DECEMBER, 1953

Radio-Television SERVICE DEALER

TV - AM - FM - SOUND

Includes: "VIDEO SPEED SERVICING"
"TV FIELD SERVICE" Data Sheet Sections

The Professional Radio-TVman's Magazine

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


TRIO proudly announces
The New ZIG-ZAG
"TWIN-SIX"
(A significant addition to the Zig-Zag line)

. . . the greatest advance ever made in ALL-CHANNEL antenna design!

Not content to bring out just another all-channel antenna, TRIO studied and tested every other model available. Months of research produced the "Twin-Six", a Zig-Zag that provides all of the desirable features indicated above. Quantitative ratings for antennas are practically meaningless because of some exaggerated claims. For this reason, the "Twin-Six" is announced without the usual gain charts. The new "Twin-Six", however, equals and, in most cases, greatly exceeds the gains of these antennas on *every* channel. For instance, the "Twin-Six" showed a 2 to 6 db higher gain than a competitive antenna which is advertised as having a 12 db gain.

MINUTE-UP ASSEMBLY

There's no antenna easier to assemble. Shipped with all hardware mounted on the boom. Complete assembly consists of matching elements to color coded insulators and snapping on spring clips. Improper assembly impossible.

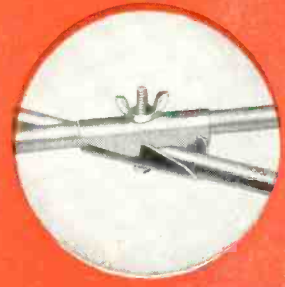
NEW ZIG-ZAG "TWIN-SIX" OFFERS:

Measurable Higher Gain On All VHF Channels Than Any Other Single Bay All-Channel Antenna

PLUS

1. One Horizontal Bay Does It All!
2. Single Lead-In Operation!
3. Easy-Up, One Minute Assembly!
4. Rugged Construction Throughout — No Droop, No Sag! Light Weight — Attractive Appearance!
5. UHF Reception For All Primary Areas!
6. Low Standing Wave Ratio!
7. Built and Backed by TRIO — A Name You Can Trust!
8. Competitively Priced!

Insulators come mounted on boom and are so designed that "shorting-out" is impossible. Antenna elements mounted merely by snapping on the spring clips.

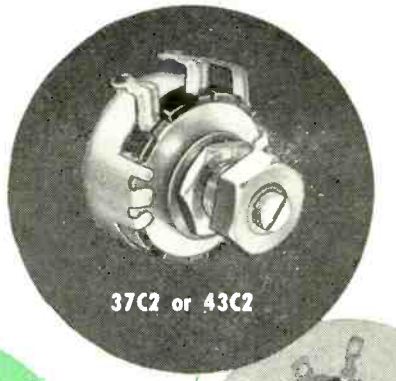


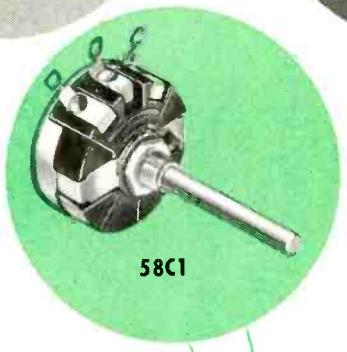
Pre-assembled high channel elements are swung into position and quickly locked by mating brackets.

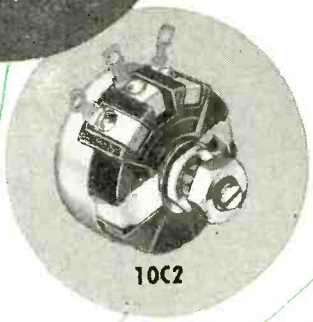
Team the new Zig-Zag "Twin-Six" with the dependable TRIO rotator for the maximum in TV enjoyment!

TRIO

MANUFACTURING CO. GRIGGSVILLE, ILL.







Where better-than-standard components are desirable . . .

CLAROSTAT

C-Line Controls

A new line of composition-element and wire-wound controls designed specifically for custom-built, industrial, laboratory or other semi-critical applications. These controls are *de luxe versions* – mechanically and electrically – of the popular Clarostat standard types widely used in radio-TV sets and for the servicing thereof.

With factory-assembled fixed 1⅝" round shaft (C1) or ⅛" screwdriver-slot shaft (C2) with split locking bushing.

All exposed metal parts have corrosion-resistant finish. Terminals have suitable finish for ease of soldering.

Close-fitting covers — no holes or cut-outs. Maximum protection against dust and dirt.

Ratings: 37C1 and 37C2 composition-element, 1 watt; 43C1 and 43C2 wire-wound, 2 watts; 58C1 and 58C2, 3 watts; 10C1 and 10C2, 4 watts.

Electrical tolerances plus/minus 10% for composition-element controls up to 100,000 ohms; plus/minus 20% from 100,000 ohms to 10 megohms.

Wire-wound controls within plus/minus 5% in all ohmages. Independent linearity to plus/minus 1% for 58C1 and 58C2, and 10C1 and 10C2 controls; for 43C1 and 43C2, plus/minus 2%.

Available with switches on special order.

Units sealed in dustproof plastic bags within standard Clarostat cartons. Factory-fresh appearance and condition, regardless of shelf life.

STAND PAT WITH CLAROSTAT

If you want still better-than-standard quality, performance and life, insist on Clarostat C-LINE controls.

CLAROSTAT Controls & Resistors

CLAROSTAT MFG. CO., INC., DOVER, NEW HAMPSHIRE

In Canada: Canadian Marconi Co., Ltd., Toronto, Ontario

Every Service Firm Owner in the U.S.A.
Receives **SERVICE DEALER** *Monthly*
DISTRIBUTION THIS ISSUE OVER 63,000

COWAN PUBLISHING CORP., 67 West 44th Street, New York 36, N.Y.
VOL. 14, NO. 12 DECEMBER, 1953

FEATURE ARTICLES

CIRCUIT AND SERVICE DATA

DEPARTMENTS

Note: Our annual index, listing all items that have appeared in RTSD during the year of 1953, will will be printed in our next issue, January 1954.

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EDITORIAL...

by S. R. COWAN
PUBLISHER

TELECAST OF COLOR

WITHOUT advance publicity, on October 31st WNBC-TV, (Chan. 4, N.Y.C.), presented Bizet's "Carmen" in full color, using the newly approved technical specifications of the National Television System Committee, and with permission of FCC.

Those people who had color TV sets in several sections in and near New York City, for test purposes, reported without exception that the telecast came in superbly. Many also opined that in comparison to monochrome (black & white) reception the color TV program was so far superior and so much more enjoyable that it would merely be a question of time before monochrome would be obsolete. That's logical, for if one had the choice of viewing the same motion picture in either monochrome or color, naturally the color version would get preference, all other factors being equal.

But the more important aspect of the unpublicized color telecast experiment was the fact that the general public who viewed the opera at home on their monochrome receivers, (not knowing it was being telecast in color), did not get inferior reception. In other words, the compatible system devised by NTSC works beautifully. Now it is believed that FCC approval will be granted before long.

However, as we have stated frequently, should FCC give color its okay, the fact remains unchanged, color TV sets will not reach the public in any appreciable quantity for many months. In the interim, services would be wise to assimilate all the information of *reliable nature* that they can obtain regarding color TV. To date practically nothing of importance or value to servicemen has been published on the subject, and when the material is available this journal will be the first to release it.

COLOR TV'S PROBLEMS

AS yet television manufacturers themselves frankly admit that they still have much to learn about the phenomena and idiosyncrasies associated with color TV reception. Thus fortified they also admit that color TV may give the servicing profession many heartaches too, though they hope to circumvent that as much as possible by passing on to us in the service field pertinent information as and when they get it.

One "expert" whose opinion we highly regard tells us that he believes the very success of color TV public acceptance may rest in the hands of the Service Profession. For example, according to this well-informed friend, color set antenna installations cannot be handled in the same manner as monochrome installations. (They're as unlike each other as UHF and VHF). We'll amplify this: We all know that at present most home TV sets pick up 2 or 3 stations beautifully and at the same time fall off a bit on the other receivable signals. For sake of clarification let's say that the other 2 or 3 stations come in with a bit of a "ghost". Yet the "ghosts" in most cases are so minor as to be acceptable, or as our expert informant put it: "they are tolerated by the eyes without excessive offense." However, in regard to color TV—absolutely *no ghost effect whatever can be tolerated* on any station, in our friend's opinion. He maintains that "ghosts" in a color receiver have a tendency toward spoiling the picture to the extent that it would not be *tolerable* to the normal viewer.

The solution to this problem is not yet at hand. Possibly new antennas, or new circuitry design might help. But from a practical viewpoint it would seem to us that much of the solution lies in being able to orient properly the receiving antenna. Yes, we believe that *every* new home TV antenna installation (regardless of where it is, city or fringe, near or far from transmitter), made from this point on should include an antenna rotating device. Ultimately in signal areas of 4 or more stations it might be necessary to have two antenna installations, *each with its own rotator.*

THE CUSTOMERS WRITE

ONLY a few days ago our November issue reached a small part of its total of 64,000 distribution. But already our desk is loaded with hundreds of complimentary letters. Most praise the over-all fine text content and of course many allude to the new section "TV Field Service" by John F. Rider. Some hailed it and the "Question & Answer" department as being "the greatest contributions to servicing by any magazine in years." With humble pride we acknowledge with thanks, by means of this editorial, all of you correspondents who were so cordial and nice in writing us. At the same time we promise that even better helps to the Service Profession are in preparation for immediate release in future issues of *"Service Dealer."*

the C·D·R Rotor

sells faster...sells easier

because.....

The best line of TV Rotors money can buy

It is the complete line of quality rotors, with a model and type to best serve 'most every type application.

TV Spot Campaign

To reach the buying public, an intensive campaign on Television in key markets pre-selling CDR ROTORS for you.

Newspaper Advertisements

Also directed at the consumer, a supporting campaign in key city newspapers exploiting the advantages of the CDR ROTOR.

Moving Displays

It's causing excitement everywhere, this display that is an eye and traffic stopper, a silent salesman for the CDR ROTOR.

Envelope Stuffers

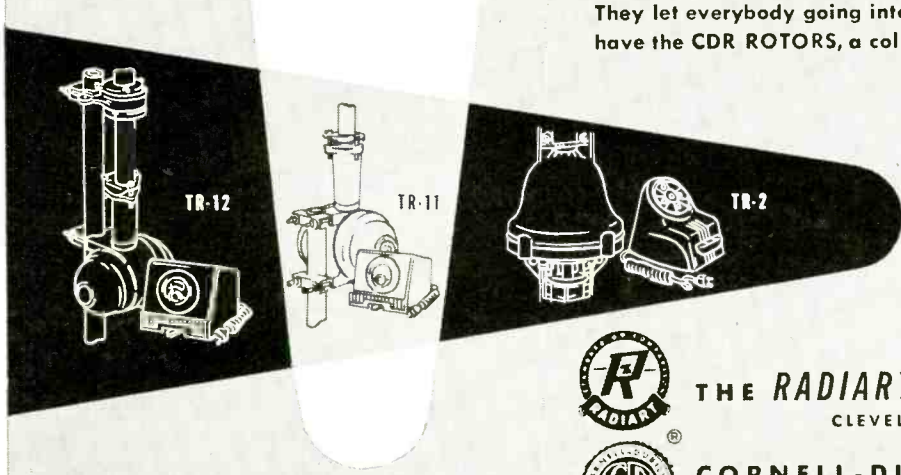
Here's another selling tool that may be mailed directly to your customers, selling them the CDR ROTOR in their home.

Newspaper Mats

A full set of completely prepared advertisements for dealers and distributors to capture extra CDR ROTOR business.

Window Streamers

They let everybody going into and by your store know that you have the CDR ROTORS, a colorful and eye-catching streamer.



THE *RADIART* CORPORATION
CLEVELAND 13, OHIO

CORNELL-DUBILIER ELEC. CORP.
SOUTH PLAINFIELD, NEW JERSEY

Mister Service Organization Owner

A suggestion by:

Here's a sure way to speed up your shops service volume and increase your profits!

We do *not* want you to buy a subscription to "Service Dealer." We won't accept such an order if you send it in because under our new controlled circulation policy we send a copy of "Service Dealer" every month to every established radio-TV service firm owner in the USA without cost or obligation.

However—much of the nation's actual radio and TV service work is done by employed technicians—the installers, the field servicemen, and the bench men who work for you—and for service shops like yours.

Your field and bench technicians must be kept abreast of the latest servicing techniques—they must have at hand *for their own reference and use* speed-ups to servicing such as "VSSS' data sheets and Rider's "TV Field Service Manual" data sheets. Every issue of "Service Dealer" is chock-full of exclusive technical data that is invaluable to all servicemen—shop owners and employed technicians alike.

All the material published in "Service Dealer" enables servicemen to do their work more efficiently, in less time, and by simpler means. The more speed and productivity a technician has—the more jobs he can do in a working day—with the end result that employed technicians will earn more for their employers, and employers in turn will be able to pay their technicians better wages out of increased profits.

Now "Service Dealer" welcomes and accepts 2-year paid subscriptions from all employed radio-TV technicians for only $1.00. (2-year subscription is 24 issues.)

You shop owners should tell your employed technicians about our new policy. Show your employees the copy of "Service Dealer" we're sending to you. They'll see at a glance how fine our text material is. They'll want to receive *their own* copy of "Service Dealer" every month. Perhaps you might want to buy subscriptions for your technicians as it's a tax deduction expense. Or, you might want to split the cost of the subscription with them. The important point is this:—it will pay you, and it will pay your technicians, to get "Service Dealer" every month!

EMPLOYED TECHNICIANS—TEAR OUT—USE THIS COUPON

EMPLOYED TECHNICIANS — 24 ISSUES for $1.00

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.

Name .....

Address .....

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

Employed by (Name of firm).....

Firm's business address .....

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

Your Position or Title .....

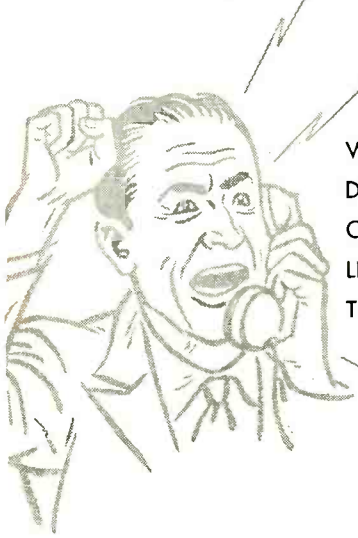
Check whether firm is:

☐ Service Organization or ☐ Dealer having Service Dept.

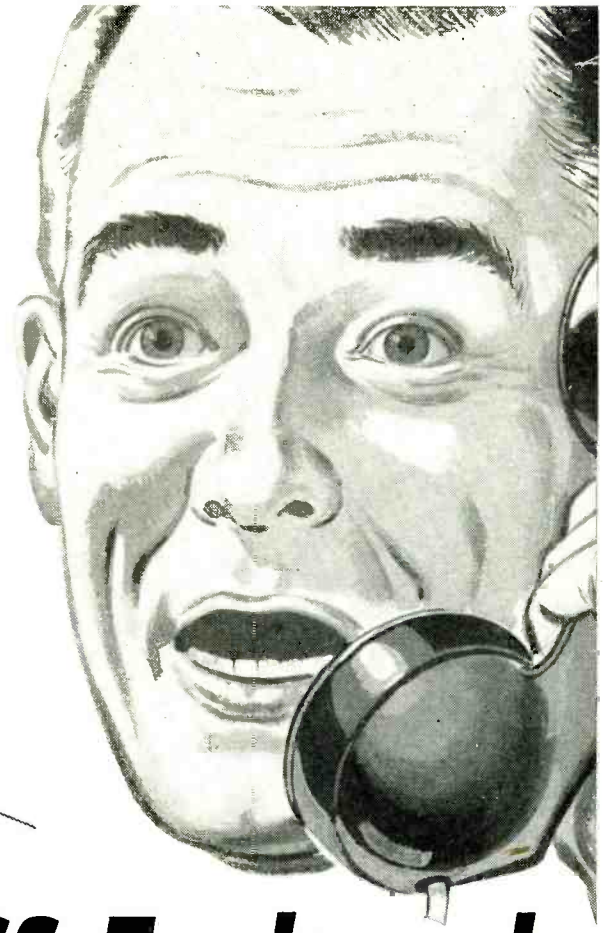
If some other type of company describe:.....

(If a group of sub. orders are being sent, simply type the list—give each man's title)

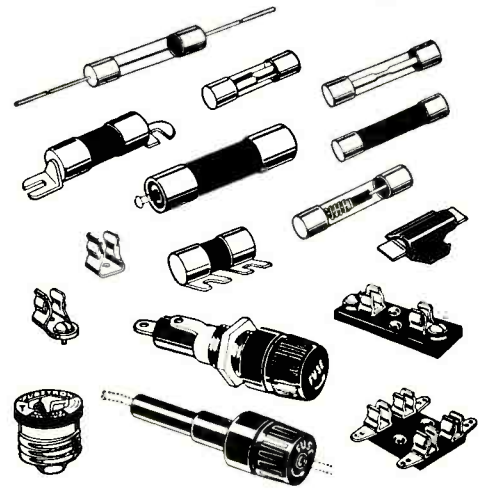
The Quality of Your Service can be no better than the Quality of the Parts You Handle



WHEN POOR QUALITY OR FAULTY DESIGN OF A COMPONENT PART CAUSES TROUBLE—YOU ARE MORE LIKELY TO GET THE BLAME THAN THE MAKER OF THE PART.



In Fuses the BUSS Trademark represents unquestioned High Quality!



Why take a chance with your goodwill, reputation and profits when BUSS and FUSETRON Fuses are available?

To maintain highest quality ***every BUSS and FUSETRON fuse used by the electronic industries is electronically tested.*** A sensitive testing device rejects any fuse that is not correctly calibrated, properly constructed and right in all physical dimensions.

BUSS quality means dependable electrical protection under all service conditions and — BUSS quality means fuses that blow to protect — never needlessly.

That's why for over 38 years it has just been good business for distributors and service organizations to handle only BUSS Fuses — the KNOWN brand.

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

FOR MORE INFORMATION *Mail this coupon*

BUSSMANN Mfg. Co. (Division of McGraw Electric Co.)
University at Jefferson, St. Louis 7, Mo.
SD-1253

Please send me bulletin SFB containing facts on BUSS small dimension fuses and fuse holders.

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*City & Zone*_____ *State*_____ 1253

famous **telrex** **4-BAY**

"CONICAL-V-BEAMS"®

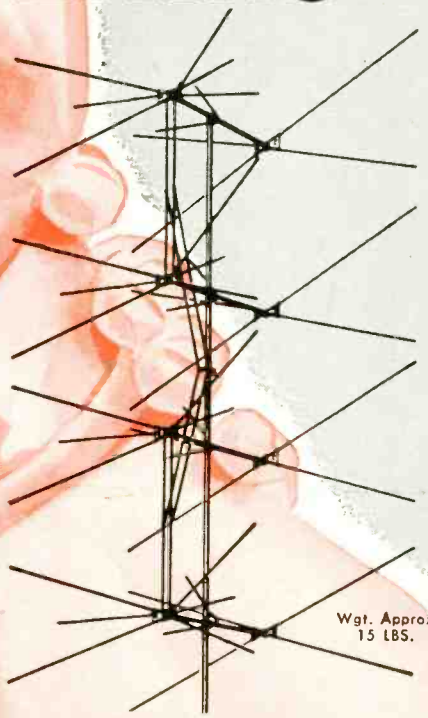
—the acknowledged champion in 1948 and STILL CHAMPION!

Install genuine Telrex "Conical-V-Beams," the Patented uni-directional, one transmission line array. Models for Ch. 2 to 13 or Ch. 2 to 83. See and hear the difference!

If UHF is available or expected, install Telrex "Duo-Band Conical-V-Beam" series. The perfect for rotation hi-gain . . . hi-F-to-B all-band one transmission line array with automatic transition from low to hi band with no lossy "distribution" pads.

"Conical-V-Beams" are designed for easy stacking as required for your particular reception area. 1 bay "C-V-B" for pri-area, 2 bay "C-V-B" for sec-area, 4 bay "C-V-B" for fringe areas.... If a 4 bay "C-V-B" does not provide a usable TV picture, TV reception is either impossible or impractical!

Broadbanded single channel highest gain hi-F-to-B yagis also available from Telrex Antenna Headquarters, builders of world renowned communication yagis for amateur or commercial use.

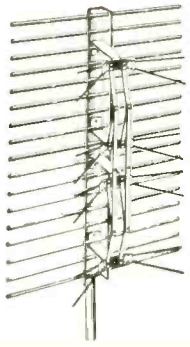


Wgt. Approx. 15 LBS.

CHAMPION-FOR-DISTANCE

MODEL 8X-TV*

The Ultimate in long distance arrays. Guaranteed to out-perform any antenna or combination of cut-to-frequency antennas. When used with Duo-Band splines it comprises the ultimate from Ch. 2 to 83. Unequalled for reception up to 200 miles.



ULTRA-HI GAIN UHF

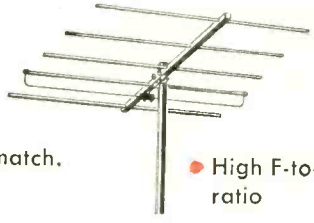
"CONICAL-V-BEAM" MODEL 84

- Four bay uni-directional array
- All in-phase signal addition at all frequencies with no lobe splitting
- All-aluminum light weight and rugged

PRE-ASSEMBLED, PRECISION TUNED

5-ELEMENT YAGI

- High gain, broad-band response
- Excellent 300 ohm impedance match.



- High F-to-B ratio

WRITE FOR COMPLETE TELREX BULLETINS, TODAY!

telrex INC. BETTER BY DESIGN

"CONICAL-V-BEAMS"

*PATENTED

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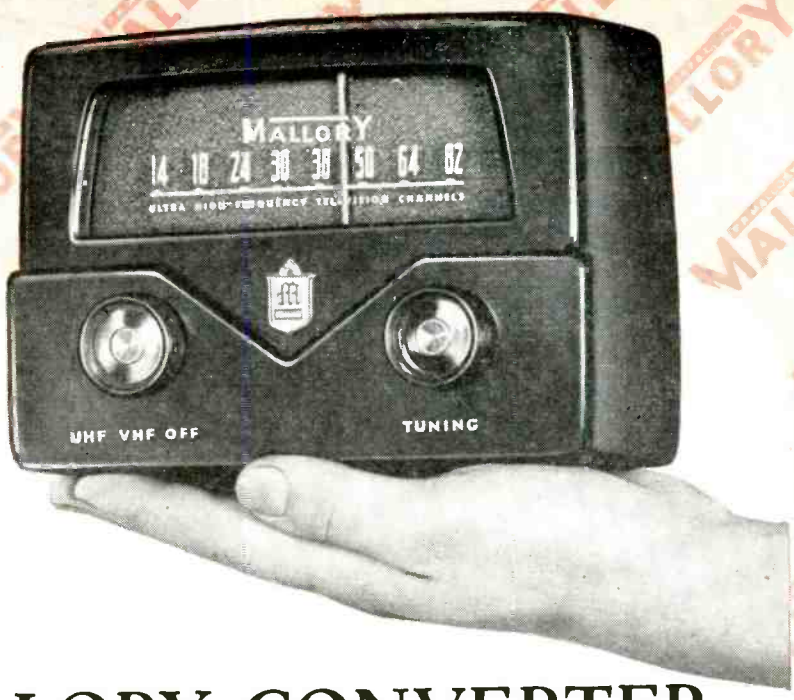
Insist on a genuine "Conical-V-Beam." Look for the Telrex Trade-Mark!

Depend on Mallory
for
Approved Precision Quality



The sales leader—
proved in every UHF area

Now...

The MALLORY CONVERTER Packs *ALL* Features in Half the Size!

The new Model 88 has these important Sales Advantages originated by Mallory:

Less than half as large . . . measuring only 7⅝″ wide x 5⁹⁄₁₆″ high x 4⅝″ deep . . . yet full Mallory quality.

It has linear tracking. Tuning is easier, more exact than ever. No bunching of channels.

The Preselector in the new 88 protects against image interference, oscillator radiation and interference at the IF frequency. It insures better selectivity.

The Mallory 88 Converter adds *all* UHF channels to *any* TV set without sacrificing a single VHF channel.

Design refinements and precision quality of the 88 assure high quality picture definition and easy tuning.

The customer has nothing more to buy, no adjustments to make for additional new channels . . . even if he moves to another area.

Installation is easy. It only takes a few minutes to connect the antenna and power leads from the Converter to the set. It can be done right in the customer's home.

ASK YOUR MALLORY DISTRIBUTOR *for complete details of the new, handsome, compact Model 88 Converter. It can be your answer to bigger profits . . . just as all Mallory Converters have been for dealers in areas where UHF is already on the air.*

P.R. MALLORY & CO. Inc.

MALLORY

CAPACITORS • CONTROLS • VIBRATORS • SWITCHES • RESISTORS
RECTIFIERS • POWER SUPPLIES • FILTERS • MERCURY BATTERIES

APPROVED PRECISION PRODUCTS

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

W. L. PARKINSON, Manager
Product Service, General Electric Co.

In this second in a series of guest editorials, we learn what a factory service manager does and how his department ties in with the work of the service man.

RETAIL dealers and servicemen often ask me: "What are the responsibilities of a factory service manager?; What are the functions of a factory service department?" The factory service manager provides a definite service in helping to produce satisfied customers. I believe the situation at General Electric is typical of this important job in any radio-television manufacturing organization.

The factory service manager's broad responsibilities are as follows:

1. Formulation and enforcement of service policy.
2. Preparation and publication of technical information.
3. Field engineering.
4. Operation of factory service shop.
5. Quality control.
6. Consumer relations.

The service manager operates at staff level and is responsible for formulating recommended policies to be adopted by management with respect to service responsibilities. Upon approval and adoption of such policies it is the service manager's duty to enforce the policy.

The timely preparation and publication of service notes, service bulletins, customer operating instructions and pertinent technical information is a most important function of the service department. This group keeps the field advised on technical problems; supplies information on replacement parts, production changes and field modifications. Close coordination between this group, engineering, field engineering, quality control, and the parts department, is necessary for efficient operation of each of these sections.

The field engineering group is responsible for training of distributor and dealer technical personnel and provides assistance to distributors in establishing and maintaining adequate service in the field. This group advises the wholesale distributor on replacement parts stock, processes claims for defective parts returned and keeps the factory advised on all technical problems encountered in the field. This group is also responsible for field testing new products before production. The factory engineering and manufacturing sections lean heavily on the advice and council of these men in the field. Close coordination between field engineering, technical publications, quality control and the parts department is required for maximum efficiency of the service department.

A small service department is maintained at the factory to handle problems reported from the field.

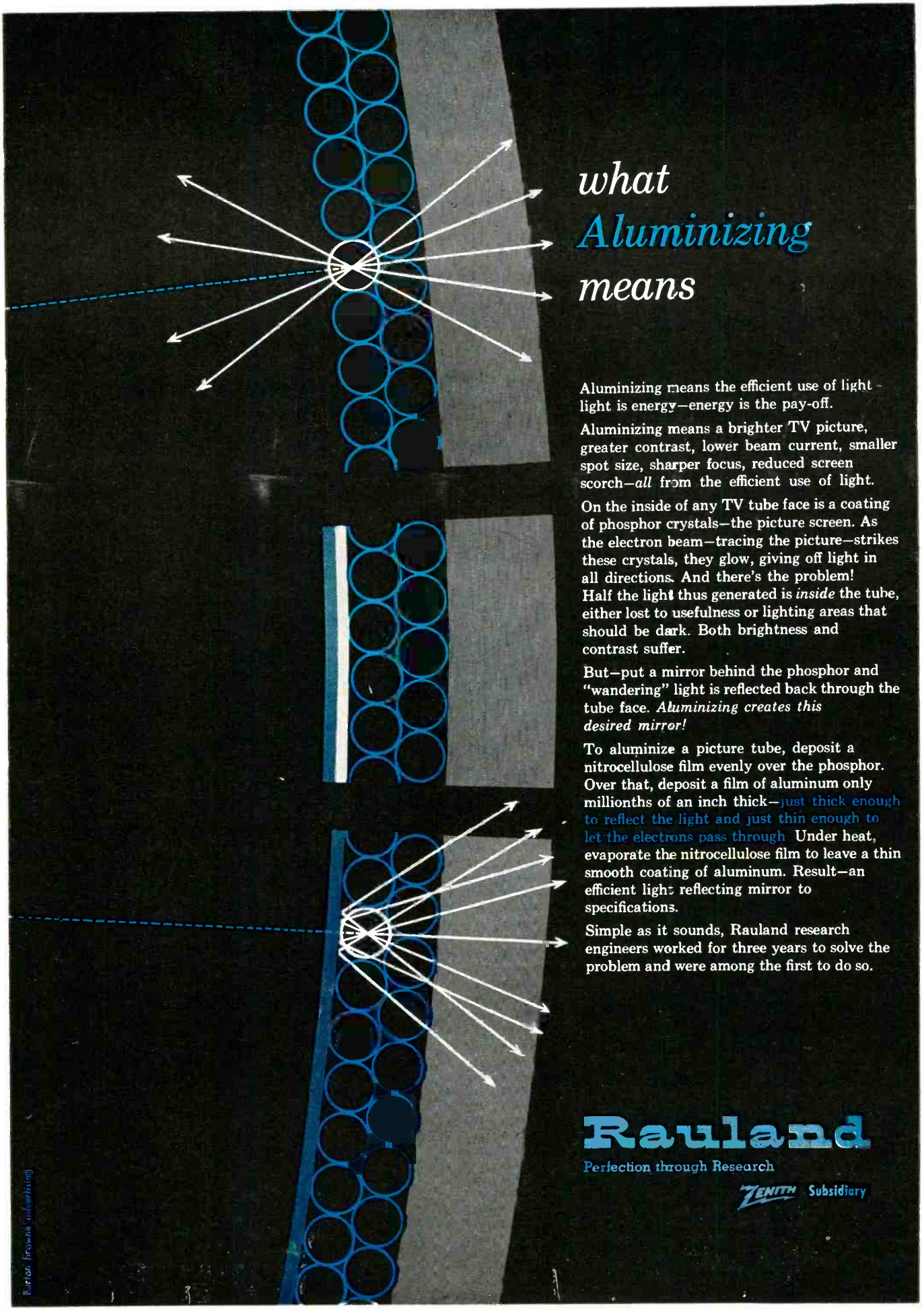
Close coordination between this group, factory engineering and manufacturing, and other sections of the service department, is required for an overall efficient service operation.

The quality control section sample-checks each day's production to make sure that the product meets consumer acceptance standards. This group has the authority to release for shipment first production of new models or to withold shipments on current production if quality does not meet acceptance standards. Close cooperation is required between this group, factory production and engineering sections, and other sections of the service department, to insure shipment of a satisfactory product to the field.

The consumer relations group handles distribution of service and technical information and all correspondence with consumers, dealers, servicemen and distributors. This group works closely with field engineering, technical publications, quality control, sales, and the service shop to insure satisfactory relations with wholesale distributors, dealers and servicemen, and to provide prompt assistance on consumer complaints received at headquarters.

In addition to these broad responsibilities, the factory service manager acts as a technical consultant to managers of sales, advertising, engineering, manufacturing and production. The factory service manager should be a diplomat, a salesman, and an engineer. He needs an active mind, a strong constitution, cast iron stomach and lungs, a sympathetic heart, and the hide of an elephant.

WE are occasionally disturbed by letters from servicemen and dealers indicating that they lack sufficient service data. We are all the more chagrined at this because we are bending every effort to provide the detailed and comprehensive service bulletins designed to make the servicing of our receivers simple and speedy. Since our literature is written by former servicemen, it is a labor of love. This technical data is available to *anyone* servicing our receivers; he need only contact his General Electric distributor. I believe this technical data can be effectively used as are other trouble shooting tools—to save time, and thus make money for servicemen.



what Aluminizing means

Aluminizing means the efficient use of light - light is energy—energy is the pay-off.

Aluminizing means a brighter TV picture, greater contrast, lower beam current, smaller spot size, sharper focus, reduced screen scorch—*all* from the efficient use of light.

On the inside of any TV tube face is a coating of phosphor crystals—the picture screen. As the electron beam—tracing the picture—strikes these crystals, they glow, giving off light in all directions. And there's the problem! Half the light thus generated is *inside* the tube, either lost to usefulness or lighting areas that should be dark. Both brightness and contrast suffer.

But—put a mirror behind the phosphor and "wandering" light is reflected back through the tube face. *Aluminizing creates this desired mirror!*

To aluminize a picture tube, deposit a nitrocellulose film evenly over the phosphor. Over that, deposit a film of aluminum only millionths of an inch thick—just thick enough to reflect the light and just thin enough to let the electrons pass through. Under heat, evaporate the nitrocellulose film to leave a thin smooth coating of aluminum. Result—an efficient light reflecting mirror to specifications.

Simple as it sounds, Rauland research engineers worked for three years to solve the problem and were among the first to do so.

Rauland

Perfection through Research

ZENITH Subsidiary

TRADE FLASHES

• • •

750 TV Station Approvals Seen

750 television stations will have been authorized by the Federal Communications Commission, "and perhaps another 100 by the end of next year," Rosel H. Hyde, FCC chairman disclosed at the Association of National Advertisers annual meeting. Of 525 authorized stations, 250 are now in actual operation in 166 markets. About 112 of those markets are one-station markets. In 48 of the one-station markets, additional stations have been authorized, and for 24 of the markets, there are contending applications. The 525 authorized stations, plus the 200 stations applied for, would cover 80 per cent of the United States population. It is not expected that the present high rate of station construction to continue indefinitely. The growth of television in small communities will depend on the extent that industry finds such operations profitable.

New CBS-Hytron Service Plan

The CBS-Hytron Certified Quality Service Plan hinges around a service tag that is attached to each set serviced by the service-dealer. On the back of the tag is space to list all parts used in servicing the set, as well as the individual charges made for them. On the face of the tag, there is space allowed for entering total charges for parts and labor . . . sales tax . . . and the grand total charge. The key to this tag's value rests in a statement that appears at the top of the tag which reads: "This certifies that parts used in servicing this set are new and of standard make and quality. All charges are made in accordance with industry standards." Since the tag itself carries an imprint of the service-dealer's name and address, it is the service-dealer himself who is certifying the work, parts, and charges.

This Certified Quality Service tag serves an additional purpose, because part of it functions as a claim check. On the perforated bottom section of the tag, the claim check, appears the statement of the certifying dealer: "Your set is being serviced by technically trained men using the latest equipment so necessary for Quality radio and TV service."

(Continued on page 64)

WHY SYLVANIA PRODUCTS MEAN BETTER BUSINESS!

YOU'RE really on board the *better-profit* special when you feature Sylvania Picture Tubes and Receiving Tubes.

Your customers know Sylvania as a pioneer in the development of fine radio and television products. From the very beginning, the name Sylvania has stood for the highest possible quality. And, as the industry has progressed and expanded, Sylvania has taken great care to maintain its recognized leadership.

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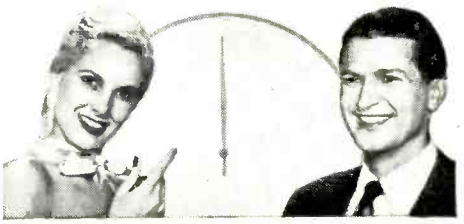

Sylvania's popular nation-wide television show "Beat the Clock" continues to tell millions of your customers week after week, all through the year, about the unbeatable quality of Sylvania products.

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In Canada: Sylvania Electric (Canada) Ltd.
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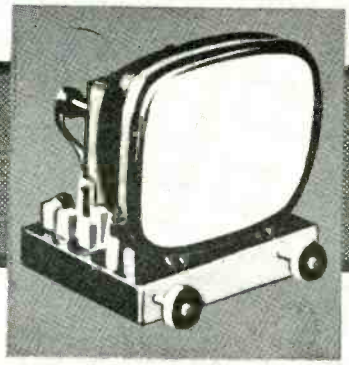
TV TROUBLE SHOOTING

USING Key Test Points



by BOB DARGAN

THE TV receiver performs the job of intercepting an incoming channel signal which contains a number of different types of signals. These signals are amplified, rectified and otherwise acted upon by different sections of the receiver through which they are routed, and the end result is picture and sound.

The entire operation could be a complicated one from a service point of view. However, if we confine ourselves to the channels in the receiver through which certain signals pass, we can simplify the servicing problems considerably.

At specific points in any receiver certain signals and waveforms must be present for proper operation. The quickest and most efficient method of servicing is to utilize these so-called check points as the means of ascertaining whether or not the desired signals are present and then to proceed to where they are missing. This technique isolates the stage or stages which are not functioning and points to the location of the defective component.

It is the purpose of this series to acquaint the technician with common key test points and to apprise him of the techniques that should be used in following through on the servicing of the receiver.

Television key test points are circuit locations. The voltages at these key points reveal to the technician quickly and easily the condition of the stage and section of the receiver, that is whether it is working or not. Key test points are the working tools of the technician and as much a part of his equipment as his voltmeter or ¼ inch socket wrench.

The technician is wealthy or poor in key test points dependent upon his ability to understand electronic fundamentals and to apply them practically

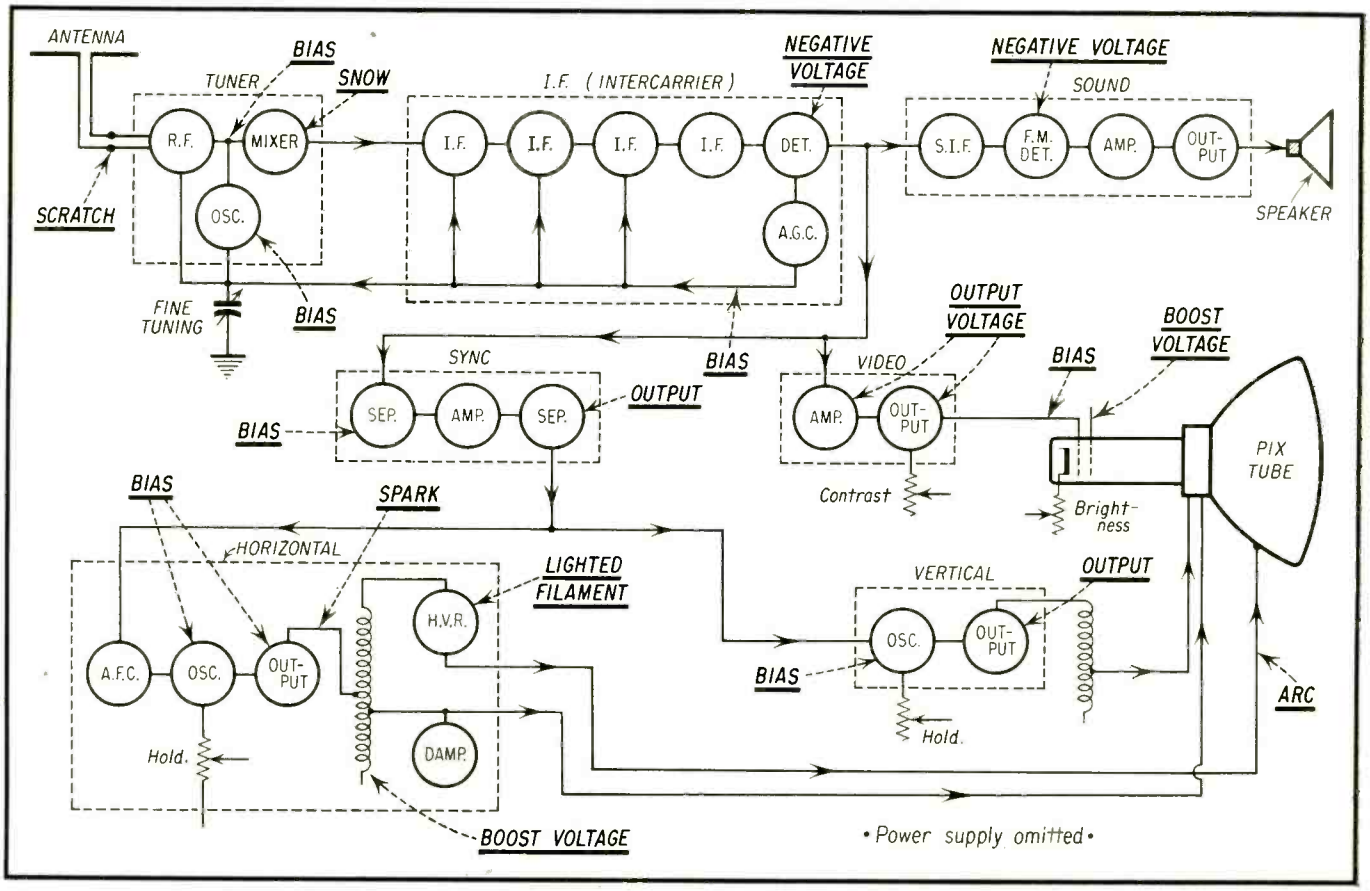


Fig. 1—Major test points common in most TV receivers.

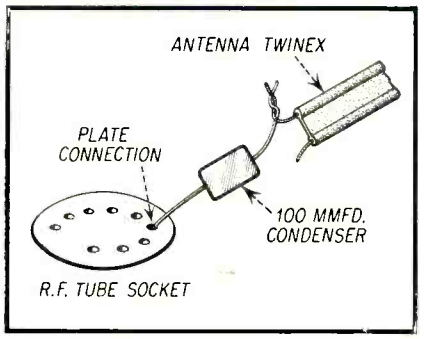


Fig. 2—Condenser used in testing *rf* stage. Note RF tube is removed.

to his service work. There are many of these quick, simple test checks which competent technicians make use of and have accumulated. It is through the use of this type of checking that speed in servicing can be accomplished. The technician should be able to go to any stage and know whether the stage is doing the job it is supposed to or not. It is the knowledge and application of good electronic theory that enables him to be outstanding and accomplish more jobs than the average serviceman. The good technician is continually building his knowledge of key test points as he comes upon them because they are the "skills of the trade."

The drawing, *Fig. 1,* indicates some of the test points common in most television receivers. These are only a few of the major ones. Many more will be delved into as the different TV sections are covered.

The value of these test points lies in the fact that they can be used with a VTVM on a 20,000 ohm-per-volt meter and therefore will prove equally useful in the customer's home where elaborate test equipment is not available. These test points will not eliminate the need and use of more elaborate test equipment but should enable the technician to do more "wood-chopping" before the equipment is required.

In the following paragraphs we will endeavor to indicate how these test points are made use of. The procedure will follow the general signal as it progresses from stage to stage.

The Tuner Section

The first section of the receiver to be considered is the tuner or front end. Many possible checks will be provided and it is up to the technician to adopt the procedures that most suit him. Naturally, he will be able to supplement these checks with some of his own.

A "V" type antenna should be part of a serviceman's working equipment. The "V" antenna can be used to determine the amount of signal strength present and a comparison can be made with the amount received from the roof antenna, if one is used.

In most customers' homes, a "V" type antenna will pick up at least enough signal to provide audio and picture when the antenna on the roof is in question or when there is no picture or sound.

Also, the "V" type antenna can be used to ascertain whether TVI flashes or other noise and outside troubles are actually being received in the antenna on the roof. After a television antenna has been up for three or four years overhauling is usually in order. The "V" type antenna can therefore aid in quickly determining whether the trouble is in the TV chassis or comes from the outside antenna.

Testing The RF Amplifier Stage

The major purpose of the *rf* stage in the tuner is to provide amplification and selectivity for the incoming channel signals. Tuned circuits are usually switched into the grid and plate circuits of the tube to select the desired channel.

In testing these stages in the tuner, the tests would be of no value if the *if* strip were inoperative because the signal would not be able to pass through the *if* strip to the sound section and picture tube. Therefore, in this discussion on tuners it is assumed that the trouble has been isolated to the tuner and the balance of the receiver is trouble free.

There are many ways of testing the *rf* stage. Some entail the use of signal generators and other equipment which will not be discussed in this article. One method is to shock-excite the circuit. This can be done with the ordinary voltmeter used for checking voltages. The shock to the tuned circuits caused by connecting the meter and disconnecting it at the plate and grid circuits should cause flashes in the picture and static noise from the speaker, indicating that signals are passing through the various circuits. Even moving the *rf* amplifier tube in and out of the socket should produce noticeable clicks in the speaker accompanied by flashes in the raster as the tube connections are made and opened. A similar check can be made by scratching the antenna leads to the connecting screws where the leads are normally fastened. This should produce the same effect. When switching the tuner from one channel to the next, making and breaking the contacts should produce the same effect, that is, enough of a shock to the tuned circuits should result so that the signal is produced which makes its way through the *if* strip, sound system (even with FM detector circuits), and video amplifier. Evidence of this disturbance will be present at the CRT and speaker.

An effective test of the *rf* amplifier stage may be made by removing the *rf* tube and connecting a small condenser (100 to 500 $\mu\mu f$ for *dc* blocking purposes), in series with one leg of the antenna as shown in *Fig 2.* The pigtail of the condenser is used as a probe and inserted into the plate connection on the socket. If a better signal is received than with the antenna at the normal connection it indicates trouble in the *rf* stage.

The Mixer Stage

In many receivers a test terminal is provided on top of the tuner for test purposes and alignment. This test terminal usually connects into the mixer grid. There should be as good a picture with the antenna connected to the mixer grid or test point as when it is connected into the plate circuit of the *rf* amplifier tube.

The mixer grid or test point can be grounded intermittently. This should produce flashes and static which demonstrates that signals can pass through the entire video and sound system. Here again, the tube in the mixer circuit can be moved in and out of the socket and clicks and flashes produced.

As in the *rf* tube a small loop of wire may be connected around the grid pin of the mixer tube as in *Fig. 3* and the antenna lead-in connected to the wire. Test adaptors are available commercially for this purpose. The adaptor is made so that the tube plugs into it, and the adaptor plugs into the

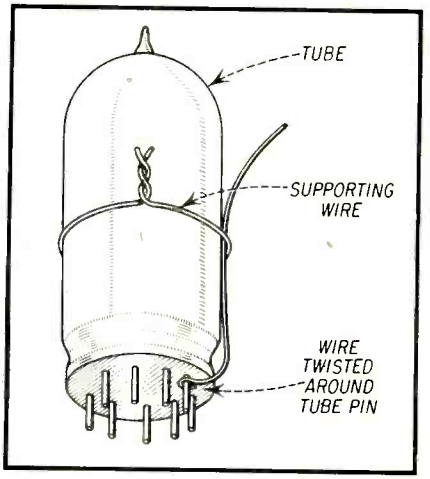


Fig. 3—Test loop for *rf* tube.

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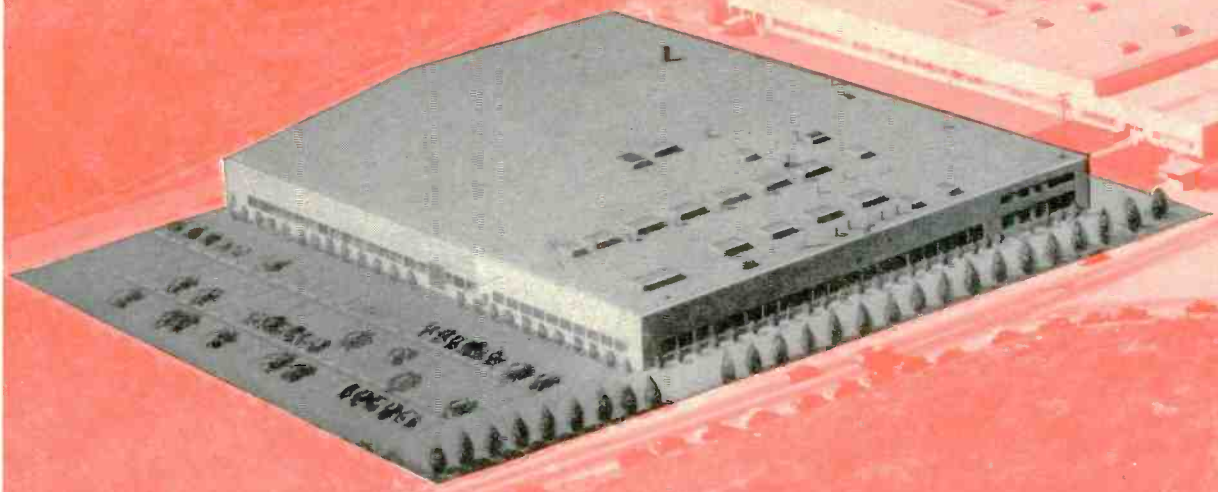

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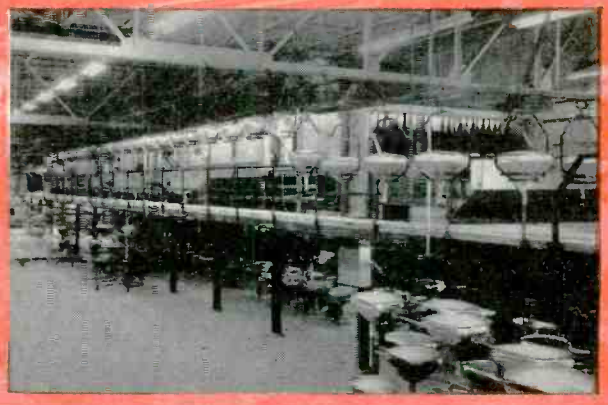
A BAKE OVEN as Big as They Come...



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The only way to make large screen (21", 24" and 27", TV Picture Tubes of unsurpassed quality is to make them with equipment especially designed to handle and produce them. That's why Raytheon built and has in operation this miracle of a picture tube plant, which houses the world's finest, largest and most advanced equipment and methods for making large size Picture Tubes. This magnificent new plant is one more indication of Raytheon's dedication to a single ideal — to continue to supply you with the finest quality Television and Radio Tubes the world has ever known.

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Receiving Tube Division

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RAYTHEON MAKES ALL THESE:

RECEIVING AND PICTURE TUBES • RELIABLE SUBMINIATURE AND MINIATURE TUBES • GERMANIUM DIODES AND TRANSISTORS • NUCLEONIC TUBES • MICROWAVE TUBES

tube socket. Around the circumference of the adaptor are lugs which permit connection to the tube elements. In the arrangement of *Fig. 3* the same thing can be accomplished. The connection of the antenna to the wire will demonstrate whether the mixer and oscillator stages are working by providing picture and sound if they are normal. A "V" type antenna can therefore be connected into the individual circuits as shown in *Fig. 4* to make certain that these stages are operating. This will permit quick, easy location of an open circuit in the signal path because the signal will not be passed at the connection where the circuit is open.

Usually the quickest check of whether or not the mixer tube is working is to examine the raster for snow or noise. If there are noise pulses present in the picture tube the mixer circuit is operating. The amount of noise generated in the mixer circuit is usually not sufficient to be heard from the speaker even with the volume control advanced to the maximum position. If a large amount of noise is present in the speaker it is being passed by the *rf* stage, indicating that it is operating. This does not, however, mean that the local oscillator is operating. The oscillator circuit will now have to be checked if the receiver is not producing picture and sound.

Note: Before continuing we might point out that one of the common troubles in tuners, whether wafer switch type or turret, is dirt and grease that form on the contact surfaces. Wiping the contacts with a good contact cleaner fluid is most always the cure for weak pictures and noisy tuners that exhibit flashes on the pix tube. A smart technician makes this one of his first operations when servicing tuners.

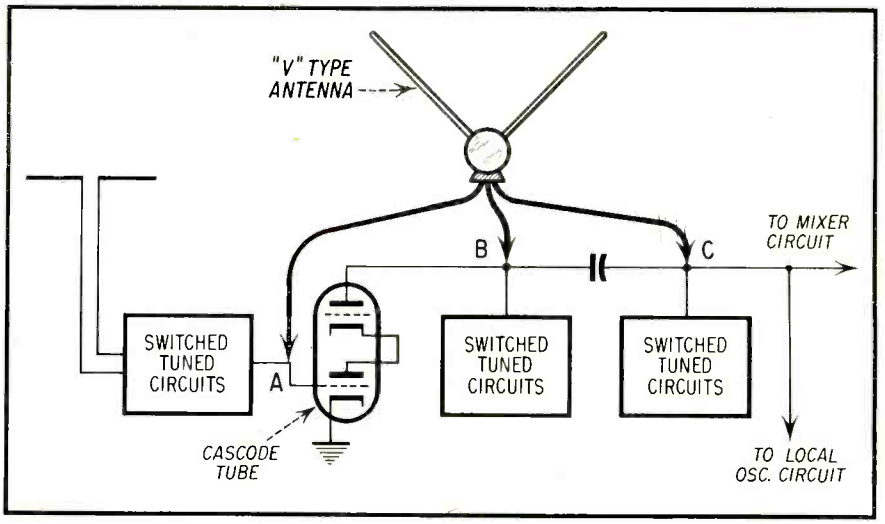


Fig. 4—"V" Type Antenna for testing individual stages.

The Local Oscillator

The local oscillator generates a different frequency signal for each channel, this frequency being adjustable over a small range with the fine tuning control. The signal from the local oscillator is fed to a mixer tube where it mixes with the signal provided by the *rf* amplifier, *(Fig. 5)*. The mixing cy which is the numercial difference of the two signal frequencies, the *rf* carrier and the local oscillator. The *if* stages amplify the signal to a suitable level for detection.

To determine if the local oscillator is working use a 20,000 ohm-per-volt meter (or a vacuum tube voltmeter). Connect a 50,000 ohm or larger resistor in series with the meter lead only when using the 20,000 ohm-per-volt meter to prevent loading the circuit. The vacuum tube voltmeter has a very high input impedance and will not cause loading so that this resistor is not needed in series with the VTVM lead. Connect the *dc* negative lead of the meter to either the grid of the mixer or the grid of the oscillator tube. At the mixer grid the voltage should be at least 2 volts minus if the local oscillator is feeding the mixer through the coupling condenser. At the oscillator grid the voltage will be higher, around 6 volts minus or more with respect to B minus or chassis whichever connection is called for. If the negative voltages are present at these points the local oscillator is operating.

The negative voltages are developed as the circuit oscillates. They are present only if the circuit is functioning properly. The actual numercial value depends on the strength of these oscillations. When checking the oscillator the presence of these negative voltages reveals immediately the condition o fthis circuit.

Another method of determining if an oscillator is functioning is to measure the plate voltage under three conditions. These are as follows:

A. With the tube out of the socket, the open circuit voltage will be the highest of the three voltages.

B. With the tube in the socket and the channel selector on channel and everything operating as it should be, the plate voltage should be lower than open circuit voltage but not as low as the voltage reading described below. This last reading first requires a small piece of wire wrapped around the pin as in *Fig. 3*. Then proceed as follows:

C. Position the channel selector in

[*Continued on page 72*]

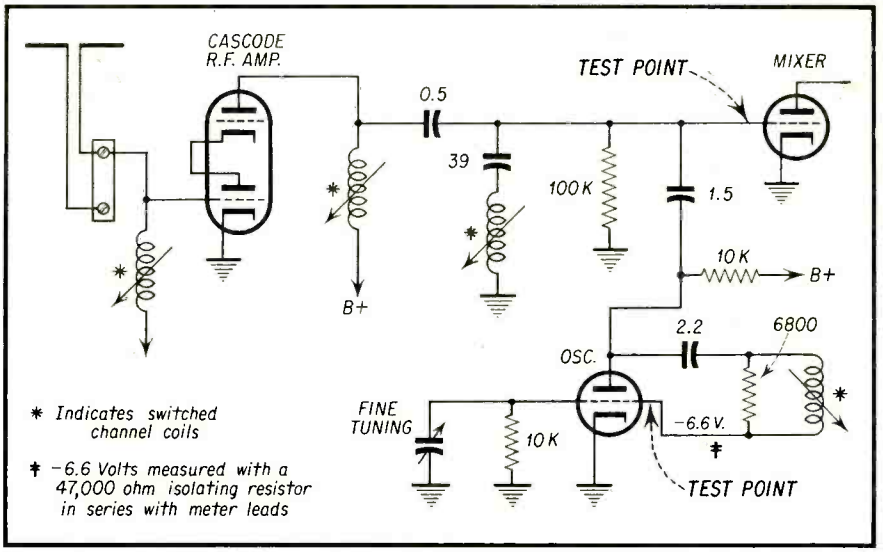
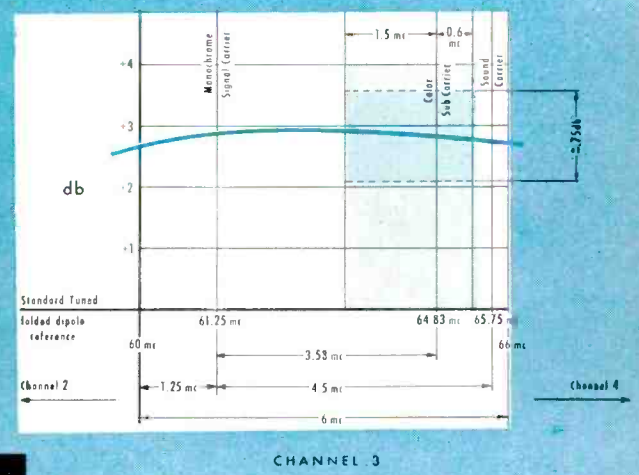


Fig. 5—Testing local oscillator and mixer stages.

you're ready for

COLOR TELEVISION

with an AMPHENOL INLINE*



CHANNEL 3

Color television is fast becoming a reality! Sets are expected to be available the first part of next year and stations are purchasing the necessary transmitting equipment. Initial costs, unfortunately, will be high but as improvements in design and production are achieved the price of color television will become within everyone's reach.

The consumer is concerned with the problems presented by television in color. He has read reports on prices and availability; all have been conflicting. He knows, however, that his set will have to be replaced or converted. What he does not know is that if *he has an* AMPHENOL INLINE*, there will be *no extra expense in antenna or installation!* AMPHENOL engineers provided for color in the original design of the INLINE*.

Every dealer, distributor and installer will want to acquaint their customers with this reassuring information. The color television market is potentially tremendous. It certainly will prove of benefit if the consumer can be reassured on one part of the cost of conversion to color.

The fact that AMPHENOL INLINEs are able to receive color television so well reflects favorably upon the engineering ability of AMPHENOL. For in ordinary black and white television the same level-gain design has proved valuable. Set owners know, now, that their AMPHENOL INLINE* is providing them with the best black and white picture their sets can deliver.

*Reissue U.S. Pat. No. 23,273

Antenna Electrical Requirements for COLOR TELEVISION

Information now available on color television has made it clear that the receiving antenna must have these characteristics:

1. Antenna gain must be flat, no gain or loss greater than one db, within 1.5 mc below and 0.6 mc above the color sub-carrier* (a width of 2.1 mc).
2. Antenna gain must be held down across the FM frequencies. Rejection of FM signals is much more important in color than in black and white television.

*Channel frequency widths are at present divided between the monochrome amplitude modulation picture carrier and the frequency modulation sound carrier. The addition of the color sub-carrier is made at 3.58 mc above the monochrome carrier.

The AMPHENOL *INLINE* fully meets the two conditions listed above. Besides being engineered to reject FM signals, from 88 mc to 108 mc, the INLINE provides very level gain across all channels, particularly over the color sub-carrier. Typical of the INLINE's performance on all channels is the gain chart† illustrated above for channel 3.*

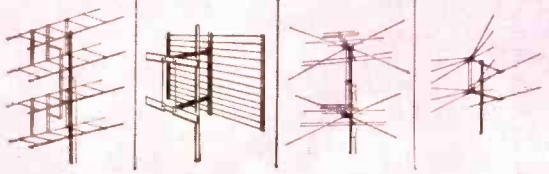
†Measured in accordance with proposed RETMA standards.

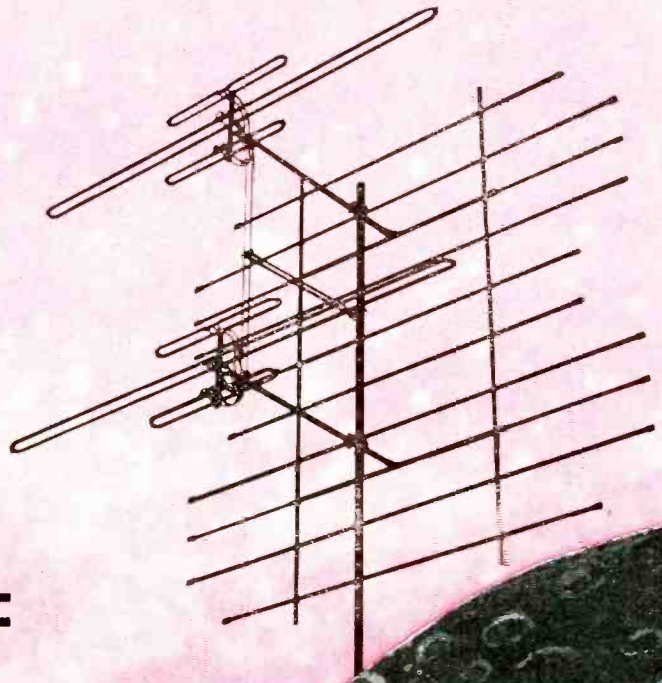
AMERICAN PHENOLIC CORPORATION
chicago 50, *illinois*

AMPHENOL

THIS ANTENNA OUT-PERFORMS:

this . . . | this . . . | this . . . | or this





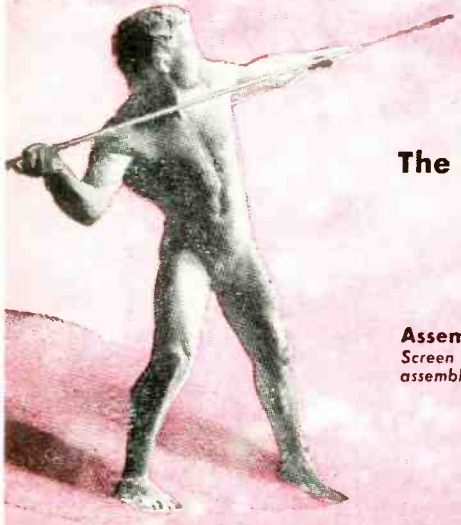
the AMAZING VHF CHAMPION*

a NEW KIND of Antenna that out-performs every all-channel VHF antenna ever made — — and many Yagis, too!

America's servicemen have spoken! In only 2 months, they've made the CHAMPION the nation's top-selling VHF antenna! It's the highest gain all-channel VHF antenna ever developed, and its performance has now been proven by over 30,000 outstanding installations.

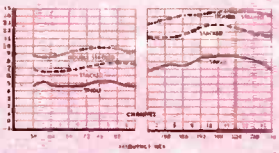
Only the CHAMPION has the unique new "Tri-Pole", a *triple-powered dipole system* in which the Low Band dipole also functions as *three* dipoles tied together, in phase, on the High Band.

Folded dipoles throughout give close to 300 ohms impedance across entire band. Lightweight, all-aluminum construction. Available in one, two, or four-bays.



The stacked CHAMPION provides:

- **11-13 DB** *High Band gain*
- **6½-7½ DB** *Low Band gain*



horizontal polar pattern (relative voltage)

Assembles faster *than a five-element Yagi. Screen "Pops-Up" instantly. "Tri-Pole" assembly just snaps into place.*

model no.		list price
325	single bay	$20.93
325-2	two bay	42.36
325-4	four bay	88.89
Separate Stacking Harnesses		
325-3	2 bay harnesses	$2.08
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CHANNEL MASTER CORP.
ELLENVILLE, N. Y.

*Pat. Pend.

3 great, new UHF antennas

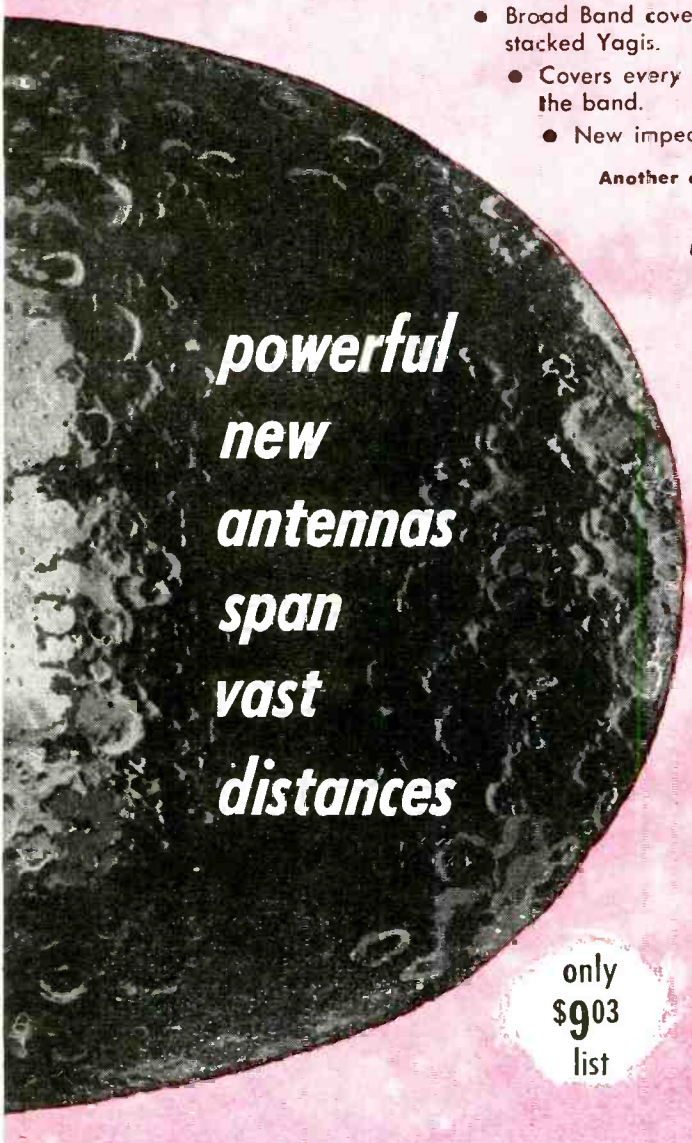
by CHANNEL MASTER

STACKED TWIN CORNER REFLECTOR model no. 406-2

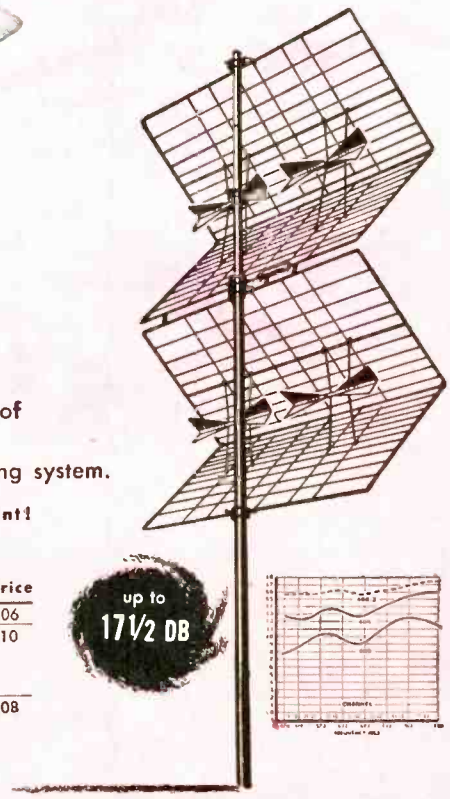
The most powerful UHF fringe area installation you can make today!

- Broad Band coverage — yet out-performs most stacked Yagis.
- Covers *every* UHF channel, *not* just segments of the band.
- New impedance-matching, two-stage stacking system.

Another original Channel Master development!

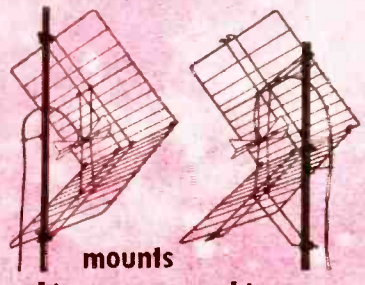


Model No.	Description	List Price
406	Twin Corner Reflector	$18.06
406-2	2-Bay Twin Corner Reflector. Stacking harness furnished free.	36.10
405-3	Stacking harness only, furnished separately.	2.08



only $9.03 list

the first UHF CORNER REFLECTOR with optional "2-way" mounting!



model no. 409

Only CHANNEL MASTER'S CORNER REFLECTOR can be adapted to any kind of UHF installation — with or without VHF — at no extra cost. Every antenna contains all necessary hardware and braces for BOTH popular types of mounting. Sharp directivity and unusually high gain across entire UHF band.

Installs instantly! Original Channel Master assembly feature: Screen swings open like a book — dipole assembly snaps into place.

"SWEET 16" The World's First 16-Element UHF Yagi!

- Custom-designed for your particular area.
- Super-power! Sensational fringe area reception.
- Delt-Weld design. Elements WELDED to crossarm. Delta-matched dipole gives uniform impedance.
- Wide band coverage, up to 21 channels.
- Average gain: 13 DB single
  16 DB stacked

model no. 420

Send for complete technical literature.

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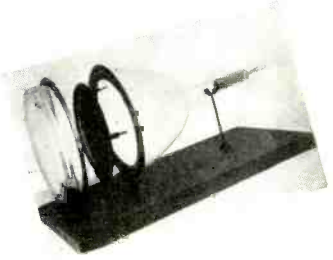
CBS COLORTRON

Application considerations, installation and adjustment procedures are dealt with in this final installment.

(PART 2)



Tube Handling

THE CBS-Colortron should never be lifted by its neck alone. It is recommended that the tube be lifted by the glass bulb and neck, or by the bulb alone. Occasionally, during transportation of the tube, small particles may become lodged between the tube elements. When voltages are applied, momentary sparking may be observed. This sparking is merely an indication of particles being dislodged. It may be necessary, however, to remove some particles by slight tapping. In this case, the tube should be placed on a padded surface with its axis parallel to the surface. Slight tapping with the fingers will, in most cases, dislodge the particles. Special care should be taken to avoid striking or otherwise damaging the metal flange near the face plate of the tube.

In general, the conventional precautions exercised in the handling of black and white tubes apply as well in the handling of the CBS Colortron.

Cover For Face Plate

A safety glass should be mounted in front of the tube when installed in a television cabinet to provide protection against accidental striking of the face plate and possible tube implosion. This precaution is similar to conventional black-and-white tube requirements.

MAXIMUM RATINGS - - Design-Center Values

Anode voltage	20,000 volts d-c
Grid-No. 4 (convergence) voltage	11,000 volts
Grid-No. 3 (focus) voltage	5,000 volts
Grid-No. 2 (accelerating) voltage, each gun	500 volts d-c
Grid-No. 1 (control) voltage, each gun	
Negative-bias value	200 volts d-c
Positive-bias value	0 volts d-c
Positive-peak value	2 volts
Peak heater-cathode voltage, each gun:	
Heater negative with respect to cathode:	
During warm-up period not to exceed 15 seconds	410 volts
After warm-up	180 volts
Heater positive with respect to cathode	15 volts

GENERAL CHARACTERISTICS

Electrical Data

Heater for unipotential cathode, each gun:	
Voltage	6.3 volts
Current	1.8 amperes
Focusing method	Electrostatic
Convergence method	Electrostatic
Deflection method	Magnetic
Deflection angle (approximate)	65 Degrees
Electron guns, three	Red, Blue, Green

Phosphor	Development No. R-13	Development No. B-12	Development No. G-11
Fluorescence	Red	Blue	Green
Phosphorescence	Red	Blue	Green
Persistence	Medium	Medium	Medium

Direct interelectrode capacitances, (approximate):

Grid No. 1 of any gun to all other electrodes except No. 1 grids of other two guns	7.5 uuf
Three cathodes externally tied together to all other electrodes	17.5 uuf
Grid No. 3 (all three No. 3 grids tied together internally) to all other electrodes	12.0 uuf
Grid No. 4 (common to all three guns) to all other electrodes	7.0 uuf

Screen	Metal-backed, tri-color, phosphor-dot type
Phosphor-dot arrangement	Approximately 250,000 triangular groups, each containing a blue, red, and green dot (a total of 750,000 dots)

Mechanical Data

Approximate weight	18 1/2 pounds
Maximum over-all length	23 3/8 inches
Maximum diameter	15 3/4 inches
Screen diameter	11 1/2 inches
Bulb Contact	Metal-flange seal
Base	Small-shell bidecal 14-pin
Mounting position	Any
Socket	Cinch 57G17902 or equivalent

TYPICAL OPERATING CONDITIONS

Anode voltage	20,000 volts
Grid-No. 4 (convergence) voltage**	9,300 volts
Grid-No. 3 (focus) voltage	3,100 volts
With grid-No. 2 voltage of 200 volts, each gun Grid-No. 1 voltage#, each gun	-45 to -100 volts
With grid-No. 1 voltage of -75 volts, each gun Grid-No. 2 voltage, each gun	210 volts
Maximum Grid-No. 4 current	5 microamperes
Maximum Peak grid-No. 3 current	400 microamperes

CIRCUIT VALUES

Maximum Grid-No. 1 circuit resistance, each gun	1.5 megohms
Dynamic-convergence voltage, approximate##	500 volts
Dynamic-focus voltage, approximate##	150 volts

* Heaters electrically paralleled within the tube.

** Does not include the a-c component of the convergence voltage.

For visual extinction of the undeflected, focused spot.

Peak-to-peak value. This a-c voltage is synchronized with the scanning and does not include any voltage developed during the blanking time.

To reduce the effects of stray magnetic fields on color purity, a magnetic shield is recommended. This shield should fit snugly around the lower portion of the glass bulb. Outline drawing of a recommended shield is shown on page 22.

CAUTION

Because the rating of this tube permits operation at voltages as high as 20,000 volts, shielding of the tube for X-ray radiation may be necessary whenever operating conditions involve voltages in excess of 16,000 volts. Sufficient shielding is usually provided by the safety glass in front of the tube.

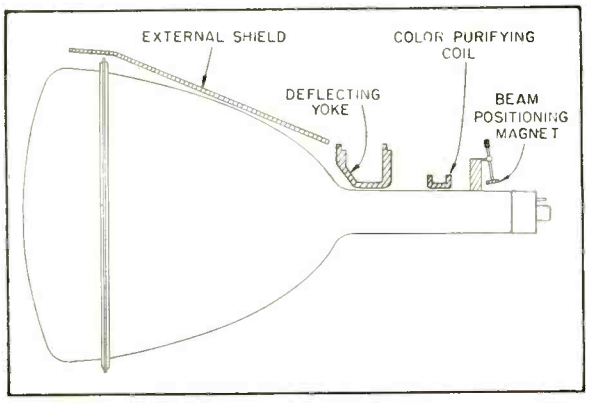


Fig. 4—Cross-sectional view of external components used with tricolor tube. Note the arrangement of these important components.

Supports

Supports for the CBS-Colortron, which weighs approximately 18½ pounds, should be in the form of an insulated support at the large end of the tube and another near the small end of the bulb. Support for this tube should never be provided at the neck of the tube. Since the deflection yoke must be free to move in an axial and traverse direction, tube supports in this area are also not advisable.

High-Voltage Requirements

Briefly stated, the high-voltage requirements of the CBS-Colortron are: anode, 20,000 volts with a maximum current drain of 600 microamperes; convergence electrode, 9,300 volts with a maximum drain of 5 microamperes; and focus electrode, 3,100 volts with a maximum current drain of 400 microamperes. In addition, the regulation of the anode and convergence voltages must be maintained within two per cent to prevent misregistration.

The regulated voltages for the convergence electrode and anode may be derived from a flyback-type deflection system that employs a tapped autotransformer. These voltages are obtained from the full winding of the auto-transformer. The focus voltage is obtained from a separate tap of the same autotransformer that supplies the rectifier used for the focus voltage.

Since two-per cent regulation is required for the anode and convergence voltage supply, a shunt regulator or corona discharge tube should be employed.

Adjustment of the focus and convergence potentials can be achieved by

the use of potentiometers in the high-voltage divider network.

Color-Purifying Coil

The function of this coil has been described in a preceding section. The approximate position of the coil on the neck of the tube is shown in *Fig. 4*. By rotating the coil around the neck of the tube, the transverse magnetic field will move the beams in different directions. Conversely, the current through the coil determines the magnitude of the movement. A typical coil requires a current source capable of supplying from 0 to 10 milliamperes.

Beam-Positioning Magnets

The function and description of this assembly have also been described in a preceding section. *Fig. 4* illustrates the position of these magnets on the neck of the tube. The field strength of each magnet is approximately 8 gauss.

Deflection Yoke

Tentative specifications for the deflection yoke are: effective field length, not exceeding 2¾ inches; center of deflection, approximately 1-15/32 inches from the Reference Line of the tube; and an inside diameter of not less than 2¼ inches to facilitate yoke adjustment. To permit adjustment for color purity, the deflection yoke should have axial movement of half an inch when placed against the glass funnel. Typical inductance values for this deflection yoke are: 15 millihenries for the horizontal winding and 79 millihenries for the vertical winding.

Grid No. 1 Drive Characteristics And Requirements

The three electron guns of the CBS-Colortron have similar transfer characteristics. Due to the differences in phosphor luminescence efficiencies, however, the cutoff voltage of each gun must be adjusted to produce equal phosphor brightness or color balance. If color balance is not maintained when the tube is reproducing black-and-white pictures, for instance, color tinting of the gray scale will result. It is recommended that individual grid-No. 2 voltage controls and grid-No. 1 drive controls be provided. The grid-No. 2 controls should allow voltage adjustment from 100 to 450 volts.

Protection Against Scanning Failure

Permanent damage may be done to the screen-and-mask assembly if scanning should cease during tube operation. For this reason, an electronic switch activated by the horizontal and vertical deflection voltages should be provided. The circuit should be arranged so that, in case of scanning failure, all beam current will be cut off.

A convenient method of achieving this protection is by obtaining the grid-No. 2 voltages from the boost voltage of the horizontal scanning circuit. This boost voltage also serves to power the vertical deflection system. Any failure of scanning, consequently, would remove the voltage from the No. 2 grid, and all beam current would cease.

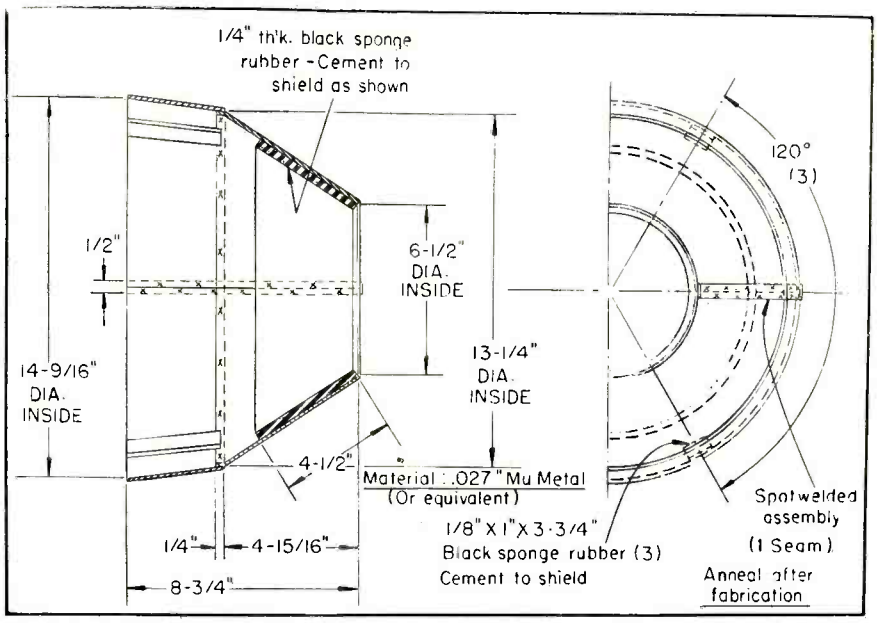


Fig. 5—Outline drawing of recommended type shield.

Magnetic Shielding

Optimum performance of the CBS-Colortron necessitates proper shielding against the effects of the earth's magnetic field and stray fields around the picture tube. A magnetic shield of MuMetal or equivalent material should be placed over the bulb portion of the tube. Placement of magnetic components of the receiver so that the effect of their fields on the picture tube is minimized will result in improved tube performance. An outline drawing of a recommended-type shield is shown in *Fig. 5*.

Installation And Adjustment

By following a systematic adjustment procedure, adjustment time of the CBS-Colortron can be reduced to a minimum. Such a procedure is described in this section. In addition to the procedural steps, screen patterns that will be observed during each step are described.

When the CBS-Colortron is removed from its carton, it should be handled at the funnel and not at the neck of the tube. Care should be taken to prevent damage to the metal flange near the face plate of the tube. The tube should be mounted securely in the manner described in the SUPPORT Section of this article.

After mounting, the color-purity coil, convergence magnets, and deflection yoke should be placed on the neck of the tube. The approximate position of each of these components have been described. Also, refer to *Fig. 4* for a graphic illustration of these external components. Once these components are positioned on the neck of the tube, the socket and high-voltage connections may be made.

Before applying voltages to the tube, turn the grid-No. 2 controls to zero and the grid-No. 1 controls to their maximum negative positions. Then, apply the proper potentials to the electrodes of the tube, and sweep power to the deflection yoke. Initially, some arcing or sputtering may be observed. This is a normal reaction.

After allowing sufficient time for the various supplies to stabilize, slowly increase the grid-No. 2 voltage of the red gun, simultaneously reducing the grid-No. 1 bias until the screen is illuminated.

The next step is to adjust the purity coil. This adjustment should be in the following steps:

1. Pull the deflection yoke back from the funnel of the tube approximately ½ inch.

2. Energize the color-purity coil.
3. Move the purity coil along the neck of the tube, while simultaneously rotating it, until the purest red field is obtained in the center of the screen. It will be noted that the pattern on the screen also contains alternate blue and green fields extending radially out from this red center.
4. Slide the deflection yoke in the direction of the face plate until the most uniform red field is obtained over the entire screen.

Once the most uniform red field is obtained, slight readjustment of the color purity coil may be required to achieve optimum color purity. The adjustment may be made by varying the current through the purity coil or by additional movement of the coil.

After obtaining optimum purity of the red field, the blue and green fields should be separately checked. No further adjustment of the color-purity coil should be necessary.

Convergence is the next characteristic to be adjusted. This adjustment procedure must be made in two separate parts. Convergence adjustment is facilitated by use of a spot generator. This spot generator should be capable of producing equally spaced horizontal and vertical rows of spots on the phosphor screen. Each of these spots contains individual red, blue, and green components. Proper convergence is attained when the three color components are superimposed.

Initially, the static convergence voltage is adjusted so that spots near the center portion of the screen are converged. If this condition is not obtained, the beam-positioning magnets should be adjusted until the spots within a small central area of the screen are converged.

Dynamic convergence can be optimized after the static convergence is attained. Horizontal dynamic convergence is obtained by adjustment of the waveform and amplitude of the horizontal-dynamic-convergence voltage. This voltage should be varied until each spot of a horizontal row near the center of the screen is converged. Vertical convergence is attained by varying the vertical-dynamic-convergence voltage until each spot of a vertical row near the center of the screen is converged. Because of the interaction between the horizontal-and-vertical-convergence adjustments, it is recommended that these adjustments be performed alternately until optimum convergence is obtained.

The final adjustment of the CBS-Colortron is the setting of the color balance. As was previously stated, the transfer characteristics and bias voltages of the three gun must be adjusted to produce a grey scale with no color tinting.

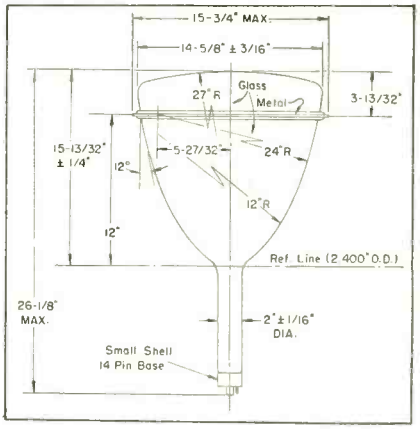


Fig. 6—Outline and mounting dimensions of the new CBS colortron.

The following steps should be taken to achieve color balance.

1. Set each grid-No. 2 voltage at the same value.
2. Set each grid-No. 1 voltage so that a low-level grey field is obtained on the screen.
3. Increase the brightness level of the composite field on the screen. This may be done by varying a master brightness control, or by varying a signal voltage simultaneously applied to all No. 1 grids.
4. As the brightness is increased during Step 3, observe which color becomes dominant.
5. Reduce the brightness of the field to the level in Step. 2.
6. Reduce the Grid-No. 2 voltage of the gun controlling the dominant color.
7. Repeat steps 3 through 6 until no color tinting is observed over the required brightness level.

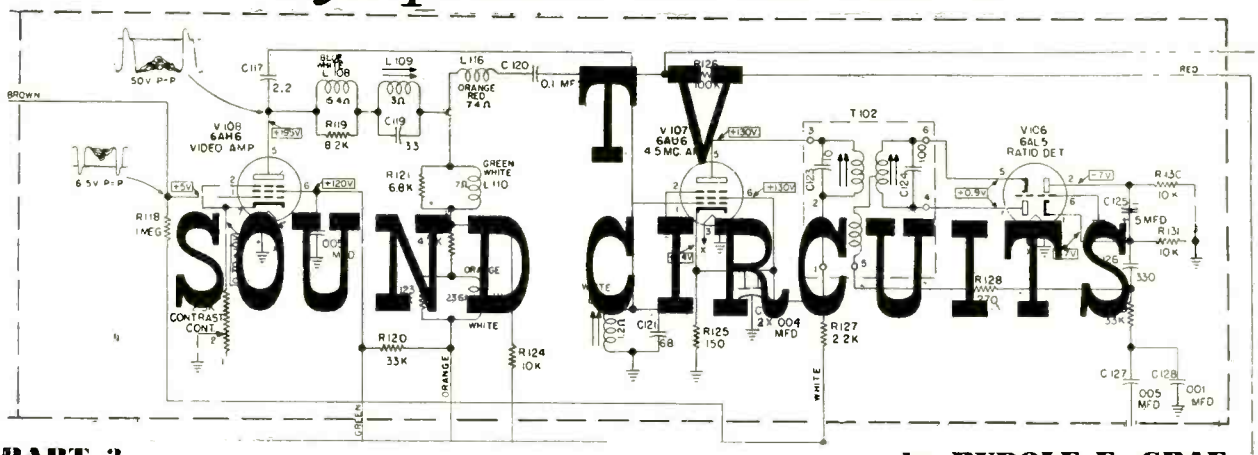
This color-balancing procedure can be simplified by the use of a combination of a density wedge and flying-spot scanner.

The foregoing adjustment procedure represents the method that achieves the fastest alignment consistent with optimum operational quality. After these steps have been completed, further adjustment should not be required. But further adjustment of the various components can be made to overcome any undesirable characteristics that may result from improper initial adjustment.

For typical operational potentials and currents refer to the tentative data chart on page 22.

Symposium Series No. 8

TV SOUND CIRCUITS



PART 3

by RUDOLF F. GRAF

Aligning Foster Seeley Discriminator

We have a choice of two separate and distinct methods we may use to align this circuit. The first method requires only two pieces of test equipment available in even the smallest shop, namely a *vtvm* and an AM signal generator with a range high enough to cover the sound *if* of the receiver. If a *vtvm* is not available, a multimeter with a sensitivity of 20,000 ohms per volt or better will also serve very nicely.

The alternate method requires an oscilloscope and a sweep generator. This sweep generator should have a built-in marker generator and if not, a separate marker generator is required. Of course both generators must cover the *if* range of the receiver under test. A crystal oscillator makes a good and accurate marker for this purpose. For intercarrier sets which are now more and more becoming the standard of the industry, the *if* is 4.5 *mc*. Now let us see, step by step, how the alignment of the Foster Seeley Discriminator is accomplished. The circuit is shown in *Fig. 6*.

AM Generator—VTVM Method

1. Set the generator to the audio *if* of the receiver and turn modulation OFF.

2. Connect the probe of the *vtvm* to point (G) at the limiter grid and set the meter to—DCV, and to its lowest range. If a connection at this point is inconvenient, the meter may be connected between point (A) and ground. The results will be the same but in this case the lowest +DCV range must be used.

3. Connect the generator output to the antenna terminals or the mixer grid if a conventional TV receiver is used, or to the grid of the video amplifier if the set has intercarrier sound. (In a conventional TV it would be advisable to disable the local oscillator when aligning the sound circuit. This may be done by removing the oscillator tube.)

4. Peak all of the *if* stages for maximum meter reading. If the meter goes off scale, do *not increase* the range, but *decrease* generator output.

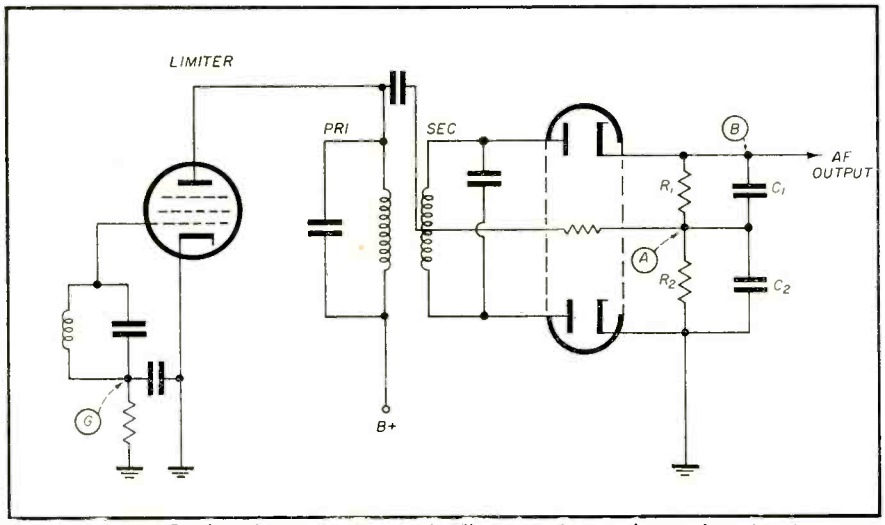


Fig. 6—Foster-Seeley discriminator with all test points indicated in the diagram.

5. Connect generator to point (G) and meter (still on lowest range) to (A).

6. Adjust primary of discriminator transformer for maximum meter reading.

7. Move meter to (B) and adjust secondary of discriminator transformer for zero reading. This zero must occur between a plus and a minus peak.

8. In order to check linearity of alignment, set meter to midscale with Zero Adjustor, and connect it to point (B) and ground. Move the generator frequency several kilocycles above and below the *if*. For equal deviation from the center frequency, the meter should give equal deflections in a positive and negative direction. If this does not occur repeat the alignment from the beginning.

Sweep Generator-Scope Method

1. Connect vertical input lead from scope to point (B) and connect a good ground between the scope and the chassis.

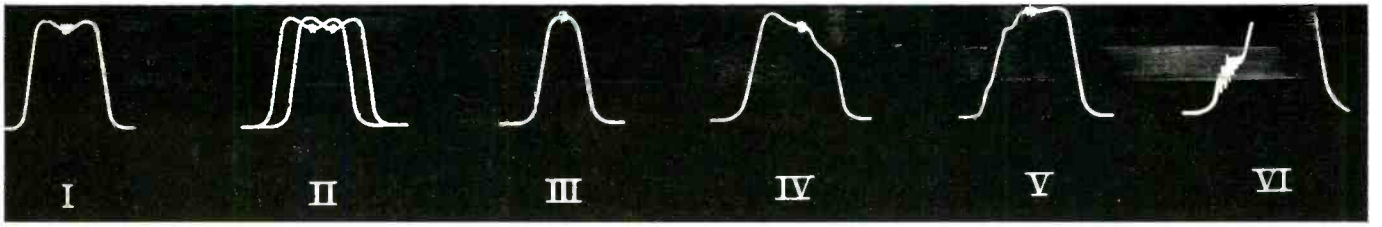
2. Set sweep generator to the audio *if* of the receiver under test and adjust for a sweep width of approximately 300 *kc*. Connect generator output to point (G). Set marker generator to the sound *if*. If an external marker is used turn the modulation OFF.

3. Connect the horizontal deflection voltage from the FM generator to the horizontal input of the scope to obtain the "S" curve shown in *Fig. 10*.

4. Adjust the primary of the discriminator transformer for proper linearity. (See *Fig. 10*)

5. Adjust the secondary of the discriminator transformer for proper center frequency as indicated by the marker pip. (See *Fig. 10*)

6. Vary the marker frequency above and below the *if* to check the width of the linear portion of the S curve. The frequency covered by the marker generator in going from the top to the bottom of the linear portion indicates the bandwidth of the circuit.



Proper response curve at points G or A, marker pip in center. Pattern's top should be as flat as possible; yet have required bandwidth.

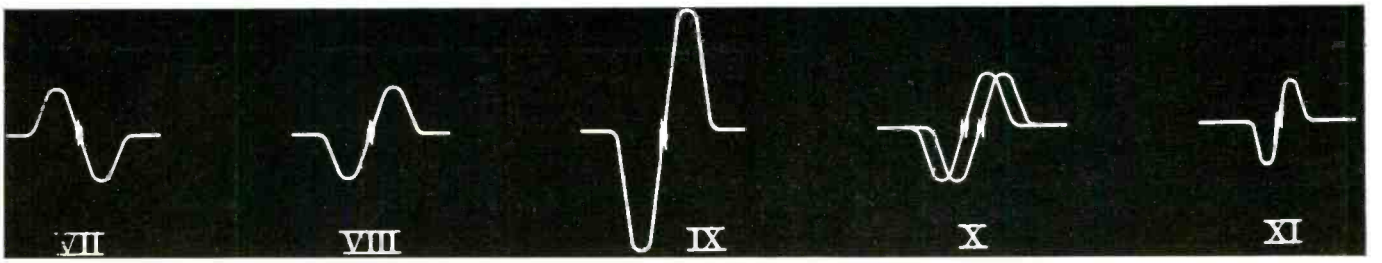
Same as I, only pattern of return trace not in phase with pattern of forward trace. Adjust PHASE CONTROL on the sweep generator.

Response curve too narrow to accept full signal. Realign in order to increase the bandwidth.

Asymmetrical response curve will cause distortion in sound. Realign for better response curve.

Another asymmetrical response curve; this time the non-symmetry is on the other side. Realign.

Curve indicates undesirable oscillations. May be due to poor grounds, open bypass condensers, poor shielding or bad tube.



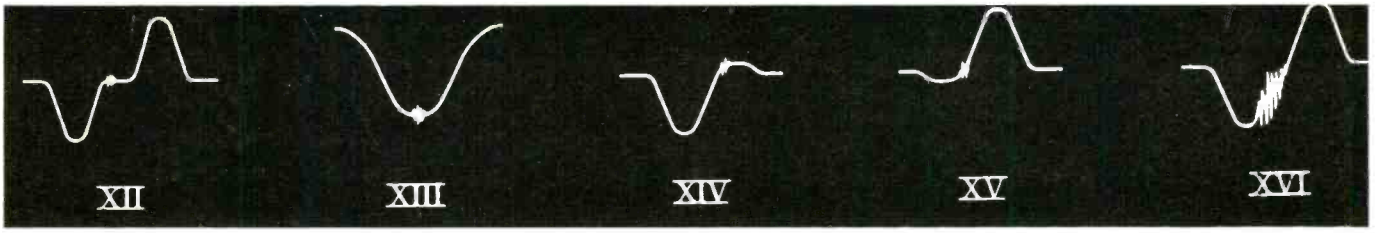
Proper response curve at point (B) of ratio detector or Foster-Seeley discriminator. Curve is symmetrical and smooth.

Same pattern as in (7), except horizontal deflection voltages are 180° out of phase with respect to each other.

Vertical gain control of 'scope is set too high. Pattern looks out of proportion; is difficult to analyze.

Same as (8), except that return trace pattern is not in phase with forward trace pattern. Some people prefer this dual pattern to the superimposed single pattern.

Curve indicates insufficient band-width; will distort the signal. Realignment is definitely indicated.



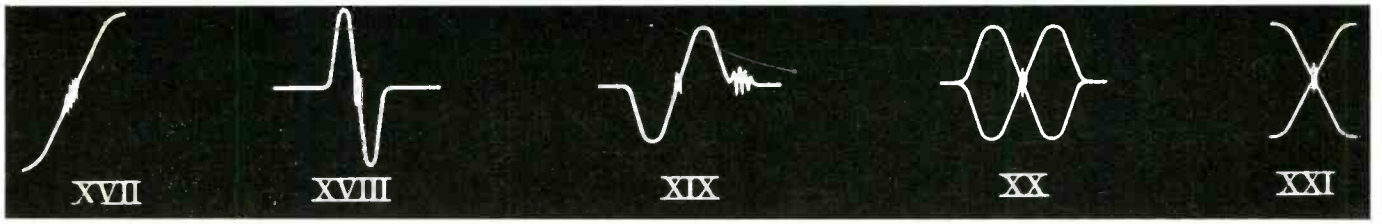
Distorted "S" type curve. Secondary of discriminator transformer must be adjusted to obtain curve shown in (8).

Another form of distortion in the "S" curve. In this case the primary of the discriminator transformer must be adjusted.

Pattern produced if one of the diodes has a lower emission than the other. Tube must be replaced.

Another pattern produced by poor emission of one of the diodes, this time the other diode. As in (14), the tube must be replaced.

"S" curve indicating undesirable oscillation. May be due to same trouble indicated in (6).



Pattern produced if FM generator has insufficient sweep, or if sweep width is insufficiently advanced. This pattern does not give enough data.

Sweep width of FM generator set too far. Pattern too narrow to indicate bandwidth and linearity properly. Reduce sweep width of generator signal.

Detector response curve okay, but some oscillation present at a frequency outside the band used. Will not affect sound but should be checked.

Butterfly or double "S" curve produced by using internal sweep of the 'scope set at 120 *cps*. Cross-over point should occur at *IF* of the set.

Same curve as in (20), except that sweep width of the FM generator has been reduced.

Fig. 10—Response curves obtained on CRT scope showing proper patterns and those indicating trouble in set.

7. Connect the FM generator output with the marker signal to the antenna terminals or the mixer grid in a conventional receiver, or to the grid of the video amplifier if the set has intercarrier sound. (As before, it is advisable to disable the local oscillator if you are dealing with a conventional TV receiver.)

8. Connect the lead from the vertical input of the scope to point (A).

9. Adjust all of the *if* stages for proper response. (See *Fig. 10*) Do not attempt to realign the discriminator transformer at this time.

10. Always keep the gain control on the scope as high as possible and the output from the generator *very* low. This must be done so as to avoid any possibility of saturating the limiter and getting a faulty alignment.

11. To check the overall alignment leave the generator where it is and reconnect the scope at point (B). The straight "S" curve should appear again. If any slight touch-ups are required they may be done now.

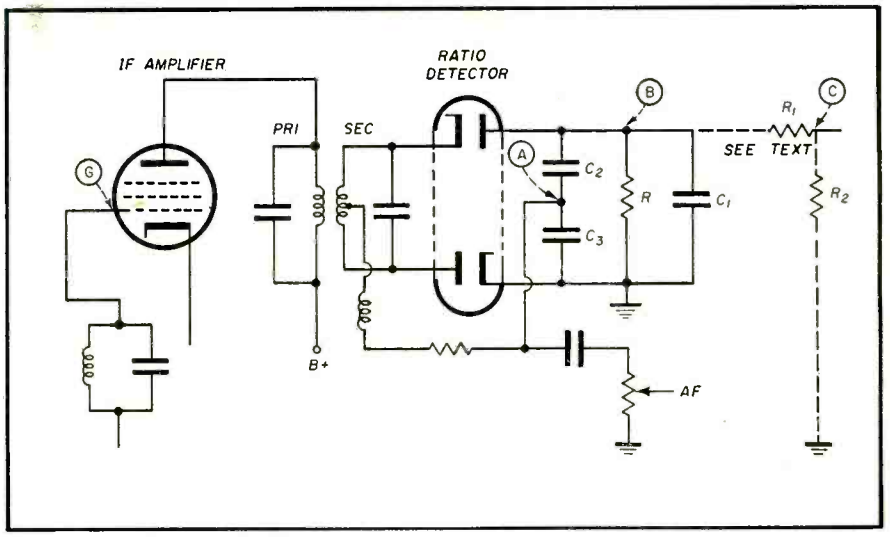


Fig. 8—Schematic diagram of an unbalanced ratio detector with test points indicated.

Aligning Ratio Detector

As with the Foster Seeley discriminator, we again have a choice of two methods of alignment. As before, one of the methods requires the use of an AM generator and a meter. The other employs an FM generator with a suitable marker and an oscilloscope. When we use the former of the two methods, there is a little alignment aid that is necessary when we deal with the Unbalanced Ratio detector. This little "gimmick" is shown in *Fig. 8* in the form of two dotted resistors *R1* and *R2*. The actual value of these resistors is not critical, but they should be somewhere between 100,000 and 200,000 ohms each. The thing that is important however, is that the two resistors are accurately matched. That is, their actual measured values should be as close to each other as possible. They should not differ from each other by any more than at the most 1%. Once you have selected such a pair of resistors, put them aside, and save them for use anytime you have to align an unbalanced Ratio detector. The alignment instruction that follow apply to the balanced and the unbalanced Ratio detector.

AM Generator-VTVM Method—Unbalanced Ratio Detector. (Fig. 8)

1. The two matched resistors described above are required for this alignment. Connect them between point (B) and ground in such a manner, that their junction point (C) is readily accessible.

2. Set the generator to the audio *if* of the receiver and turn modulation OFF.

3. Set the meter to —DCV on its lowest range and connect to point (B).

4. Connect the generator output to the grid of the *if* amplifier. (Point (G)).

5. Adjust the primary for maximum meter reading.

6. Connect the Common lead of the meter to point (C) (the junction of the temporarily added resistors) and the other meter lead to point (A). Now align the secondary for true zero reading.

7. In order to check the linearity of alignment leave all connections as in *6* above. Set the meter to mid-scale or any other reference point with the ZERO ADJUST. Move the generator frequency several kilocycles above and several kilocycles below the sound *if*. For equal deviations from the center frequency, there should be equal deflections in a positive and negative direction. If this does not happen, repeat the alignment process from the beginning.

8. Remove resistors *R1* and *R2* and save for future use. Detector alignment is now complete.

9. In order to align the *if* stages, reconnect the meter between (B) and ground, and adjust all *if* circuits and sound traps for peak reading.

AM Generator-VTVM Method Balanced Ratio Detector. (Fig. 7)

1. Set the generator to the audio *if* of the receiver and turn modulation OFF.

2. Set the meter to —DCV on its lowest range and connect to point (B).

3. Connect the generator output to point (G) on the grid of the *if* amplifier.

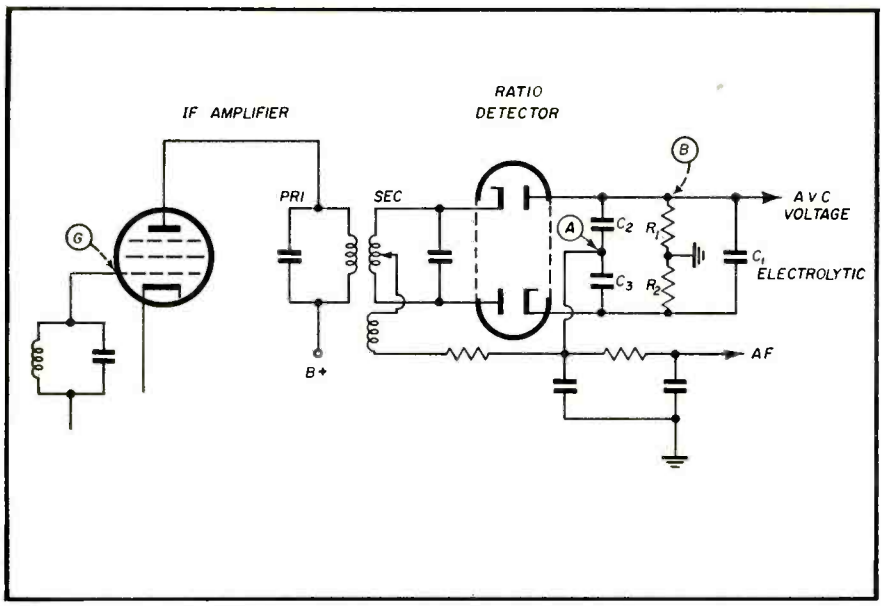


Fig. 7—Schematic diagram of balanced ratio detector with test points indicated. The audio signal is taken from point A.

4. Adjust the primary for maximum meter reading. If the needle goes off scale, reduce the generator output rather than increase the meter range.

5. Move the meter to point (A), and align the secondary for true zero reading. This zero must occur between a positive and negative peak.

6. The linearity of alignment should now be checked as outlined in step *7* above.

7. Detector alignment is now complete. In order to align the *if* stages, reconnect the meter to point (B), and peak all *if* stages and sound traps.

Sweep Generator-Scope Method For Balanced Or Unbalanced Detector

1. Connect the vertical input lead from the scope to point (B), and properly interconnect the grounds of the scope, the chassis under test and the signal generator (s).

2. Set the sweep generator to the audio *if* of the receiver, and adjust the sweep width to approximately 300 *kc.* Also set the marker generator to the *if* of the receiver. Connect signal at *if* grid (G).

3. Temporarily disconnect one side of the electrolytic condenser *C1.*

4. Connect the horizontal deflection voltage from the sweep generator to the horizontal input terminals of the oscilloscope to obtain an "S" curve. (See *Fig 10*)

5. Adjust the primary and secondary to obtain a linear "S" curve with the correct center frequency. It may be required to alternate adjustments between the primary and the secondary before a final setting is obtained.

6. Reconnect *C1.*

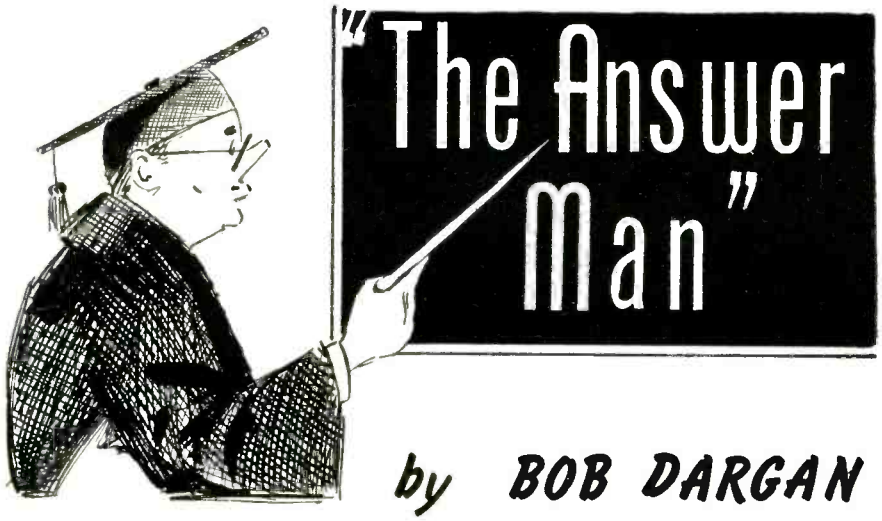
Trouble Shooting

Trouble in the FM detector stage can show up as poor sensitivity, noise, distorted output, high frequency hiss, or any combination of the above. Troubles of this type do not originate at the detector every time they occur, so it is important that we eliminate all other stages before we "dig" into the detector. We should look for trouble before, as well as after the detector. The audio stage can be quickly checked with a phono-pickup and the stages before the detector should be subjected to the usual procedures for trouble-shooting, such as tube checking and voltage and resistance analysis as well as signal tracing. The detector circuit is, of course, subject to the usual troubles such as open resistors and coils, and shorted, leaky or open condensers.

A simple method of determining whether the trouble is before or after the discriminator involves the voltage across the grid resistor in the limiter shown in *Fig. 6.* If a negative voltage is developed across this resistor (point (G) to ground) when an *if* signal is applied to the preceding stages, then the trouble is after this point. Now, if the audio stages have also been found to be OK, the trouble has been localized to the stage between the limiter and the audio amplifier—the detector. If the noise level of the audio signal becomes abnormally high, the trouble probably lies in the limiter. You will recall from the beginning of this article that the limiter clips off all noise pulse since the discriminator is not able to eliminate them. Hence if there is noise, the limiter is not doing its job. The limiter is operated with *unusually low* plate and screen voltages. Check them to see if they are as low as they should be. If they are higher than the manufacturer's service notes specify, that stage works simply like another *if* amplifier and does not clip off the noise pulses. If you can not get a true zero at point (B), this may be due to the fact that the two diodes have widely different characteristics, or that the two resistors *R1* and *R2* are not sufficiently close in value, or simply that the set is not aligned properly. Various conditions of alignment are shown in *Fig. 10,* and this chart should be kept handy when aligning FM detector stages.

Now the ratio detectors in *Figs. 7* and *8* do not require a limiter because the electrolytic condenser *C1* together with whatever resistance is in parallel with it absorb and suppress noise pulses. Hence, if the set becomes noisy, the condenser and the resistor (or resistors if the detector is of the balanced type) should be checked. This condenser is a high capacitance-low voltage type which usually does not short, but like all electrolytics it may lose capacitance after a while, particularly if the set has been idle.

If the higher audio frequencies are unusually strong and if there is a strong hiss, we should suspect the condenser used in the de-emphasis network. Due to heat this condenser may open. This trouble may occur in any FM receiver regardless of the type of detector used. This trouble is not always noted since it may generally be almost completely compensated for by an adjustment in the setting of the tone control. Low output is generally caused by bad tubes, misalignment or leaky coupling condensers in the first *af* amplifier.



by BOB DARGAN

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

Dear Answer Man:

I have a model RCA 7T104 which goes out of sync after an operation of from an hour on. Before going out of sync there is a noticeable pull on the right side of the picture tube as when the horizontal oscillator transformer is out of adjustment. Adjusting the horizontal drive and lock-in range has no effect once it drops out of sync, but when the width control is turned full counter-clockwise it will drop into sync but this narrows the picture. I have changed the resistors in the hold control, etc., with no effect.

C. A. S.
Bronx, N.Y.

Dear C. A. S.:

One of the most common failings of Television servicemen is their negligence in replacing all tubes by substitution in the circuits where the trouble can possibly exist. It always goes without saying that the tubes should have been substituted. In this case the 6SN7 and 6BG6 tubes are assumed to be good tubes.

The most probable cause of drifting of the horizontal frequency is the blocking oscillator condenser, 180 $\mu\mu f$ at the grid, pin #4, of the 6SN7 horizontal blocking oscillator. The condenser is changing capacitance during the first hour period until the phase comparer can no longer take care of the correction of the frequency, with the result that the horizontal oscillator goes out of sync. See *Fig. 1.*

The horizontal oscillator is corrected in frequency when the width control is rotated counter-clockwise because in this circuit the B plus voltage is fed to the width control through the variable arm. When the width control is adjusted in the minimum width position that same position permits maximum voltage to be supplied to voltage divider resistors of the horizontal hold control. The increase in positive voltage supplied to the hold control causes heavier conduction in the phase comparer tube with a resultant larger voltage supplied from the cathode circuit of the phase comparer to the grid, pin #4, of the horizontal blocking oscillator. The increase in grid voltage supplied to the horizontal blocking oscillator brings it back into frequency correcting for the change in capacity of the condenser.

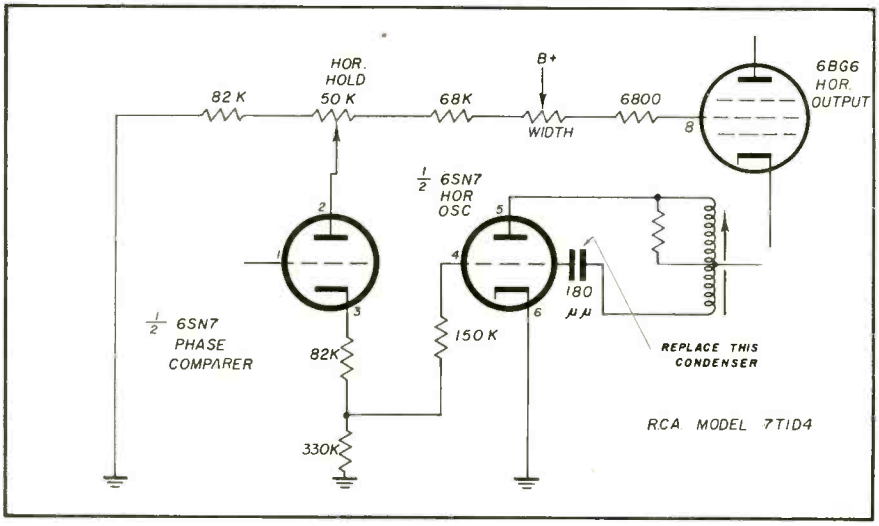


Fig. 1—Changing blocking oscillator condenser in RCA Model 7T104.

• • •

Dear Answer Man:

I have several customers who have complained to me about a ghost on Channel 2. I have tried a number of things to correct this trouble and they have not worked out. The problem is rather common, I understand, and therefore I have not done much about it. What do you suggest?

L. M.
Chicago, Ill.

Dear L. M.:

There are a number of things that can cause this type of trouble. Ghosts on Channel 2 are often caused by the antenna. Changing the type in many cases will correct the ghost. Most TV antennas are not cut to favor Channel 2 with the result that ghosts can originate because of the mismatch at the antenna and in the transmission line. Also, a very broad receiving lobe can cause this trouble if the ghost is due to reflections and therefore caused by a delayed second signal. See *Fig. 2.*

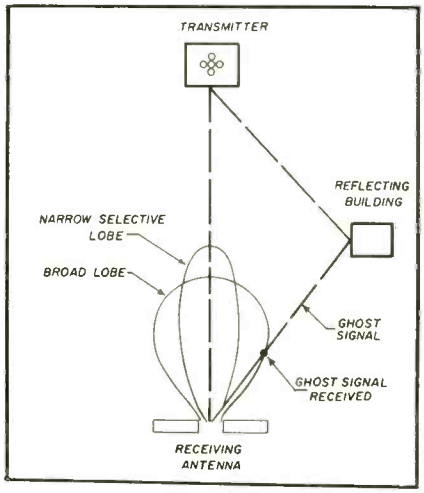


Fig. 2—Broad lobe antenna brings in ghosts with greater amplitude.

Mismatch resulting in standing waves and reflections on the transmission line can also cause ghosts on a particular channel. One type of stubbing has been found to be very

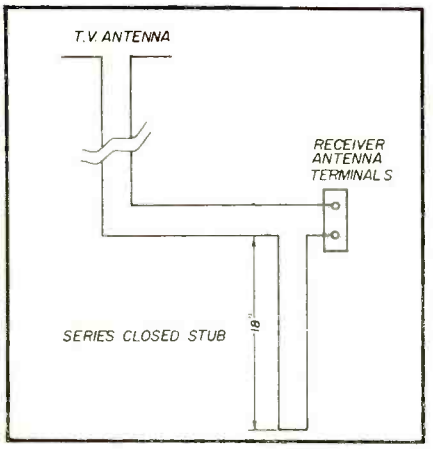


Fig. 3—Use of series closed stub to eliminate ghosts on channel 2.

effective. It is the closed stub in series with one side of the transmission line. This stub will cancel the reactive component at the receiver and the termination will be mostly resistive. In most cases the stub should be of the closed type. The technician starts with a piece of twinlead of about 24 inches and reduces the length to about 18 inches which is the optimum in many instances. However, there are other cases where an open stub is more effective in balancing out the reactive component.

Stubbing of the antenna to give better reception is not something new, but most technicians think only in terms of parallel stubs and never consider the series type as illustrated in *Fig. 3*. Stubbing is experimental and usually involves a *cut-and-try* procedure. In general the series closed stub about 18 inches long has proven successful in eliminating many ghost problems on Channel 2.

One other point concerning this is the mixer plate coil. The mixer plate

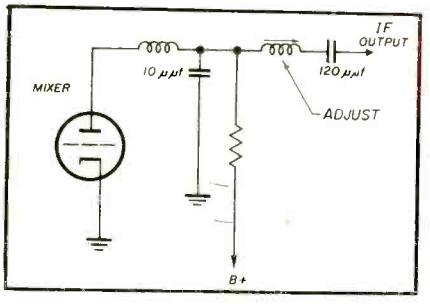


Fig. 4—Adjusting mixer plate coil can eliminate ghosts on channel 2.

circuit can in some cases cause this difficulty also. The staggered tuned coil in the mixer plate circuit can be adjusted one turn in either direction to help overcome the apparent ghost if the technician is careful *(Fig. 4)*. He should be able to return to the original setting if no improvement is experienced.

Dear Answer Man:

I am a TV serviceman and have converted a smaller TV receiver for use with a 21 inch size picture tube. The conversion worked out very nicely except for one difficulty. After a few hours of operation the high voltage system develops a blooming condition as the brightness control is advanced.

I have replaced the 1B3 high voltage rectifier tube four times and after each replacement the set works fine for a period of hours and then the same condition develops. What do you think is the cause of this condition?

T. T.
New Hyde Park, Long Island

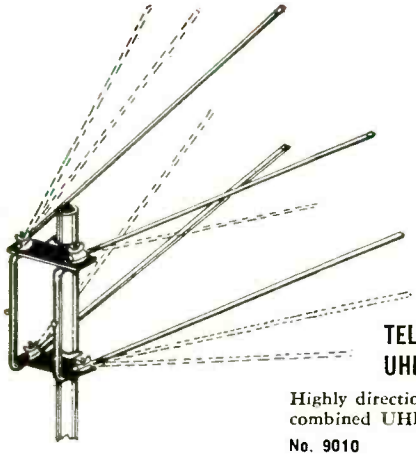
Dear T. T.:

A condition of repeated blooming often occurs in receivers due to insufficient filament voltage being applied to the high voltage rectifier tubes. In series with one side of the filament lead to the high voltage rectifier tube is a resistor and the purpose of this resistor is to reduce the voltage available from the transformer to a proper value for the operation of the H.V. rectifier tube.

If the voltage applied to the tube is larger or smaller than required, difficulties will develop. If the voltage is insufficient to heat the emitting ma-

[Continued on page 66]

THE "TELCO TEN"



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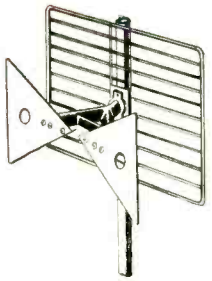

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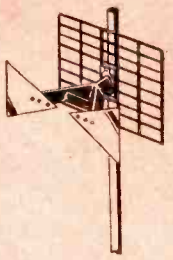

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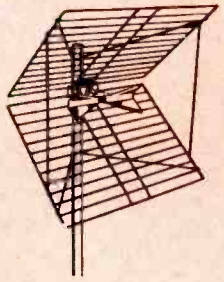

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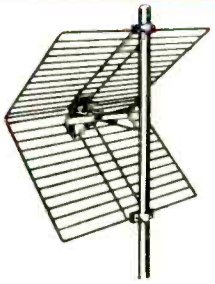

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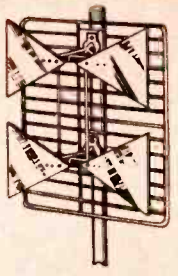

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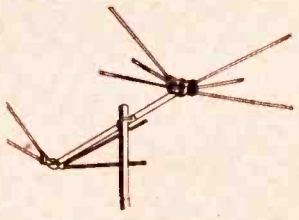

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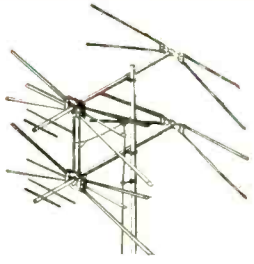

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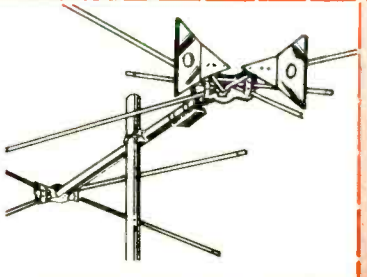

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COLOR TV

by LEONARD LIEBERMAN

Basic principles of color TV transmission and reception explained for the serviceman

THE NTSC color system *(Fig. 1)* consists of a transmitting section in which a scene is scanned by a three color camera. The camera output is then mixed with other necessary signals so that the transmitted signal is composed of the following elements:

1. An amplitude modulated video r-f carrier signal corresponding to the present monochrome signal.

2. An amplitude and phase modulated color sub-carrier.

3. The same horizontal and vertical sync signals as transmitted at present plus an additional color sub-carrier reference signal (color burst).

4. The sound system remains the same as at present.

At the receiver, the signal is treated as at present up to the video detector. The sound and sync sweep systems remain the same and the scanning system is the same with some slight modifications. The brightness or luminance portion of the video signal is handled through video amplifiers, essentially the same as at present. The color or chrominance signal is processed in the color decoder so that at its output we have the original three color signals. These signals, when added to the luminance signal at the input of the color CRT, result in a reproduction of the scene at the camera.

Picture Channel Consideration

Before going into the details of the blocks in *Fig. 1,* let us first examine the basic principles of the color system. In the monochrome signal, the picture details are determined by:

1. The degree of whiteness of the scanned element (white and different shades of grey and black).

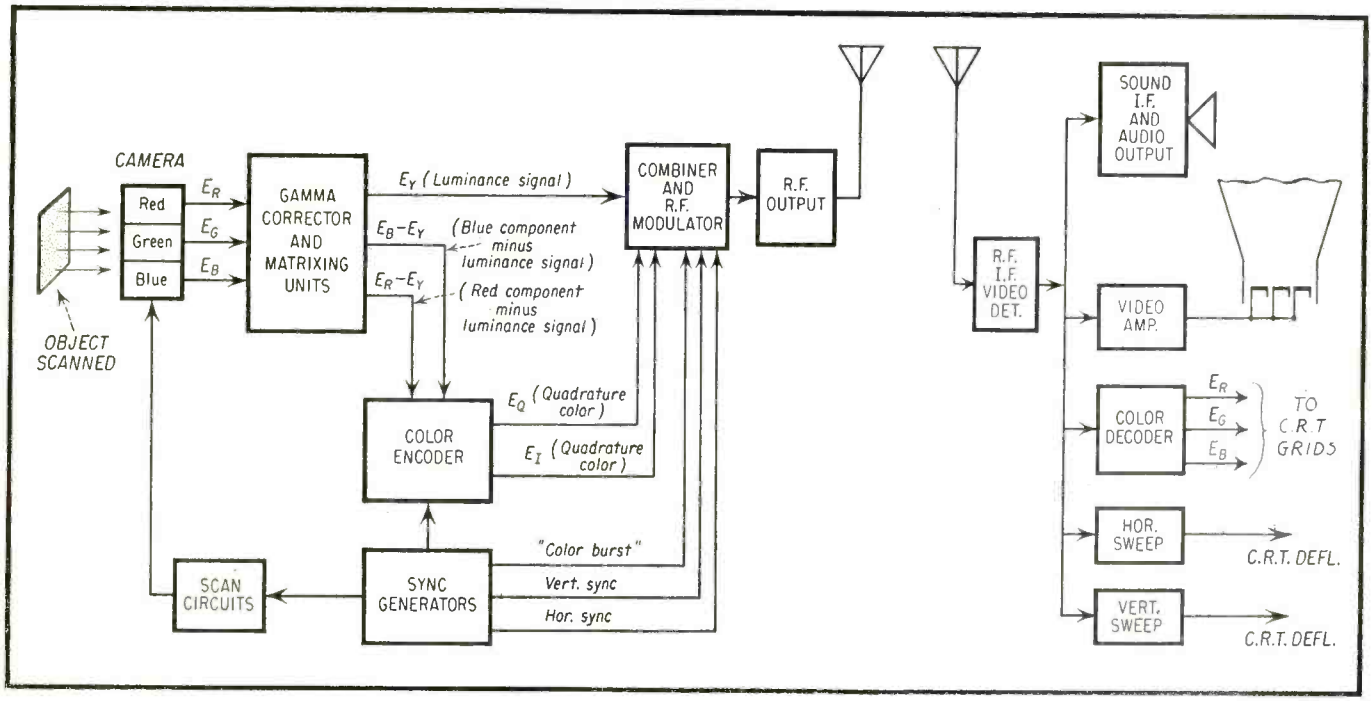


Fig. 1—Block diagram of NTSC System showing transmitter and receiver.

2. The degree of brightness of the over-all scene.

In the color picture, as stated previously (*Nov. RTSD*), the picture detail is determined by:

1. Hue (color).
2. Saturation (shade of color).
3. Over-all scene brightness.

In the NTSC compatible color system, the equivalent of the monochrome video information is carried in what is known as the *luminance* channel. This channel is an amplitude modulated signal at the video carrier frequency. It is a vestigial side-band modulated signal, as at present.

The color information is carried on an additional frequency which is both phase and amplitude modulated. This is called the chrominance or chroma channel.

Where no provision is made in the receiver to demodulate the chrominance sub-carrier, as in present monochrome sets, only the luminance channel appears at the CRT. In this way, a color picture can be received in black and white on a monochrome receiver. In the color TV receiver, however, the demodulated chrominance channel is added to the luminance channel at the CRT and the result is a color picture.

Chrominance Channel Considerations

Let us look a little closer into some of the relationships of the luminance and chrominance channels. It has been proven that the eye, at normal viewing distance, is insensitive to fine detail in color. That is, the eye tends to integrate the fine color details, at a distance, into a single color. The result is that the chroma channel does not need as wide a frequency response as the luminance channel.

The chroma channel itself, consists of two sub-channels. These sub-channels operate at the same frequency, but in a certain fixed phase relationship to each other (90°). The purpose of this phase difference will be discussed in detail further on in this article.

Fig. 2 shows the demodulated luminance and chrominance channels in their relation to each other. A quick glance would seem to indicate that there is a contradiction between what was said previously about the low-frequency requirements of the chroma channel and its position on the video curve. Further examination, however, will reveal that although the *color sub-carrier* is at 3.58 *mc*, the actual frequencies modulating this carrier extend 1.3 *mc* below the sub-carrier and

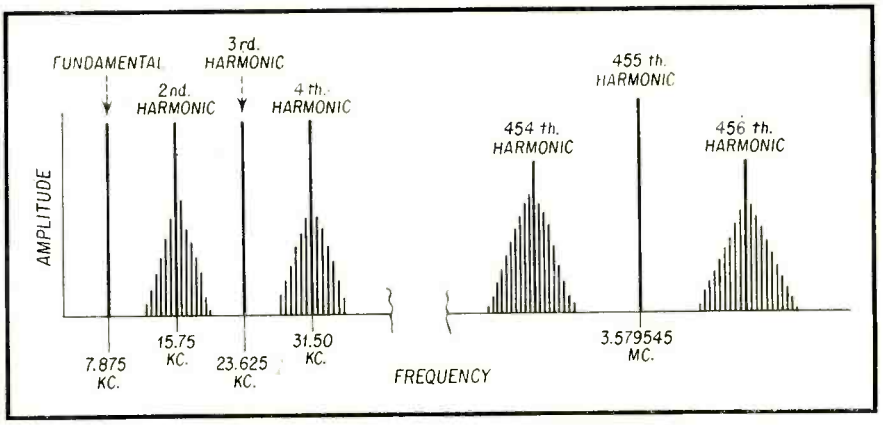


Fig. 3—"Interleaving" showing video clusters of energy.

about 300 *kcs* above the sub-carrier. Looking at this response curve by itself, we observe that it is comparatively narrow with respect to the *video* response curve.

The chroma channel consists of two sub-channels for the following reason:

Refer to *Fig. 1*. Observe that three individual color signals are extracted from the color camera. These signals are then mixed in a suitable network and we have, as a result, three new signals. These are:

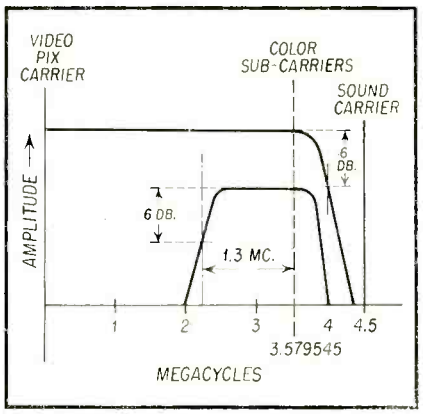


Fig. 2—Relationship of video carrier and color sub-carrier in NTSC system.

1. E_Y, which is a combination of certain proportions of all three original colors added together.
2. E_R-E_Y, which is the result of the subtraction of E_Y from the original full red signal.
3. E_B-E_Y, which is the result of the subtraction of E_Y from the original full blue signal.

The complete transmitted video channel contains E_Y as the black and white signal and E_Q and E_I which are derived through an additional network (color encoder) from E_R-E_Y and E_B-E_Y.

Now here is where the crux of the whole system of color transmission is made possible:

1. E_Y is transmitted as a separate black and white signal on the original pix carrier.
2. E_Q and E_I can be considered as a separate signal transmitted in such a way that they do not interfere with each other or with the luminance signal.

In summation, we might qualitatively point out that the E_Q and the E_I signals contain elements of all three original colors and by proper electronic mixing of these two signals we can reproduce the three original colors in the receiver. The additions and selection of the proper proportions of the several signals is known as matrixing.

Sub-Carrier

The origin and composition of the color sub-carrier is the heart of the NTSC system. A detailed examination of this signal is, therefore, in order. The first thing to note before discussing the component of this signal, is that we will encounter a number of ideas, which, while used in other branches of communication, will be completely new concepts to the busy practicing serviceman. We will try to explain them as simply as possible without extensive mathematics. So for the sake of simplicity, a number of statements will be made and left to the enterprising serviceman for the mathematics involved.

The first principle under this heading is the fact that in the video signal, the energy present is not in a continuous band of power, but is so bunched that there exists, at the odd harmonics of half the line frequency, *no energy*. *Fig. 3* shows how the even harmonics of half line frequency contain the video information in clusters of energy around the even harmonic positions on the graph. Note that in between (odd harmonic positions) no energy is present. It is possible, at this point, to insert another signal the basic frequency of which is an odd harmonic of half the line frequency without disturbing the original signal. This process is

[*Continued on page 78*]

R-C CIRCUITS

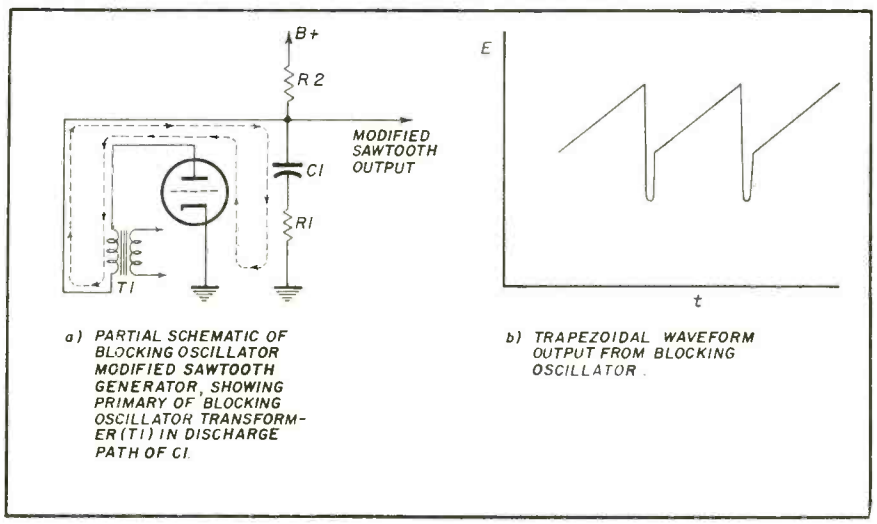
by Cyrus Glickstein

Theory of series R-C circuits, covered in first installment, is now applied as a means of understanding four basic and important circuit types.

A GOOD point to remember is that in the blocking oscillator type of sawtooth generator the trapezoidal waveform is not quite the same at the output of the oscillator. This is because the primary of the blocking oscillator transformer is in the discharge path, and has an inductive effect, *Fig. 8a*. The typical trapezoidal waveform for such a circuit is shown in *Fig. 8b*. The output waveform may also be modified somewhat in sawtooth generator circuits which use feedback from the output stage to the oscillator stage.

A clear understanding of series *RC* circuits helps the technician analyze how voltage is distributed around a circuit. A good example to test your ability in this direction is a multivibrator type of circuit used in many different types of electronic equipment, as shown in *Fig. 9*. There is −85V bias on V1, because of the voltage divider arrangement in the cathode. This is sufficient to cut off V1. V2 is conducting. From the information given on the diagram, a) what voltage is *C1* charged up to? b) When a large negative square wave is applied to the grid of V2 and cuts the tube off, what is the voltage across *R1* at the instant V2 is cut off?

The answer to a) is 30V. A coupling condenser (in the usual type of circuit connection) charges up to the value of *dc* voltage on the plate of the tube to which it is connected. The condenser therefore charges up to the value of plate voltage on V2. The answer to b) requires a more detailed explanation. When V2 is cut off by a large negative square wave, the plate voltage of V2 starts to rise to the B+ value (+150V) and *C1* starts to charge to this new value. The equivalent circuit at this instant can be represented by *Fig. 10a* or even more simply by *Fig. 10b*.



a) PARTIAL SCHEMATIC OF BLOCKING OSCILLATOR MODIFIED SAWTOOTH GENERATOR, SHOWING PRIMARY OF BLOCKING OSCILLATOR TRANSFORMER (T1) IN DISCHARGE PATH OF C1.

b) TRAPEZOIDAL WAVEFORM OUTPUT FROM BLOCKING OSCILLATOR.

Fig. 8—Condenser discharge in blocking oscillator.

Since V2 is cut off, the condenser starts to charge through the charge path of *R1* and *R2*. The voltage already across the condenser (30V) can be considered to buck the source voltage of the battery (B+). The difference in voltage can be considered to divide across the resistors in the circuit at the instant the condenser starts to charge. Since there is 150V in the battery and 30V across the condenser, the difference of 120V divides proportionally across the two resistors. There is 80V across *R1* (100K) and 40V across *R2* (50K). Incidentally, plate voltage of V2 at this instant rises from +30V to +110V, which is 40V (the drop across *R2*) less than B+. Then as the condenser charges, the voltage across both resistors drops accordingly.

We now come to a very important group of series *RC* circuits for the electronics technician — differentiating and integrating circuits. A brief review of this action in series circuits will be made at this point, so it can be compared to similar action in more complex circuits, where definite differences will be found in the results.

Differentiating and integrating circuits have the property of changing the shapes of complex waveforms, such as square waves, sawtooth waves, etc.

The shape of a sine wave is not changed in going through these circuits, although the phase is shifted.

A differentiating circuit, *Fig. 11,* has a short time constant, and the output is taken off the resistor. By a short time constant is meant an *RC* or time constant ($T = R \times C$) value that is short compared to the time of an incoming signal. For example, assume a square wave has a frequency of 10,000 cycles per second. One cycle is equal to 100 microseconds. Each half of the square wave is applied to make the condenser charge up first in one direction then in the other. The duration of each half of the cycle is 50 microseconds, *Fig. 11.* This square wave is applied across a circuit with a time constant of 5 microseconds (*R* is 5K, *C* is .001 μf, $RC = 5{,}000 \times .001 \times 10^{-6}$ or 5 microseconds). This means the condenser will charge to 63% of the source voltage (peak voltage of the square wave) in 5 microseconds, and to the full (100%) source voltage in 5 *RC* or 25 microseconds. In other words, the condenser becomes completely charged before the polarity of the square wave reverses. The input square wave is changed to the output differentiated wave or pips as shown in *Fig. 11.* Note that after the first half-cycle, the output waveform has *double* the peak-to-peak voltage as compared to the input waveform. This is typical of differentiated circuits, since the condenser acts very much like a condenser in a voltage-doubling circuit in a power supply. The charged condenser acts in series with the source voltage and the combined voltage is applied across the resistor at the first instant the polarity changes in every half-cycle.

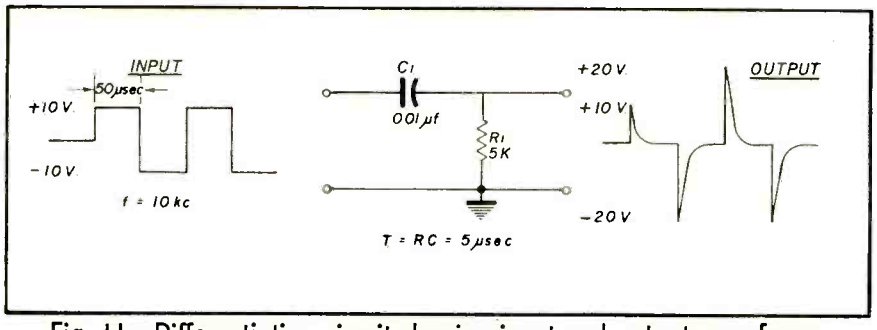


Fig. 11—Differentiating circuit showing input and output waveforms.

An integrating circuit does the opposite. A large time constant is used and the output is taken off the condenser *(Fig. 12a).* A familiar example of such a circuit is the integrating circuit in TV which is used to distinguish between vertical and horizontal pulses, *Fig. 12b.* Narrow horizontal pulses do not occur for long enough time to charge up the condensers in the integrating circuit to any substantial value. This is true because the condensers have a large time constant (take a comparatively long time to charge as compared to the input frequency). However, the broad vertical sync pulses at the end of each field do charge up these condensers sufficiently to trigger the vertical oscillator and so keep it in sync with the transmitter.

We are now ready to apply all of this information to the basic types of series-parallel *RC* circuits and to see how differently they behave as compared to series circuits.

[*To Be Continued*]

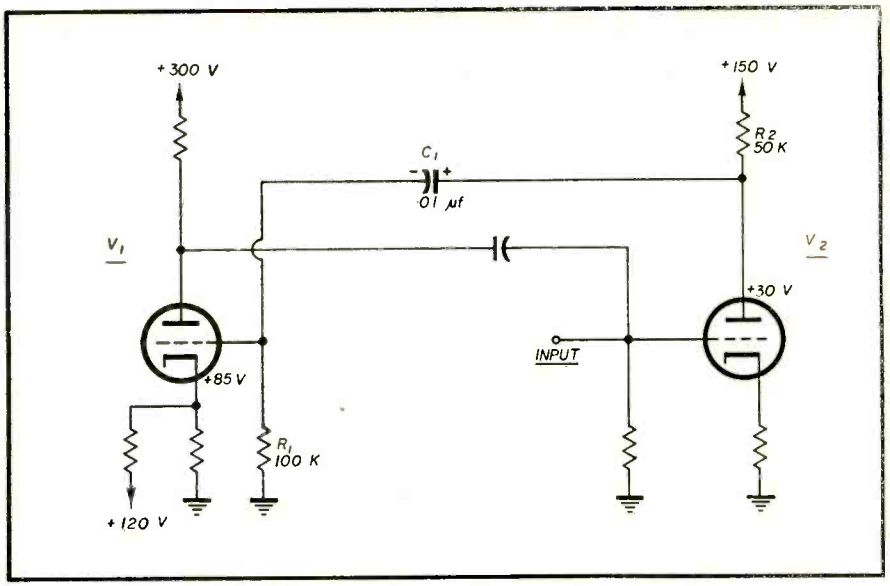


Fig. 9—Multivibrator circuit—V1 cut off, V2 conducting.

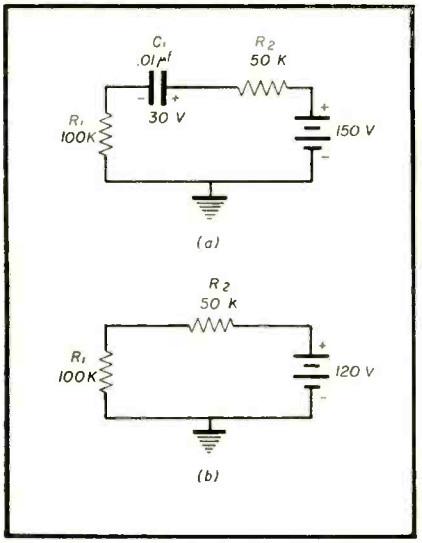


Fig. 10—Equivalent circuits of multivibrator (Fig. 9) at instant V2 is cut off. C1 discharges across R1.

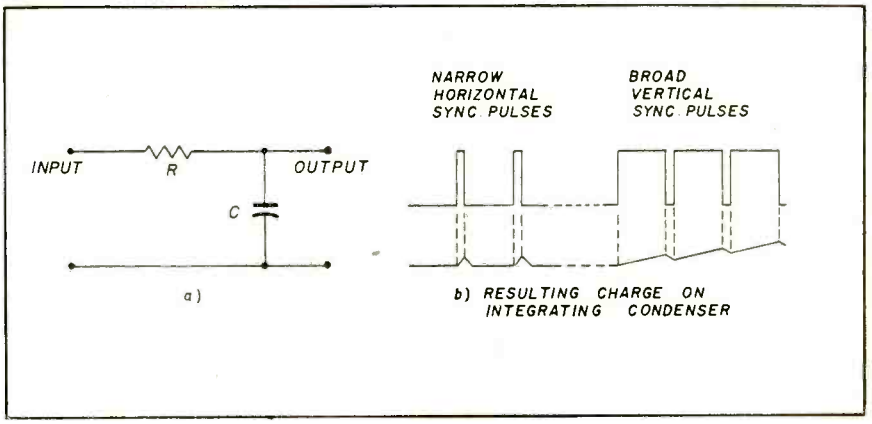


Fig. 12—Basic integrating circuit. Large RC time constant causes sync pulse inputs to result in integrated output across C.

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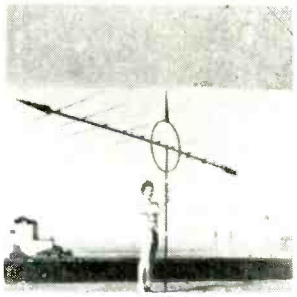
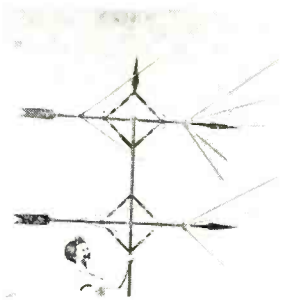


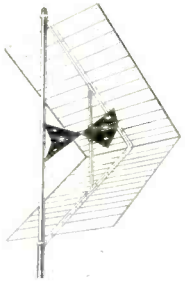
New Ward Antennas

Two new TV antennas have been introduced by **Ward Products Corporation, Division of the Gabriel Co.**, Cleveland, Ohio. The Circlevane and the Dymon-vane, designed by Dave Chapman, industrial designer, are made of strong aluminum elements with cross-arms of Jones and Laughlin Perma-Tube. This electric weld steel tubing is coated inside and out with Vinsynite, an exclusive pastic-type corrosion-resistant finish. The Circlevane is for use in rural or suburban fringe areas where high sensitivity is required. It consists of 10 horizontal aluminum elements fastened to the Perma-tube cross-arm. The Dymon-vane conical type antenna is for use in metropolitan areas where both low and high band TV stations transmit in the same general direction. Design of the Circle-vane is based on the original concept of Dr. Yagi who patented the first directional radio antenna about 1919.



VTVM Training Aid

EICO has produced a new aid for teaching the use of the vacuum tube voltmeter. This demonstrator is a giant replica of **EICO's** Model 221. Actual size is 14¾" x 3⅛". It features movable function and range switches and a settable dial pointer. Available to schools and instructors, the teaching aid has an oversize dial face and authentic markings. For further details write to **Electronic Instrument Co., Inc.**, 84 Withers St., Brooklyn 11, N.Y.



New Tesco Antenna

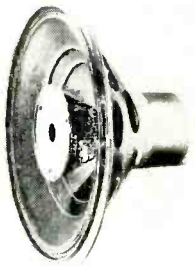
A single bay corner UHF antenna, Model 706, has been introduced by **TV Products Co. ("TESCO")**, Springfield Gardens, N.Y. Model 706 is an all channel UHF antenna designed for fringe areas. It is factory pre-assembled for quick installation. Also known as the "Cor-Tenna," the Model 706 is reported to make possible a gain of 14.8 db.

Kirby Xfmr Tester

The Model 98 Flyback Transformer Tester indicates shorted turns in the flyback transformer by the power absorption method and will indicate as low as one shorted turn. In addition, it will test for continuity on yokes, transformers, switches, etc. Further information on this portable, compact, and time-saving device is available from **Kirby Products Corp.**, 175 Fifth Avenue, N.Y. 10, N.Y.

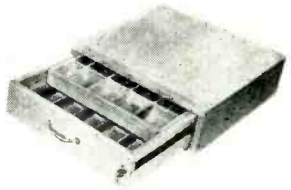
Duotone Hi-Fi Speakers

Duotone of Keyport, N.J. announces a new line of hi-fi speakers designed to replace woofer-tweeters. The new speakers feature "Ticonal," a new magnet steel giving a high flux density that makes possible an air gap of twice the normal depth. The "Master" range includes an 8⅛", a 10", and two 12" models. Frequency responses vary from 40 to 13,500 cps in the 8½" to 40 to 20,000 cps in the finest 12".



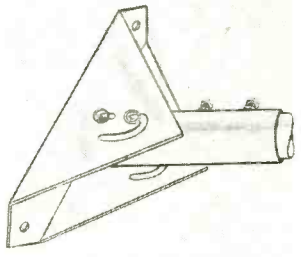
Under-Counter Cash Drawer

Many stores and shops have experienced a need for an under-counter cash drawer to be used as a bank drawer. The lower section of this drawer has 10 currency compartments. A sliding tray—the top section—has 5 coin tills for handling loose coins and 5 coin compartments for handling packaged coins. Size is 21½" long x 20⅛" wide x 6⅜" deep. Further details on this Model G-1 may be had by addressing **Indiana Cash Drawer Co.**, Shelbyville, Ind.



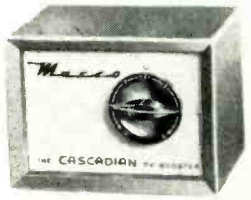
South River Antenna

South River Metal Products Co., Inc. announces its new type of TV antenna roof mounting. The RM-15 has South River's "walkup-drop lock" feature in which the antenna and mast are inserted into the mast holder from a horizontal position, and then "walked up" to a vertical position where a notch holds the antenna erect. The RM-15 may be mounted on either a flat or pitched roof.



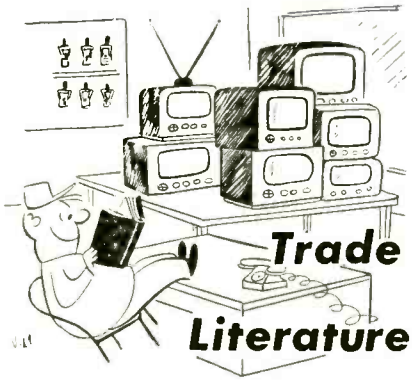
New Masco Booster

Masco's new Tunable VHF-TV Cascadian Booster increases the signal strength at least 56 times (35 db.) average on all channels. Field proven, the Cascadian provides high gain and bandwidths continuously for all channels 2 to 13. Permeability tuning and a single control knob are featured. For further information, write to the Mark Simpson Mfg. Co., Inc., 32-38 49th St., Long Island City 3, N.Y.



UHF-VHF Universal Standoff

A new universal standoff eliminates the metal ring from around the transmission line. It is said to overcome problems of standing waves and voltage losses and to permit the closest approach possible to running a transmission line in free space. It accommodates all types of transmission line without the need to thread. Write to **Argyle Electronic Co.**, 8 West 18th Street, New York 11, N.Y. for further information.



• • •

Through the cooperation of Snyder Manufacturing Company, Philadelphia, the new 1954 edition of *TV 'Tenna Tips* is being made available free to all in the television field. A new feature of the publication this year is the "Antenna Selector," a special section of "Antennas for Areas" recommended by Matt Mandl and Ed Noll. In this feature, the best antennas for each area are noted, with first, second and third choices being listed. Also included in the subject matter are the latest *uhf* and *vhf* data, Directronic antennas, Yagis, Installation Do's and Don'ts, Dimension Guide, Channel Frequencies, Helpful Hints and many other subjects relating to television antennas. The publication is illustrated throughout with diagrams and charts. This pocket size reference manual is being offered free to TV servicemen, service dealers, dealers, distributors, salesmen, manufacturers and "Hams." Free copies may be obtained by writing to Snyder Manufacturing Company, Philadelphia 40, Pa.

* * *

John F. Rider, Publisher, Inc., 480 Canal St., New York 13, N. Y., announces a new publication *"How To Troubleshoot A TV Receiver,"* by J. Richard Johnson. Written to aid the service technician to systemacically troubleshoot all TV receivers, this step-by-step guide tells the reader where to start troubleshooting and how to continue, from the moment he is told or observes what the symptoms are. Complete listings are given of materials, tools, tubes and test equipment required to troubleshoot in a customer's home or the service shop. The primary purpose of the book is to teach the technician how to approach TV troubleshooting systematically, rather than by means of hit or miss time-consuming practices. This latest book in the publisher's "how to" series on TV and radio servicing contains approximately 128 pages in a paper binding.

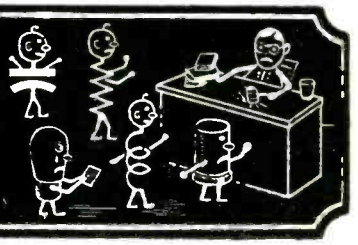
The new *Stancor Transformer 24-page catalog* carries complete electrical and physical specifications on almost 500 transformers for radio, television, high-fidelity, amateur, military, and other electronic applications. A cross index chart between obsolete power transformers and the current "8400" series power transformers has been included.

This catalog is available, without charge, by writing the Chicago Standard Transformer Corporation, Standard Division, Elston and Addison, Chicago 18, Illinois.

A new *condensed price list* on all Sprague "bread and butter" service capacitors and resistors has just been announced. Mounted on a wall, or almost any place, the sheet makes an ideal, ready reference of the most widely used Sprague ratings. Dealers will find it a convenient way to determine what the customer should pay, as well as an easy means of checking inventory of "must" components. The new list P-143 may also be obtained by writing Sprague Products Company, 71 Marshall Street, North Adams, Mass.

[*Continued on page 76*]

CIRCUIT COURT



Du Mont RA 164—Sync Separator

The sync separator in the Du Mont RA 164 *(Fig. 3)* uses a 6BE6 as the separator. As shown in *Fig. 1*, the first grid is fed a sync-phase negative signal from the video detector. The third grid is coupled to the plate of the video amplifier. The signal from this source is sync-phase positive. The signals fed to the grids are then 180° out of phase. The characteristics of the 6BE6 are such that as long as plate current flows, the third grid acts as the control grid. The first grid, however, can cut the tube off. The third grid can only apply the signal when the first grid is above cut-off.

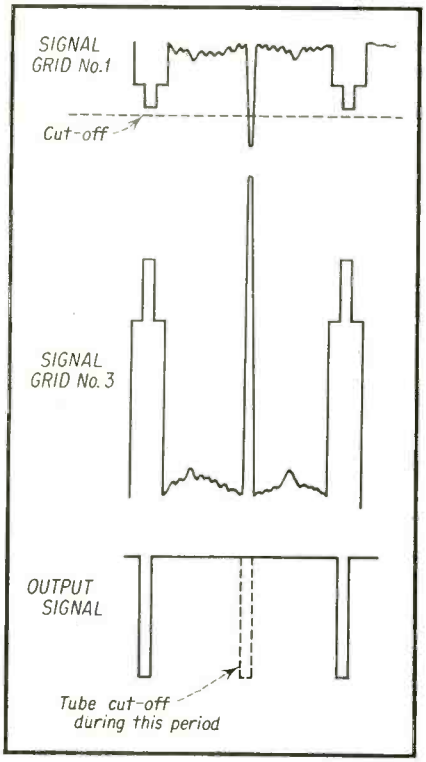


Fig. 2—Signals fed to first and third grids in sync separator using 6BE6.

The bias on grid #1 is set so that the top of the sync pulse is just above the cut-off point. *Figure 2* shows what happens when a noise pulse whose amplitude is greater than that of the sync pulse. The noise pulse drives grid #1 beyond cut-off, therefore, during this period what appears on grid #3 does not appear in the output.

Noise pulses on the sync pulse will, of course, cut off the tube and the sync pulse from the output. The oscillator circuits, however, are so designed that the flywheel effect of the oscillators will keep them in sync until the reappearance of the sync pulses.

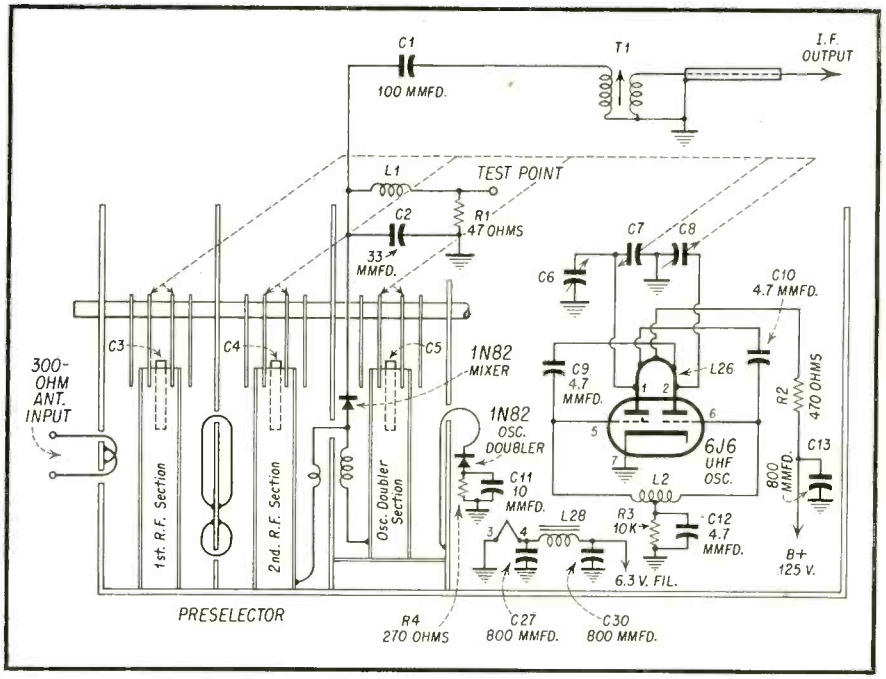


Fig. 3—Schematic of General Industries UHF tuner.

General Industries UHF Tuner

THIS *uhf* tuner, one of the more popular makes used by manufacturers for the *uhf* channels, is shown schematically in *Fig. 3*. This unit works on the oscillator frequency doubler principle.

The 6J6 tube operates as a balanced push-pull oscillator. The in-phase voltage required to keep the unit oscillating is supplied to the opposite grid by each of the plates. This operation is a modification of a Hartley oscillator. The oscillator is tuned to half the frequency needed for the *uhf* channels.

Crystal #1 (1N82) is fed the output of the 6J6. As a non-linear device, the output of this crystal is rich in the harmonics of the oscillator. A circuit tuned to the oscillator's second harmonic couples the crystal #1 output

[*Continued on page 76*]

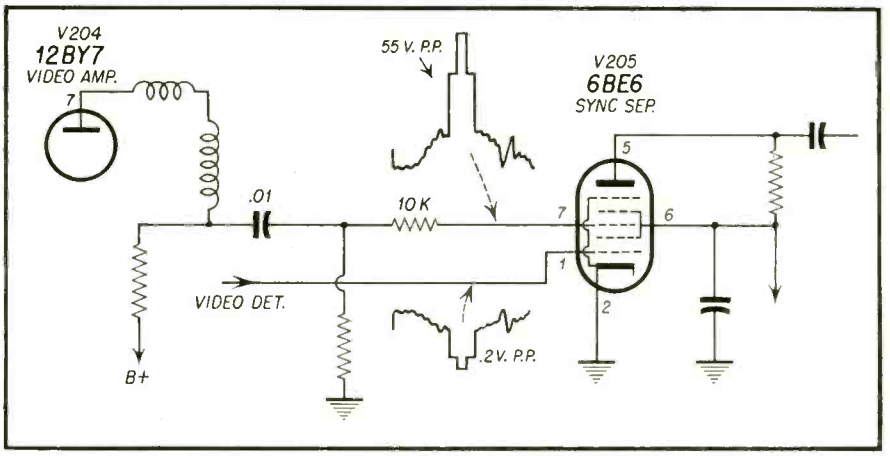


Fig. 1—Simplified schematic, Du Mont RA-164 sync separator.

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NEW PHONO-CARTRIDGE CARRY-KIT *or* DISPLAY-DISPENSER

Handy All-Metal Carry-Kit Holds 6 E-V Cartridges

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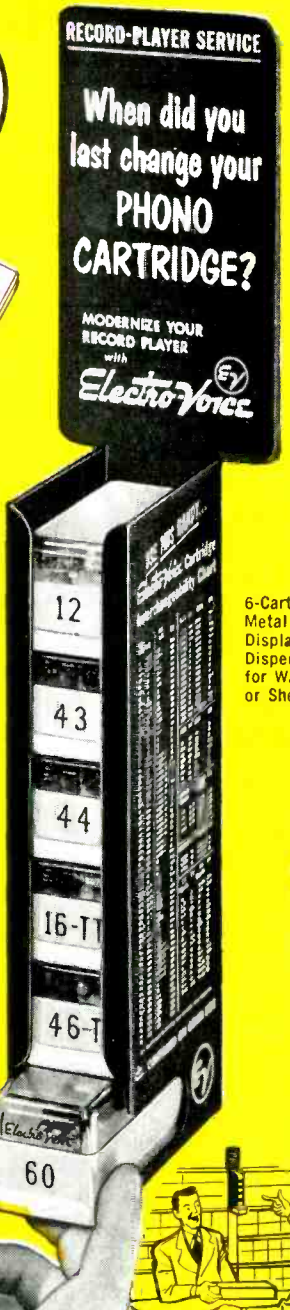

6-Cartridge Metal Display Dispenser for Wall or Shelf

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PHONOGRAPHS ARE WAITING TO BE SERVICED

Get your share with these E-V aids to sales!

Again E-V gives you a positive profit-maker—and helps make *you* the authority on Phono-Service in your community!

Free of extra cost, from your E-V Distributor, you can get your choice of new Cartridge Carry-Kit or Display Dispenser *plus* professional Decal and up-to-date set-model Replacement Guide, with *every* purchase of *any* 6 E-V Phono Cartridges.

Furthermore, the new E-V high output, high compliance, permanent Ceramic Cartridges revolutionize servicing. They are *not* affected by moisture or heat—can be carried in your service kit or kept on display without fear of deterioration. *And they are directly interchangeable with silent-needle type crystal cartridges that do not use a thumb screw*—yet cost no more than crystal. They are part of the famous E-V Basic 6 Preferred Types that make over 92% of all cartridge replacements.

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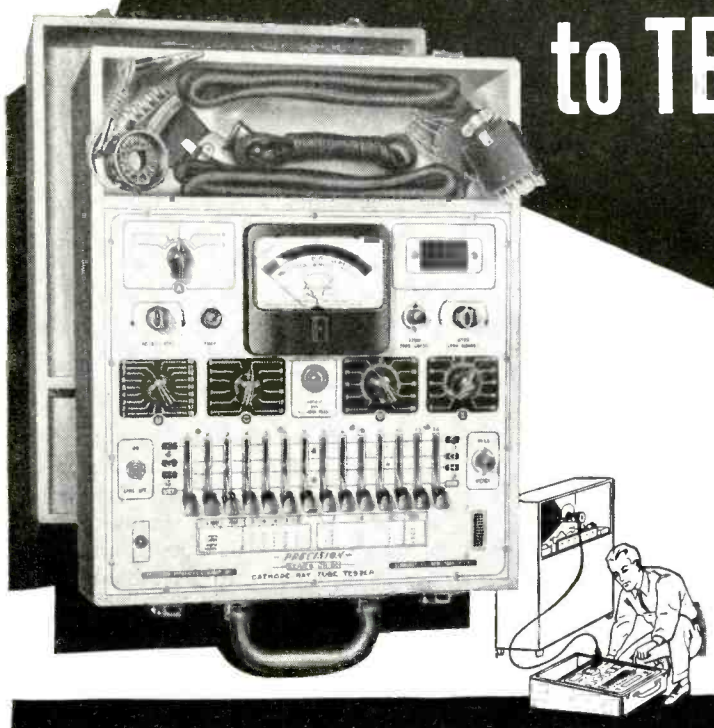
It takes a CR TUBE TESTER to TEST a CR TUBE...



...because CR tubes are electrically and physically different from all other types of electron tubes! Some of the more obvious differences include:

PICTURE PRODUCING BEAM CURRENT
EXTREMELY LOW ANODE CURRENTS
DIFFERENT, MULTIPLE OPERATING VOLTAGES
HIGH LEAKAGE and SHORT CHECK LIMITS
MORE and DIFFERENT TUBE ELEMENTS
- ELECTROSTATIC FOCUS ELEMENT
- ELECTROSTATIC DEFLECTION PLATES
- ELECROMAGNETICALLY FOCUSED GUN
- ELECTROMAGNETICALLY DEFLECTED BEAM

ETC., ETC., ETC.

YES, IT TAKES A CR TUBE TESTER TO TEST A CR TUBE...

AND THE *PRECISION CR-30*

WAS SPECIALLY DEVELOPED FOR THIS VERY IMPORTANT PURPOSE!

TESTS ALL TV PICTURE TUBES

Magnetic & Electrostatic
Oscilloscope & Industrial Types

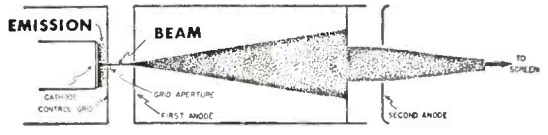
...FOR BEAM CURRENT INTENSITY (Proportionate Picture Brightness)

Stop Guess-Checking with CABLE ADAPTERS!

- *Receiving* tube checkers were made for testing *receiving* tubes and NO CABLE ADAPTER *can adapt them to do the job of the CR-30.*
- CABLE ADAPTERS only check for filament continuity, a degree of inter-element short and a so-called emission test.
- CABLE ADAPTERS do not test for the all-important, picture producing beam *current.*

You can't afford to guess when you test the most expensive component of a TV set.
Be sure with PRECISION Model CR-30!

IT IS THE ELECTRON BEAM **(and NOT total cathode emission) which traces the pictures on the face of the CR tube.**



Cathode emission can be high, and yet Beam Current (and picture brightness) unacceptably low. *The CR-30 will reject such tubes* because it is a Beam Current tester. Conversely, cathode emission can be low and yet Beam Current (and picture brightness) perfectly acceptable. *The CR-30 will pass such tubes because it is a Beam Current Tester.*

The CR-30 incorporates additional special test facilities necessary for overall performance evaluation of the CR tube as will permit positive answer to the question "Is it the Picture Tube or the TV Set?" And the CR-30 gives the answer in but a fraction of the time required to test the other 2 dozen or so tubes in the set.

SERIES CR-30: In hardwood, tapered, portable case, with hinged, removable cover. 17¼" x 13¾" x 6¾". Complete with standard picture tube cable, universal CR tube test cable and detailed instruction manual. Shipping weight: 22 lbs.

NET PRICE $104.75

PRECISION TEST EQUIPMENT — Standard of Accuracy

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92-27 HORACE HARDING BLVD., ELMHURST 13, N. Y.
Export Division: 458 Broadway, New York 13, U.S.A. • Cables—Morhanex
In Canada: Atlas Radio Corp., Ltd., 560 King Street, W., Toronto 2B

TRADE FLASHES

[from page 12]

More TV Sets Than Bathtubs!

The Minneapolis-St. Paul area now has more television receivers in use than home telephones or bathtubs.

According to W. C. Johnson, vice president of Admiral Corporation, there are approximately 405,000 television receivers within the Minneapolis-St. Paul receiving area. That compares with the Northwestern Bell Telephone Company's count of about 370,000 home phones in the 40 mile area around the Twin Cities and the Census Bureau's estimate of 280,000 bathtubs—presumably in use.

The Admiral executive said that the amazing acceptance of television in the home put over 25,000,000 sets in use throughout the country in the short period of seven years. He said there are 50,000,000 telephones in service throughout the United States, but pointed out that telephones had a substantial head start on TV, since the first instruments were installed in New England over 70 years ago.

JFD Daily Production of 17,000 Antennas Sets Output Record

Mr. Julius Finkel, President of the JFD Manufacturing Company, Inc., of Brooklyn, N.Y., announces an all-time high in TV antenna production. The JFD organization, Mr. Finkel stated, manufactures 10,000 outdoor antennas and 7,000 indoor antennas daily. This substantial increase in production is attributed to the new 4-story factory (140,000 square feet of manufacturing space) on 62nd Street —a plant specifically designed for the manufacture of television antennas.

DuMont Heralds "Telectronic" Age

America is entering a new age—the "Telectronic Age" according to Dr. Allen B. Du Mont, television pioneer and president of Allen B. Du Mont Laboratories, Inc. In a recent address before the Industrial Council at Rensselaer Polytechnic Institute, Dr. Du Mont stated that the new age would "effect tremendous changes in our patterns of thought, morals, actions, commercial operations, and everyday living." In explaining the "Telectronic Age," Dr. Du Mont said: "The Telectronic Age symbolizes to me electronics with visibility. It embraces the idea of a useful television system applied to the facts of everyday living."

Dr. Du Mont cited many examples of the Telectronic Age in action. He called attention to its use as a vital tool in education, in medicine, in factories, in atomic plants, in financial institutions, and in transportation.

The role of Telectronics, according to Dr. Du Mont, has a potential much greater than the commonly accepted factors of television entertainment and culture. Its greatest usefulness, he stated, will be in closed-circuit type of transmissions. He indicated that the innumerable applications of electronics combined with vision over privately connected circuits would make this type of transmission more important than commercial broadcasting.

Leader Electronics, Inc., Moves

Leader Electronics, Inc. announce they have moved to larger quarters "to meet the unprecedented demand for Leader products." New address: 2925 East 55th St., Cleveland 27, Ohio.

RCA Ready To Start Delivery Of Color TV

The Radio Corporation of America has announced that it will soon commence delivery of compatible color television equipment to enable stations across the nation to broadcast color programs in their areas. The announcement indicated an early start for the first color television programs to be broadcast after the Federal Communications Commission approves standards for a compatible color system for television.

"One or more stations in 57 different cities have already placed orders with RCA Victor for color broadcast

[Continued on page 74]

MANDL'S TELEVISION SERVICING *Means*

- Quicker, More Accurate Trouble-Shooting
- Fewer Call-Backs
- More Satisfied Customers

An increasing number of TV servicemen are finding the 'Mandl way' the answer to quicker, more accurate trouble-shooting and greater customer satisfaction.

A complete Master Trouble Index makes it easy for you to locate the exact source of trouble quickly. It's in the form of a handy chart, listing the various hums, sound distortions, streaks, bars, focus defects and 100 other trouble symptoms in sound and picture together with the possible causes of each and the page on which servicing instructions are given.

Written by the nationally known expert

MATTHEW MANDL

Author of the "Television Servicing Clinic" in *Radio Electronics* and of regular articles on the technical and servicing problems of radio and television in other leading trade magazines; Director of Electronics and TV courses at Temple University; former operator of a radio station and owner of his own servicing business.

other practical features

plus new data on transistors cascode tuners automatically focused tubes and other recent developments

- Special servicing instruction for color TV; for VHF and UHF receivers; the latest circuits and innovations.
- Large, clear schematics of commercial circuits for all basic parts of the TV receiver.
- New, original photographs showing trouble symptoms as they appear on the TV screen for quick identification.
- Handy lists of troubles that may occur in each section of the TV receiver and the exact procedure for correcting each.
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You'll Learn Easily From This Book

It is written in the clearest, simplest, most practical terms by a man who is nationally known for his helpful articles on radio and TV servicing. From these step-by-step explanations and illustrations you'll clearly understand just how each unit in the TV receiver functions, how it is set up by the various manufacturers, what flaws may occur in it, what points in the circuitry cause these flaws, how they affect the other components in the unit, and how they show up on the TV screen. All faults likely to occur, including those hard-to-find troubles are fully dealt with. And you won't be confused by unnecessary theory. Only the essentials actually needed for practical servicing are given in clear, easy-to-follow terms.

You'll Find Full Instruction on

Simple signal tracing procedures • How to improve reception in fringe areas • How to use the oscilloscope and other test equipment • How to trouble-shoot keyed A.C.C. and synchroguide circuits; align I.F. stages • Any many trade tricks for diagnosing troubles in minimum time. $5.50

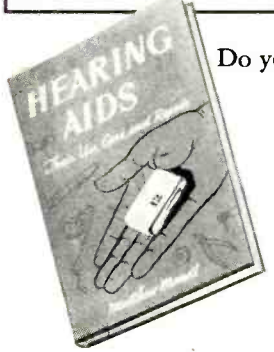
Coming Soon!

Matthew Mandl's

Television Service Course Laboratory Manual

Learn TV Servicing by Experiment

with this brand new manual. It's a work book of experiments designed to give you practical experience in trouble-shooting and servicing procedures of television receivers.



Do you know enough about hearing aids?

Hearing Aids

by Matthew Mandl

A rapidly increasing number of the 15,000,000 hard-of-hearing people in this country are turning to hearing aids which ALL REQUIRE SERVICING! This book explains the operation of modern hearing aids, the differences between the various types of earpieces, amplifiers, batteries, etc.; what may go wrong with them; how to locate trouble, and how to make adjustments and replacements. $3.50

Radio and Television Mathematics

by Bernard Fischer

"A book for the place of honor beside its natural partner, the slide-rule," says *Radio Electronics*. Here are step-by-step solutions for hundreds of circuit problems in radio, TV and industrial electronics. Whatever YOUR problem, whether it is how to correct the power factor of a motor, find the impedance and length of a matching stub between a TV antenna and its transmission line, or any of hundreds of other problems you're apt to encounter, here is the clear and exact solution. $6.75

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Please send me the books I have checked below. In 10 days I will either return the book or you may bill me at the prices shown, plus a small delivery charge. (SAVE: send check or money order and we pay postage.)

☐ TV SERVICING ..... $5.50 ☐ RADIO AND TV MATH $6.75
☐ HEARING AIDS $3.50

Signed .....

Address .....

.....

[from page 31]

terial sufficiently, the tube may operate satisfactorily for a few hours but a blooming condition will develop which can be corrected temporarily by the substitution of another tube. *However, the proper correction is to reduce the value of the series filament dropping resistor, thereby increasing the filament voltage to the tube (Fig. 5).* As an example, if the filament dropping resistor is 4.7 ohms, reduce it to 3.3 ohms.

In this problem as stated in the letter, it is very possible that the wrong resistor was used or the transformer requires a lower resistor even though service literature indicates the proper resistor is in use.

On the other hand, too much filament voltage can be detrimental to the high voltage rectifier tube. If the filament on the tubes repeatedly opens, it is more than likely due to the voltage being too high. This would require the series filament resistor to be increased in value. If the resistor is 4.7 ohms it can be increased to 6.8 ohms. This type of difficulty could easily occur if the picture tube is overscanned, thereby causing too much filament voltage to be applied from the transformer.

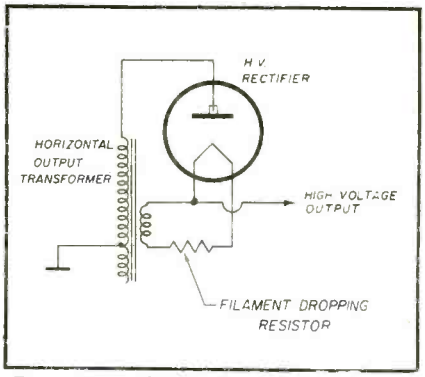


Fig. 5—Reducing value of filament dropping resistor increases voltage.

Dear Answer Man:

I have used several universal replacement yokes in servicing TV receivers and I do not seem to have any luck with them. Most frequently my trouble is a ripple in the left-hand side of the picture and raster, with several vertical bars. It appears to be some kind of damper trouble due to the yoke. Have you any suggestions as to what I can do to overcome this?

A. S. P.
Washington, D. C.

Dear A. S. P.:

It is suspected that the yoke does not have a damping resistor and condenser across the top horizontal deflection coil as illustrated in *Fig. 6.* Some yokes have been made available without these components and it is therefore necessary to install them. Suitable values are 2700 ohms for the resistor and 120 $\mu\mu f$ for the condenser. The series 2700 ohm resistor and 120 $\mu\mu f$ condenser are connected in parallel with the top horizontal coil and are used for damping purposes. Without them the left side of the picture can contain a ripple. This is most common with the low impedance yokes of 10 millihenry inductance. However, an open condenser across the 30 millihenry high impedance type yoke can also produce the same result.

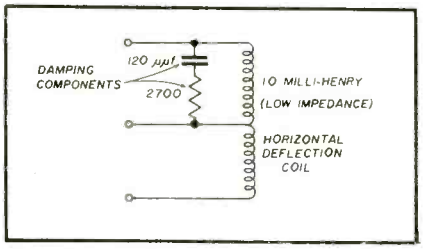


Fig. 6—If 120 $\mu\mu f$ condenser shorts, it gives the effect of a shorted yoke.

These damping condensers should have at least a 2000 volt rating and are usually connected on the yoke itself. On occasion they short across giving the effect of a shorted yoke. Technicians have been known to replace the yoke when the trouble was actually a shorted condenser.

• • •

ASSOCIATION NEWS

NATESA

Frank J. Moch, president of the National Alliance of Television-Electronics Service Associations, said today that the fifth annual NATESA Convention, to be held in Chicago next Fall will introduce what he termed "a revolutionary new idea in trade association meetings" in which all thirty-nine affiliated associations will participate.

"Planning for the event was started during the recent NATESA convention here," Moch said, "to give us a full year in which to perfect the idea. In my opinion it will prove to be the most valuable and practical idea yet offered the industry, and will be geared to the growing importance of the service industry in relation to manufacturers.

"We have felt for some time that the present concept of trade association conventions and shows needed a drastic rejuvenation to keep pace with this fast-moving industry," Moch said, "and our 1954 NATESA Convention gives us an ideal opportunity to put those theories into practice."

Moch did not elaborate on the plan, except to say that it will be submitted for approval of all affiliated groups in the Alliance soon. Tentative dates selected for the Chicago meeting are mid-September, 1954.

UARTS

The *Utah Association of Radio and Television Serviceman,* Salt Lake City, has become affiliated with the National Alliance of Television and Electronic Service Association.

ARTSNY

Station WNBC and WNBT have joined forces with Associated Radio-Television Service men of New York, Inc., in a concentrated campaign for better, more fairly-priced radio and television receiver service in the Greater New York area.

Every star seen and heard on the two NBC Flagship Stations in New York will join in this first-of-its-kind public service campaign supporting topflight service by the ARTSNY.

On-the-air spots will outline the objectives and rigid code of ethics of the organization. Other spots will urge viewers and listeners to put their television and radio receivers in top operating condition "to get the most enjoyment out of WNBC-WNBT's new fall programs.

While urging radio-TV audiences to insist on the best, most reliable service available—the best being provided by ARTSNY—more than $2,000 a day, seven days a week, will be devoted to the campaign by WNBC-WNBT. Over a month's period, the stations will devote more than $60,000.00 to the *ARTSNY Salute.* Many of the TV announcements will display the organization's seal while the station urges televiewers to watch for this insignia when a repair man calls at their home.

ETA

Electronic Technicians Association recently held the first of a series of 1953 lectures for radio and television servicemen and dealers, co-sponsored by Sylvania Electric Products. The event was held in the Veterans Memorial Building, Highland Park, Michigan, with more than 900 persons attending.

Ralph L. Carew, Chairman of the ETA discussed the progress of the association and the established code of ethics for members. Emery H. Lee, FCC, delivered an interesting talk on

TVI filtering. Andrew Ferguson, Sprague Products, offered many suggestions regarding capacitors. William Anderson, Sylvania's Field Engineer discussed *UHF*—servicing and test equipment, antennas and reception. He felt confident the average serviceman would be able to work into *UHF* without much difficulty. He supplemented his remarks by using a projector and slides for a clearer understanding.

NEDA Regional Conferences

National Electronic Distributors Association's program for a series of regional educational conferences for distributors was given form and substance in a committee meeting held October 30, 31, and November 1, in Pittsburgh at the Greater Pittsburgh Airport Hotel.

The group voted unanimously to hold the first of the conferences in New York City at the Hotel New Yorker. The date was not definitely decided on, but has narrowed down to February 8 or March 1, 1954.

Invitations to attend will be sent to distributors, members and nonmembers of NEDA, in the area of the Keystone Chapter, New York Metropolitan Chapter area, upstate New York, Yankee Chapter area, and Southern New England area.

NEDA-Wisconsin

The Wisconsin Chapter of the National Electronic Distributors Association held its annual election of officers on October 19, at the Milwaukee Athletic Club. Milwaukee, Wisconsin.

New President of the group is John A. Swanson, Standard Radio Parts Company, Racine. Other officers elected are Harris E. Sterman, Harris Radio Corporation, Fond du Lac, Vice President; Byron C. Deadman, Northern Radio & Television Co., Green Bay, Secretary; and Charles B. Deadman, Radio Distributors, Madison, Director.

NETSDA

NETSDA has gone on record endorsing a TV Lecture Course for the coming year which is promoted by many leading manufacturers for NETSDA members. It was decided by the delegates that under their Charter, three meetings per year will be held. The first Sunday in February, May and October was selected as regular meeting dates for the organization. The next meeting will be held in Philadelphia, Pa., Sunday, February 7, 1954. Mr. John Wheaton, 464 Sagamore Avenue, East Williston, Long Island, N. Y., is Corresponding Secretary

TV Group Secures Charter

Television Service Dealers Association of Wyoming Valley, Pa. was recently granted a charter of incorporation by decree of Judge W. A. Valentine. The organization has offices at 336 Wyoming Avenue, Kingston, Pa. An application for a charter was filed August 3 and signed by 10 incorporators. The petition said the association's objective was to foster the interest of television sales and servicing industry in Wyoming Valley. Two of its aims were to create a code of ethics for the servicing industry and a uniform rate schedule.

New Service Group Incorporated At Charlotte, N.C.

Radio and Television Service Association, Inc., has recently been issued a non-stock certificate of incorporation. The corporation has no capital stock and participation is by membership. It is a service organization at the management level, with the object of bringing together owners and managers of radio and television repair

and service businesses for their mutual interest and the betterment of their profession. In addition to promoting cooperation among service dealers, the group attempting to protect customers by adhering to a code of ethics. Meetings are held on the third Tuesday of each month. Group discussions and technical speakers constitute the programs.

The 26 charter members have elected Avery C. Kimbiri, Radio Television and Appliance Co., as President; James Gupton, Foy Electric Co., Inc., Vice-President; Robert Lamb, Lamb Radio and Television Co., Inc., and Harry Murray, Murray's Radio and Television Service, Secretary.

The ultimate aim of our association, Mr. Kimbiri said, "is to build up the prestige of the service dealer to a point where the general public will not be afraid to call on any service shop displaying the organization's emblem."

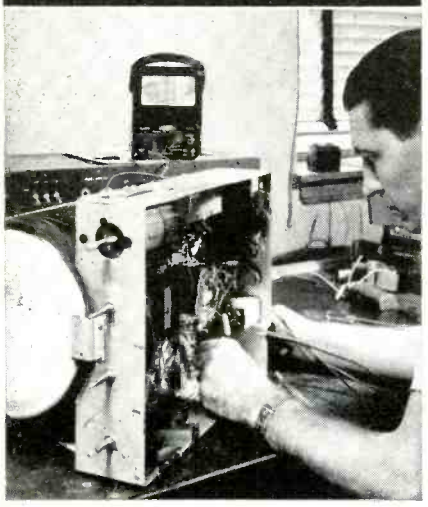
Color TV Symposium Sponsored By Chicagoland Reps

The Chicagoland Representatives and their guests, including many industry leaders in this area, and numbering 250 in all, were given a frank and honest appraisal on the status of color TV Monday evening, November 2, at Nielson's Restaurant.

The panel, consisting of several industry leaders who spoke "off the record," told the group what, in their opinion, they expected 1954 to bring. They discussed the impact expected on the industry, the problems faced by broadcasters and manufacturers, as well as distributors and service men. A true picture of color TV was presented, starting from the first sets which would be offered to the public with a time table of developments and improvements expected. The limitations and problems were honestly revealed, perhaps for the first time, to as large an industry group. A lively question and answer period followed the speeches.

The panel consisted of Kenneth C. Prince, Executive Secretary of EP & EM and General Manager of the Electronic Parts & Equipment Shows, Inc., acting as moderator; Earl W. Ewald, Director of Tube Engineering, Crosley Corporation, presenting the problems and viewpoint of the color tube manufacturers; Robert W. Galvin, Executive Vice President of Motorola, presenting the manufacturers' point of view; and Harry Alter, President of the set distributor organization bearing his name, covering the distributors' expectations and problems.

TV Voltage Trouble?



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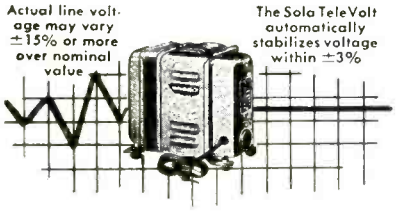

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There are more C-D capacitors in use today than any other make.

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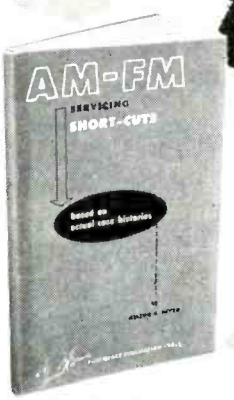
"AM-FM SERVICING SHORT-CUTS"

by Milton S. Kiver

Based on Actual Case Histories



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The book is divided into ten sections, each of which deals with specific troubles, such as hum, oscillations, weak sets, etc. The handy index makes it possible to refer instantly to the specific troubles and solutions discussed in the various case histories. The discussions which follow each case history are invaluable—they explain how to apply the proper time-saving techniques to any AM or FM receiver. Here, in one handy volume, is the successful experience of experts—to make your service work easier, quicker, more profitable. 152 pages, 5½ x 8½".

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KEY TEST POINTS

[*from page 18*]

between channels or short the grid to chassis. This makes the oscillator circuit inactive. The grid bias on the tube should no longer be present. Remember that this bias is due to the feedback of the signal voltage from the plate circuit to the grid circuit where it causes the grid to draw current thereby charging up the coupling condenser. Now with no grid bias the tube will conduct heavily and the plate voltage will be lower than either of the two readings in *A* and *B*. If the three plate voltages are found to exist in the relative amounts indicated above it is reasonable to assume that the oscillator tube is functioning. This plate voltage information is included only as a supplementary check for cases where there is doubt as to the condition of the oscillator. However, in most cases, checking the grid bias on the oscillator and mixer tubes should be enough to confirm whether or not the oscillator is working properly.

[*To Be Continued*]

TRADE FLASHES

[*from page 64*]

equipment. This equipment is now in production," T. A. Smith, vice president in charge of the company's Engineering Products Department, disclosed.

Mr. Smith said that deliveries of the first items of color equipment will commence in December. These items, consisting of color monitors and terminal apparatus to be added to existing TV transmission equipment, will enable stations to telecast programs received over telephone circuits.

Ram Educational Forum On TV Sweep Circuits

Ever since 1952, as a service to the television repair industry RAM Electronics has had a team of factory engineers touring the important centers of the country to disseminate valuable data and trouble-shooting hints. The latest 5th such forum, held under the joint sponsorship of all RAM St. Louis distributors, featured RAM's Al Friedman (National Sales Coordinator) and Victor Markosian (Chief Engineer).

Over 600 servicemen attended the meeting, which covered such topics as: basic functions of each sweep component, considerations in choosing sweep replacements, trouble-shooting sweep circuits, variations in sweep circuits and components, 90-degree deflection circuits and their applications, and current and future developments in sweep components.

To learn when the RAM team will forum in your city, write directly to RAM Electronics, Irvington-on-Hudson, New York, or inquire at your local distributor.

CBS-Hytron Sets Price For Color TV Picture Tubes

CBS-Hytron, electronic-tube manufacturing division of Columbia Broadcasting System, Inc. recently established a price of $125 for its new color television picture tube, the CBS-Colortron.

John Q. Adams, vice-president in charge of sales, announced that this is the price that will be charged television set manufacturers for sample tubes in the 15-inch size. It compares with a cost of $200 for the more complicated planar-mask tube.

The CBS-Colortron is a revolutionary, low-cost and greatly improved picture tube, simple to mass produce. Developed by a team of CBS-Hytron engineers, after two years of research and development, it was first demonstrated here in October.

A Full Size
LIGHTNING ARRESTER
at the Price of a Midget

LIGHTNING ARRESTER

MODEL TA5 Real protection against lightning and static charges — the RADIART Lightning Arrester has all the features! Fits anywhere . . . inside or out . . . handles standard or jumbo leads . . . no wire stripping necessary . . . does not unbalance the line . . . low internal capacity . . . no loss of signal . . . internal resistance "leaks off" static discharges! UNDERWRITERS LABORATORIES APPROVED.

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WHY

pay more for questionable quality* tubular TV lead-in wire?

**subject to patent infringement.*

LOOK JSC

for highest quality license-labeled* Tubular TV Wire . . .

**JSC Tubular Wire is manufactured under license of Amphenol Pat. 2543696.*

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the most for your wire dollar . . . get BOTH Quality**! AND Low Price**!

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JSC NEW Twin Tubular TV Lead - In Wire . . .

The best low loss, low cost 300 ohm lead-in for UHF and VHF television.

Rain, snow, dirt or salt deposits do not materially affect impedance and electrical efficiency.

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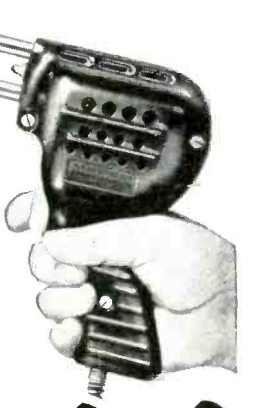
567 HOURS CONTINUOUS SERVICE



250 WATT
110-120 VOLT AC

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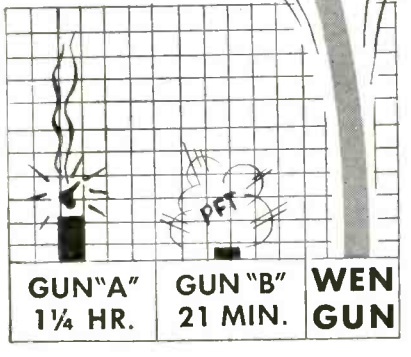
Which Soldering Gun?



You be the judge! Three competitive soldering guns were to be plugged in each morning . . . kept connected, operative, HOT all day. But Soldering Gun "A" lasted *only 1¼ hours,* burned out its transformer and started smoking! Gun "B" burned out in *21 minutes!* The WEN Soldering Gun with Feraloy tip scored *567 HOURS!* Or compare this way — the WEN Gun with 50c Feraloy tip averages 25,000 soldering connections. Gun "A" (replacement tip 25c) 800 connections. Gun "B" (new tip $5.00) 1,627 connections. That means your soldering connections need cost you but 1/500 of 1c — using the WEN Gun. Practically lasts forever under ordinary conditions.

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Ideal for home use and many shop operations. It's *light* (2½ lbs.) quiet like an electric razor and *handy* to work with. Operates 240 strokes per second. Sands wood, metal, polishes furniture, your car — *anything* Even gives a good massage

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Get the Facts! — See Your Jobber or Write —

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(Export sales — Scheel International, Inc., Chicago)

TRADE LIT.

[*from page 39*]

A new *catalog*, four-page, multicolored, is now available on the complete line of electronic equipment manufactured by Perma-Power Company, 4727 North Damen Avenue, Chicago 25, Illinois.

* * *

A *color code calculator* covering both capacitors and resistors is being produced by Centralab, 900 East Keefe Avenue, Dept. G-44, Milwaukee, Wis. By setting seven rotating wheels, capacitance or resistance, tolerance, and temperature co-efficient can be read directly. The calculator covers RTMA color code specifications on normal and extended range tubular ceramic capacitors and radial or axial lead resistors.

* * *

The 3rd revised and enlarged edition of Milton S. Kiver's well-known book *Television & FM Receiver Servicing*, published recently, has in addition to helpful material on trouble-shooting, antennas, installation and servicing covered in previous editions, a whole new chapter on *UHF* and new material on test instruments, Cascode tuners, keyed sync separators and more. List price is $4.20. D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York 3, N. Y.

CIRCUIT COURT

[*from page 40*]

to crystal #2 (1N82) the mixer diode.

The antenna is coupled into a pre-selector which is essentially a tuned line with a variable condenser across it to vary the electrical length of the line. This pre-selector is coupled to another tuned pre-selector which operates in the same way as the first one did. The purpose of the second pre-selector is to improve the image-rejection characteristics of the tuner and at the same time make the matching of the antenna and mixer impedances simpler.

The mixer heterodynes the output of this pre-selector and that of the doubler. The output is coupled by means of the detector load into the *if*. This *if* is generally 40 *mc*, although it can be either 82 *mc* for feeding the front end of a *vhf* tuner or 21.25 *mc*. for sets that use this as their video *if* frequency.

COLOR TV

[*from page 34*]

known as *"interleaving."* The harmonic which has been chosen for the sub-carrier frequency works out to be the 455th harmonic of $\frac{15{,}750}{2}$, *which* equals 3.579545 *mc.*

The second principle explains how two signals can be transmitted at the same frequency. It has been found that by displacing two signals 90° with respect to each other, both can modulate a single carrier to produce a phase modulated signal in which the individual signals do not interfere with each other. This is known as *quadrature transmission.*

At the receiver, suitable circuits can extract the original signals. This process takes place in the color decoder and is known as synchronous demodulation.

The third new principle is the fact that an r-f signal can be transmitted containing the sideband resulting from beating a carrier with a modulating signal but omitting the signal carrier frequency itself. This system is known as *suppressed carrier transmission.* Further, in this system, it is not necessary to transmit both sidebands, in their entirety. One sideband plus a portion of the other can be sent. This is known as *vestigial sideband-suppressed carrier transmission.* One of the color channels is of this nature. The other channel, due to its low pass-band, is sent double sideband.

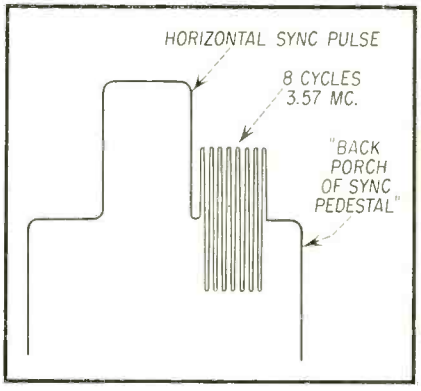

Fig. 4—Color burst; receiver oscillator is put into sync with transmitter.

Suppressed carrier transmission is needed because if we do not suppress the 3.58 *mc* carrier, interference between this carrier and the luminance signal will take place during the reproduction of the white portions in a scene. This way, when there is no

modulation, there is absolutely no output from the color channel.

The last item to note is that the quadrature signals are in fixed reference to the sub-carrier at the transmitter. The receiver, itself, does not have such a reference signal for demodulation purposes. Therefore, a separate 3.579545 *mc* oscillator is used at the receiver. This oscillator is kept in phase sync with the transmitter sub-carrier by means of a *color-burst*. This burst consists of from 8-10 cycles of the sub-carrier signal inserted on the back porch of the regular signal sync pedestal *(Fig. 4)*. This color burst brings the receiver oscillator into exact phase sync with the transmitter oscillator resulting in a reference phase for demodulating.

Fig. 5 shows the relationships of the various signals when four bars (saturated red, saturated green, saturated blue and white) are transmitted.

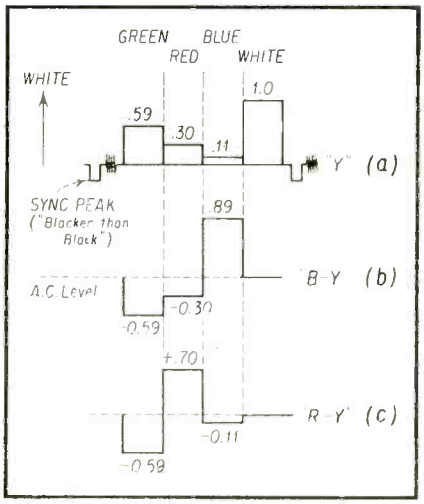

Fig. 5—Relationships of signals when four color bars are transmitted.

Fig. 5a represents the amplitude relationships of the four bars in the luminance channels as they would be at the output of this section. *Fig. 5b* shows the relative amplitudes in the output of the B-Y channel before modulation in the transmitter, and after demodulation in the receiver. By addition of the B-Y and the luminance signals we come out with the blue signal only, the white signal serving as the light reference. The same analysis can be applied to the R-Y channel *(Fig. 5c)* to derive the red bar. As for the green bar, there is a slightly more complicated process mixing certain proportions of R-Y and B-Y. This resultant signal is inverted and mixed with the luminance channel to extract the green bar. In this manner the individual colors are made available at the proper terminals of the CRT.

[*To Be Continued*]

● ADVERTISING INDEX ●

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No. Pairs	1	6	6	Not Paired	Not Paired	
Insulation Thickness (inches)		.010	.010	.010	.010	
Tinned Copper Shielding	None	None	None	Over 1 conductor	Over 3 conductors	
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No. Pairs	2			
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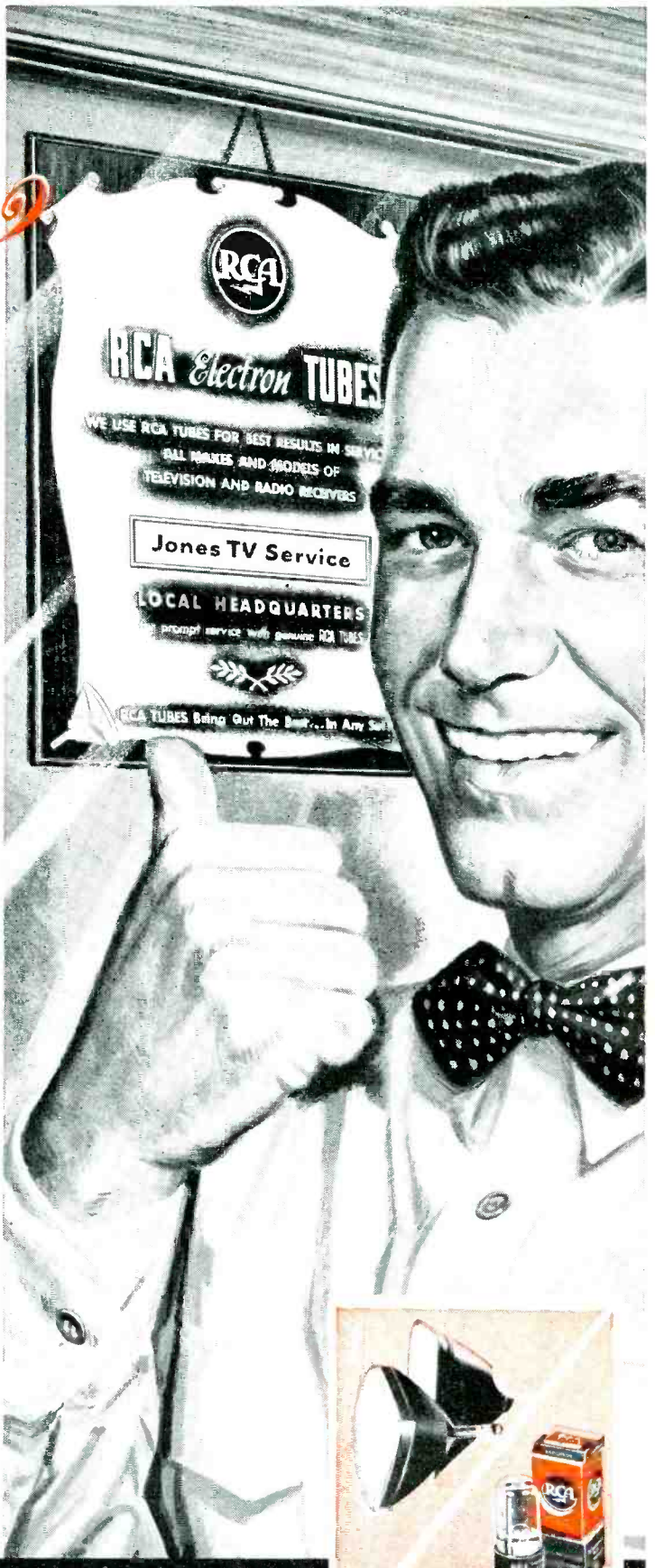
And it's so easy to do . . . because RCA's new Dealer Identification Program provides you with a handsome "shingle" with your name on it, that you'll be proud to display in your shop. When a customer sees this Dealer Identification Plaque he *knows* you are using the best tube products available.

So, we ask . . . "Have you hung up *your* shingle yet?" If not, be sure to see your **RCA Tube Distributor** today and learn how *you* can qualify for a Registered Dealer Plaque at no extra cost.



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