FEBRUARY, 1954

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.

ONE HALF MILLION SOLD!

Original Snyder PHILADELPHIA

UHF 3D VHF

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PORTABLE TV ANTENNA

New Low Price!

7.95

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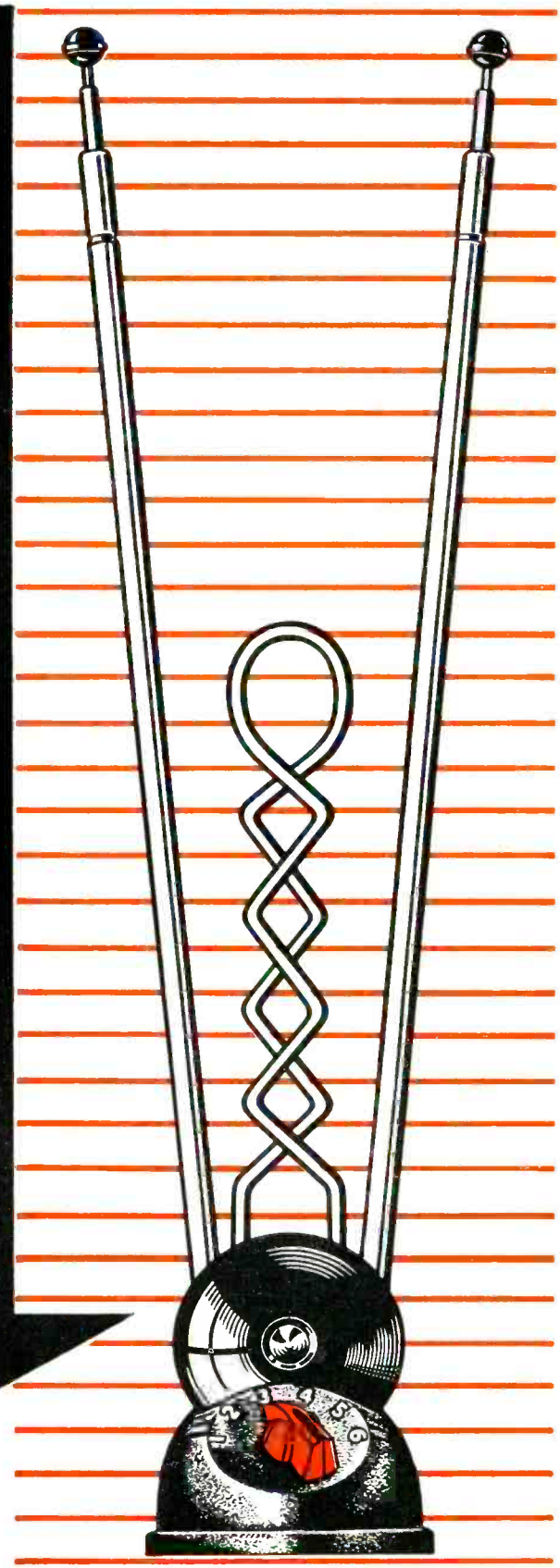

SNYDER

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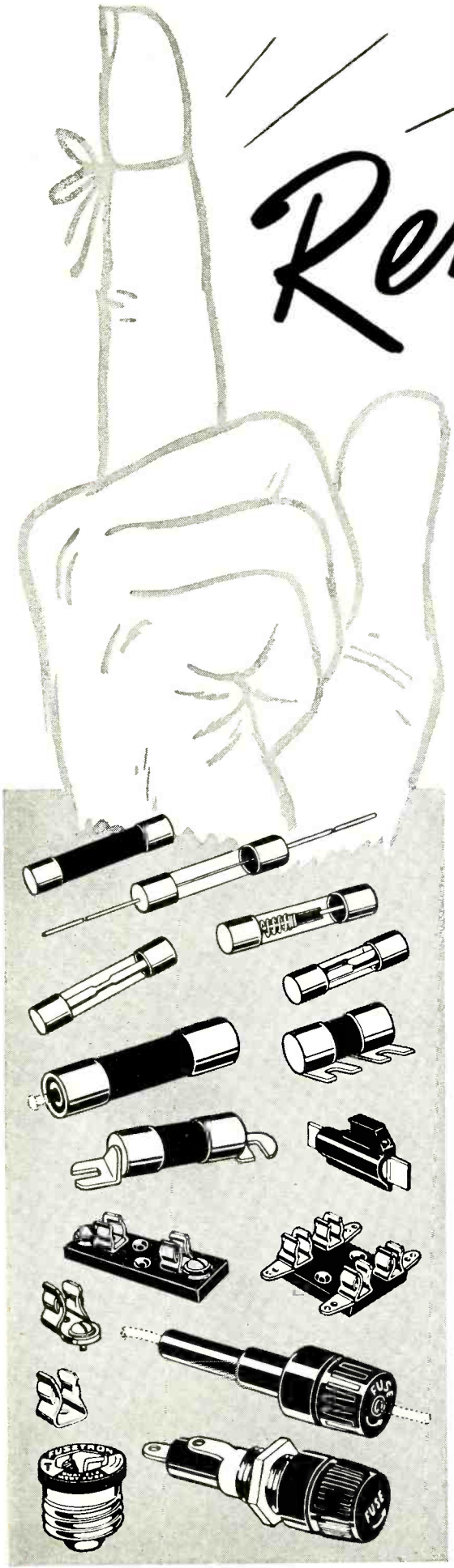
SNYDER ANTENN-GINEERS LTD., TORONTO, CANADA • WORLD EXPORT: ROBURN AGENCIES, INC., N.Y.



Remember!

For "Trouble-Free" Fuses Handle BUSS FUSES

There is a reason manufacturers and service organizations have learned to rely on BUSS fuses to operate properly under all service conditions. Every BUSS fuse normally used by the Electronic Industries is tested in a sensitive electronic device that rejects any fuse that is not correctly calibrated, properly constructed and right in all physical dimensions.

Once properly installed, a BUSS fuse will blow only to protect. If a BUSS fuse does blow, the service man knows there is trouble in the circuit. When he has corrected the trouble and installed a new BUSS fuse the job is finished. There won't be any costly and time-wasting "call-backs" due to the fuse failing to operate properly . . . because a BUSS fuse will carry its rated current and it is properly constructed to prevent poor contact heating causing needless blows.

And by standardizing on BUSS fuses, you can fill your exact fuse needs from one source. The line is complete-dual-element (slow-blowing), renewable and one time types . . . in sizes from 1/500 ampere up.

To your customers too, the BUSS trademark represents quality.

Millions and millions of fuses, used throughout the country for over 39 years, have firmly established BUSS as the *known* brand. When you furnish a BUSS fuse, there are no "kicks" or "comebacks" from the customer. It's just good business to handle only *genuine* BUSS fuses.

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-254

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

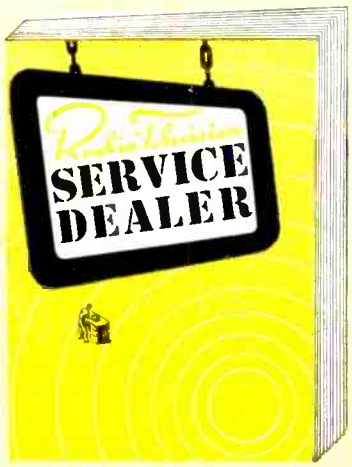
*Name*_____

*Title*_____

*Company*_____

*Address*_____

*City & Zone*_____ *State*_____ 254



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

VOL. 15, NO. 2 FEBRUARY, 1954

FEATURE ARTICLES

CIRCUIT & SERVICE DATA

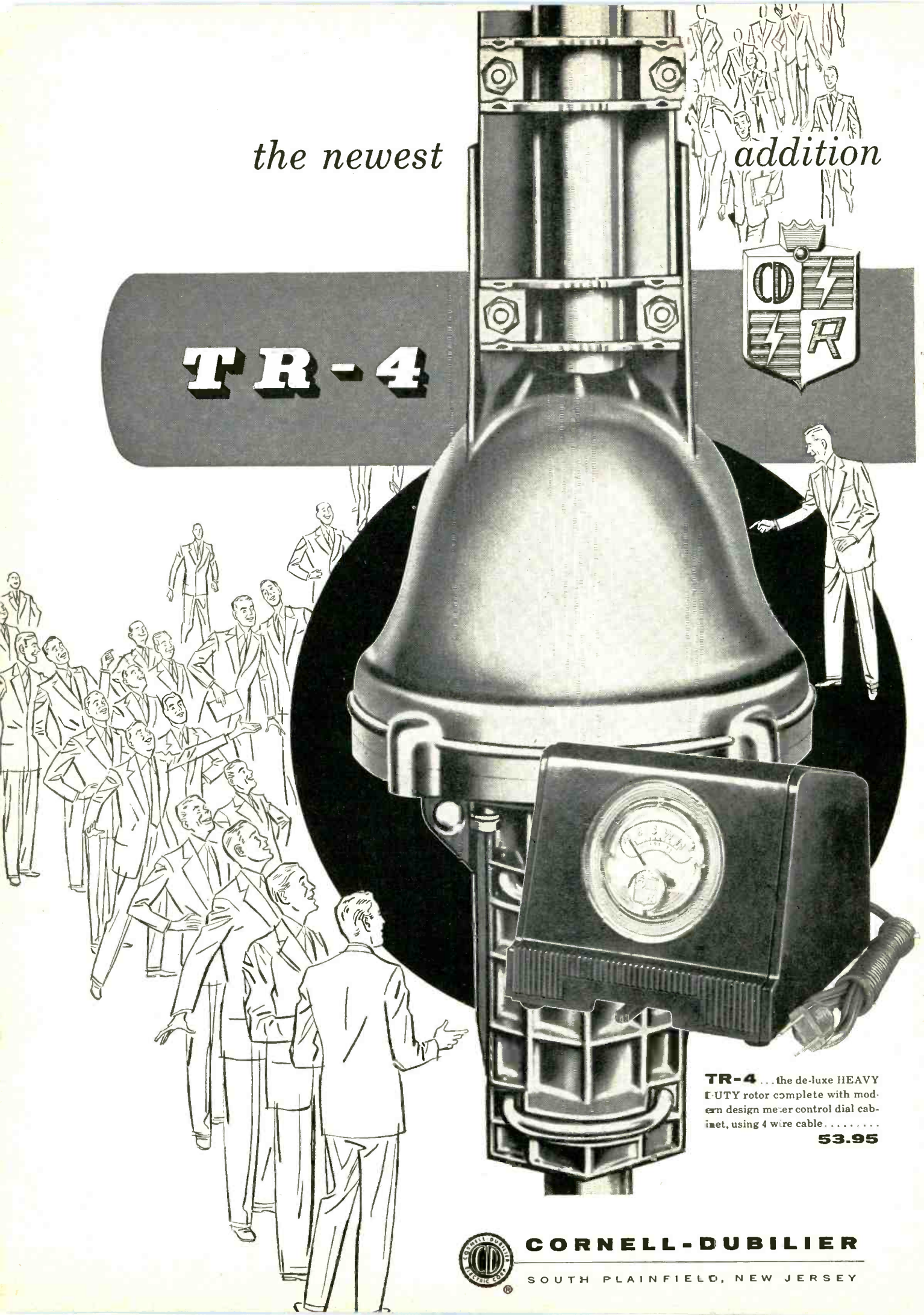
DEPARTMENTS

RADIO-TELEVISION SERVICE DEALER is published monthly by Cowan Pub. Corp., 67 West 44th St., New York 36, N. Y. Subscription price: $1 for 2 years in the United States, & U.S. Poss. Elsewhere $1 per year additional. Single Copies 25c. Reentered as second class matter Sept. 25, 1950 at the Post Office at New York, N. Y. under the Act of Mar. 3, 1879.

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

the newest *addition*

TR-4



TR-4 . . . the de-luxe HEAVY DUTY rotor complete with modern design meter control dial cabinet, using 4 wire cable **53.95**

CORNELL-DUBILIER

SOUTH PLAINFIELD, NEW JERSEY

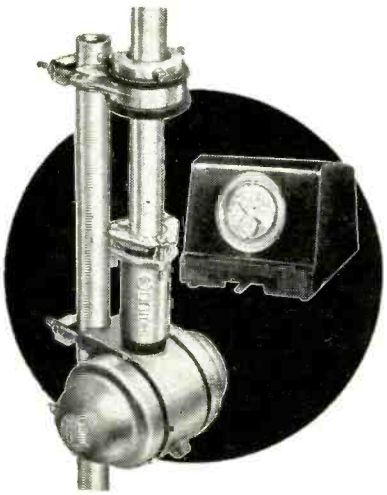
to the family of C·D·R Rotors

C·D·R ROTOR

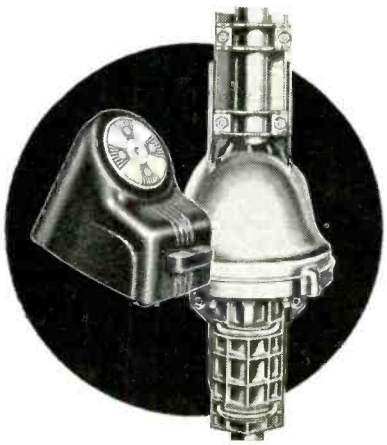
the ultimate in heavy duty Rotors

incorporating all the fine features
that have made the TR-2 outstanding
plus these fine features:

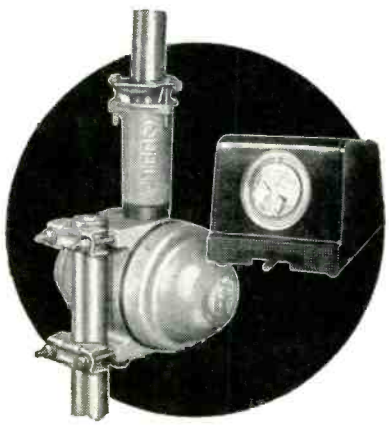
★ **Handsome Meter Dial Cabinet** ★ **Uses 4 Wire Cable**



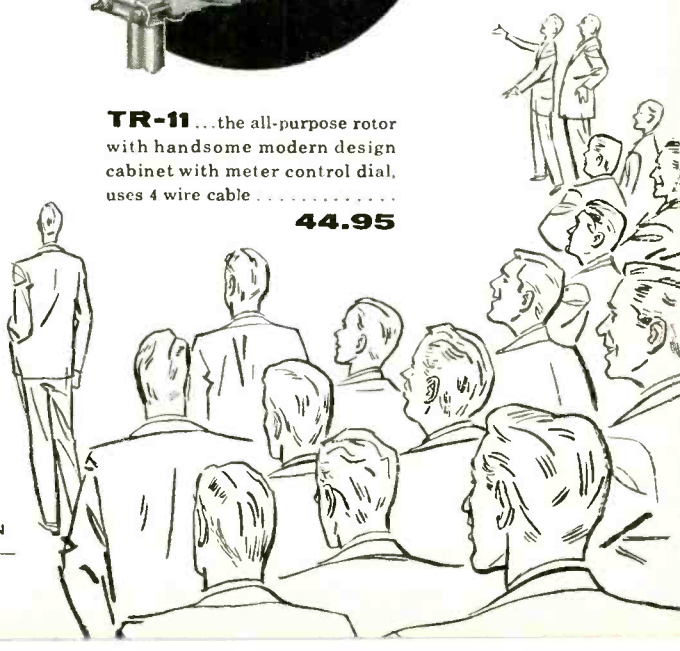
TR-12 . . . a special combination value consisting of complete rotor, including thrust bearing . . . handsome modern design cabinet with meter control dial, 4 wire cable
47.95



TR-2 . . . . the Heavy-Duty rotor, complete with "Compass Control" cabinet having illuminated "perfect pattern" dial . . .
49.95



TR-11 . . . the all-purpose rotor with handsome modern design cabinet with meter control dial, uses 4 wire cable . . . . . .
44.95



THE **RADIART** CORPORATION
CLEVELAND 13, OHIO

Thomas Electronics To Produce Lawrence Color TV Tubes

21-inch color tubes and larger will be mass produced by next Summer in the Thomas Electronics, Inc. plant in Passaic, New Jersey. The nation's largest independent manufacturer of cathode ray picture tubes, Thomas Electronics, Inc. is setting up pilot operations at once and expect to begin sample deliveries to the TV set manufacturers within the next few months, according to Thomas L. Clinton, President of the company. Personnel will be increased as production gets under way.

Dr. Ernest O. Lawrence, director of the Radiation Laboratory of the University of California and winner of the Nobel Prize in physics in 1939, developed the tube for Chromatic Television Laboratories, Inc. of New York and Oakland, California. The tube employs a single electron gun like present black and white picture tubes, and is capable of receiving black and white images as well as color.

RCA Making Color TV Training Available to Service Industry

A comprehensive training and educational program designed to make available to the entire TV service industry the knowledge gained through years of research and development in color television was announced by the RCA Service Company recently.

The program will provide information on the theory and practice of installation and service for color television receiving equipment to the service industry even before the first commercial color sets reach the public.

The industry-wide training and educational program for service technicians is divided into four major elements. One is a series of two-day technical clinics to be held in 65 key cities across the country, starting early in February. The clinics will be conducted by technical specialists of the RCA Service Company, using textbooks, test equipment, and other instructional materials developed especially for the clinics by the company. Service dealers and servicemen in each city will be invited to attend.

The RCA Service Company has also prepared a comprehensive textbook, "Practical Color Television for the Service Industry." The text, illustrated by photographs in four colors, graphically depicts service techniques for color television receiver installation and maintenance. Copies of the book will be available to servicemen completing the clinics. It will also be made available either through RCA parts and tube distributors or directly from the RCA Service Company, Camden, N. J., at $2.00 per copy.

A third service will be a home study course in color television offered to technicians in the television service industry by the RCA Institutes, New York.

As a fourth point, the company has developed new test equipment for use with color TV sets. Called the color signal simulator, it is essential for the proper phasing and alignment of color sets. The importance of this test equipment is indicated by the fact that ample color test patterns may not be available. The equipment is now installed in the company's factory service branches located in areas where color television will be received. Should this special equipment be scarce during the early stages of color broadcasting, the company will make its services available to local servicemen. Under this arrangement, local service-

men would be able to bring sets to the RCA Service Company branch for alignment at a nominal charge.

CBS-Columbia Sees 1954 As Big Year

"While the nation's population is expanding, personal disposable income is at an all-time high and there are 20,000,000 homes still without television receivers, it is the industry's immediate job of creating in the public's mind the idea of buying a television receiver for the first time, or replacing an old, small-screen set." states CBS-Columbia president, David H. Cogan.

"The biggest television news in 1954 will be color. As far as quantity production is concerned, this is a difficult question but I believe it will be a great deal more than the 50,000 generally estimated. However, in spite of this anticipated production figure, color poses problems of engineering, testing, establishment of efficient production techniques, and the re-training of servicemen.

"The introduction of color receivers will have only a temporary effect on the sale of black and white receivers. This lull will be more pronounced in higher priced video units. The industry will experience a situation directly paralleling that of radio some years ago when television was introduced. There was a temporary lull in radio sales then. However, once the novelty of television wore off, radio sales came back up to their normal levels.

"The radio receiver industry should experience a banner production and sales year in 1954 with total sales easily topping the 14 million projected figure for 1953. More widespread use of radio as a personal instrument of entertainment plus increasing popularity of clock and portable radios and quality high fidelity radio-phonograph combinations make this segment of the electronics exceedingly bright.

"High Fidelity, at modest cost, has provided the electronic industry with another magnificent market opportunity. To the public it means a new experience in listening, that is new and satisfying. To the distributor and dealers it means a new and expanded business. The huge market for good reproduction and good music has no limit. Sales of mass-produced quality high fidelity combination units, such as our 360, should break previous high-water marks.

"The significance of high fidelity in television cannot be overlooked. The introduction of High Fidelity sound in production-line receivers is the greatest advance in black and white television reception in recent years."

G.E. Forecasts Pix Tube Sales

Almost one in every seven TV sets in use today will require a new picture tube in 1954, predicts J. Milton Lang, general manager of the G-E Tube Department.

The country now has over 27 million sets in use. The G-E executive said the high replacement tube figure represents "a normal development, with so many sets growing older."

Despite the advent of color TV, the industry should produce about 5,200,000 additional picture tubes for new black-and-white sets, Mr. Lang estimated.

Sylvania Builds New Plant

Sylvania Electric Products Inc., has announced that construction of a 200,000 square-foot plant extension to be used for the manufacture of large-size (24 and 27-inch) television picture tubes, and for pilot-line production of color tubes, is nearing completion in Seneca Falls, N. Y.

The new extension, which was begun in mid-December, 1952, will bring Sylvania's total manufacturing space to 687,000 square feet. The company now has 418,000 square feet in Seneca Falls, N. Y.; 218,000 square feet in Ottawa,

[Continued on page 57]

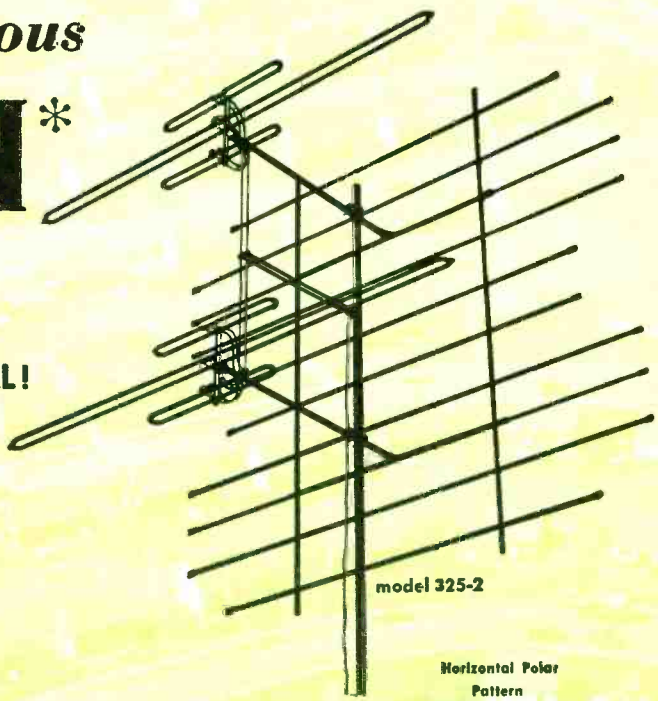
over 100,000 already installed!


model 325-4


model 325

CHANNEL MASTER'S *fabulous*

CHAMPION*


model 325-2

the world's most powerful all-channel VHF antenna —OUT-PERFORMS AND OUT-SELLS THEM ALL!

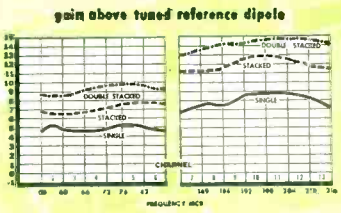
Never before in the history of television has an antenna received such an overwhelming reception. Channel Master's CHAMPION — in a few short months — has rocketed to the top as the nation's most-wanted, best-selling, best-performing VHF antenna!

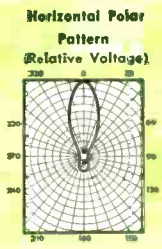
CHAMPIONSHIP Performance: Only the CHAMPION has the unique new "Tri-Pole", a *triple-powered dipole system* in which the Low Band dipole also functions as *three* dipoles tied together, in phase, on the High Band.

All-aluminum. Assembles faster than a 5-element Yagi! The CHAMPION is *another* great contribution of the Channel Master Antenna Development Laboratories.

CHAMPIONSHIP Promotion: The CHAMPION is the antenna America knows best!

• Publicized in leading magazines! • Outstanding dealer Cooperative Advertising Program! • Free newspaper mats, window streamers and TV film commercials!

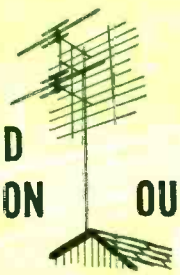




THE STACKED CHAMPION PROVIDES:

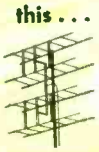
11-13 DB High Band gain

6½-7½ DB Low Band gain



THE STACKED CHAMPION OUT-PERFORMS

this . . .



this . . .

this . . .

or this

Model No.		List Price
325	Single Bay	$20.83
325-2	2-Bay	$42.36
325-4	4-Bay	$88.89
Separate Stacking Harness		
325-3	2-Bay Harness	$ 2.08
325-5	4-Bay Harness	$ 4.17

CHANNEL MASTER CORP.

ELLENVILLE, N. Y. WORLD'S LARGEST MANUFACTURER OF TELEVISION ANTENNAS

*pat. pending

TIE SEPARATE ANTENNAS TO ONLY ONE TRANSMISSION LINE

CHANNEL MASTER inter-action filters

Only *Channel Master* filters are permanently sealed in a block of moisture-proof, high melting-point electrical wax, locked in an attractive styrene case.

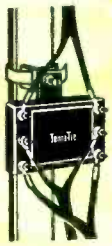
- Single lead
- No switching
- No signal loss
- No inter-action, effective isolation.

VHF only

New!

TENNA-TIE

model no. 9033-A



Use with leads of any length!

New, specially designed High and Low Pass filters entirely eliminate the need for critical lead lengths! This new, extremely effective circuit makes the TENNA-TIE the most effective filter of its type now available.

— *only* $3.50

VHF-UHF

ULTRA-TIE

model no. 9034

JOINS — separate VHF and UHF antennas for use with a single lead.

SEPARATES — VHF and UHF signals at the set or converter where separate terminals are provided.

"Free-space" terminals.

new low price — $3.75

VHF-UHF

TRIPLE-TIE

model no. 9035

Ties together all *three* TV reception bands:

1. *Low Band VHF*
2. *High Band VHF*
3. *All UHF*

High and Low Pass filters enable the Triple-Tie to adapt all Hi-Lo VHF installations to UHF — quickly and effectively. "Free-Space" terminals for perfect all-weather UHF reception.

new low price — $4.86

THE ANTENNA IN COLOR TELEVISION

by Harold Harris, *Vice President, Sales and Engineering*

Now that color telecasting is a reality, we will see an ever-increasing flow of color sets to the consumer. Although much is being said and written on the subject of color sets, many unanswered questions remain about the role of the television receiving antenna in color television.

Will present antennas work on color?

Will a special antenna be needed?

The results of thorough laboratory and field tests made by engineers of the Channel Master Antenna Development Laboratories show that practically all present TV antenna types will perform satisfactorily on color. Gain variations as high as 3 DB across one channel can be tolerated. When this figure is exceeded blurring or smearing of the picture may occur. Although there are certain antennas on the market which do have excessive gain variation, this is not the case of the vast majority of present installations.

There are also indications that fringe area color reception may be more critical. This may necessitate the use of fringe area antennas in areas closer to the TV station.

In the nation's most advanced television research laboratory, Channel Master antennas have always been designed for full band width and minimum variation in gain on any one channel.

For this reason, every Channel Master antenna which you have installed in the past, as well as the ones you install today, will provide reception of outstanding quality when color TV comes to your area.

Channel Master antennas were the antennas selected for the tests which led to the F.C.C.'s approval of the National Television Standards Committee color system.

EDITORIAL...

by S. R. COWAN
PUBLISHER

RANDOM NOTES AND QUOTES

Idaho Falls recently had a "first reading" of a new TV code that calls for the licensing and bonding of all TV installers. A provision of the proposed code also limits the height of TV towers atop buildings to 20 feet maximum. If passed, the ordinance will require that TV installers each be bonded in the sum of $10,000; designates installation methods to be used; requires the use of non-combustible materials; designates location of the antenna; and requires that a permit be obtained where a tower exceeding 15 feet high is used.

Several Philadelphia TV service firms have started to farm out TV antenna installation work to other service organizations who specialize solely in that type of endeavor. It is said that the average skilled TV technician is paid from $2.50 to $3.00 per hour, an amount too high to allow for time-consuming antenna installation work, while antenna installers are paid from $1.60 to $2.00 per hour. Dealers generally charge customers $30.00 for an antenna installation, and farm out the contract for $22.00, which allows a fair profit margin to all parties. However, large service firms prefer to do their own antenna installation work, using apprentices and lower salaried beginners for this work.

PICTURE TUBE PRICES

RCA announced long ago that they would "soon offer" color TV picture tubes to all buyers. Subsequently, other manufacturers announced that they were in production of color TV tubes. Thus most of the major manufacturers are on record as having color TV picture tubes in production, but one cannot buy any tubes yet to the best of our knowledge.

Selling price of the RCA color TV picture tubes to other TV set manufacturers is placed at $175.00. No list prices have been announced. But jobbers hope list prices will not exceed $275 to $300.00. One rumor puts the dealer list price closer to $500.00.

COLOR TV SET PRICES

No manufacturers had announced definite selling list prices of their color TV set lines as of January 15, 1954, but an Admiral executive is quoted as saying that their line will probably sell for about $1,000 to $1,175, and Emerson's prexy is quoted as saying that they may price their first models at $875 to $950. It's much too soon to guess what price levels will be established for initial production.

Despite all guesstimates by optimists, we believe that during the 12 months of 1954, less than 50,000 color TV sets will be produced by all manufacturers combined. Time alone will tell how right or wrong our guess is.

But even if 50,000 color TV sets are made and sold during 1954, and if they are distributed into the same geographic ratios as black and white TV sets now in use, New York and the Eastern Seaboard would have 25,000 of them; the Mid-West and South combined would have 9,000; and the West Coast would get the 16,000 balance. Economic factors are important—as is the number of hours of weekly color casts to be available to a person who contemplates spending almost $1,000 for a new TV set.

SERVICING COLOR TV SETS

Don't misunderstand us—we're sold on color TV—only we believe it will not hit with a volume sales impact for months to come. Meanwhile, technicians and Service Dealers must use the interim time to learn what there is to know about servicing color TV sets. Happily, RCA Institutes of New York has just announced (see page 6) that it now has available a "Color Television Home Study Course." It consists of nine lessons "that will prepare the TV technician for the color TV problems he will encounter." We mention this editorially because we fully subscribe to the idea that servicing color TV is so much more complex compared to servicing conventional monochrome TV sets, that all technicians must start to study the subject *now*, well in advance of the time when they will be called upon to put that knowledge into actual practice. And, as we have said repeatedly—as authoritative and practical facts and data on color TV servicing become available, we'll publish all of that material in *Service Dealer*. We won't waste our reader's time on puff and glamorous hog-wash articles that are, to all practical purposes, of no value to a professional technician.

TV CHANNEL CHANGES

Many TV stations have, after being "on the air" for a while, switched from one channel to a different one. The reasons behind the changes do not justify discussion here. But the fact that such frequency changes do affect relationships between Service Dealers and their customers does merit discussion. Customers who have bought and paid for a certain type yagi antenna, cut, let us say to Channel 6 and oriented to it—suddenly find they must pay for installation of a new antenna cut to Channel 8. The broadcast stations don't bear the brunt of blame as a rule—no, instead the service dealer gets the abuse for the extra expense involved.

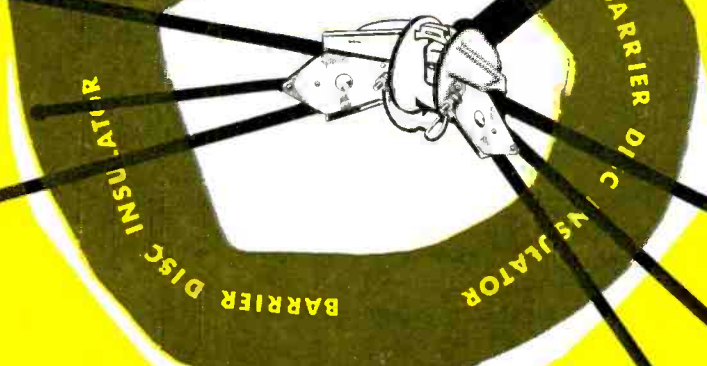
Here's where a new type of public educational program is needed to take the pressure off the Service Dealer.

PRICE CUTTING IS RAMPANT

Frank Moch, editor of the "NATESA Scope," (house organ for the National Alliance of TV and Electronic Service Association) openly declared war in his December issue, on the "termites in the house of TV," as he so aptly classifies certain disrupting factions to the service profession. He particularly blasts at the independent service firm operator who advertises a "No Service Fee" to the public, hoping to cash in on gyp practices of one kind or other so that the final bill gets up into high figures.

We subscribe to Mr. Moch's views completely, and urge every technician to read the article in question.

NEW



WALSCO *Imperial*

INTRODUCING the greatest advance in Conical antennas ... it's the *all-new* WALSCO *Imperial*. Featuring a new "barrier disc" insulator with 2 inches of air space between the terminals to prevent *shorts*. Soot deposits, dirt, moisture, salt, etc., *cannot* affect this insulator. The WALSCO *Imperial* will therefore maintain *lasting* high gain performance *anywhere*, regardless of weather conditions. Contact surfaces and terminals will never rust or oxidize. Front end hardware is *stainless steel* to prevent corrosion losses *permanently*.

MOST REVOLUTIONARY CONICAL ANTENNA IN 4 YEARS

Front end elements are pre-assembled to holding plates which are fastened to the insulator with one wing nut. Less than 2 minutes to assemble.

Guaranteed lasting high gain on all VHF channels

3 year unconditional guarantee!

WALSCO ELECTRONICS CORPORATION

3602 Crenshaw Blvd., Los Angeles 16, Calif.

Guest Editorial

HAROLD J. SCHULMAN
Director of Service,
Allen B. Du Mont Laboratories, Inc.

I AM wondering whether or not we, as members of the television service fraternity, are taking sufficient advantage of the science of semantics. This science deals with the emotional connotations of words, rather than the actual words themselves.

A long time ago the airlines learned that they could help remove the butterflies from the stomachs of first-time passengers by calling the belts that held the passengers in their chairs, "Seat Belts" instead of "Safety Belts." Nowadays, they never tell you that "we're rushing into a storm." They say, "Mild turbulence ahead."

Perhaps we can increase the public's acceptance of service and its attendant costs, if we call our work "maintenance" instead of repair.

If you replace a small tube for a customer one week and find that two weeks later you are called back to replace another one, the impact of the second call on the customer will be lessened if during the first call it is pointed out that small tube replacement is part of the normal maintenance of a television receiver; that it may very well be necessary to replace any of the other small tubes at any time.

This can be compared to replacing a fouled spark plug in a car. The auto mechanic doesn't thereby guarantee the remaining plugs. This similarity can be pointed out to the customer, tactfully, as a matter of information.

Some people don't like the idea of being told that your service work is done on a C.O.D. basis. Then why not call it "pay as you go maintenance."

I am sure that if you give a little thought to all the words and actions that go to make up a service call—from the time the telephone rings to the moment you close your tool kit on a satisfactory repair—you will agree that there is plenty of room for much more sell in both our words and our actions.

H. J. S.

RAYTHEON **Ask your TUBE DISTRIBUTOR how you can get the**

time and money saving new RAYTHEON BROW-LITE

Here's another sensational *Raytheon first.* It's a different kind of flashlight that sheds a new light on Radio-TV servicing — makes it faster, easier, more profitable.

RAYTHEON BROW-LITES *are available through your Raytheon Tube Distributor. Ask him how to get a supply for you and your men.*

Here's why Service Dealers from coast to coast are hailing the RAYTHEON BROW-LITE:

- **FREES BOTH HANDS** — work is easier, faster
- **DIRECTS LIGHT AUTOMATICALLY**—you see what you look at in a clear, bright light
- **USES STANDARD PARTS** — 1½ volt penlite batteries and 3 volt penlite bulb
- **ANYONE CAN USE IT** — fits easily above glasses
- **EASY TO CARRY** — folds compactly to pocket size
- **REPLACES FLASHLIGHTS** — easier, safer to use
- **DURABLE** — made of rugged plastic

RAYTHEON®

Excellence in Electronics

RAYTHEON MANUFACTURING COMPANY

Receiving Tube Division

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

RAYTHEON MAKES ALL THESE:

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

ASSOCIATION NEWS

Long Island Television and Radio Technicians Guild

A recent color forum sponsored and conducted by Guild members in Williston Park broke all attendance records for any association meeting. Two hundred and forty-three attended. The lecture and discussion were considered so interesting and vital that more than one hundred and fifty applications were requested and handed out to guests.

Mr. Henry Wawryck, new president of LITRTG, stressed that the present-day service technician is "better educated, with larger and more complicated problems, more interested in his work, his customers, and his fellow technicians."

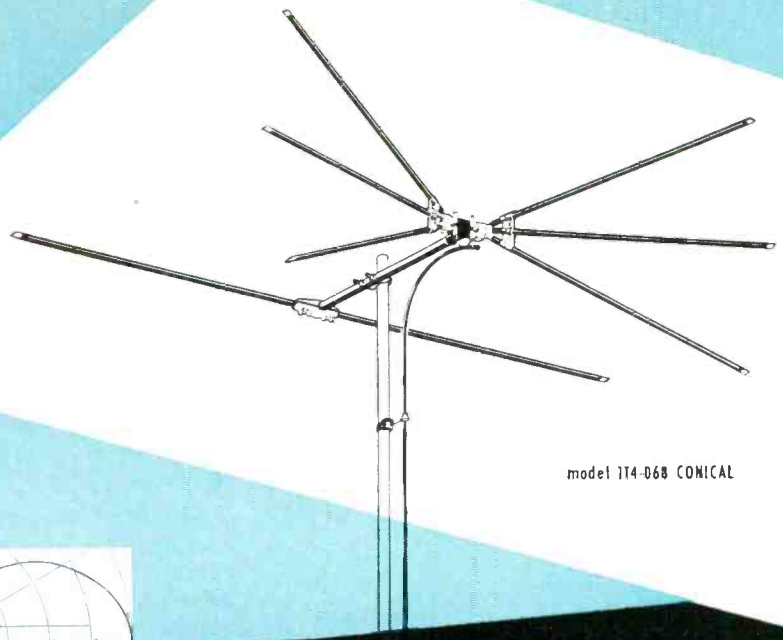
Mr. Barlowe lectured on color TV circuitry, stressing that the "screwdriver mechanic was through," and that "Service is now an industry that requires more study and should be better compensated." Additional knowledge and new shop equipment requirements were also mentioned.

NATESA Awards G.E.

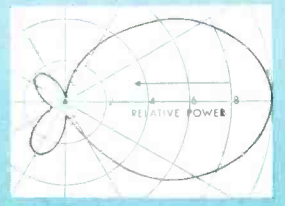
G-E Tube Dept's fifth award for its extensive public relations program in behalf of the TV service industry came recently from the National Alliance of Television and Electronic Service Associations. Bertram L. Lewis, left, Rochester, N. Y., NATESA Eastern vice-president, presents the "Friends of Service Management" plaque to John T. Thompson, center, manager

of replacement tube sales for the Tube Dept. At right is Frank J. Moch, Chicago, president of NATESA. Award, made to G.E. for second straight year, cited Tube Dep't, "for outstanding service to television service management in creating better customer relations." Precious awards to G.E. came from NATESA, the Associated Radio and Television Service Dealers, Inc., Columbus, Ohio; the Federation of Radio Servicemen's Associations of Philadelphia, and the Radio Technicians Guild of Boston.

now!



model 1T4-068 CONICAL



69 mc—channel 4

195 mc—channel 10

Directivity patterns of the CONICAL are exceptionally clean. The strong major lobe indicates fine directivity.

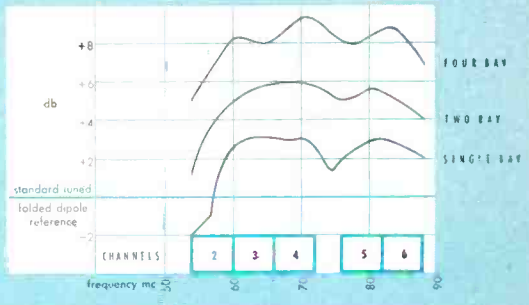
a VHF CONICAL antenna built to the Quality Standards of AMPHENOL

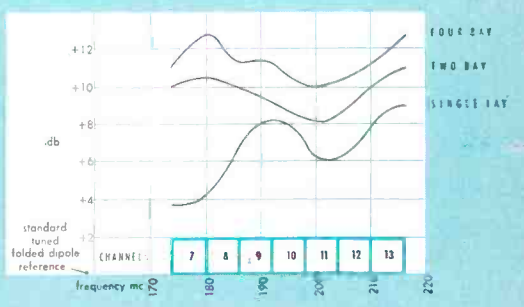
Now ready to join the fastest-growing and fastest-selling antenna line in the United States is a new AMPHENOL VHF antenna. Designed to supplement the fabulous INLINE* for VHF reception, the new CONICAL antenna will give true-picture reception in *every VHF signal area*: major, fringe and long-distance. Gain and directivity have been engineered to the high AMPHENOL standards that have set the quality goal for the entire industry; craftsmanship attention to the small but important details make the CONICAL another example of AMPHENOL's fine antenna work.

AMPHENOL CONICALs are available in single, two and four bay models. The stacked models use unique phasing harnesses for extra gain. The CONICAL may be obtained in packaging that contains all the necessary stacking equipment or else the individual antenna may be purchased one or two to a carton. In addition, the single bay CONICAL is available in a complete antenna installation kit.

All elements of the CONICAL are constructed of sturdy, long-lasting seamless aluminum tubing — assuring rust-free years of top performance.

*Reissue U. S. Patent 23,273





High gain of the CONICAL is illustrated in the gain charts for single, two bay and four bay models. Measured in accordance with proposed RETMA standards, the charts also show the desirable flatness of the gain.

AMPHENOL

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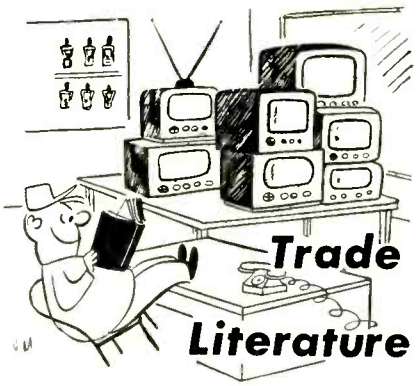
Mid-Atlantic Reps Elect Officers

The Mid-Atlantic Chapter of The Representatives has elected to office and appointed as Committee Chairmen for 1954 the following: President, George G. Scarborough; Vice-President, John J. Mahoney; Secretary, David G. Quinlan; Treasurer, Kenneth Randall; Publicity and Information, Wilfrid Graham; Industry Relations, Samuel A. Jeffries; Membership, J. R. Benge; New Industry, C. H. Newson, Jr.; Entertainment, Charles W. Lienau; Board of Governors, Robert L. Wilkinson.

PRSMA Hears Color TV Talk

PRSMA members recently enjoyed an informative talk on color television presented by the Sylvania Caravan. Mr. James Early, of Sylvania's commercial engineering department, gave the lecture with the aid of projected pictures on a screen among which were block diagrams of color TV transmitter and receiver. The question and answer period which followed the lecture brought up many important technical points.

[*Continued on page 56*]



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TV Books

John F. Rider, publisher, has announced that the list price of their package service information on TV receivers, known as *TV TEK-FILE*, has been reduced to $1.50 per pack to the television technician. Former price was $2.00 . . . *Rider Television Manual* Volume 12, the latest edition in the series of unabridged, factory-authorized, TV servicing information, contains complete data on TV receivers manufactured during the period March through August 1953. TV boosters, tuners, and converters are also incorporated. The total number of 8½ by 11-inch pages published in the 12 Rider TV Manuals is now over 27,000.

• • •

Catalogs, Bulletins, and Guides

RSM (Radio Merchandise Sales, Inc.), New York manufacturers of TV antennas and accessories, has produced a brochure entitled "Get the Rabbit Habit." Indoor antennas presently manufactured by the company are described. In addition, RMS has just published *Hardware Bulletin H953*, describing the entire line of insulators and standoffs carried by the firm.

RMS has changed their method of packaging Tenna-Tek. Each gross of tubes of the corrosion resistant compound now comes packed in yellow and black counter display carton. Further information can be secured from RMS, 2016 Bronxdale Ave., New York 62, N. Y.

• • •

R.F. noise suppression filters housed in hermetically-sealed metal cases are dealt with in the bulletin *Aerovox R-F Noise Suppression Filters* issued by Aerovox Corporation, New Bedford, Mass. The bulletin lists seven filter types, together with their dimensions and drawings, electrical factors, attenuation curves and approximate weights. The bulletin may be had for the asking.

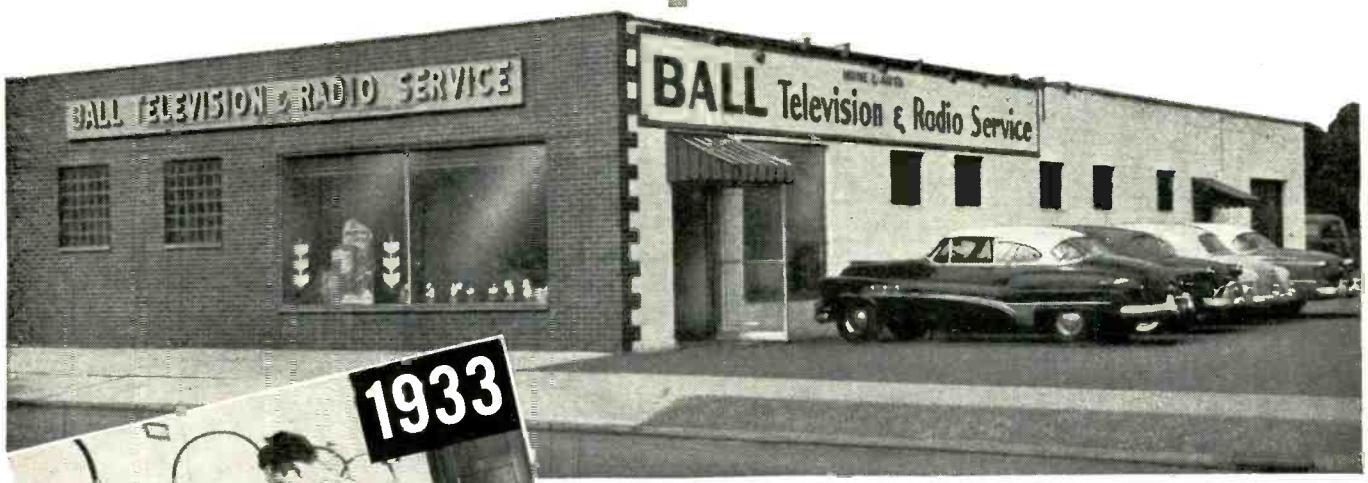
[*Continued on page 55*]

Another Outstanding Service Success Story...

with SYLVANIA!

From Basement Repair Shop to prosperous Service Business... featuring Sylvania Tubes, Parts and Promotion Programs!

The steady and substantial growth of the Ball Television and Radio Service, from basement shop to the large handsome brick building, shown below, is a tribute to the fair practices and alert policies of the owner, Mr. Ted Ball.



Early photo of Ball Radio Service Shop.

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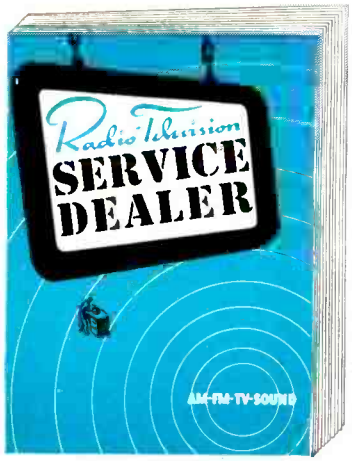

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4. Employees of Distributors.
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A TYPICAL ISSUE COVERS

- Video Speed Servicing Systems
- Rider's "TV Field Service Manual" data sheets
- Latest TV Installation and Maintenance Techniques for VHF and UHF
- Auto Radio Installation and Service
- Advanced Data on New Circuitry
- Production Changes and field service data on receivers
- New Tubes
- New Test Equipment, operation and application
- Hi-Fi installation and service
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To win one of these 503 prizes all you have to do is complete in 25 words or less "I like Pyramid capacitors because_____" You fill in this statement on a Pyramid contest entry blank which can be obtained from any electronic parts jobber selling Pyramid capacitors. You have this entry blank countersigned by your jobber or one of his salesmen and forward it to us attached to a Pyramid Dry Electrolytic Capacitor box top —the top being the part which carries the description of the item. There is no limit to the number of entries which you may make in this contest but each entry must be accompanied by a box top. Full rules for the contest appear on the entry blank.

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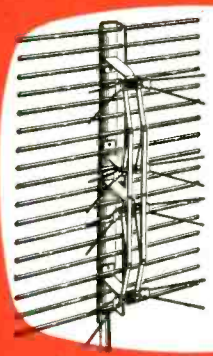

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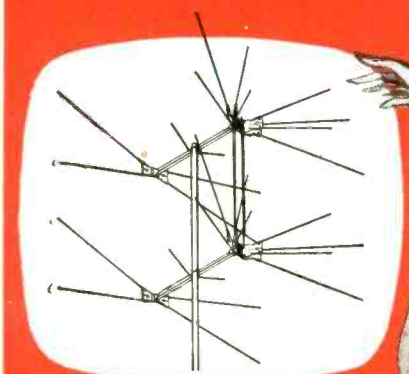

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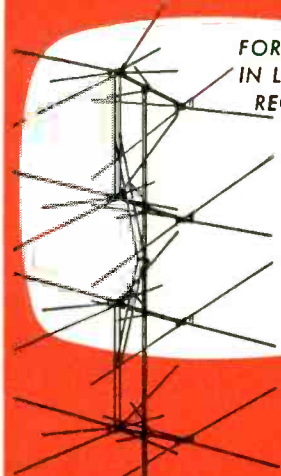

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"Better By Design"... Rain or Shine—For UHF or VHF you can depend on Telrex for clearer, sharper pictures... finer sound reception. Near or far—city, suburb or rural area—there's a Telrex model engineered for your particular locality. Over 60 antenna types are included in the new Telrex catalog. Write for your copy, today!

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VIDEO I-F SYSTEMS

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BY MATTHEW MANDL

Operation of video i-f systems; troubles that develop; symptoms they cause; how to signal-trace, align and troubleshoot.

TROUBLES in the video *if* stages of television receivers can cause such symptoms as loss of picture and sound, poor sync, poor contrast, intercarrier buzz, and intermittent reception. Besides these, misalignment or tube defects can increase susceptibility to interference and impair fine detail. For such reasons it is worthwhile to investigate the general characteristics of the video amplifier stages of television receivers so that increased knowledge will enable the technician to facilitate trouble shooting.

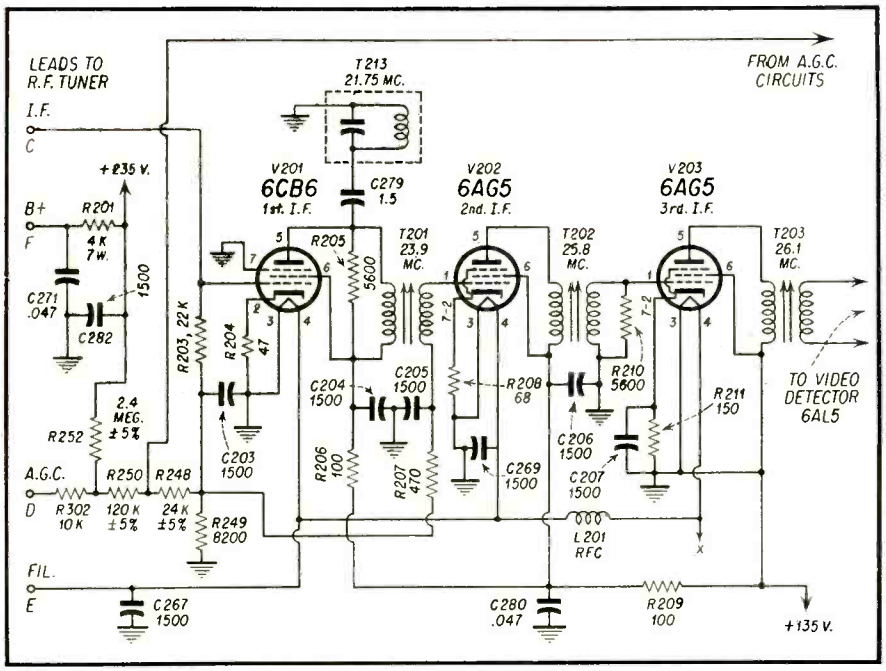

Fig. 1—Capehart CX-33A-M-K: staggered tuned *if* systems.

It is in the video amplifier stages that the degree of the receiver's selectivity is established. Here maximum gain can be achieved by the design engineer for the particular band-pass required. In television, the *if* circuits must have the broad response necessary for the picture signal. This means that some gain must be sacrificed. Thus, we find that there are usually three or four stages of *if* as compared to the single *if* tube found in many radios, to bring the gain up to that required.

Stagger Tuning System

In order to widen the band-pass response of the video *if* stages, some resistive loading across the tuned circuit is utilized. Besides this, however other means are employed to get the required 3.5 or 4 *mc* response needed. This usually consists of either over coupling the transformers between the plate and grid circuits, or tuning the various circuits to different frequencies around the *if* response required. This system is known as "stagger tuning" and the combination of the various frequencies results in a general overall band-pass. A typical example of a staggered tuned *if* system is shown in *Fig. 1*. Here the stage between the first and the second amplifier is tuned to 23.9 *mc*, while the transformer between the second and third *if* stages is tuned to 25.8 *mc*. The transformer between the third *if* stage and the video detector is tuned to 26.1 *mc*. The combination of the various resonant circuits produces the band-pass response curve shown in *Fig. 2*.

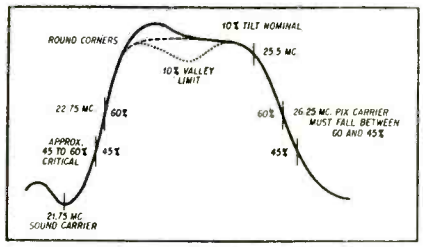

Fig. 2—Band-pass response curve produced by video *if* stages.

The response curve must be such that the sound carrier is sufficiently low to prevent sound bar interference on the screen while at the same time minimizing buzz in intercarrier receivers. The picture carrier should be down approximately 50 per cent on the response curve so that the vestigial sideband components will not give abnormal amplification of the sidebands around the carrier.

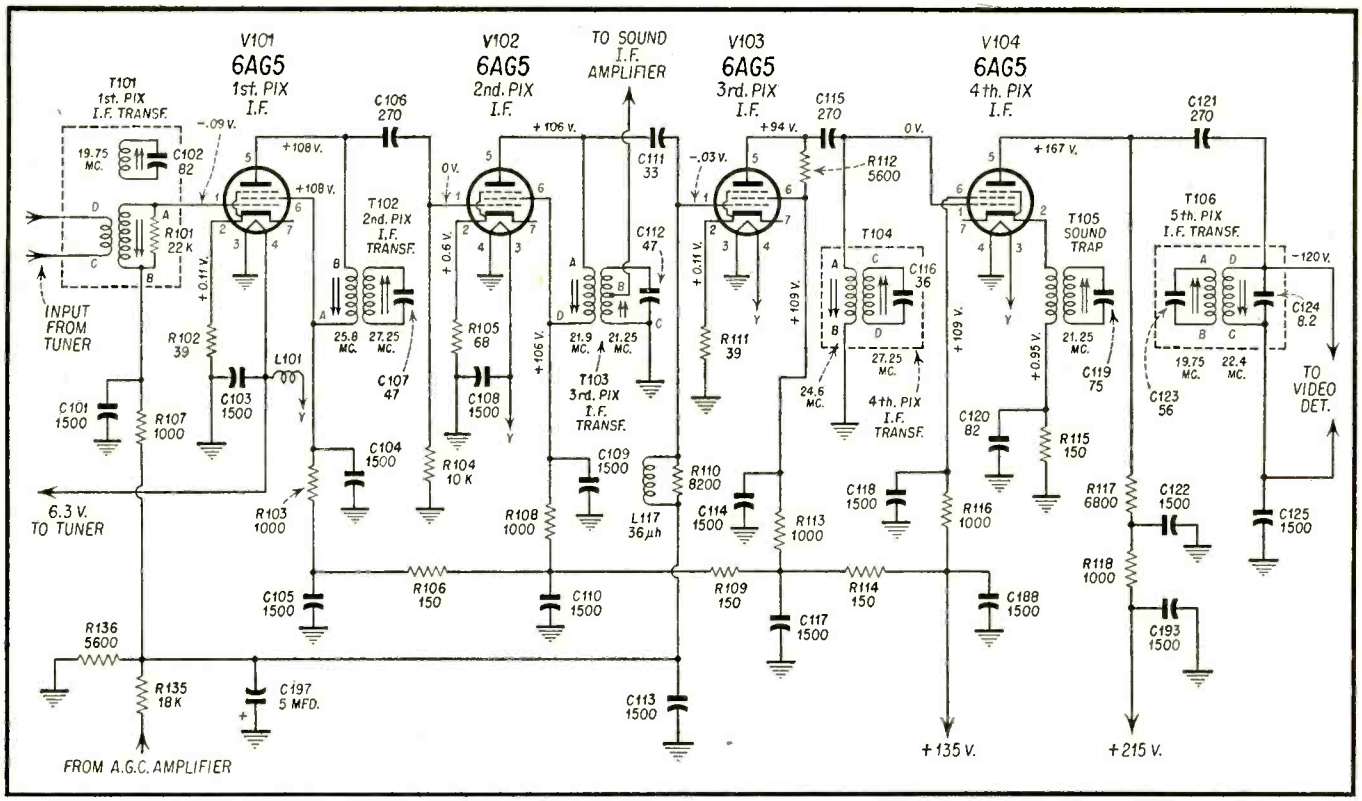

Fig. 3—RCA 8T241 receiver using split-sound system.

Tubes used are of the remote cut-off type to permit usage of automatic gain control. The automatic gain control *(agc)* is similar to the automatic volume control for radios. When a strong signal is received it will increase the bias and reduce the gain, while a weak signal will decrease bias and increase gain. (The *agc* is, of course, also applied to tubes in the tuner.)

In intercarrier receivers both sound and picture signals must travel through the video *if* stages for heterodyning at the video detector. For this reason the characteristics of intercarrier video *if* circuits differ somewhat with respect to response characteristics than the conventional split-sound receivers. In the intercarrier receivers the slopes of the band-pass curve are usually designed to be fairly steep so that the sound *if* rests approximately 90 per cent down from the peak of the response curve. The steep slope also minimizes adjacent channel interference. When such a response curve is utilized the manufacturer often dispenses with upper and lower adjacent channel traps and includes only the trap for the sound carrier for the receiver itself.

With older types of receivers using the split-sound system instead of intercarrier, the sound take-off must be included within the video *if* system. This is shown in *Fig. 3* where the sound for the audio *if* amplifiers is taken from a combination trap and feed coil following the second picture *if* amplifier. In some such receivers the sound *if* signals may be taken from earlier video *if* amplifiers or from the output of the tuner.

It will be noted that the adjacent channel traps are included in this circuit (19.75 *mc* and 27.25 *mc*). Two traps are also included for the sound *if* to minimize the appearance of interfering bars on the screen of the receiver.

In *Fig. 3* the *agc* again is applied to the grid of the first video *if* as well as the third. The second and fourth stages do not have *agc* control. In some receivers all video *if* stages will be directly controlled by the *agc*, while in others only one or two of the video *if* stages may have *agc* applied to them. In *Fig. 1*, for instance *agc* is applied to the first and second *if* stages only and omitted from the third.

In many of the modern receivers an *if* frequency as high as 44 *mc* is used in contrast to frequencies around 25 *mc* for other models. The higher intermediate frequency has been adopted by many manufacturers because of the several advantages which result from its usage. These include reduced oscillator radiation interference to neighboring television receiver; reduced image frequency interference; and interference from local FM stations or short-wave installations. Besides this, the higher *if* frequencies also reduce the tendency for the reception of other interfering signals such as diathermy, etc.

At the higher *if* frequencies the local oscillator stability is affected to some extent and is more critical. Besides this, the 44 *mc* is over one and one half times higher than the earlier 25 *mc if* amplifiers. This produces some problems in servicing because of the higher frequency involved. Invariably, operation at higher frequencies will make circuit function more critical and precautions must be observed to assure peak performance. Thus, parts replacements in video *if* stages using the higher frequencies should be made with exact duplicates and lead dress must not be disturbed. Tube replacements are apt to influence the band-pass characteristics to a greater extent than with lower *if* values. It would, therefore, be preferable to try several tubes to avoid serious disturbances of the resonance or the necessity for realignment of the video *if* system.

The general factors detailed in this article apply to all video *if* systems even though considerable circuit variations exist. Thus, some video *if* systems may use transformers as shown in *Fig. 1*, but may incorporate four stages instead of three. The transformers may be over-coupled and each tuned to the same frequency, or they may be stagger-tuned and use frequencies other than those shown. Besides this, the system may be intercarrier or split-

sound and may use a minimum of traps, or may use duplicate traps for the upper and lower adjacent channels.

Common Troubles

As with other circuits in a television receiver, the tubes should be checked first when troubles occur. Tube failures are common, as well as a decline in emission characteristics. Tube failures will result in complete picture loss in such instances where sound take-off is made prior to the defective tube. In intercarrier receivers tube failures in video *if* stages would mean loss of both picture and sound.

Component parts also contribute their share of troubles to those which are found in video *if* stages. In particular, capacitors can become leaky or open and resistors can change in value. Thus, if tube substitutions do not help, a thorough check should be made for leaky, shorted, or open capacitors, or for off-value, or open resistors. Parts values should be compared with those given in the schematics for the receiver in question and replacement made when values are off by more than 10 per cent.

Besides tubes and component defects, the circuit should also be checked for proper voltages at the screen and anode terminals of the tubes. Voltages should also be read between grid and cathode to make sure that a minus potential exists at the grid of each tube.

This is particularly important when coupling capacitors are used between the stages as shown in *Fig. 3*. A leaky coupling capacitor can nullify the minus potential on the grid of the tube or can produce a positive potential at the grid. When this occurs, amplification will be excessive and an overly contrasty picture will result. Besides this, picture quality will be very poor and some of the sync tip amplitude may be decreased. This will result in picture weave and pulling.

The *agc* bias on the tubes should also be checked with a *vtvm*. The *vtvm* should show a negative bias from the *agc* line to ground. The bias should vary as the fine tuning control is adjusted or the station selector switched. A strong incoming signal should increase the negative *agc* bias to the grids of the tubes affected while a weak signal should produce a corresponding decrease in the applied bias. Failure of the *agc* circuit to function in this manner would indicate either a defective *agc* rectifier or amplifier tube, an open *agc* resistor, or shorted and leaky capacitors. Again, a check of the component parts involved is necessary.

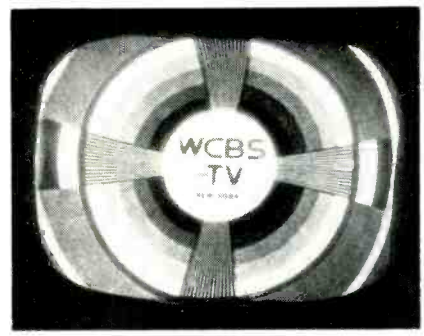

Fig. 4—Misaligned *if* or sync clipping which causes pix to "bend."

When a screen grid by-pass capacitor opens, the stage may go into oscillation. This would give a very distorted signal, or also produce diagonal line heterodyne interference. If a screen by-pass capacitor should short it would cause excessive current to flow through the voltage dropping resistor and usually cause it to over-heat or burn out. Thus, a burned-out resistor would mean that a check should also be made of the associated by-pass capacitor for shorted conditions.

A change in tube characteristics may also result in some sync clipping. With the sync amplitude below normal, the picture may not lose synchronization entirely but may bend to the upper position as shown in *Fig. 4*. This bending or pulling at the top can also be caused by a misaligned *if* system. If, for instance, the carrier sets down too far on the response curve, it would mean that the side-bands which are clustered around the carrier will not be amplified as much as the rest of the signal. This decline in amplification would diminish the 60 and 15,750 sync signals as well as the lower frequency video signals. The result would be a picture which would have some trailing smears because of poor low frequency response as well as some bending and pulling at the top as shown in *Fig. 4*.

Misalignment could also aggravate intercarrier buzz because it would upset the relationships of the sound versus the video signal. (This is what occurs when the fine tuning control is not adjusted for minimum buzz.)

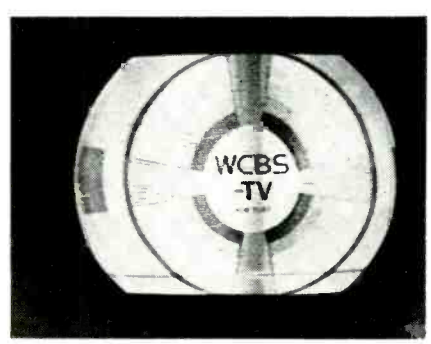

Fig. 5—Misalignment of the *if* traps causes this "framing" effect on pix.

Misalignment of the traps in the *if* system could also cause adjacent channel interference. If the slopes of the response curve are too broad, adjacent channel interference will also result. Such interference can cause diagonal line interference on the screen so characteristic of heterodyne interference or it can cause "framing" as shown in *Fig. 5*. Here the next lower channel picture signal is interfering but inasmuch as it is not sychronized it will sweep across the screen in a *wind-shield wiper* effect. In *Fig. 5* the blanking bar is shown down the center of the picture and obscures the vertical wedge. The horizontal dark bar is also visible at the lower position of the screen and represents the blanking which occurs at the bottom of the sweep.

Signal Tracing

Defective or dead stages can be located by signal tracing procedures. A variety of equipment can be used for signal tracing purposes with the procedure illustrated in *Fig. 6*. Here an indicating device is applied across the video detector load resistor as shown. The signal injecting unit can be a single-signal generator or a sweep generator. If a single signal generator such as a marker unit is used, the indicating device across the detector load can be a vacuum-tube voltmeter using a low *dc* range. This will then indicate the rectified signal derived from the signal generator.

If the signal generator has provisions for internal modulation an oscilloscope can be used for the indicating device. If, for instance, the signal generator is modulated with a 400 cycle tone the scope would show the 400 cycle waveform if the signal is getting through the last picture *if* stage. A sweep generator could also be used in conjunction with an oscilloscope. The response curve waveform would be visible on the oscilloscope and would be the identifying clue if the injected signal is getting through the stages. The signal generator is then moved progressively back toward the tuner to ascertain which stage does not pass the signal. In this manner each stage can be checked for signal transfer by moving the signal generator but leaving the indicating device across the detector load resistor. This is a much simpler method than moving both the indicating device and signal generator from one stage to an-

[*Continued on page 62*]

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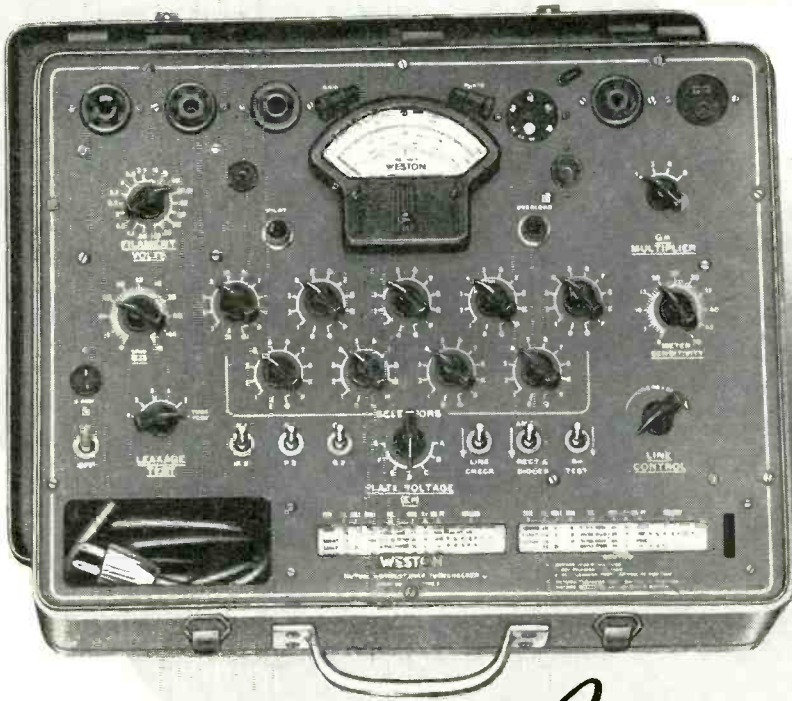

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COLOR TV

by LEONARD LIEBERMAN

Part 4 of this series explains the receiver used in color TV.

A representative NTSC set which was shown to the FCC will now be analyzed in detail. This model is typical of the 16 different developmental models made by as many manufacturers. By the time sets reach the market in mass production quantities, some specific circuit changes may have been made, but basic design consideration however will still be the same. The 630 monochrome RCA can still be validly used to explain monochrome operation even though present day sets vary widely from it, in circuitry.

Figure 1 is a block diagram of the chroma channel in greater detail than analyzed previously. Note that the burst gate (pentode section of a 6U8) is also a burst amplifier *(Fig. 2)*. The composite video signal from the plate of the first video amplifier is coupled to the gate grid. The tube is in a cut off condition except when a negative pulse from the horizontal transfer is applied to the cathode. This pulse occurs at the same time that the color burst is present in the signal.

The separated and amplified burst is applied to the phase detector. The output of a 3.58 *mc* (see block diagrams) oscillator suitably amplified and adjusted is also fed to the phase detector. If the oscillator and color burst are not in phase, an error voltage is developed by the phase detector. This voltage is filtered and applied to a reactance tube (6U8). The reactance tube then acts to change the oscillator phase in the direction of reducing the error voltage to zero.

The 6BL7 "killer" tube serves to kill the chroma channel when a monochrome signal is being shown. The E_R, E_B, E_G channels are designed so that when a white signal is shown, their outputs are proportioned so that the total output will add up to white. When only a monochrome signal is

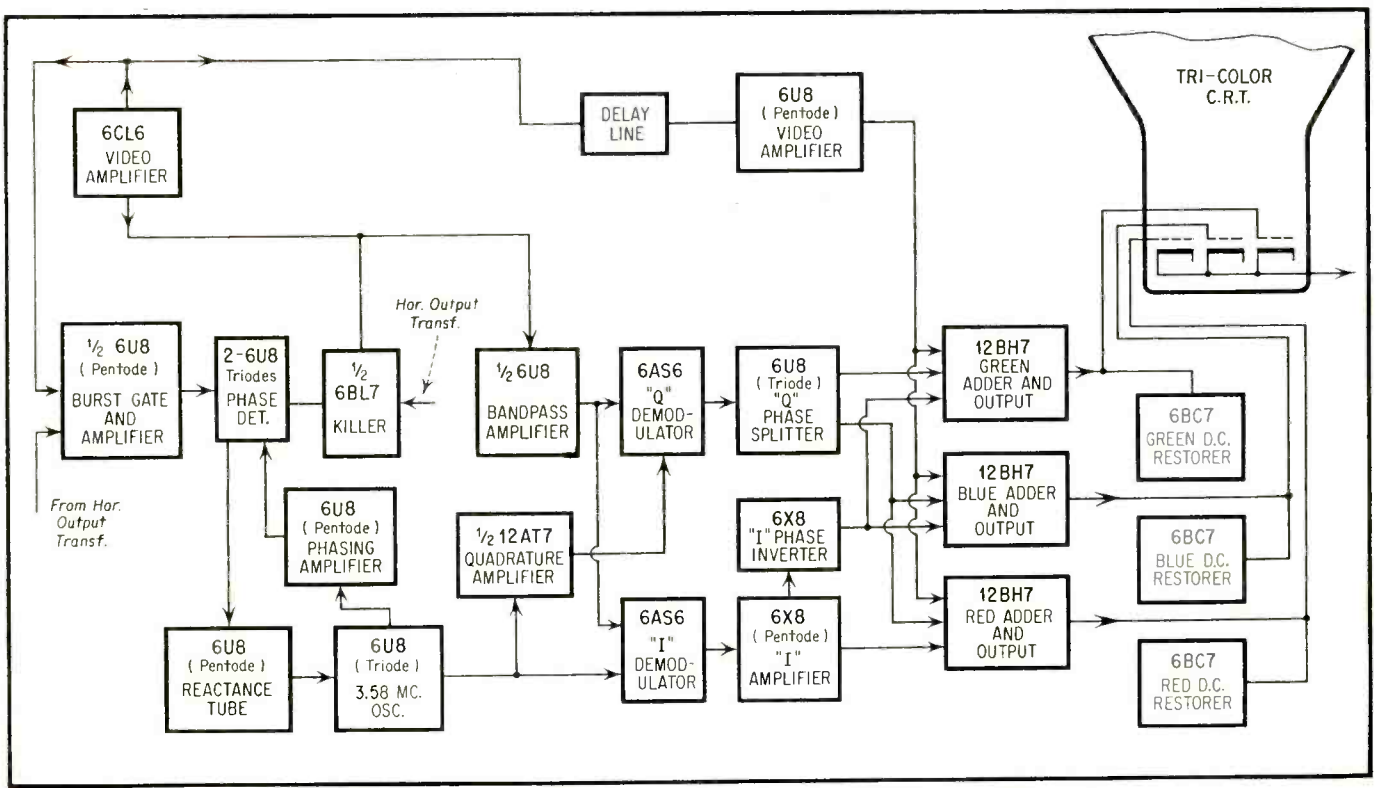

Fig. 1—Block diagram of the chroma channel in the NTSC color TV receiver.

present, the chroma channel is killed and only the luminance signal is applied to the inputs of the adder tubes. The chroma channel is killed to prevent any interaction from the 3.58 *mc* oscillator or its associated circuits.

From the correctly phased oscillator, a reference signal is applied to the "I" demodulator directly, and the "Q" demodulator through a quadrature amplifier. This circuit arranges the reference voltage so that the "I" and "Q" channel oscillator inputs are 90° apart.

The luminance signal is fed to the 6U8 band-pass amplifier. The output of this amplifier is a signal containing the low frequency color signal. This signal is then applied to the demodulators. (*Figure 3* shows a partial schematic.) The oscillator signal is applied to the suppressor grid. The output of the band-pass amplifier is fed to the control grid. In the plate circuit, we find a band-pass filter which passes only the desired signal.

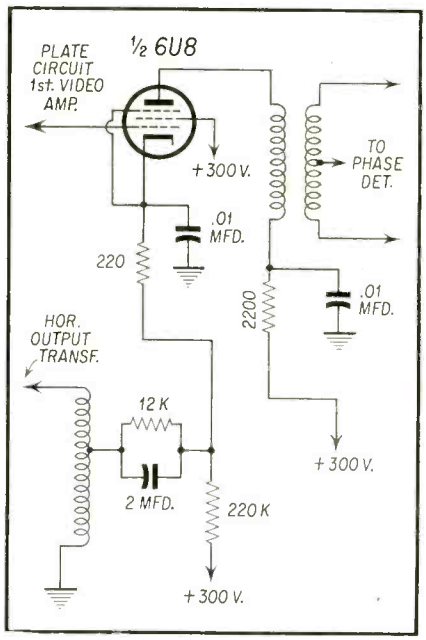

Fig. 2—Burst gate (pentode section of 6U8) is also burst amplifier.

From the demodulators, the signal is fed to phase splitters. The E_Q and E_I signals contain both (E_R-E_Y and (E_B-E_Y). (E_G-E_Y) can therefore be formed by correctly mixing E_Q and E_I. By taking both positive and negative phase outputs of the E_Q and E_I channels and applying the outputs to the E_R, E_B, and E_G adder grids, the E_R-E_Y, E_B-E_Y and E_G-E_Y can be obtained. The E_Y output of the second video amplifier is also applied to the grids of the color adders. The output of the tubes are the E_R, E_G and E_B signals of the scene as presented to the pick-up camera. *Figure 4* is a partial schematic of the adder circuit.

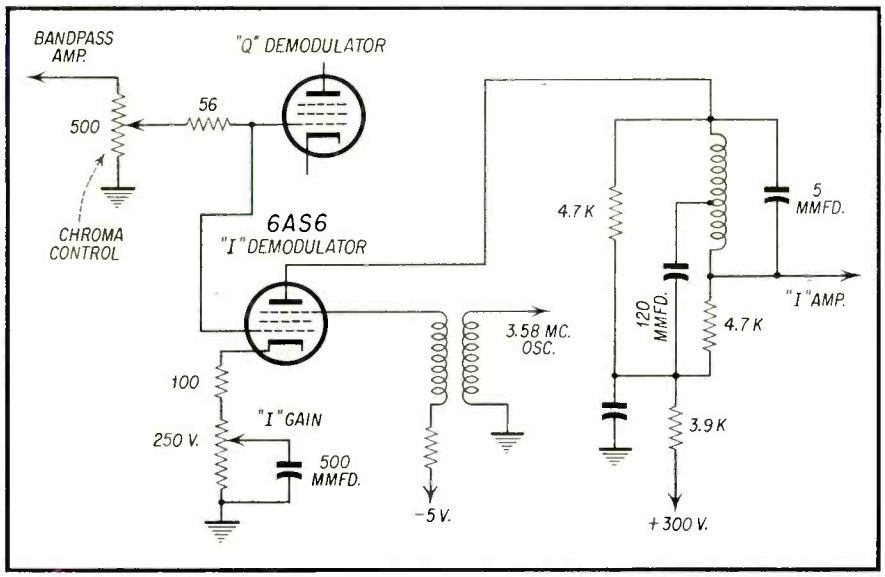

Fig. 3—Partial schematic of the demodulators.

The Deflection Circuit in a Three Gun CRT Section

The three gun CRT which is the one discussed in this article is used in most of the current, developmental models. The corrective measures in the deflection system mentioned previously consist of the following devices:

1. Purity coil, beam positioning magnets and tube neck shield.
2. Dynamic focus and convergence circuits.
3. Regulated high-voltage supply.

The purity coil provides a means whereby the three electron beams can be aligned with their respective color dots. The beam positioning magnets keep the three beams in proper alignment with each other. The neck shield acts to exclude any stray magnetic fields from entering the beam fields.

In order to maintain a constant focus for all three beams, an additional electrostatic focusing element is added to the standard electrostatic focusing plates. This is known as the convergence electrode. On this electrode an *ac* wave form *(Fig. 5)*, is superimposed on the *dc* voltage. This wave form, by adjusting the electrostatic focusing field, allows the beams to be kept in focus from one end of the sweep to the other.

In this dynamic convergence circuit *(Fig. 6)*, a wave form is taken off the cathodes of the horizontal and vertical deflection output tubes. These voltages are coupled to the input of the convergence amplifier. The adjustable coil and potentiometer are for the purpose of phasing the horizontal and vertical wave forms.

The output of the dynamic convergence amplifier is applied through two transformers to the convergence electrodes. The taps insure that the voltage ratio between the dynamic convergence and dynamic focusing elements is kept constant. The *dc* voltage for the convergence electrode (approximately 11 KV) is taken off the high voltage regulator bleeder supply. The focusing *dc* is supplied by a rectifier tapped on the horizontal output transformer primary. A potentiometer in the cathode ground return of the rectifier acts as the focus control.

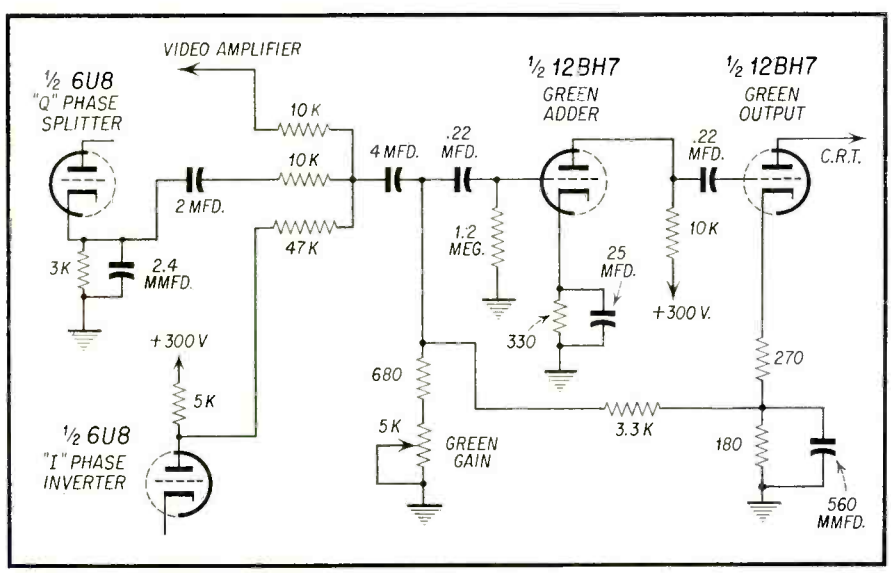

Fig. 4—Partial schematic of the adder circuit.

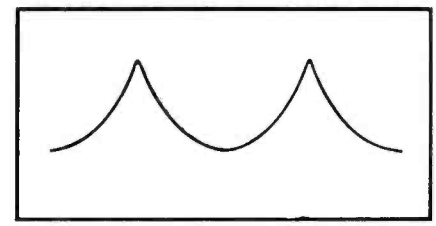

Fig. 5—Waveform applied to convergence electrode aids focus in CRT.

The high voltage supply *(Fig. 7)* consists of three rectifiers hooked up in a doubler circuit. The output is between 20 and 25 kc. It is filtered by a 2,000 $\mu\mu$f condenser at the output in parallel with 2,000 $\mu\mu$f in the CRT coating to ground. Across this output is a bleeder network of 132 megohms to ground. A shunt regulator tube is connected across the bleeder. The current from this tube maintains the voltage across the bleeder constant within a very small range.

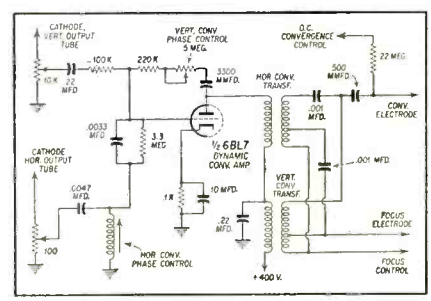

Fig. 6—Dynamic convergence circuit.

The CRT

There are at present two approaches to the construction of the color tube. One is the dot triad system, as represented by the RCA, or CBS Hytron (RTSD, Nov. '53). The second type being tried is the Lawrence tube developed by the Chromatic Labs., Inc.

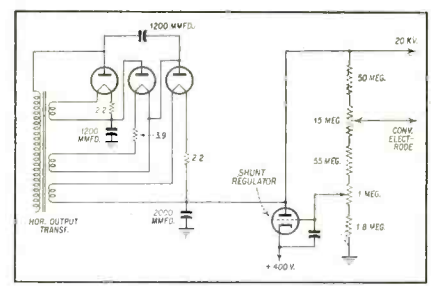

Fig. 7—High voltage supply.

[Continued on page 61]

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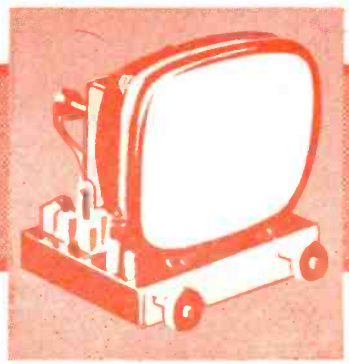

by BOB DARGAN

PART 3

In the third article of this series, trouble-shooting the i-f system is continued. Also discussed are the video and sound portions to the CRT and audio output stages.

IN the second article one of the key test points of the *if* strip, the point at which the video detector load resistor voltage is obtained was examined and explained. There is also another test point in the *if* strip that also must be discussed.

The Agc Line

Another excellent test point of the *if* stages is the negative voltage at the *agc* line. If the negative bias is present, it indicates that the video *if* information is being supplied to the detector and *agc* rectifier. The negative voltage on the *agc* line is also an indication of the signal strength being received for the individual television channels. The stronger the channel signal applied to the receiver by the antenna, the more negative will be the *agc* voltage. This voltage is developed in some manner due to the rectification of the video *if* signals and therefore confirms that *if* signals are present at the video *if* detector in most television receivers.

Use Of A Bias Box

Many technicians will not accept the facts and act accordingly. If there is any possibility of trouble in a receiver due to the *agc* system, connect a bias box that supplies a negative voltage to the *agc* line. Adjust the negative voltage so that about 2 to 3 volts are at the grid of the *if* tubes. If the trouble is in the *agc* system, the picture will be presented normally when this is done. The bias box will confirm quickly and easily if the trouble is in the *agc* system. One of the reasons that many technicians are very slow in completing a television repair is that they are very hesitant about making easy, quick checks like this when they should be done. With the more complex, fast acting *agc* systems in use, there is more possibility of trouble in this system than formerly. If there is any possibility of the trouble being in the *agc* system, the technician will be guessing and groping until this type of check is performed.

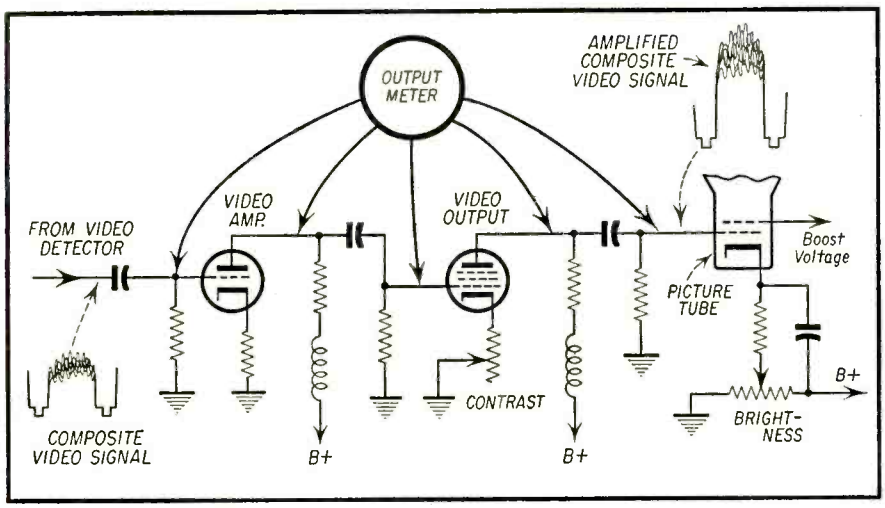

Fig. 1—Signal tracing at key test points in the video section. See text for correct meter hook-up.

The Video Section

The purpose of the video amplifier and output stages is to amplify the composite video signal from the video detector to the level that will properly drive the picture tube, thereby providing a satisfactory black and white picture. The polarity of the signal is such that the sync and blanking pulses made the grid negative with respect to the cathode of the CRT and therefore cut the picture tube current off for these signals.

In this section, the same checks can be performed for signal continuity as can be made in other amplifier stages, in that the video tube can be clicked in and out of the socket. Flashes in the raster, indicate the circuits will pass signals. As before, scratching of the grids or sparking the plate elements will also indicate whether there is signal continuity in these sections by causing bars to flash on the picture tube. Another method of checking the video amplifier and output stages is to feed filament voltage to the grid of the video amplifier or output tube through a .1 μf *dc* blocking condenser.

This will cause dark and light horizontal bars to appear on the raster.

Another indication of whether signals are passing through the amplifiers can be obtained with an *ac* voltmeter using a .1 μf condenser in series with one lead to block the *dc* potentials. The condenser will prevent damage to the meter if the lead is connected into a plate circuit. The arrangement can then be used the same as the output section of most volt-ohmmeters and it is an effective composite video signal tracer (see *Fig. 1*). The exact numerical value is not important. If it is desired to know whether video information is present at these points, the grids and plates of the video amplifiers, and whether there is gain in the stages, the output voltage will provide a rough idea of the gain in the stage as well as indicate whether the signal is present. The use of an output meter has never been fully appreciated and adopted as a useful tool by television technicians.

The CRT Section

The socket that supplies the voltages to the CRT is an excellent means of checking the voltages that control the picture tube. By removing the female socket from the back of the picture tube, a number of voltages can be measured in the socket terminals.

First, the No. 1 anode voltage can be determined by connecting the *dc* voltmeter between the #10 pin and chassis as shown in *Fig. 2*. The No. 1 anode voltage for picture tubes is usually about 350 volts. Measuring it at the disconnected socket will reveal immediately whether this voltage is normal.

An important consideration concerning this voltage is the fact that it is

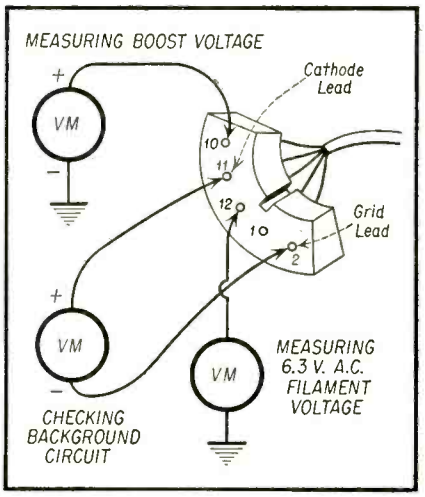

Fig. 2—Using a D-C voltmeter to check socket at the CRT.

generally supplied by the horizontal damper boost voltage circuit. This is because of the modern trend in power supplies. Since the low voltage supply using selenium rectifiers can only develop 250 volts *dc* it cannot be used for the No. 1 anode of the picture tube. So the voltage is obtained from the damper boost circuit where it is much higher. Very little current will be drawn from the picture tube #1 anode and the boost voltage at the damper circuit is a convenient source for this purpose. But the important consideration is the fact that by measuring the voltage at the #10 pin on the picture tube socket, an indication of the horizontal deflection system can be quickly obtained. If the deflection system is operating properly, this voltage will be normal.

However, if the damper boost is not used for the #1 anode, pin #10 is still an excellent check on the B plus voltage on the chassis and it is readily accessible.

The Background Circuit

Many television technicians have no idea of how the background circuit may be checked for proper operation. If high voltage is present and yet there is no raster on the picture tube, some technicians are stumped and at a loss as to how to check further. It is a case of not being able to apply common electronic theory to the practical case. The current in any tube can be cut off when sufficient bias is applied between the grid and the cathode. As the bias is reduced (the grid is made less negative with respect to the cathode), current flow through the picture tube is permitted. *This same theory applies to picture tubes.* The electron beam in picture tubes is cut off when the grid is about 55 volts negative with

respect to the cathode. It is not too important whether the background control is in the grid circuit supplying negative voltage, or is in the cathode supplying positive voltage, because the same result will be accomplished.

When the cathode is made more positive with respect to chassis, it increases the negative bias of the grid with respect to the cathode. When the grid of a picture tube is made negative 55 volts with respect to the cathode, the picture tube current will be stopped. Any less negative voltage between the grid and cathode will permit tube current to flow. Therefore, a check of the background circuits is made between the grid and cathode connections in the socket, pin #11 for the cathode and pin #2 for the grid. The background control is adjustable, and it should provide a range of voltages from about zero volts when the background control is in the full brightness position, to much more than 55 volts negative in the position of the minimum brightness. If this range of voltages is measured at the CRT socket, it is evident that the background circuit is operating properly. The bias voltage in some receivers may be as high as 125 volts negative at the grid with respect to cathode, but it is only necessary to make the grid negative 55 Volts with respect to the cathode to perform the proper action.

Also, the grid pin can be used to determine if the video information is reaching the grid (provided the circuit design is for the picture information to be applied to the grid and not the cathode) by measuring the grid, pin #2, with respect to chassis. This measurement is made with an output meter and it will indicate whether the composite video signal is being applied to the picture tube grid circuit.

Another check which can easily be made at the picture tube socket is of the filament voltage to the picture tube. This voltage is easily measureable at the socket and can be made use of when the picture tube filament is not lighted as a confirmation that filament voltage is being supplied to the tube. This measurement would be performed with an *ac* meter.

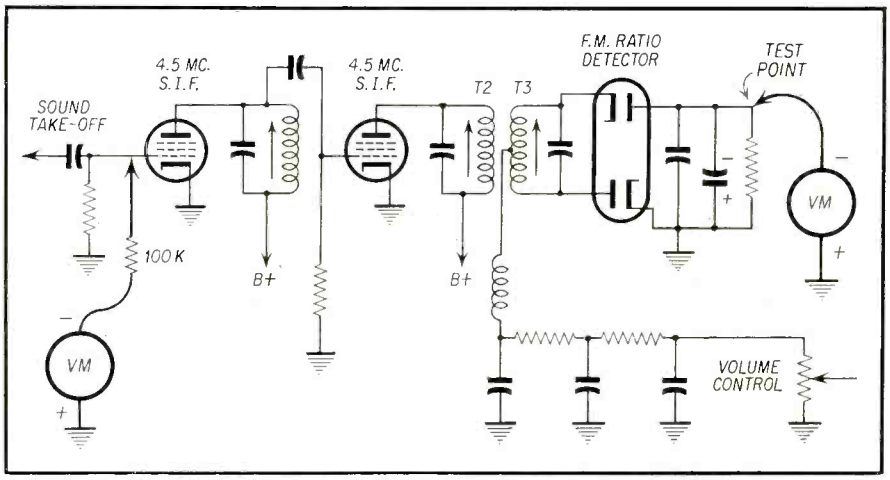

Fig. 3—Schematic of typical FM ratio detector circuit, showing key test points to be checked with D-C voltmeter.

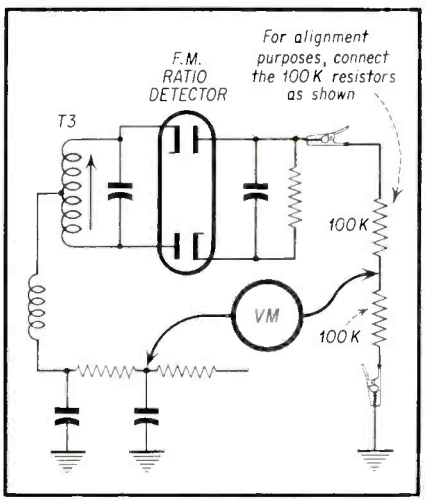

Fig. 4—Checking secondary winding of FM detector transformer.

The Sound System

With intercarrier sound systems the FM and video carriers beat together in the video detector. The resultant 4.5 *mc* signal output contains the exact modulating signal that the original FM carrier contained. From the video detector the 4.5 *mc* FM signal is fed to the sound intermediate frequency stages which are tuned to 4.5 *mc*, and the signal is amplified. There may be two sound *if* stages in some receivers before the signal is applied to the FM detector.

The ratio detector stage takes the frequency modulation deviations and converts them to corresponding audio signals. The audio signal is then applied across the volume control which is a means of adjusting the level of sound supplied to the grid of the audio amplifier tube.

Ratio Detector

In the FM ratio detector circuit, there will be developed at the FM test point, a negative *dc* voltage which is proportional to the amplitude of the FM signal received. This test point is the top point of the AM filter which consists of a parallel resistor-condenser combination. A negative voltage will be developed at this point which is proportional to the FM signal strength. If the FM signal is not reaching the FM detector circuit, no voltage will be measurable at this key test point. With average signal strength, the potential developed can be minus 30 volts or higher. See *Fig. 3*. This test point can also be used for checking signal strength of different channels since it provides an excellent indication of relative signal level.

This key test point in the FM sound section is the dividing or half way point in the sound system. The first step in servicing a receiver with no sound is to measure the voltage at the test point with respect to chassis to determine if the FM information is

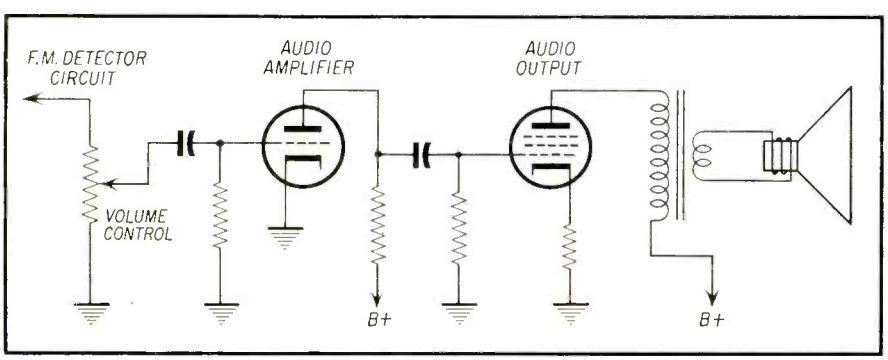

Fig. 5—Simplified schematic of conventional audio output section. See text for points to be checked.

[*Continued on page 59*]

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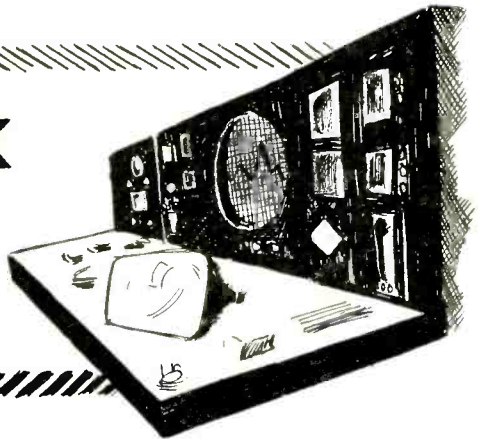
BY PAUL GOLDBERG



Correcting sync circuit troubles in three TV receivers is the subject of this month's installment.

THREE sync circuit troubles have been chosen for this installment. Much useful information can be obtained in analyzing them as they are not too common in today's TV receivers.

Capehart Model CX-33 Horizontal Wiggle

The set was turned on and the horizontal gradually began to pull into sync and then start to wiggle. It was an "S" shaped wiggle. The first video amplifier tube was pulled out to see if the raster was wiggling also, but all four sides were straight, which proved that the wobble was entering the pix via the sync circuits. All tubes that affected the horizontal sync, 6AL5, 6SN7, and the 6AU6 were then replaced without effect. The 6AL5, *afc* phase detector tube was then removed again to determine if the trouble was in the horizontal oscillator. It was observed this time that even though the picture was out of sync, the diagonal lines were not "S" shaped anymore.

After replacing the 6AL5, the syncrolock (Primary of T209) adjustment was varied and it was noticed that there was a point where momentarily the horizontal would straighten out, and then start wiggling again. Because the horizontal range was affected only slightly and the vertical hold was functioning properly, it was deduced that the trouble was probably somewhere in the phase detector.

The scope was set up and a few waveforms on the *afc* detector and reactance tube were checked, but the waveforms bounced all over the scope. In fact, the only place a decent waveshape could be obtained was at the horizontal oscillator 6SN7 grid. Voltages were then taken on the 6AU6 reactance tube. The plate and screen readings were close enough, but the grid read about 4.5 volts positive when it should have read about 2 volts positive.

Here was a clue. Now what would cause it? Let us see. If *C251* were leaking, it should have affected the horizontal range greatly. However, the horizontal range was only slightly affected. That left out *C251*. If *C247* were leaking, it probably should have affected the vertical hold somewhat. But the vertical hold was okay. That left *C247* out.

It was then decided to make a fast resistance check for leakage across *C249, C250,* and *C248*. One side of *C248* was clipped out of the circuit because it was across the primary of T209. It checked okay. The other two condensers did not have to be clipped out of the circuit as they were in parallel with high resistors. *C250* measured okay, but *C249* measured a complete short. It was clipped out of the set and measured again. Sure enough it was shorted. The odd thing about this 600 volt, .0047 μf condenser shorting is that there is no B+ applied to it. The most that would ever be applied probably would be about 5 volts. You will observe that *C249* in parallel with *R279*, and *C250* act as a pulse voltage divider network in the output section of the *afc* detector. These components also filter out extraneous noises and occasional vertical sync pulses that sneak through. Now with *C249* shorted, the full *afc* detector output (5V) voltage is applied to the grid of the 6AU6 reactance tube. *C249* was replaced with a new .0047 μf-600 volt condenser and the set functioned properly.

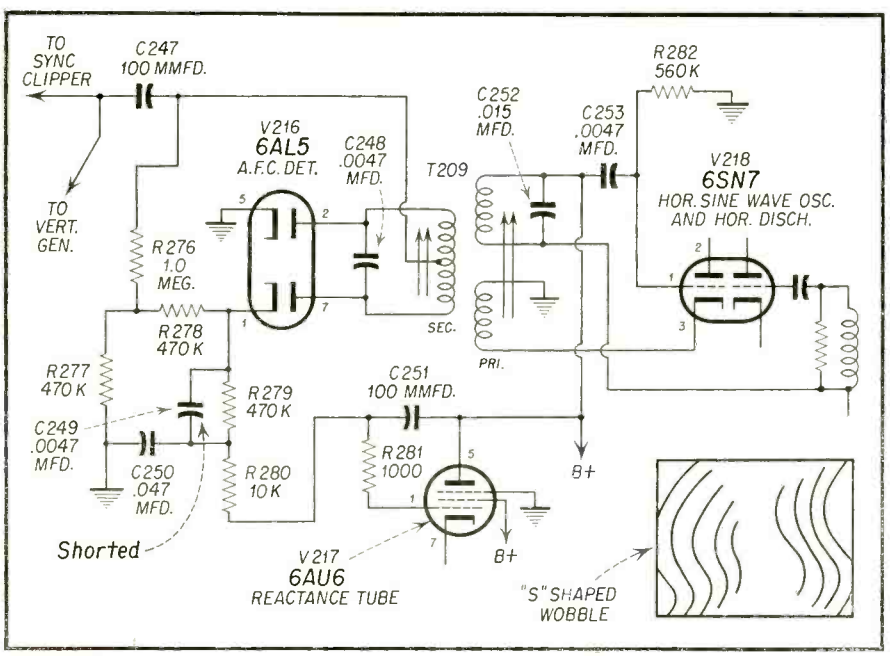


Fig. 1—Capehart CX-33, horizontal sync circuit.

Motorola TS-60— Poor Horizontal Hold

When the set was first turned on the horizontal pulled into sync and then proceeded to fly far out of the horizontal frequency range. Attempts to bring it back into sync by adjusting *L23, (Fig. 2)* the horizontal oscillator slug, were of no avail. The 6SN7 (V16) was then changed, but the trouble remained. After replacing the old 6SN7 (V16), the 6AL5 (V15) was removed to see if trouble in the phasing detector was causing the horizontal oscillator range problem.

As soon as the 6AL5 was pulled out, the horizontal oscillator came back into range. Naturally, it did not hold

well horizontally. However, it proved that the trouble was not in the horizontal oscillator. The 6AL5 (V15) phase detector was replaced next. This too, did not cure the trouble. Since the vertical hold was okay, the 6SN7 (V12) was eliminated as a possible cause of the trouble.

The chassis was then turned on its side and trouble-shooting was begun in the phase detector circuit. A voltage reading at pin 4 of the horizontal oscillator tube (V16) was first taken. Here, any trouble in the phase detector could be checked voltage-wise. The meter read approximately 5 volts positive whereas the diagram called for about 1.2 volts positive with respect to chassis. So far we were on the right track.

A waveform check with the scope at pins 5 and 7 of the 6AL5 (V15) phase detector was then taken. At pin 5 the waveform was fairly similar to the correct waveform, but at pin 7 it was obvious that something was wrong. *C83* (.001 μf) was clipped at pin 7 and checked for leakage with a *vtvm*. There was no leakage. With the scope, *C83* was now checked for an open. On the 6SN7, clipper (V12) side of the condenser, the waveform was correct, but on the other side, there was no waveform. Thus, *C83* (.001 μf) was open.

The grid voltage on the horizontal tube V16 depends on the sync signal from the clipper causing conduction in 6AL5 phase detecter. Under these conditions a voltage is developed across *R82* (4.7M). If no sync signal is present this voltage becomes less negative with respect to B—, which is what the symptom was in this case.

Compared to shorted condensers, open condensers are rather rare. In

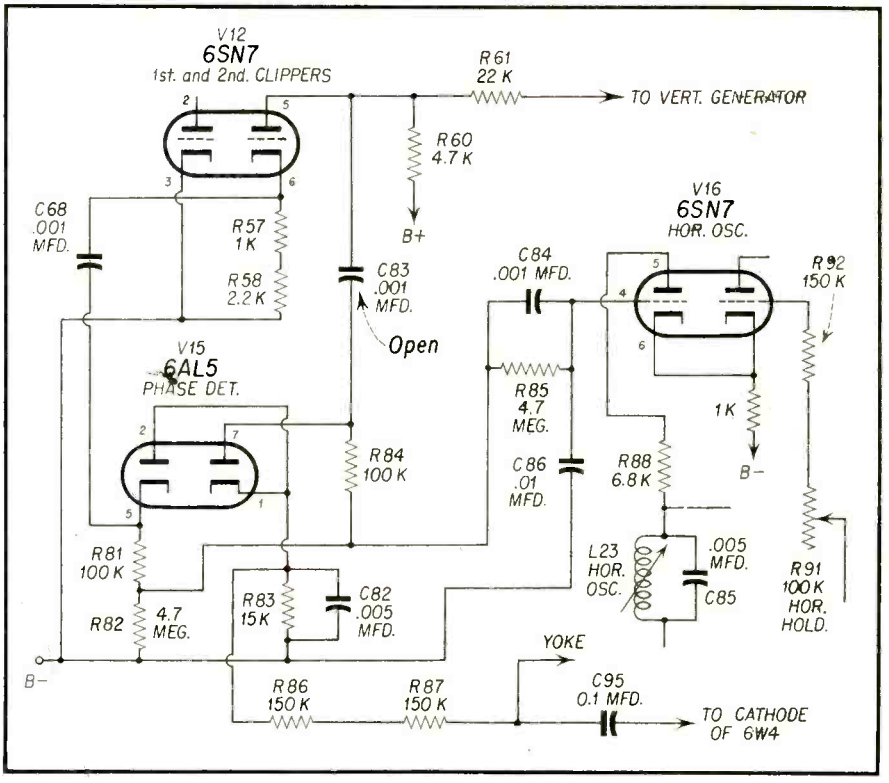


Fig. 2—Motorola TS-60, horizontal sync circuit.

examining the connections, it was noticed that the condenser *(C83)* barely reached the terminal to which it was soldered and had to be stretched to a maximum in order to be soldered. Since it was a paper condenser, this stretching probably aided in causing it to open. Replacing the condenser cured the original trouble.

G.E. 12T1—Horizontal Tearing

The set was turned on and everything appeared normal for a while. However, a horizontal tearing which started to get worse with time became evident. The set also broke out of horizontal hold severely and vertical sync slightly. It was also noticed that as the brightness was decreased the left side of the raster got dark before the right side. However, as the brightness was increased the raster became normal again. The latter symptom usually means a bad filter. However, there was some question as to whether or not the filter was causing the sync problem. Therefore, the 12SN7 horizontal oscillator (V21 A & B), and the 6SL7 sync amp. (V20) were individually replaced; but the tubes didn't solve the sync problem.

The filter most likely to cause these combined symptoms would be one associated with the horizontal section because a sync problem was also present. *C406,* 10 mf, was checked for an open by placing across it another 10 mf condenser. As soon as this was done the dark side of the raster became as bright as the right side. The vertical and horizontal sync trouble were also corrected.

This particular problem was selected for those who have not come across the "dark left-side symptom." This is a wonderful clue to solving filter troubles. Many times a filter may be leaking only slightly and by observing the raster as you vary the brightness control, a filter trouble can be diagnosed immediately. Moreover, the dark left side may appear at a very low level of brightness and as you increase the brightness even slightly, the left side will brighten up to normal.

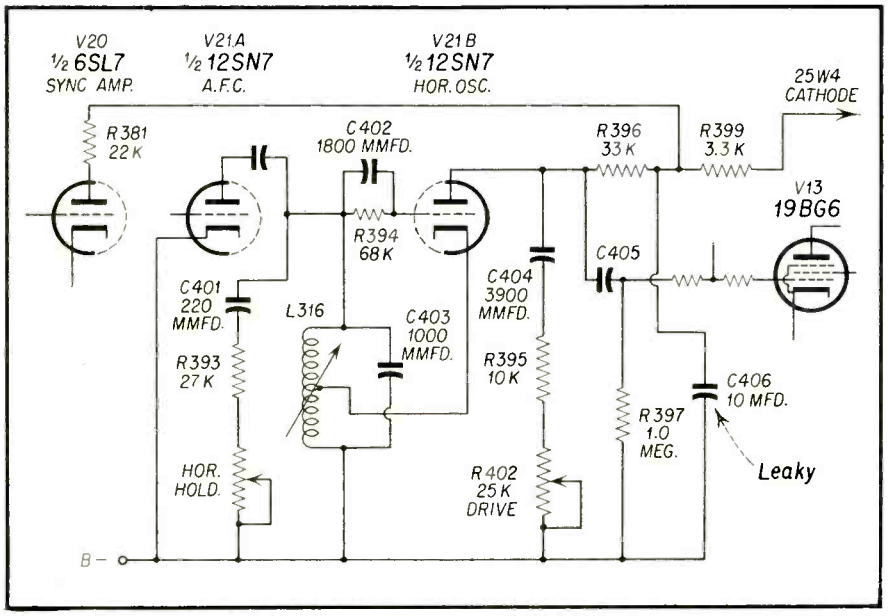


Fig. 3—GE 12T-1, horizontal sync circuit.

Mfr. Du Mont **Model No.** RA109

Card No. DM-109-7

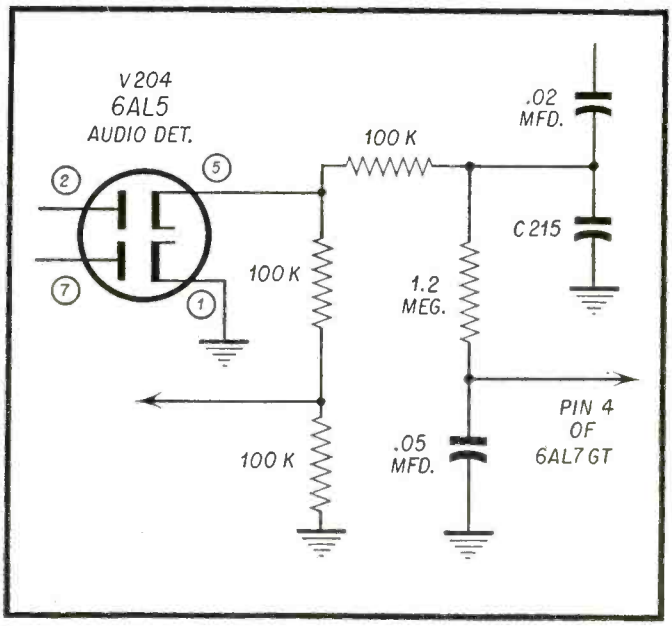
Section Affected: Sound

Symptom: No sound.

Cause: Component failure.

What To Do:

Replace: *C215* (680 *μμf*)—shorted.



Mfr. Du Mont **Model No.** RA109

Card No. DM-109-8

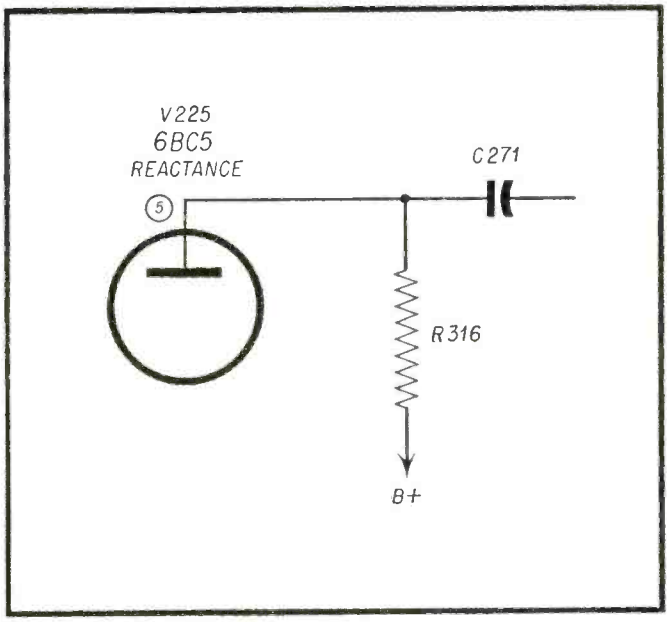
Section Affected: Sync

Symptom: No horizontal hold

Cause: Component failure.

What To Do:

Replace: *C271* (.005 *μf*)—shorted.
Also, R316 (22K)—burned up.



Mfr. Du Mont **Model No.** RA109

Card No. DM-109-9

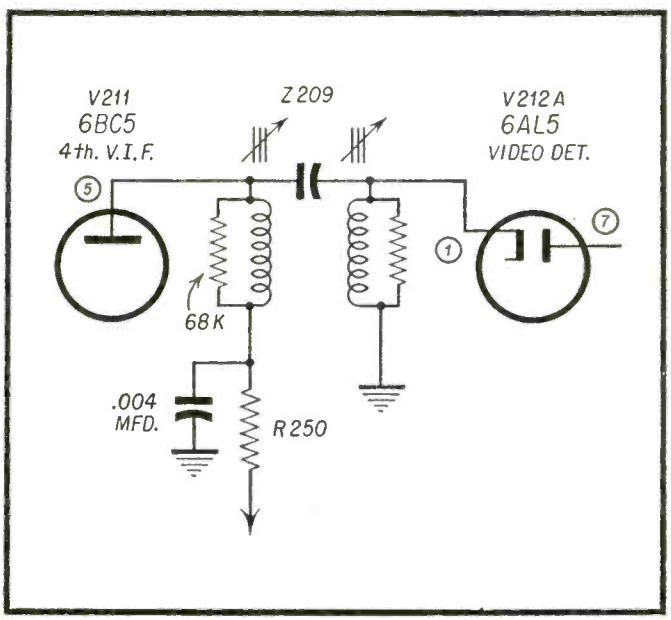
Section Affected: Pix

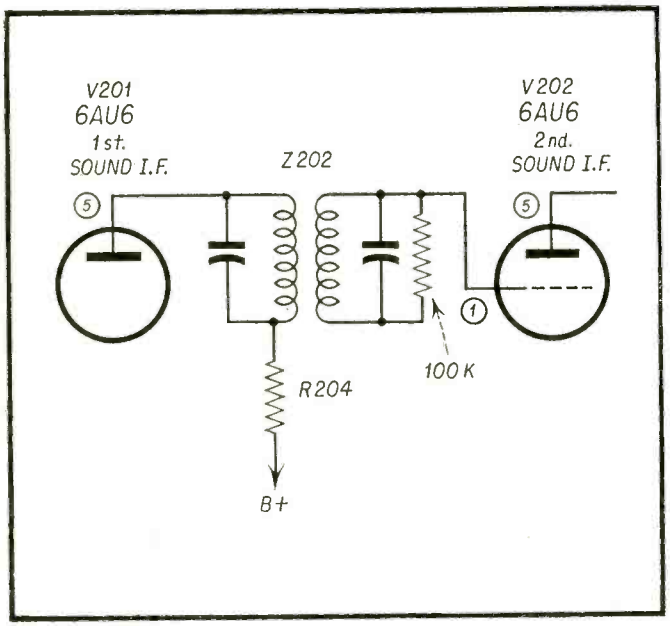
Symptom: No pix; *R250* burns.

Cause: *Z209 shorts* (primary to secondary).

What To Do:

Replace: *Z209* and *R250* (1K).





Mfr. Du Mont **Model No.** RA109

Card No. DM-109-10

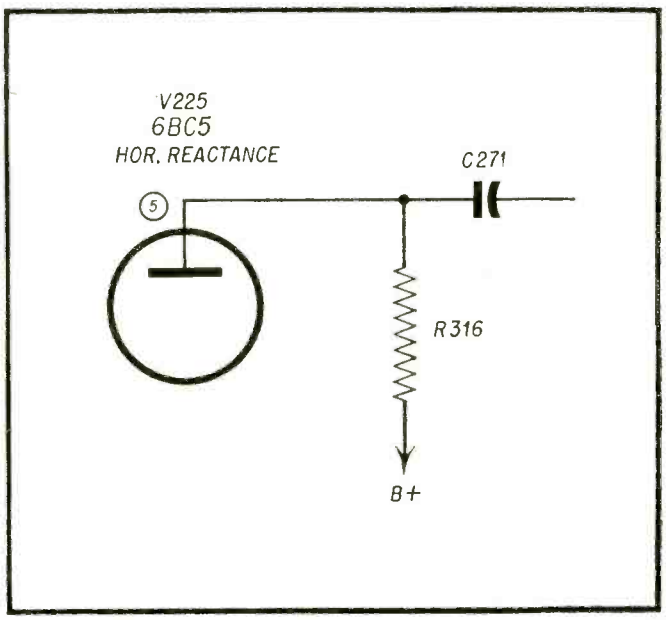
Section Affected: Sound

Symptom: No sound; also *R204* burns.

Cause: *Z202* shorts (primary to secondary)

What To Do:

Replace: *Z202* and *R204* (1K).



Mfr. Du Mont **Model No.** RA109

Card No. DM-109-11

Section Affected. Sync

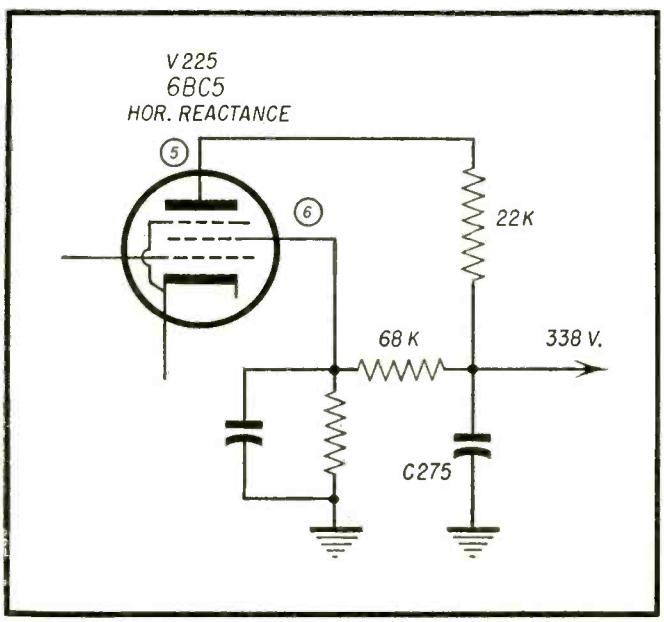
Symptom: Very critical horizontal hold.

Cause: Component failure.

What To Do:

Check: *R316* (22K)—loses resistance.

Replace: *C271* (.005 *μf*)—may be leaky.
Also, V225 (6BC5) Hor. reactance tube).



Mfr. Du Mont **Model No.** RA109

Card No. DM-109-12

Section Affected: Sound and raster

Symptom: Set does not light.

Cause: Power fuse blown.

What To Do:

Replace: *C275* (.05 *μf*)—common cause of B+ failure.
Also, 5 amp power fuse.

Mfr: Philco **Model No.** RF41, 42 and 44

Card No. PHRF 41-1 **Code No.** 121 and 123

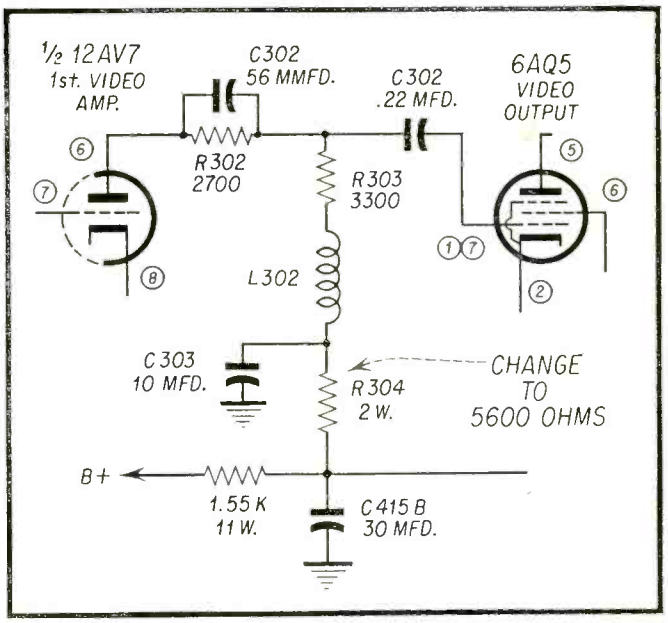
Section Affected: Pix

Symptom: Poor low frequency response.

Reason For Change: Circuit improvement.

What To Do:

Change: *R304* (3.9K) to 5.6K.



Mfr: Philco **Model No.** RF41, 42 and 44

Card No. PHRF 41-2

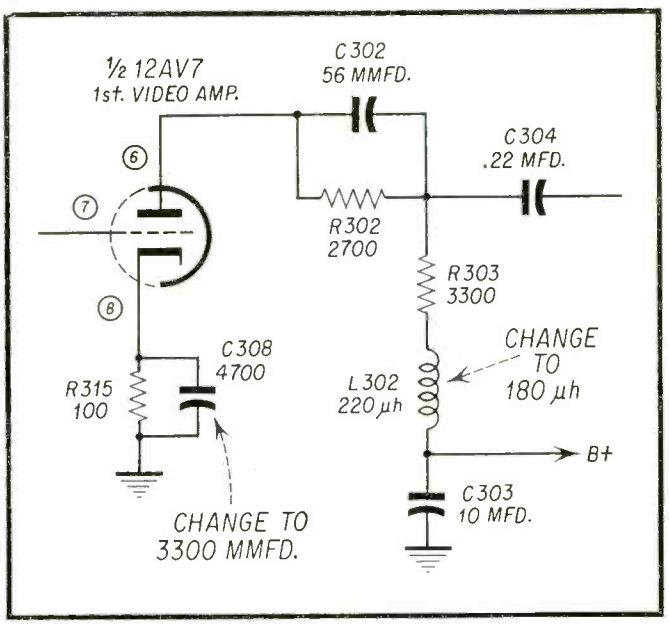
Section Affected: Pix

Symptom: Insufficient high frequency detail.

Cause: Shunt peaking coil inductance (*L302*) too high.

What To Do:

Change: *L302* (220 *μh*) to 180 *μh*.
Also, C308 (4700 *μμf*) to 3300 *μμf*.



Mfr: Philco **Model No.** RF41, 42 and 44

Card No. PHRF 41-3 **Code No.** 121 and 125

Section Affected: Sync

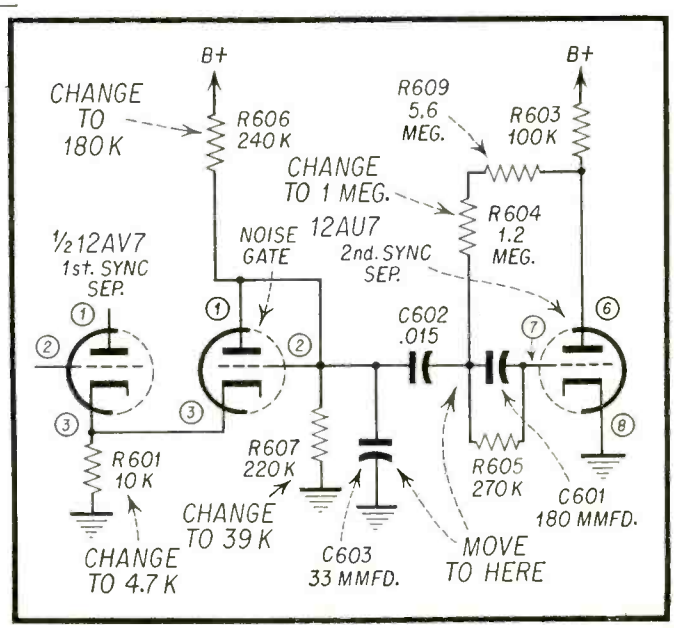
Symptom: Insufficient sync lock-in action in locations where signal strength varies between extremes of low and high.

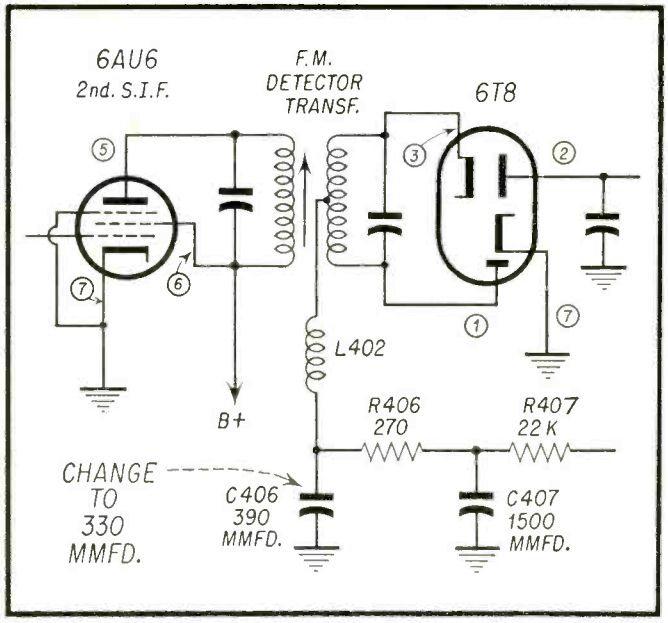
Reason For Change: Circuit improvement.

What To Do:

Change: *R601* (10K) to 4.7K; *R607* (220K) to 39K.
Also, R606 (240K) to 180K; *R604* (1.2 meg) to 1 meg.

Move: *C603* (33 *μμf*) from 12AU7 grid (pin #2) and plate (pin #1 at *C602*—.015 *μf* to the other side of *C602* (junction of *R604, R605, C601*).





Mfr: Philco **Model No.** RF41, 42 and 44

Card No. PHRF 41-4 **Code No.** 121 and 125

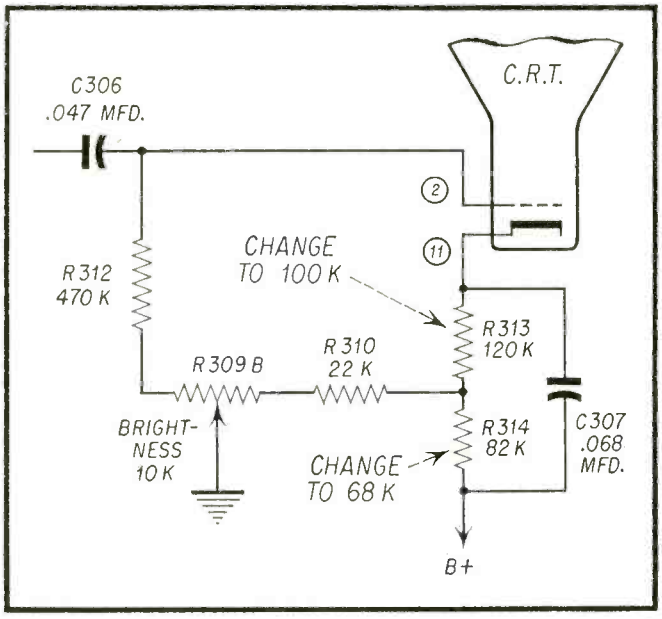
Section Affected: Sound

Symptom: Sound buzz.

Reason For Change: Circuit improvement.

What To Do:

Change: *C406* (390 $\mu\mu f$) to 330 $\mu\mu f$—ceramic.



Mfr: Philco **Model No.** RF41, 42 and 44

Card No. PHRF 41-5 **Code No.** 121 and 125

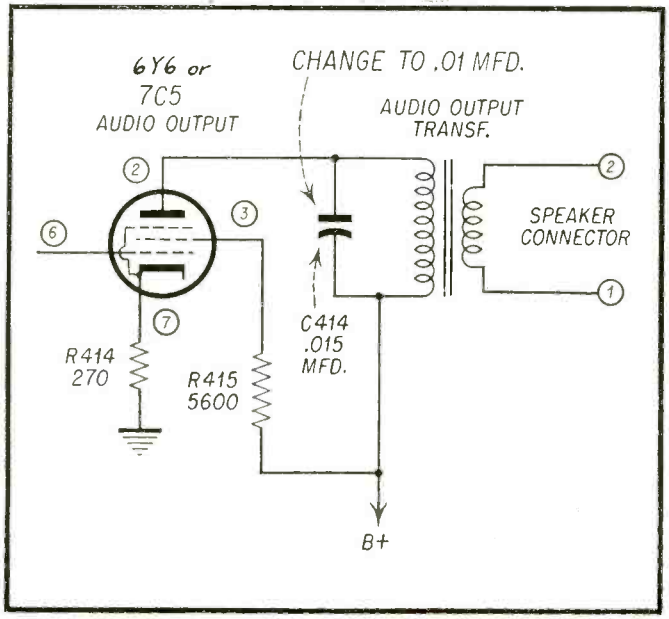
Section Affected: Pix

Symptom: Excessive brightness.

Reason For Change: Circuit improvement.

What To Do:

Change: *R314* (82K-½W) to 68K-1W.
Also, R313 (120K) to 100K.



Mfr: Philco **Model No.** RF41, 42 and 44

Card No. PHRF 41-6

Section Affected: Sound

Symptom: Sound too boomy.

Reason For Change: Circuit improvement.

What To Do:

Change: *C414* (.015 μf) to .01 μf.

Mfr: Zenith **Chassis No.** 23G22

Card No. ZEG50-7

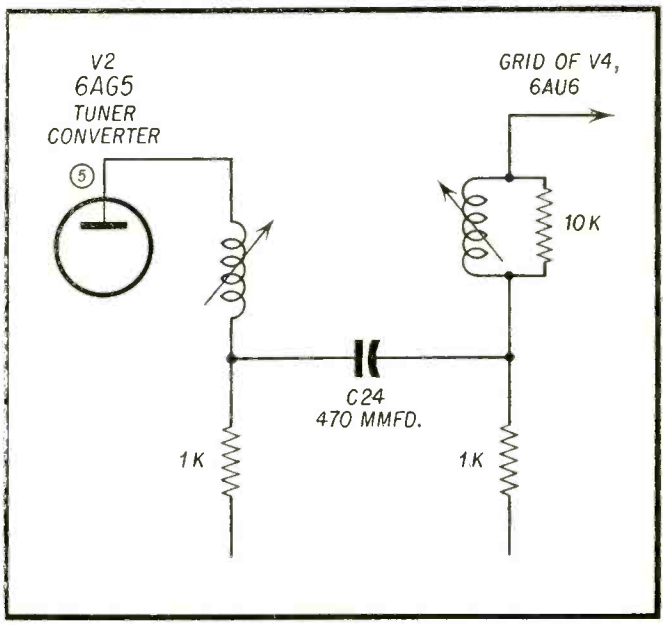
Section Affected: Pix

Symptom: Pix overload.

Cause: Leaking video *if* coupling condenser.

What To Do:

Replace: *C24* (470 $\mu\mu f$).



Mfr: Zenith **Chassis No.** 23G22

Card No. ZEG50-8

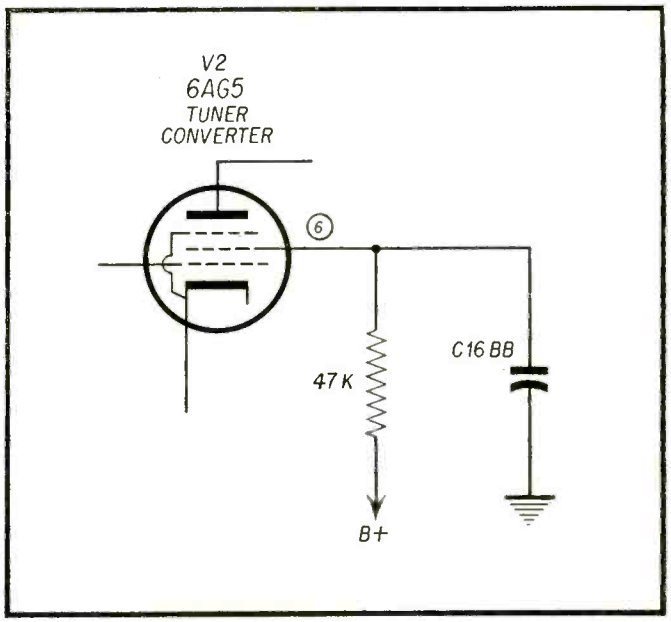
Section Affected: Pix

Symptom: Intermittent flashes in pix.

Cause: Leaky condenser (intermittent).

What To Do:

Replace: *C16BB* (110 $\mu\mu f$).



Mfr: Zenith **Chassis No.** 23G22

Card No. ZEG50-9

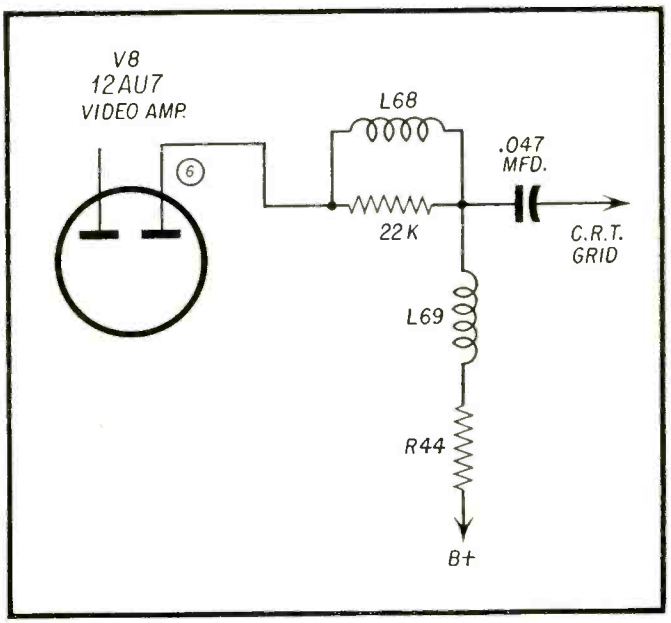
Section Affected: Pix

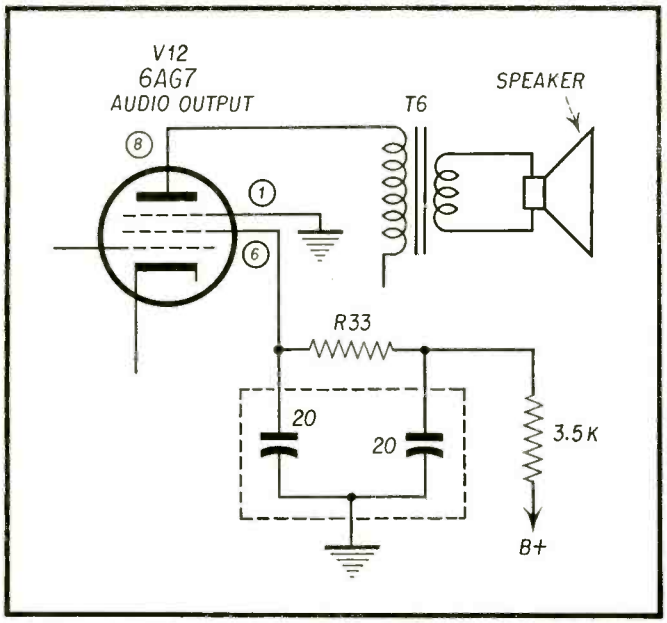
Symptom: Pix smeared.

Cause: Resistor drops in value.

What To Do:

Replace: *R44* (8.2K).





Mfr: Zenith **Chassis No.** 23G22

Card No. ZEG50-10

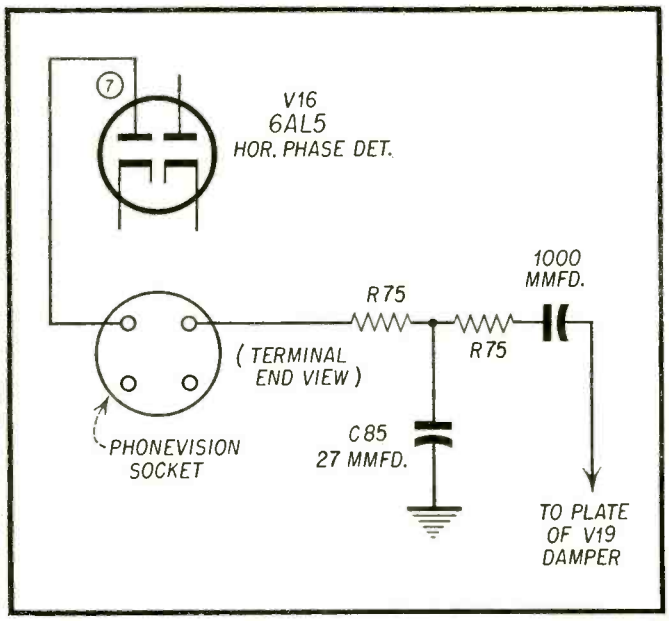
Section Affected: Sound

Symptom: Sound raspy.

Cause: Open screen resistor.

What To Do:

Replace: *R33* (12K).



Mfr: Zenith **Chassis No.** 23G22

Card No. ZEG50-11

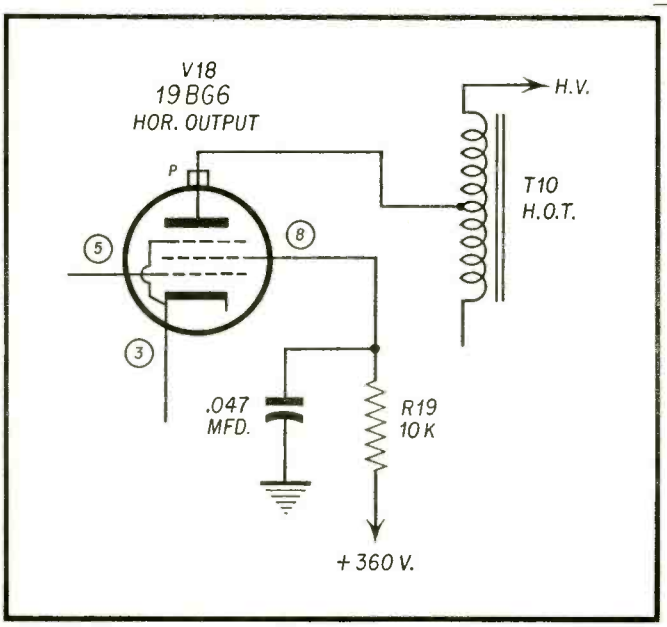
Section Affected: Sync

Symptom: Erratic horizontal sync.

Cause: Resistors increase in value.

What To Do:

Replace: *R75* (Both 56K-½W) with 56K-2W.



Mfr: Zenith **Chassis No.** 23G22

Card No. ZEG50-12

Section Affected: Raster

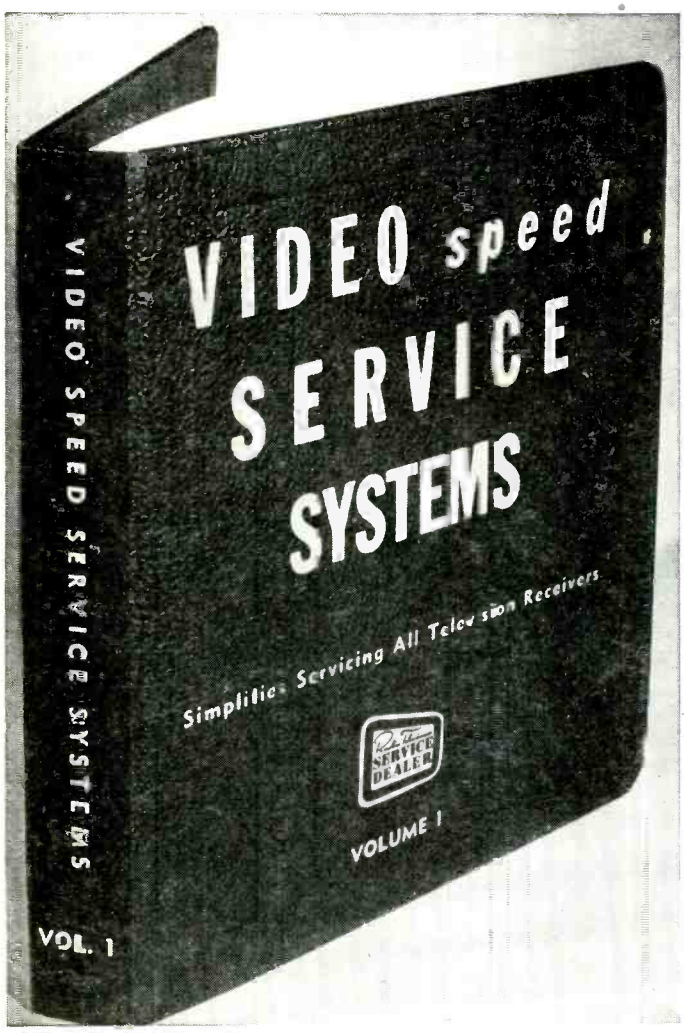
Symptom: Raster collapses intermittently leaving white vertical line momentarily

Cause: Resistor opens intermittently.

What To Do:

Replace: *R19* (10K-2W) with 10K-5W.

FOR GREATER PROFITS



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EMERSON

MODEL NUMBERS	TV CHASSIS	TUBE SIZE
711F 712F, 720D, 732B, 734B	120169-B	21MP4 (metal-rect.)
733F	120169-F T.V. 120152-F RADIO	21MP4 (metal-rect.)

TUBE COMPLEMENT

SYMBOL	TUBE	FUNCTION
V1	6CB6	1st Vid. IF Ampl.
V2	6CB6	2nd Vid. IF Ampl.
V3	6CB6	3rd Vid. IF Ampl.
V4	6AL5	Vid. & A.G.C. Det.
V5	6CB6	Vid. Ampl.
V6	6AU6	1st Sound IF Ampl.
V7	6AU6	Sound Limiter
V8	6AL5	Sound Discriminator
V9	6AU6	1st AF Ampl., A.G.C. Clamp & Noise Suppressor
V10	6V6	AF Output Ampl.
V11	12AU7	Sync Ampl. & Hor. Separator
V12	12AU7	Hor. Sync Phase Inverter & Hor. Phase Det.
V13	6SN7	Hor. Osc.
V14	6BQ7	Hor. Output Ampl.
V15	1B3	HV Rect.
V16	6W4	Hor. Damper
V17	6C4	Vert. Sync. Separator
V18	6SN7	Vert. Osc.
V19	6W6	Vert. Output Ampl.
V20	5U4	Low Voltage Rect.
V21	5U4	Low Voltage Rect.
V22	6BQ7	RF Ampl.
V23	6J6	Osc. & Mixer
V24	21MP4	Picture Tube

Key Voltages

All voltages are measured with respect to chassis ground:
B+ voltage, Plate of Damper tube V16 pin 5....230V DC
Boosted B+ voltage, Terminal 8 of Hor. Out. Trans. .....465V DC
Plate voltage of Vert. Osc. V18 pin 2.....68V DC
V18 pin 5 ....75-115V DC*
Plate voltage of Vert. Out. Ampl. V19 pin 3....220V DC
Plate voltage of Hor. Osc. V13 pin 2.....200V DC
V13 pin 5.....175V DC
Grid voltage of Hor. Out. Ampl. V14 pin 5....—20V DC
* This voltage reading depends on the Vert. Size and Hold control setting.

ADJUSTMENTS

Beam Bender (Ion Trap)

A single magnet type of beam bender is used and should always be adjusted by sliding and rotating the unit for maximum brightness. Do not adjust the trap for removing corner shadows if in so doing the brightness is reduced.

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

Use Of The Fringe Compensator

In fringe areas there is generally a higher ratio of electrical impulse noise (ignition, neon signs, electrical motors, etc.) to signal which might tend to effect sync operation. To reduce this condition this chassis has been equipped with a "Fringe Compensator and Switch." This compensator is located at the rear of the chassis, and can be adjusted to handle the effects of electrical interference in most fringe locations. This compensator is provided with an on-off switch so that it can be disconnected when not required.

NOTE: In most locations this added protection will not be necessary and the fringe compensator should remain in the "off" position.

Improper adjustment or application of the fringe compensator may result in excessive audio buzz and/or picture wiggle. This device is designed to give added performance in fringe areas and will result in satisfactory operation only if instructions are carefully adhered to.

Adjustment Of The Fringe Compensator

1.) Tune set to a low frequency channel in a normal fashion. If low channels are not available use a higher channel.
2.) Turn fringe compensator switch to the "ON" position and adjust the potentiometer to the center of its mechanical range.
3.) Check all channels normally received in the area and re-adjust compensator if necessary for best performance.

[*Continued on page 46*]

EMERSON TROUBLE SHOOTING CHART

NO SOUND—NO RASTER
Power input circuit
B+ Fuse F-1
V20, V21
Phono-TV Switch

NO RASTER—SOUND OK
Brightness control
V12, V13, V14, V15, V16, V24
Ion trap
HV xformer Hor. yoke CRT connections

WEAK PIX—SOUND AND RASTER OK
Tuner fine tuning
Contrast control
V1, V2, V3, V4, V5, V22, V23

POOR HOR. LIN.
V14, V16
Check 0.1 mf cap. connected to terminal 8 of Hor. Out. Trans.

POOR VERT. LIN.
Vert. Lin. and Size Controls
V18, V19
Check 0.1 and 0.047 mf caps. connected to pin 5 of V18

PIX JITTER SIDEWAYS
Hor. Balance and Hold controls
Hor. Phase Coil Adj.
Fringe Compensator control
V11, V12, V13, V14
Check 0.0022 and 0.001 mf caps. connected to pin 1 of V12

SMEARED PIX
Tuner fine tuning
Contrast control
Fringe Compensator control
V1, V2, V3, V4, V5, V23
Check Vid. Det. and Amp. peaking coils
IF and RF alignment

POOR PIX DETAIL
Tuner fine tuning
Focus control
V1, V2, V3, V4, V5, V23, V24
Check Vid. Det. and Amp. peaking coils
IF and RF alignment

SOUND BARS IN PIX
Tuner fine tuning
Check alignment of L16
Contrast control
V1, V2, V3, V23
IF and RF alignment

SNOW IN PIX
Fringe compensator control
V1, V2, V3, V4, V11, V22, V23
Antenna and transmission line

AC IN PIX (DARK HOR. BAR)
V1, V2, V3, V4, V5, V11, V22, V23

ENGRAVED EFFECT IN PIX
Tuner fine tuning
Contrast control
V1, V2, V3, V4, V5, V23
Check Vid. Det. and Amp. peaking coils

VERT. BARS
V14, V16
Check damping network connected between terminals 3 and 7 of defl. yoke
Defl. yoke ringing

PIX JITTER UP AND DOWN
Vert. Hold and Fringe Compensator controls
V11, V12, V17, V18, V19

PIX BENDING
Hor. Balance and Hold controls
Hor. Phase Coil Adj.
Fringe Compensator controls
V11, V12, V13, V14
Check 0.01 and 0.001 mf caps. connected to pin 1 of V12

AUDIO HUM IN SOUND
V6, V7, V8, V9, V10

DISTORTED SOUND
Tuner fine tuning
V6, V7, V8, V9, V10, V23
Check 0.047 mf cap. connected to pin 5 of V10
Sound and Vid. IF alignment T5 and T6
Det. alignment T7

NO SOUND—PIX OK
Tuner fine tuning
Volume control
V6, V7, V8, V9, V10
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment T5 and T6
Det. alignment T7

WEAK SOUND—PIX OK
Tuner fine tuning
Volume control
V6, V7, V8, V9, V10, V23
Sound and Vid. IF alignment T5 and T6
Det. alignment T7

NOISY SOUND—PIX OK
Volume control
V6, V7, V8, V9, V10
Check sound system for loose connections
Speaker
Sound IF and Det. alignment T5, T6, T7

SYNC. BUZZ IN SOUND
Tuner fine tuning
V6, V7, V8, V11
Fringe Compensator control
Sound IF and Det. alignment T5, T6, T7

INTERMITTENT SOUND—PIX OK
V6, V7, V8, V9, V10
Poor connections in sound system

WEAK OR NO PIX—
SOUND WEAK—RASTER OK

Tuner fine tuning
Contrast control
Fringe Compensator control
V1, V2, V3, V4, V5, V11, V22, V23
RF and IF alignment

INTERMITTENT RASTER—
SOUND OK

Brightness control
V12, V13, V14, V15, V16, V24
HV xformer

RASTER BLOOMING

V14, V15, V20, V21, V24
Check 100KΩ res. connected in series with sec. anode lead
Check 0.1 mf cap. connected to pin 4 of V14

INSUFFICIENT BRIGHTNESS

Ion trap
Brightness control
V14, V15, V16, V20, V21, V24
Check 6.8KΩ res. connected to pin 4 of V14
Low line voltage

EXCESSIVE RASTER (PIX SIZE)

Hor. and Vert. Size controls
V14, V15, V24

INSUFFICIENT RASTER WIDTH

Hor. Size control
V13, V14, V16, V20, V21
Check 0.001 and 0.22 mf caps. connected to pin 5 of V13
Check 220 mmf cap. connected in series with 0.22 mf cap. connected to pin 5 of V13
Low line voltage

INSUFFICIENT RASTER HEIGHT

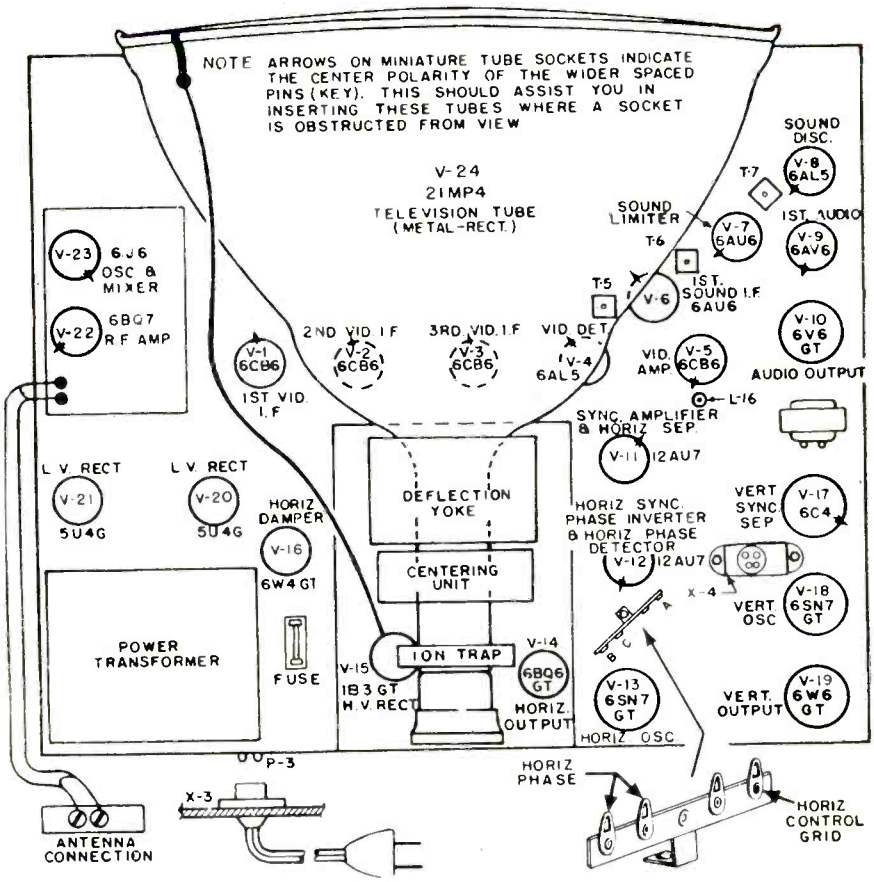
Vert. Lin. and Size controls
V18, V19, V20, V21
Check 0.047 and 0.1 mf caps. connected to pin 5 of V18
Low line voltage

NO VERT. DEFL.

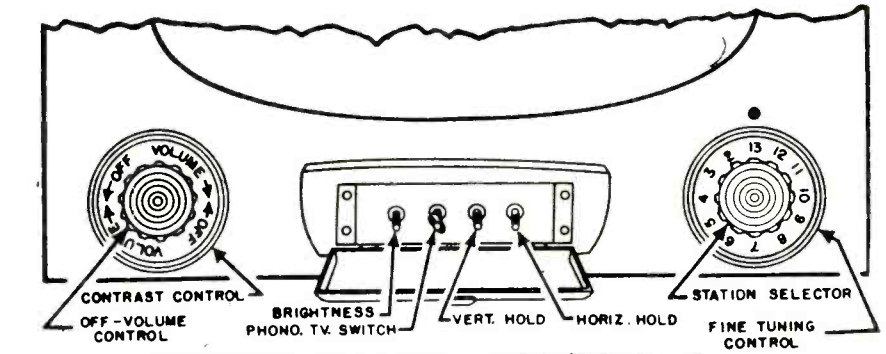
V18, V19
Check 0.0047 mf cap. connected to pins 2 and 4 of V18
Check 0.047 and 0.1 mf caps. connected to pin 5 of V18
Vert. Defl. yoke
V.O.T.

NO VERT. SYNC.
HOR. SYNC. OK

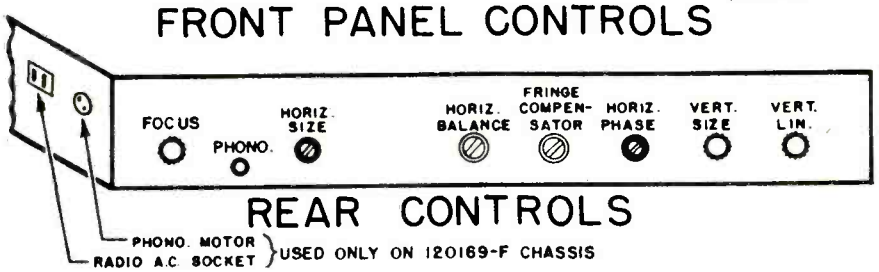
Vert. Hold control
V11, V17, V18
Check 0.047 mf cap. connected to pin 1 of V18



TUBE LOCATIONS DIAGRAM FOR CHASSIS 120169B and F



FRONT PANEL CONTROLS



REAR CONTROLS

NO. HOR. OR VERT. SYNC.—
PIX SIGNAL OK

Fringe Compensator control
V11, V12, V17
Check 0.01 and 0.047 mf caps. connected to pin 6 of V11

NO HOR. SYNC.—
VERT. SYNC. OK

Hor. Hold, Phase and Balance controls
V12, V13, V14
Check 470 mmf cap. connected between pins 2 and 4 of V13
Check 120KΩ res. connected to pin 5 of V13

[from page 43]

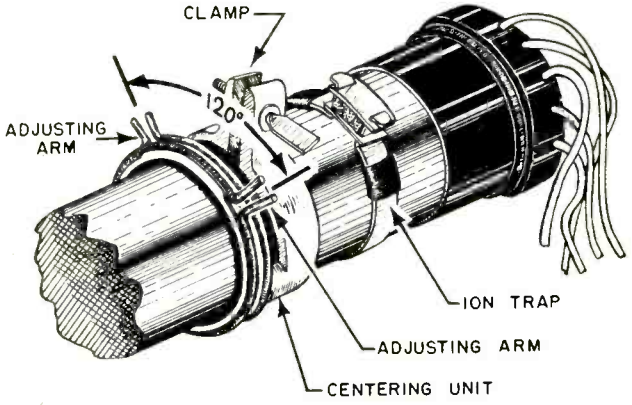
Alignment Of Miracle Picture Lock

1) Tune set to a good channel.
2) Short phase coil leads have been brought to top of chassis on a terminal strip near fuse (see tube location diagram).
3) Short horizontal control grid to chassis. This point has also been brought to top of chassis on same strip as mentioned in step 2.
4) Rotate horizontal hold control to center of its mechanical range.
5) Adjust horizontal balance control (rear of chassis) until picture pulls into synchronism (in most cases picture will sway from side to side).
6) Remove short from horizontal phase coil and adjust for same synchronous condition as step 5 above.
7) Remove short from horizontal control grid. Horizontal frequency circuits are now properly aligned.
8) When properly adjusted (steps 1-7) the horizontal hold control can be moved slowly over most of its range without throwing the picture out of sync.

Centering Procedure

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

CAUTION: It is important that the centering magnets not be operated too close to the yoke as the A-C field from the yoke may cause the centering magnets to become demagnetized.



CENTERING UNIT LOCATION DRAWING

NOTE: Some slight improvement in focus may be obtained by adjusting the ion trap magnet within the range of the maximum brightness.

On no account should the trap magnet be adjusted to give good focus at the expense of brightness, as this condition produces ion "burns" on the screen in the course of time.

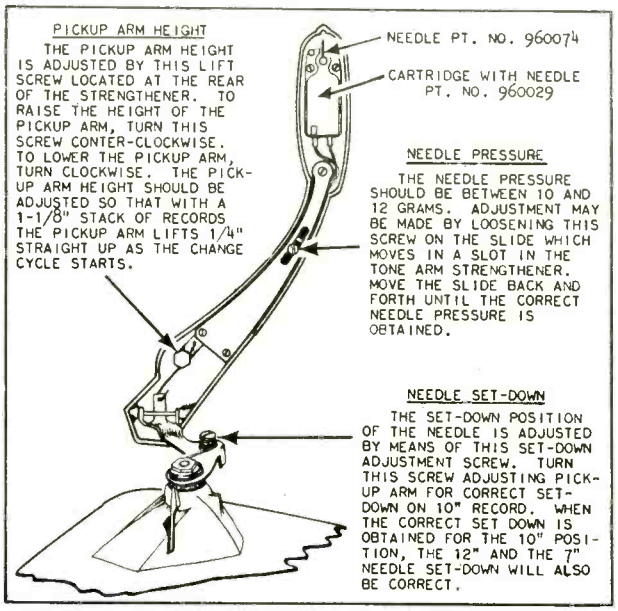
RECORD CHANGER

3 SPEED (78, 45, 33-1/3 R.P.M. AUTOMATIC RECORD CHANGER pt #819069 (MODEL 733F)

This changer plays records through the sound portion of the TV chassis when the "Phono-TV switch" is placed in the phono position.

Features of this changer include playing and automatically changing as many as ten—12", twelve—10", twelve—7", or any assortment of intermixed 10" and 12" records of the same R.P.M. (78, 45, 33-1/3 R.P.M.)

This changer shuts off automatically after the last record has been played.



PREPARING FOR OPERATION

1. SHIPPING BOLTS

Before placing in operation, the changer must be floated freely on the mounting springs. During shipment, the mechanism is secured by means of two shipping bolts. To float the changer, remove the turntable* by lifting it straight up the spindle. Turn the two shipping bolts in a clockwise direction as far as they will go and replace the turntable. Before the turntable can be fully seated, the idler wheel must be gently pushed back out of the way to prevent damage to the rubber tire.

* When shipped turntable is secured to the back of the cabinet.

2. LEVELING RECORD CHANGER

It is essential to have the record changer absolutely level. Use a torpedo or similar type level on the record changer baseplate. Use adequate shims to level the record changer pan or radio combination cabinet to achieve perfect level.

SYLVANIA

MODEL NUMBERS

172K, 172KU, 172M, 172MU
175B, 175BU, 175L, 175LU, 175M, 175MU
176B, 176BU, 176L, 176LU, 176M, 176MU
177B, 177BU, 177M, 177MU
178B, 178BU, 178M, 178MU

CHASSIS NUMBERS

1-508-1, 1-508-2

TUBE COMPLEMENT

SYMBOL	FUNCTION	TYPE
V1	R.F. Amplifier	6BK7
V2	Oscillator-Mixer	6J6
V3	1st Video IF Amplifier	6CB6
V4	2nd Video IF Amplifier	6CB6
V5	3rd Video IF Amplifier	6CB6
V6	4th Video IF Amplifier	6CB6
	Video Detector	D440 Crystal
V7	Video Amplifier	12BY7
V8	Sound IF Amplifier	6AU6
V9	Sound IF Limiter	6AU6
V10	Ratio Detector	6AL5
V11	1st Audio Amplifier & Tuner AGC Clamp	6AV6
V12	Audio Output	6V6GT
V13	AGC Amplifier	6AU6
V14	Sync Separator & AGC Rect.	12AX7
V15	Sync Amplifier & Clipper	12AU7
V16	Vertical Oscillator	6C4
V17	Vertical Output	6AH4GT
V18	Horizontal Discriminator	6AL5
V19	Horizontal Control	6CB6
V20	Horizontal Oscillator & Discharge	12AU7
V21	Horizontal Regulator	40A1
V22	Horizontal Output	6BQ6GT
V23	Damper	6V3
V24	H.V. Rectifier	1B3GT
V25	H.V. Rectifier	1B3GT
V26	L.V. Rectifier	5U4G
V27	L.V. Rectifier	5U4G
V28	Picture Tube	21EP4A
	UHF Oscillator (1-508-2 only)	6J6
	UHF Oscillator Doubler (1-508-2 only)	1N82 Crystal
	UHF Mixer (1-508-2 only)	1N82 Crystal

Key Voltages

All voltages are measured with respect to chassis ground.

B+ voltage, Plate voltage of Damper tube V23 pin 9	330VDC
Boosted B+ voltage, Terminal #5 of Hor. Out. Trans.	560VDC
Plate voltage of Vert. Osc. V16 pin 1	295VDC
Plate voltage of Vert. Out. Ampl. V17 pin 5	310VDC
Plate voltage of Hor. Osc. V20 pin 1	270VDC
Plate voltage of Hor. Control tube V19 pin 5	125VDC
Plate voltage of Hor. Dis. tube V20 pin 6	70VDC
Grid voltage of Hor. Out. Ampl. V22 pin 5	0VDC

SPECIAL INSTALLATION AND SERVICE INSTRUCTIONS

Chassis Handling Precaution

Whenever handling a 1-508-1, 1-508-2 chassis exercise extreme caution at all times. The chassis should be carried by means of the handle provided on the rear tube mounting bracket and the front center lower lip of the picture tube. When carrying a chassis in this manner care should be observed that the hands are free of dirt and grease to prevent slipping on the smooth surface of the glass.

Alignment of Picture Tube To Mask

Replacement of the chassis after normal servicing should not necessitate alignment of the mask and picture tube. However, if the tube support members have been disturbed as in the case of tube replacement it will be necessary to observe the following procedure.

1. Locate the tube and its associated mounting brackets in their approximate normal position, with the front face of the tube tilted forward about 3 degrees, then tighten the following just enough to permit further adjustment in the cabinet.
   a. Mounting stud nuts on tube holddown strap.
   b. Nuts on holddown strap rods.
   c. Nut on rear mounting bracket rod.
   d. Wing nuts on yoke.
   e. Screws at base of rear mounting bracket, if previously loosened.
2. Carefully slide chassis in cabinet, replace and tighten chassis holddown screws.
3. Replace all knobs and electrical connections. If tuner shaft does not center, loosen tuner rear bracket wing nuts and shift tuner until knobs function freely.
4. By carefully moving the tube in its mountings align the mask and face of the tube.

ADJUSTMENT OF HORIZONTAL AFC CIRCUIT

Check of Operation

The operation of the AFC circuit should be checked as follows:

A. Tune the receiver to a channel on which no signal is received and return to the original channel. The picture should immediately fall into synchronization.

B. Switch off the power to the receiver for about five minutes and then switch back on. Picture should immediately fall into synchronization.

C. Check for correct phasing of Horizontal AFC Circuit by noting that there is approximately ¼" of blanking visible on the right hand edge of the picture. It will be necessary to turn the Picture (Contrast) control towards minimum and readjust the Brightness Control to see the blanking.

If the receiver cannot pass checks "A," "B," or "C" the adjustment of the Horizontal Hold control as noted under "Horizontal Hold Adjustment" should be made.

[*Continued on page 50*]

SYLVANIA TROUBLESHOOTING CHART

NO SOUND—NO RASTER
- Power input circuit
- V26, V27
- Check B+ Filter Network

NO RASTER—SOUND OK
- Brightness control
- HV Fuse (0.25) Amp)
- Ion trap
- V19, V20, V21, V22, V23, V24, V25, V26
- HV xformer Hor. yoke CRT connections

WEAK PIX—SOUND AND RASTER OK
- Tuner fine tuning
- Contrast and A.G.C. controls
- V2, V3, V4, V5, V6, V7
- Check Vid. Det. crystal D440 (Part of T58)

POOR HOR. LIN.
- Hor. Lin. and Drive controls
- V21, V22, V23
- Check 0.033 and 0.1 mf caps. connected to Hor. Lin. coil

POOR VERT. LIN.
- Vert. Lin. and Height controls
- V16, V17
- Check 0.1 and 0.047 mf caps. connected to red lead of Vert. Osc. Trans.
- Vert. Out. Trans.

PIX JITTER SIDEWAYS
- Hor. Hold and Phasing controls
- V18, V19, V20
- Check 100 mmf cap. connected to terminal 5 of Hor. Osc. Trans.

SMEARED PIX
- Tuner fine tuning
- Contrast and A.G.C. controls
- V2, V3, V4, V5, V6, V7, V13
- Check Vid. Det. crystal D440 (Part of T58)
- Check Vid. Det. and Amp. peaking coils
- IF and RF alignment

POOR PIX DETAIL
- Tuner fine tuning
- V3, V4, V5, V6
- Check Vid. Det. crystal D440 (Part of T58)
- Check Vid. Det. and Amp. peaking coils
- IF and RF alignment

SOUND BARS IN PIX
- Tuner fine tuning
- A.G.C. control
- V1, V2, V3, V4, V5, V6, V13
- Check Vid. Det. crystal D440 (Part of T58)
- IF and RF alignment

SNOW IN PIX
- V1, V2, V3, V4, V5, V6
- A.G.C. control
- Antenna and transmission line

AC IN PIX (DARK HOR. BAR)
- V1, V2, V3, V4, V5, V6, V7, V13

ENGRAVED EFFECT IN PIX
- Tuner fine tuning
- Contrast and A.G.C. control
- V2, V3, V4, V5, V6, V13
- Check Vid. Det. crystal D440 (Part of T58)
- Check Vid. Det. and Amp. peaking coils

VERT. BARS
- Hor. Drive control
- V22, V23
- Check 68 mmf cap. connected to defl. yoke
- Defl. yoke ringing

PIX JITTER UP AND DOWN
- Vert. Hold and A.G.C. control
- V13, V14, V15, V16, V17
- Vert. Int. Network

PIX BENDING
- A.G.C. control
- Hor. Hold and Phasing controls
- V18, V19, V20, V22

AUDIO HUM IN SOUND
- V8, V9, V10, V11, V12

DISTORTED SOUND
- Tuner fine tuning
- V1, V8, V9, V10, V11, V12
- Check 0.01 mf cap. connected to pin 5 of V12
- Sound and Vid. IF alignment L62, T51
- Det. alignment T52

NO SOUND—PIX OK
- Tuner fine tuning
- Volume control
- V8, V9, V10, V11, V12
- Speaker (open voice coil or defective connection)
- Sound and Vid. IF alignment L62, T51
- Det. alignment T52

WEAK SOUND—PIX OK
- Tuner fine tuning
- Volume control
- V1, V8, V9, V10, V11, V12
- Check Vid. Det. crystal D440 (Part of T58)
- Sound and Vid. IF alignment L62, T51
- Det. alignment T52

NOISY SOUND—PIX OK
- Volume control
- V8, V9, V10, V11, V12
- Check sound system for loose connections
- Speaker
- Sound IF and Det. alignment T51, T52, L62

SYNC. BUZZ IN SOUND
- Tuner fine tuning
- A.G.C. control
- V8, V9, V10
- Sound IF and Det. alignment L62, T51, T52

INTERMITTENT SOUND—PIX OK

V8, V9, V10, V11, V12

Poor connections in sound system

WEAK OR NO PIX—SOUND WEAK—RASTER OK

Tuner fine tuning

A.G.C. control

V1, V2, V3, V4, V5, V6, V7, V13

Check Vid. Det. crystal D440 (Part of T58)

RF and IF alignment

INTERMITTENT RASTER—SOUND OK

Brightness control

V18, V19, V20, V21, V22, V23, V24, V25, V28

HV xformer

RASTER BLOOMING

Hor. Drive control

V22, V24, V25, V26, V27, V28

Check 3-1 megΩ res. connected to plate cap of V24

INSUFFICIENT BRIGHTNESS

Ion trap

Brightness and Hor. Drive controls

V20, V21, V22, V23, V24, V25, V26, V27, V28

Low line voltage

EXCESSIVE RASTER (PIX SIZE)

Hor. Drive, Size and Height controls

V21, V22, V24, V25

INSUFFICIENT RASTER WIDTH

Hor. Drive and Size controls

V21, V22, V23, V26, V27

Check 0.001 mf and 680 mmf caps. connected to pin 6 of V20

Low line voltage

INSUFFICIENT RASTER HEIGHT

Height and Vert. Lin. controls

V16, V17, V26, V27

Check 0.047 mf cap. connected to red lead of Vert. Osc. Trans.

Low line voltage

NO VERT. DEFL.

V16, V17

Check 0.1 and 0.047 mf cap. connected to red lead of Vert. Osc. Trans.

Defl. yoke

V.O.T. and Vert. Osc. Trans.

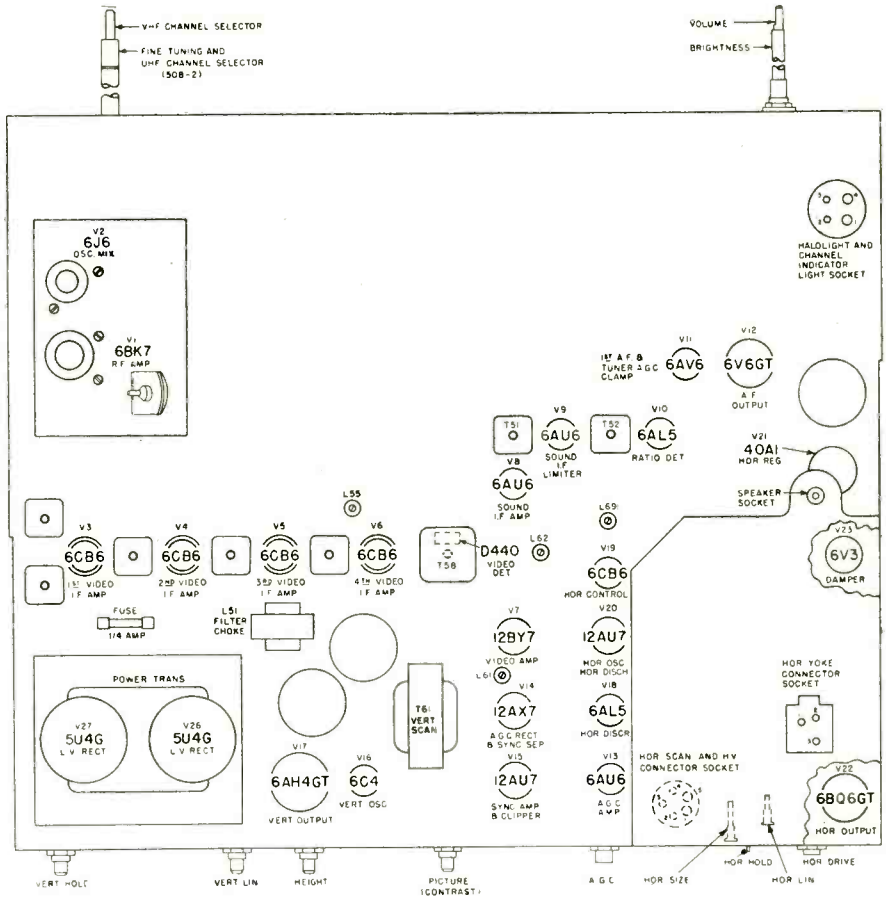
NO VERT. SYNC—HOR. SYNC. OK

Vert. Hold and A.G.C. controls

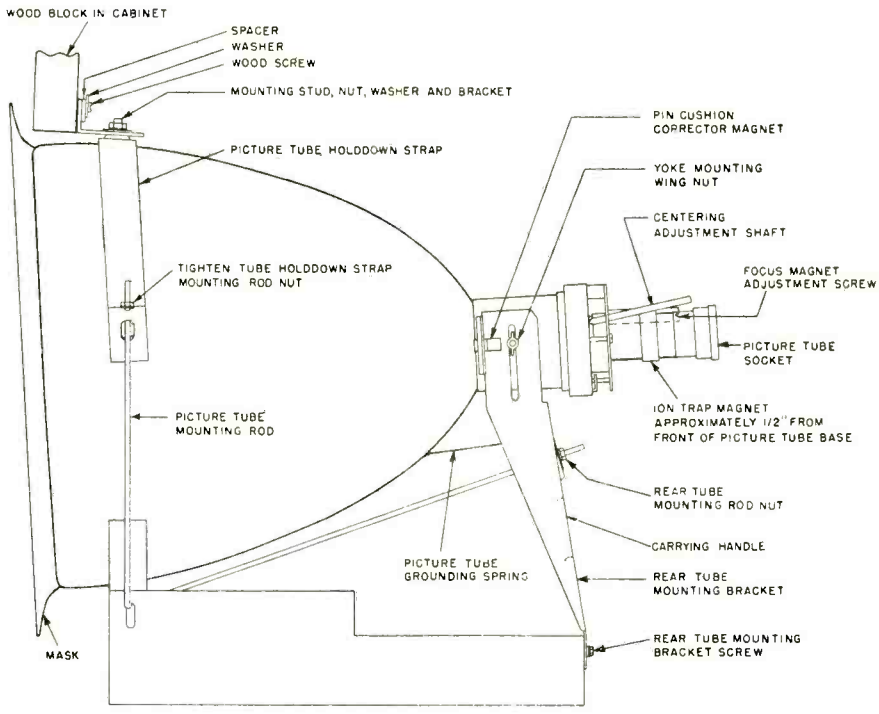
V13, V16, V17

Vert. Int. Network

Check 0.001 mf cap. connected to Vert. Hold control



TOP LAYOUT FOR 1-508-1, 1-508-2 TV CHASSIS



NO HOR. SYNC.—VERT. SYNC. OK

Hor. Hold and Phasing controls

V18, V19, V20

Check 0.0022 mf cap. and 470KΩ res. connected to pin 2 of V20

NO HOR. OR VERT. SYNC.—PIX SIGNAL OK

A.G.C. control

V13, V14, V15

[*from page 47*]

Horizontal Hold Adjustment

A. Tune in a station and adjust the Channel Selector for best picture quality. Adjust the Picture Contrast and Brightness controls for normal picture.

B. Remove V18 - 6AL5 - Horizontal Discriminator tube.

C. Turn the Horizontal Hold control until the picture moves back and forth across the screen with blanking bar vertical.

D. Replace the Horizontal Discriminator tube and repeat A, B, and C under "Check of Operation" above.

E. If receiver still will not pass these checks, it will be necessary to proceed with "Phase Adjustment."

Phase Adjustment

A. Turn the core in Ringing Coil - L69 - all the way out counterclockwise). Short out the 4,700 ohm horizontal charge circuit peaking resistor - R264. With the horizontal size coil set for approximately the correct picture width, and with the horizontal linearity coil adjusted for best linearity, rotate the Horizontal Drive control fully counterclockwise. Slowly turn the drive control clockwise until crowding is visible in the center of the picture. Now carefully turn the control back (counterclockwise) just enough to remove the crowding or vertical lines in the picture or pattern.

NOTE: Do not operate the receiver with the Horizontal Drive control maladjusted.

B. Remove the Horizontal Discriminator tube V18 - 6AL5 from its socket.

C. Carefully turn the horizontal hold (frequency adjustment) screw top of Horizontal Discriminator Transformer - T62 until the picture moves back and forth across the screen with the blanking bar vertical.

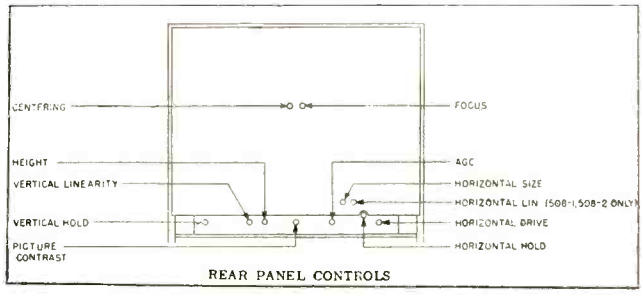
D. Replace the 6AL5 in its socket.

E. Adjust the phase adjustment screw bottom of Horizontal Discriminator Transformer - T62 until approximately ¼" of "blanking" is visible on the right-hand edge of the picture. In order to see the "blanking" it will be necessary to readjust the Brightness Control and turn the Picture (Contrast) control towards minimum.

F. Check the "free-running" of the horizontal oscillator as described under paragraphs "B," "C," and "D," and, if necessary, readjust the frequency adjustment screw on top of Horizontal Discriminator Transformer - T62.

G. Make a final check of the phasing as described in paragraph "E" above. It is important that both the "free-running" and the phasing are correct.

H. Remove the short from across the 4,700 ohm resistor R264 and readjust the Horizontal Drive control as described in "A." Turn the core in the Horizontal Ringing Coil - L69 - clockwise until approximately ¼" of "blanking" is again visible on the right-hand edge of the picture.



REAR PANEL CONTROLS

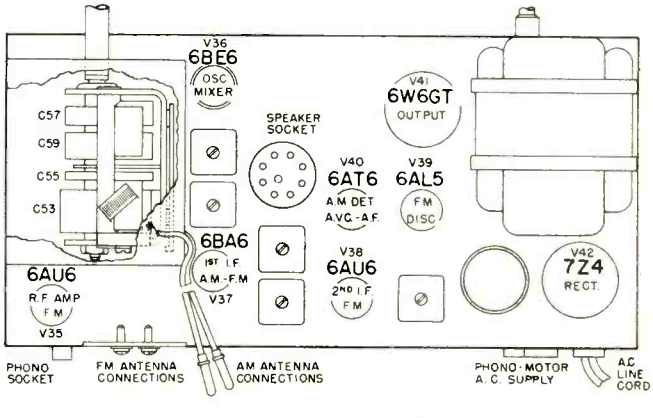
I. Before the horizontal synchronization circuit is adjusted to the final position, it will be necessary to check the operation as follows:

Slowly turn the oscillator frequency adjustment screw (top of transformer T62) in either direction until the picture suddenly falls out of synchronization as indicated by the presence of a number of diagonal bars. Slowly turn the adjustment screw so as to decrease the number of bars and note the total number of bars visible just before the picture again falls into synchronization. The last number of bars visible must not be less than three, or more than six. The two half-bars at the top and bottom of the screen are counted as only one bar. In order to get an accurate indication of the minimum number of bars obtainable, the adjustment screw must be turned very slowly and carefully once the number of bars has been reduced to six or seven. Turn the adjustment screw in the opposite direction until the picture suddenly falls out of synchronization in the opposite direction and repeat the foregoing procedure. Again, not less than three or more than six bars must be visible just before the picture falls into synchronization.

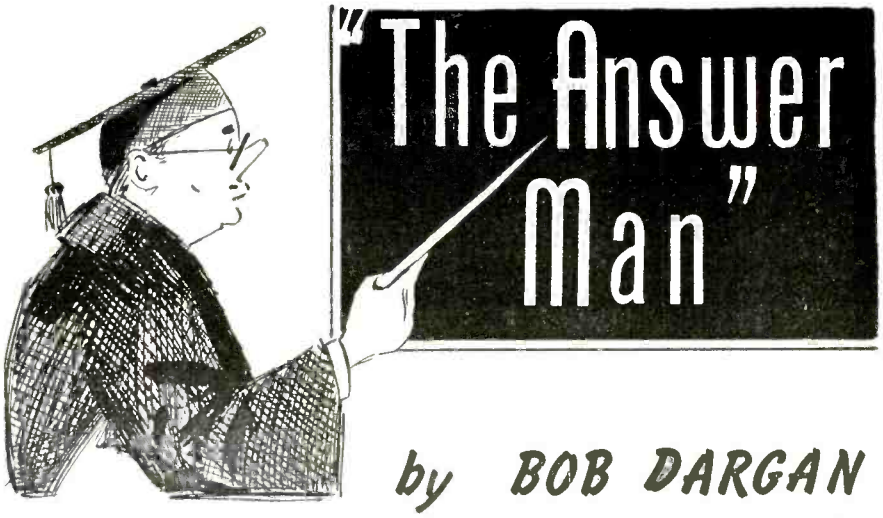
J. After checking the operation as in "I," it is necessary to repeat the procedure described in paragraphs "B," "C," and "D."

K. Remove the signal by tuning to a "free" channel, then returning to the original channel. The picture should immediately fall into synchronization.

L. Switch off the power to the receiver for about five minutes and then switch receiver on and check that the picture pulls into synchronization.



TOP VIEW OF RADIO CHASSIS



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.

Replacing Tuner with Standard Cascode Type

Dear Answer Man:

I constructed a TV kit some years ago. Since then I have improved the set in many ways. This is a Model P30 (630TS chasis) 10-inch, converted to a 12½ inch receiver, made by the Philmore Mfg Co. of New York.

This set has three 6J6 tubes in a 13 channel tuner which is giving me trouble because the points on the switches are becoming separated. Because the set is in wonderful condition I am interested in replacing the tuner. Is it possible to replace this tuner with a cascode type, and what circuit changes will have to be made? Kindly advise where I can purchase the parts, if available, for the 630TS chassis.

C.K.
Chicago, Ill.

Dear C.K.

Because of the many other inquiries concerning the installation of more sensitive tuners in older TV receivers the following information is discussed in a rather broad manner.

Many tuners have been replaced in the 630TS chassis. It is not a very difficult job. The results, after the installation of a cascode tuner, are well worth the efforts. The biggest problem is the mechanical one of mounting the tuner in the chassis, rather than the electrical adaptation of the tuner. This has been made easier with the availability of exact mounting frames for this chassis.

Several different tuners have been made available for this purpose, such as the Colorado cascode tuner. Another favorite is the Standard cascode tuner TV-2232. See *Fig. 1.* This tuner is obtainable from most local electronic distributors along with the proper mounting frame for the tuner. The Standard cascode tuner provides a considerable improvement in sensitivity and noise reduction in the picture. A mounting frame has been made available that will adapt the tuner to the 630TS chassis with the shaft at the level with the other controls without the need of extension cutting, bending and fitting.

After the old tuner has been removed from the chassis, mount the new tuner if the shaft does not need to be cut. This depends upon the shaft length of the previous tuner and the cabinet. If the tuner shaft has to be cut it should be done before the tuner is installed.

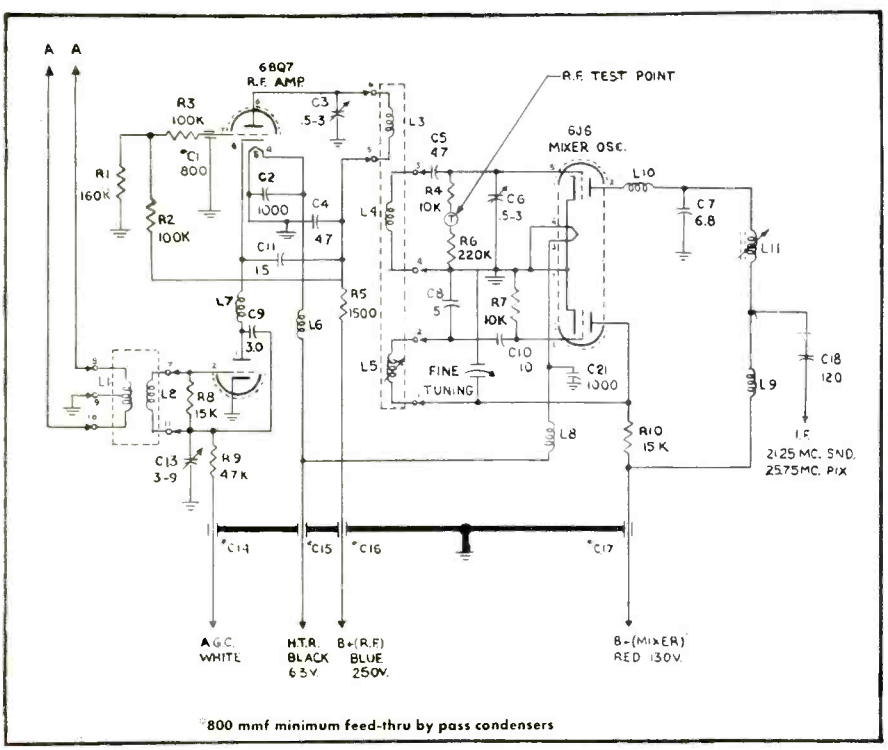


Fig. 1—Schematic, Standard Cascode Tuner TV-2232.

Recommended Procedure For Cutting Shafts

WARNING: Do not remove the drum assembly from the tuner chassis.

1. Remove the fine tuning trimmer bracket held to the chassis with a screw.
2. Remove the outer fine tuning shaft assembly, arched spring and fiber spacing washer.
3. Cut the drum shaft to the desired length, making sure that the shaft is clamped securely in a vise near the point to be cut off. Hold the piece of shaft to be removed in the vise so as not to damage the balance of the shaft on the drum. Make sure that during the cutting operation the tuner chassis and drum are supported so that no strain is placed on the shaft bearings. Remove burrs from the cut end.
4. Cut the fine tuning shaft to proper length and remove burrs.
5. Reassemble the fiber spacing washer, spring, fine tuning shaft assembly and bracket in that order.

Installation

Install the tuner physically on the chassis after cutting the shafts to the

proper length and connect the leads as follows:

White—	to *agc* source.
Black—	to 6.3 volt heater source.
Red	to 135 volt B plus source.
Blue—	to 250 volt B plus source.
Output terminal—	to *if* input on main chassis.
Antenna—	to antenna terminals.

Note: The color of the wire indicates, except for white, the tracer color.

Prior to aligning the *if*, check the high B plus voltage to be supplied to the blue lead with the antenna lead disconnected and the two wires shorted. The *dc* voltage should be 250 volts under this condition for optimum

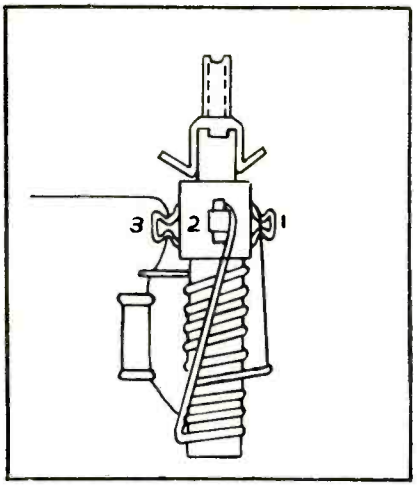


Fig. 2—Separate coil, part XM-752.

operation. The 630TS chassis supplies 275 volts from the B plus supply, so a series voltage dropping resistor will have to be inserted to drop 25 volts which will fullfill this condition.

Split Sound IF Systems

In those TV receivers which have the sound split at the tuner it will be necessary to provide some means of obtaining the sound signal to be fed to the sound *if* tube.

For those systems which previously required the use of a 21.25 *mc if* sound "take off" coil connected to the tuner converter plate circuit, as did the 630TS, there has been made available with the Standard tuner a separate coil, part XM-752. See *Fig. 2.* This coil can be mounted in a suitable location on the TV chassis and connected as shown in *Fig. 3.* When more audio output is required, connect the trap as shown in *Fig. 4.* The sound-*if* coil can be adjusted for maximum audio output once it has been installed. A simple method of accomplishing the sound "take-off" when the coil is not handy is shown in *Fig. 5.* In this circuit the sound is tapped off through a 2 $\mu\mu f$ condenser without benefit of a trap.

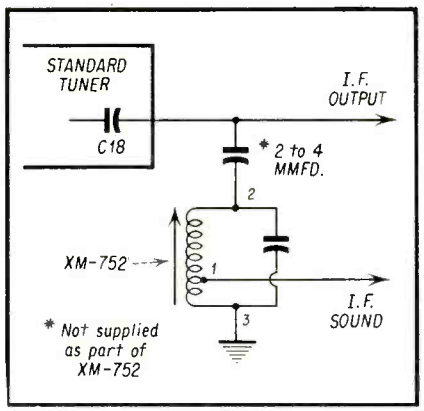


Fig. 3—One way to connect XM-752.

Some TV receivers may not have enough sound rejection built into the *if* system and will require more trapping than the XM-752 sound "take off" trap will provide. In these sets it is suggested that an additional trap at sound *if* frequency be included in the *if* system.

Fringe Areas

For optimum performance in fringe areas, the B plus supplied to the blue tracer lead should be 250 volts. Approximately -.8 to -1.1 volts bias to the *agc* white lead will result in the best sensitivity. A suitable bias control, however, must be available to avoid overload on strong signals.

IF Alignment

Connect a *dc* voltmeter with a 10,000 ohm resistor to the video detector output on the main chassis. Remove the tube shield on the 6J6 tube on the tuner. Capacitive couple an *AM* signal generator to the 6J6 tube by slipping a tight-fitting, ungrounded tube shield over the 6J6 and connecting the generator to the ungrounded shield. Set the frequency of the generator to the *if* recommended by the set manufacturer. Tune *L11* (screw set at an angle on the top of the tuner) for maximum voltage at the video detector. Use a low output for this adjustment.

Note: The Standard cascode tuner *if* coil is normally set at 22.3 *mc* at the factory, but can be adjusted to any frequency within the range of 19 to 26 *mc*. Therefore, if other *if* frequencies are required, or if tube or other parts are replaced, alignment will be necessary.

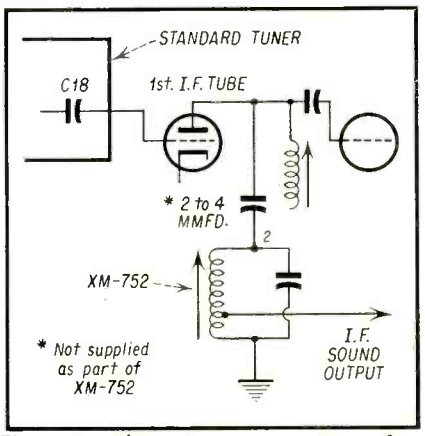


Fig. 4—Alternate connection for XM-752 when more audio is needed.

RF And Mixer Alignment

1. Set station selector to Channel 10.
2. Connect oscilloscope through 10,000 ohm resistor to the test point T (wire loop on top of the tuner).
3. For negative bias connect -3 volts *dc* to the *agc* lead (white covered wire) from tuner.
4. Feed sweep generator into antenna terminals, sweeping Channel 10.

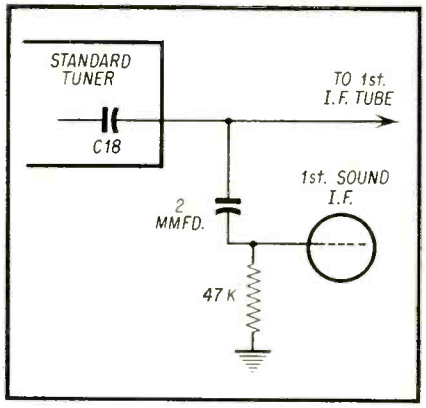


Fig. 5—Getting sound "take-off."

5. Adjust *C3, C6* and *C13* on the top of the tuner for a flat top response curve and maximum gain. Check markers on all channels. They should fall in automatically on all channels.

Oscillator Alignment

1. Turn on set and select a channel to be viewed.
2. Center the fine tuning control.
3. Place a non-inductive screwdriver through the opening and adjust the oscillator coil for the best picture and sound.
4. Repeat this adjustment for each channel that can be received in the area.

Gain can be considerably improved in most cases at least 50%—with the installation of a Standard cascode tuner. This tuner has the distinct advantage for those areas where *uhf* stations are transmitting. Insertable coils can be used for this type of reception as well as for the *vhf* reception.

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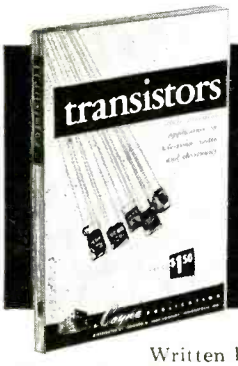

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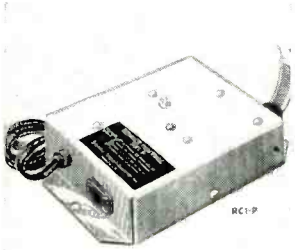
New Products

Universal Lightning Arrester

Introduced by (Vee-D-X), **La Pointe Electronics Inc.** this product is believed to be the first hermetically sealed arrester with completely encased electrodes fully protected from moisture and deterioration due to weather aging. Quick installations can be made without wire stripping, cutting or wire separation. Form fitted channels assure positive anchorage for all popular types of lines.

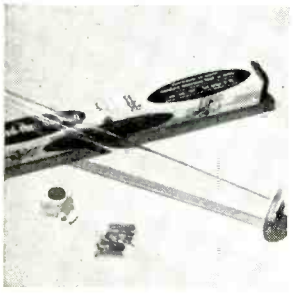
New Peak-To-Peak VTVM

Radio City Products Company, Inc., 152 West 25th Street, New York 1, N. Y., has announced VTVM, Model #655. This unit gives a true reading measurement of complex and sinusoidal voltages. RMS value read directly, for the analysis of waveforms in video, sync. and deflection circuits. The model provides complete versatility of measurement and serves all equipment utilizing any type of waveform or DC.



Remote Control TV Boosters

With **Blonder-Tongue's** 2-piece remote control unit, any B-T television amplifier, uhf converter or distribution unit may be operated automatically from the TV set "On-Off" switch. The power control unit of the Model RC-1 plug into any 117 volt A.C. outlet and receives the TV set line cord. A single heavy duty 300 ohm line is used between the two parts to carry A.C. power out and TV signals back at the same time.



New Feed-Thru Bushing

Walsco Electronics Corporation has developed a practical, new Feed-Thru Bushing that can accommodate any and all popular TV lead-in wires. It also has provision for terminating to open line, enabling the serviceman to bring a 300 ohm twin-lead through a wall and into a room. The Walsco bushing is 15" over-all and fits walls up to 14" thick. It requires a ¾" hole and can easily be cut to fit with knife.

Marker-TV Bar Generator

Electronic Measurements Corp. 280 Lafayette St., New York, N. Y. has announced a new RF-AF-Crystal Marker-TV Bar Generator. EMC Model 700 gives complete coverage from 18 cycles to 108 megacycles on fundamentals. It provides a bar generator for TV adjustment with a variable number of bars available for horizontal or vertical alignment, square wave generator to 20 kilocycles.

Pre-Inspection Kit

Duotone Company, Inc. Keyport, N. J., is now giving dealers absolutely free of charge an inspection kit as part of a bargain offer of $25.00 worth of needles for only $12.50. This kit includes a microscope and electro-wipe cloth, a professional tool for replacing needles and a plastic kit box. The microscope has a fine 50 power wide angle lens which enables dealers to quickly and accurately examine needles without removing them from the cartridge.

Remote TV Control Unit

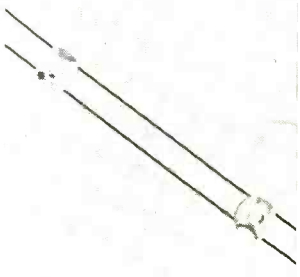
A universal TV remote control unit which may be attached to any conventional TV receiver is now in production by the **Gonset Company**, 801 South Main Street, Burbank, California. Featuring a standard coil cascode tuner ahead of a booster amplifier, the unit not only permits channel selection from the viewing position but also provides improved reception in weak signal areas, particularly on older sets.

Miniature Oscillograph

A new wide-band, quantitative oscillograph which features quality, laboratory-performance and versatility, with "brief-case" portability, is announced by the **Du Mont Laboratories, Inc.** The new instrument, designated the Du Mont Type 301-A, measures 9⅛" high x 6½" wide x 16⅝" deep, and weighs only 20 pounds. Mechanical specifications are available from the Technical Sales Department at 760 Bloomfield Ave., Clifton, N.J.

Open Wire Transmission Line

Fretco Inc., of Pittsburgh, introduces their Model Saucerline—the newest open wire transmission line used for uhf and vhf lead-in purposes. The insulator is designed for minimum signal loss and is the newest type of low loss material available, called polythemalyne. The impedance of the wire is 300 ohms and is good in wet and dry weather. No standoffs are necessary.



ATR Inverters

New models of ATR Inverters for operation from 6 volt or 12 volt storage batteries in automobiles and trucks have recently been announced by the **American Television & Radio Company,** 300 East Fourth Street, St. Paul, Minnesota. Provides 110 volt AC 60 cycle output in various wattage capacities for the operation of test equipment and other related small electrical or electronic apparatus.

TRADE LIT

[from page 16]

A *bulletin on the new Du Mont Type 322-A Cathode-ray Oscillograph* is now available from Technical Sales Department, Allen B. Du Mont Laboratories, Inc., Clifton, N. J.

• • •

A new *Catalog* has just been published by the Precision Equipment Company. Many new items have been added to Precision's standard line consisting of steel shelving, lockers, ladders and other storage and maintenance equipment for industrial and institutional use. Each item is clearly illustrated and priced. Cartoons by nationally famous cartoonists are included throughout the publication. Write Precision Equipment Co., 3702 N. Milwaukee Ave., Chicago 41, Illinois, for your copy.

• • •

Catalog RC-9 contains information on the complete line of fixed and variable composition resistors, line and slide switches, fixed composition capacitors, powdered iron cores, molded coil forms, and Ceramag ferromagnetic core manufactured by the Electronic Components Division, Stackpole Carbon Company, St. Mary's, Pa. Complete electrical and mechanical specifications, dimensions, and application data for all standard Stackpole electronic components are given. Copies of the new *Catalog RC-9* are available on letterhead request to Stackpole.

• • •

The 19th edition of the *Tung-Sol Electronic Tube Characteristics Manual* contains technical data on receiving and cathode ray tubes. Many charts and diagrams supplement the text. In the back of the manual there is a special 20-page section which contains basic marketing information to help servicemen plan a local promotion program for their own business. The Manual is distributed through Tung-Sol tube wholesalers.

• • •

Jensen Industries, Inc., 329 South Wood, Chicago, has issued a *two-color pocket-sized booklet on the care of records, needles, pickups, and cartridges*. The booklet, designed as a consumer publication available for dealer distribution, illustrates needle wear comparison, information on caring for your phonograph and has included a comprehensive chart showing how to determine the exact needle replacement for your specific record player.

• • •

A new *bulletin describing television antennas and accessories for uhf installation* has just been published by RMS (Radio Merchandise Sales, Inc.), 2016 Bronxdale Ave., New York 62, N. Y. Its six pages are devoted to complete description of yagis, bow ties, corner reflectors and other antennas designed and manufactured by the company for *uhf*. The newest *uhf* lightning arrestors are also discussed. Copies obtainable from RMS.

• • •

A new notebook providing practical technical data on *vhf-uhf* tuners, *uhf* antenna performance, *uhf* propagation characteristics and *uhf* converters has been published by The Paul H. Wendel Publishing Co. The new *notebook, Number 7* in the Television Technicians Lecture Bureau series, was written by Edward M. Noll. The author has presented *uhf* data in three logical steps: discussion of *vhf* tuners, basic *uhf* considerations and useful *uhf* service information. Tabular data on *uhf* TV Channels and wavelengths in inches at center frequency is also given. The 72-page notebook contains over one hundred illustrations, including block diagrams, schematics and photographs of components and circuit sections to supplement readily understandable text. Copies may be obtained by remittance of $1.00 direct to The Paul H. Wendel Publishing Co., Inc., Post Office Box 1321, Indianapolis 6, Indiana.

ASS'N NEWS

[from page 16]

NEDA—Chicago

Twenty-eight distributors attended the recent monthly meeting of independent parts distributors in the Chicago area sponsored by the Chicago Chapter of the National Electronics Distributors Association. Verne Swanson, staff member of the Vocational Guidance Association of the International Harvester Co. addressed the group on a timely subject entitled "On How You Handle Your People." Lantern slides added to the lecture. An enthusiastic question and answer period followed Mr. Swanson's remarks.

Council of Radio and Television Service Associations

Proper care and maintenance of home radio and television receivers will be stressed in an intensive public service campaign conducted jointly by the Council of Radio & TV Service Dealers and Service Technicians Associations, and WFIL and WFIL-TV. The Council represents all of the service associations in the station's coverage area, with all cooperating in this project.

David Krantz, chairman of the Industry Relations Committee for the Council, announced that more than 2,500 service men from Eastern Pennsylvania, New Jersey, and Delaware, will participate in this campaign.

In addition to on-the-air promotion of this campaign, displays and handbills will be distributed by the Council to its members for use at the neighborhood level. Periodicals published by the Council will also be used extensively to point up the advantages of the campaign, and to enlist the active cooperation and support of the members in this project.

LIETA Issues Monthly Journal

RTSD congratulates the Long Island Electronic Technicians Association (Oceanside, N. Y.) on putting out a terrific monthly gazette, the *LIETA News*. The 12-page mimeographed journal reports that members of LIETA have approved a plan whereby the Association will guarantee all repairs made by a LIETA member.

LIETA News contains the Association's "Code of Ethics" concerning the serviceman's handling of his job and relation to the public. Also explained is the "Share-A-Day" plan whereby members who are not busy may find a day's employment with technicians who are busy.

LIETA News carries reports on meetings lectures and discussions of color TV and other servicing points. In addition, the paper contains a page for women (who have formed a Ladies' Auxiliary to LIETA), classified ads, and personal news.

NATESA Honors Publisher

The electronics industry, the City of Indianapolis, the Chamber of Commerce and nearly a hundred of its leading citizens joined here on Thursday noon, January 7th, to pay tribute to Howard W. Sams, founder of Howard W. Sams & Co., Inc., Indianapolis, technical publishers, when Sams was presented with the "Friend of Service Management" Award of the National Alliance of Television-Electronics Service Associations at a luncheon at the Indianapolis Athletic Club.

As guests of Mayor Alex Clark and the Chamber of Commerce, the city's leading industrialists, bankers, merchants and educators heard Frank J. Moch, of Chicago, president of NATESA, laud Sams for his efforts in behalf of the service business and his contributions to the training of service personnel. William Book, executive secretary of the Indianapolis Chamber of Commerce served as master of ceremonies at the award luncheon.

TRADE FLASHES

[from page 7]

Ohio; and 51,000 square feet in a new picture tube plant now being erected in Fullerton, Calif.

Color Television Will NOT Require Special Antennas

Color television will not require new or special antennas, reports Harold Harris, Vice President in Charge of Engineering of the Channel Master Antenna Development Laboratory, Ellenville, New York.

This break for consumers is due to the fact that color TV will be broadcast over the same frequencies as black and white. Since the size and design of a television antenna determines the frequencies received, it makes no difference whether a particular frequency is used for color or black and white.

"With the advent of color television, the antenna would assume even greater importance than it does today," Harris noted. In order for the color picture to be reproduced faithfully and clearly on the screen, a particularly strong, clear signal must be brought into the television set. An antenna which may provide an acceptable black and white picture will, in many cases, not produce a satisfactory color picture.

"If the antenna purchased now is selected with care, it not only will furnish superior black and white pictures today but also will be able to provide satisfactory color TV reception in the future," said Harris.

Channel Master recently announced a new $1,500,000 TV antenna plant with a production potential of over four times its present factory.

1st New England Television Exposition

New Englanders are enjoying an opportunity to be the first people in the nation to view many TV and Electronic advancements of "Tomorrow" at the New England Television Exposition held in Worcester, Mass. Feb. 5, 6 and 7. The purpose of this 1st New England Television Exposition is to give this section of the nation a closer and clearer picture of the "behind-the-scenes story" of Television.

Mr. Ansel E. Gridley, Chairman of the Exposition Steering Committee, reports that in addition to exhibits representing the leading TV set manufacturers, unusual demonstrations of every type of television antenna and industry accessories can be seen on the Exhibitors Roster, including a special section of the Exposition called "TV The American Way."

RETMA Reports On Set Production and Sales

Television set production during the first 10 months of 1953 set a new record while the radio output remained at the highest level since 1950, the Radio-Electronics-Television Manufacturers Association reports. Total production in the first 10 months was 6,204,803 TV sets and 11,201,656 radios, RETMA reported, compared with 3,394,707 television receivers and 8,398,750 radios manufactured in the same 1952 period. Radios with FM circuits manufactured in October totaled 19,797. In addition, 5,002 TV receivers with FM facilities were produced.

During the period, 4,922,128 TV receivers and 4,911,415 radios, excluding automobile sets, were sold through retail outlets.

These RETMA surveys on retail radio and television sales are conducted with the cooperation of dealers throughout the country as a service to the radio and television industry.

Pyramid Announces Cash Prize Contest for Servicemen

A contest for servicemen that offers $5,600 in cash prizes has been an-

announced by the Pyramid Electric Company of North Bergen, N. J.

The contest begins Feb. 1 and will continue until the end of April. First prize in the Pyramid contest will be $2,000. The second and third prizes are $500 and $100, respectively. In addition, there are 500 other cash awards.

The contest entails completing the sentence, "I like Pyramid capacitors because . . ." in 25 words or less. Entry blanks for the contest are available through jobbers, who will countersign each one submitted. Duplicate awards will be granted to the lucky jobbers whose servicemen win prizes. Each entry in the competition must be accompanied by the top of a box from a Pyramid dry electrolytic capacitor. There is no limit to the number of entries that may be submitted by each serviceman.

Simpson to Send Middleton On Servicemen's Lecture Tour

Bob Middleton, formerly with RCA and Precision Apparatus, has joined the sales-engineering division of Simpson Electric Company, Chicago. In his new position, which became effective January 2nd, Bob Middleton will conduct lectures for servicemen throughout the country. A novel twist will be his open invitation to all servicemen who attend the meetings to bring their 'can't-fix-it' repair problems to the sponsoring jobber the following morning. Bob will personally tackle each repair problem with Simpson test equipment.

Permo Enlarges Plant

Sherman E. Pate, President of Permo, Inc. announced today that contracts have been let for the construction of a new building addition of 17,000 square feet to its plant at 6401-6433 Ravenswood Avenue, Chicago.

Teletypewriter Service

Clarostat Mfg. Co., Inc., Dover, N. H., announce that they are now connected to the nation-wide teletypewriter service. Thus another channel has been added for expediting customers orders and inquiries. The exchange number is DOVER, N. H., TWX 275-U.

Reon Tube Corp. Protects Buyers with Escrow Fund

Recognizing the necessity of instilling confidence in his product—as well as in his company—Leon Resnicow, president of Reon Tube Corp., in Maspeth, L. I., manufacturers of TV cathode ray picture tubes, has established an escrow fund in the Royal Industrial Bank. And, to further protect his distributors and their dealers Reon is also paying the controversial federal excise tax on all tubes.

KEY TEST POINTS

[from page 31]

being detected. If the negative voltage is not measured at this test point, the trouble must lie between the video detector and the FM detector; particularly in the FM detector transformer itself.

The Sound IF Stages

One or two stages of FM sound *if* amplification are usually employed between the video detector and FM detector. The servicing of these circuits is rather simple consisting mainly of checking voltages and measuring resistances of the components in these stages. The grids can be scratched, the tubes clicked in and out of the socket or the plates of the tubes sparked to chassis to produce noise in the speaker indicating whether or not the sound system is operating.

In many types of sound *if* amplifiers, the developed grid bias indicates the presence of signal at the stage. Sound *if* stages are sometimes supplied with fixed cathode bias, and sometimes are biased by the signal driving the stage causing grid current to be drawn which develops a negative voltage at the grid. In the latter case the negative bias is due to the signal and therefore indicates the presence of a signal at that particular grid circuit. See *Fig. 3*.

This is a very convenient method of signal tracing the 4.5 *mc* sound *if* amplifiers using this method of biasing. It is important that a resistor of about 100K ohms or higher be used in series with the meter lead to prevent loading of the circuit when making these tests.

The presence of the 4.5 *mc* signal voltage can be confirmed by varying the fine tuning control which will increase and decrease the voltage. The negative voltages can be as low as 2.5 volts in some receivers and as high as 8 volts in others. The important consideration is whether or not the negative voltage is present, thereby indicating the presence of the 4.5 *mc* signal.

FM Detector Alignment

As pointed out previously with intercarrier receivers the sound *if* frequency is 4.5 *mc*, which is the result of the beating of the two carriers. The difference between the two carriers is fixed by the television transmitter and cannot be changed in the receiver. Therefore, no matter how the fine tuning control is adjusted, the resultant signal fed to the sound *if* stages is 4.5 *mc*. Actually, the fine tuning control changes the local oscillator frequency. This changes the *if* frequencies of the FM and video carriers but cannot affect their frequency separation of 4.5 *mc*. What does change with the different settings of the fine tuning control is the amplitude relationship of the FM and video carriers. The 4.5 *mc* resultant beat signal can be increased or decreased in amplitude with different settings of the fine tuning control but the signal provided by the station is probably more accurate than most frequency generators in use in repair shops.

In aligning the FM stages, the fine tuning control is adjusted to the position that will provide the best possible picture. A *dc* voltmeter is connected with the polarity as shown in *Fig. 3*; the negative lead of the meter being connected to the plate of the ratio detector tube. T1 and T2 are adjusted for maximum negative voltage at the test point. Also any sound take-off coils can be adjusted for the same maximum indication. This adjusts the sound *if* circuits and the *primary* of the FM detector transformer. This does not apply to the secondary.

In the adjustment of the secondary winding of the FM detector transformer, two 100K ohm resistors are

connected in series as shown in *Fig. 4*. These resistors should be closely matched. The *dc* voltmeter is connected between the junction of the two resistors and the tertiary section of the FM detector circuit. The secondary core is adjusted for zero voltage between the two points indicated in *Fig. 4* and is therefore balanced. The voltmeter in general used by technicians can be adjusted off center for the zero voltage setting by turning the zero adjustment. This will permit a definite zero adjustment of the secondary of the FM detector transformer.

Audio Amplifier and Output Stages

If the normal negative voltage is measured at the FM detector key test point, the audio trouble is after the test point towards the audio amplifiers and speaker. In this case, the audio amplifier and output stages can be checked as the other stages by clicking the tubes in and out of the socket to determine if making and breaking the connections results in static noise bursts in the speaker. Other checks which can be made are to scratch the grids of the audio tubes or to spark the plates of the tubes to chassis momentarily. Another means of signal tracing is to feed a 60 cycles filament voltage signal into the grids and plates of the audio tubes with a .1 μf condenser to isolate the 60 cycle source from the points being tested.

Another quick and easy method is to place a finger on the grid of the audio amplifier or at the top of the volume control whichever is convenient. A 60 cycle signal will be transferred through the amplifier into the speaker. These checks are to be made after tubes have been substituted for in the suspected stages.

If no audio is heard when the tubes are clicked in and out of the sockets, the secondary of the audio output transformer or voice coil may be open. This can easily be determined with an ohmmeter. However, remember that these two items are in parallel and therefore if one or the other is open, there will still be resistance of a low value measured from the top of the secondary and the voice coil when they are connected together in the circuit. If the voice coil is not open, there should be a click heard when the lead of the ohmmeter is connected because of the battery voltage in the meter energizing the voice coil. If the click is heard, suspect the transformer and check by resistance measurements, making sure to open one leg of the transformer. In most receivers the plate voltage fed to the audio output tube can be measured by removing the

tube from the socket and making contact with the plate terminal into the tube socket from the top of the chassis, thus confirming that the primary of the audio output transformer is not open.

The Use Of An Output Meter

In checking circuits in an audio system, the audio signal can be traced through the stages with an output meter which is nothing more than an *ac* meter with a *dc* blocking condenser in series with the lead to the meter. The output meter will indicate the presence of signals in the audio stages and is made use of in alignment. It can also effectively be used in other stages where a scope is not immediately available and it is desired to know whether signals are present as in the video amplifier stages.

The audio voltage at the top of the volume control can be measured with the output meter to be sure that the audio signal is being applied to control from the detector circuit.

Audio Hum

If the trouble is hum in the audio signals from the speaker, turn the volume control to the position of minimum volume. This puts the audio amplifier grid at ground potential. See *Fig. 5*. In this position, examine the receiver for hum. If the hum is present, it is probably due to poor filtering in the B plus supply or hum pickup in the audio amplifier grid circuit. In the grid circuit, a large coupling condenser in combination with a large grid leak resistor is used to couple the signal from the volume control. Across this resistor-condenser circuit hum voltages can easily be developed because of the high impendance. Move any poorly filtered leads from close proximity to this junction. If grounding the grid of the audio amplifier removes the hum, it indicates that this is the possible cause of the trouble. If grounding the grid of the audio output stage does not remove the hum, it is probably due to poor B plus filtering and the electrolytics should be checked.

If hum is experienced only when receiving a signal the trouble is most likely due to improper alignment of the FM detector or video and sound *if*. This takes for granted that the tubes are not defective. The FM detector alignment would then have to be checked as previously discussed, and if the hum is still present, the video and sound *if* alignment should be investigated, particularly the circuit adjustments which involve the sound shelf.

COLOR TV

[*from page 27*]

In the Lawrence tube, instead of the color phosphors being arranged in triads to form a single color element, the color phosphors are arranged in lines. By means of voltage applied to a grid network in front of each line, the beam is directed to the proper point to be scanned.

Although the principle of fixing the color dots varies between the RCA and CBS-Hytron tube, the dynamic operating method of each is basically the same.

This series could not cover all aspects of the theory and problems of color TV. As an indication of the complexity of pioneer sets, the RCA set discussed has 31 potentiometer controls.

Setting up and aligning these receivers will, of course, come from practice, but speedier servicing can come from previous study of the principles of operation. If color kits appear on the market, get and build one, if only for the adjustment and alignment experience.

VIDEO I-F

[*from page 23*]

other. When this is done the oscilloscope or *vtvm* would have to have a diode probe to get a signal indication when applied to the anode circuits of the video *if* stages.

Alignment Factors

When alignment of the video *if* stages becomes necessary the service notes for the receiver in question should be consulted. This is necessary because each receiver requires different procedures. This is the case because of the relative methods of coupling which might be encountered as well as the particular response characteristics and design factors. Thus, no routine method for aligning of receivers can be detailed. There are, however, several factors which should be observed during any video *if* alignment. To minimize spurious signals from appearing on a response curve the local oscillator tube of the tuner should be removed.

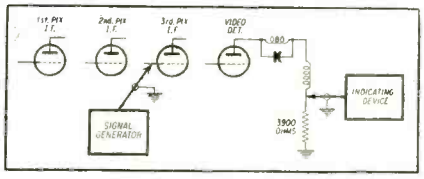


Fig. 6—Signal generator and indicating device shown in position for tracing signal through video i-f.

On occasion it has also been recommended that the vertical and horizontal oscillator tubes be removed to minimize the creation of spurious signals from the latter generators. This, however, is not advisable in modern receivers because removal of these tubes may upset load factors on the power supply and change voltages which are applied to the video *if* stages. At the same time removal of the horizontal oscillator tube will also eliminate the flyback voltage and will thus obliterate the voltage boost potentials derived from the damper tube. Since many receivers feed the voltage boost potentials to various circuits, over-all performance will be seriously affected and proper alignment will be difficult.

It is preferable to bond the sweep generator, marker, and other units to the chassis of the receiver to minimize losses and the effects of floating grounds. This also may not always be feasable because some receivers have

"hot" chassis which would cause power shorts. If possible, however, the generators should be grounded where permissible and shielded cable used.

The output from the generator should be kept as low as possible while still getting an indication on the oscilloscope. *An overload which would result from an excessive output from the sweep generator would cause saturation of the video i-f amplifiers and this would result in the pattern giving a false indication of having a flat top.* When the video amplifiers are working at saturation the output level will be constant for various degrees of alignment adjustments and therefore cannot be adjusted properly by observation of the response curve.

The same holds true of the *agc* bias furnished by the system. The *agc* system should be made inoperative by removing the *agc* amplifier tube or by disconnecting the *agc* bus from the *agc* rectifier or amplifier. A substitute *agc* voltage of a fixed value (approximately 4 volts) should be applied to the *agc* circuits. If this isn't done an increase in gain, which results as the *if*'s are brought into correct alignment, will cause an increase in *agc* bias, which in turn reduces the gain. Thus, the output waveform would not show variations in amplitude which are necessary during the alignment procedure. Of greatest importance is the accuracy of the marker generator and the flat output of the sweep generator. The marker generator should be calibrated against a crystal calibrator unit or crystal markers should be used. (Calibration of television alignment generators was covered in the July 1951 issue of Radio-Television Service Dealer.)

The sweep generator does not have to be accurate in terms of frequency because the marker will indicate the correct frequency required. The sweep generator should, however, have a substantially flat output over its entire sweep range. If not, it will give a false indication of a perfect response curve when actually some of the amplitude may be contributed by a decline or an increase in amplitude at some portions of the sweep from the sweep generator.

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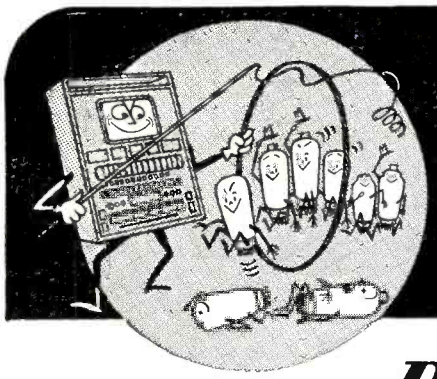

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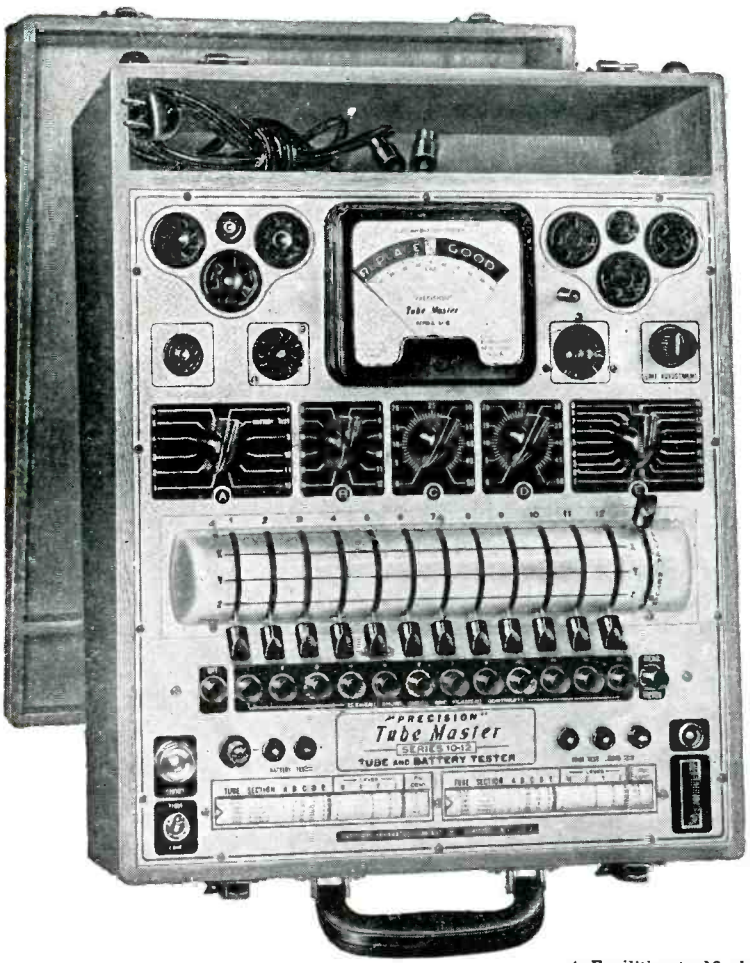

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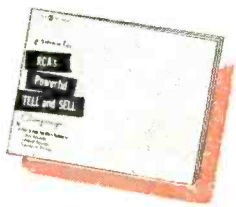

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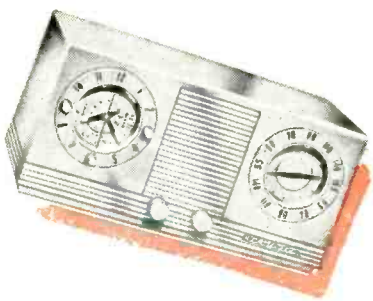

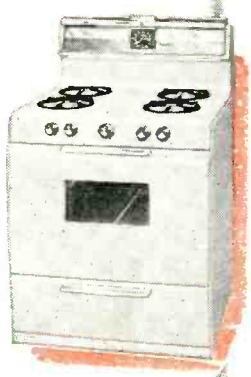

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