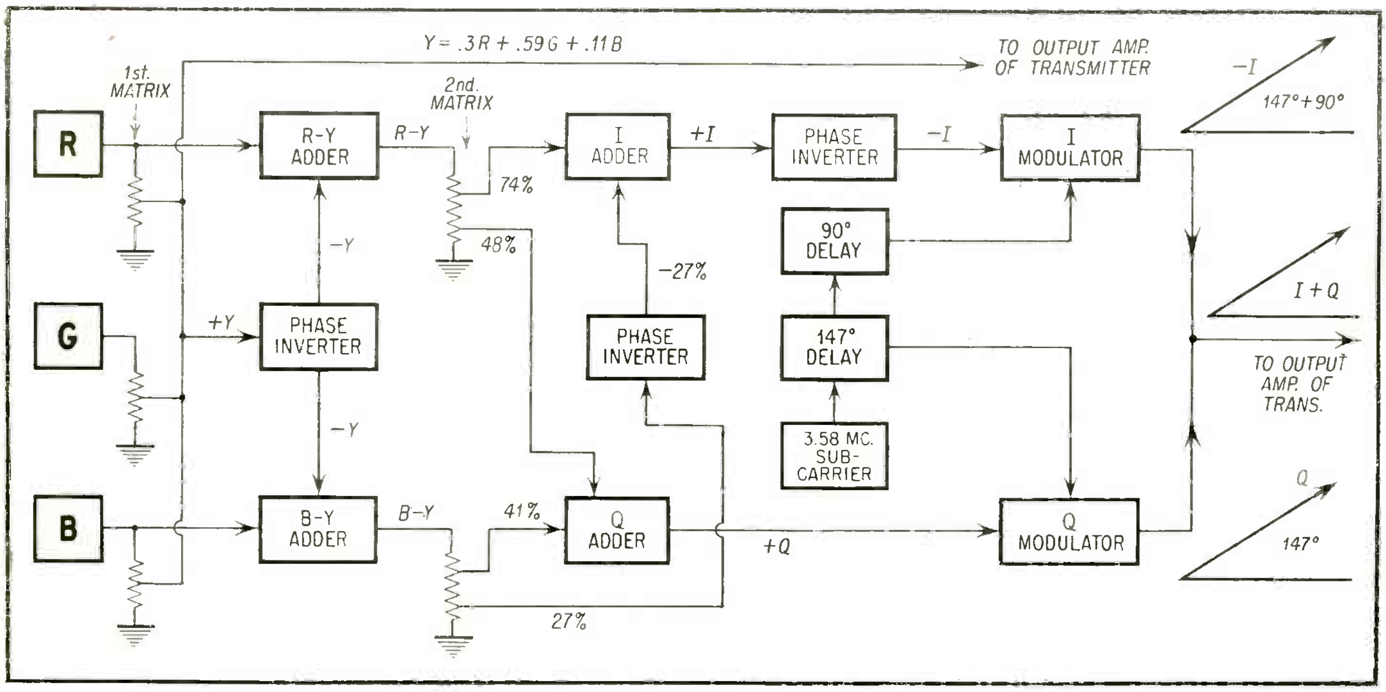


Fig. 5 — Block diagram of assumed transmitter, showing how R-Y and B-Y signals may be developed initially followed by the development of I and Q.

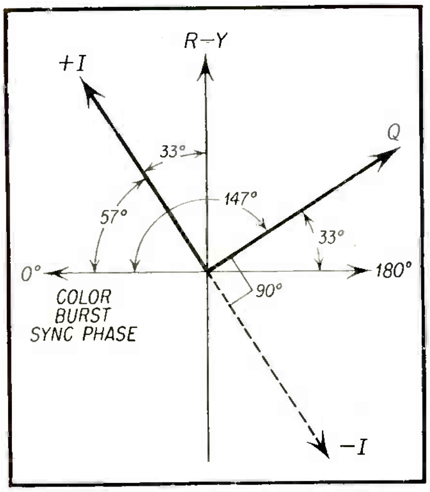


Fig. 6 — Relative locations of I, Q, R-Y, B-Y, and color burst sync phases. 180° phase shift separates +I and –I.

which actually takes place in a transmitter and affords a better understanding of the processes involved.

Let us assume that the scene being scanned is a highly saturated red image which provides the maximum permissable red color tube output of 1 volt. In this case R = 1 volt, and the blue and green tube outputs are each zero.

Referring to Table 1:
from (6)

$$Y = 0.3R = 0.3 \text{ volt}$$
$$R-Y = 1-0.3 = 0.7 \text{ volt}$$
$$B-Y = 0-0.3 = -0.3 \text{ volt}$$

Thus, the output of the R-Y adder is 0.7V, and that of the B-Y adder is –0.3V.

These two color difference signals are now compressed in the 2nd matrix to provide the color-mixture signals that go to make up the I and Q signals.

Referring again to Table 1, the values of developed I and Q are:

from (2)

$$I = 0.74 \times 0.7 - 0.27 \times (-0.3)$$
$$I = 0.518 + 0.081 = 0.599V$$

from (3)

$$Q = 0.48 \times 0.7 + 0.41 \times (-0.3)$$
$$Q = 0.336 - 0.123 = 0.213V$$

I is fed into a phase inverter which converts +0.599V to –0.599V. This signal is then fed into the I Modulator. Q is fed directly into the Q Modulator. Also fed into each of the Modulators are the 3.58 *mc* subcarrier signals which position or phase the I and Q signals with reference to the color burst sync phase (see *Fig. 6*). Thus, assuming a color burst sync phase of 0°, the Q signal is delayed 147° and is positioned as shown. The –I signal is delayed an additional 90°, placing –I as shown (dotted line). This is equivalent to positioning +I (solid line) in the phase shown.

Observe the relative positions of the R–Y and B–Y axes. R–Y lags behind I by 33°, and B–Y lags behind Q by 33°. We now have established the relative phase positions of the signals we are interested in and can continue further with our analysis.

Referring to *Fig. 7* we observe that the output of the I Demodulator now contains the I signal of 0.599V at an angle of 57° behind the color burst sync phase. Similarly, the output of the Q Demodulator contains the Q signal of 0.213V at an angle of 90° behind the I signal. The resultant of these two signals has a value of 0.645V, and lies along the red signal axis which leads the R–Y axis by 13.5°.

(1)	Y = + .30R - .59G + .11B
(2)	I = + .74(R-Y) - .27(B-Y)
(3)	Q = + .48(R-Y) + .41(B-Y)
(4)	I = + .60 R - .27 G - .32 B
(5)	Q = + .21 R - .52 G + .31 B
(6)	(R-Y) = + .96 I + .62 Q
(7)	(B-Y) = - 1.11 I + 1.70 Q
(8)	(G-Y) = - .275 I - .636 Q
(9)	(R-Y) + Y = R
(10)	(B-Y) + Y = B
(11)	(G-Y) + Y = G
(12)	(G-Y) = - .51 (R-Y) - .19 (B-Y)

TABLE I

Various arithmetic relationships between Y, I, Q, R-Y, B-Y, G-Y, R, B, and G. These are constantly referred to.

This resultant is the chrominance signal which forms part of the composite signal transmitted along with the station carrier. At the receiver the chrominance signal is removed from the composite signal and fed into the color demodulators. As pointed out in previous installments, demodulation takes place by feeding a pair of "in phase" and "quadrature" reference signals from a local 3.58 *mc* oscillator into the I and Q demodulators respectively. These reference signals are developed in the color sync section.

Reference-Phase

The manner in which the color sync section provides the "in phase" and "quadrature" reference signals for demodulating the incoming color signal is discussed in detail in the chapter on "Color Sync Circuitry and Operation". For the present it should be

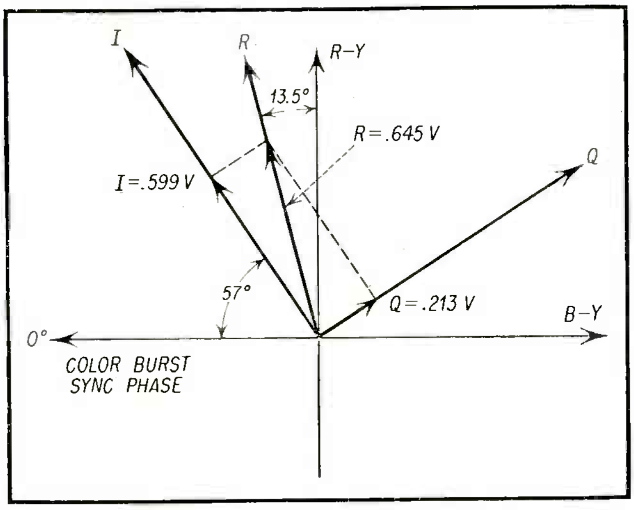


Fig. 7 — Combined I and Q signals in output of balanced demodulator produces color signal corresponding to red. Different values of I and Q would produce resultant signals at different angles and correspondingly different colors. Thus, the various colors transmitted each have a different angle.

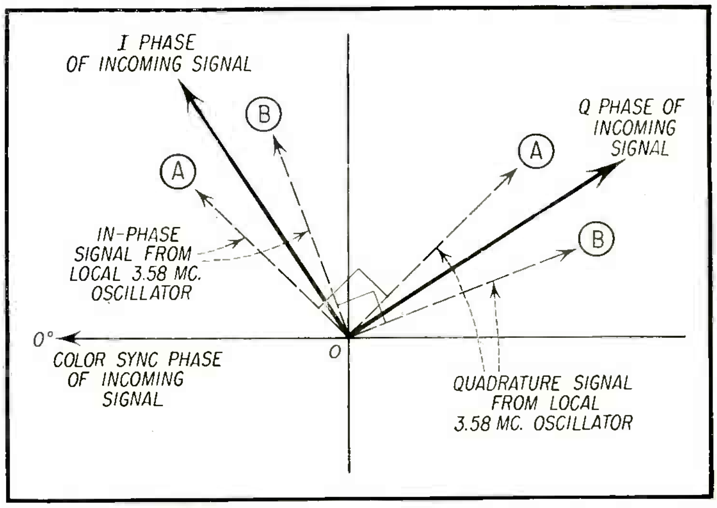


Fig. 8—In-Phase and Quadrature signals from local oscillator can be made to swing in either direction (using point 0 as a pivot) around I and Q phase positions of incoming color signal. Two pairs of phase conditions, "A" and "B", are shown. "A" leads and "B" lags phase of incoming color signal. B-Y and R-Y axes are as in Fig. 7.

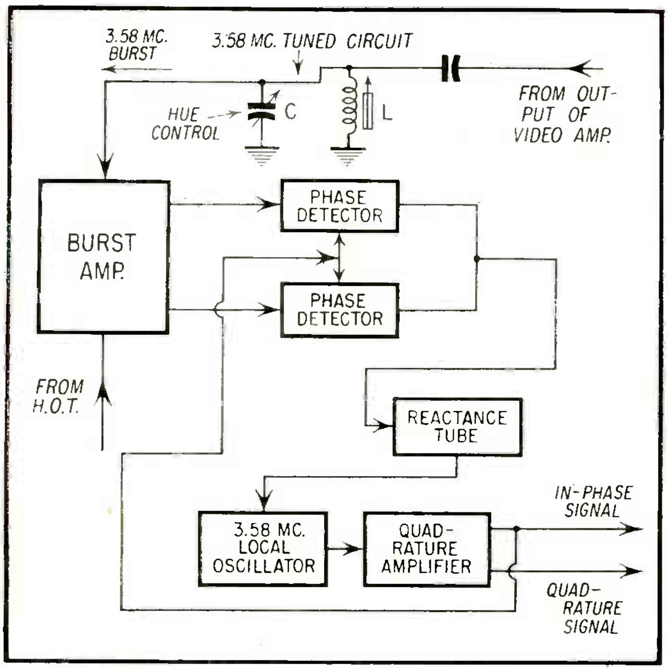


Fig. 9—Automatic phase control (APC) loop of typical color receiver. *L* and *C* control phase of incoming burst signal which is applied to burst amplifier. This phase determines phase of "In-Phase" and "Quadrature" signals. Pulse from H.O.T. keys Burst Amp.

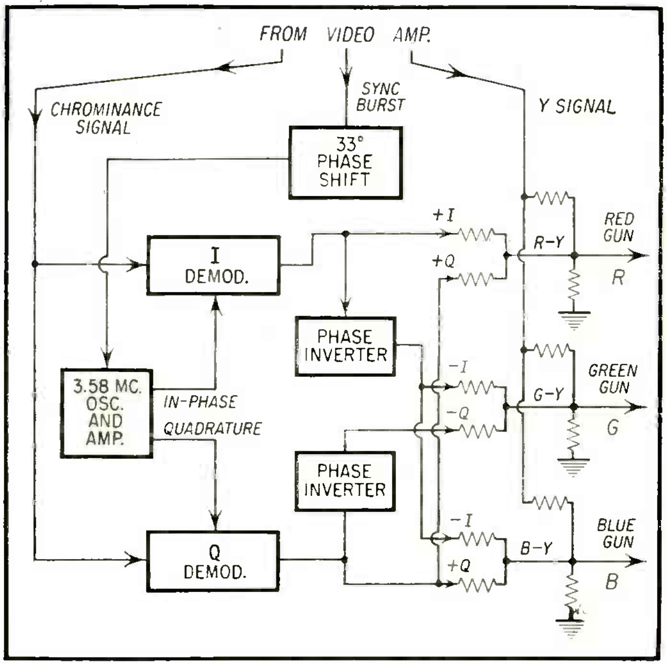


Fig. 10—Block diagram of I/Q demodulation system. Here a phase shift network at the output of the video amplifier provides an initial phase shift of 33° to the sync burst which triggers the local oscillator so that its phase is 33° removed from sync burst.

borne in mind that it is possible to provide a pair of reference-phase signals from the output of the 3.58 *mc* local oscillator which can be made to swing around in any position as shown in *Fig. 8*. This is made possible by an adjustment of a parallel tuned 3.58 *mc* circuit located in the connection between the output of the video amplifier and the input of the color burst amplifier as shown in *Fig. 9*. Through an APC (automatic phase control) loop this tuned circuit varies the phase of the local 3.58 *mc* oscillator with respect to the color signal fed into the chrominance channel. The output of the local oscillator constitutes the I reference signal. The Q reference signal is obtained from the output of a quadrature amplifier fed by the 3.58 *mc* oscillator. Thus, the tuned circuit ends up varying the phase of the reference signals with respect to the color signals in the demodulators. The phase of the previously mentioned tuned circuit may be shifted by a slug which provides the pre-set adjustment, and by a variable air trimmer which provides fine adjustment. The latter is the hue or phase control which is mounted as a front panel control on the receiver.

In an I/Q receiver the reference phases from the 3.58 *mc* local oscillator are adjusted so that they coincide with the I and Q phases of the color signal provided at the transmitter. In a color-difference receiver, however, the reference phases coincide with the R-Y and B-Y axes of the color signal. The above represents the key to the manner in which a color TV receiver may be adjusted to receive I/Q or color-difference signals.

As a parting thought on this subject one must bear in mind the facts that the two reference voltages from the quadrature amplifier are derived from one source, the 3.58 *mc* local oscillator signal. The latter provides the I or R-Y reference voltage, depending on the type of demodulation used, and the Q or B-Y reference voltage is a separate signal developed in the quadrature amplifier. Shifting the phase of the burst signal by means of the phase or hue control, shifts the phase of the I reference signal of the 3.58 *mc* oscillator. The latter in turn causes an identical shift in phase of the Q reference signal which constantly tracks with the I reference signal by 90°.

Let us now continue our analysis of the color signal as it enters a pair of I/Q demodulators as shown in *Fig. 10*. To simplify the calculations we will assume that the input voltages at the I and Q demodulators are the same as those developed at the output of the transmitter, so that:

$$I = 0.599V$$
$$Q = 0.213V$$

Using the formulas shown in Table 1, we can set the matrix resistor values so that the correct percentages of plus and minus I and Q are obtained to give us R-Y, B-Y, and G-Y. Following this the Y signal is added to each of these color-difference signals in order to obtain the primary color signals, R, G, and B. Thus, *for the red gun*:

from (6)
$$R-Y = 0.96I + 0.62Q = 0.96 \times 0.599 + 0.62 \times 0.213 = 0.7 \text{ volt}$$

from (1)
$$R = (R-Y) + Y = 0.7 + 0.3 = 1 \text{ volt}$$

For the blue gun:
from (7)
$$B-Y = -1.11I + 1.7Q = -1.11 \times 0.599 + 1.70 \times 0.213 = -0.666 - 0.366 = -0.3 \text{ volt}$$

from (10)
$$B = (B-Y) + Y = -0.3 + 0.3 = 0$$

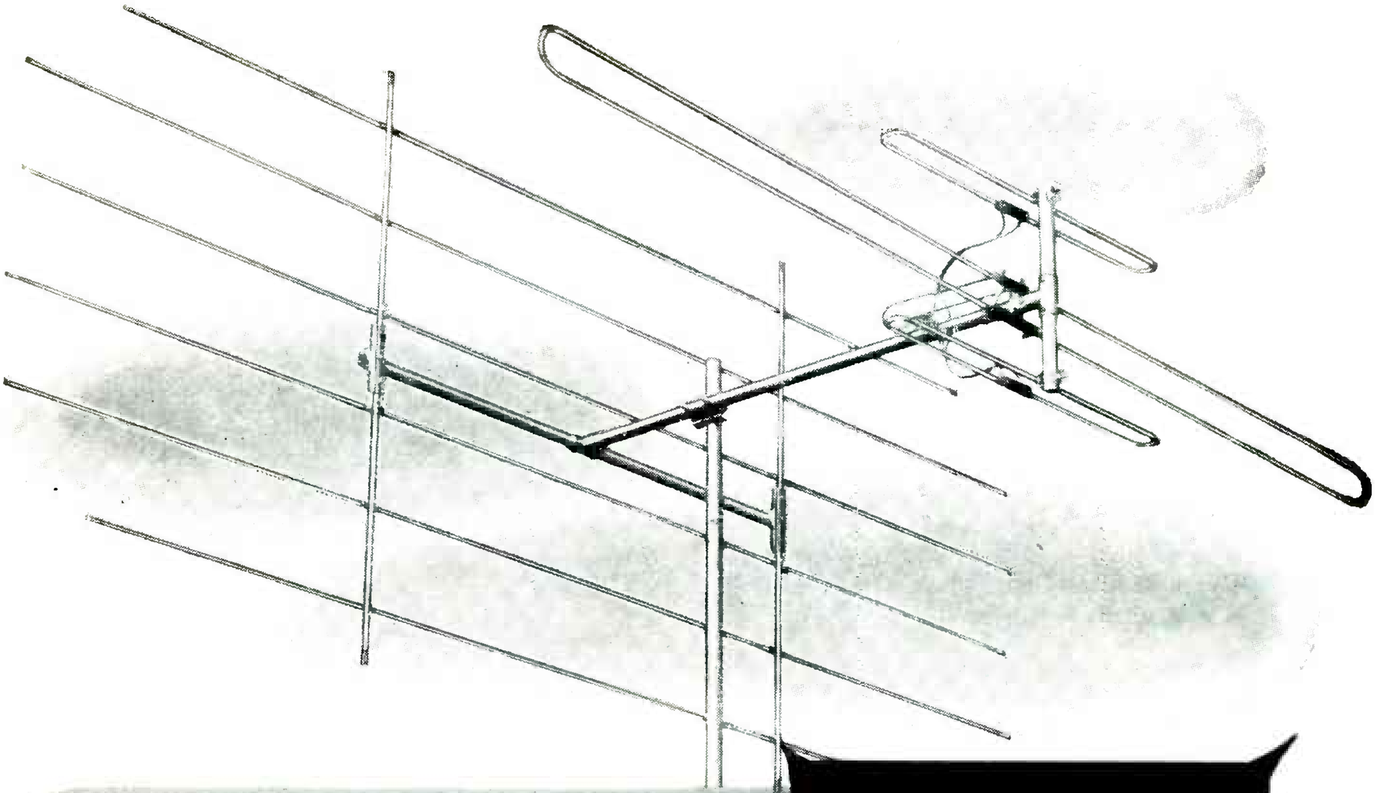
For the green gun:
from (8)
$$G-Y = -0.275I - 0.636Q = -0.275 \times 0.599 - 0.636 \times 0.213 = -0.3 \text{ volt}$$

from (11)
$$G = (G-Y) + Y = -0.3 + 0.3 = 0$$

These values correspond to those obtained at the output of the camera tube.

In the above illustration we have shown how by using the various color formulas, and by applying them in an I/Q system, the correct color voltages are applied to the color guns. While only a red color signal was con-

[*Continued on page* 52]



RADIART

ULTAMATIC

All-Channel TV Antenna

for the **FIRST** time
...the **FIRST**
Antenna with
which You Can
See the Difference

perfectly synchronized for monochromatic and color TV

THESE QUALITIES HAVE BEEN COMBINED INTO THIS SINGLE ANTENNA — THE ULTAMATIC...

★ LOW VOLTAGE STANDING WAVE RATIO . . . the mis-match between antenna and transmission line is lower than four competitive types tested, an attribute to its broad band quality.

★ FRONT-TO-BACK RATIO . . . higher than multi-element, yagi-type antennas, minimizing co-channel interference.

★ GAIN . . . expressed in decibels, is a ratio of signal voltage developed by an antenna over that of reference folded dipoles. It is not a quality sold by the pound or achieved by the addition of meaningless elements. The curves shown accurately describe the gain of the Ultamatic. Loss of sound or picture due to erratic antenna response is eliminated.

MECHANICAL FEATURES

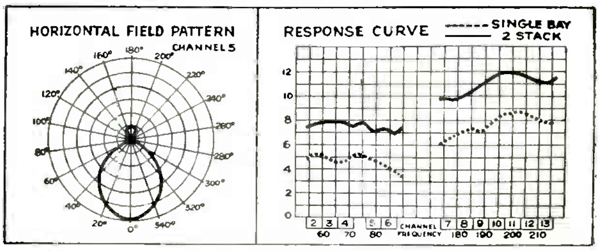
★ Aluminum screen reflector of exclusive fold-out design, assembled in seconds with adequate stability for years of trouble-free service. Longer elements insure maximum front-to-back ratio on channels 2-6 and are more closely spaced for increased performance on channels 7-13.

★ Dipole and boom assembly are of heavy gauge, seamless tubing. Dipoles fold out and are rigidly supported and reinforced to minimize sag and sway.

★ Specifically designed mechanically by stress analysis of each unit and sub-assembly to provide a low vibrational period of all elements — your assurance of trouble-free installations.

MODEL UM-213 . . . double stacked UM-213-2

Most Uniform Gain Response *The gain response DOES NOT VARY MORE THAN 3 D.B. ON ANY CHANNEL across the band. This quality is exceedingly important in color reception to insure adequate color synchronization without resetting.*



SUBSIDIARY OF THE **RADIART** CORPORATION
CLEVELAND 13, OHIO
TV ANTENNAS ★ AUTO AERIALS ★ VIBRATORS ★ ROTORS ★ POWER SUPPLIES

a new instrument for testing and repairing CATHODE RAY TUBES

by Engineering Dept., Raytronic Laboratories, Inc.

THE test equipment manufacturers, always mindful of the problems of the service business, have now come up with an instrument that takes the fight out of customers who balk at the high cost of picture tube replacement.

This article describes a new instrument which actually repairs many of the common faults by kinescopes. Called the "Cathode Beamer" it has been successfully used by many service dealers.

What It Does

The Cathode Beamer, and its associated accessories performs two major functions: it tests TV kinescopes for quality, and repairs many of the weaknesses heretofore considered unrepairable.

Test procedures include filament condition, element continuity, shorts, leakage between elements, emission, grid-cut-off, cathode condition, and gas. The repair functions include the restoration of brightness and contrast by cathode sweeping or grid expansion, the removal of high resistance inter-element shorts, the removal of low-resistance cathode-to-grid shorts, and the welding of open cathode tabs.

Electron Gun Construction

The Electron Gun (*Fig. 1*) is the heart of any kinescope. Its function is to provide and control a stream of electrons, and, with the aid of external magnets plus the final anode, to direct and accelerate that stream in such a way to cause scanning lines to appear on the face of the tube.

At the base of the gun is a heater, located inside a tubular cathode. The normal placement of the heater is quite close to the cylinder wall of the cathode, and thus any abnormal jarring can cause the heater to touch the cathode, creating a short. The control grid is located from three to eight hundredths of an inch (.03" to .08") from the cathode. This opening being so small is susceptible to shorts caused by foreign matter or bits of tube coating material. But, because these spaces are quite tiny, the shorts resulting are usually able to be burned off without much difficulty.

The control grid aperture determines the controlling ability of this electrode. The aperture is usually about .035" in diameter. Being so small it may become clogged with foreign matter, causing the grid to lose control. This defect may be remedied by burning off the foreign matter, or actually melting some of the metal forming the aperture. This is specially effective in restoring tubes that have lost much of their emission.

Some of the most common faults are shorts between elements, open connections to elements, weak emission, stale cathode caused by prolonged inactivity, broken cathode tab connection, and gas. All except the gassy tube are repairable, *in most cases*, by the Cathode Beamer. Gas which is caused by air leaking into the tube, results in a defect which cannot be repaired.

Test Procedures

Test procedures are straight-forward. Filament condition is examined with the aid of a pilot lamp in series with the tube filament. If the pilot lamp fails to light, the filament is open. If the bril-

ONLY ROTATOR AVAILABLE
IN FOUR GLORIOUS COLORS:

BROEGE MARBLE
MAHOGANY
GOLDEN WHEAT
DECORATOR'S GRAY

AMERICA'S MOST DEPENDABLE ROTATOR

THE TRIO
"ARISTOCRAT"

NOW . . .
America's most beautiful!

The sleek, modern, low silhouette of the new TRIO rotator control case marks a new high in styling. Beauty, here, is more than skin deep since its low center of gravity makes it tip-proof! Note, too, that there are NO unsightly control knobs or switches to spoil its beauty. These are located at top rear of case — where your hand naturally rests in operation of rotator! There is no obscuring the easily-read lighted dial. Available in four glorious colors — to blend perfectly with any decor. TRIO has a new plan which makes it convenient for the dealer and distributor to carry a complete selection of colors with no major increase in rotator investment. With this plan the home-maker has a choice of colors — even at the time of installation.

Switch and directional controls are located at top rear of case for most convenient manual operation. Lighted dial permits operation in darkened room and also indicates when rotator is on. When on, pointer always shows exact position of antenna.

- ✔ Only Rotator With Factory Attached Cable.
- ✔ Only Rotator With Two-Year Guarantee.

THE TRIO
"ARISTOCRAT"
. . . CULMINATION OF SIX YEARS RESEARCH AND PRODUCTION

TRIO *Manufacturing Co.*
GRIGGSVILLE, ILLINOIS

liance is excessive it indicates a partial short in the filament. Element continuity is determined by a mutual conductance test. A neon lamp lights if continuity is present. A selector switch allows the cathode, grid and first anode to be tested separately. Weakness of emission is indicated in this test if the lamp glows weakly or not at all on the first anode position. If the lamp fails to glow on all positions, an open cathode is indicated.

Inter-element shorts are indicated on a separate neon indicator lamp through the use of a selector switch which allows the heater, cathode, grid, first anode, and second anode to be tested individually. A short on one position will be matched by an indication of short to the other element involved. The actual value of the leakage can then be measured by a built-in Wheatstone Bridge Circuit, which measures leakage up to 20 megohms.

Emission of the tube is read on the indicating meter, and is tested from the final anode. Grid cut-off characteristics are read on the meter with the aid of a calibrated potentiometer which applies negative bias to the grid of the tube under test. Cathode condition is shown by a separate indicator lamp.

In testing for gas, a high voltage, high frequency source is applied to the pins of the tube under test. A purplish glow within the tube indicates the presence of an excessive amount of gas. Large quantities of gas will result also in a shorts indication between several elements within the tube.

Repair Procedures—Increasing Emission

Unquestionably the most interesting functions of the Cathode Beamer are the repair procedures. Previously it has been possible to restore brightness to a degree by increasing the filament voltage. This results in more heat, driving more electrons from the surface of the cathode. With such procedures, however, the eventual life of the tube is shortened, since the cathode emitting material is depleted more rapidly than under normal voltage.

The Cathode Beamer increased emission by "Cathode Sweeping," rather than by increased heat. An electrostatic charge of 600 volts is fired between the grid and the cathode, resulting in the removal of gas ions and stale emitting material from the surface of the cathode. The operation is accompanied by a visible flash in the neck of the tube. For stubborn tubes a Super-Sweeper is also provided which increases the amount of current used to sweep the cathode. A cathode activator which raises the filament voltage to 12.6 volts may be used to help loosen the foreign matter from the cathode before sweeping exceptionally difficult tubes.

With very old tubes, in which the cathode material is just about depleted, it is possible to increase the flow of electrons to the final anode by enlarging the grid aperture with the aid of the Cathode Beamer. The filament voltage is raised, and at the same time the Cathode Sweeper relay is energized causing the grid to become so hot that some of the metal within the aperture is melted away. This operation must be done with constant visual inspection, as melting too much metal will cause the grid to lose control. This operation is only used with very old tubes, but is quite successful if carried out cautiously.

Removing Shorts

Inter-element shorts of high resistance values are burned off by the use of the auxiliary high-voltage, high-frequency source, furnished with the instrument. The base pin of one of the elements involved in the short is connected to a suitable ground, while the high frequency coil is touched to the pin of the other element involved. A high frequency, high voltage charge then passes through the material causing the short, and burning it off. Tests have shown that foreign material within the tube envelope is the major cause of high resistance shorts.

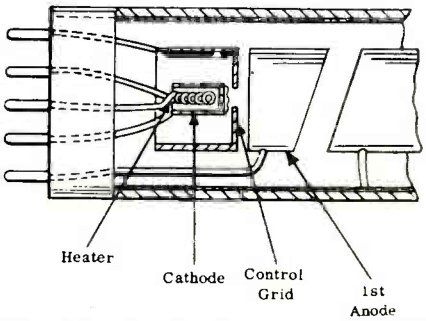


Fig. 1 — Sectional view of CRT electron gun.

The more stubborn low resistance cathode-to-grid shorts are burned off by the application of a high-current, low voltage charge. Two values of current are available — 5 amperes and 20 amperes. This high current burns off the short existing between the two elements. Dead shorts, caused by the elements actually touching each other cannot be removed, but these are comparatively rare.

Repairing Cathode Tabs

The connection between the cathode and its connecting wire leading to the tube base is called the cathode tab. This union may break resulting in an open cathode. The distance between the two broken ends is, however, quite small, so that it could be welded, if it were possible to make the ends touch or pass close to each other by vibration. This is accomplished with the Cathode Beamer by the use of an auxiliary vibrator much like the therapeutic variety. The tube is placed in a horizontal position, and the vibrator applied to the neck of the tube. This causes the broken elements to vibrate, and at times, pass quite close to each other. At the same time a high-current charge is placed on the cathode pin of the tube. When the broken elements pass close to each other, or touch each other, the high current charge jumps between the two broken ends, firmly welding them together. Tests made by tube manufacturers on tubes repaired in this way have revealed that the welds are strong and permanent. The fact that a weld has been obtained is indicated by a special neon cathode lamp in the Cathode Beamer. A steady glow indicates a good contact. A flickering or sputtering indicates an intermittent condition.

Ease of Operation

The Cathode Beamer is a fairly large instrument, and therefore is used primarily for shop work rather than on home calls. Operation is quite simple with the aid of a Master Selector Switch on the front panel and various individual push button controls and selector switches for the various test and repair procedures.

Since the majority of picture tubes employ the same basing arrangements, no element selectors are required, and the only connections to the tube are its base socket and second-anode clip. The Cathode Beamer will work with all TV kinescopes, employing magnetic or electrostatic focusing. It has been used experimentally on other types of cathode ray tubes, and has even been employed to restore the emission in receiving tubes.

Effectiveness of Repairs

One of the big questions asked by servicemen about the Cathode Beamer is "How Long Will The Repair Last." The question can only be answered by knowing the condition of the tube beyond its normal limits. But, most faulty tubes go bad long before the end of their normal lives, and it is these tubes on which the Cathode Beamer works best. A good cathode which is covered by gas ions can be swept very effectively and the result can be expected to last. Conversely, the restoration of brightness to an old tube by grid expansion can only be a temporary repair, since the emitting material was practically exhausted before the tube was reactivated. The removal of shorts should be per-

[*Continued on page 50*]

HEAR THE DIFFERENCE!

MAKE *Every* P.A. A HI-FI INSTALLATION WITH THE *New* MODEL BLC

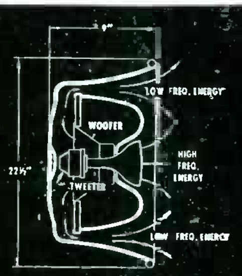
FULL RANGE WEATHERPROOF COAXIAL SPEAKER

Based on the famous University model WLC Theater System used so successfully and extensively in deluxe stadium and outdoor theater installations . . . auditoriums, expositions, concert malls and other important applications where only the highest quality equipment is acceptable—University engineers now bring you a smaller, compact version—the BLC—for general application in public address work. The BLC is the New standard for both voice and music, indoors and outdoors. The BLC is now yours, at the low *low* price of

ONLY $75 LIST

SPECIFICATIONS

Response	70-15,000 cps
Power Capacity	25 watts
Impedance	8 ohms
Dispersion	120 degrees
Mounting	180° adjustable "U" bkt.
Dimensions	22½" diameter, 9" depth



Ask your distributor for a convincing demonstration, and HEAR THE DIFFERENCE!

More Efficient: DUAL RANGE THEATER TYPE SYSTEM permits uncompromising design of the "woofer" and "tweeter" sections for greatest efficiency. Hear it penetrate noise with remarkable fidelity and intelligibility.

Less Distortion: SEPARATE LOW AND HIGH FREQUENCY DRIVER SYSTEMS with electrical crossover reduces intermodulation and acoustic phase distortions common to other systems which attempt to use two different horns on a single diaphragm.

Better Lows: BALANCED "COMPRESSION" TYPE FOLDED HORN, starting with eight inch throat and energized by top quality low frequency "woofer" driver provides more lows than other bulky designs.

Better Highs: DRIVER UNIT TWEETER with exclusive patented "reciprocating flares" wide angle horn transmits more highs with greater uniformity . . . high frequency response that you can *hear!*

More Compact: EXCLUSIVE WEATHERPROOF DUAL RANGE COAXIAL DESIGN eliminates wasted space. Depth of BLC is only 9"; can be mounted anywhere, even flush with wall or ceiling.

More Dependable: EXPERIENCED MECHANICAL ENGINEERING AND CAREFUL ELECTRICAL DESIGN meet the challenge of diversified application and environmental hazards. Rugged, and conservatively rated—you can *rely* on the BLC.

Write Desk No. 41 for full descriptive literature.

University LOUDSPEAKERS INC.
80 SOUTH KENSICO AVENUE WHITE PLAINS, N. Y.

auto ignition interference suppression

by **Steve Travis**

This article deals with the type of interference resulting only from pickup of the rf radiated by the ignition system of an automobile.

SERVICE problems that occur quite frequently in auto radio work and which give rise to ignition noise are sometimes very difficult to solve. This type of interference is most often experienced when the car motor is running and is recognized as a whine which will increase or decrease in audible frequency in proportion to the speed of the motor. Generally its output is relatively constant over the whole radio tuning range.

Since there are many possible causes of noise in a car radio, an understanding of the voltage generator and ignition system can be helpful in curing the interference. Basically, the electrical system of an automobile is composed of the spark plugs, spark or ignition coil, distributor, voltage generator and voltage regulator as shown in *Fig. 1*. These items are all tied together with leads and are operated or turned on from an ignition switch. It is from these components and their associated leads that *rf* energy from the high tension is fed back and radiated. This energy is developed in connection with the firing of the spark plugs or with the voltage generator system. The impulses of *rf* energy are strong over a range of frequencies up to 100 megacycles although they may be particularly powerful over a narrow band of frequencies.

Methods of Elimination

The elimination of the interference involves possibly the lead dress of the high tension wires, the use of bypass condensers, the checking and repairing of components in the radio that may have failed, and even the use of resistors as suppressors. With regard to the latter, some car manufacturers suggest that resistor type spark plugs be installed. Also, 15K resistors may have to be used in the high tension lead to the distributor to reduce the radiation of *rf* energy from this source.

One of the first items to be tested when checking for defective ignition suppression components is the bypass condenser connected across the ignition coil. This condenser must be checked by substitution with another metal case type .5 μf condenser. This condenser connected across the ignition coil is shown in *Fig. 2*. It is most important that this condenser be located on the battery side of the ignition coil. When the power source for the radio is connected through the ignition switch it is also advisable to bypass this point with another .5 μf condenser.

Actually the interference should be suppressed at its source as much as possible, therefore a complete examination of the ignition system is desirable, with particular care being devoted to the dis-

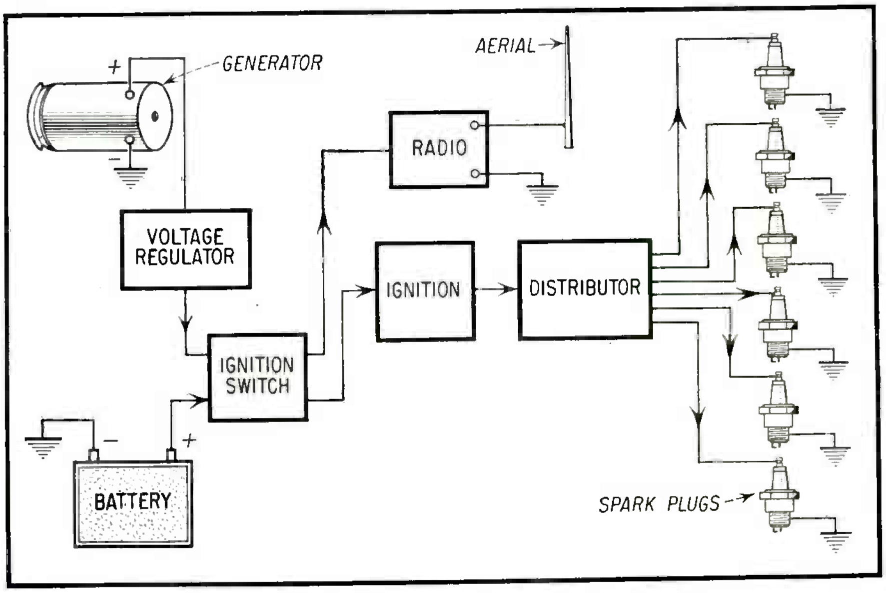


Fig. 1 — Block diagram of the electrical wiring system of the ignition circuit of an automobile.

tributor points and spark plug gaps. An examination of these electrical contacts and points should be made to make sure that these surfaces are not pitted or dirty. Also, cracked cables, where the insulation has split or fallen off, and which can give rise to easier leakage paths for high tension currents, should always be replaced.

The lead from the battery to the radio, often known as the "A" lead, is a common path taken by the *rf* voltages into the radio chassis. It may be possible to position this "A" lead so that a quiet spot can be located where little interference is experienced. This lead should be dressed away from any other leads or cables that pass through the firewall as well as those under the dashboard.

There is a tendency on the part of car radio servicemen to shield all the leads that pass through the firewall with braided wire when a particularly difficult

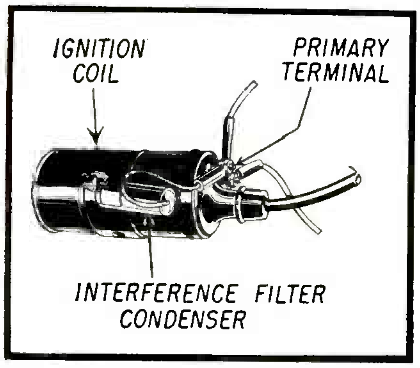


Fig. 2 — Bypass condenser installed at the ignition coil to filter out noise pulses.

noise case arises. However, many causes of ignition interference are caused by an actual component failure. Therefore, a preliminary check of the certain key components is a better procedure than the immediate shielding of all leads. One of the first measures to be taken is to substitute a good condenser for the ignition coil bypass condenser as well as the generator bypass condenser as previously stated. The voltage generator and its bypass condenser is shown in

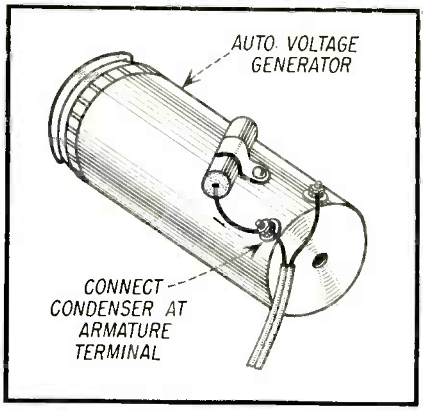


Fig. 3 — Condenser installed at voltage generator of car.

Fig. 3. (It is important that this condenser be at the armature terminal and not at the field coil terminal.) It might also be a good idea to check the voltage regulator and to determine if a .5 *uf* condenser has been installed. Should there be no bypass condenser at the voltage regulator, as shown in *Fig. 4*, one might be added and the improvement noted. Considerable reduction of ignition noise pulses can often be obtained by this addition.

One system employed by several technicians to locate the source of the interference is to turn off the ignition switch while the car is in motion. This check is good only if the radio is not also shut off when the ignition is switched off. With the radio in operation and the car coasting along, listen for the interference. If the noise cuts out immediately when the switch is in the off position the trouble is more than likely due to ignition and high tension radiation. If the noise continues at a reduced level the commutator segments and brushes of the voltage generator should be examined and cleaned.

Ignition interference can also enter the auto radio through the antenna lead. Then again, it is also possible that the chassis housing may not offer sufficient shielding for the receiver because of corroded mounting facilities, ventilating holes, housing covers, etc. To determine whether or not the ignition interference is caused by the first of the above two conditions, the aerial should first be disconnected, and the antenna terminal shorted to ground. If the level of ignition noise changes and is reduced it is then assumed that the noise is entering through the aerial. If the noise level remains the same the noise is probably being induced via the battery lead. However, this is no hard and fast rule, because when the antenna terminal is removed from the radio the *rf* stage is almost always detuned, thereby reducing its sensitivity. Under these circumstances there would normally be a decrease in response of the receiver to interference. Then again, the *agc* system

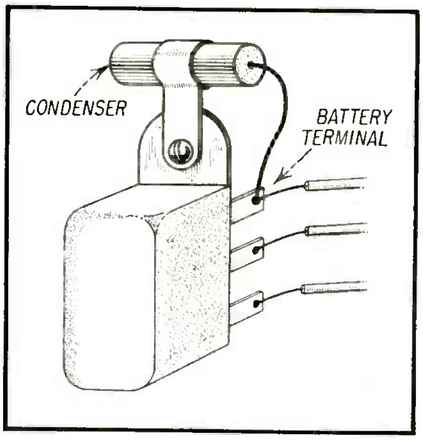


Fig. 4 — Bypass condenser installed at voltage regulator.

of the radio might alter the amplification to such a degree that the noise level would be nearly the same as before. In this case a more rigid test is to use a shielded dummy antenna which picks up no signal and provides the same circuit constants as the regular antenna.

With regard to interference entering the receiver directly, the *rf* stage may pick up interference through ventilating holes and through the housing or covers of the radio, especially if a high tension lead is nearby. If moving the

[*Continued on page 49*]

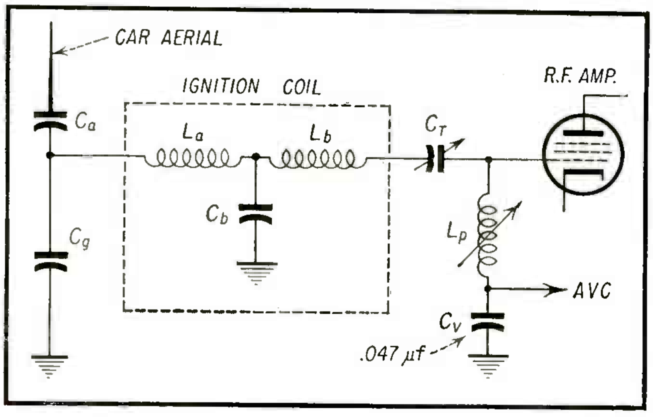


Fig. 5 — A typical auto radio input circuit.

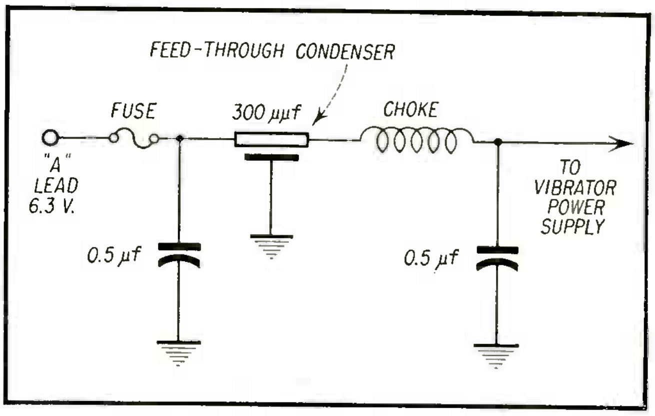


Fig. 6 — Auto radio "A" lead filter components.

an unusual HORIZONTAL OUTPUT TESTER

by E. A. Bramsen
Seco Mfg. Co.

THE horizontal amplifier in our modern TV receiver has to perform several functions in proper order and some are simultaneous. These may be listed in groups as below and are the end results when the tube and circuit are functioning normally with the proper operating potentials on the tube and a proper load impedance for the tube to work into.

1. Suitable amount of linear saw tooth current for proper width.

2. Beam retrace by reaction scanning within *allotted* blanking time.

3. H.V. pulse for H.V. rectifier power supply: (Note: The amplitude of the HV pulse is determined largely by the speed of the beam on retrace. The faster the retrace, the higher the HV pulse.)

Failure in the horizontal sweep and high voltage is usually tracked down by isolating faulty components in major groups then to smaller groups and then to component as in most other trouble shooting procedure. The exact order in which the following operations are performed varies with the particular TV set and the habits of the technician:

1. Elimination of faulty tubes—all rectifiers, horizontal, oscillator and horizontal amplifier.

2. *DC* voltage measurements and general *dc* continuity.

3. Test for generation of sweep signal by checking damper boost voltage.

4. Frequency and waveform observation of grid drive with C.R.O.

5. Loading effects on the flyback transformer by the yoke and width coils. Repeat test No. 3 above.

6. Checking of paper bypasses and electrolytics in boosted B+ loads.

7. Substitution of known good bypasses.

The TV bench technician should be able to make a number of well chosen tests to get down to the root of the trouble in the least possible time without performing a great number of substitution tests. It was with this in mind that the *Flyback Interval* check feature of the Seco Model FB-4 was developed. Briefly—it *looks* into the *connected group* of components in the horizontal amplifier plate circuit and checks the flyback resonant frequency. The "L" of the coil components and the distributed capacity in the coils and circuit are designed to tune to between approximately 50 *kc* to 70 *kc*. This represents 10 μsec to 7μsec for retrace time. This characteristic establishes the period or time interval set up to produce retrace of the electron beam within the allotted blanking time. If beam retrace is too slow, horizontal fold over will result. *Fig. 1* shows a block diagram of the Seco FB-4 checker. *Fig.* 2 shows the basic signal generator circuit and cathode follower.

The resonance indicator consists of a 6E5 tube operating the triode as a plate detector. This plate is directly coupled to the deflecting electrode in the indicator. A simplified schematic is shown in *Fig.* 3. *Fig. 4* shows how the coils are connected to the checker for testing.

An *rf* signal fed to points A and B will divide proportionately across the sensitivity control and the *LC* components under test. The voltage drop across the *LC* circuit will be greatest at its resonant frequency. At this frequency the increased signal fed to the plate detector causes the tube to conduct and deflects the eye tube. A suitable range of tolerance is allowed on the "FB-OK"

[*Continued on page* 50]

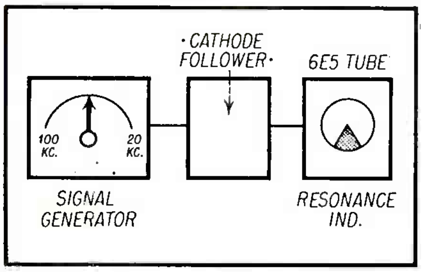


Fig. 1 — Block diagram of Seco FB-4 H.O.T. Checker.

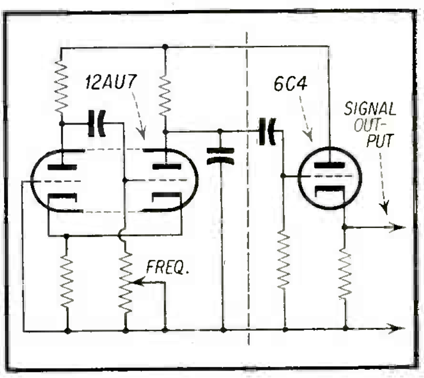
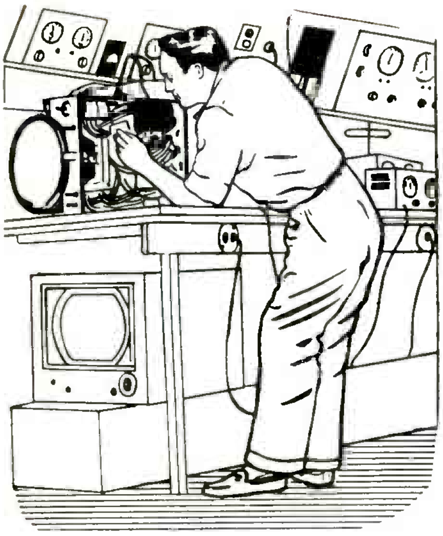


Fig. 2 — Basic signal generator circuit and cathode follower.



The Work Bench

by PAUL GOLDBERG

This Month:

WIDTH PROBLEMS

THREE width problems have been chosen for this installment. With proper diagnosis of the defective raster, the problems can be solved with ease.

RCA KCS68C—Insufficient width

The receiver was turned on and the raster showed a case of insufficient width. About two inches were missing on each side. The horizontal linearity was satisfactory. Adjustment of the vertical size and vertical linearity controls indicated proper vertical sweep. The high voltage also seemed okay because the brightness was good, we were able to draw a healthy arc from the high voltage cap, and there was no blooming. V116, the 6SN7 horizontal oscillator, V117, the 6CD6 horizontal output tube, and V119, V120, the 6W4 dampers were replaced individually, but they had no effect.

The diagram was then consulted and it was observed that this receiver used an air core series type of horizontal output transformer. The 6CD6, the transformer and the horizontal deflection coils are all in series and the 6W4's are effectively shunted by the horizontal deflection coils. Two 6W4's are utilized to handle the tremendous damping current, and the high positive voltage at its cathodes.

Knowing these facts, a voltage check was made at the grid (Pin #5) of the 6CD6 to see if the horizontal oscillator was supplying the correct drive. The meter measured it correctly at about 30 volts negative. P105, the width link, was then plugged in, in its alternate position, cutting out the width coil, but the trouble remained. The screen voltage (Pin #8) at the 6CD6 was also measured and was found to be correct at about 160 volts positive. Because there was no trapezoidal effect of any kind, it seemed doubtful that the yoke might be defective. Moreover, because T115 was of the autotransformer variety, it seemed doubtful that it could become defective so as to only affect the width and not the high voltage.

At this point it was noticed that the horizontal linearity control, *L107*, had a few discolored turns, and when adjusted from maximum to minimum seemed to have no effect on the picture's linearity. In fact it acted as if it had been completely shorted. Knowing from past experience on this model receiver that the horizontal linearity control had a tremendous effect on linearity and width when it was adjusted, *L107* was replaced with a new one. The receiver was turned on and the width was now correct. Adjusting the horizontal linearity control again, it was noted that besides varying the linearity, the width could be reduced to where it was lacking one and a half inches on both sides and to where it was two inches in excess on both sides. Evidently *L107* had been subjected to a heavy transient current which it could not take. This resulted

[*Continued on next page*]

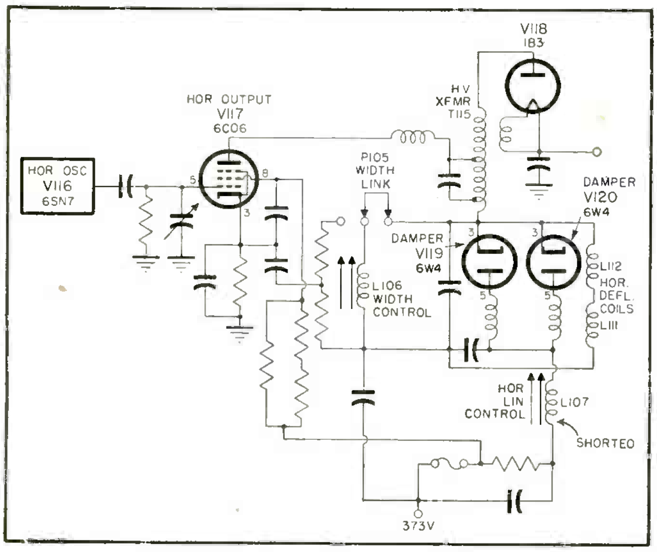


Fig. 1—Partial schematic of RCA KCS68C showing horizontal output circuit components and wiring.

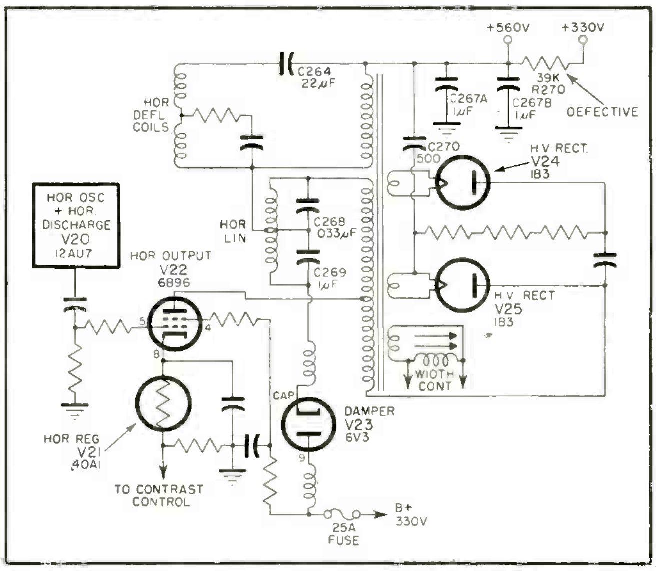


Fig. 2—Partial schematic of Sylvania 1-508-1 horizontal output circuit showing components and wiring.

in breaking down the insulation on the wire, resulting in a shorted coil.

SYLVANIA 1-508-1—Insufficient width and high voltage

The receiver was turned on and it was observed that there was insufficient high voltage and width. About one inch was lacking on each side. The vertical sweep moreover, just managed to fill the screen. Reference to the diagram indicatd that the 560 volt positive boost voltage was supplied to the vertical oscillator, 6C4, V116, but was not supplied to V20, 12AU7, the horizontal oscillator and discharge tube.

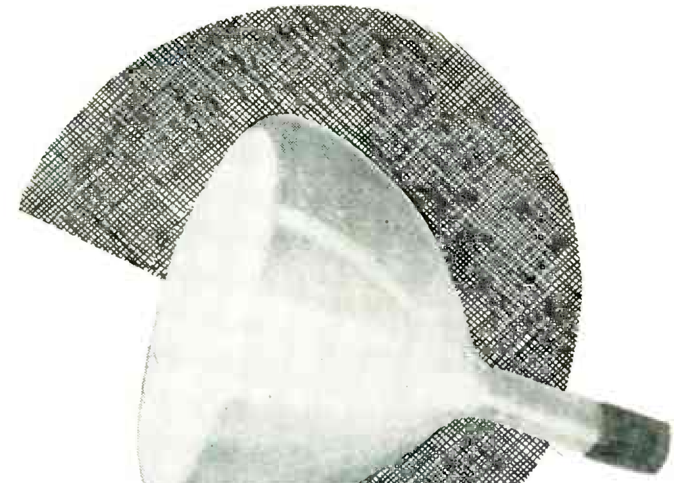
The first check was a voltage measurement at the high voltage fuse where the B+ supply voltage was located. The meter measured correctly at about 330 volts positive. This eliminated the low voltage supply as a possible cause of the trouble. V24 and V25, the 1B3 high voltage rectifiers were replaced individually, because if they have a plate to filament leak they could affect the width, boost, and high voltage. V23, 6V3, damper and V22, 6BQ6, horizontal output tube were replaced individually but had no effect.

A scope was next set up and a waveform check was made at the grid of the 6BQ6. The waveform checked correctly with the manufacturer's service data. Therefore, the horizontal oscillator was supplying the correct drive. The boost voltage was next measured at the cathode (cap) of the 6V3, damper. Here, instead of measuring the correct 560 volts positive, the measurement was 450 volts positive. This low boost voltage we assumed was the reason for the insufficient vertical sweep and horizontal width. The screen, pin #4, of the 6BQ6, was next measured correctly at about 160 volts.

Because there was not the slightest sign of a trapezoidal effect which would accuse the yoke, I was beginning to suspect T63, the horizontal output transformer. Before doing anything so rash, as replacing it, a voltage leakage check was made of the following condensers in the high voltage section: *C267A*, *C267B*, *C264*, *C270*, but all showed no leakage. No check was made of *C268* and *C269* across the horizontal linearity coil as the horizontal linearity seemed okay.

It was noticed at this point after glancing at the diagram that the bleeder resistor *R270*, 39K, could most assuredly cause a trouble of this kind. *R270* was then resistance checked and was found to measure 3K. What was amazing was that this resistor didn't have a charred or burned mark on it in any way. After replacing *R270* with a new 39K-2 watt, the receiver functioned properly. The

[*Continued on page 43*]



testing and rejuvenating *picture tubes*

by **Milton S. Kiver**

Description of a versatile CRT tester and rejuvenator with detailed discussion of the procedures to be followed.

THERE is one problem that every television serviceman meets again and again, no matter how long or how short a time he has been in the business. The problem revolves around the all-important picture tube and the question it poses is this: "When is a picture tube useless?"

The obvious cases occur when the filament refuses to light, or the glass envelope is cracked or the tube is shattered. On the basis of carefully tabulated case histories, these happen less than 2 per cent of the time. How about those tubes whose emission is low or where shorts exist between two elements or where the connections to an element may be partially or fully unsoldered? Are these tubes irrevocably lost? Not necessarily! With the proper type of processing, a surprising number can be returned to function usefully for periods as long as one year or more.

A careful record of picture tube failure has shown that less than 9 per cent of the departing tubes owe their difficulty to shorts. Of the remaining 91 per cent, a full 73 per cent are waylaid by low emission and 18 per cent by varying amounts of gas. Thus, by far the highest percentage are afflicted by low emission and, as the subsequent discussion will reveal, this is the one ailment which lends itself most readily to corrective treatment.

The causes of low emission are many and diverse and not even a tube design engineer will be able to explain them all. But, and here is the crux of the matter, a tube with low emission can frequently be raised to a satisfactory operating level; in short, it can be rejuvenated by the instrument such as

● Light On
○ Light Off
◐ Half Lighted

H	G1	G2		
○	◐	◐	GOOD	
○	○	◐	BAD	Open G1 (Control Grid)
○	◐	○	BAD	Open G2 (First Anode)
○	○	○	BAD	Open K (Cathode)
◐ or ●	◐	◐	BAD	Short H-K
●	●	◐	BAD	Short H-G1
●	◐	●	BAD	Short H-G2
○	●	◐	BAD	Short G1-K
○	◐	●*	BAD	Short G2-K
○	◐	●	BAD	Short G1-G2

Table 1—Indicates lucid manner of identifying defects.

Fig. 1 — Appearance of tester. Note its portability.

the one shown in *Fig. 1* in a matter of just a couple of minutes. Usually the cause of low emission is contamination of the cathode emitting surface. The emission can be restored by removing the contamination from the cathode. By "sweeping" the cathode surface with a critical voltage at a proper cathode temperature, the impurities can be driven off. This instrument, the B&K Cathode Rejuvenator Tester Model 350, will do a variety of jobs.

1. It will test a cathode ray tube for all of the important factors which determine the quality of the tube.

2. It will check for continuity between base pins and the elements of the tube, and also for shorts or leakage between elements in the tube (up to several megohms). Furthermore, it not only checks for shorts, but it will actually indicate which elements are shorted together.

3. The unit will check for the amount of cathode emission and the grid bias necessary to cut the tube off.

4. The Cathode Rejuvenator Tester will also repair many of the common faults in cathode-ray tubes, such as shorts between elements, open connections to elements and low emission.

5. And last, but far from least, the instrument will predict the probable useful life of the picture tube. Here is a feature which is unique in picture tube testers.

When using this instrument the first tube check is made with the Selector switch in the "Continuity-Short" position. In this position, you are checking for continuity of all the elements. Also, if there are any shorts between these elements, they will immediately show up by completely lighting one of the three bulbs on the front panel of the instrument. One bulb is tied into the cathode heater circuit: one is in the cathode control grid circuit and the third is in the cathode screen-grid circuit.

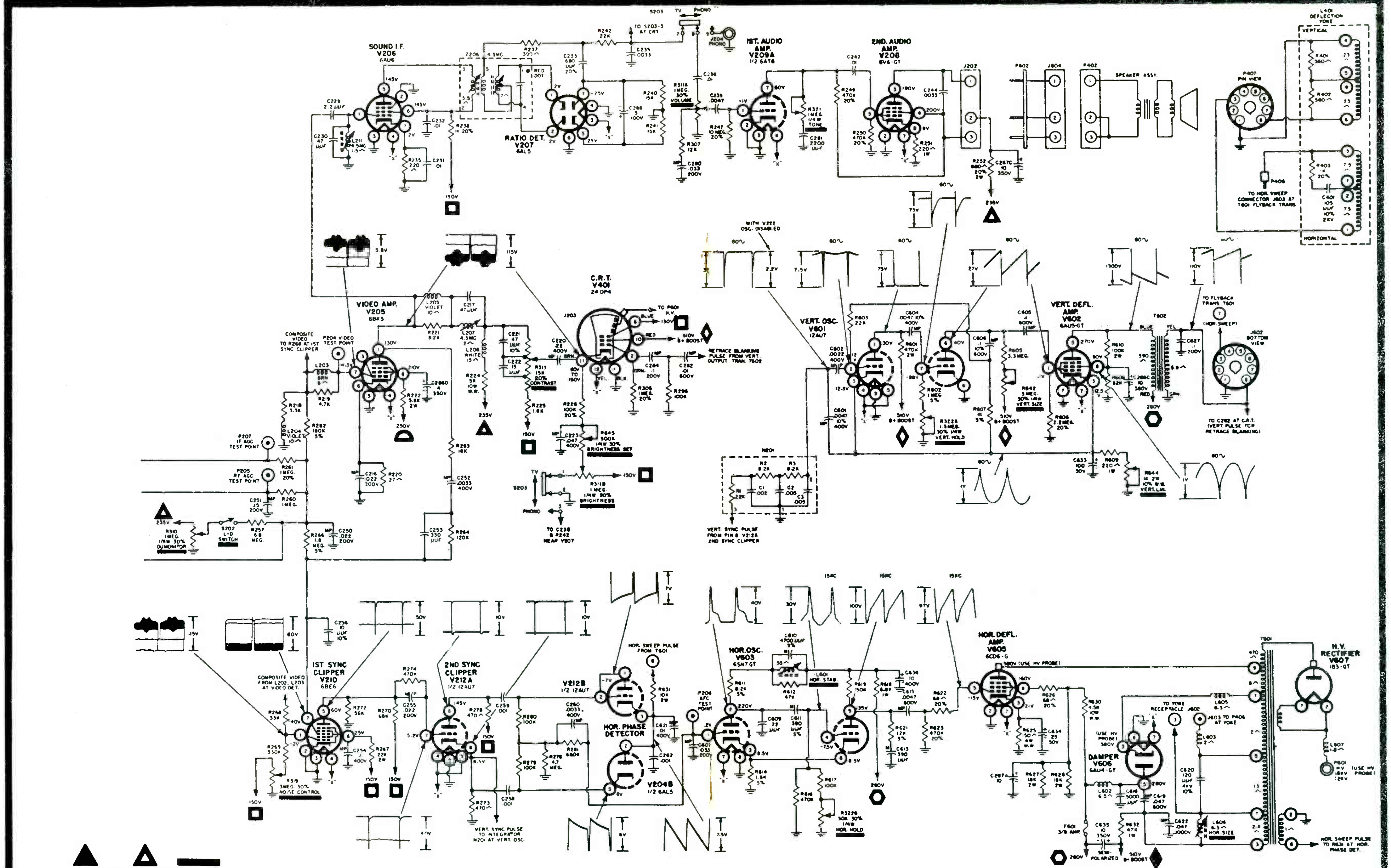
All possible combinations of bulb in-

[*Continued on page* 43]

Du Mont

MODEL GLENDALE
Ch. RA-321, RA-322

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



USE OF SYMBOLS

Solid symbol indicates source of voltage.
Open symbol indicates point to which voltage is applied.
Solid bar indicates an adjustable control.

NOTES

1. All waveforms and voltages were taken under operating conditions. The receiver was tuned to an average strength TV signal, the Contrast control rotated fully clockwise and the Noise control was rotated fully counter-clockwise.
2. The Noise control and L-D switch consists of a potentiometer, R319, and a snap switch, S202. When R319 is rotated fully counter-clockwise S202 opens (L position as shown in the schematic).
3. Voltages ± 20% of those shown are normal.
4. All resistors are 10%, one-half watt, unless otherwise indicated. W. W. indicates wire wound resistor.
5. All capacitors are 20%, 500V, unless otherwise indicated. All capacitors are ceramic, unless indicated as follows: M-mica, P-paper, ±-electrolytic, MP-Molded Paper.

RADIO-TELEVISION SERVICE DEALER
COMPLETE TV SERVICE INFORMATION SHEETS

Du Mont
MODEL GLENDALE
Ch. RA-321, RA-322

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

PARTS LIST

CHASSIS

Symbol	Part No.
C201	03 151 900
C202	03 153 710
C203	03 133 830
C204	03 151 960
C205	03 133 830
C206	03 151 520
C207	03 151 520
C208	03 151 960
C209	03 151 900
C210	03 151 960
C211	02 153 740
C213	03 153 180
C215	03 146 750
C216	03 140 320
C217	03 151 550
C218	03 153 710
C220	03 141 140
C221	03 151 550
C222	03 133 010
C223	03 141 100
C229	03 152 490
C230	03 151 550
C231	03 015 920
C232	03 015 920
C233	03 151 960
C235	03 153 730
C236	03 015 920
C239	03 153 740
C242	03 015 920
C244	03 153 730
C249	03 140 170
C250	03 140 320
C251	03 140 370
C252	03 141 030
C253	03 151 930
C254	03 141 120
C255	03 140 320
C256	03 146 790
C258	03 153 800
C259	03 153 800
C260	03 141 030
C262	03 153 700
C280	03 140 330
C281	03 153 820
C282	03 141 760
C284	03 140 360
C286	03 151 425
C287	03 151 427
C288	03 138 362
C401	03 122 462
C601	03 140 580
C602	03 140 540
C604	03 140 580
C605	03 141 820
C606	03 141 540
C607	03 140 330
C609	03 133 020
C610	03 033 340
C611	03 021 110
C613	03 020 500
C615	03 141 740
C616	03 153 750
C619	03 141 500
C620	02 122 463
C621	03 141 060

Symbol	Part No.
C622	03 139 684
C627	03 140 360
C633	03 138 770
C634	03 138 760
C635	03 250 421
C636	03 138 363
C637	03 151 423
F601	11 000 730
I201	12 001 310
J101 (321)	40 018 001
J101 (322)	40 018 011
J202	40 016 721
J203	34 003 466
J204	09 002 760
J205	09 002 760
J602	34 002 380
J603	40 016 131
J604	40 016 721
L201	21 012 421
L202	21 012 451
L203	21 006 622
L204	21 006 628
L205	21 006 628
L206	21 006 629
L207	21 010 964
L209	21 012 432
L211	21 012 212
L213	21 011 762
L214	21 011 762
L215	21 011 762
L401	89 013 333
L601	21 010 991
L602	21 012 191
L603	21 006 280
L604	21 010 951
L605	21 006 550
L606	21 011 601
L607	21 006 280
N201	88 000 631
P201	09 036 920
P203	09 018 810
P208	09 018 810
P406	51 013 830
P407	09 015 590
P601	36 005 351
P602	09 033 001
R201	02 041 930
R202	02 031 610
R203	02 032 490
R205	02 032 400
R206	02 034 970
R207	02 031 980
R208	02 031 630
R210	02 032 400
R211	02 031 980
R214	02 031 680
R215	02 032 400
R218	02 031 830
R219	02 031 850
R220	02 031 580
R221	02 031 880
R222	02 037 860
R224	02 113 070
R225	02 031 800
R226	02 032 540
R235	02 031 690
R237	02 031 720
R238	02 032 420

Symbol	Part No.
R240	02 031 910
R241	02 031 910
R242	02 041 930
R247	02 032 660
R249	02 032 580
R250	02 032 580
R251	02 034 690
R252	02 038 410
R257	02 032 230
R259	02 032 270
R260	02 032 130
R261	02 042 600
R262	02 031 020
R263	02 031 920
R264	02 032 020
R266	02 031 260
R267	02 037 930
R268	02 031 950
R269	02 032 070
R270	02 031 990
R272	02 031 980
R273	02 031 730
R274	02 032 090
R275	02 032 010
R276	02 032 210
R278	02 031 730
R280	02 032 010
R281	02 032 110
R296	02 032 010
R303	02 045 010
R305	02 042 600
R306	02 235 201
R307	02 031 900
R310	01 056 035
R311	01 058 341
R313	01 054 571
R317	01 056 035
R319	01 054 591
R321	01 056 034
R322	01 058 331
R401	02 041 740
R402	02 041 740
R403	02 042 420
R601	02 038 090
R602	02 031 200
R603	02 041 930
R605	02 032 190
R606	02 032 620
R607	02 030 480
R608	02 032 000
R609	02 034 690
R610	02 038 010
R611	02 030 700
R612	02 031 970
R614	02 030 540
R616	02 032 090
R617	02 032 010
R618	02 044 870
R619	02 032 030
R621	02 030 740
R622	02 032 350
R623	02 032 580
R625	02 121 620
R626	02 022 350
R627	02 027 920
R628	02 037 920
R630	02 113 060
R631	02 037 890
R632	02 034 970

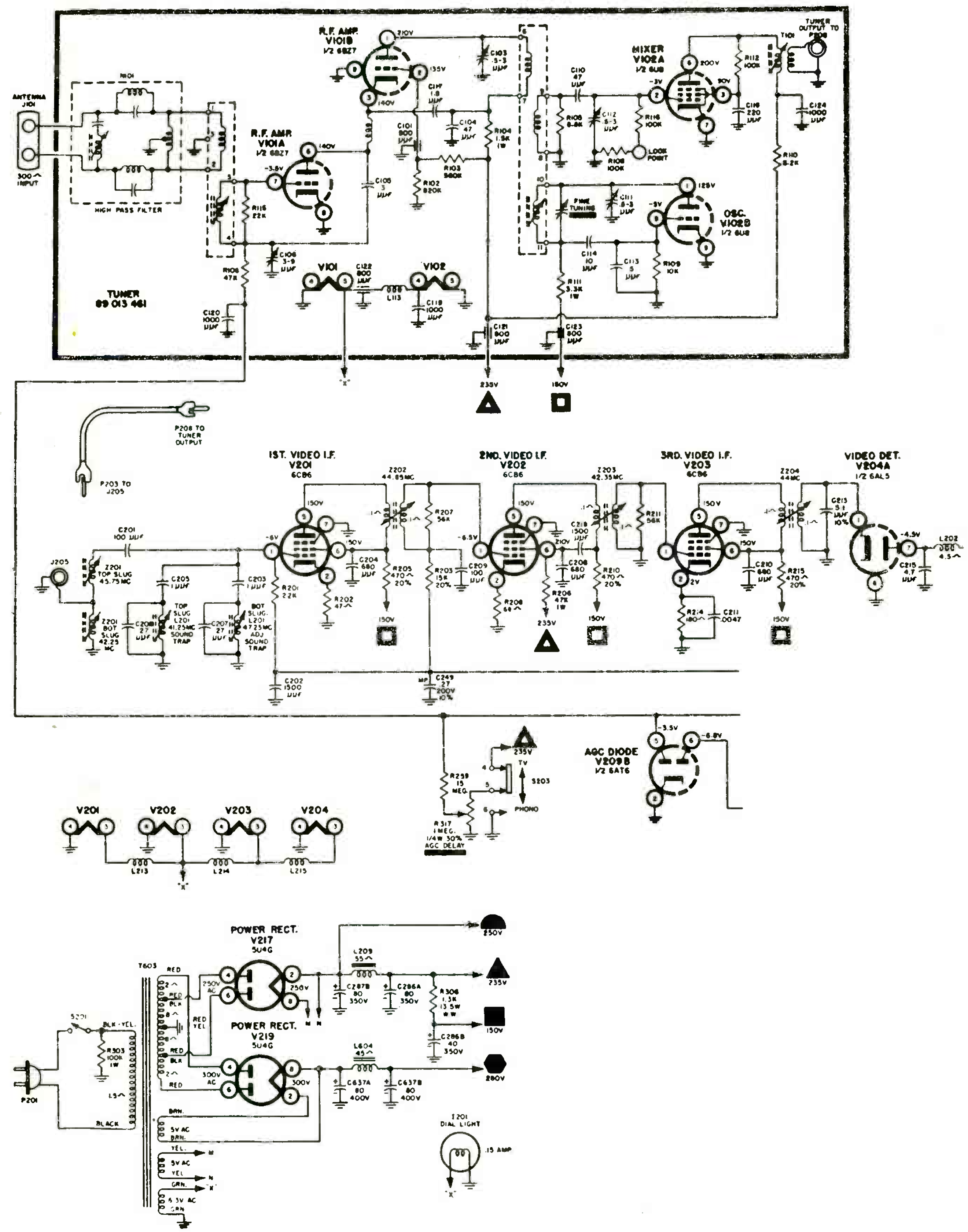
Symbol	Part No.
R642	01 056 041
R644	01 024 780
R645	01 056 042
S201	01 058 341
S202	01 054 591
S203	05 005 120
T601	20 009 091
T602	20 008 711
T603	20 009 071
Z201	20 008 745
Z202	20 008 991
Z203	20 008 991
Z204	20 008 991
Z206	20 009 041

TUNER
89 013 461, 89 013 471

Symbol	Part No.
C101	03 125 500
C103	03 119 150
C104	03 119 170
C105	03 123 020
C106	03 119 160
C110	03 160 041
C111	03 119 150
C112	03 119 150
C113	03 123 010
C114	03 126 010
C116	03 154 580
C117	03 123 030
C119	03 100 490
C120	03 100 490
C121	03 125 500
C122	03 125 500
C123	03 125 500
C124	03 100 490
C129	03 100 490
L101	21 012 041
L113	21 010 470
N101	88 000 861
R102	02 032 120
R103	02 032 100
R104	02 034 790
R105	02 031 870
R106	02 031 970
R108	02 032 010
R109	02 031 890
R110	02 031 880
R111	02 034 830
R112	02 032 010
R114	02 031 950
R115	02 031 930
R116	02 032 010
R119	02 031 660
T101	20 009 311
T114	20 009 311

UHF TUNER
89 013 451

Symbol	Part No.
C151	03 163 471
C152	03 137 300
C154	03 125 500
C155	03 125 500
C156	03 119 150
CR102	26 001 082
L154	21 013 401
L155	21 013 401
L156	21 013 401
L157	21 013 411
L158	21 013 421
P101	09 006 570
R151	02 031 890
R152	02 033 640
18 003 611	Speaker Assembly 10"

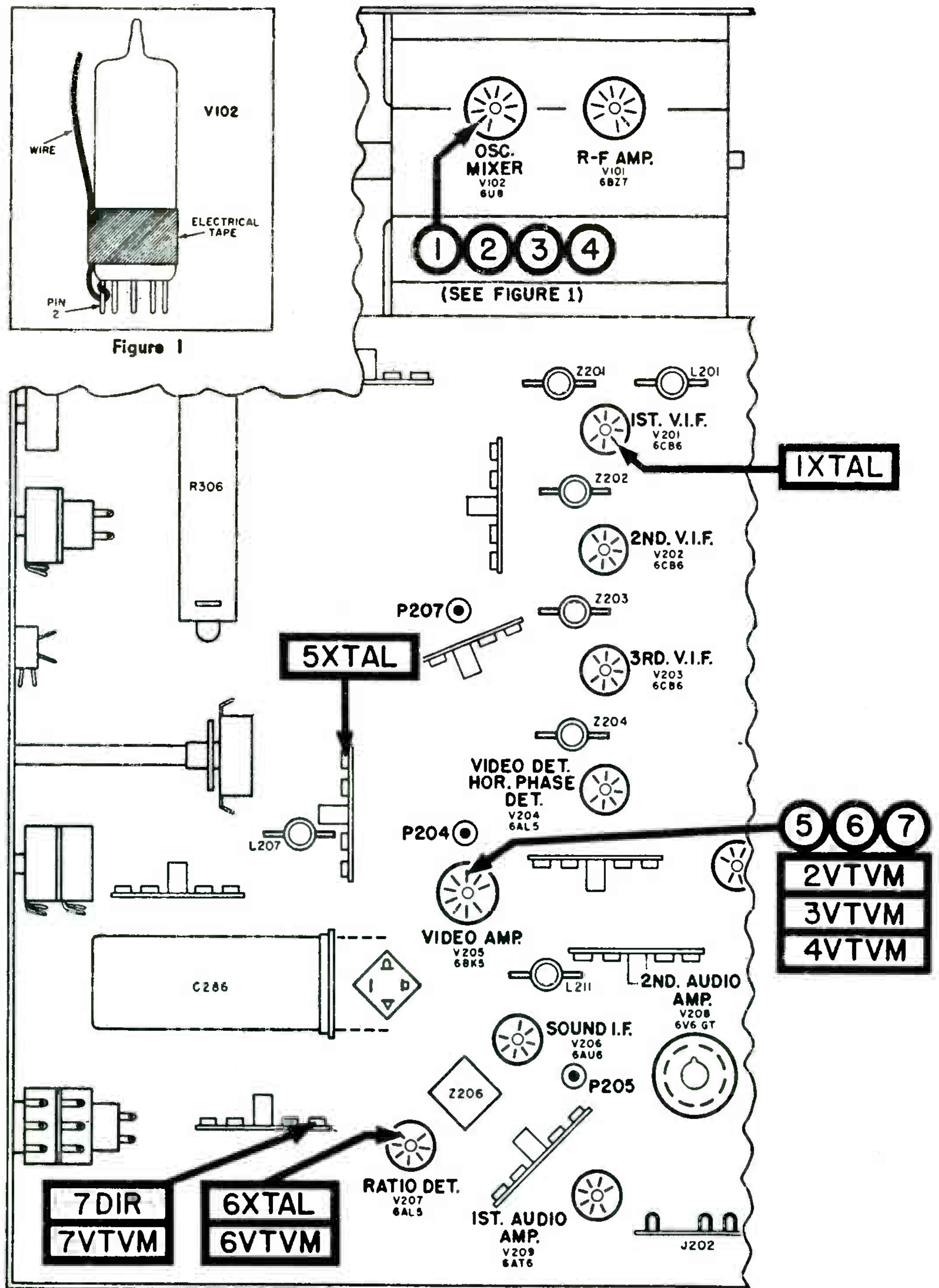


Du Mont

MODEL GLENDALE
Ch. RA-321, RA-322

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

ALIGNMENT TEST POINTS



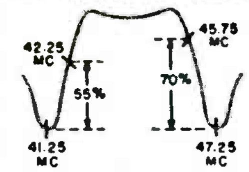
NOTES

When the alignment procedure has been completed the setting of the tuner oscillator slugs should be checked on each available channel and corrected if necessary.

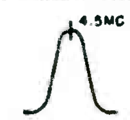
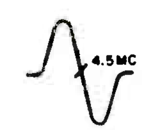
1. Tune the receiver to each available channel.
2. Place the flat of the Fine Tuning control face downward and adjust the oscillator slug for best picture and sound.

VIDEO IF ALIGNMENT RA-321/322

Place STATION SELECTOR between channels to disable oscillator. Remove fuse, F601. Connect a short length of wire to grid of mixer tube (see figure 1). Use the lowest VTVM range for all steps.

Step	Signal Generator Frequency	Signal Generator Connect To	Output Indicator	Connect to	Adjust
1	43.5 MC Center Freq. 10 MC deviation.	Grid of Mixer (1)	Oscillograph through XTAL	Pin 5, V201 1XTAL	L201 (top) for 41.25 MC trap. L201 (bottom) for 47.25 MC trap. Z201 (bottom) for 42.25 MC marker. Mixer plate coil (T101) and Z201 (top) for 45.75 MC marker. Note: Repeat adjustments until markers are positioned as specified. 
2	44.0 MC (Marker) No Sweep	As Above (2)	VTVM	Pin 7, V205 2VTVM	Z204 for maximum negative reading. Set signal generator output to maintain reading on lowest range of VTVM.
3	42.35 MC (Marker) No Sweep	As Above (3)	VTVM	As Above 3VTVM	Z203 for maximum negative reading.
4	44.85 MC (Marker) No Sweep	As Above (4)	VTVM	As Above 4VTVM	Z202 for maximum negative reading.
5	4.5 MC 400 CPS AM	Pin 7, V205 (5)	Oscillograph through XTAL	Junction of C220 and R226 5XTAL	L207 for minimum reading.

SOUND IF ALIGNMENT

Step	Signal Generator Frequency	Signal Generator Connect To	Output Indicator	Connect to	Adjust
6	4.5 MC 1 MC Sweep	Pin 7, V205 (6)	Oscillograph through XTAL	Pin 7, V207 6XTAL	L211 and Z206 (bottom) for waveform 
7	As Above	As Above (7)	Oscillograph DIRECT	Junction of C235 and R242 7DIR	Z206 (top) for waveform. 

ALTERNATE SOUND IF ALIGNMENT — USING TV SIGNAL

Step	Signal Generator	Output Indicator	Connect to	Adjust
6	TV Signal. Teleset must be tuned for best picture	VTVM	Pin 7, V207 6VTVM	L211 and Z206 (bottom) for maximum reading.
7	As Above	VTVM	Junction of C235 and R242 7VTVM	Z206 (top) for null point.

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

Du Mont
MODEL GLENDALE
Ch. RA-321, RA-322

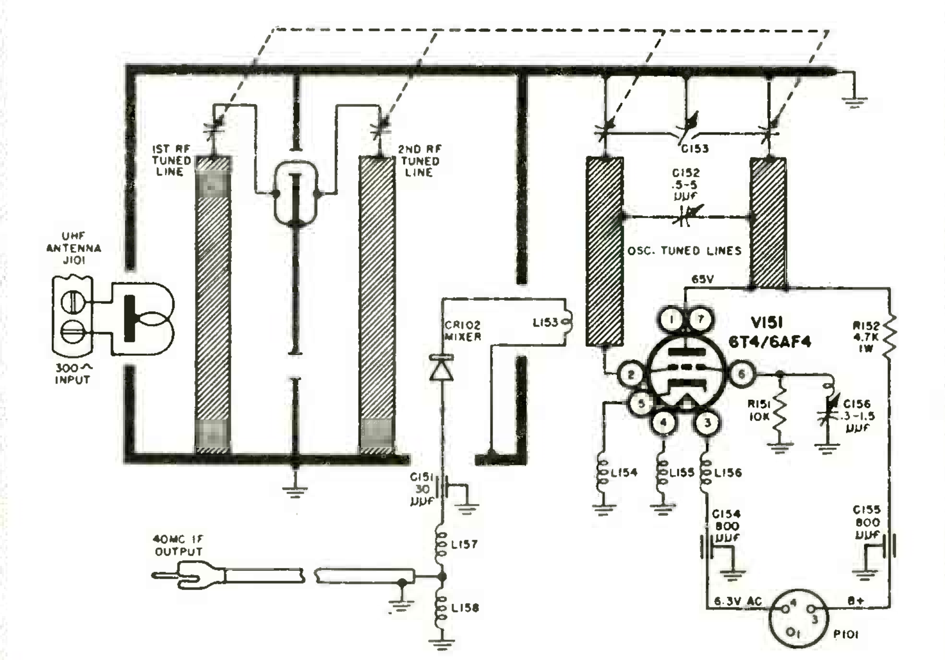
RESISTANCE MEASUREMENTS
All Readings to Ground

		1	2	3	4	5	6	7	8	9
V101	6BZ7	70K	350K	INF	0	.05	INF	1.3M	0	0
V102	6U8	70K	200K	170K	.05	0	70K	0	0	10K
V201	6CB6	1.3M	47	.05	0	70K	70K	0		
V202	6CB6	1.3M	68	.05	0	70K	110K	0		
V203	6CB6	.1	180	.05	0	70K	70K	0		
V204	6AL5	.1	10K	.1	0	4.8M	0	3.3K		
V205	6BK5	70K	NC	3.3K	.05	0	27	3.3K	70K	NC
V206	6AU6	1.5	0	0	.05	70K	70K	220		
V207	6AL5	INF	INF	.05	0	15K	0	15K		
V208	6V6	NC	0	70K	70K	470K	NC	.05	220	
V209	6AT6	10M	0	0	.05	1.2M	180K	500K		
V210	6BE6	35K	0	0	.05	40K	70K	2M		
V212	12AU7	4.8M	4.8M	10K	.05	.05	70K	600K	470	0
V217	5U4	NC	70K	NC	8	NC	8	NC	70K	
V219	5U4	NC	13K	NC	10	NC	10	NC	13K	
V601	12AU7	INF	25K	220-1.2K	.05	.05	INF	1M-2.5M	0	
V602	6AU5	2.2M	.05	220-1.2K	NC	15K	NC	0	50K	
V603	6SN7	5.5M	30K	1.8K	85K-120K	170K	1.8K	.05	0	
V605	6CD6	NC	0	150	470K	470K	9K	.05	9K	Cap INF
V606	6AU4	NC	NC	INF		13K		.05	0	
V607	1B3	NC	INF	NC	NC	NC	INF	INF	NC	Cap INF
V401*	24DP4	0	1M				70K			

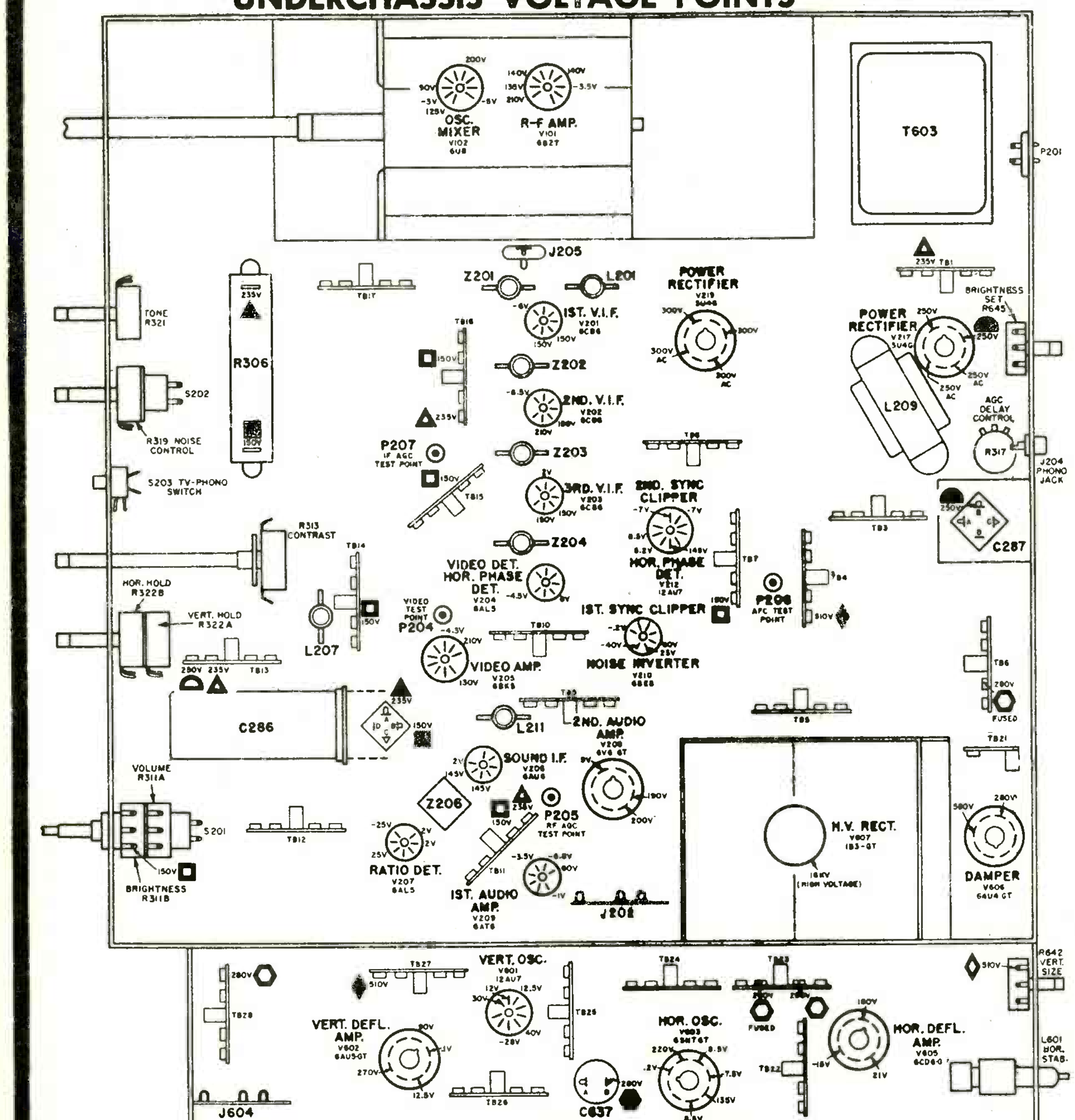
*10	11	12
INF	110K-1M	.05

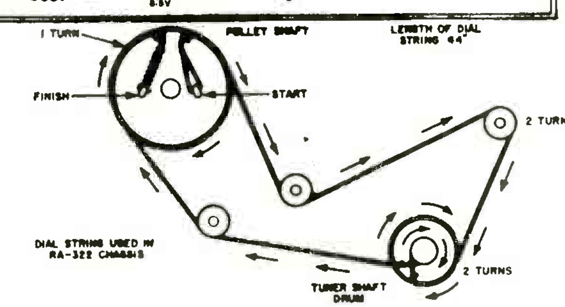
The above resistance readings were taken with an RCA Model WV97A VTVM. All readings are in ohms, K = 1000, M = million. When the reading is affected by a control two readings are given. These readings indicate the variation produced by the control.

UHF TUNER 89 013 451



UNDERCHASSIS VOLTAGE POINTS





DIAL STRINGING

TV INSTRUMENT CLINIC

PART 7

Based on CHALLENGE CLINIC demonstrations, this new series discusses many measurement and test problems raised by service technicians.

By ROBERT G. MIDDLETON

Chief Field Engineer, Simpson Electric Co.
Author of "Pix-O-Fix Troublefinder Guide," published by Rinehart & Co.; "TV Trouble-shooting & Repair Guidebook," Vols. I & II; and co-author (with Alfred A. Gherardi) of "How to Use Test Probes," published by John F. Rider, Publisher.

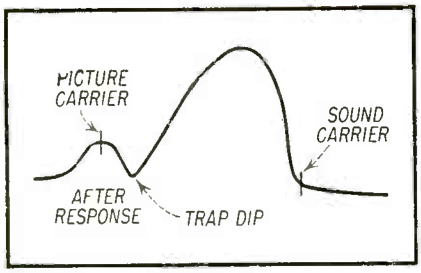


Fig. 1—Effect of trap dip.

Q. I have heard that misalignment of the receiver circuits can produce a leading smear in the picture. What is the nature of the misalignment in this case?

A. This situation arises when a trap is misadjusted in such manner that the picture carrier is separated from the main portion of the curve by the trap dip, as shown in *Fig. 1.*

Q. Does a 60-cycle square wave, such as developed by the Genescope, appear the same on either an *ac* scope or on a *dc* scope?

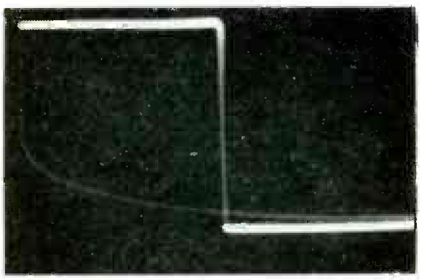


Fig. 2—Typical square wave pattern seen on scope.

A. Yes. The square wave is shown in *Fig.* 2. The relation of the square wave to the zero-volt level is shown in *Fig.* 3. We expect to find that the positive area of the pattern is equal to the negative area of the pattern, because an *ac* waveform has just as much positive current as it has negative current. Since the 60-cycle square wave is an a-c voltage, with no *dc* component, the square wave is displayed in the same position on the screen of an *ac* scope as on a d-c scope.

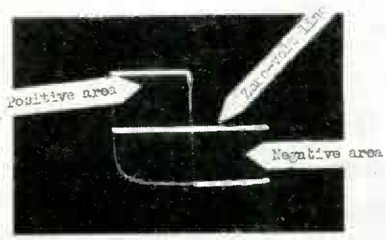


Fig. 3—Pattern and zero level.

Q. What causes a tilted baseline to appear on the scope screen when a visual-alignment test set-up is being used?

A. If the base line is level when no signal is applied to the scope, the trouble is usually due to hum voltage. (See *Fig. 4A*).

Q. What causes an elliptical baseline to appear?

A. An elliptical baseline is also caused by hum; when there is a phase shift between the 60-cycle horizontal sweep voltage in the scope, and the 60-cycle hum voltage entering the vertical-input circuit, the ellipse appears as shown in *Fig. 4A.*

Q. Why would the ellipse be distorted?

A. Such distortion is observed when an automatic line-voltage regulating transformer is used to power the scope; the transformer delivers a clipped sine wave. (*See Fig. 4B.*)

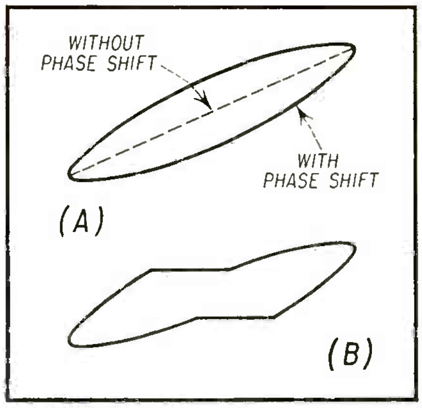


Fig. 4—Hum voltage effects.

Q. Why should leakage between tube elements be preferably tested with *ac*?

A. As shown in *Fig.* 5, the leakage may be unidirectional, as if a rectifier were in series with the leakage resistance. Accordingly, an a-c leakage-resistance test is preferred. If an ohmmeter is used, a test should be made with the input leads applied both ways. Tube checkers commonly make "hot" leakage tests, since the leakage may show up only when the heater is energized.

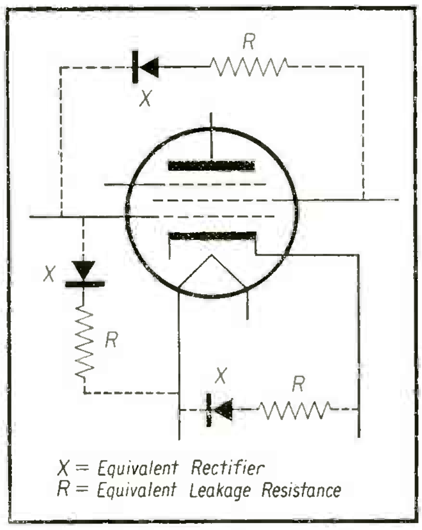


Fig. 5—Tube leakage paths.

Q. What causes a reproduced square

[*Continued on page 41*]

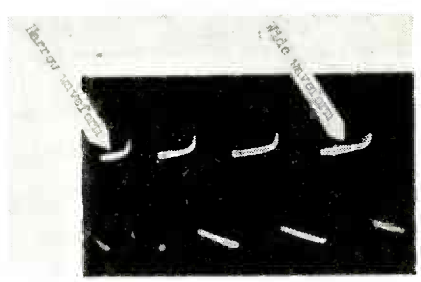


Fig. 6—Variable square waves.

TV FIELD SERVICE

Pre-published from Rider "TV Field Service Manuals"

by Rider & Alshero

EMERSON

TYPE	MOD. NOS.	TV CHASSIS	PIC. TUBE
"VHF" Receivers	741F	120182-D	17LP4
	757D		
	758F		
	781A	120196-B	21MP4
	792D	120206-D	21YP4
	781E		
"All Channel" UHF - VHF Receivers	784E	120197-B	21MP4
	784K		
	784G	120197-D	21YP4
	785K	120195-D	17LP4
	759C		
	784M	120211-D	21YP4

TUBE LIST

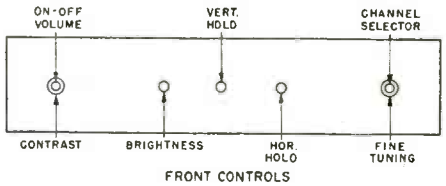
SYM.	TYPE	CIRCUIT FUNCTION
V1	6CB6	1st Vid. IF Amp.
V2	6CB6	2nd Vid. IF Amp. and Sound IF Amp.
V3	6CB6	3rd Vid. IF Amp.
V4	6AL5	Vid. Det.—A.G.C. Det.
V5	6CB6	Vid. Amp.
V6	6AU6	Sound Limiter
V7	6AL5	Sound Disc.
V8	12AX7	Sound Amp.—Sync. Sep.
V9	6V6GT	Sound Out.
V10	12AU7	Sync. Phase Inv.—Vert. Osc.
V11	6SN7 or 12AU7	Hor. Osc.—Hor. Control
V12	6BQ6GT	Hor. Out.
V13	1X2A	H. V. Rect.
V14	6AX4GT	Damper
V15	6K6GT	Vert. Out.
V16	5U4G	L. V. Rect.
V17	5U4G	L. V. Rect.
V18	6BK7 or 6BQ7	RF Amp.
V19	6J6	Mixer-Osc.
V20	17LP4, 21MP4, 21YP4	Picture tubes

KEY VOLTAGES

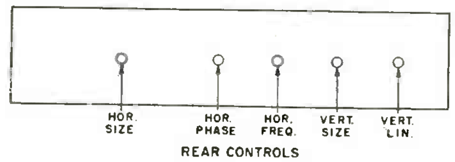
B+, plate of damper, V14 pin 5	225 vdc
Boosted B+, cath. of damper, V14 pin 3	450 vdc
Plate of VERT. OSC. V10 pin 2	−62 to −90 vdc
Plate of Vert. Out., V15 pin 3	280 to 430 vdc
Plate(s) of Hor. Osc. (and control), V11 pin 5*	160 vdc
pin 2*	100 to 150 vdc
Grid of Hor. Out., V12 pin	−17 vdc

All voltages are measured with a VTVM connected between the tube pins and chassis.

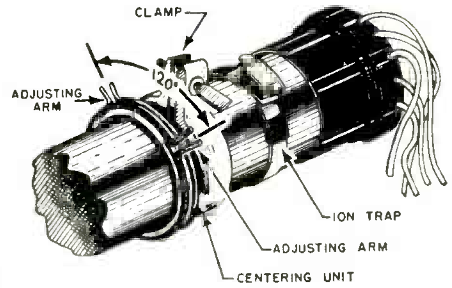
*RECEIVERS USING A 12AU7 TUBE IN PLACE OF A 6SN7 TUBE USE PIN 6 AND 1 INSTEAD OF PINS 5 AND 2.



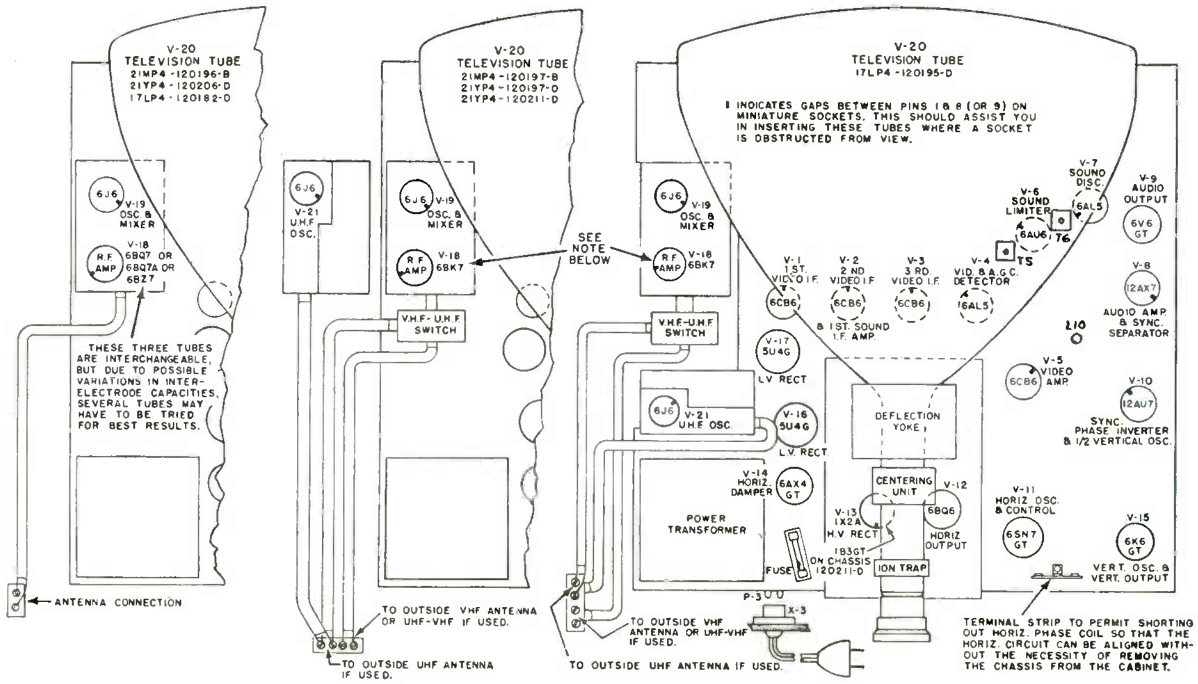
FRONT CONTROLS



REAR CONTROLS



CENTERING UNIT LOCATION DRAWING



NOTE: THE R.F. AMP. TUBE PRESENTLY USED IS A 6BK7. IN THE FUTURE A 6BQ7, 6BQ7A OR A 6BZ7 MAY BE USED. THESE THREE TUBES ARE INTERCHANGEABLE, BUT DUE TO POSSIBLE VARIATIONS IN INTERELECTRODE CAPACITIES, SEVERAL TUBES MAY HAVE TO BE TRIED FOR BEST RESULTS.

TOP VIEW

ADJUSTMENTS

FOCUS AND CENTERING

The picture tubes used in these chassis (V-20) are pre-focused electrostatically by means of a focus electrode in the gun asembly operating at a nominal voltage of 210 volts. The use of electrostatic focus insures good result even under wide variation of line voltage.

Centering is accomplished by means of a centering unit placed on the neck of the picture tube slightly behind the yoke.

This device consists of two magnetized rings which when rotated together cause the electron beam to shift thus centering the picture. If the centering range is not sufficient a slight rotation of one of the rings with respect to the other will vary the amount of range until the right point is reached.

CENTERING PROCEDURE

1. Set the unit, magnets forward, on the tube so that the magnets are about ¼" behind the yoke. Adjust the clamp so that the unit is a sliding fit on the tube.
2. Set the magnets so that the adjusting arms are approximately 120° apart.
3. Adjust the ion trap magnet for maximum brightness.
4. Rotate the whole unit, this will cause the picture to move around a circle. Stop where the picture is most nearly centered.
5. Rotate the magnets separately, in equal distances, but in opposite directions to complete the centering.
6. Repeat steps 3, 4 and 5 if necessary.
7. Tighten clamp.
8. Readjust the ion trap magnet to give maximum brightness.

BEAM BENDER (ION TRAP)

A single magnet type of beam bender is used and should always be adjusted by sliding and rotating the unit for maximum brightness. The adjustment of the beam bender can effect picture focus. You will usually find that only one setting of the beam bender will yield both maximum brightness and optimum focus (sharp raster lines). Do not adjust this device for removing corner shadows or improving focus if in so doing the brightness is reduced.

If two positions of maximum brightness are found use the one closer to the picture tube socket.

ALIGNMENT OF MIRACLE PICTURE LOCK (HORIZONTAL OSCILLATOR AND A.F.C.)

This can be accomplished without removing chassis from cabinet.

1—Tune set to a channel known to be good.

2—Short phasing coil by using a clip lead across phasing coil terminal strip located on top of chassis next to horizontal oscillator tube.

3—Rotate horizontal hold control (R-54) fully clockwise.

4—Starting with horizontal frequency slug (T-8) all the way out, rotate in until picture just locks into sync. (Turn slug in ½ turn more).

5—Adjust horizontal size if necessary; if picture falls out of sync. repeat Step 4.

6—Adjust centering so that right hand edge of picture is visible while facing front of set.

7—Decrease contrast and turn up brightness while viewing a good picture so that the horizontal blanking porch is visible on right hand side of picture.

8—Remove the short across the phasing coil. If the picture falls out of horizontal sync. adjust the phasing coil to re-sync. the picture and then carefully continue to adjust the phasing coil so that the start of the horizontal sync. pulse is just visible at the end of the front blanking porch.

It should be noticed that the sync. pulse is darker than the front blanking porch but not quite as dark as the unlit portion of the picture tube.

SOUND ALIGNMENT USING TRANSMITTED TV AIR SIGNAL

1) Connect antenna and tune to a good on the air TV station.

2) Adjust fine tuning control for best picture.

3) Adjust antenna coupling for moderate signal so as to provide a sharp meter indication with adjustment of transformers.

4) Meter reading may pulsate due to changes in signal strength; do not confuse with a peak adjustment.

EMERSON TROUBLE SHOOTING CHART

INSUFFICIENT RASTER HEIGHT
Vert. Size and Lin con.
V10, V15, V16, V17
Check 0.047 and 0.1 μf caps. connected to pin 1 of V10
Vert. Out. trans.
Low line voltage

NO VERT. DEFL.
V10, V15
Check 0.047 and 0.1 μf caps. connected to pin 1 of V10
Check 0.0047 μf cap. connected to pin 2 of V10
Vert. Defl. coils (yoke)
Vert. Out. trans.

NO VERT. SYNC.—HOR. SYNC. OK
Vert. Hold con.
Vert. Int. network
V10, V15
Check 0.01 μf cap. connected to pin 3 of V15
Check 0.0047 μf cap. connected to pin 2 of V10

NO HOR. OR VERT. SYNC.—PIX SIGNAL OK
V8, V10
Check 0.01 μf cap. connected to pin 7 of V10

NO HOR. SYNC.—VERT. SYNC. OK
Hor. Hold, Phase and Freq. con.
V11, V12
Check 82 μμf cap. connected to pin 1 of V11
Check 330 μμf cap. connected to pin 4 of V14

AUDIO HUM IN SOUND
V6, V7, V8, V9

DISTORTED SOUND
Tuner fine tuning
V6, V7, V8, V19
Check 0.047 μf cap. connected to pin 5 of V9
Sound and Vid. IF alignment T3, L5
Det. alignment T6

NOISY SOUND—PIX OK
Vol. con.
V6, V7, V8, V9
Check sound system for loose connections
Speaker
Sound IF and Det. alignment T3, L5 and T6

SYNC. BUZZ IN SOUND
Tuner fine tuning
V2, V6, V7, V19
Sound IF and Det. alignment T3, L5 and T6

INTERMITTENT SOUND—PIX OK
V6, V7, V8, V9
Poor connections in sound system

ENGRAVED EFFECT IN PIX
Tuner fine tuning
Contrast con.
V1, V2, V3, V4, V5, V19, V20
Check Vid. Det. and Amp. peaking coils

VERT. BARS
Hor. Drive con.
V12, V14
Check 50 μμf cap. connected to yoke terminals
Defl. yoke ringing

PIX BENDING
Hor. Hold, Phase and Freq. con.
V10, V11, V12
Check 0.022 and 0.047 μf caps. connected to pin 3 of V11

INSUFFICIENT BRIGHTNESS
Ion trap
Brightness and Hor. Drive con.
V12, V13, V14, V16, V17, V20
Low line voltage

RASTER BLOOMING
Hor. Drive con.
V12, V13, V14, V20
Check HV Filter cap.

INSUFFICIENT RASTER WIDTH
Hor. Drive and Size con.
V11, V12, V14, V16, V17
Check 0.001 μf and 820 μμf caps. connected to Hor. Phase coil
Hor. Out. trans.
Low line voltage

NO RASTER—SOUND OK
Brightness con.
Ion trap
V11, V12, V13, V14, V20
HV trans. Hor. yoke CRT connections

POOR HOR. LIN.
Hor. Drive con.
V12, V14
Check 0.1 μf cap. connected to terminal 1 of Hor. Out. trans.
Hor. Out. trans.

POOR VERT. LIN.
Vert. Size and Lin. con.
V10, V15
Check 0.047 and 0.1 μf caps. connected to pin 1 of V10
Check 100 μf Elec. cap. connected to pin 8 of V15
Vert. Out. trans.

"The Answer Man"

by BOB DARGAN

Do you have a vexing problem on the repair of some radio or TV set? If so, send it in to the Answer Man, care of this magazine. All inquiries acknowledged and answered.

Note: Only communications with Radio-TV Service Firm letterheads will be considered and answered. Please indicate make, model, and chassis number of receiver.

DuMont RA-312—Pix Overload and Poor Sync

Mr. Answerman:

I have a condition on a new Du Mont RA-312 chassis that has me stumped. The picture overloads on strong signals and there is poor sync action with a tendency to pull and tear out. In the sound there is some sync buzz which disappears when the strong signal is removed. I have substituted tubes in the *agc* system, *if* strip and front end as well as checked the voltages, which were found to be normal. The trouble is apparently in the *agc* circuits but I have been unable to locate it. What suggestions do you have to help me with this problem.

Also I am not too sure that I am adjusting the *agc* control on this receiver correctly. Perhaps this is where I am making my mistake.

J.E.
Los Angeles, Cal.

Because of the widely different signal levels TV receivers are expected to operate under, one circuit that has become more complicated is that for the Automatic Gain Control. One of the more intricate systems as used in the Du Mont RA-312 chassis is shown in *Fig. 1*.

The bias voltage applied to the tuner *agc* line and first and second *if* amplifier tubes in the Du Mont RA-312 is proportional to the peak input *rf* signal. This negative voltage is derived from two voltage sources, one at the grid of the 6BE6 tube and the other developed across the video detector load resistor as shown in *Fig. 1*. The negative voltage present at the grid of the 6BE6 tube is a function of the peak to average voltage and is due to grid rectification of the composite video signal. Across the video detector load resistor is developed a negative voltage that is a function of the average level of the modulation of the video signal. The negative voltage drop across the detector load resistor becomes less as the modulation increases.

The combination of these two negative voltages results in a bias voltage for the *agc* line that is directly proportional to the peak *rf* signal applied to the receiver.

The 6AT6 diode circuit provides a delay before a negative bias is applied to the *rf* amplifier. This is not a time delay but means that a certain level of negative voltage must be generated to cancel out the existing positive voltage before control action will begin. A positive voltage is applied to the *agc* line that is shorted out by the diode if no negative voltage is present to counteract it. A negative voltage of equal amount to the adjusted positive voltage is required before *agc* action will take hold and govern the amplification of the *rf* and *if* stages.

A switch is provided in the *agc* circuit known as the local-distant switch. When placed in the distant position additional positive voltage is applied to the *agc* line which further reduces the negative bias voltage so as to obtain increased sensitivity for the reception of distant stations.

[Continued on page 42]

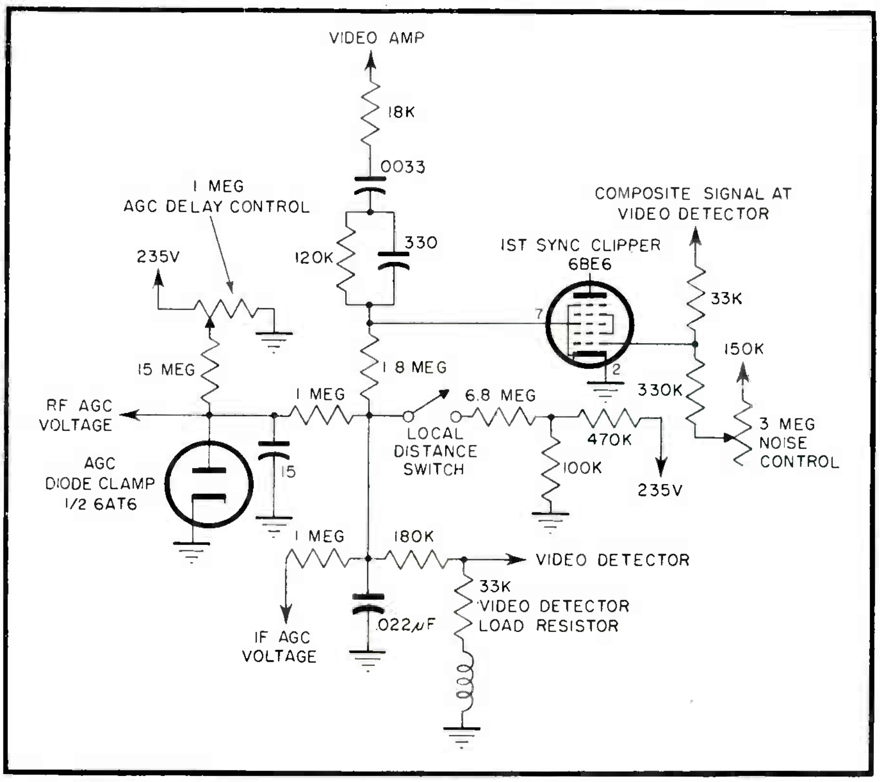
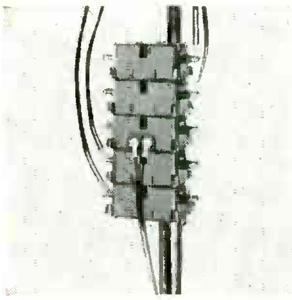


Fig. 1—Partial schematic of Du Mont RA-312

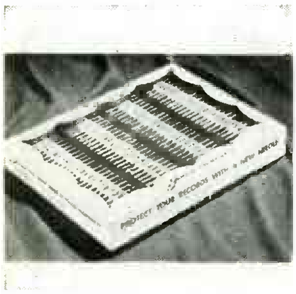


Channel Master Coupler

An entirely new system which very efficiently permits the coupling of an unlimited number of antennas to a single transmission line, has been developed by Channel Master Corporation, Ellenville, N.Y. It is called the SelecTenna Coupling System. Using this system, it is now possible to obtain multi-channel, multi-direction TV reception without rotators, without switches, and without multiple lead-in wires.

Authorized Multivolter

Authorized Manufacturing Company, 919 Wyckoff Avenue, Brooklyn 27, New York, has just released the Model #301 Multivolter Power Supply. Fitting in a pocket, tool box or tube caddy, it conveniently provides a range of variable DC voltage from minus 135 through 0 to plus 135, as well as an AC range of 0 to 135V. An added feature provides one ampere of 6.3 filament voltage at separate terminals.



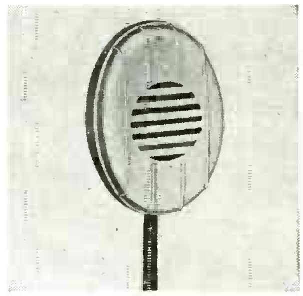
Jensen Display Kit

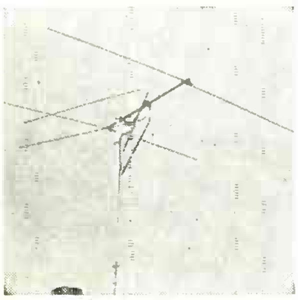
A new phono-needle kit now being offered to retailers promises almost as many advantages to the dealer as the number of needles (100) in the kit, according to its manufacturer, Jensen Industries, 7333 W. Harrison St., Forest Park, Ill.

The new 711 white leatherette display case containing 64 different types of needles actually supplies the correct needle, through a substitution method, for 95% of all retail needle sales.

Astatic Convertible Microphone

The newest addition to The Astatic Corporation's microphone line is a new design of the convertible hand and desk stand type. Exceptional performance quality is claimed for the new Astatic unit, which is being produced in both crystal and ceramic versions. Both have excellent frequency range: the Model M302, crystal, 30 to 10,000 c.p.s., with flat response; the Model M301, ceramic, 30 to 8,000 c.p.s., with slightly rising characteristics in the medium range.



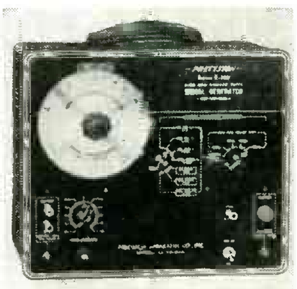


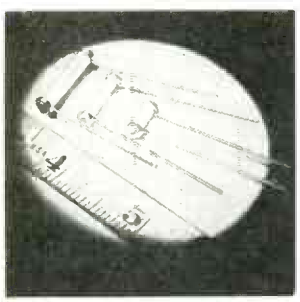
CBS Broadband Array

CBS-Columbia is making available to its distributors an antenna specially designed to have the broad bandwidth needed for color television reception; the unit maintains a flat response within 2 db. across the entire UHF and VHF spectrums. It offers an average gain of approximately 7 db. relative to resonant dipoles at UHF and approximately 3 db. at VHF. For details, write CBS-Columbia, 3400 47th Ave., Long Island City 1, N.Y.

"Precision" Signal Generator

Precision Apparatus Co., Inc., 92-97 Horace Harding, Elmhurst, N.Y., announces a new basic test instrument, the Model E-300 Sine-Square Wave Signal Generator, covering the audio-video range, which provides accurate sine and square wave signals for direct performance, efficient testing. Because sine-square wave testing is a most reliable indicator of frequency response, phase shift, amplitude distortion, etc., analysis with the Model E-300 streamlines amplifier test procedure.





Aerovox Ceramic Capacitors

To provide closer temperature-coefficient tolerances than those normally available, the Hi-Q Division of Aerovox Corporation, Olean, N.Y., announces its Type CNP ceramic capacitors. A newly developed and unique manufacturing process insures uniformity of temperature coefficient and consequently the capacitors can be supplied in close temperature-coefficient limits without individual TC testing. Type CNP units are available in a non-insulated tubular style

Concert-Line Mike

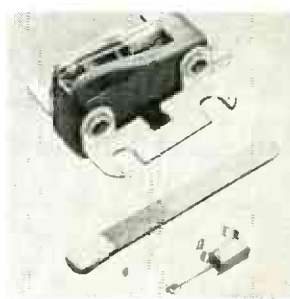
Shure Brothers, Inc., 225 W. Huron Street, Chicago 10, Ill., announce their new Model "333" High Fidelity Studio Microphone, which is a uni-directional microphone which has (1) extended frequency response: 30-15,000 c.p.s., plus or minus 2½ db; (2) the world-famous, patented "Uniphase" system; (3) small size, slim design, matchless beauty. The "333" is recommended for professionals and hi-fi enthusiasts who demand the highest quality for their recordings in the home.

ATR Shav-Pak

The ATR Shav-Pak is especially designed for operating standard AC Electric Shavers in automobiles, buses, trucks, boats and planes; it plugs into cigarette lighter receptacle on dash and is small enough to be kept in glove compartment, and is attractively packaged. Complete information is available by writing the manufacturer, American Television and Radio Co., 300 E. Fourth Street, St. Paul 1, Minnesota.

Sonotone LP Cartridge

A new single-needle, high-fidelity ceramic cartridge is announced by Sonotone Corporation, Elmsford, N.Y. Known as the 1P, this new cartridge features high compliance and an extended frequency response. It is available in two versions—one for fine groove records (33's and 45's) and the other for standard groove records (78's). The 1P does not require either equalizers or pre-amplifiers and is unaffected by moisture or temperature.



CORRECTION NOTICE

On page 58 of the Oct. '54 issue of RTSD the new Tung-Sol Tube Characteristics Manual should have been listed as being available only through Tung-Sol distributors at a price of seventy-five cents.

ASSOCIATION NEWS

[from page 6]

National Electronic Technicians & Service Dealers Associations (N. Y.)

The necessity of having an impartial board, composed of various segments of the service industry, Government and public, to examine applicants for licenses and issue licenses would be primary requisite for a good license bill.

This opinion was generally agreed upon at a meeting in New York of the National Electronic Technicians and Service Dealers Associations. The meeting was attended by delegates representing associations in New York, Pennsylvania and New Jersey.

Joseph Forman, association counsel, gave a review of the licensing bill pending in New York City and some of the problems that confronted the formation of the bill.

Radio TV Guild of L. I. (N. Y.)

The following men were chosen to be our officers for the coming year: Murray Barlowe, President; Jim Lyons, Vice President; Chris Stratigos, Corresponding Secretary; Bob Henderson, Recording Secretary; Jim Thornton, Treasurer; George Volkens, Sergeant at Arms. The three Trustees elected for Nassau were Art Cyr, Jack Wheaton, and Ralph Raynor. The five Trustees elected for Queens were Chet Amble, Jim Clifford, Pristas, Henry Rogers and Len Silverman. The five Trustees elected for Suffolk were George Knoldl, Sam Margolis, H. McDonald, Gerry Rawlins and Fred Strickland.

TISA-Denver Elects

Newly reorganized group reelects Robert A. Miller, President; Tom Sampson, Secretary; Angelo Guseman, Andy Andrews, Wayne Young, Bill Dwinelle, Dick Sebaugh, and George Kelso, directors. Now boast 35 members in Denver locale.

INSTRUMENT CLINIC

[from page 34]

wave to vary in width across the scope screen?

A. The variation (shown in *Fig. 6*) is the result of deflection non-linearity in the horizontal sweep system of the scope.

ANSWERMAN

[from page 39]

The adjustments in this circuit are not involved and can be examined before preceding to other checks. The *agc* delay control usually has to be touched only after the replacement of a tube and even then not very frequently.

Select the strongest station to be received. Starting at full counter-clockwise position rotate the delay *agc* control clockwise until the picture overdrives with resultant poor sync lock-in and buzz in the sound. Just before this overload occurs is the proper position for this control setting. It is adjusted on the strongest channel to be received in all cases.

Once the *agc* delay control has been set up the noise control can be touched up if it is suspected of being out of the proper setting. The noise control is positioned so that noise pulses do not disturb the deflection oscillators.

After setting up the *agc* delay and noise controls, if the receiver is not performing normally, or more particularly, if it is not possible to easily adjust the *agc* delay control it would be desirable to determine if the .0033 μf condenser is leaking. Measure the voltage drop across the 1.8 megohm grid leak resistor with the 6BE6 tube removed. If a voltage is found to exist across this resistor it is the result of current through it and the only way this can result is for the .0033 μf condenser to be leaking.

If the circuit continues to overload check the *if* transformers to determine if one of them is shorted primary to secondary.

Of course one of the best checks on an *agc* system that can be made is to use a bias box and determine if the circuits will operate normally when sufficient negative voltage is applied. This has been previously discussed in the May 1954 issue.

Further Information On Muntz 21"-Arcing

A number of our readers have written in with regard to the item which appeared in the November issue on the above set. Their concensus is that high voltage arcing is caused by a breakdown of the stand-off insulator for the 1B3 socket. Properly cleaning this stand-off should remedy the above condition. If this doesn't help, replacement is necessary.

Thanks to all of you fellows who took the trouble to write us on this score. We most certainly welcome further correspondence of this nature for we certainly don't know all the answers.

WORK BENCH

[from page 23]

boost voltage which was obviously diminished by the defective R270, is naturally the plate voltage for the 6BQ6, horizontal output tube. If it is lowered due to a defect of this kind it would naturally cause the insufficient width and poor high voltage.

PIX TUBE TESTER

[from page 24]

dications are shown and interpreted in Table 1. After the tube has been allowed to warm up, the indications for a normal tube would be an unlit H bulb, and half lit G-1 and G-2 bulbs. Since the H neon bulb is situated between heater and cathode, no light means that the circuit between these two elements is open, a condition which is desirable. The G-1 neon bulb is located between cathode and control grid. If no shorts exist between these two elements, only one side of the neon indicator will light up. If a complete short exists, both sides of the neon bulb will light up. And if the grid circuit is open, permitting no grid current to flow, the G-1 indicator will remain unlit. The same arrangement is employed with the G-2 bulb and its indications carry the same significance.

Note the simplicity that is obtained by using neon bulbs as indicators. By reading the three lights and comparing them, you immediately uncover any open connections or any short circuits between tube elements, and furthermore determine which elements are affected.

If a tube shows no open connections or no shorts, the testing procedure continues to the emission check. If a short does exist in the tube, the emission test is skipped and the procedure for removing shorts is instigated.

Emission Test

The emission test is simple and straightforward. The selector switch is rotated to the Emission position and then an Emission pushbutton is depressed. If the meter reads over 300 microamperes, the tube is good. The customer can see the meter pointer on "Good" at 300 microamperes or more. If the emission is low, tube regeneration is in order. More on this in a moment.

A second test in the Emission position for tubes which meet the minimum

[Continued on page 46]

Construction of a large electronics laboratory for engineering and research, to cost nearly $1,500,000, began on Monday, November 29th, in Wayland, Mass., 20 miles from Boston, according to Charles F. Adams, Jr., president of Raytheon Manufacturing Company. Grading of the 73-acre site has been under way throughout most of the summer. The contract has been let to Vappi and Company, Inc., of Boston, who were lowest bidders for the project. The building will have approximately 150,000 square feet of floor area.

700 radio-and-electronic firms will exhibit in the 1955 Radio Engineering Show, a gain of 16% over 1954. This expansion, which is needed to keep pace with the growing radio industry has been made possible, says William C. Copp, Exhibits Manager, by the addition of exhibits in the Kingsbridge Palace, a large skating rink on Jerome Avenue, two-tenths of a mile south of the Kingsbridge Armory. Dates are March 21 to 24. IRE has scheduled its 1956 Convention in the New York Coliseum and has booked its entire facilities. It is the first definite booking for the gigantic four floored exhibition hall scheduled for completion March 1, 1956.

An outstanding jobber educational program is in progress through SREPCO's Fall Color TV School. The 12-week course includes material presented in the Summer School sessions which was attended by 135 men. New developments in preparation to service color equipment are included in the instruction. Louis Sandor is teaching the fundamentals of color signal and its application to all types of receiving equipment, using color receivers, color bar and dot generators, and all modern test equipment needed to demonstrate "set-up" and maintenance technique.

The Armed Forces Communications Association will devote its annual convention to the vital topic of "Global Communications" when it meets, May 19 to 21, 1955 at the Hotel Commodore, in New York City, according to George W. Bailey, its President.

In planning for the largest participation in some years, T. L. Bartlett of RCA, Exhibits Chairman, says that the New York Chapter, which will be the host to the national organization, has made provision for approximately 35 manufacturers exhibits in addition to those of the military services.

A basic schedule of 27,000 Raytheon color television sets to be produced before the end of 1955 has been announced by Henry F. Argento, vice president and general manager of the television and radio operations of the Raytheon Manufacturing Company. Argento said 2,000 of the color sets will be produced during the remainder of this year. They will utilize a 19-inch three-gun color tube, and will sell for $1,095; the schedule calls for 25,000 Raytheon color sets, using a 21-inch color tube, to be produced during 1955.

News from *RETMA* . . . Average weekly production of television receivers during October, a four week reporting period, was at the highest level on record and unit output for the month was second only to five-week September of this year . . . On recommendation of the Service Committee of *RETMA*, President Glen McDaniel recently sent a letter to Mayor Robert F. Wagner of New York City expressing the Association's opposition to the licensing of television set servicemen and offering RETMA's assistance in correcting any TV service abuses. Calling attention to recent newspaper articles concerning actions by the office of the Brooklyn District Attorney in investigating fraudulent practices of TV servicemen, Mr. McDaniel said the spotlight was turned on dishonest practices of a few and inferences were made that this may be the operational pattern of many service technicians . . . The activities of the Radio-Electronics-Television Manufacturers Association in the field of television technician training will be presented in detail during the 48th annual convention of the American Vocational Association in San Francisco Dec. 3-7 . . . Latest *RETMA* dealer-census figures indicate that in less than two years, the number of retail radio and television dealers in the country increased by nearly 12,000.

S. N. Shure, president of Shure Brothers, Inc., manufacturers of microphones and acoustic devices, has announced plans to begin construction of a modern, one-story plant in Evanston, Illinois, a suburb of Chicago. The new building, occupying 80,000 sq. ft. (on industrial property covering 220,000 sq. ft. for future expansion), will serve as the new home for the entire Shure organization. It is expected the plant will be completed in the spring of 1956.

Color-television service meetings have been conducted by Simpson Electric Company in the Los Angeles area and Arizona. The meetings are primarily of the demonstration type, in which a color-TV chassis and suitable test equipment are set up in the meeting hall, and correct methods of testing shown. The new Chromatic Probe and Chromatic Amplifier are among the testing devices which are used, and technicians are instructed in proper methods of checking chrominance circuits with the new devices.

Developments in color TV throughout the nation: RCA's 21-inch, three-gun shadow mask type picture tube is now in production at that company's Lancaster, Pa. plant, and is being made commercially available to TV set manufacturers . . . Motorola's production record for 1954 has approached 10,000 units . . . Manufacturers claim that two main factors inhibiting sales of color sets are the high price of the individual sets and lack of programming . . . Motorola-Philadelphia is offering their 19-inch color TV receiver on a free-trial, free-installation basis to commercial establishments . . . Seymour Mintz, president of CBS-Columbia, purportedly predicts industry will standardize on 22-inch rectangular tube size, rendering the 21-inch size obsolete because of its essentially round configuration.

A new Admiral 17-inch table model television receiver containing "printed circuits" equivalent to over one-half of all normally exposed wiring, has been announced by Stanley Lundy, vice-president-sales, Canadian Admiral Corporation.

This compact, lightweight set, "The Traveller," Model T1802X, weighs only 51 pounds, about 40% lighter than Admiral's previous 17-inch model. It features the new vertical "Printed" Robot chassis with full tube complement recently introduced by Admiral in 21-inch table models, and uses a shorter-length 90° deflection 17 inch tube.

[from page 43]

requirements of 300 microamperes concerns the cut-off characteristic of the tube. This is important because it is directly related to the contrast range of the screen. The lower the bias voltage needed to cut a tube off, the better will be the contrast of a picture on that screen.

Here is how the test is performed. With the selector switch in the Emission position, the Cut-off control is rotated until the meter reads 0 microamperes. If this is achieved with the Cut-off control pointer within the "good" range, then the cut-off characteristics of the tube is good. If the cut-off reading is higher (the pointer is to the left of the "good" position of the scale), the tube may still be usable if its emission current is exceptionally high. However, if the emission current is near 300 microamperes or below and the cut off control does not fall within the "good" range, the tube is bad.

Additional Instrument Functions

Three of the most important functions of the Cathode Rejuvenator Tester is removing inter-element shorts, repairing open elements and restoring emission. Let us consider how each is accomplished.

Removing Inter-Element Shorts:

Put Selector switch in the Dynamic Intensifier-Lo position. Press the Dynamic Intensifier-Lo button for 1 or 2 seconds. An arc should develop between the shorted elements and if successful, you should be able to burn out the short with this arc. After each attempt at removing shorts, the tube is tested for shorts. In attempting to repair the tube, if the arc does not burn out the short in the Dynamic Intensifier-Lo position, an Intensifier-Med position is available and if necessary, a still more powerful Dynamic Intensifier-Hi position. There will be some cases which will not respond to any of these treatments and for these tubes nothing can be done. But many will respond and if tube emission is good, you have a tube which is practically as good as new.

Repairing Open Elements:

If the continuity test shows an open G1 or G2, the probable cause is a bad solder connection at the base pins. For an open G1, try soldering pin #2, and for an open G2, try soldering pin #10.

If the continuity test shows an open cathode, it may actually be a break in the weld between the cathode and its connecting tab, or very weak emission from the cathode. First try restoring emission. If that does not work, you can attempt to weld the cathode tab as follows: Turn the Selector switch to the Dynamic Intensifier-Hi position. With the non-metallic handle of a screw

What Magazines Do Servicemen Subscribe To?

Many magazines *claim* they reach radio-TV-electronic servicemen. Only three, by being members of an *accredited* circulation audit bureau, *prove without question,* just what coverage they really have.

These are the facts! All of the circulation figures shown herein are the actual A.B.C. or B.P.A. *audited* circulation figures which are now current—and represent the true circulation each respective magazine provided its advertisers between January and June 1954.

	Classification	Service Dealer	Service	Technician
1a	Radio, TV or Electronic Independent Service Firms	26,717	25,335	14,861
1b	Service Managers Employed by Above Firms	300	289	84
1c	Technicians Employed by Above Firms	3,077	2,076	1,345
	Total	30,094	27,700*	16,290*
2a	Retailers With Radio, TV Service Departments	18,741	3,274	10,396
2b	Service Managers Employed by Above Firms	628	510	1,001
2c	Technicians Employed by Above Firms	2,551	1,297	2,969
	Total	21,920	5,081	14,366
3a	Part-Time Servicemen	1,282	*	*
3b	Firms Doing Electronics Industrial Servicing Only	1,095	*	*
	Grand Total "Service Category" or "Effective Circulation"	54,656†	32,781	30,656
4	Distributors	1,547	742	1,188
5	All Other Distribution Combined	9,768	17,681	18,084
	Total Average Monthly Distribution Jan.-June 1954	65,706	51,204	49,928

**Both "Service" and "Technician" include their Industrial Electronic Service Firm and Part-time Serviceman coverage in with those shown as classifications 1a, 1b and 1c whereas "Service Dealer" shows them as separate entities.*

†33,084 of this 54,656 "effective circulation" is PAID.

Now you have proof positive that "Service Dealer" has more paid subscribers amongst and reaches every month more radio-TV service firm owners—more retailers having service departments and more industrial electronic service firms than any other publication—and at much lower advertising cost per thousand readers. (Incidentally, effective January 1955 the average monthly circulation of "Service Dealer" will exceed 70,000.)

That's why in 1955—and the years ahead—more of the leading tube, parts, instrument and accessory manufacturers will advertise more dominantly in "Service Dealer" than in any other service field publication . . . to keep more of the nation's servicemen informed of their new products and the merits of their lines.

RADIO-TELEVISION SERVICE DEALER—*published by* COWAN PUB. CORP.

BPA *Main Office: New York City—Branches in Cleveland, Chicago and Los Angeles* driver, tap lightly on the neck of the tube. Watch carefully as you press the Dynamic Intensifier button for a few seconds. If the weld takes, you will see a bright flash. Then the tube is tested for continuity. If the continuity is good, the tube is checked for emission.

Restoring Emission:

Reactivation of the cathode of a picture tube is one of the most important applications of this instrument. Investigations during the design of the instrument revealed that optimum results are obtained when reactivation is carried out in graded steps. Thus, for the initial charge, the Selector switch is set to the Dynamic Intensifier-Lo position. Then the Dynamic Intensifier button is pressed momentarily. After the tube has been treated in this position, its Emission is carefully checked. If the emission current is over 300 microamperes, the rejuvenation of this picture tube has been satisfactorily completed.

It may be that a still greater charge is required to bring the tube back to the desired emission range. For this there are two additional Dynamic Intensifier positions available, each stronger than the first. In one of these two positions the majority of low emission cathodes will be reactivated to a useful level. However, there will admittedly be some instances where nothing the instrument does will cause the tube to return to normal. In those cases the tube is useless.

Life Test Function of Tester

A unique feature of this cathode Rejuvenator Tester is its ability to indicate the approximate life expectancy of picture tubes. This particular test is based on the mass of the emitting material that is in the cathode and also on the amount of gas present in the tube. The instrument is so designed that the life of a picture tube is directly proportional to the manner in which the needle falls to zero when the Life Test push button is depressed. If the meter reading falls rapidly to zero, there is either a considerable amount of gas in the tube or there is only a small mass of active emitting surface left. In either case, the expected life of the tube is quite short. On the other hand, a momentary pause and then a slow descent of the needle will indicate a fairly long life. A serviceman, by practicing on several new and several gassy tubes, will soon be able to determine with a fair amount of accuracy which tubes have a long useful life and which can be expected to die out shortly. Here is a valuable piece of information, both to the technician and the customer.

INTERFERENCE

[*from page 20*]

aerial lead or others under the dashboard brings about an increase or decrease in the interference it is advisable to investigate all leads that can cause such a change, particularly the antenna lead terminal which should be checked for a poor or open connection.

There are other components in the receiver itself which if defective can give rise to ignition interference as described above. The following discussion will show how this is brought about. From *Fig. 5* it can be seen that the aerial and lead-in are designed as a definite part of the *rf* tuned circuit. This also includes the lead-in cable. The latter has a specified dimension that is part of the total input capacitance and inductance. In fact, the type of cable used and its inherent capacitances and inductances should be as originally designed for best alignment of the *rf* stage.

Going one step further it might be pointed out that noise pickup often can be reduced if the antenna stage is properly aligned. The auto radio is designed by most car manufacturers to have the aerial fully extended when the *rf* stage is aligned. However, it is generally possible to touch up the aerial trimmer with the aerial collapsed; but maximum sensitivity cannot be obtained under these conditions. Therefore, when aligning the antenna stage be sure to align the receiver with the antenna extended to a length generally used by the customer.

In *Fig. 5*, *Ca* is shown as the added capacitance of the dipole antenna, and *Cg* the capacitance of the lead-in. Coils, *La* and *Lb* (usually 3 microhenry) in conjunction with the condenser *Cb* comprise an ignition noise filter. *Ct* is the aerial trimmer and is also used for *dc* blocking purposes to prevent the *agc* voltage from appearing on the antenna. The tuning coil is *Lp*, a permeability type. All of these components are part of the input circuit and can effect the tuning and interference filtering. However, since *La* and *Lb* are very small in value it is often possible for these coils to have a shorted turn and not appreciably reduce the *rf* sensitivity. This would permit ignition noise to pass into the *rf* circuits and then onto the mixer circuit. *Cb* and *Cv* are components that should not be overlooked when looking for trouble in this circuit.

The filter chokes as shown in *Fig. 5* are designed to be effective at the *rf* frequencies that the ignition system produce. The best check of these choke coils is to substitute a proper replacement part. Service literature usually provides resistance values for the *rf* chokes. However, because of considering allowable tolerance of these chokes and the inaccuracies of most ohmmeters at low resistances, a resistance check is found wanting, and may postpone the completion of the repair. Unquestionably, the best check is to substitute a new choke for the suspected one.

In addition to the above, there are other components associated with the power or "A" lead that can cause ignition interference if they fail. Referring to *Figure 6* we observe a condenser known as a spark plate or feed-through type because of its construction. This condenser is used because other types would have too much inductance at high frequencies for this purpose. Associated with the condenser we usually find a choke coil. The condenser generally has one plate, the outside ground connection being riveted to the radio housing. If this rivet becomes loose ignition noise will be heard. The choke coil is seldom found to be defective unless too much current has been drawn through it. If this happens the insulation and covering will be visibly charred.

As pointed out previously one of the important tests is to make sure that all ground points are fastened securely. If there are two chassis making up the car radio both of them should be bonded to the frame of the car as well as to each other.

A NEW INSTRUMENT

[from page 16]

manent. But, since many shorts are caused by foreign material within the tube envelope it is quite possible that new shorts may form at a later date.

The Cathode Beamer should be a welcome addition to many shops, because it will enable them to repair sets for their customers at much lower costs than would be involved in tube replacement. At the same time the shop can make good profits, because the amount of time involved in the use of the Cathode Beamer is relatively slight. From the overall viewpoint, the Cathode Beamer will not result in fewer picture tube sales, since it can only postpone rather than eliminate picture tube replacement. The shops now using this new instrument are reporting excellent results from its use. It is one of many pieces of test equipment that actually pays for itself.

H.O.T. TESTER

[from p. 21]

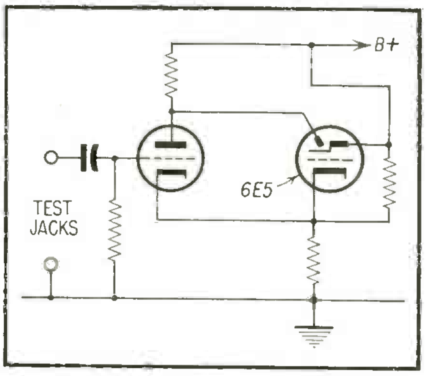


Fig. 3 — Resonance indicator.

sector which has been determined by testing a great many makes and models of sets.

Application

The method of connecting the checker for determining the self-resonant frequency of the horizontal plate load is done by attaching one of the two test leads to the TV chassis and the other to the primary plate lead going to the horizontal amplifier tube plate. The frequency control knob is scanned and if the eye tube opens in the "FB-OK" sector, the coil components can be considered to be OK. Should the eye tube fail to open at all, it would indicate severe transformer loading either in the transformer itself, a faulty width coil or a faulty yoke. In this case then the process of elimination starts. If the transformer by itself is OK, the eye tube will open in the transformer sector. Stock transformers and yokes can be checked for inductance by the comparison method. With the "Selector" switch in the "yoke" position, the approximate inductance range is from 5 *mh* to 250 *mh*. 50 *mh* will read on the dotted line separating the transformer and yoke sector. The "Selector" switch connects a 270 $\mu\mu f$ capacitor across the output jacks in "yoke" position.

By knowing that the flyback resonant frequency is correct, it also verifies transformer and yoke matching. This in-

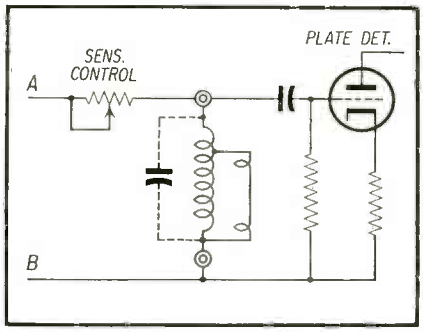
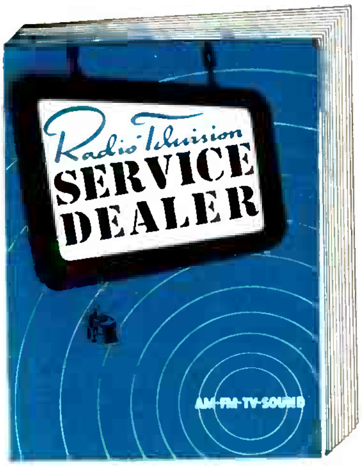


Fig. 4 — How coils are connected.

This is your last chance to obtain a

2-Year Subscription only $1⁰⁰

Effective March 1, 1955 a 2-yr subscription will cost $2—a 1-yr subscription $1.00



NOW AVAILABLE TO . . .

1. Servicemen who are employed by Service Organizations.
2. Servicemen employed by radio/TV Dealers.
3. Independent servicemen who do not have business establishments.
4. Employees of Distributors.
5. Students enrolled in accredited Radio/TV Schools, Colleges, etc.
6. Hobbyists and Experimenters.

A TYPICAL ISSUE COVERS

- Video Speed Servicing Systems
- Rider's "TV Field Service Manual" data sheets
- Latest TV Installation and Maintenance Techniques for VHF and UHF
- Auto Radio Installation and Service
- Advanced Data on New Circuitry
- Production Changes and field service data on receivers

- New Tubes
- New Test Equipment, operation and application
- Hi-Fi Installation and service
- New developments, such as transistors, color, UHF, etc.
- News of the trade
- Service Short Cuts & Shop Notes
- Explanation of difficult circuits

and many more EXCLUSIVE . . . ORIGINAL . . . AUTHORITATIVE . . . TIMELY . . . FULLY ILLUSTRATED subjects that can ONLY BE READ IN "SERVICE DEALER"

This order form good only until March 1, 1955. After that date a 2-yr subscription will cost $2.

RADIO-TV SERVICE DEALER

67 W. 44 St., New York 36, N.Y.

☐ NEW ☐ RENEWAL

Gentlemen: Here is $1.00 for which enter my 2-year subscription. (This rate applies in USA only. Elsewhere add $1 per year)

Name ....

Address ....

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

Employed by (Name of firm) ....

Firm's business address ....

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

Your Position or Title ....

Check whether firm is: ☐ Service Organization or ☐ Dealer having Service Dept.

If some other type of company describe: ....

IF STUDENT, Name of School ....

formation is especially useful when installing replacement flyback transformers.

Other inductances can be checked by the comparison method by adding a fixed capacitor across the coil under test so that the combination will tune within the frequency limits of the checker. (Note: This capacitor should be ten times or larger than the distributed capacity to minimize error.) Example: To check a ringing coil, place a .001 or .002 μf capacitor across the coil to make it resonant in the upper part of the transformer sector. The TV technician is always on the lookout for a good time saver and in all sincerity a good coil checking device will be welcomed on his bench.

COLOR

[*from page 12*]

sidered in the analysis, any color or combination of colors chosen would produce the same results.

To help the reader visualize the demodulation process of the I and Q color signals (that make up the red bar under discussion) along a pair of I and Q references axes *Fig. 11* is provided. Here we see a pair of correctly phased I and Q reference voltages which have been produced by the local 3.58 *mc* oscillator. Notice that the incoming

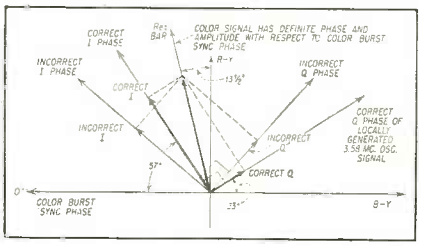


Fig. 11—If locally generated 3.58 *mc* signal phase is correct, the component values of I and Q taken off the incoming signal will also be correct (as shown in heavy lines). If 3.58 *mc* signal phase is incorrect, the component values of I and Q will be incorrect.

signal develops I and Q components along the locally generated demodulating axes, these components being the original I and Q signals developed at the transmitter.

On the other hand incorrectly phased locally generated reference axes produce incorrect values of I and Q. This naturally results in the production of incorrect colors as seen on the picture tube screen.

Color-Difference System Analysis

In an R-Y/B-Y system the in-phase and quadrature signals from the locally generated 3.58 *mc* oscillator have the phases shown in *Fig. 12*. Notice that the in-phase signal lies along an R-Y axis, and the quadrature reference phase lies along a B-Y axis. The incoming signal, R = 0.645V, will then be processed so that a correct R-Y component is demodulated on the R-Y axis of the local oscillator, and a B-Y component is demodulated on the B-Y axis of the local oscillator.

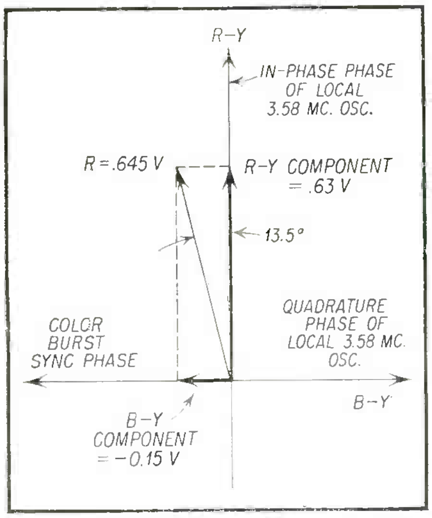


Fig. 12 — Demodulation of red color signal in an R-Y/B-Y system.

We are now ready to analyze the progress of the color signals developed along the R-Y and B-Y axes. This analysis is made with the aid of the simplified block diagram of a color-difference system as shown in *Fig. 13*.

Referring again to *Fig. 12*, we observe that R = 0.645V. It can easily be shown mathematically that its component along the R-Y axis is equal to 0.63V. This voltage appears at the output of the R-Y demodulator.

Similarly, the B-Y component of the color signal is –0.15V. This value appears at the output of the B-Y demodulator.

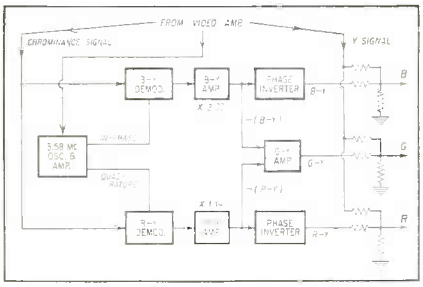
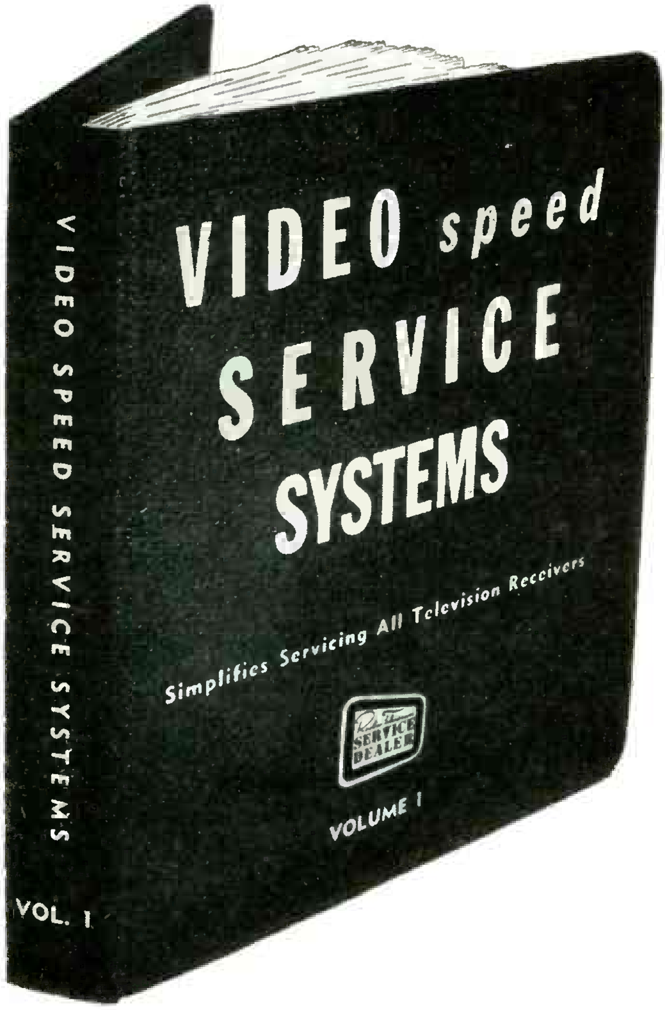


Fig. 13 — Block diagram of an R-Y/B-Y demodulation system.

It should be recalled at this time that the original R-Y signal at the transmitter was compressed, that is, it was divided by 1.14, and the B-Y signal likewise divided by 2.03. This was

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 ....

done in order to prevent overmodulation of the *rf* carrier on certain colors.* In order to restore the color-difference signal to their original relative values we process them at the receiver by multiplying the received R-Y signal by 1.14, and the B-Y signal by 2.03. This is done by suitable adjustments of the circuit constants in the respective color-difference amplifiers shown in *Fig. 13*.

The new B-Y signal now becomes:

$$B\text{-}Y = -0.15 \times 2.03 = -0.3V$$

Similarly, the new R-Y signal becomes:

$$R\text{-}Y = 0.63 \times 1.14 = 0.7V$$

At this point the G-Y signal may be obtained by mixing the following amounts of B-Y and G-Y (see Table 1, (12).

$$\begin{aligned} G\text{-}Y &= -0.51(R\text{-}Y) \; -0.19(B\text{-}Y) \\ &= -0.51 \times 0.7 \; -0.19(-0.3) \\ &= -0.357 + 0.057 = -0.3V \end{aligned}$$

The luminance or Y signal remains unchanged in the color-difference system, and is equal to 0.3V. The Y signal, added to the various color-difference signals produces the following results:

$$R = (R\text{-}Y) + Y = 0.7 + 0.3 = 1 \text{ volt}$$
$$B = (B\text{-}Y) + Y = -0.3 + 0.3 = 0$$
$$G = (G\text{-}Y) + Y = -0.3 + 0.3 = 0$$

Thus the correct color signal voltages are reproduced at the color picture tube grids.

A question that might arise at this point is why the factors, 1/2.03 and 1/1.14 were not used in the color-difference signals derived from I and Q. The answer is that the relationships given in formulas 6, 7, and 8 of Table 1 already include these factors.

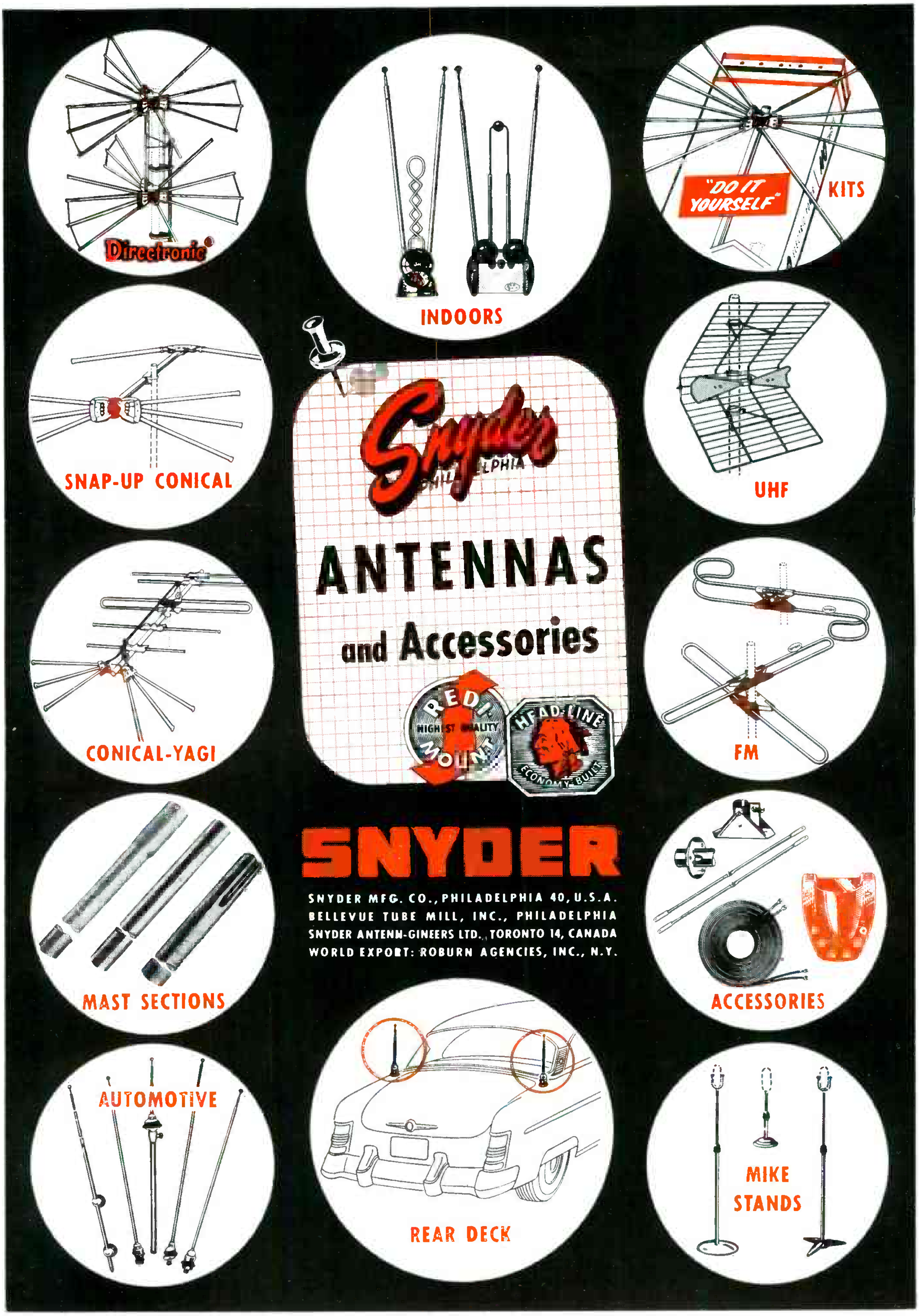
In comparing the I/Q and color-difference systems we might point out the fact that while it is true that the higher color video frequencies (0.5 to 1.5 *mc*) are not reproduced in a color-difference receiver, subjective analysis at the present state of the art seems to indicate little difference in the viewing acceptance of both systems. It really is difficult to distinguish one from the other.

In addition, the elimination of the 33° tuned phase shift circuit required in I/Q demodulation, plus the elimination of the I delay line in the I demodulator output, plus the greater gain possibility of reduced color frequency circuits, plus the possibility of direct matrixing of the R-Y/B-Y signals in the color picture tube; all these factors have contributed toward a definite trend to color-difference receivers.

* RTSD Oct., 1954—"Block Diagram Analysis of Color Transmission and Reception"—p. 16 (Reduced Color Difference Signals)

[To be continued]

Advertising Index


Directronic
INDOORS
"DO IT YOURSELF"
KITS
SNAP-UP CONICAL
UHF
Snyder
PHILADELPHIA
ANTENNAS
and Accessories
REDI MOUNT
HIGHEST QUALITY
HEAD-LINE
ECONOMY BUILT
CONICAL-YAGI
FM
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.
MAST SECTIONS
ACCESSORIES
AUTOMOTIVE
REAR DECK
MIKE STANDS

GET ERFORMANCE

From TV-Deflection and High-Voltage Circuits . . .

Use RCA TUBES . . . with built-in quality!

Better performance and longer life are *built into* each RCA Tube. In TV Deflection and High-Voltage Circuits, RCA Tubes operate with high efficiency. That's because rigid structural specifications help them to deliver the required currents or to withstand the high voltages. For instance, on the new RCA 6BQ6GTB/6CU6 striking structural changes have produced a decidedly uniform temperature radiation and new cathode material assures greater reliability. You get greater deflection and higher efficiency. RCA's severe dynamic life tests simulate actual operating conditions and help assure you better-performing, long-life tubes.

When you replace with RCA Tubes, your customers are sure of dependable performance. Insist on genuine RCA Tubes for *all* your service work!

RADIO CORPORATION of AMERICA
ELECTRON TUBES — **HARRISON, N.J.**

First Choice for TV circuits . . . dependable RCA Tubes!