MARCH, 1954

Radio-Television SERVICE DEALER

TV - AM - FM - SOUND

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

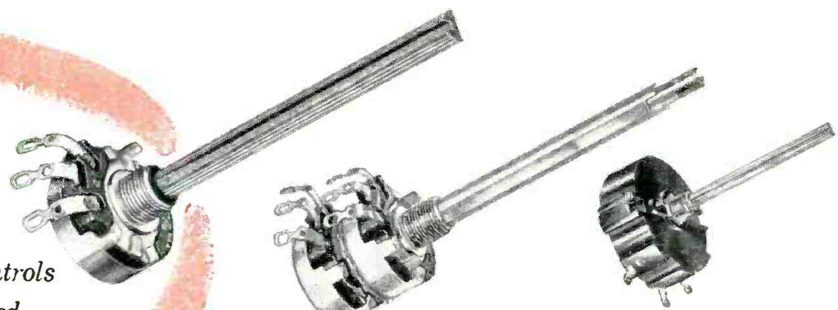
The Professional Radio-TVman's Magazine

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

No. 1 CHOICE

of service technicians for

TV CONTROLS*



* *Not Claims! Not Predictions! But Plain Facts! More Service Technicians prefer IRC TV Controls than the next 2 brands combined. Proved by unbiased, authoritative, independent surveys.*

ASK FOR IRC TV CONTROLS... MOST SERVICE TECHNICIANS DO!

IRC

Wherever the Circuit Says

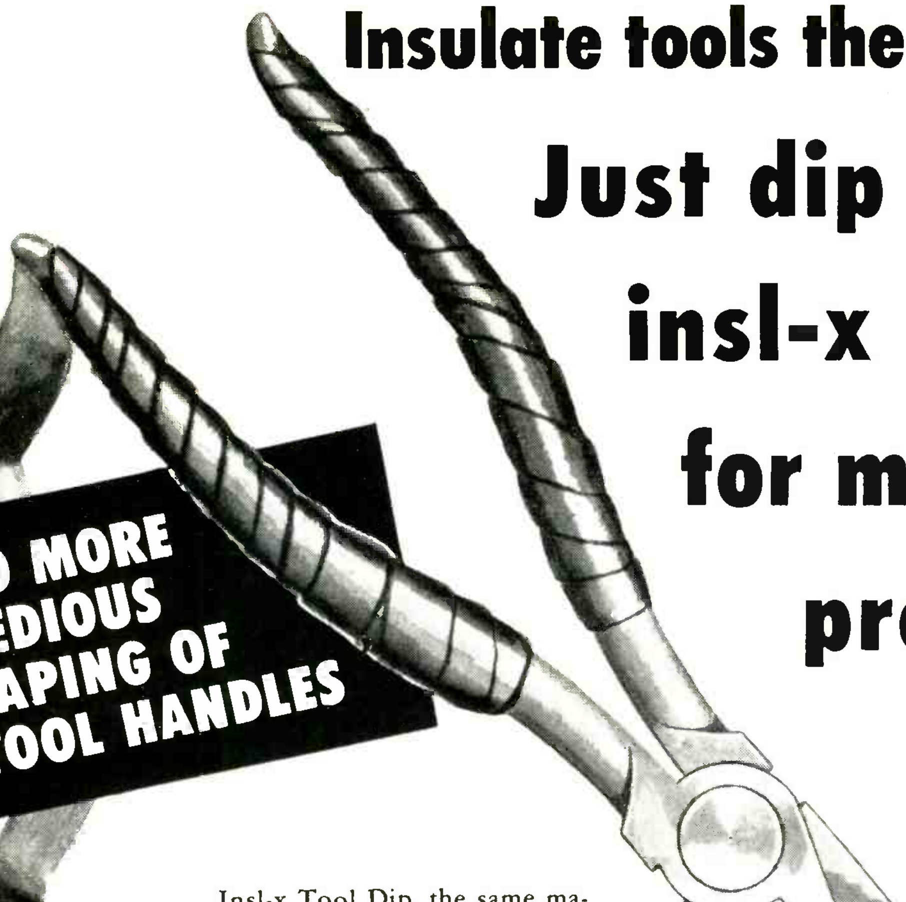
INTERNATIONAL RESISTANCE COMPANY

413 N. Broad Street, Philadelphia 8, Pa.

In Canada: International Resistance Co., Ltd., Toronto, Licensee

Insulate tools the easy way!

Just dip tools in insl-x tool dip for maximum protection



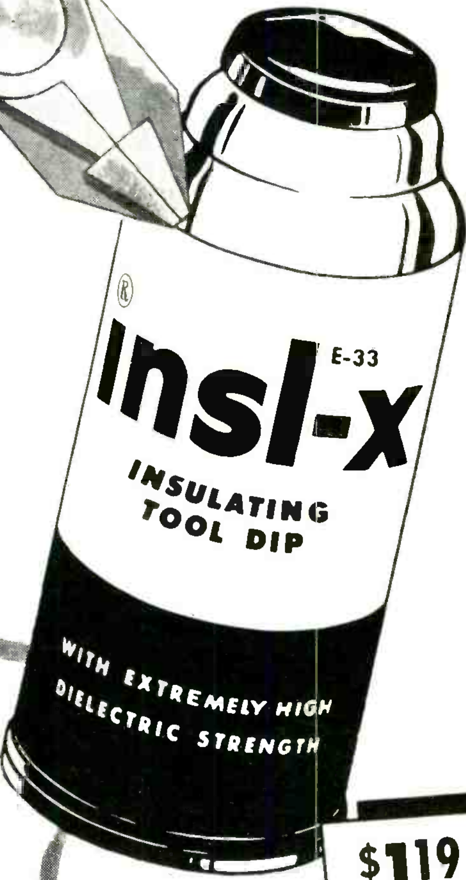
NO MORE TEDIOUS TAPING OF TOOL HANDLES

Insl-x Tool Dip, the same material used by major utility companies for insulating power linemen's tools, is now available in a handy six-ounce container to the electrical trade.

Simply dip the tool into the Insl-x container, withdraw, and you have a smooth, tough coating that gives more than adequate protection.

Any desired thickness for use of tools on high voltage circuits may be built up by dipping in INSL-X.

The Insl-x coating is bright red so you can spot your insulated tools at a glance. Also available in black.



$1.19 LIST
6 oz. Packed
12 to case

List $1.79
12 oz. Packed
12 to case

USE INSL-X INSULATING SPRAYS FOR ELECTRICAL AND TELEVISION INSULATION

Insl-x E-16 for the television serviceman and Insl-x E-26 for the electrical trade are both quality insulating sprays of extra high dielectric strength that are guaranteed to completely insulate, rustproof and waterproof.

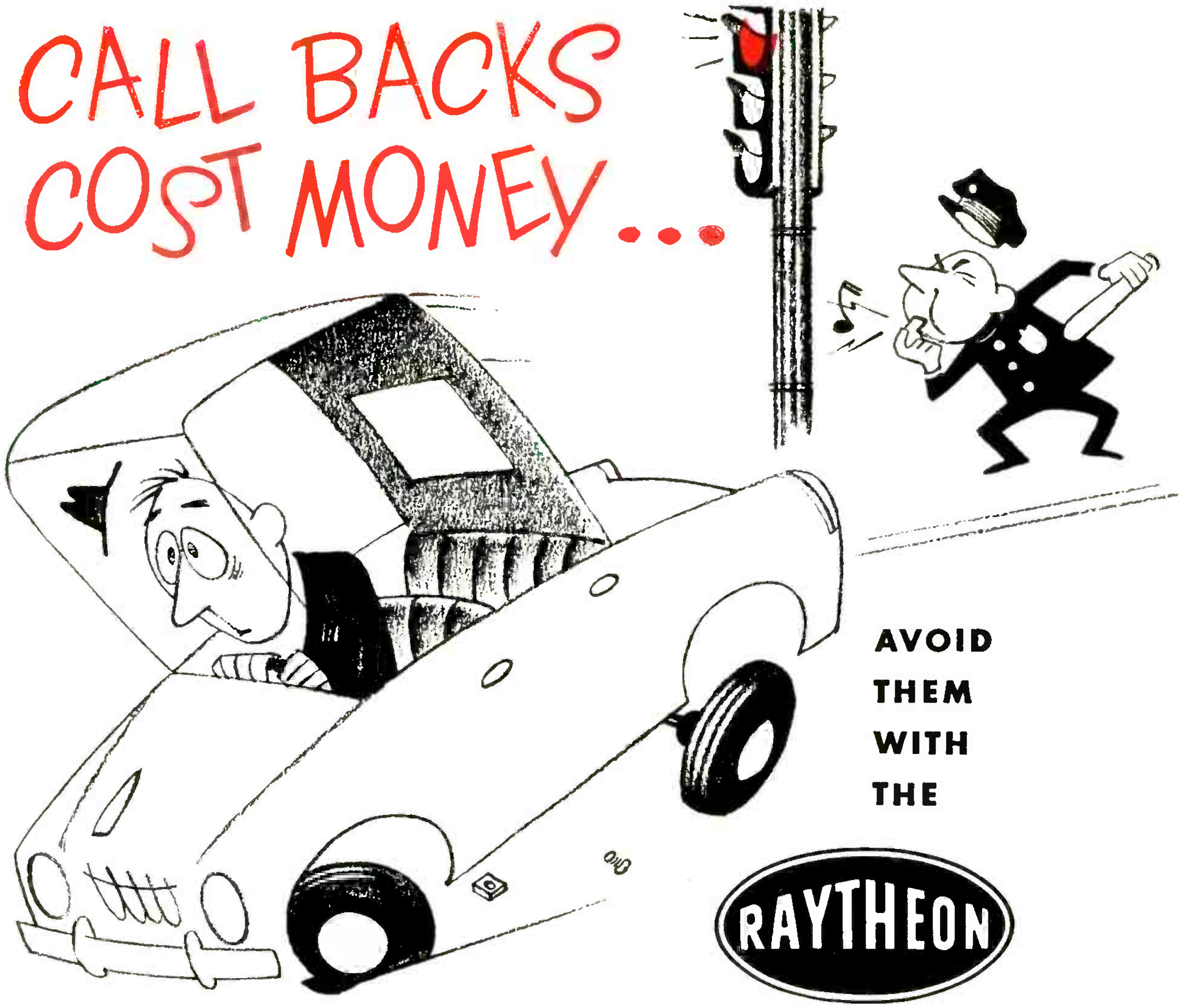
Packaged in aerosol containers, Insl-x is easy to apply. Just press the button and spray.

List $1.79
12 oz. Packed
12 to case

See your jobber or write for complete technical data, Dept. 303

INSL-X SALES COMPANY, 26 Rittenhouse Place, Ardmore, Pennsylvania

Insl-x Products are available in bulk for spray, dip, and brush application.



SERVICE SAVER PLAN

available through your RAYTHEON TUBE DISTRIBUTOR

The Raytheon Service Saver Plan, which permits customers to identify about 85% of all the troubles that may occur on the screen of a defective TV receiver — *and accurately transmit this information to the Service Dealer via telephone* — is helping to minimize costly call-backs two ways.

First, when a Service Dealer goes on a call knowing in advance what ails a TV receiver (thanks to Raytheon's Service Saver Plan), he goes completely equipped to do the job — no more running back to the shop for tubes or parts.

Second, customers frequently call about TV receiver trouble when a minor control adjustment is all that is needed to correct the fault. The Raytheon Service Saver Plan helps Service Dealers avoid these needless, unprofitable calls.

Ask your Raytheon Tube Distributor to tell you how to put the Raytheon Service Saver Plan to work for you.

RAYTHEON RADIO AND TELEVISION TUBES cut call-backs, too! Their outstanding quality reduces early tube failures to a minimum. Use them. You'll find them Right . . . for Sound and Sight . . . and *you!*

RAYTHEON®

RAYTHEON MANUFACTURING COMPANY

Receiving Tube Division

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

Excellence in Electronics

RAYTHEON MAKES ALL THESE:

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

Every Service Firm Owner in the U.S.A.
Receives **SERVICE DEALER** *Monthly*
DISTRIBUTION THIS ISSUE OVER 65,000

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

VOL. 15, NO. 3 — MARCH, 1954

FEATURE ARTICLES

Color Oscillator and Control Circuits, *by Bob Dargan and Sam Marshall* 19
Lucid explanation of circuit action in color TV receiver.

Video Amplifier Servicing Hints, *by Robert G. Middleton* 27
Unusual but effective trouble-shooting techniques for the serviceman.

Enterprising TV Serviceman Brings Shop to Customer 30
The "Ryan Mobile-Kar," first rolling repair shop.

Universal Test Bench Connectors, *by Irving Tepper* 31
Using test connectors for speed in servicing.

Vertical Hold Problems, *by Paul Goldberg* 33
A Work-Bench feature.

Torture Test for TV Rotators, *by Herbert G. Koenig* 41
A TV rotator is subjected to a series of tests to insure against mechanical defects.

Rhombic Antennas 53
An Answerman feature.

CIRCUIT & SERVICE FORUM

Work Bench
Philco model 52-1882-121 RF chassis 44,
Deflection chassis D4: Vertical roll 33
Du Mont RA 164: critical vertical hold 34
G.E. 10T-1: critical vertical hold 34

Video Speed Servicing Systems (VSSS)
Emerson chassis no. 120066-B, model no. 571 35
Motorola chassis no. TS32B, model no. 12VT13 37
Westinghouse chassis no. V2150-101 39

Rider TV Field Manual Service Data Sheets
Admiral TV chassis nos. 22C2; 22E2 43
Capehart model 12F272M, TV chassis CT-74 47

Circuit Court
Du Mont RA-160: vertical amplifier 52
Capehart CX36: sync system 52

Answer Man
Rhombic Antennas 53
Philco 51-T1606: pix pulls 53
Portable Field Strength Meter 54

DEPARTMENTS

Editorial 6
Trade Flashes 8
Association News 14
Work Bench 33
Circuit Court 52
Answer Man 53
New Products 56
Advertising Index 64

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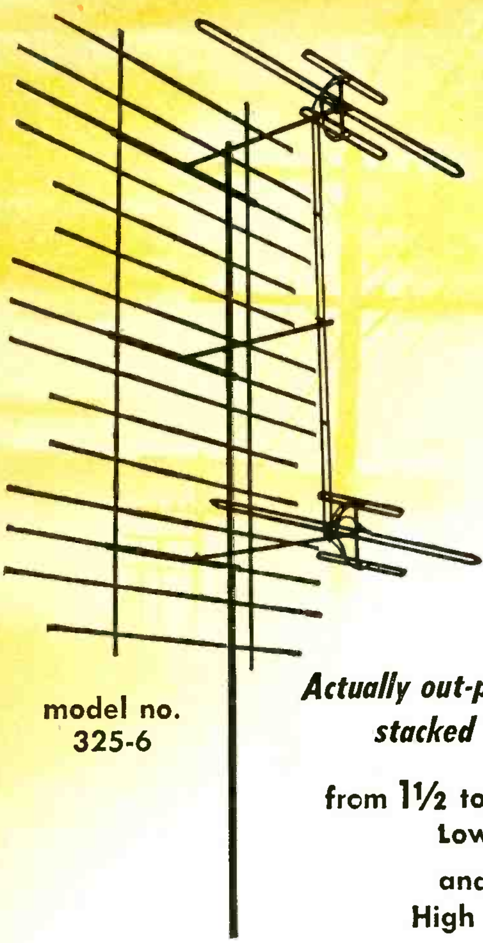
POSTMASTER: SEND FORM 3579 TO RADIO-TELEVISION SERVICE DEALER, 67 WEST 44th ST., NEW YORK 36, N. Y.

CHANNEL MASTER'S *new*

SUPER CHAMP

featuring wide-spaced stacking of Tri-Pole assemblies



model no. 325-6

Actually out-performs the stacked CHAMPION

from 1½ to 3 DB *more* Low Band gain

and 1 DB *more* High Band gain!

Channel Master proudly introduces the SUPER CHAMP — the newest addition to the Champion antenna family. The Super Champ is a super-powerful antenna that provides extraordinary VHF-UHF reception at *greater distances* than has ever before been possible.

How it Works:

The Tri-Pole assemblies of the stacked Champion have been wider-spaced by the addition of a third reflecting screen between the antennas. These antennas are joined with a newly-designed half-wave stacking harness. The result: Tri-Pole assemblies are spaced a full half-wave on the Low Band, increasing both Low and High Band gain.

Champion Performance on UHF

In addition to its sensational VHF performance, Channel Master's entire Champion series — including the Super Champ — has been carefully designed to provide excellent reception on the UHF band. Write for complete technical details.

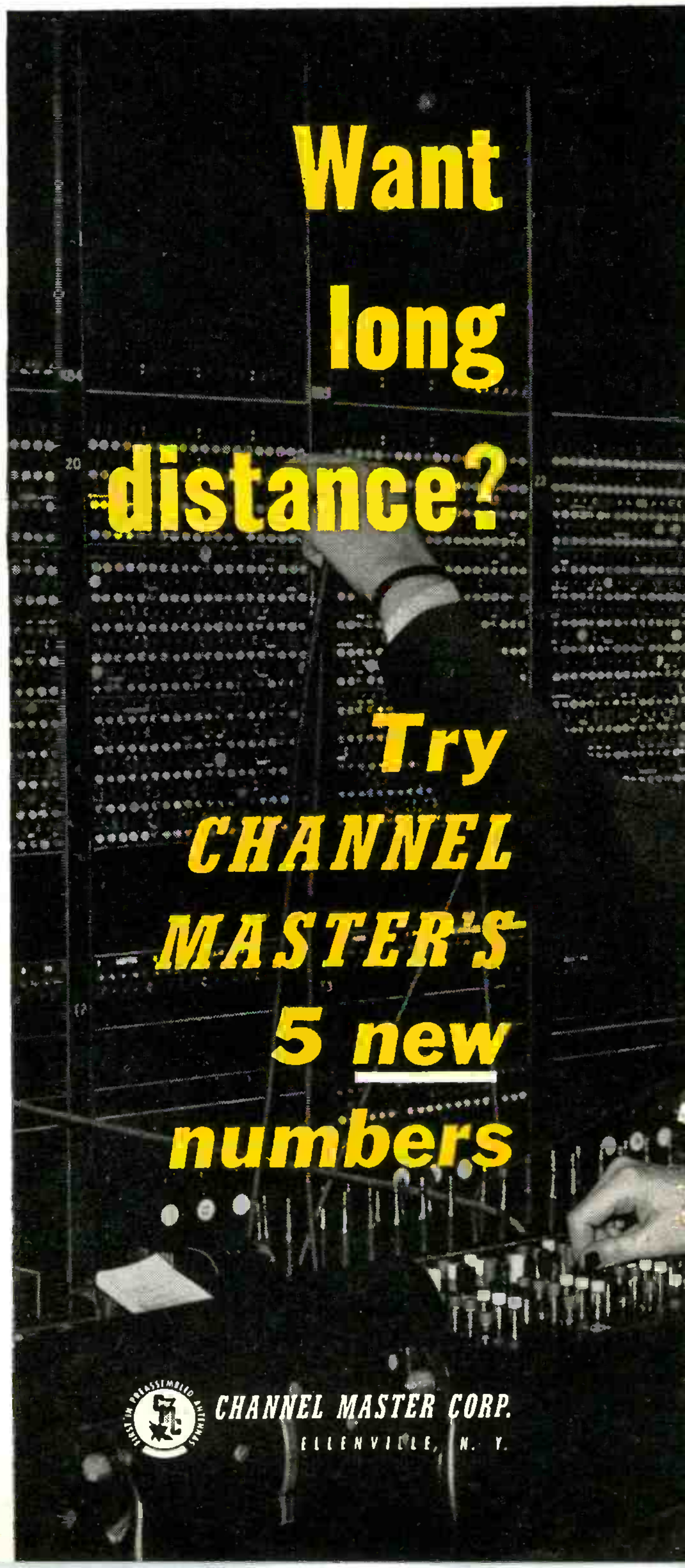
AVAILABLE TWO WAYS:

1. *As a complete antenna, model no. 325-6*

Consists of two Tri-Pole assemblies, three reflecting screen assemblies and a special stacking harness for wide-spaced Tri-Pole. — **$54.17 list**

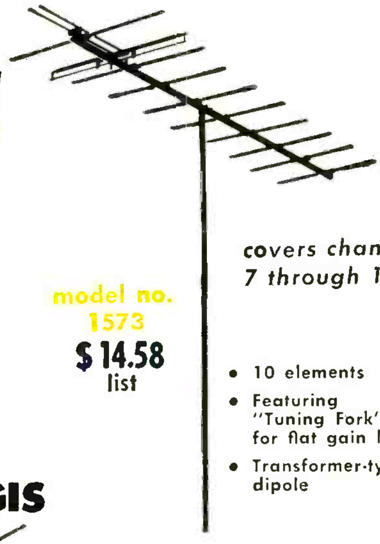
2. *As a Conversion Kit, model no. 325-7*

For converting standard 2-bay Champions into Super Champs. Consists of reflecting screen and specially-designed stacking harness. — **$14.58 list**



Designed for **POWER!**
Low Priced for **ACTION!**

These new antennas are the most sensitive of their type — feature Channel Master's famous built-in quality at remarkable low prices, to help you meet competition on any level.



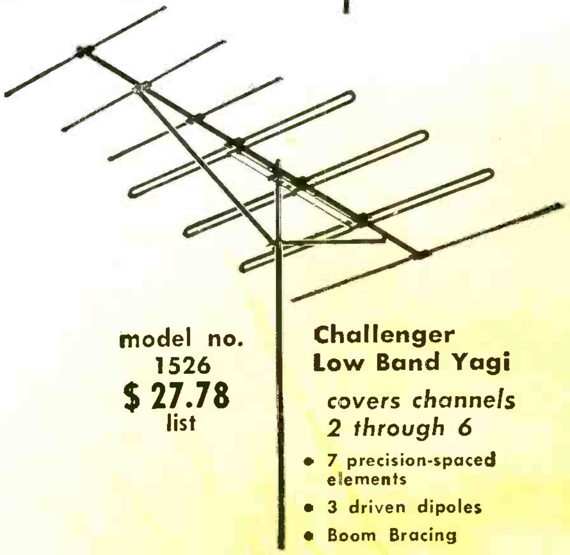
model no. 1573
$ 14.58 list

covers channels 7 through 13

- 10 elements
- Featuring "Tuning Fork" for flat gain level
- Transformer-type dipole

CHALLENGER BROAD BAND YAGIS

Here's Broad Band coverage with the high gain and directivity of the Yagi. Ideal for areas served at present by two or more VHF stations on the same band and areas where new VHF stations are being added to present ones, on the same band. Feature 100% aluminum construction; are completely preassembled. They give high gain across the band; high front-to-back ratio. Can be stacked for extra sensitivity.

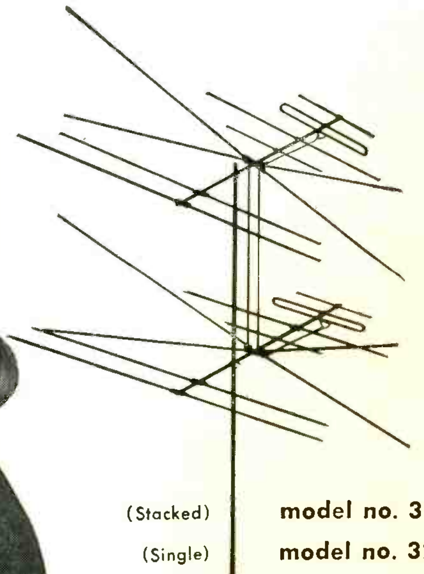


model no. 1526
$ 27.78 list

Challenger Low Band Yagi

covers channels 2 through 6

- 7 precision-spaced elements
- 3 driven dipoles
- Boom Bracing



GLOBE TROTTER

- All-channel VHF *fringe area* coverage.
- All-channel UHF *primary area* coverage.
- 100% aluminum construction.
- Completely preassembled — no loose hardware.

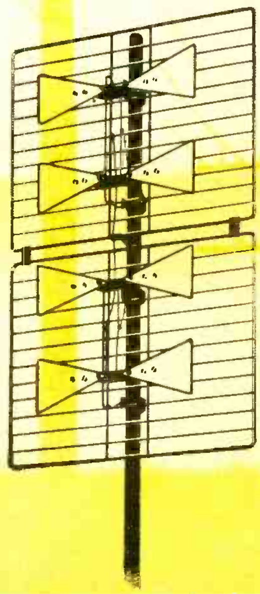
(Stacked) model no. 321-2 **$ 25.97** list

(Single) model no. 321 **$ 12.64** list

MULTI-BOW

covers channels 14 through 83

- Outstanding fringe area reception.
- All-aluminum, solid sheet elements.
- "Free-Space" terminals.
- Heavy-duty welded wire screen, bright zinc electroplated.



model no. 410
$ 11.11 list

The World's Largest Manufacturer of Television Antennas

EDITORIAL...

by S. R. COWAN
PUBLISHER

BEWARE OF FAKE SUBSCRIPTION SALESMEN!

We have been gratified to find that thousands of service shop owners have gone along with our recommendation that each of their employed technicians should individually subscribe to *"Service Dealer"* so that every man will have his own personal file of "Video Speed Servicing Systems" and "TV Field Servicing" data sheets.

However, there's a fly in the ointment! Of late, men who purport to be our subscription sales agents, (and particularly a guy who uses the name R. H. Brown), have tried to bilk unsuspecting service shopowners into buying a subscription to *"Service Dealer."* Remember—while we do have field subscription salesmen out—they are *not* authorized to sell subscriptions to any full-time independent serviceman, or to any service shop owner, or to any retail store owner who operates his own service department. Our field salesmen have proper credentials and they are authorized to sell subscriptions only to technicians who are employed by service organizations and service dealers. *Caveat Emptor!*

WE APOLOGIZE!

Our mail last month was chock full of inquiries from subscribers wanting to know why, in our January issue, did we run less than "the usual number" of pages allocated to "Video Speed Servicing Systems" and to "Rider's TV Field Service" data sheets.

Our only excuse was that we were forced by space limitations to sacrifice some regular departments, and we chose "VSSS" and "TV Field Service" knowing that we would be able, in subsequent issues, to make up for that deficiency.

In other words, during the months ahead, additional pages of "VSSS" and "TV Field Service" data sheets will appear in certain issues over and above the regular number that would normally be scheduled to appear.

Incidentally, John F. Rider just advised us that his first complete volume of "TV Field Service Manuals" has been shipped to jobbers and is now in distribution . . . but we assure you that none of the items that we have published in *"Service Dealer"* are included in that Rider book.

Also, although we continuously receive here at this office orders from servicemen for Volume I of "VSSS" we would prefer to have our subscribers buy this volume and all of their other books from their regular distributors. Ask your jobber first—then if he can't serve you—order from us.

OPTIMISTS ARE WE!

Much air time used by commentators, and much space allocated by newspapers, at present, is devoted to business conditions and the number of people who are gainfully employed. It is all timely and relevant to the conflict of opinion as to whether or not this country is now in a general business slump, or whether the proper steps are being taken by executives to prevent our country from heading into such a slump. Mark Twain is credited with opining that "while many people talk about the weather, none of them seem to do anything about it!" Regarding the trend of business, it seems to me that many people—and particularly the President of the United States—are at present not only talking, but they are also doing many things in an effort to forestall and prevent a falling-off of business and employment. Mark us down as being among the optimists.

It is axiomatic that when radio and television sales are at high levels the servicing industry is likewise at a proportionately high level. The two seem to tie in somewhat.

But, by the same token, when new receiver sales taper off because of general business conditions or even localized conditions, servicing activities continue to expand. Many people who refrain from buying new items such as television sets, because of economic factors, naturally have repair work done on old items that otherwise would have been traded in or disposed of.

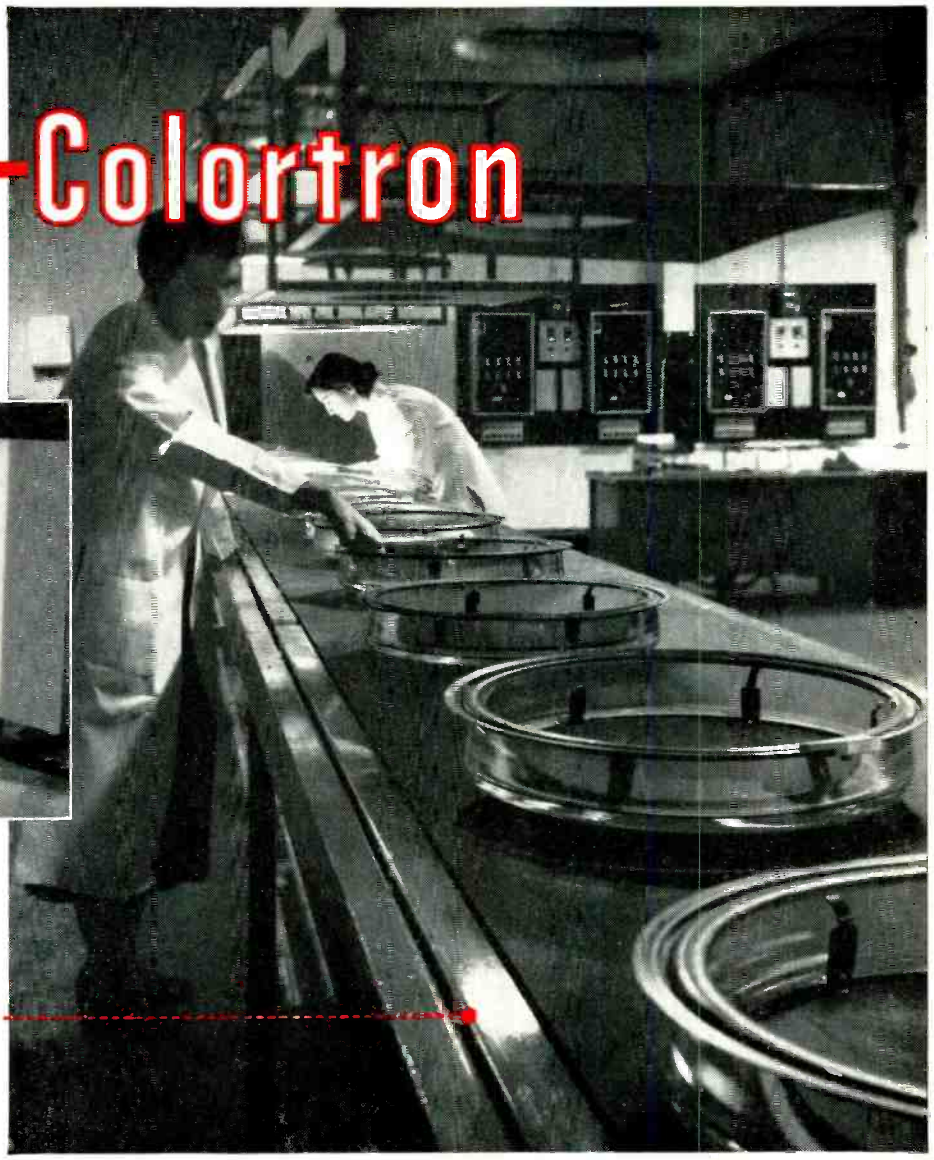
Checking with our readers in all parts of the country, in an effort to get an overall view of business conditions, we now happily report that the concensus is: that Service Dealers are now doing quite well and in general are running approximately the same sales volume as at this time last year. Independent servicemen seem to be running around 13% ahead of last year in dollar billing while contractors and service organizations report their volume up five to seven percent over last year. The biggest cities, where television has been firmly established, report less optimistically than in the new territories where television is for the first time making inroads. Summarized—1954 looks like another record-breaking year for the servicing profession as a whole.

Service dealers and service organizations situated in "average-sized" cities throughout the country would be particularly astute if they were to re-examine now the service potential afforded rather than to worry too much about the sales potential of new equipment.

New CBS-Colortron

NOW IN MASS PRODUCTION

Unique photographic process, like photoengraving, uses aperture masks as negatives to print consecutively the red, green, and blue phosphor dots (250,000 of each) on CBS-Colortron screens.



After tri-color screens are printed, aperture masks are temporarily removed and face plates move on to critical inspection for screen imperfections.

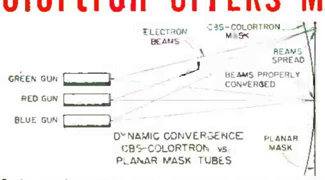
COLOR TV IS COMING . . . faster than you think. The revolutionary new CBS-Colortron . . . a practical color picture tube . . . hastens the day. Already it is in lower-cost, mass production . . . made possible by its simplified, advanced design.

As in black-and-white tubes, the CBS-Colortron's screen is deposited directly onto the inside of its face plate. A unique photographic technique makes this possible. Because each aperture mask serves as a negative to print its tri-color screen, perfect register of mask and screen is automatically achieved and maintained. The rugged, simple, light-weight mask sharply reduces assembly and exhaust problems. And the spherical design of mask and screen simplifies convergence circuitry and adjustment.

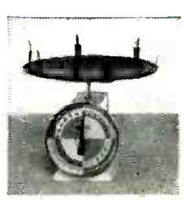
The CBS-Colortron is now a 15-inch, round tube. But, as soon as tooling is completed, it will be made in larger sizes. Watch for the new CBS-Colortrons. You'll see plenty of them soon. And you'll be sold on sight by their logical simplicity . . . their superior performance . . . their many advantages.

CBS-Colortron OFFERS MANY ADVANTAGES

Cross-section (face plate, aperture mask, funnel, tri-color electron gun) shows simplicity of CBS-Colortron and its adaptability to low-cost, mass production.

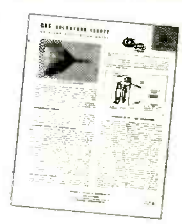


Spherical screen and aperture mask of CBS-Colortron simplify convergence and focus. Electron beams remain in focus over entire surface of screen.



Light-weight (6 oz.), rugged, simple aperture mask of CBS-Colortron minimizes problems of exhaust, handling, and assembly.

COMPLETE CBS-Colortron DATA *FREE!*



Take a look into the future. Write today for complete information on CBS-Colortron 15HP22: Construction . . . operation . . . application . . . installation and adjustment . . . electrical and mechanical data. Four packed pages . . . free!

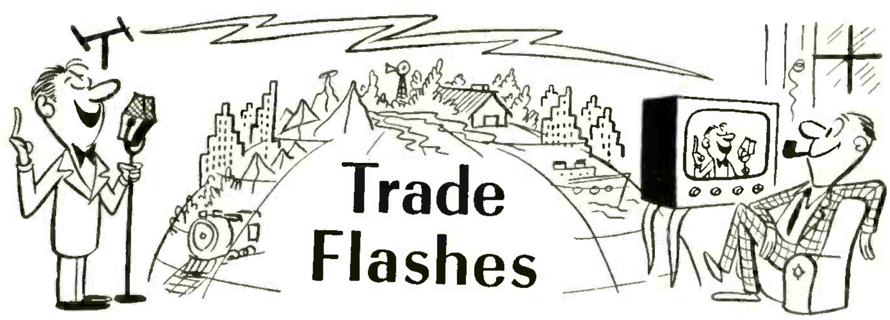
CBS-HYTRON, Main Office: Danvers, Massachusetts

Manufacturers of Receiving Tubes Since 1921

A Division of Columbia Broadcasting System, Inc.

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

RECEIVING • TRANSMITTING • SPECIAL-PURPOSE • TV PICTURE TUBES • GERMANIUM DIODES AND TRANSISTORS



Servicemen Receive Awards

Two top winners in RCA Service Company "Man of the Hour" sales contest for TV service technicians are shown receiving awards for their record

sales of TV service contracts over a three-month period. Above, William A. Jackson, San Francisco, Western Area winner, receives trophy from Donald H. Kunsman, vice president, consumer products division, RCA Service Co. Below, Kunsman presents award to Robert Goldman, New York Eastern Area winner.

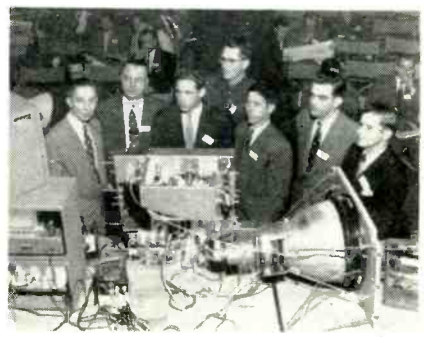
Scott Lowers Prices

Price reductions averaging twenty-five percent were announced today for Scott high fidelity equipment.

John Meck, president of Scott Radio Laboratories, Inc., Chicago, stated these reductions are made possible by the mushrooming growth of the high fidelity market. No changes of specifications accompanied these price adjustments said Meck.

G. E. Explains Color TV

W. L. Parkinson, General Electric's television product service manager, at the left, introduces a representative group of company service personnel and technicians to color television. This group was among 200 TV distributor and dealer servicemen who recently attended a week-long color TV seminar at Electronics, Park, Syracuse. The technicians went through thirty-five hours of intensive indoctrination into



all phases of color TV alignment and service. With Mr. Parkinson, from the left, are R. L. Cam, R. Cooper, Jr., Chicago; A. B. Sherwood, General Electric Supply Co., Los Angeles; Arthur D. Schulze, Schulze Radio Service, Richmond, Texas; Richard Goins, GESCO, Houston, Texas; Robert K. Yeaton, GESCO, Boston; and Paul I. Bayless, GESCO, Jacksonville, Fla.

RCA Tube Contest

A $50,000 contest which will award 400 prizes to radio-TV service dealers offering the best reasons for using and recommending RCA kinescopes and receiving tubes was announced today by the Tube Department of the RCA Victor Division, Radio Corporation of America.

The "Tell and Sell" prize contest, open to all radio and TV service dealers, requires the completion in 25 words or less of the sentence beginning, "I use and recommend RCA tubes because . . ." Winners will be selected on the basis of originality and aptness by an independent, nationally-known judging organization. The contest closes midnight, April 30, 1954. Official entry blanks are available from RCA tube distributors.

[*Continued on page 12*]

$5,600 IN PRIZES

...easy to win

503 PRIZES!

$2000 - 1st prize

$500 - 2nd prize, $100 - 3rd prize
100 - $10 prizes, 400 - $5 prizes

HOW TO WIN

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.

It's so easy. Here is the kind of statement that might win:

"I like Pyramid capacitors because they always check out perfectly and don't deteriorate and so I know I won't have to call back at my expense."

"I like Pyramid capacitors because the line is so complete that I can always get what I need and don't have to worry about an off-brand capacitor."

PYRAMID

PYRAMID FEATURES:

1. Only one quality—the best at no premium. All Pyramid capacitors are made of materials commanded by rigid military specifications.
2. All Pyramid capacitors are non-hygroscopic.
3. Highest quality insulator material used in all production results in low leakage factor.
4. Exclusive non-contamination technique guarantees close tolerances and no deterioration. Peak performances for life.
5. Pyramid capacitors operate unchanged at ambient temperature of 85° centigrade.
6. Designed by service technicians across the country for their requirements.
7. Individually packaged for protection.
8. Permanently legible, high visibility ratings on each item.
9. 100% absolute electronic inspection before shipment.

Pyramid is in its 10th year as a leading manufacturer of high-quality capacitors.

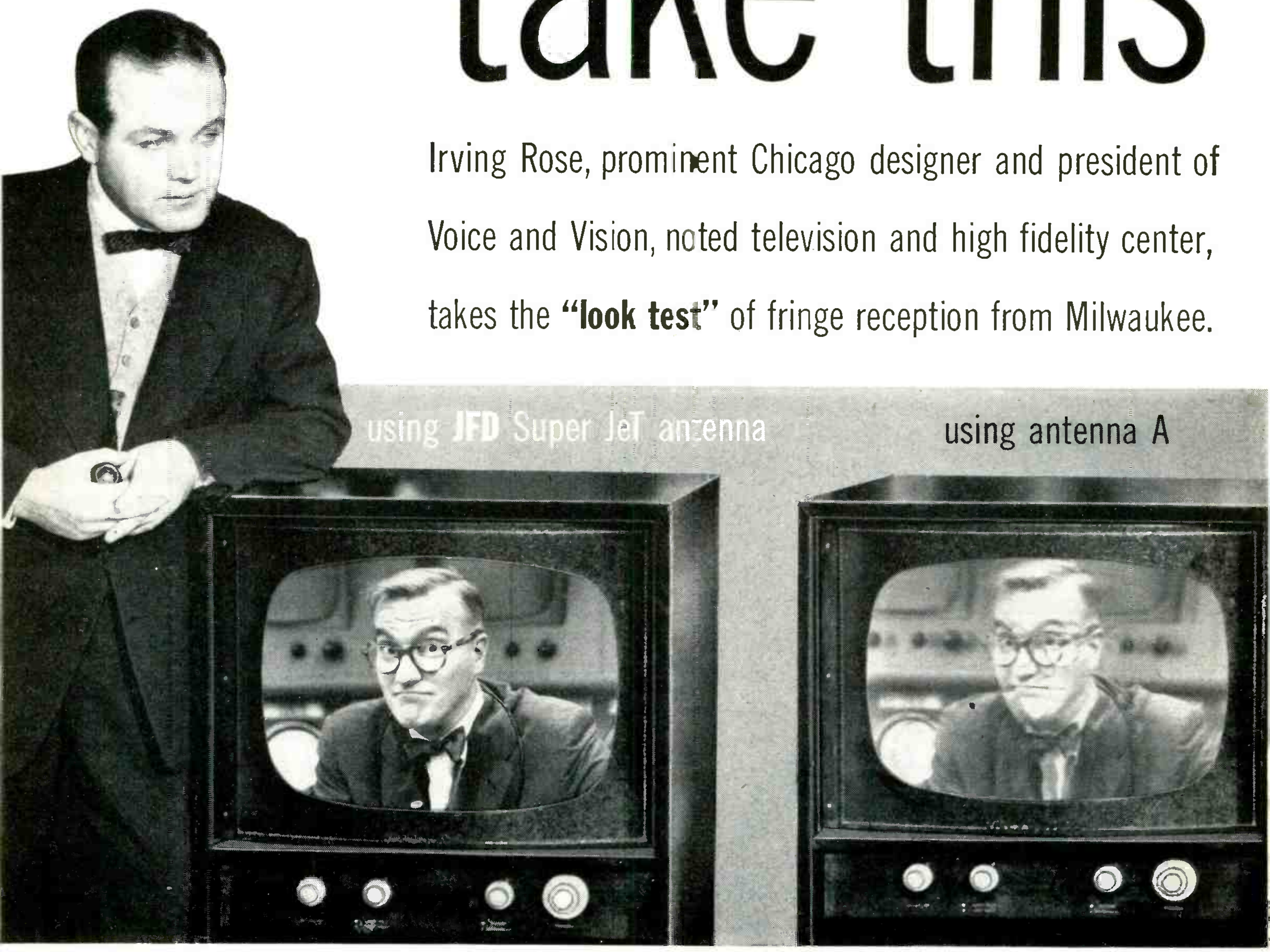
PYRAMID ELECTRIC COMPANY
1445 HUDSON BOULEVARD
NORTH BERGEN, N. J.

Burton browne advertising

Before you install another antenna

take this

Irving Rose, prominent Chicago designer and president of Voice and Vision, noted television and high fidelity center, takes the **"look test"** of fringe reception from Milwaukee.



1. Four TV receivers of one brand, same model, same production run were set up. Technicians went over these sets to make sure they were identically aligned.

2. Three other leading high gain TV antennas were installed—each oriented for maximum performance. Each antenna was connected to a set by identical type lead-in.

3. Each receiver was tuned with infinite care to the same channel to make certain the reception was as good as possible. The picture is the proof—the result can be immediately seen—the JFD Super JeT outperformed all others.

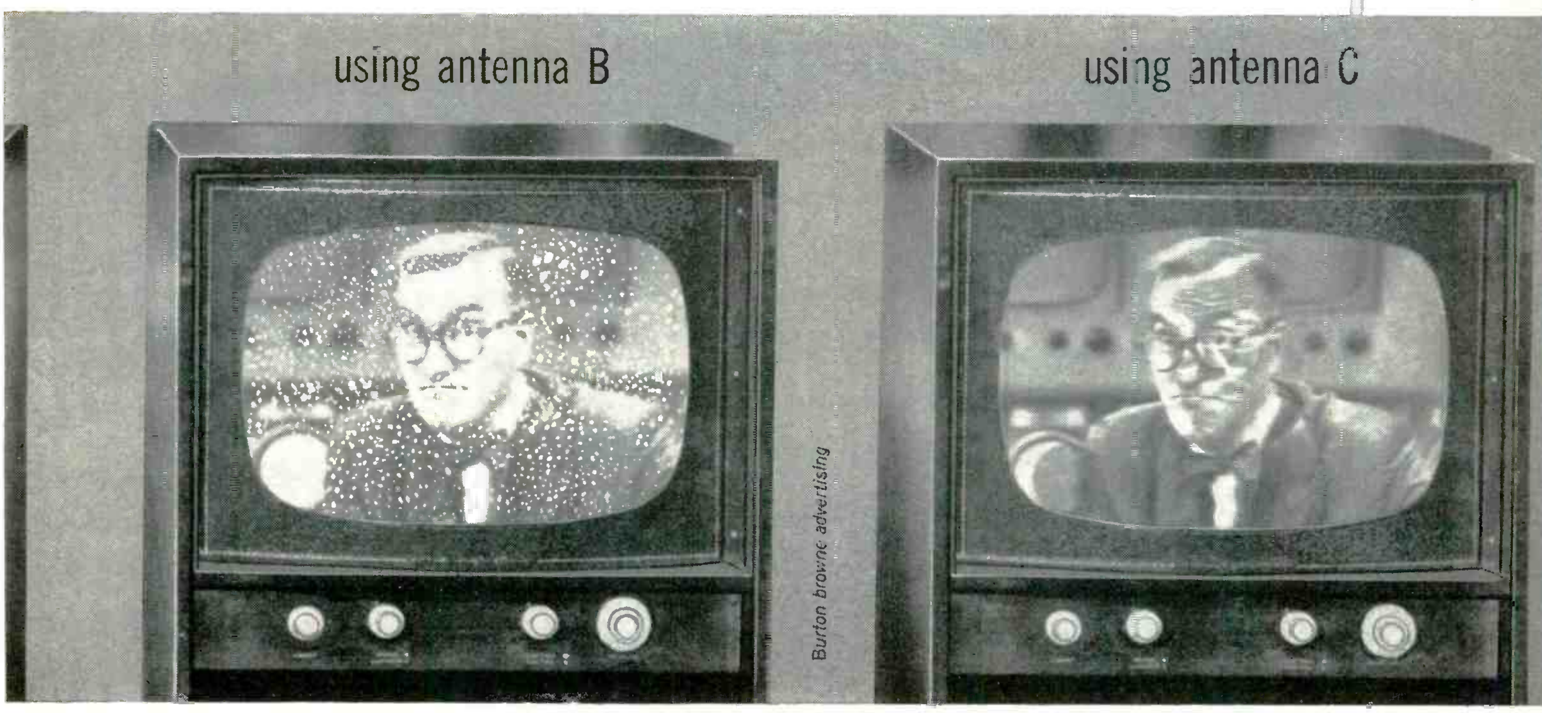
4. The chart shows why the "Look-test" is your proof positive of sharper, clearer, more brilliant pictures . . . in Black and White or Color on all channels present and future.

JeT 213 (single Bay) $18.70
JeT 213S* (2-Bay) $38.35
***complete with stacking transformer**

"look-test"


JeT 213S

Here is your clinical proof that only the **JFD Super JeT TV antenna Out-Performs** all others on all channels



ANTENNA LIST		CHANNELS 2	3	4	5	6	7	8	9	10	11	12	13
Competitor A Radar Screen with 3 dipoles (2-bay) Partly Pre-Assembled	$42.36	4.5	4.3	7.3	7.0	7.0	10.00	10.75	11.5	11.7	11.0	11.5	11.6
Competitor B Radar Screen with 2 dipoles (2-bay) Not Assembled	$34.95	0.75	3.25	4.5	3.5	3.5	6.0	7.0	6.5	7.75	8.0	7.5	6.0
Competitor C Bedspring (4-bay) Pre-Assembled	$55.00	4.0	5.0	7.0	6.25	5.0	5.25	6.0	5.25	7.25	9.25	6.5	7.0
JFD Superjet Model JeT 213 S (2-bay) Pre-Assembled	$42.50	6.5	7.5	9.5	8.5	8.5	11.0	11.0	12.0	12.0	11.25	11.75	12.0

DB GAIN

World's largest manufacturers of TV antennas and accessories

Write for Bulletin #230

JFD Electronics

JFD Manufacturing Company, Brooklyn 4, N.Y.

TRADE FLASHES

[*from page* 8]

The grand prize is a choice of a 1954 DeSoto hard-top convertible automobile or a 1954 Dodge panel truck, plus a full set of RCA test Equipment.

Simpson TV "Challenge Clinics"

Television service men, in increasing numbers, have requested that industry service meetings be conducted on a practical basis, and Simpson Electric Co. will accede to these requests in its 1954 series of television service meetings. These meetings will feature "Challenge Clinics," to which television service men are invited to bring their "dog" receivers for diagnosis and repair by a field engineer.

The challenge Clinics are conducted by Bob Middleton, a "service man's service man," known throughout the United States and Canada as a speaker, demonstrator, and author of best-selling books on television troubleshooting.

Because technical audiences often request that proceedings of service meetings be made available in printed form, Simpson Electric Co. has inaugurated a new house organ entitled *The Technicians Timesaver*, an easy-to-read four-page publication which points out profitable shortcuts to faster TV servicing. Each issue covers, in part, the formal discussions and demonstrations made at the meetings.

Raytheon "Service Saver" Meetings

Carroll Hoshour, director of service and sales for Raytheon's television and radio division, explains some of the fine points of "Service Saver." It's the ingenious new TV trouble-shooting method which was enthusiastically received by more than 1,000 of Greater New York's television dealers and repairmen assembled on January 13 at Manhattan Center, New York City. L. to R.: Adolph Langer, H. L. Dalis Co.; Bill Marcus, John F. Rider Publications; Carroll Hoshour; John F. Rider, John F. Rider Publications; Syd Fink, H. L. Dalis Co.; Bob Dalis, H. L. Dalis Co.; F. E. Anderson, Manager Replacement

and Export Sales, Raytheon Manufacturing Co., Receiving Tube Division.

Over 600 service dealers attended recent "Service Saver" meetings held in Florida, Georgia and South Carolina. Attending dealers were most enthusiastic in their response to the informative and educational talk presented by Bill Ashby, RAYTHEON TV's popular staff lecturer.

Over 400 service dealers attended the recent RAYTHEON Bonded Electronic Technician meeting held in Buffalo, N. Y., while approximately 500 service dealers attended "Service Saver" meetings held in Reading and Wilkes-Barre, Pa. and Hagerstown, Md.

First TV For Wyoming Town

A new milestone in television was reached when the people of Casper, Wyoming, second largest city in the state, received television for the first time recently. The programs come from Denver, Colorado via a unique closed circuit community television system which uses microwave facilities for the first time in such a system.

[*Continued on page* 51]

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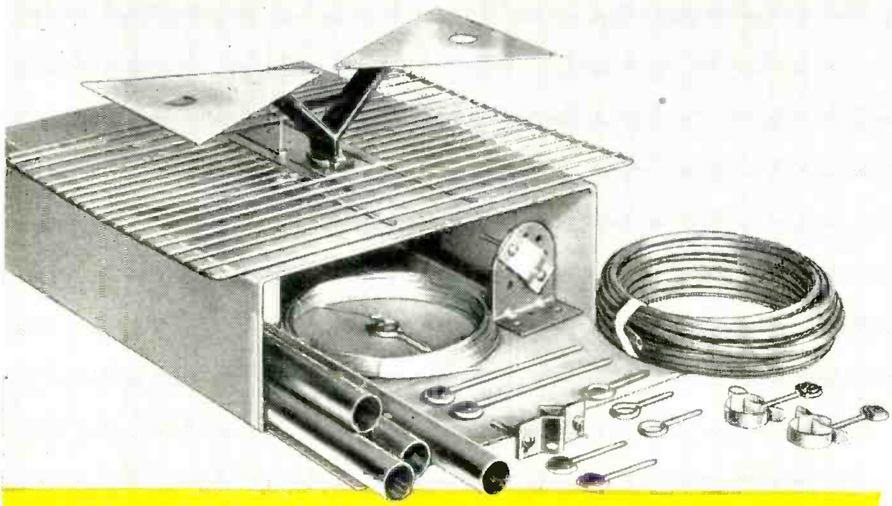

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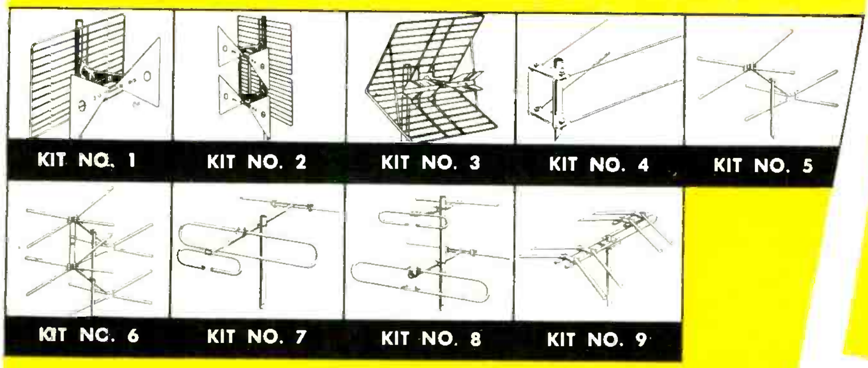

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ASSOCIATION NEWS

I.R.E. Convention

The 1954 National Convention of the Institute of Radio Engineers will be held on March 22-25 at two locations in New York City—the Waldorf-Astoria Hotel and the new exhibit site, the Kingsbridge Armory.

Meetings and social features will take place at the hotel. The Convention will open with the Annual Meeting of the Institute at 10:30 am on March 22.

An outstanding feature of the Convention will be the 600-exhibit Radio Engineering Show to be housed on one floor in the Armory. The extensive technical program of 51 sessions and 242 technical papers will include a Medical Electronics Symposium, as well as an Audio Seminar on hi-fi, both to be held on the evening of March 23.

Members of the I.R.E. and guests may register either at the Waldorf-Astoria or at the Kingsbridge Armory. Fee is $1.00 for I.R.E. members and $3.00 for non-I.R.E. members.

LIETA Prexy and Staff In Shop

LIETA president, William A. Carey, takes a break in his repair shop in Garden City, L. I., N. Y. with his staff of technicians, all LIETA members.

Left to right: Mr. James Sedden, Mr. Carey (better known as Dick); Mr. Napoleon Revels; Mr. William H. Cuffey.

SARTA

The San Antonio (Texas) Radio and Television Association reports interesting technical sessions on color TV. Recent guest speaker was Mr. C. R. Bowman of the P. R. Mallory Co. SARTA has increased membership dues to $4.50 a month, which includes a 50 cent contribution to their state organization, Texas Electronic Association (TEA). SARTA's business meeting

[*Continued on page 17*]

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ASSOCIATION NEWS

[*from page 14*]

this month features a tape recording of Al Robertson's speech made at the TEA clinic and Fair held last summer at Fort Worth. In addition to the technical forums being sponsored by SARTA, this association is also giving a business course for servicemen which is sponsored by General Electric, Modern Radio, and SARTA.

NARDA (Newport, R.I.)

The National Appliance and Radio-TV Dealers Association is organizing a group in the Newport, R. I., area, to be headed by George Ganong of T & C Radio, Newport.

Other Newport stores participating are Bob Nass's, Newport TV Service Center, Richards Radio & TV Service, Ace Television, Radio Shack, Henry's Radio Service, Leo Kain's TV, and Shumaker & Evans Radio.

Middletown, R. I., stores participating include Radio & Appliance Center and Bestoso TV.

ARTSNY

At a meeting held by the Associated Radio TV Servicemen of N. Y. at their headquarters on Thursday, Feb. 4th, Bob Dargan, chief instructor, Philco Distributors, L. I. City, N. Y., assisted by Don Sabatini, presented an interesting lecture on the new Philco chasses. Servicing techniques were demonstrated with the aid of a scope and various types of probes.

Eastern TV Conference

The Eastern Television Service Conference, composed of service associations on the eastern seaboard, will hold its annual session in the Bellevue-Stratford Hotel, Philadelphia, on April 2, 3, and 4, in connection with the Color Symposium to be held at the same time and place.

The Color Symposium is being arranged by the major manufacturers, and is sponsored by the manufacturers and distributors in the Philadelphia area, and by the Council of Radio and Television Service of Philadelphia, which will also act as host for the Eastern Conference.

All persons connected with the television or radio industry, whether affiliated with an association or not, are welcome to attend the symposium and the conference sessions.

Harold B. Rhodes, of Paterson, N. J., president of the Radio and Television Servicemen of New Jersey, Inc., and Eastern Secretary of N. A. T. E. S. A., was re-elected chairman of the conference at a meeting of the Conference Executive Committee in Philadelphia January 31. Groups represented at the meeting, and who will join in sponsoring

the Eastern Conference sessions were: N. A. T. E. S. A., N. E. T. S. D. A., A. R. T. S. N. Y., Philadelphia Radio Servicemen's Association, Federation of Radio Service Associations of Pennsylvania, Council of Radio and Television Service of Philadelphia, Mid-State Radio Servicemen's Association of Harrisburg, Pennsylvania, Radio and Television Servicemen of New Jersey, Inc., Allied TV Technicians of New Jersey, Long Island TRT Guild, Empire State Federation of Electronic Technicians, Radio Technicians Guild of New England, Television Service Dealers of Philadelphia, Television Service Dealers Association of Delaware County, Pennsylvania, and Radio and TV Servicemen's Association of Pittsburgh.

RTASV

Russel L. Dovel has been elected president of the Radio and Television Association of Springfield (Ohio) and Vicinity. He succeeds Jack Carpenter. Anthony Petrausky will serve as vice-president, while Walt Kugler, treasurer and Paul Boller, secretary, have both been re-elected for another term.

[*Continued on page 58*]

Speaking of Speakers...

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COLOR OSCILLATOR and CONTROL CIRCUITS

From a forthcoming book entitled "FUNDAMENTALS OF COLOR TELEVISION"

by BOB DARGAN and SAM MARSHALL

COLOR receivers will require an understanding of many new electronic concepts and a mastery of new adjustments relating to color balance in the various circuits associated with the color picture tube. With regard to the new electronic concepts, the most intriguing are the principles and operation of color encoding and decoding circuitry. In the transmitter the sections relating to this function are the color matrixing and multiplexing circuits which are often referred to as the color encoding sections. In the process of matrixing we cross-mix the primary colors to produce the luminance signal plus the two chrominance signals. Following this operation we make possible the transmission of these three signals on a single channel which is called multiplexing.

In the receiver, color decoding involves:

1. The Color Sync Section
2. The Color Demodulation Section
3. The Color Matrixing Section

This chapter is primarily concerned with the color sync section. It describes the action taking place in the color oscillator and control circuits, and the progress of the transmitted sync signal as it influences and combines with other developed signals in this important section of the color receiver.

The Color Sync Section which involves the Color Oscillator and Control Stages is positioned between the Video Amplifier and the Q and I Demodulator Sections as shown in the block diagram of *Fig. 1*.

A block diagram of a typical color oscillator and control circuit is shown in *Fig. 2*. As can be seen, the Burst Amplifier is supplied with two signals, the horizontal deflection spike and the reference burst from the transmitted video signal. This combination results in passage and amplification of only the 8-cycle reference burst. This burst signal enters a phase detector which is used to compare the phase of the burst with that of a 3.579545 *mc* crystal oscillator commonly referred to as 3.58 *mc*. Any difference of phase in this circuit produces an error voltage which is coupled to a reactance tube for the purpose of accurately re-phasing the crystal oscillator in sync with the incoming burst.

Typical commercial color sync circuits are shown in *Figs. 3* and *4*. Except for a slight difference in tube type used by RCA in the phase detector, *Fig. 3* illustrates the circuitry used in the CBS and RCA receivers. *Fig. 4* is the system used by Emerson. Notice that in this receiver no crystal is used in the oscillator circuit, sufficient frequency stability being obtained with the particular circuit used.

The Burst Amplifier

Coming back to the first video amplifier as shown in *Fig. 2*, it should be noted that a tuned circuit resonant at 3.58 *mc* is used to remove the Ey signal component and pass only the burst and color information. The 3.58 *mc* signal developed across the tuned circuit is then coupled to the grid of the Burst Amplifier.

Referring to *Fig. 5* which is a partial schematic of the RCA Burst Amplifier circuit, we observe that in the 6U8 burst amplifier tube the cathode is connected through a 220 ohm resistance to the junction of the 12K and 220K voltage divider network between B plus and ground. This places a relatively high negative bias between grid and cathode causing tube cut-off.

Along comes the sync pulse followed immediately by the 8-cycle color burst (see *Fig. 2*). A simultaneous action occurs on the tube whereby the negative going sync spike from the horizontal output transformer (*Fig. 5*) is injected into the cathode circuit, thereby neutralizing the positive voltage on the cathode and driving the tube into conduction. Just at that moment the 8-cycle color burst enters the grid of the tube and is amplified. These two actions are such that at the termination of the spike no further color burst signal occurs, and the tube goes back into cutoff again. In this manner no spurious signals which could disrupt the color demodulation action can pass through the burst amplifier.

The relative phase positions of the horizontal sync pulse, the spike and the color burst are shown in *Fig. 6*. The 8 cycle burst is then amplified in the tube and passed on to the Phase Detector through the tightly coupled transformer in the plate circuit. The circuit constants are so proportioned as to produce a negative spike which opens up the burst amplifier wide enough to permit passage of the full 8 cycles of the color burst.

Another method of gating the burst amplifier used in some commercial receivers is to maintain the tube in a non-conducting condition by applying a large negative voltage to the screen grid. See *Fig. 7*. At the time when the tube is

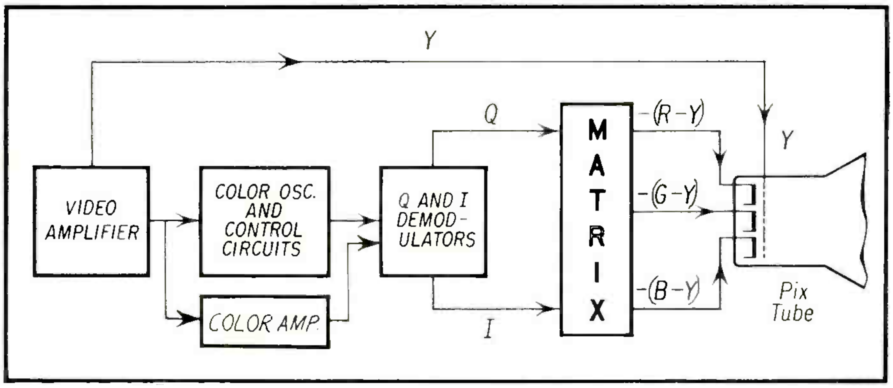

Fig. 1—Color oscillator and control circuits follow video amplifier.

to be made to conduct a positive horizontal spike from the horizontal output transformer is coupled to the screen grid. This temporarily removes the blocking potential and permits the tube to conduct, thereby resulting in amplification of the 8 cycle 3.58 *mc* burst.

The horizontal pulse for the gating of the burst amplifier is obtained in most cases from a separate small winding on the horizontal output transformer.

Automatic Phase Control

It will be recalled that the purpose of the phase detector is to lock the crystal oscillator with the color burst. This is shown in block diagram form in *Fig. 2*.

Referring to *Fig. 3*, a correction voltage is derived from the phase detector which is fed to the grid of the reactance circuit tube in case the incoming color and the crystal oscillator are out of phase. A portion of the crystal frequency is fed to the color phasing amplifier the output of which is fed into the phase detector. At the same time the color burst is applied to the phase detector from the burst amplifier. Thus, the Phase Detector is able to compare the burst phase with the crystal oscillator phase. If the correct phase relationship exists between them no correction votage will be applied to the reactance tube. On the other hand should there be a phase shift in the crystal oscillator frequency, for some reason or another, this change will be transmitted through the color phasing amplifier to the phase detector where an unbalance in the conduction of the diodes will result, causing a correction voltage to be applied to the reactance tube. The latter will then convert this correction voltage into a capacitance change across the tank circuit of the oscillator bringing the latter into proper phase relationship with the burst signal.

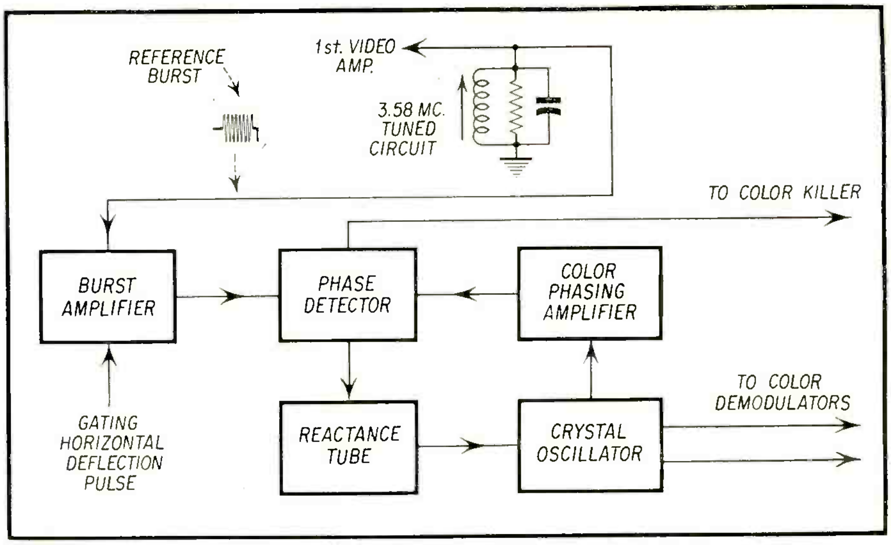

Fig. 2—Block diagram of color oscillator and control section.

A circuit balancing potentiometer of 50,000 ohms is usually made use of to permit manual balancing of the inequalities that may result in the Phase Detector circuit components and tubes. A center tap on the secondary of the Phase Detector transformer is connected to the variable arm of the balancing potentiometer. It is from this point that the pulses charge the filter network, the purpose of which is to provide an RC time constant slow enough to absorb noise pulses that manage to get through the previous circuits and fast enough to permit reactance tube control.

Reference to *Fig. 3* will reveal that the balance potentiometer affects the balance currents in the Phase Detector and therefore affects the correct phasing of the 3.58 *mc* oscillator. This, in turn affects the color registration so that this control is one of the controls used in obtaining proper color register.

The quartz crystal signal is not fed directly to the Phase Detector but is applied through the Color Phasing Amplifier which permits adjustment of the phase of the oscillator frequency. If there is a lead or lag in phase of the local oscillator signal with respect to the burst signal, a *dc* error voltage is developed in the phase detector circuit which is supplied to the reactance tube through the filtering or integrating network. The voltage obtained from the Balanced Detector corresponds directly to the phase difference between the two signals. A phase difference of plus or minus 5 degrees between the burst and the oscillator frequency is the maximum tolerable phase shift that will produce neglible change in color fidelity.

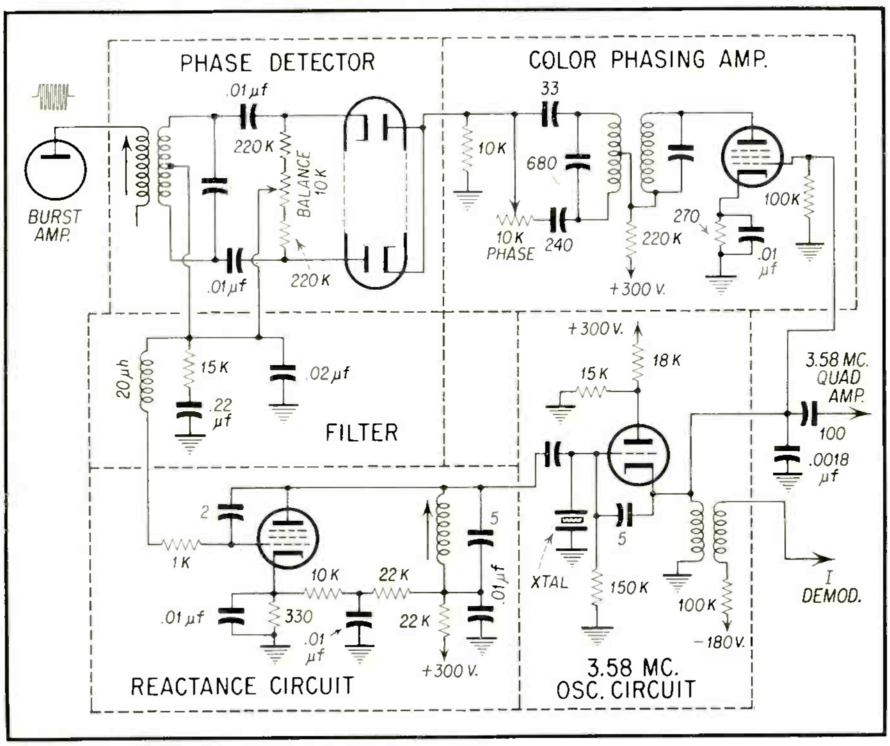

Fig. 3—Basic color oscillator and control circuit.

Reactance Tube Circuit

The reactance tube circuit provides a means of correcting the phase of the 3.58 *mc* color oscillator signal should its phase be different than that of the color burst signal. In effect it is equivalent to adding or subtracting inductances or capacitances (depending on the type of circuit used) across the tank circuit of an oscillator. In this manner the frequency or phase of the oscillator tank may be varied. For example, the reactance tube connected in *Fig. 5* keeps the phase of the 3.58 *mc* crystal oscillator locked in phase with the incoming color burst signal.

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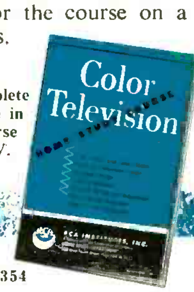

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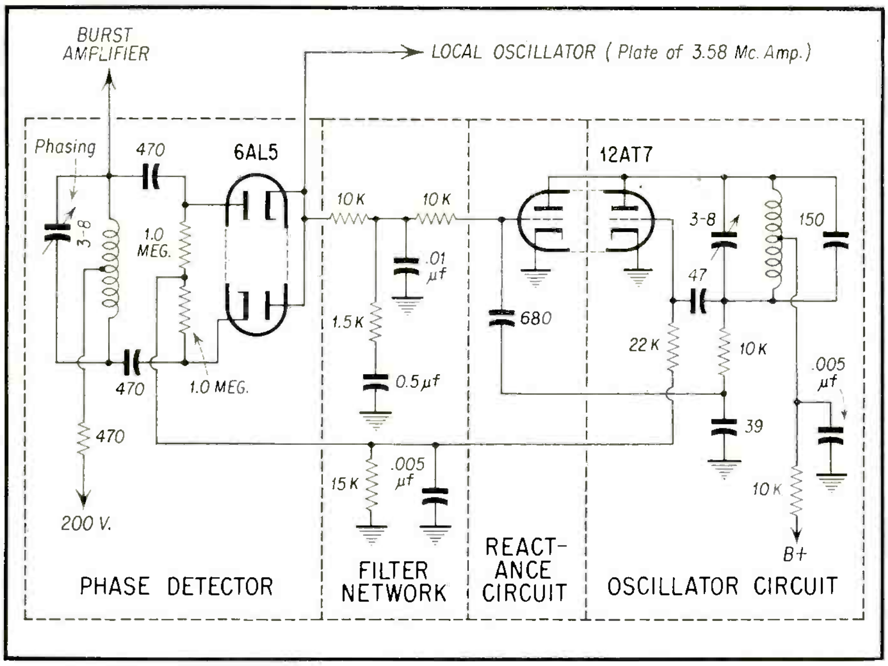

Fig. 4—Color sync circuit used by Emerson.

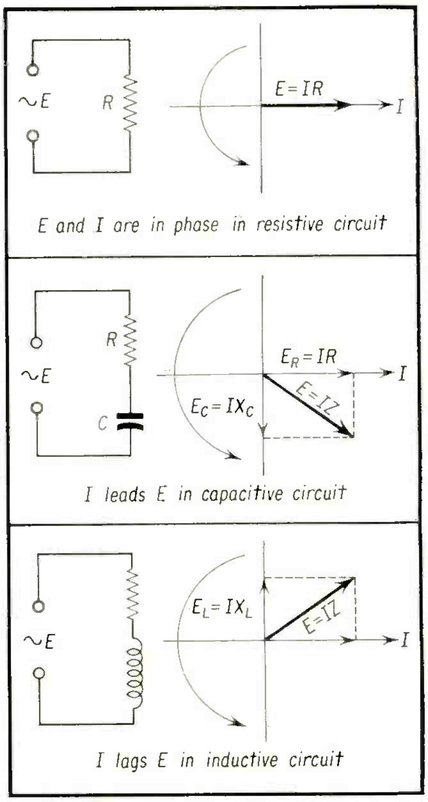

Fig. 8—(top)—Resistive circuit.
Fig. 9—(middle)—Capacitive circuit.
Fig. 10—(bottom)—Inductive circuit.

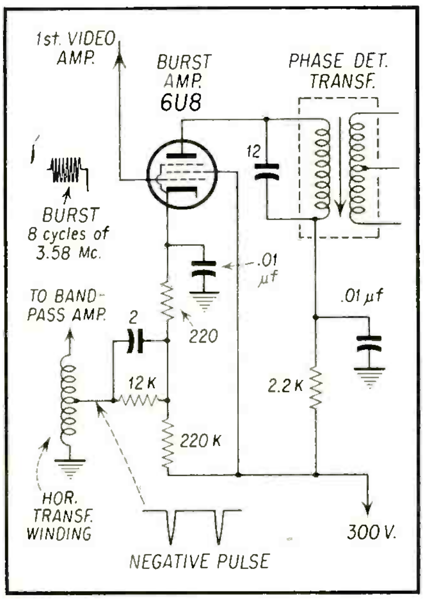

Fig. 5—Burst amplifier circuitry.

The current in an *ac* circuit containing resistance only is in phase with the applied voltage, E, as shown in *Fig. 8*. Conversely when the current is in phase with the applied voltage, the circuit is resistive.

If a condenser is connected in an *ac* circuit as shown in *Fig. 9*, the current leads the applied voltage. Conversely, when the current leads the applied voltage, a circuit is said to be capacitive.

If a coil is connected in an *ac* circuit as shown in *Fig. 10*, the current lags the applied voltage. Conversely, when the current lags the applied voltage E, a circuit is said to be inductive.

The manner in which a reactance tube circuit takes on the property of inductance is shown in *Fig. 11*. The folowing step by step analysis refers to the circuit action that takes place.

1. A voltage E, from the oscillator tank is sent through C_2 (low reactance) and appears across R_1 and C_1.

2. A current *I* flows as a result of this voltage.

3. R_1 is made very much higher than X_{c1}, so that the circuit may be considered resistive and *I* is in phase with *E*.

4. The current *I* produces a voltage drop, E_{c1}, across C_1. E_{c1} lags *I* by about 90 degrees.

5. Since E_{c1} lags *I* it will also lag *E*.

6. The voltage E_{c1} is in phase wtih the plate current I_p as a natural result of triode tube action.

7. Therefore I_p lags E which is the equivalent of *Fig. 10*; so that the reactance tube circuit of *Fig. 11* represents an inductive load across the tank.

8. Variation of the grid bias on the tube affects its operation so that by introducing a variable *dc* bias on the tube we can vary the amount of equivalent inductance connected across the tank circuit or its frequency. Thus, if the grid bias is very high the tube is cut off and no inductive effect is observed.

The manner in which a reactance tube circuit takes on the property of capacitance is shown in *Fig. 12*. The following step by step action refers to the circuit action taking place:

1. A voltage E from the oscillator tank appears across C_1 and R_1.

[*Continued on page 25*]

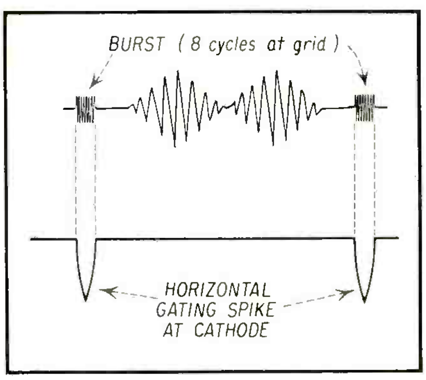

Fig. 6—Comparative burst signal and horizontal gating spike phase relations.

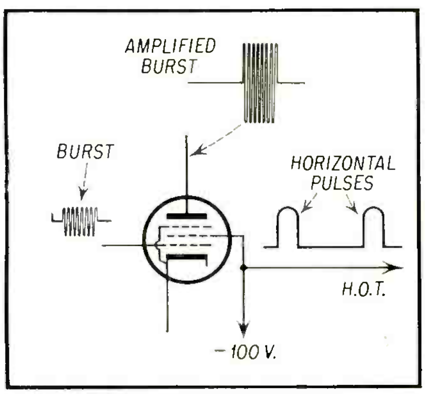

Fig. 7—Alternate method used in gating the burst amplifier.

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COLOR

[from page 22]

2. A current I flows as a result of this voltage.

3. X_{c1} is made very much higher than R_1 so that the circuit is capacitive. I leads E by approximately 90 degrees.

4. The current I produces a voltage drop E_g across R which is in phase with I.

5. Since E_g is in phase with I it leads E.

6. Since I_p is in phase with E_g, I_p leads E and the circuit is capacitive.

Thus the reactance tube circuit presents an equivalent capacitive effect across the tank circuits. This equivalent capacitance may be varied by varying the grid bias on the tube. Reference to the Reactance Circuit in *Fig.* 3 will reveal the similarity between this circuit and *Fig. 12*. C_1 and R_1 in *Fig. 12* correspond to the 2 $\mu\mu f$ condenser and the

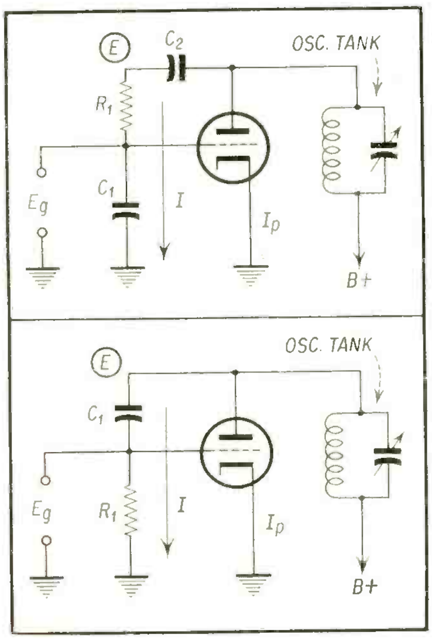
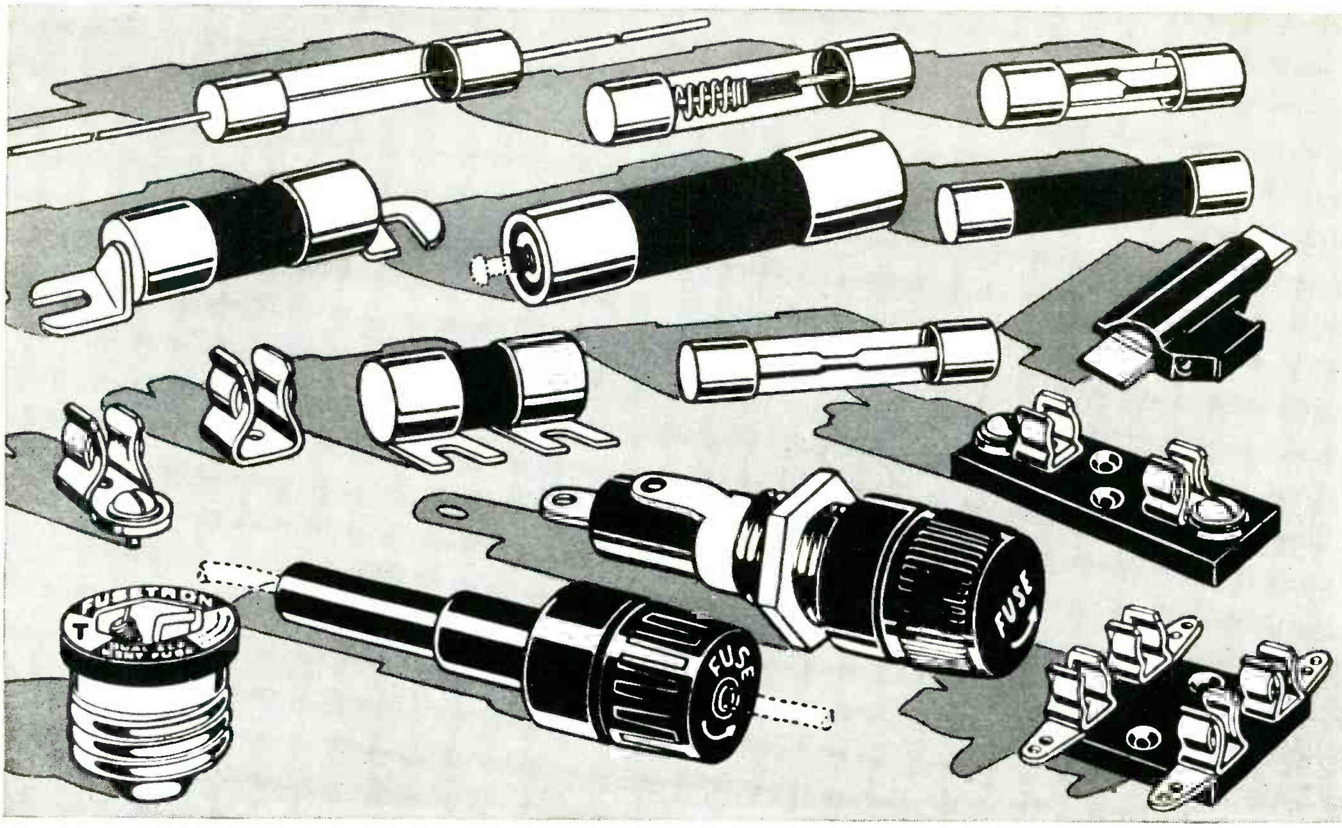


Fig. 11—(top)—Inductive circuit.
Fig. 12—(bottom)—Capacitive circuit.

1K resistor in the Reactance Circuit of *Fig.* 3.

The correction voltage from the Phase Detector is applied to the grid of the Reactance tube. If the incoming burst phase signal is in phase with the crystal controlled oscillator no correction voltage is developed. On the other hand, should the crystal controlled oscillator shift phase in either direction a correction voltage from the phase detector will be applied to the grid of the reactance tube. The latter will then take on the properties of a variable capacitance which will retune the crystal controlled oscillator back to the correct phase; that is, the phase that produces no correction voltage in the Phase Detector output.



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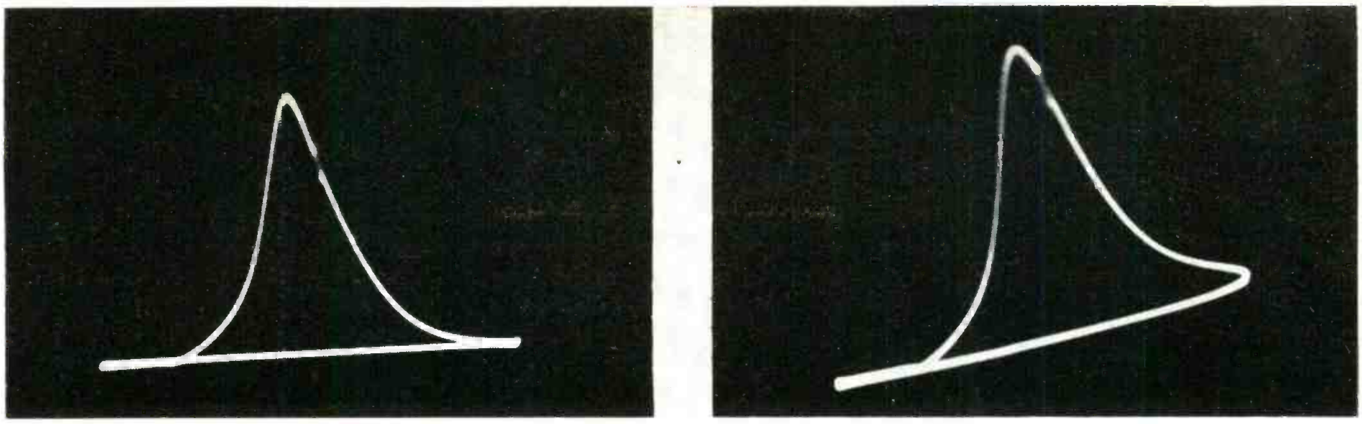


Fig. 1—(left)—I-F response curve with scope connected at output of picture detector. (Right)—Moderate distortion (tilt) of response curve with scope connected at output of video amplifier. Such distortion is usually caused by coupling or decoupling condensers too low in value. Close examination reveals that some 60-cycle hum is also apparent.

VIDEO AMPLIFIER Servicing Hints

By ROBERT G. MIDDLETON

Field Engineer, Simpson Electric Co. Author of TV Troubleshooting Guide, Vols. I and II and co-author of TV Test Probes with Alfred A. Ghirardi, published by John F. Rider

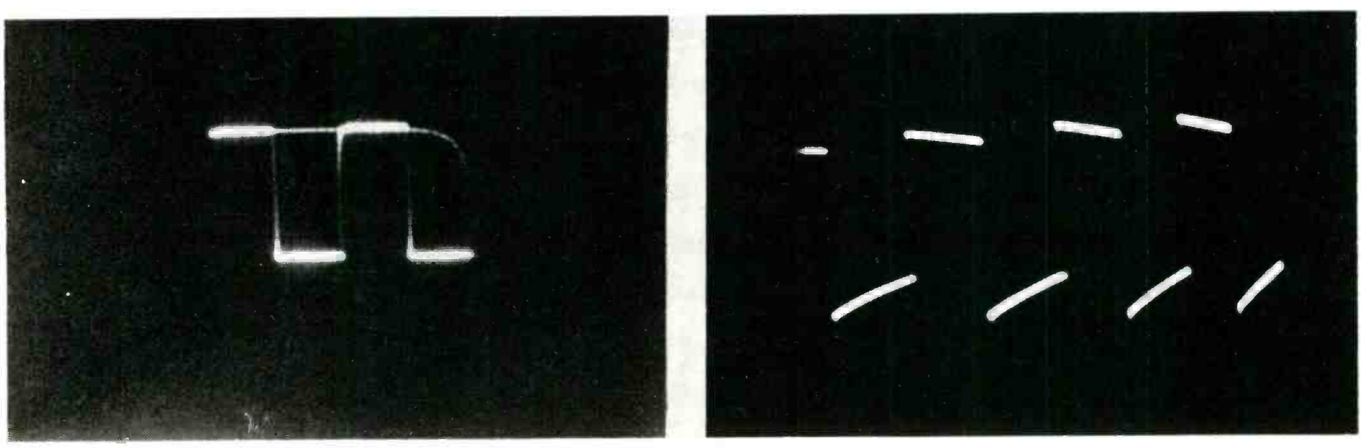
Servicemen may use the scope as a tool to detect elusive video amplifier troubles. Certain patterns showing up on the scope indicate specific circuit faults. Some of these are discussed in this article.

THE video-amplifier section of the receiver is an important link in the reproduction of a distortionless picture. Because the video amplifier "looks simple," it is often neglected during servicing of the signal circuits, with the result that although the *rf*, mixer, and *if* circuits are in proper alignment, picture quality is poor. The points noted below will serve to point out the more important of these difficulties, and explain how to correct them at the bench.

Sixty-Cycle Phase Distortion in Video Amplifier Changes Shape (Tilt) of I-F Response Curve

As shown in *Fig. 1*, the *if* response curve may have a different appearance at the output of the video amplifier as compared to the output of the picture detector. For the record, the curve should have the same appearance in either case, and if a difference is found, the difficulty is due to low-frequency phase distortion. Low-frequency phase distortion produces a background smear, or change in shading from top to bottom of the picture, which may be confused with *dc* restorer trouble, or possibly with 60-cycle hum in the video signal. Of course, combinations of

Fig. 3—(Left)—Undistorted passage of 60-cycle square wave through video amplifier. (Right)—Tilt introduced into reproduced square wave by phase distortion. Amplitude distortion is also present, causing the tilt to develop in an unsymmetrical manner. Speed and accuracy in interpreting TV receiver video waveforms of this type comes with practice.



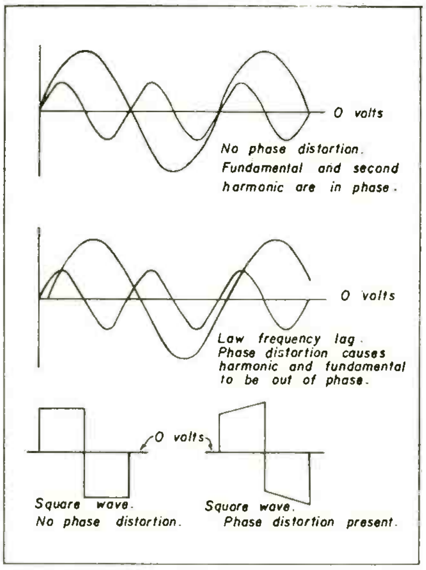


Fig. 2—Practical pointers on phase distortion. See text for details.

these difficulties are responsible for poor background rendition in some cases, but of these, phase distortion is most likely to be overlooked.

Phase distortion is usually caused by coupling or decoupling capacitors in the video-amplifier circuit which are too low in capacitance. Electrolytic capacitors, such as used in the low-frequency compensation circuit are frequent offenders. The nature of phase distortion is shown in *Fig.* 2, from which it is seen that phase distortion means that the high frequencies do not travel through the circuit at the same speed as the low frequencies. When high frequencies arrive at the picture tube out-of-step with low frequencies, typical smear and phase distortion become apparent.

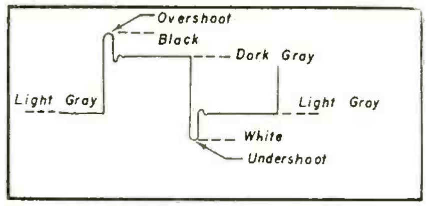


Fig. 4—Over- and undershoot result from too high values of damping resistors across peaking coils.

Why does the *if* response curve show the presence of phase distortion? It does so, because the *if* response curve is a member of the generic family which includes a 60-cycle square wave. When a square wave is passed through a video amplifier with phase distortion, tilt is introduced into the square wave, as shown in *Fig.* 3. Likewise, phase distortion in a video amplifier must introduce tilt into the *if* response curve, as seen in *Fig. 1*.

Overshoot of Square Wave Causes Trailing Reversal in Picture

As shown in *Fig. 4*, overshoot and undershoot cause trailing reversal in the picture. Trailing reversal causes the edge of a light-gray object to be outlined with a black line, and causes the edge of a dark-gray object to be outlined with a white line. This distortion has the effect of crispening the picture somewhat in a low-definition receiver, and some technicians adjust the damping resistors across the peaking coils to obtain a certain amount of overshoot in the square-wave response.

Whether or not overshoot develops in a video amplifier depends upon whether the L and C in the amplifier is overdamped or underdamped, as shown in *Fig.* 5. In this respect, the plate-load resistors and the plate resistance of the video-amplifier tubes exert damping influence upon the peaking coils. The capacitance associated with the peaking coils is distributed between winding capacitance, lead capacitance, and interelectrode capacitance of the tubes.

Insofar as picture quality is con-

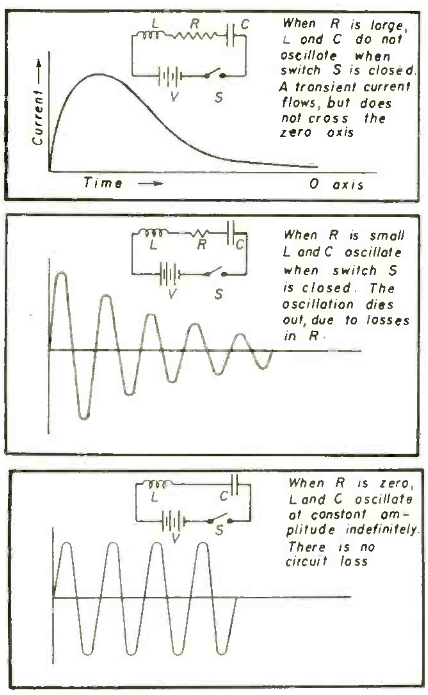


Fig. 5—Circuit responses showing overdamping and underdamping.

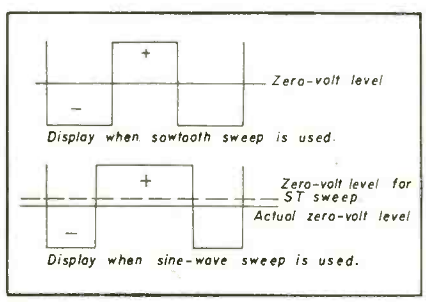


Fig. 6—Square-wave swept with sine-wave instead of sawtooth voltage: center expands; ends compress.

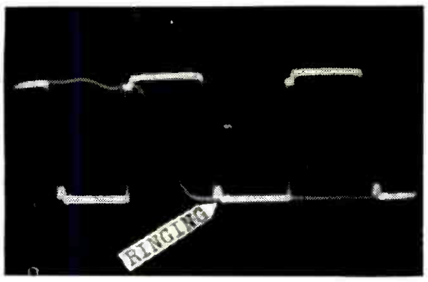


Fig. 7—Ringing in the first video stage, followed by rounded corner in second video stage, produces a notched corner (lack of crispness).

cerned, it is found that the phase characteristic of the video amplifier is of more importance than the frequency characteristic. For this reason, more informative data are obtained from a square-wave test of the video amplifier, than from a sweep-frequency test. Although it is possible to determine the phase characteristic of a video amplifier from a study of the frequency characteristic, the determination is somewhat difficult, and the square-wave test is much more practical.

It is found in practice that the picture quality developed by a video amplifier is not necessarily better because the frequency-response characteristic is made quite flat. On the other hand, a trailing video-amplifier characteristic provides the best square-wave response. However, if the *if* response is quite poor, the technician may be forced to use high-frequency peaking of the video amplifier to build up some of the high-frequency losses in the video amplifier. Accordingly, practical situations usually call for some compromises.

Use of 60-Cycle Sine-Wave Sweep Instead of Sawtooth Sweep Changes Display

Because 60-cycle sine-wave sweep is practically standard when running frequency-response curves, the technician often utilizes 60-cycle sine-wave sweep when running a 60-cycle square-wave test of a video amplifier. It is immaterial whether sine-wave or sawtooth sweep is utilized, but the operator must recognize the characteristic change in the horizontal development of the display, as shown in *Fig. 6*.

Tilt and Overshoot Are Independent of Square-Wave Frequency

Overshoot of a reproduced square wave may occur either at low frequencies or at high frequencies. If overshoot is developed at high frequencies, it is also present when a low-frequency square wave is passed through the video amplifier; however, the overshoot may be invisible when a low-frequency square-wave test is made, because the details of the leading and trailing edges become so highly compressed at low repetition rates.

Furthermore, it is not always true that a low-frequency square wave will ring the high-frequency video circuits to the same degree as will a high-frequency square wave. There are several reasons for this situation; first, the rise time of a square-wave generator is not always as fast at low frequencies as it is at high frequencies (although some generators develop the same rise time at any repetition rate). Second, the harmonics of a square wave drop off in voltage with the order of the harmonic. The 20th harmonic is only 1/20 as strong as the fundamental, and the 50th harmonic is only 1/50 as strong. Hence, even if the output waveform from the square-wave generator is practically perfect, the ringing circuits have more voltage applied to them at their resonant frequency when the square-wave repetition rate is high.

Tilt remains constant in percentage as the frequency of the square-wave test is varied, but tilt developed at low frequencies may be overlooked during

[*Continued on page 60*]

Enterprising T.V. Serviceman Brings Shop To Customer

A TRUCK that is capable of servicing a majority of television complaints at the home of the set-owner is the "Ryan Mobile-Kar."

The first of its kind in the United States, this rolling TV repair shop was designed and built by H. Michael Ryan of 1310 W. Broad St., Richmond, Virginia. The idea is to increase the convenience of servicing sets both from the customer's viewpoint and the serviceman's.

Serviceman at work inside the Mobile-Kar. Note location of test panel and AC receptacles.

According to Ryan, his Mobile-Kar is ideally suited for suburban areas. It can be parked practically on the customer's doorstep. This, says the inventor, brings the serviceman closer to the consumer helping to increase confidence in the serviceman. It also serves as a free advertising campaign for the serviceman, since his trade-name and insignia printed on the truck would be plainly visible to all. Another factor: with a repair shop doing reliable work and capable of coming to a community that is relatively remote from the main shopping area, many potential customers may be encouraged to bring their sets over to the truck. Repair jobs that might have gone undone because of the inconveniences of time and distance would now be facilitated.

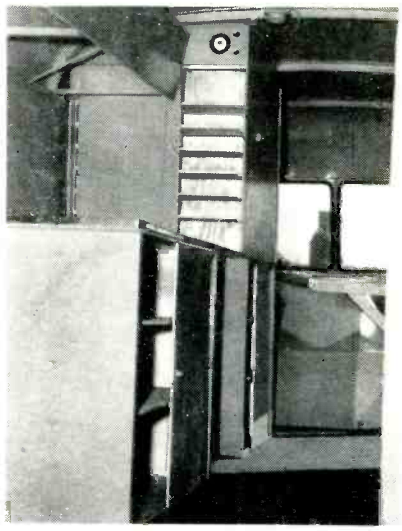
H. Michael Ryan designed and built the Mobile-Kar, first of its kind.

Power Plant

The "Ryan Mobile-Kar" is equipped with a self-contained 110 volt, 60 cycle, 1000 watt power plant that runs off the truck engine. Its interior is fitted with work-benches, storage cabinets containing adjustable shelves, tube compartments, and test panels that will accommodate all standard types of test equipment. There are start and stop switches for the power unit as well as a meter for maintaining the 60-cycle, 110 volt output. After long research, the power plant has been made virtually noiseless and vibrationless.

Work-benches and test panels are equipped with 110-volt receptacles. In addition, there is an overhead ventilator and rubber-lined floor.

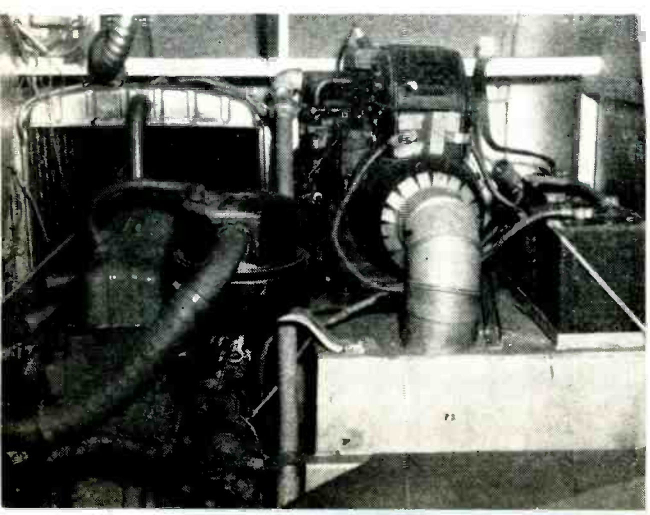
Built onto the chasis of a standard Chevrolet panel delivery truck, the pilot model shown at the top of this page is the result of nine months study and research.



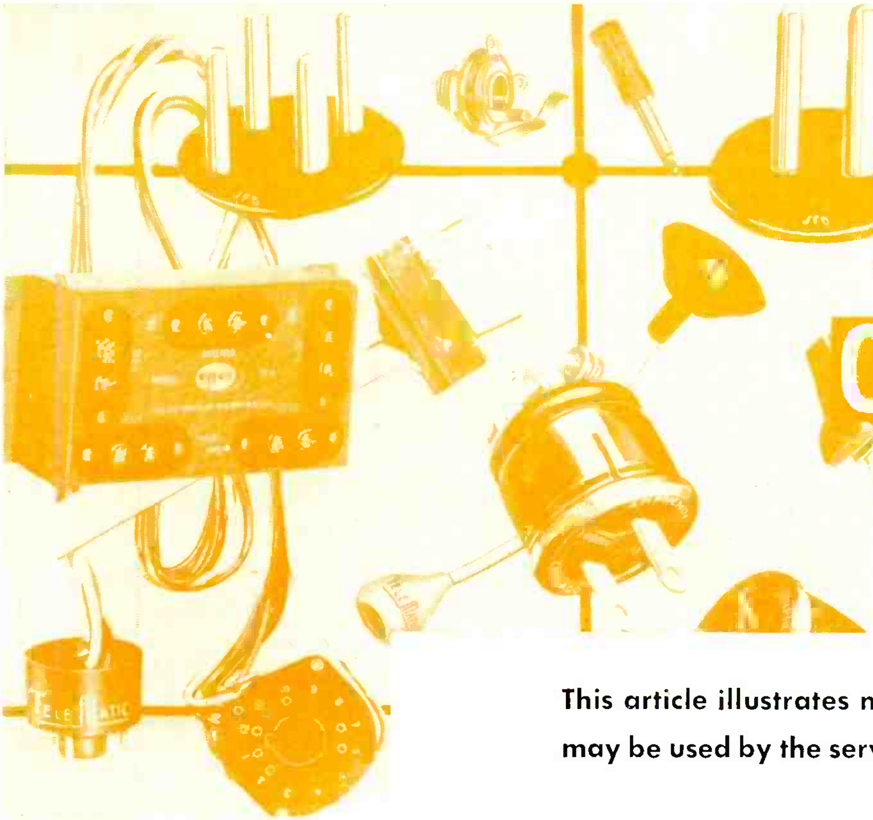
Interior showing work-bench, storage area, 60 cps meter, start-stop switch, test panel.

Physical Features

In addition to the rear doors, Ryan has developed two side doors that open to four feet wide to permit easy access of equipment to and from the sidewalk. Body length from the back of the driver's seat is 12 feet. Inside width is 6 feet, 3 inches. Inside height is such that a man as tall as 6 feet, 3 inches can stand erect and move about in comfort. The front of the truck has been modified as shown in the photo; in addition it contains clearance lights, front and rear turn signals, and triple side-view mirrors.



Generator (right) puts out 110 volts at 60 cps, is vibrationless, runs off truck engine (left).



UNIVERSAL TEST-BENCH CONNECTORS

BY IRVING TEPPER

The illustrations shown at the left were made available through the courtesy of: Amphenol, EBY, EPCO, Insuline, JFD, and Telematic.

This article illustrates many types of connectors that may be used by the serviceman to speed up his work.

SAVING time pays dividends in service efficiency and increased customer satisfaction. If repair time can be reduced for the individual television receiver without impairing the quality of the service then the serviceman can realize a greater return for his time. A simple device such as a test speaker can save time for both the bench man and outside man. If the outside man knows that all speakers of certain types can be provided for in the shop he will not spend the time necessary to remove it. This article will attempt to show some of the many time savers used by the servicemen in the field. These are:

(1) test speaker and leads
(2) special extension leads
(3) device for rapid parts substitution
(4) antenna system for the service bench

Test Speaker

All universal test speaker designs ever seen by the author have been very complex because they attempt to make provisions for all voice coil impedances, output transformer impedances and field coil resistances. This always presents constructoin complications and application problems. Evaluating all types of speakers encountered we find the popularity rating as follows:

(1) PM speaker
(2) PM speaker and output transformer
(3) field coil type

A simple test speaker can be made if no provisions are made for field coils or different impedances of output transformers. The average impedance of the TV output transformer is from 5,000 to 7,000 ohms, and should have a wattage rating of at least 7 watts. When selecting a speaker for the test unit it should be a PM type of the largest size possible so that it will stand up under the abuse it is bound to receive. *Fig. 1* shows the diagram of the test speaker circuit. Even a simple test speaker has little value unless it is easily connected to the set under test. For this purpose

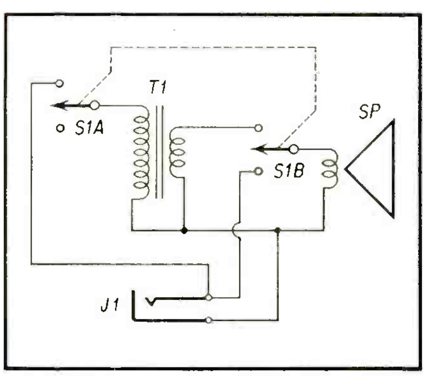


Fig. 1—Test speaker circuit.
SP—largest PM available.
S1 (A & B)—DPDT toggle.
T1—Stancor A 2313.
J1—I.C.A. 1870 open circuit jack.

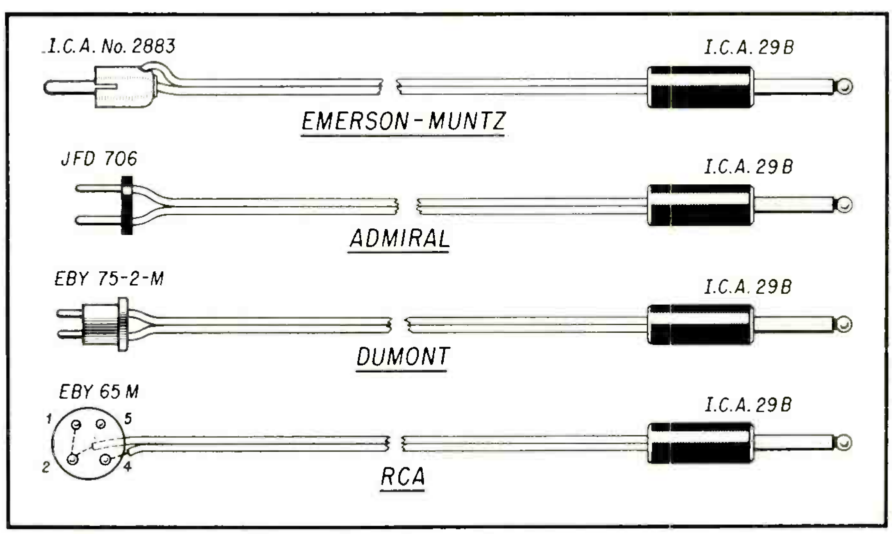


Fig. 2—Sets of leads for typical sets.

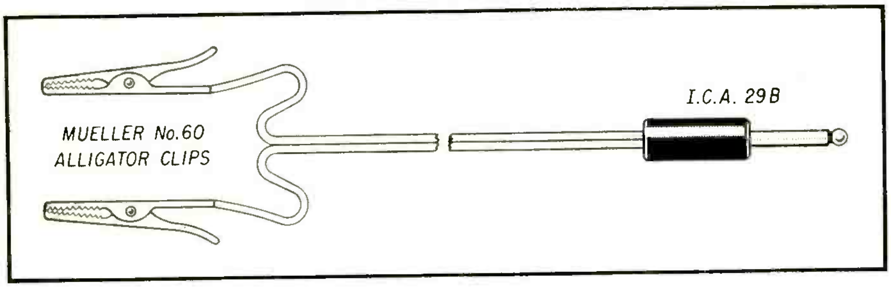


Fig. 3—General purpose leads using any type wire.

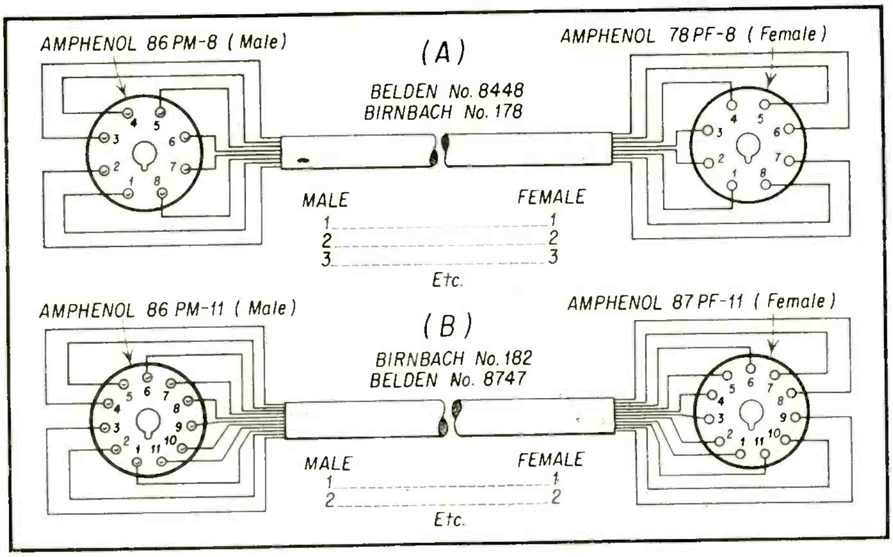


Fig. 4-A shows octal extension; B eleven prongs.

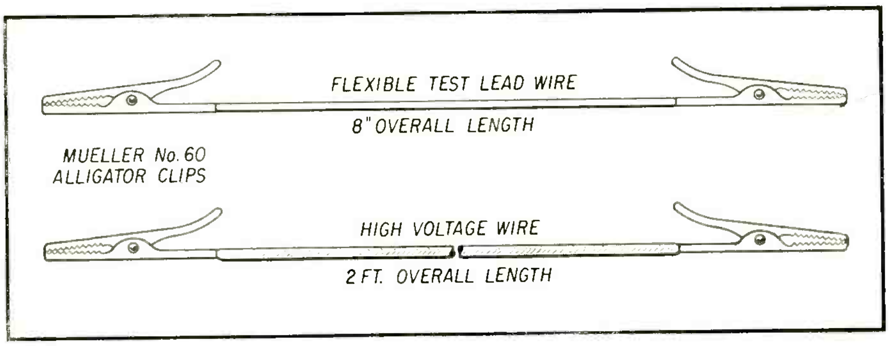


Fig. 5—General purpose extension leads.

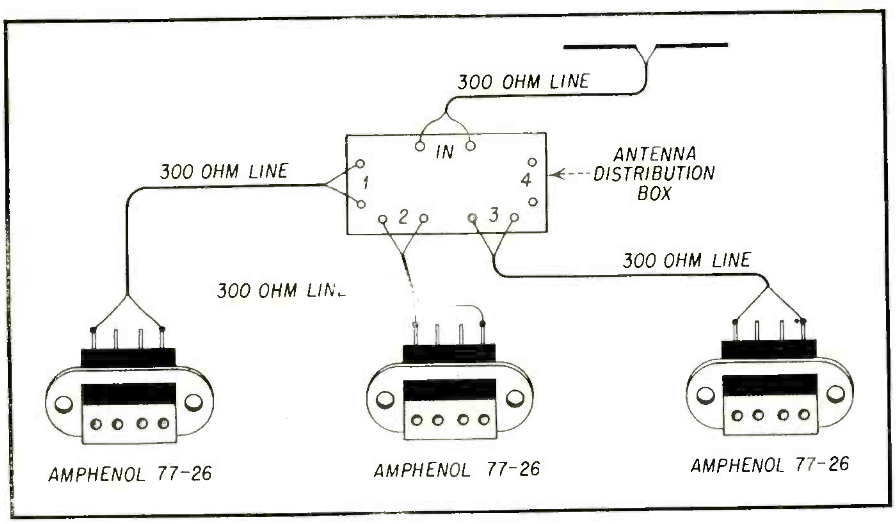


Fig. 7—Bench antenna system.

a set of leads were made to fit the more popular television sets. These leads are shown in *Figs.* 2 and 3. If other type sets are encountered frequently appropirate sets of leads can be made in much the same manner.

Extension Leads

The need for extension leads of special types have been so evident that several manufacturers do produce the most necessary types. These are:

(1) CRT extensions
(2) H.V. extensions
(3) octal plug extensions

The CRT and high voltage extensions are simpler bought than made because of the difficulty in getting the proper fittings for them. However the octal extension can very easily be assembled with readily available parts. This cable is shown in *Fig 4A.* The cable may be used for setting up receivers for test on the bench when the cables are too short. Some typical examples are the Philco split chassis receivers and the RCA KCS47 and KCS49. For the Freed Eisman Model

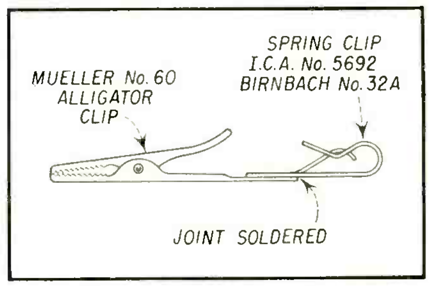


Fig. 6—Substiting clips.

1620 an 11 prong cable of the same type is almost a necessity. This cable is shown in *Fig. 4B.* These cables serve a specific purpose. There is a crying need for general purpose extension leads. These can be made up in varying lengths and special wire for each application. These are shown in *Fig. 5.*

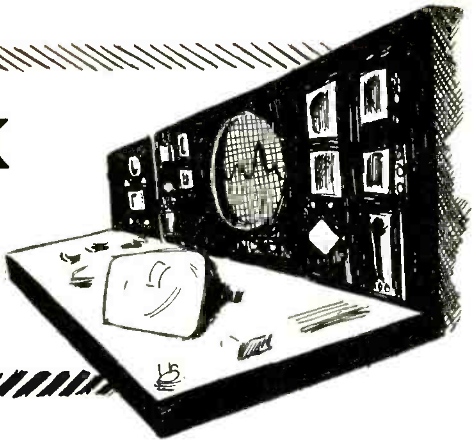
Rapid Parts Substitution

When servicing we very often come upon situations where new parts are needed but the values for some reason are in doubt. Determining the correct value part usually entails a trial and error procedure. With several values to be tried, time is lost soldering and unsoldering. Even if the parts are only crimped into place it is time consuming. This type of job can be done in much less time if the device shown in *Fig. 6* is made. The shank of the alligator clip is flattened in a vise and then tinned. The spring clip is then soldered to the alligator clip shank with a heavy iron. With a pair of these clips, condensers or resistors can be connected into a circuit with ease. The serviceman should

[*Continued on page* 63]

THE WORK BENCH

BY PAUL GOLDBERG



Vertical Hold Problems in Three Sets

THREE vertical hold problems have been chosen for our discussion. These should prove exceedingly interesting as they are rather odd.

Philco Model 52-1882-121, RF chassis 44, Deflection Chassis D4—Vertical Roll

The set was turned on and the picture immediately began to roll. The vertical hold was adjusted and the vertical range was found to be satisfactory, but the picture could not be brought into sync. The set was acting as if no vertical sync pulses were reaching the vertical generator. However, when the contrast control was turned to maximum, the vertical did make a feeble attempt to go into sync but immediately began to slip out of sync again. All the tubes that might affect the vertical sync (V1, V2, V3 and V4) were changed, but none of these seemed to solve the problem.

It was then decided to set up the oscilloscope and check a few waveforms to see if the trouble could be localized to a single stage. The wave form was first checked at point "W," the point at which the vertical sync pulse enters the vertical generator. It seemed a good idea to start here and work back. The wave-form showed the vertical sync pulse riding on a vertical generator wave, but the sync pulse was exceedingly small. Before going further, however, the horizontal hold control was carefully checked to determine whether the horizontal sync circuits were functioning properly. Since they were O.K. the sync amplifier circuits of V1B, V2A, and V2B were eliminated as possible sources of trouble as these circuits would also affect the horizontal sync. Also eliminated was the grid circuit of V4A for the same reason.

Well, where did this leave us? It left us at the plate circuit of V4A, the sync inverter tube (7N7). The scope was set aside and the plate voltage was measured. It was exactly what the diagram called for. The vertical range of the oscillator was okay; therefore, it seemed improbable that *C700, C606,* and *C605* could cause the trouble. The resistance values of *R613, R614,* and *R615* were checked and found to be satisfactory.

Here was a baffling case to say the least. It was recalled that in many sets, a grid to cathode leak in the picture tube could cause the vertical to slip. However, in those cases, the sync pulses were fed to the sync amplifiers from the plate circuit of the video output tube [what we can consider the input circuit of the picture tube], while in this receiver the sync pulses are taken off in the plate circuit of the first video amplifier, V1A (12AV7).

This gave us an idea. It was decided to check the first video amp for a defective component that could affect the vertical sync pulse without affecting the picture quality. (From a visual inspection, the picture quality seemed to be satisfactory.) The circuit was studied

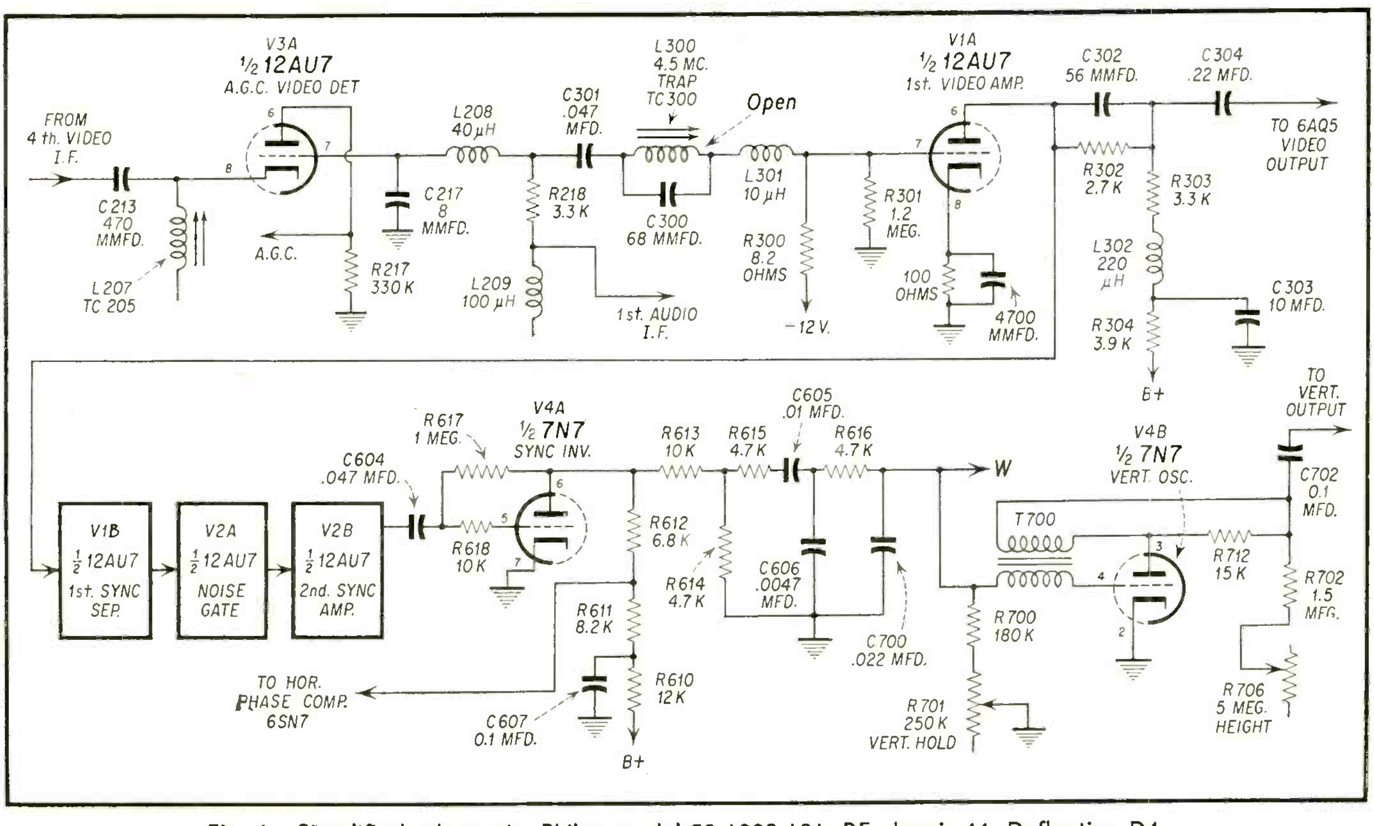


Fig. 1—Simplified schematic, Philco model 52-1882-121, RF chassis 44, Deflection D4.

carefully with the idea of picking some component that would meet these qualifications. It was observed that any defective component in the plate circuit of V1A would most certainly affect the picture quality. However there was a possibility of just such a component in the grid circuit. At this point the resistance of L300 was checked and found open.

One can see that the 68 *uuf* condenser, C300, in parallel with the open L300, can easily transfer to V1A the video information, the horizontal sync pulses, but *not the vertical sync pulses.* The reactance of a 68 *uuf* condenser to the 60 cycles sync pulse is so high that very little of this signal can get through indeed. Now, very rarely do coils open. In most cases, the pigtails of the coils have been poorly soldered. This case was no different. The pigtail of L300 was resoldered and it read its normal resistance of 2 ohms.

L300 and C300 act as a 4.5 *mc* trap. It was noticed now, with the 4.5 *mc* trap functioning properly, a slight amount of herringbone was removed from the picture. We wish now that we had noticed this slight amount of herringbone at first; it might have saved us a lot of time. Oh well! All in a day's work.

Du Mont RA164—Critical Vertical Hold

The vertical hold was found to be very critical, although the vertical range

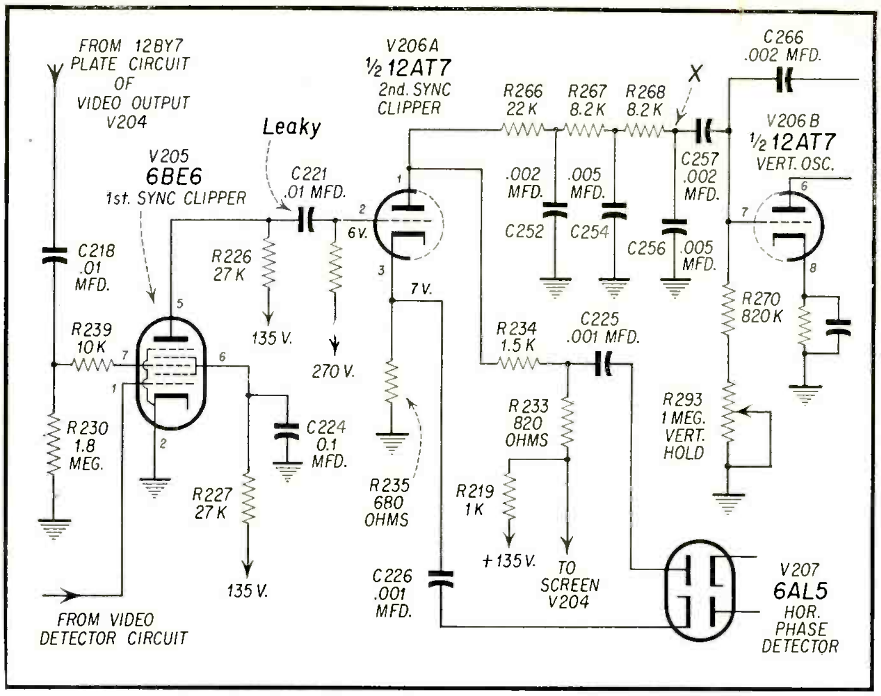


Fig. 2—Simplified schematic, Du Mont RA-164.

seemed fine. The horizontal hold was then varied to check its operation and found satisfactory. The picture quality and gain were also okay.

First replaced were the sync amp tubes V205, V206; but this did not cure the trouble. The scope was then set up and a waveform check at point "X" was taken. Here we found the vertical sync pulse exceedingly small. C252, C254 and C256 were then checked for leakage, but these condensers were perfect. The resistors in this integrator network, R266, R267, R268, also checked satisfactory.

Now, normally any defective component in the clipper circuits (V205) 6BE6, and (V206A) ½ 12AT7, should affect the horizontal syncs, but the horizontal sync was okay. Not to overlook any possibility, however, we measured the plate voltage of V206A, 1/2 12AT7. It was 50 volts, while the diagram called for 100 volts to ground. The next move was to check the grid of V206: and it measured about 20 volts. Here the diagram called for 6 volts to ground. C221, .01 *mf*, was then clipped at the grid and checked for leakage. We were not surprised to find it leaking badly. It measured about 50,000 ohms.

After replacing a new 600 volt, .01 *uf* condenser the vertical hold was no longer critical. The odd thing about this trouble was that the leaky condenser did not seem to affect the horizontal sync. So to prove a point, we placed a shorting bar across C221 and turned the set on. The set now would not hold vertically and the horizontal held only in the center of the horizontal hold control range; whereas before the horizontal hold control would hold over its entire range. This seems to prove that different amounts of condenser leakage can cause different results, especially in sync clipper circuits where the tubes are biased so critically.

G.E. 10T1—Critical Vertical Hold

Although the vertical hold in this set was critical, the horizontal hold seemed satisfactory. Furthermore, at a normal

[*Continued on page 62*]

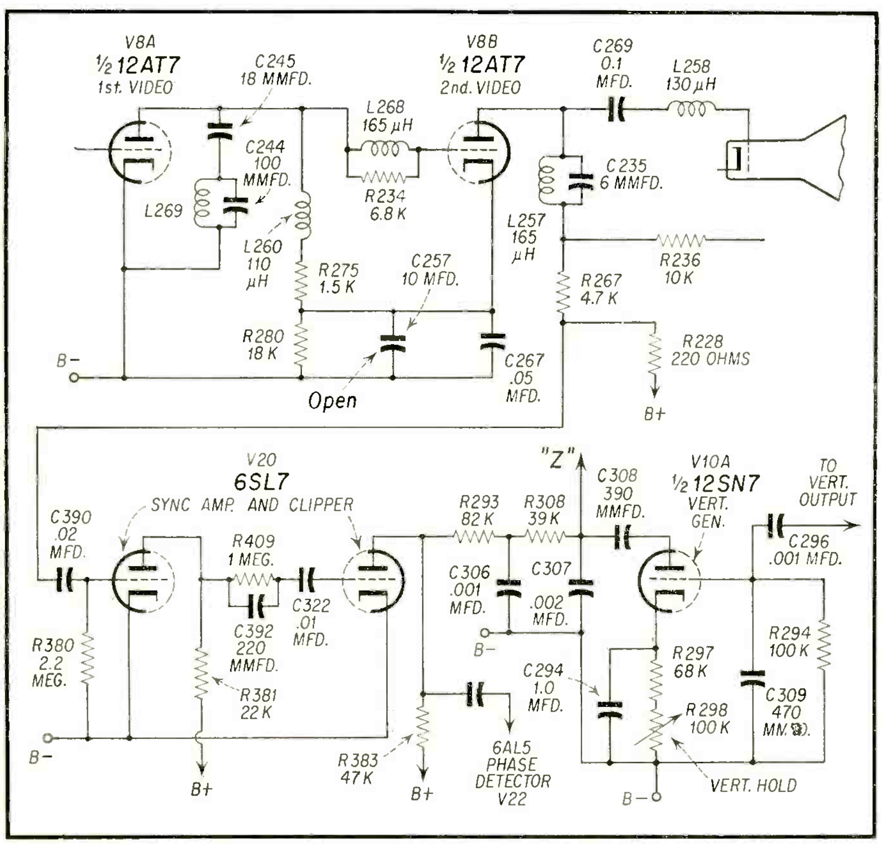


Fig. 3—Simplified schematic, G.E. 10T1.

Mfr: Emerson **Chassis** 120066B

Card No. EMO66-1 **Model No.** 571

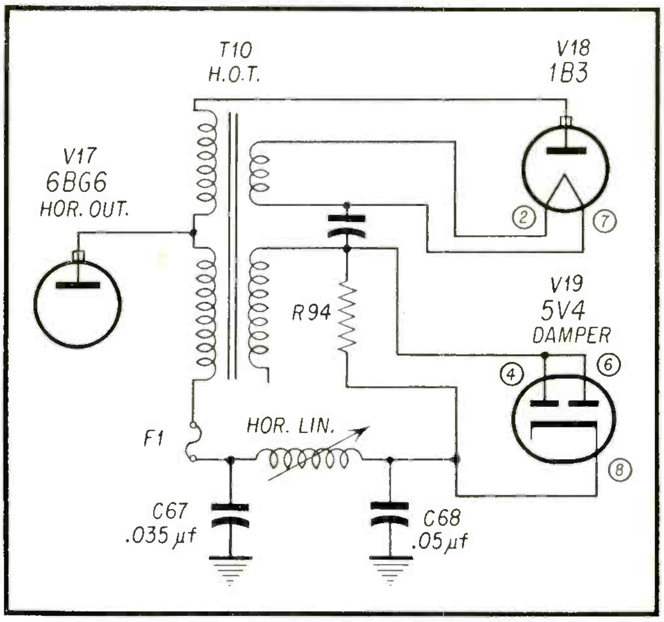
Section Affected: Raster

Symptom: White vertical lines on left side and horizontal linearity

Cause: Open resistor in damper circuit

What To Do:

Replace: *R94* (7.5K)



Mfr: Emerson **Chassis No.** 120066B

Card No. EMO66-2 **Model No.** 571

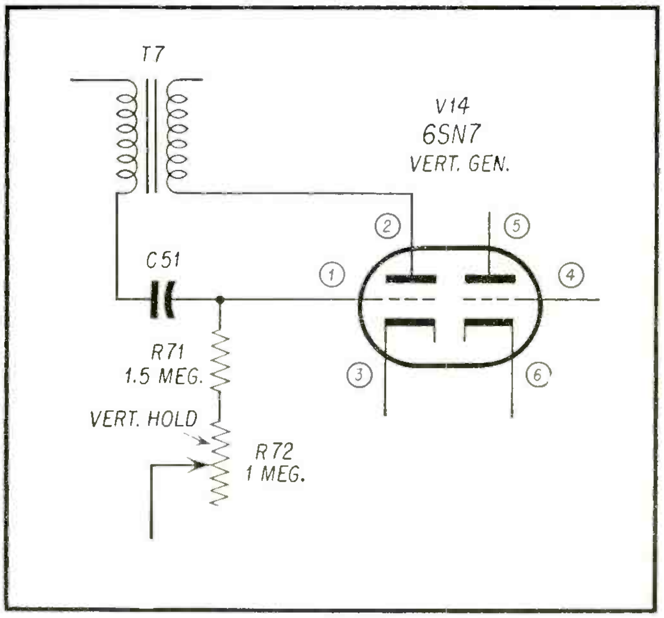
Section Affected: Sync.

Symptom: Vertical hold out of range

Cause: Leaky Condenser

What To Do:

Replace: *C51* (.003 *µf*)



Mfr: Emerson **Chassis No.** 120066-B

Card No. EMO66-3 **Model No.** 571

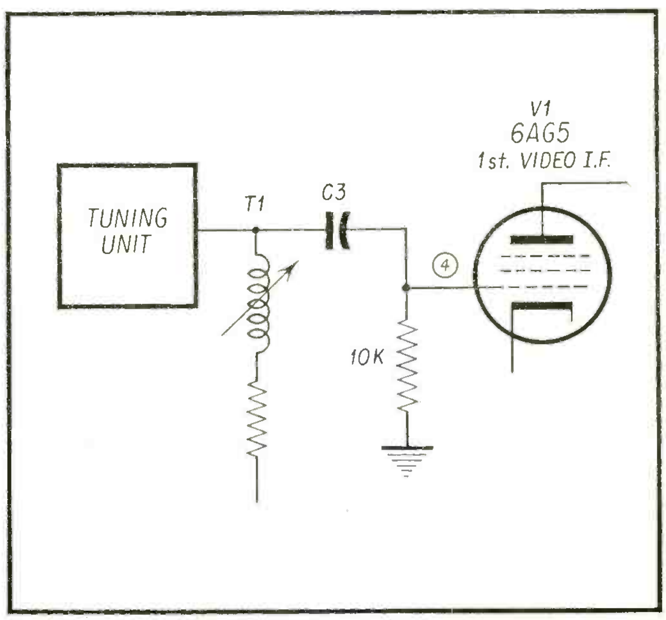
Section Affected: Pix

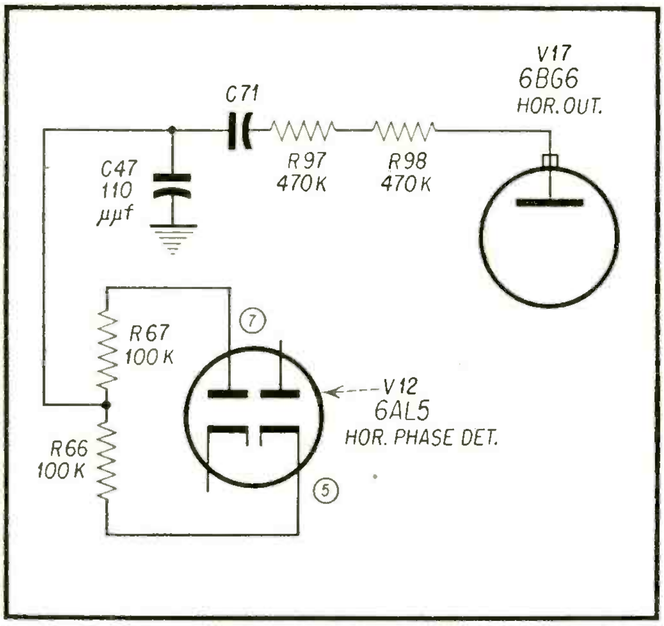
Symptom: Video overload

Cause: Leaky coupling condenser

What To Do:

Replace: *C3* (270 *µµf*)





Mfr: Emerson **Chassis No.** 120066-B

Card No. EMO66-4 **Model No.** 571

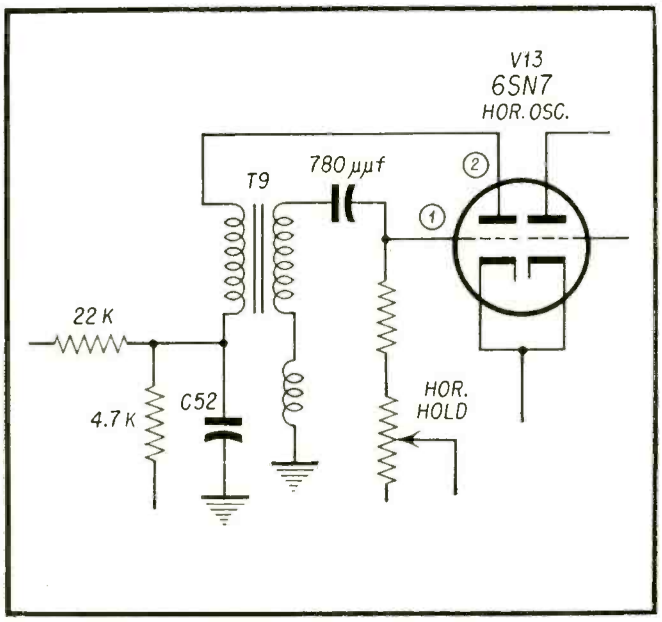
Section Affected: Sync

Symptom: Horizontal tearing

Cause: Defective component

What To Do:

Replace: *C71* (.005 μf)—Leaky *Also R97* (470K)—probably increased in value and burned



Mfr: Emerson **Chassis No.** 120066-B

Card No. EMO66-5 **Model No.** 571

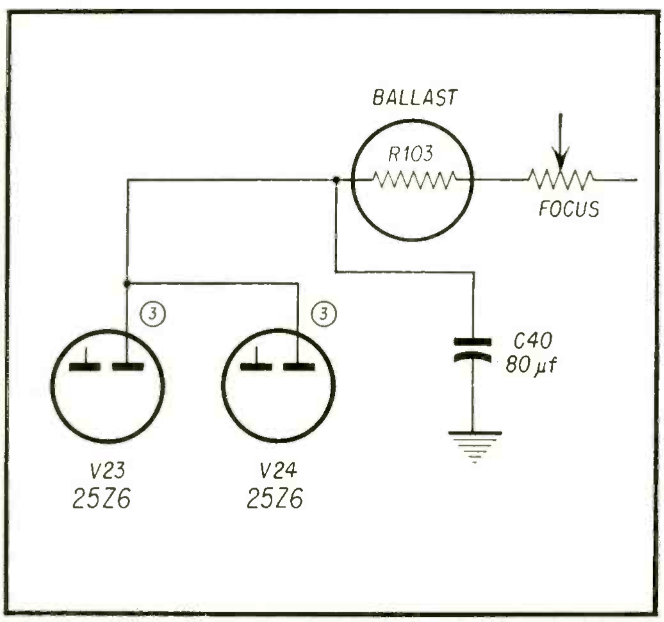
Section Affected: Sync

Symptom: Horizontal Frequency far out of range

Cause: Leaky condenser

What To Do:

Replace: *C52* (8 μf)



Mfr: Emerson **Chassis No.** 120066-B

Card No. EMO66-6 **Model No.** 571

Section Affected: Raster

Symptom: No raster

Cause: Open filter condenser

What To Do:

Replace: *C40* (80 μf)

Mfr: Motorola **Chassis No.** TS23B

Card No. MO23-1 **Model No.** 12VT13

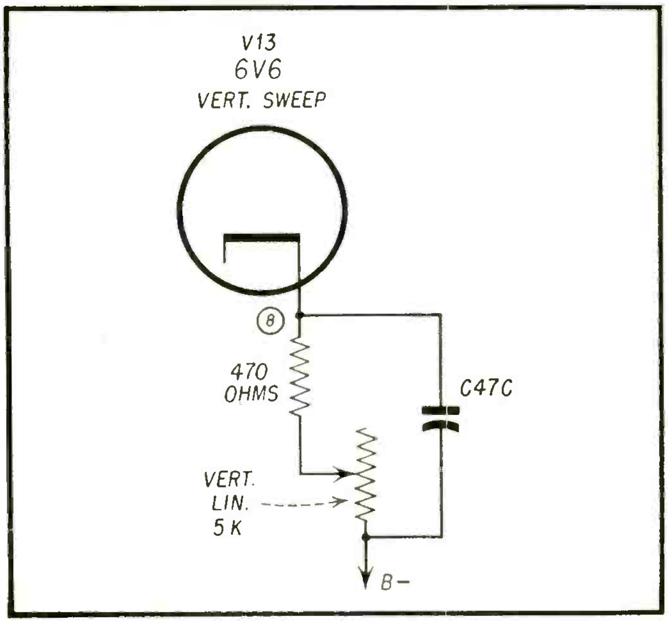
Section Affected: Raster and Pix

Symptom: Poor vertical linearity—not enough height

Cause: Defective component

What To Do:

Replace: *C47C* (100 μf)—opens up



Mfr: Motorola **Chassis No.** TS23B

Card No. MO23-2 **Model No.** 12VT13

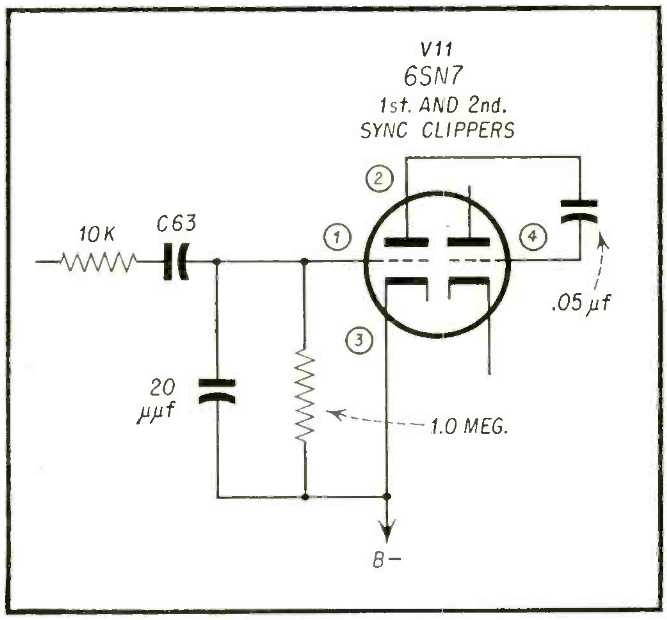
Section Affected: Sync

Symptom: Vertical and horizontal instability

Cause: Defective component

What To Do:

Replace: *C63* (.001 μf)—leaky



Mfr: Motorola **Chassis No.** TS23B

Card No. MO23-3 **Model No.** 12VT13

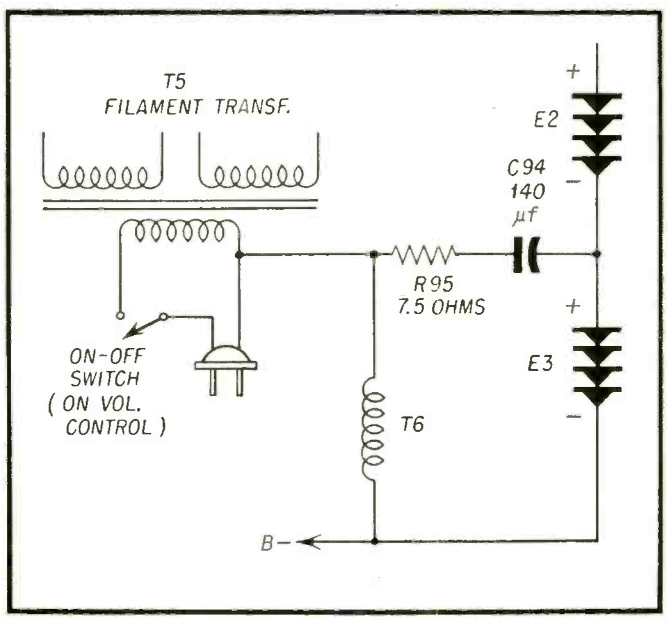
Section Affected: Raster

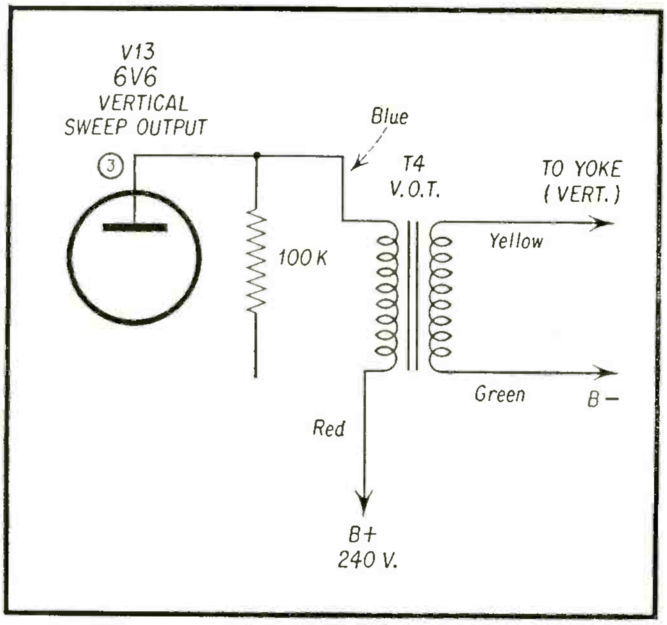
Symptom: Filaments light—No. B+

Cause: Defective component

What To Do:

Replace: *R95* (7.5 ohms)—open





Mfr: Motorola **Chassis No.** TS23B

Card No. MO23-4 **Model No.** 12VT13

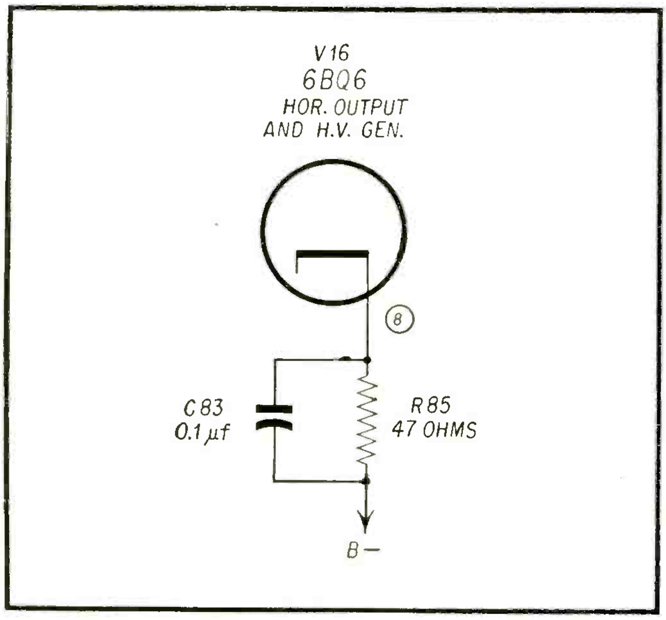
Section Affected: Raster

Symptom: Vertical shrinking

Cause: Defective component

What To Do:

Replace: Vertical output transformer (T4)



Mfr: Motorola **Chassis No.** TS23B

Card No. MO23-5 **Model No.** 12VT13

Section Affected: Raster

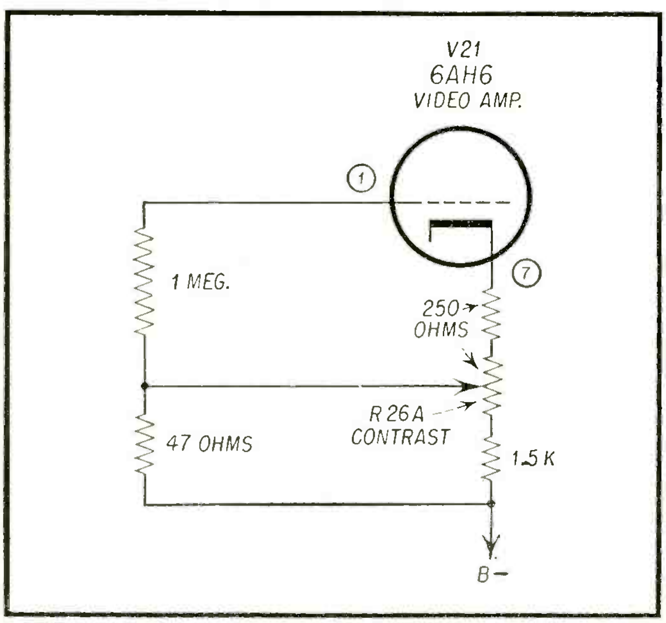
Symptom: Intermittent raster

Cause: Defective component

What To Do:

Replace: *R85* (47 ohm—½ W) with 47 ohm—1 watt; opens intermittently

---



Mfr: Motorola **Chassis No.** TS23B

Card No. MO23-6 **Model No.** 12VT13

Section Affected: Pix

Symptom: No pix

Cause: Defective component

What To Do:

Replace: Contrast control R26A (250 ohms)—opens up

Mfr: Westinghouse **Chassis No.** V2150-101

Card No. WE2150-1

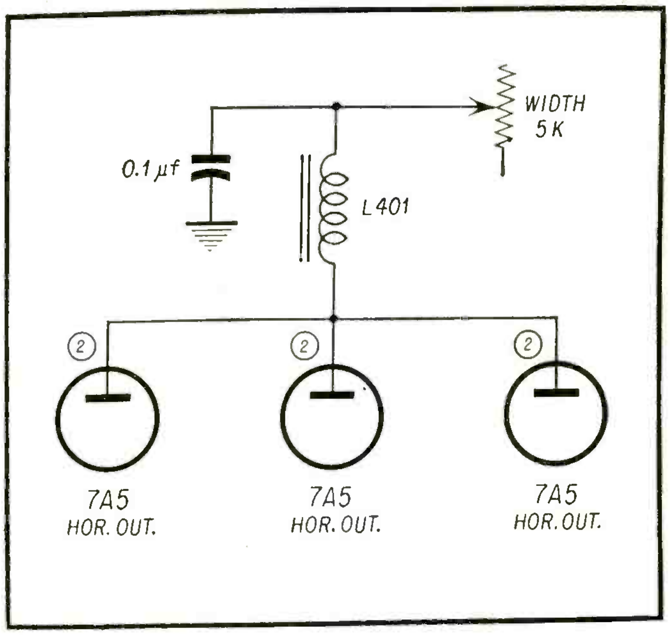
Section Affected: Raster

Symptom: No raster, no sound, 5U4's get red

Cause: Shorted condenser

What To Do:

Replace: *C422* (.1 μ*f*)



Mfr: Westinghouse **Chassis No.** V2150-101

Card No. WE2150-2

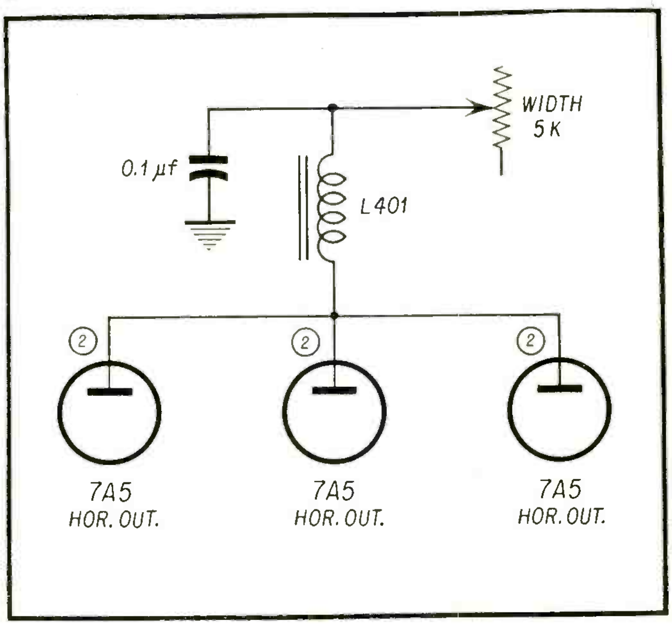
Section Affected: Raster

Symptom: Horizontal flashes—L 401 burning

Cause: L 401 arcs internally

What To Do:

Replace: L 401



Mfr: Westinghouse **Chassis No.** V2150-101

Card No. WE2150-3

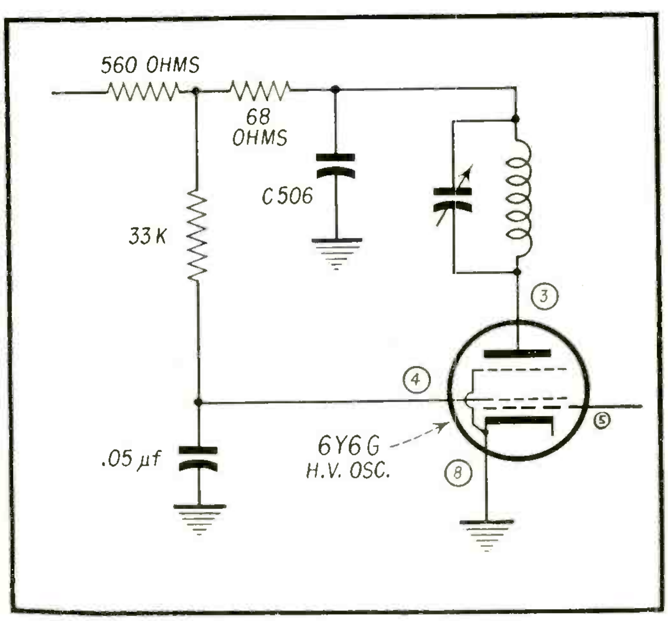
Section Affected: Raster

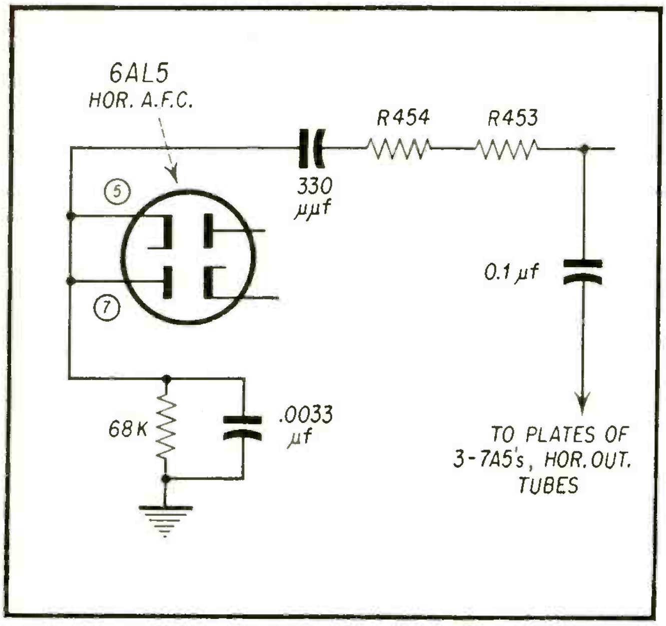
Symptom: No hi-voltage

Cause: Shorted condenser

What To Do:

Replace: *C506* (.05 *f*) also, R502 (68 ohms)—
burned





Mfr: Westinghouse **Chassis No.** V2150-101

Card No. WE2150-4

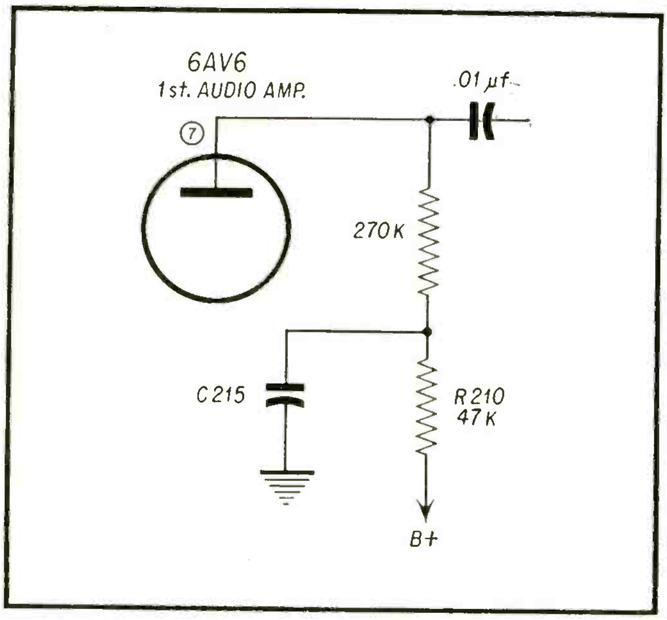
Section Affected: Sync

Symptom: Critical horizontal sync

Cause: Resistors increased in value

What To Do:

Replace: *R453* and *R454* (both 220K)



Mfr: Westinghouse **Chassis No.** V2150-101

Card No. WE2150-5

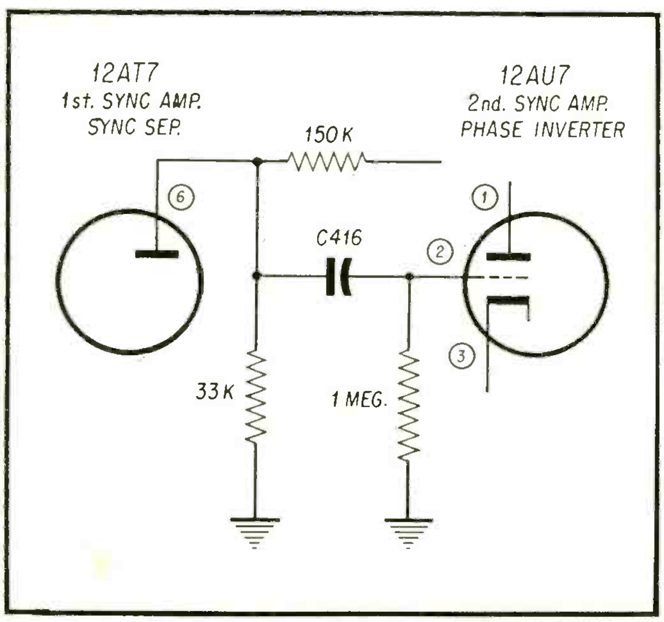
Section Affected: Sound

Symptom: No sound—R210 burned

Cause: Shorted condenser

What To Do:

Replace: *C215* (.1 *μf*)



Mfr: Westinghouse **Chassis No.** V2150-101

Card No. WE2150-6

Section Affected: Sync

Symptom: No vertical and horizontal hold

Cause: Shorted condenser

What To Do:

Replace: *C416* (.05 *μf*)

Torture Test
FOR
TV ROTATORS

by HERBERT G. KOENIG
Design Engineer, Rotator Division
Trio Manufacturing Company

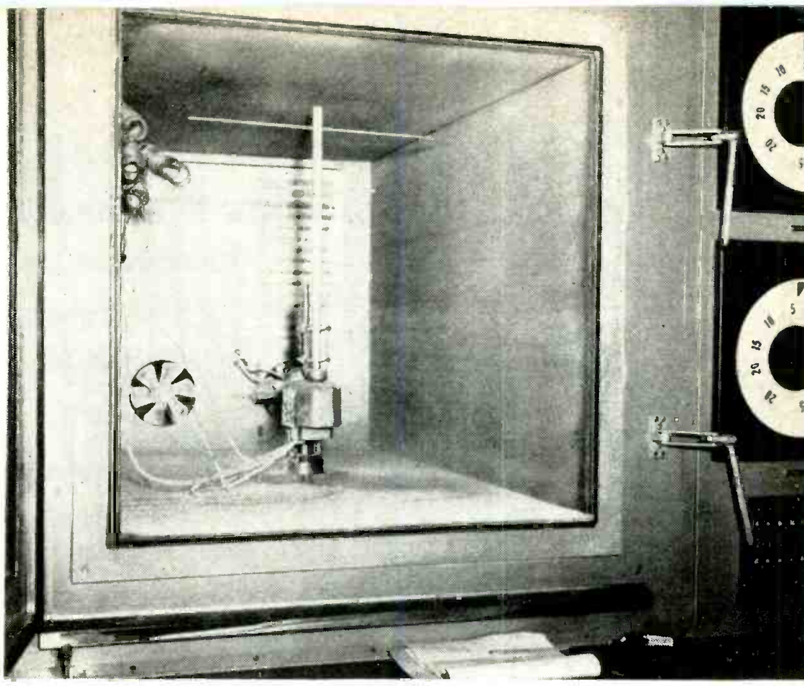


Fig. 1—Close-up of cold chamber when opened, following minus 50° F. exposure. Note icing.

TV ANTENNA rotators are wonderful things—when they work!

Any TV viewer will heartily agree, since rotator failure, for whatever cause, usually calls for service work that is expensive to the customer—and not particularly profitable for the serviceman dealer.

Because of rotator's location high on the tower where it is difficult to service and where it is constantly exposed to the worst the elements have to offer, it is of great importance that complete dependability be engineered into the unit.

After a rotator has been designed and built, actual testing under every conceivable simulated weather and load condition is indicated to prove whether the engineer's theories are correct.

One manufacturer uses a test set-up (see *Fig. 1*) which provides degrees of stress and strain up to five times greater than those encountered by a rotator supporting a Channel 4 Yagi in an average installation.

The rotator shown is a Trio (*Fig. 2*) which is supporting a 9 foot mast at the top of which are two wooden cross arms, each 85 inches long by 8 inches wide. Two 8 pound and two 4 pound weights are hung 8 inches down from the wooden cross arm ends, providing an unbalanced load.

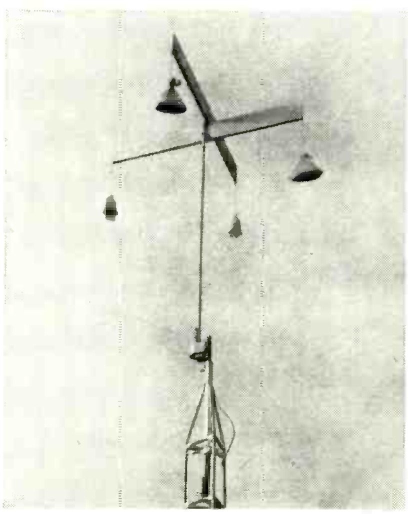


Fig. 2 — Test set-up to simulate stress and strain conditions.

The wooden cross arms offer wind resistance approximately four times greater than a Channel 4 Yagi. The loosely hanging weights apply a constantly shifting load equal to an 8 stacked Channel 4 Yagi. The uneven weight distribution provides the excessive bending moment.

The rotator shown has been in constant operation—the equivalent of 15 years normal use!

This particular test provides the engineer with conclusive proof as to whether his rotator will stand up under heavy, bulky arrays, and in high winds during actual use. Actually, this test exerts stresses and strains far greater than any rotator will be subjected to in normal usage.

Another important rotator test was taken to the Electronic Parts Show in Chicago this spring and put on display there. A standard rotator was operated *continuously*, turning to the end of rotation in one direction, then to the other, while supporting four swinging weights totalling 200 pounds. Tests such as these have guided us in constanty improving performance, by increasing the rating or design of individual components when indicated.

Part II of the rotator "torture" test involves rotator dependability during extremes of temperature. Equipment used in this test was a Bowser environmental test chamber. See *Fig. 3*.

This particular test consisted of placing a rotator in the chamber, hooking it up, and then operating it at various degrees of temperature. The rotator was checked for rotation in both directions (the Trio has two motors—one for each direction of rotation.) at 0°, −10°, −20°, −30°, −40°, and −50°. At −50° a vacuum was applied to the entire chamber to simulate the conditions of a 15,000 ft. altitude!

Throughout the test, the rotator did not falter. There was no appreciable slowing up of the operation nor, at anytime, was the accuracy of direction in any way impaired. When the temperature reached −50°, heavy ice and frost formed on the antenna, rotator housing, lead wires, etc.

To make the test even more accurate and fool-proof, the rotator was not operated continuousy. For example, when −10° was reached, the rotator was stopped and allowed to "freeze-up" if it could. This procedure was followed for every 10° drop in temperature. Happily, even after a "freezing-up" wait at the −50° mark, when the rotator was turned on, it broke the encasing ice and functioned perfectly.

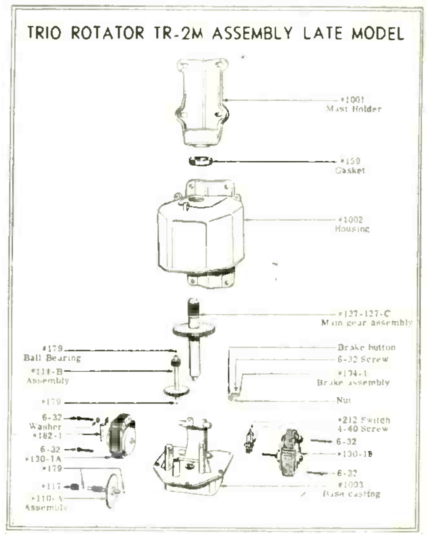
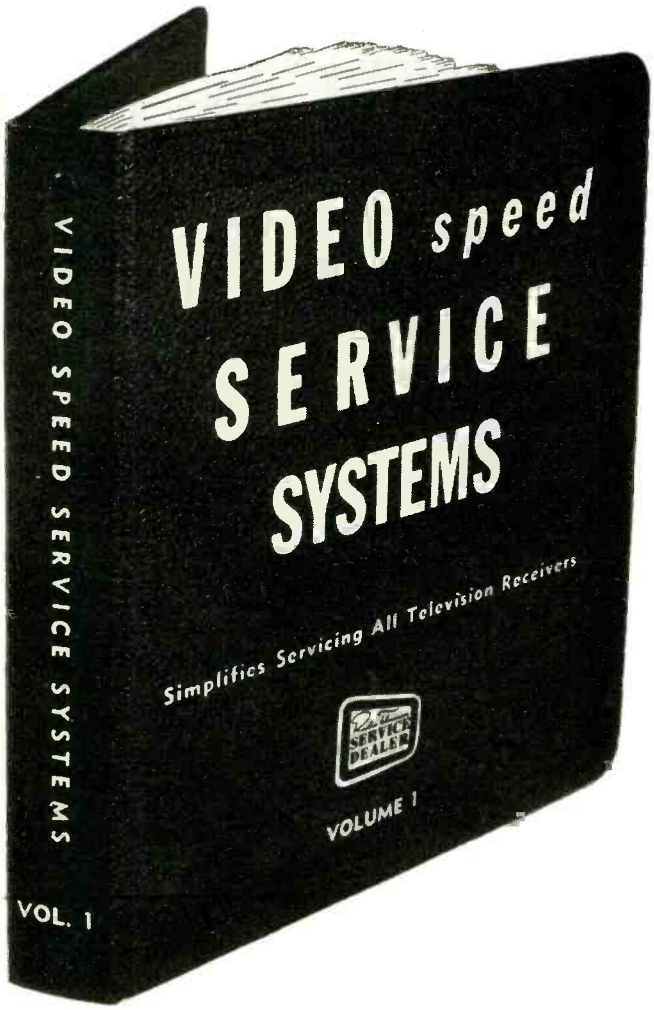


Fig. 3—Exploded view of Rotator mechanism showing internal parts.

FOR GREATER PROFITS



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TV FIELD SERVICE

Pre-published from Rider "TV Field Service Manuals"

by Rider & Alsberg

ADMIRAL

MODEL NUMBERS Model numbers may have suffix letter "N"	TV Chassis	Picture Tube	Record Changer	Radio	Tone Control
222DX15S, 222DX16, 222DX17	22C2	21EP4A	......	......	Yes
222DX26, 222DX27	22C2	21EP4A	......	......	Yes
222DX48, 222DX49	22C2	21EP4A	......	......	Yes
322DX16	22E2	21EP4A	RC600	Built-in AM	Yes

TUBE COMPLEMENT

V101	6BZ7	RF Amplifier
V102	6J6	Oscillator and Mixer
V201	6AU6	Sound IF
V202	6AL5	Ratio Detector
V203	6AV6	AM Detector, AVC / Sound Amplifier
V204	6V6GT	Sound Output
V301	6CB6	1st IF
V302	6CB6	2nd IF
V303	6AG5	3rd IF
V304	*12AU7 or 12AT7	Video Detector / 1st Sound IF
V305	6AC7	Video Amplifier
V306	21EP4A	Picture Tube
V307	6AU6	Gated AGC
V401A / V401B	6SN7GT	Vertical Oscillator / Sync Inverter
V402	6S4	Vertical Output
V403	12AU7	Sync Separator and Clipper
V404	6AL5	Sync Discriminator
V405	6SN7GT	Horizontal Oscillator
V406	6CD6G	Horizontal Output
V407	1B3GT	2nd Anode Rectifier
V408	6W4GT	Damper
V501	5U4G	Rectifier
V701	6BE6	Converter (AM Radio)
V702	6BA6	IF Amplifier (AM Radio)

* Tubes not directly interchangeable

Key Voltages

All voltages are measured with a VTVM and in respect to chassis ground.

B+ voltage, fuse holder (M401)	265V DC
Boosted B+ voltage, cathode of damper tube V408 pin 3	400V DC
Plate voltage of Vert. Osc., pin 2 of V401	150V DC*
Plate voltage of Vert. Out. Tube, pin 9 of V402	375V DC*
Plate voltage of Hor. Osc. pin 2	300V DC
pin 5	180V DC
Grid voltage of Hor. Out. Tube, pin 5 of V406	—30V DC

*This voltage varies widely with control setting.

All tube filaments are connected in parallel.

ADJUSTMENTS

DX Range Finder Adjustment

Incorrect adjustment of this control in a strong signal area may result in bending of the picture, excessive contrast and poor sync.

In normal signal strength areas, the DX Range Finder Control will generally be set at the "0" position. In intermediate areas, where the TV signal strength is lower and the noise level is higher, the DX Range Finder control will generally be set within the 10 to 150 position. In fringe areas or areas where long distance "DX" reception is possible, the DX Range Finder control will generally be set within the 150 to 300 position. In weak signal and high noise level areas, adjust the DX Range Finder for minimum noise (snow) and flashing in the picture.

Adjust the DX Range Finder as follows:

a. Rotate the DX Range Finder control fully to the left (to the "0" setting).

b. Tune in a picture, preferably on the strongest TV channel.

c. Set the Picture (contrast) control fully to the right (clockwise).

d. While observing a test pattern or picture, slowly rotate the DX Range Finder control to the right for best contrast with a minimum of snow and flashing in the picture.

Check for bending of vertical objects (overloading) in the picture. Also check to see that the picture locks in sync properly when switching off and on channel. If necessary, rotate the DX Range Finder control to the left or to the right until the operation is satisfactory.

In some fringe areas where long range reception is possible, TV signals may be subject to excessive fading. This may vary with season and time of day. If the signal in the area concerned is subject to excessive fading and the Range Finder is adjusted during the time the signal is weakest, overloading (picture bending) will take place when the signal is stronger. For this reason be sure that the customer is instructed on the adjustment of this control for periodic variations in signal strength.

[*Continued on page 46*]

ADMIRAL TROUBLE SHOOTING CHART

NO SOUND—NO RASTER
Power input circuit
V501
Check line cord and connector
Phono-Radio-TV Switch

NO RASTER—SOUND OK
Check HV Fuse M401 (¼ Amp)
Brightness control
Ion trap
V305, V306, V405, V406, V407, V408
HV xformer Hor. yoke CRT connections

WEAK PIX—SOUND AND RASTER OK
Tuner fine tuning
Picture control
V101, V102, V301, V302, V303, V304, V305, V306, V307
DX Range Finder control

POOR HOR. LIN.
Hor. Lin. and Drive controls
V405, V406, V408
Check 0.02 mf, 0.047 mf and 0.25 mf caps. connected to Hor. Lin. coil

POOR VERT. LIN.
Vert. Lin. and Height controls
V401, V402
Check 0.1 mf and 0.047 mf caps. connected to pin 6 of V402
Vert. Out. Trans.

PIX JITTER SIDEWAYS
Hor. Lock and Hold controls
DX Range Finder control
V401, V404, V405, V406
Check 0.01 mf and 12K res. connected to pins 5 and 7 of V404

SMEARED PIX
Tuner fine tuning
Picture control
V102, V301, V302, V303, V304, V305, V307
Check Vid. Det. and Amp. peaking coils
IF and RF alignment

POOR PIX DETAIL
Tuner fine tuning
Focus control
V102, V301, V302, V303, V304
IF and RF alignment

SOUND BARS IN PIX
Tuner fine tuning
V101, V102, V301, V302, V303, V305, V307
Check adjustment of L-301
IF and RF alignment

SNOW IN PIX
V101, V102, V301, V302, V303, V304, V307
DX Range Finder control
Antenna and transmission line

AC IN PIX (DARK HOR. BAR)
V101, V102, V301, V302, V303, V304, V305, V307

ENGRAVED EFFECT IN PIX
Tuner fine tuning
Picture control
DX Range Finder control
V102, V301, V302, V304, V305, V306, V307

VERT. BARS
Hor. Drive and Width controls
V406, V408
Check 47 mmf. cap. and 1K Ω res. connected between terminals 1 and 2 of yoke
Defl. yoke ringing

PIX BENDING
Hor. Hold and Lock controls
DX Range Finder control
V307, V404, V405, V406
Check 0.047 mf cap. connected to pin 1 of V405

AUDIO HUM IN SOUND
V201, V202, V203, V204, V304

DISTORTED SOUND
Tuner fine tuning
V102, V201, V202, V203, V204, V304
Tone control
Check Printed ckt connected to pin 5 of V204
Sound and Vid. IF alignment L-202, L-203
Det. alignment T-201

NO SOUND—PIX OK
Tuner fine tuning
V201, V202, V203, V204, V304
Volume control
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment L-202, L-203
Det. alignment T-201

WEAK SOUND—PIX OK
Tuner fine tuning
Volume and Tone control
V102, V201, V202, V203, V204, V304
Sound and Vid. IF alignment L-202, L-203
Det. alignment T-201

NOISY SOUND—PIX OK
V201, V202, V203, V204, V304
Volume and Tone controls
Check Sound System for loose connections
Speaker
Sound IF and Det. alignment L-202, L-203, T-201

SYNC. BUZZ IN SOUND
Tuner fine tuning
DX Range Finder control
V201, V202, V304, V307
Check 500 mmf cap. connected to pin 2 of V202
Sound IF and Det. alignment L-202, L-203, T-201

INTERMITTENT SOUND—PIX OK
V201, V202, V203, V204, V304
Poor connections in sound system

WEAK OR NO PIX—SOUND WEAK—RASTER OK
Tuner fine tuning
Picture and DX Range Finder controls
V101, V102, V301, V302, V303, V304, V307
RF and IF alignment

INTERMITTENT RASTER—SOUND OK
Brightness control
V404, V405, V406, V407, V408
HV xformer

RASTER BLOOMING
Hor. Drive control
V306, V406, V407, V408, V501
Check HV Filter cap.
Check 470K res. connected to HV Filter cap.

INSUFFICIENT BRIGHTNESS
Ion trap
Brightness and Hor. Drive controls
V305, V306, V406, V407, V408, V501
Check 3.3K res. connected in series with a 82 res. to pin 6 of V406
Low line voltage

EXCESSIVE RASTER (PIX SIZE)
Hor. Drive, Width and Height controls
V406, V407

INSUFFICIENT RASTER WIDTH
Hor. Drive and Width controls
V405, V406, V408, V501
Check 330 and 680 mmf caps. connected to pin 5 of V405
Low line voltage

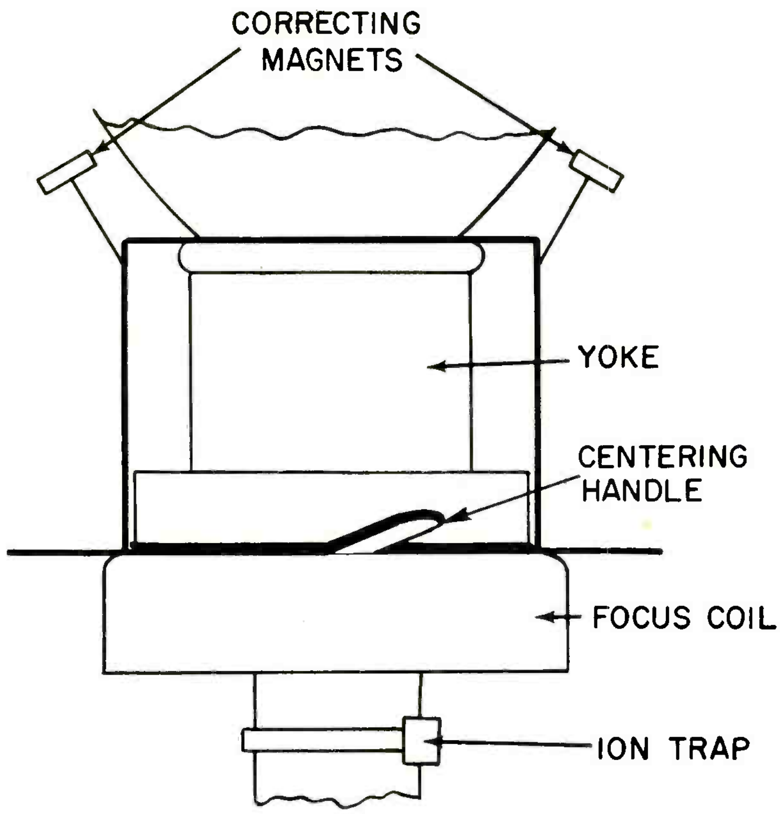
INSUFFICIENT RASTER HEIGHT
Vert. Lin. and Height controls
V401, V402, V501
Check 100 mmf cap. connected to pin 2 of V402
Check 0.1 and 0.047 mf caps. connected to pin 6 of V402
Vert. Out. Trans.
Low line voltage

NO VERT. DEFL.
V401, V402
Check 0.1 mf and 0.047 mf caps. connected to pin 6 of V402
Vert. Defl. yoke
V. O. T.

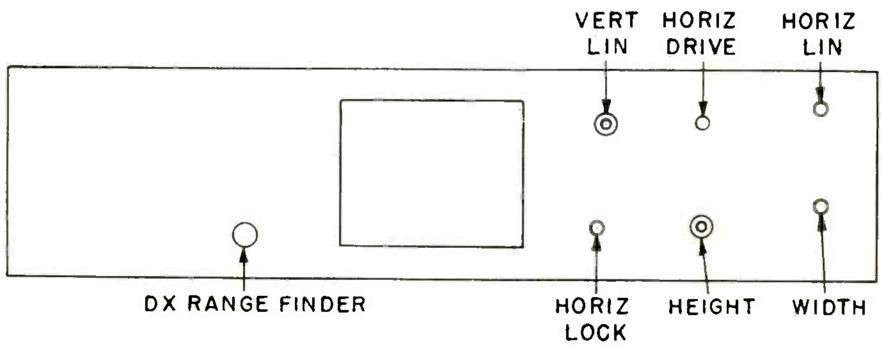
NO VERT. SYNC.—HOR. SYNC. OK
Vert. Hold control
Check Vert. Int. Network
Check 0.0047 mf cap. connected to yellow lead of Vert. Osc. Trans.
V307, V401, V402, V403
DX Range Finder control

NO HOR. OR VERT. SYNC.—PIX SIGNAL OK
V101, V401, V403
Check 0.01 mf cap. connected to pin 4 of V401

NO HOR. SYNC.—VERT. SYNC. OK
Hor. Hold and Lock controls
V101, V301, V302, V303, V307, V404, V405, V406
Check 330 mmf cap. connected between pins 2 and 4 of V405

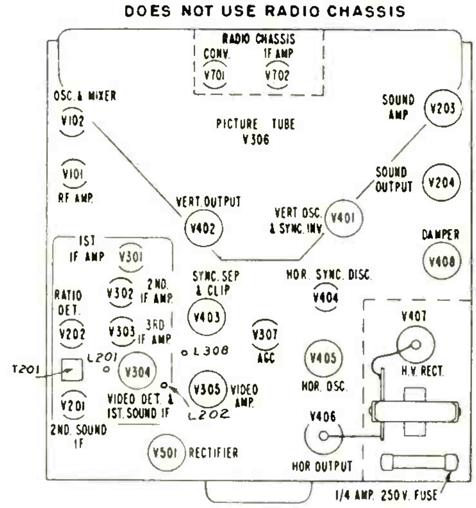


PICTURE TUBE ADJUSTMENTS



REAR VIEW CONTROL PANEL

22C2 CHASSIS
DOES NOT USE RADIO CHASSIS



Top View of 22E2 & 22C2 Chassis. (V701 and V702 are accessible from underside of chassis).

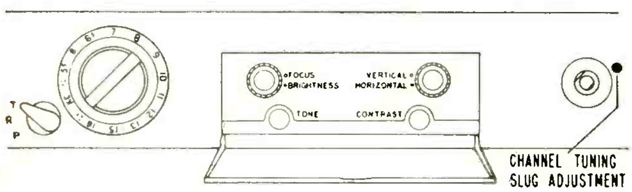
[from page 43]

Individual Channel Slug Adjustment Using a Television Signal

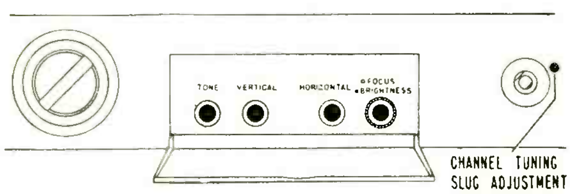
Individual channel oscillator adjustment of every receiver should be checked upon installation or servicing. If this adjustment is properly made, it is possible to tune from one station to another by merely turning the CHANNEL control. With correct oscillator channel adjustment, best picture will be located at the approximate center of the range of the TUNING control. However, this may not necessarily be maximum sound output.

Channel slug adjustment can be made without removing the chassis from the cabinet. Adjust as follows:

a. Turn the set on and allow 15 minutes to warm up.
b. Set the CHANNEL knob for a station in operation. Set all other controls for a normal picture.
c. Set TUNING control at center of its range by rotating it approximately half-way.
d. Remove the CHANNEL and TUNING knobs.
e. Insert a 1/8″ blade, NON-METALLIC screwdriver in the 1/4″ hole adjacent to the channel tuning shaft. For each channel in operation, carefully adjust the channel slug for best picture with clear detail. Be sure that the Tuning control is set at the center of its range before adjusting each channel slug. Only slight rotation of the slug will be required; turning the slug in too far will cause it to fall into the coil. (If the slug falls into the coil, remove the coil, move the retaining spring aside, lightly tap the open end of the coil until the slug slips out. Replace slug and reset retaining spring.)



Control Panel in 22E2 Sets. Channel and Tuning Knobs Removed.

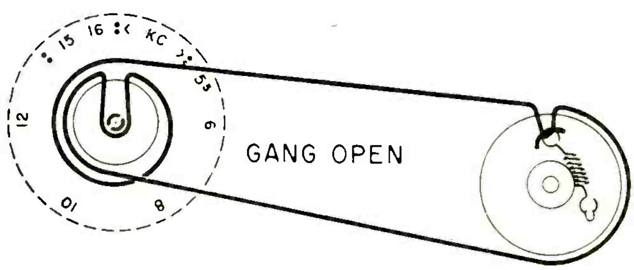


Control Panel in 22C2 Sets. Channel and Tuning Knobs Removed.

Touch-Up of Ratio Detector Secondary Using Television Signal (Bottom Slug of T201)

*This adjustment is accessible through the 1/4″ hole (just below T201) in bottom of the cabinet or the chassis mounting shelf, located toward the left side facing the rear of the set. Removal of the chassis is therefore not required. *Adjustment need be made on one channel only.* Proceed as follows:

a. Turn set on and allow about 15 minutes for warm up.
b. Tune set for normal picture and sound.
c. Carefully insert a non-metallic alignment tool through the opening in cabinet bottom below T201. An alignment tool with a screwdriver blade or hexagonal end is required depending on the transformer used, see note below. When the alignment tool engages the bottom tuning slug, adjust the slug for best sound with minimum buzz level. Do this carefully as only slight rotation in either direction will generally be required. Correct adjustment point is located between the two maximum buzz peaks that will be noticed when turning the slug back and forth about 1/4 to 1/2 turn.
d. If necessary, repeat individual channel slug adjustment and conclude with retouching the ratio detector secondary. Note: If oscillator adjustment is required for other channels, it will *not* be necessary to repeat the ratio detector secondary adjustment after *once* correctly adjusting it.



Dial Stringing for the 22E2 Chassis.

Adjusting Curvature Correcting Magnets for Sets Using a 21EP4 (21″) Picture Tube

If either side of the picture has excessive curvature (pin cushion effect) or if corners of the picture are bent inwardly, this can be minimized by adjustment of the correcting magnets located on the yoke bracket. Either side of the picture can be adjusted individually by using the magnet on that side of the picture tube. A picture or test pattern having straight vertical lines near the sides can be used for making adjustment; the pattern from a cross-hatch generator is preferable. IMPORTANT: A cross-hatch generator which is not capable of locking the picture in both horizontal and vertical sync is not suitable. Adjust as follows:

a. Set the receiver control for normal picture. Be sure that the picture is centered properly and vertical linearity adjustment is made.
b. Check the radial position of the magnet brackets. The magnet brackets are generally set so that the mounting screw is centered in the curved slot. It should only be necessary to change from this setting if the curvature at the side of the picture is not centered with respect to the side of the picture tube.
c. Move the correcting magnet against the deflection yoke bracket. While observing the vertical lines on the same side of the picture that the magnet is located, slowly move the magnet forward until curvature of vertical lines near the side is minimized. If the magnets are moved too far forward, the corners of the picture will bend inwardly or become shaded.

Servicing Radio Tubes and Dial Light in 22E2 Sets

The radio tubes can be serviced without removing the TV chassis from the cabinet. The radio tubes can be reached through the opening in the underside of the chassis shelf.

The dial light can be serviced by removing the tuning knobs and plastic control panel.

CAPEHART

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

MODEL 12F272M

TV CHASSIS CT-74

TUBE COMPLEMENT

REF. NO.	TYPE	FUNCTION
V101	6BQ7	R. F. Amplifier
V102	6J6	Osc. & Mixer
V201	6CB6	1st I.F. Amplifier
V202	6CB6	2nd I.F. Amplifier
V203	6CB6	3rd I.F. Amplifier
V204	6CB6	4th I.F. Amplifier
V205	6X8	Triode Section, 1st Video Amplifier; Pentode Section, 1st Sound I.F. Amplifier
V206	6AQ5	Video Output
V208	27GP4 or 27EP4	Picture Tube
V301	6AU6	2nd Sound I.F. Amplifier
V302	6AL5	Ratio Detector
V303	6AV6	1st Audio Amp. & AGC Clamp
V304	6AQ5	Audio Output
V401	6AU6	Keyed A.G.C. Amplifier
V402	6BA6	Sync Amplifier
V403	6BE6	Sync Sep. & Noise Clipper
V404	12AT7	1st Triode, Sync Clipper; 2nd Triode, Reactance Tube
V501	6AL5	Horizontal A.F.C.
V502	12AU7	1st Triode, Horizontal Oscillator; 2nd Triode, Horizontal Discharge
V505	1B3	H.V. Rectifier
V506	6C4	Vertical Multivibrator
V508	6CD6	Horizontal Output
V509	6AX4	Damper
V510	6AX4	Damper
V511	6AV5	Vertical Output
V601	5U4	L. V. Rectifier
V602	5U4	L. V. Rectifier
CR201	1N64	Video Detector (Germanium Diode)

Key Voltages

All voltages are measured with a VTVM connected to the tube pin and chassis.

B+ voltage, HV Fuse	300V DC
Boosted B+ voltage, cathode of damper tube V509 pin 3	540V DC
Plate voltage of Vert. Osc., V506 pins 1 and 5	5.2 to 140V DC
Plate voltage of Vert. Out., V511 pin 5	280V DC
Plate voltage of Hor. Osc. V502 pin 6	260V DC
Grid voltage of Hor. Out. V503 pin 5	—23V DC

Filament Wiring

All tube filaments are connected in parallel.

ADJUSTMENTS

Oscillator Adjustment Using a Television Signal

1. Turn set on and allow sufficient time for set to reach normal operating temperature.
2. Turn Channel selector to the channel to be adjusted and adjust Shading, Contrast and Volume controls for normal sound and picture. Set the Fine Tuning control to the midpoint of its range.
3. Remove Channel and Fine Tuning knobs and adjust the oscillator slug for that channel, using a small non-metallic screwdriver. When the CHANNEL selector is set for a particular channel, the oscillator "slug" for that channel is accessible through a small hole in the front of the tuner chassis.

Adjust the oscillator slug for the clearest and sharpest detail in the picture. At this point the sound should be best, but not necessarily the loudest.

NOTE: BE CAREFUL NOT TO TURN THE SLUG TOO FAR, AS IT MAY FALL COMPLETELY OUT OF ITS MOUNTING.

Beam Corrector Magnet Adjustment

Adjust the Height Control so that the top and bottom edges of the raster are just visible and check to see if the raster lines near the top and bottom are sufficiently straight. If the lines are bent adjust the two Beam Corrector Magnets (attached to the CRT metal support ring, one above and the other below the bell of the CRT) to remove the bend. These magnets are adjusted at the factory and should not require re-adjustment unless they have been accidently bent out of position.

These magnets can be adjusted by moving them closer to or further from the bell of the CRT or by moving them from side to side. As the magnet is moved closer to the tube, the raster lines will be pulled toward the magnet. Likewise as the magnet is moved away from the tube, it will have less effect on the raster lines. If the magnets have been shifted either to the left or right, an irregular bend may appear in the raster lines near the top or bottom.

Adjustment of Horizontal A.F.C. Circuit

There is no Horizontal Hold front panel control provided on this chassis. The picture should lock in synchronism automatically when switching from channel to channel. In event, however, that adjustment of this circuit is required, because of tube or component replacement, the following procedure should be followed:

1. Remove the Horizontal A.F.C. Detector Tube (6AL5) from its socket and adjust the Horizontal Frequency slug until the picture is synchronized horizontally. When properly adjusted the picture will move slowly back and forth horizontally with one vertical blanking bar.
2. Re-insert the 6AL5 tube, and as soon as the tube reaches its normal operating temperature, the picture should fall in sync.
3. After making the frequency adjustment, check the horizontal phasing. This can best be done by decen-

[*Continued on page 50*]

CAPEHART TROUBLE SHOOTING CHART

NO SOUND—NO RASTER
Power input circuit
V601, V602

NO RASTER—SOUND OK
Brightness control
HV Fuse (F502 2/10 Amp)
Ion trap
V208, V404, V501, V502, V503, V505, V509, V510
HV xformer Hor. yoke CRT connections

WEAK PIX—SOUND AND RASTER OK
Tuner fine tuning
Contrast control
A.G.C. Set control
V102, V201, V202, V203, V204, V205, V206, V208, V401
Check Vid. Det. crystal CR201 (1N64 Part of T205)

POOR HOR. LIN.
Hor. Drive control
V503, V509, V510
Check 0.1 mf cap. connected to HV Fuse

POOR VERT. LIN.
Height and Vert. Lin. controls
V506, V511
Check 100 mmf cap. connected to pin 3 of V511
Check 0.1 and 0.033 mf caps. connected to pins 1-5 of V506
Vert. Out. Trans.

PIX JITTER SIDEWAYS
Hor. Hold and Phasing controls
V404, V501, V502, V503
Check 0.0047 mf cap. connected to pin 1 of V501
Check 100 mmf cap. connected to terminal "E" of Hor. Osc. Trans.

SMEARED PIX
Tuner fine tuning
Contrast and A.G.C. Set. controls
V102, V201, V202, V203, V204, V205, V206, V401
Check Vid. Det. crystal CR201 (1N64 Part of T205)
Check Peaking Coils
IF and RF alignment

POOR PIX DETAIL
Tuner fine tuning
V201, V202, V203, V204, V205, V206, V208, V401
Check Vid. Det. & Amp. Peaking Coils
Check Vid. Det. crystal CR201 (1N64 Part of T205)
IF and RF alignment

SOUND BARS IN PIX
Tuner fine tuning
V102, V201, V202, V203, V204
Check Vid. Det. crystal CR204 (1N64 Part of T205)
Check alignment of L208 and L215
IF and RF alignment

SNOW IN PIX
V101, V102, V201, V202, V203, V204, V401
Antenna and transmission line

AC IN PIX (DARK HOR. BAR)
V101, V102, V201, V202, V203, V204, V205, V206, V401

ENGRAVED EFFECT IN PIX
Tuner fine tuning
Contrast and A.G.C. Set control
V102, V201, V202, V203, V204, V205, V206, V401
Check Vid. Det. crystal CR201 (1N64 Part of T205)

VERT. BARS
Hor. Drive control
V503, V509, V510
Check 47 mmf cap. and 39Ω res. connected across terminals 1 and 2 of yoke
Defl. yoke ringing

PIX BENDING
Hor. Hold and Phasing controls
V401, V404, V501, V502, V503
A.G.C. Set control

AUDIO HUM IN SOUND
V205, V301, V302, V303, V304

DISTORTED SOUND
Tuner fine tuning
V102, V205, V301, V302, V303, V304
A.G.C. Set. control
Sound and Vid. IF alignment L1301
Det. alignment T-301

NO SOUND—PIX OK
Tuner fine tuning
Volume control
V205, V301, V302, V303, V304
Speaker (open voice coil or defective connection)
Sound and Vid. IF alignment L-301
Det. alignment T-301

WEAK SOUND—PIX OK
Tuner fine tuning
Volume and A.G.C. Set. controls
V102, V205, V301, V302, V303, V304
Sound and Vid. IF alignment L-301
Det. alignment T-301

NOISY SOUND—PIX OK
Volume control
V205, V301, V302, V303, V304
Speaker
Sound IF and Det. alignment L-301, T-301

SYNC. BUZZ IN SOUND
Tuner fine tuning
A.G.C. Set. control
V102, V205, V301, V302
Check Vid. Det. crystal CR201 (1N64 Part of T205)
Sound IF and Det. alignment L-301, T-301

INTERMITTENT SOUND—PIX OK
V205, V301, V302, V303, V304
Poor connections in sound system

WEAK OR NO PIX—SOUND WEAK—RASTER OK
Tuner fine tuning
Contrast and A.G.C. Set control V102, V201, V202, V203, V204
Check Vid. Det. crystal CR201 (Part of T205)
RF and IF alignment

INTERMITTENT RASTER—SOUND OK

Brightness control
V404, V501, V502, V503, V505, V509, V510
HV xformer

RASTER BLOOMING

Hor. Drive control
V502, V503, V505, V509, V510, V601, V602
Check HV Filter cap.
Check 1 Meg res. connected to HV Filter cap.

INSUFFICIENT BRIGHTNESS

Ion trap
Brightness and Hor. Drive controls
V208, V502, V503, V505, V509, V510, V601, V602
Low line voltage

EXCESSIVE RASTER (PIX SIZE)

Hor. Drive, Width and Height controls
V503, V505
Check 0.047 mf cap. and 12KΩ res. connected to series res. on pin 8 of V503

INSUFFICIENT RASTER WIDTH

Hor. Drive and Width controls
V208, V503, V509, V510, V601, V602
Check 0.001 and 0.0082 mf caps. connected to pin 1 of V502
Check 120 mmf cap. connected to terminals 1 and 3 of Hor. Out. Trans.
Low line voltage

INSUFFICIENT RASTER HEIGHT

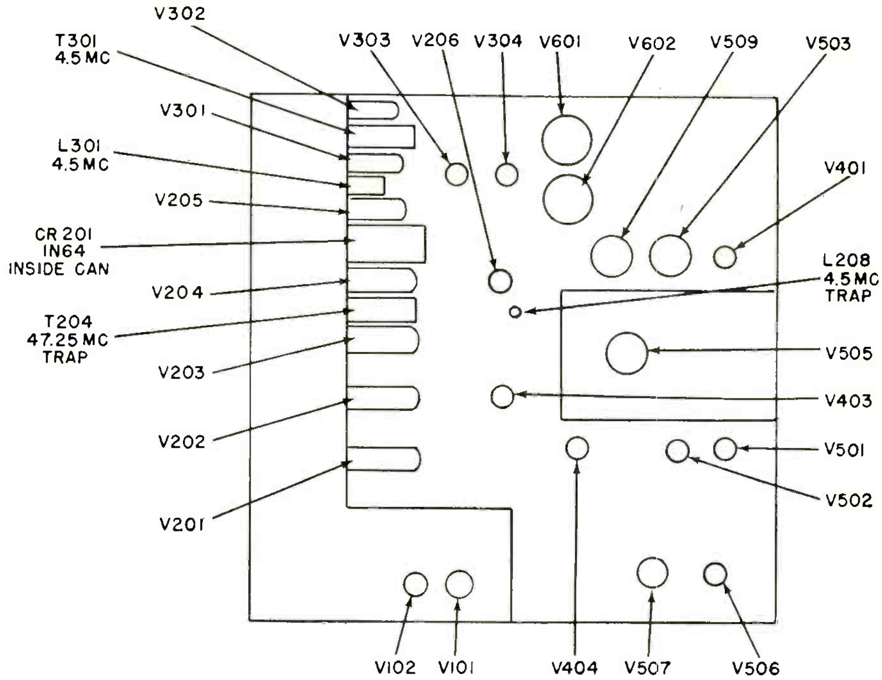
Height and Vert. Lin. controls
V506, V511, V601, V602
Check 0.1 and 0.033 mf caps. connected to pins 1 and 5 of V506
Vert. Out. Trans.
Low line voltage

NO VERT. DEFL.

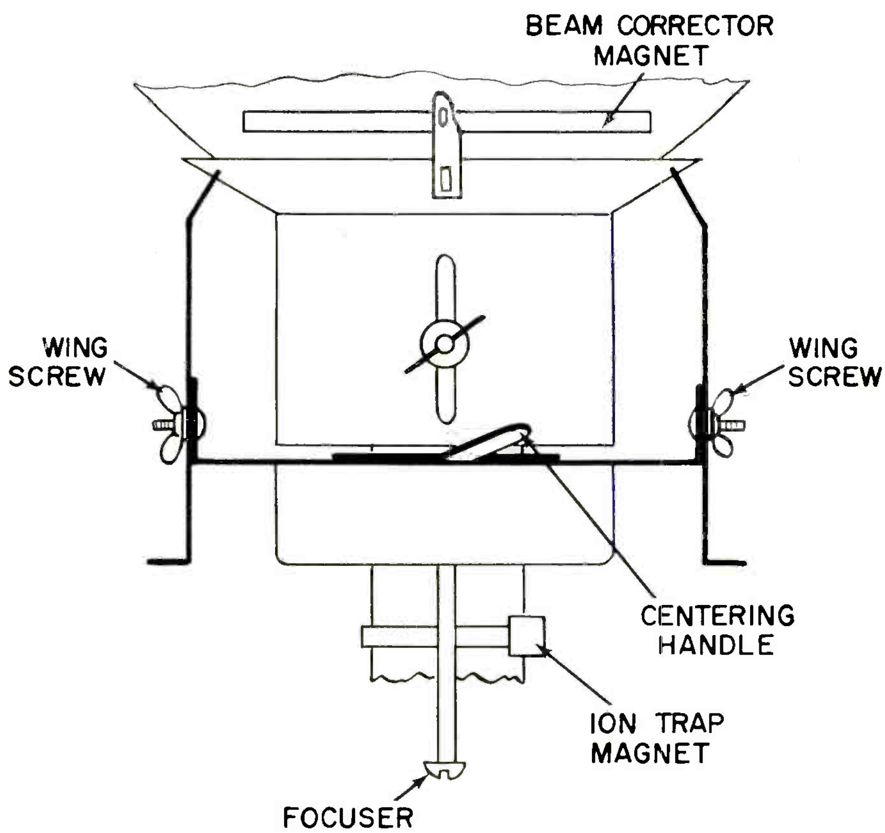
V506, V511
Check 390 mmf cap. connected to pin 5 of V506
Check 0.1 and 0.033 mf cap. connected to pins 1 and 5 of V506
Vert. Defl. yoke
V. O. T.

NO VERT. SYNC.—HOR. SYNC. OK

Vert. Hold control
Vert. Int. Network
V401, V403, V404, V506, V511
A.G.C. Set control
Check 0.001 mf cap. connected to pin 6 of V506



TOP VIEW CHASSIS LAYOUT
CT-74
Location of Components, Tubes and Alignment Adjustments



PICTURE TUBE ADJUSTMENTS

NO HOR. SYNC.—VERT. SYNC. OK

Hor. Hold and Phasing controls
A.G.C. Set. controls
V404, V501, V502, V503
Check 0.001 mf, 1100 mmf and 1200 mmf caps connected to pin 1 of V404

NO HOR. OR VERT. SYNC.—PIX SIGNAL OK

V303, V401, V402, V403, V404
Check 0.047 mf cap. connected to pin 5 of V403

[from page 47]

tering the picture so that the right hand edge of the raster is visible. Adjust the Shading control for maximum brilliance and reduce the Contrast control until the raster edge can be seen. There should be approximately 3/16 inch between the edge of the raster on 17 inch tubes and 1/4 inch on 21 inch tubes. If the picture is out of phase, adjust the Horizontal Phasing "slug" on the rear of the chassis.

If considerable amount of change is required in the phasing adjustment, it may be necessary to re-adjust the horizontal frequency as in Step 1, above.

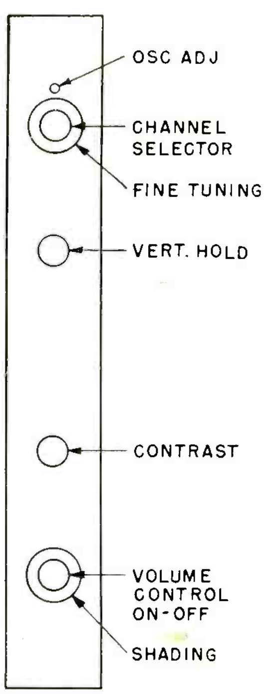
Picture Size and Linearity:

Adjust the Horizontal Drive and Width controls to obtain the proper picture width and horizontal linearity. The Horizontal Drive control should be adjusted first to provide maximum scan and then the Width control should be used to adjust for the proper horizontal size. If a vertical white line (or lines) appears in the picture, back off the Horizontal Drive control slightly.

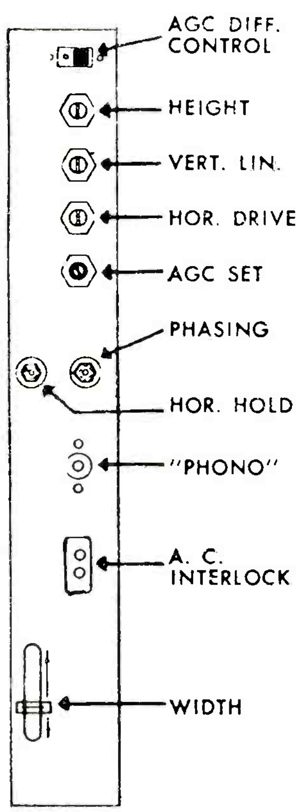
Adjust the Height and Vertical Linearity controls to obtain proper height and vertical linearity. It may be necessary to adjust the Vertical Hold control while making these adjustments, if the picture should roll.

Final Check:

In sequence, set the Channel knob to all channels on which reception is obtained. Adjust the receiver for operation as outlined in the Owner Operating Instructions. Check the quality of reception, picture and sound on all available TV stations in the area.



FRONT CONTROLS



REAR CONTROLS

NOTE: If a degree of "background noise" is noticed on moderate signals the AGC Differential Control (switch on rear chassis apron) should be placed in the DOWN position. If no background noise is apparent with the switch in the UP position, it should be left in this position.

Recheck the focuser adjustment and Ion Trap Magnet setting for good picture *focus*.

Check to see that the best reception is obtained on all channels with the Fine Tuning control set to the approximate center of its range. This can be obtained by making the adjustments outlined under "Oscillator Adjustments Using a TV Signal."

Remove the "cheater cord" and replace the cabinet back.

OPERATION AND INSTALLATION

Removing the Picture Tube From the Cabinet

To remove the CRT:

1. Remove the cabinet rear door assembly (held in place by twelve (12) wood screws).
2. Remove the CRT socket from the CRT base.
3. Disconnect the Deflection Yoke Cable.
4. Disconnect the H.V. Anode Connector from the CRT.
5. Remove the rear braces from the deflection yoke support assembly.
6. Remove the four (4) nuts which fasten the front CRT strap assembly to the cabinet. NOTE: Unless the instrument is in the face down position (as described above) the CRT should be supported from the rear while the mounting nuts are being removed.
7. Lift the tube out of the cabinet tilting it slightly to avoid striking the H.V. Section of the TV Chassis.

After removing the CRT assembly from the cabinet place it face down on a pad (to protect the CRT face) and remove the Ion Trap, Focus Magnet and Deflection Yoke. When installing a new CRT be certain that the rubber collar, which is used to hold the deflection yoke in place against the bell of the tube, is solidly in place.

Removing the Chassis From the Cabinet

The chassis used in this model is bolted to a sliding skid which fits in grooves provided in the cabinet construction. For maintenance the chassis can be removed from the rear of the instrument as follows:

1. Remove the control knobs from the front of the instrument.
2. Remove the cabinet rear door assembly (held in place by twelve (12) wood screws).
3. Remove the Antenna Terminal strip (fastened to cabinet by two (2) wood screws).
4. Remove the CRT Socket from the CRT base.
5. Disconnect the Deflection Yoke Cable.
6. Disconnect H.V. Anode Connector from the CRT.
7. Remove the Speaker plug from the TV chassis.
8. Remove the wood screws which fasten the chassis mounting skid to the cabinet (four screws at the rear and one at the front near the R-F Unit).
9. Slide the chassis on the sliding skid from the rear of the instrument.
10. Remove the wooden skid from the chassis to facilitate service.

TRADE FLASHES

[*from page 12*]

The system was engineered and installed by Jerrold Electronics Corporation of Philadelphia, Pa., manufacturers of television master antenna systems. This new type of public service facility in Casper is operated by a group of local businessmen who have formed Community Television Systems of Wyoming, Inc.

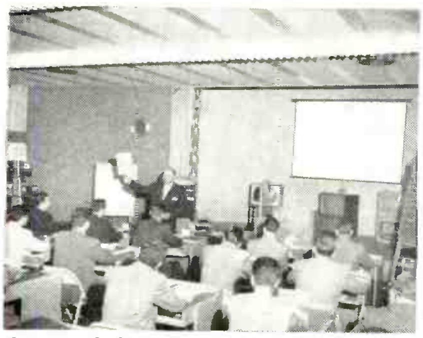
Book-Naming Prize Contest

H. G. Cisin, Publisher of Amagansett, N. Y. announces a new book-naming prize contest in connection with his newest TV service book now in preparation. If the name suggested is selected as the title of this new book, the winner will receive a one hundred dollar cash award. In addition, there will be fifty consolation prizes including cash, test instruments, subscriptions to TV magazines and other valuable prizes.

This contest is open to everyone, with the exception of employees of H. G. Cisin or of his advertising agency. As many names as desired may be submitted. To participate, write to the publisher.

Westinghouse Holds Color TV Service School

Westinghouse is staging a color television service school to review the unique problems of maintaining and servicing color TV receivers, according to A. H. Kuttruff, Television-Radio Division service manager, who is in



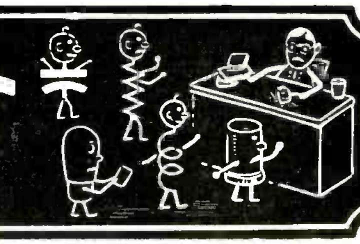
charge of the intensive two-week training program here.

All key Westinghouse field service engineers are taking part in the classroom and laboratory sessions. Subjects discussed include: colorimetry, the study of colors; composite color signals and their function; transmitter requirements and variables; basic color TV receiver design requirements; and adjustment of color receivers.

May Parts Show Has Sellout

The 1954 Electronic Parts Show management received a total of 215 contracts for the 202 Exhibition Hall booths available at the Conrad Hilton, May 17-20th.

CIRCUIT COURT



Du Mont RA 160—Vertical amplifier

The video amplifier of the Du Mont RA 160 chassis (*Fig. 1*) has many interesting features. In addition to being direct coupled in both the input and output circuits, this chassis has a most unusual compensated contrast control.

The video signal is, as indicated previously, applied to the grid across the video detector load circuit which makes up the grid d-c return to ground. This signal is coupled to the grid across *L208* which acts as a high frequency peaking network. This coil is damped by *R224* to prevent excessive peaking and the "ringing" in the picture which this can cause. In the amplifier plate circuit we find first *L207* which is another damped peaking coil. *L205* shunted by *C217* serves two purposes. Its natural resonance is 4.5 *mc* and presents a high impedance to any 4.5 *mc* intercarrier sound beats which might be present in the video signal. In addition, *L205* serves as another peaking coil.

Beside the series peaking coils just mentioned, *L209* acts as a shunt peaking coil. L209 is in series with *R221*, the plate load resistor. *R227* is connected at the junction of *L209* and *R221*. This resistor acts to directly couple the video signal to the sync and *agc* circuits.

The output frequency response of any uncompensated amplifier varies with the tube gain. As a result, when an uncompensated contrast control is varied from max. gain to min. gain, the video response curve will tilt on either the high frequency or low frequency side. Because of this, many methods of contrast control compensation are employed in order to get a uniform response at all gain levels.

The method used in this model consists of a tapped control which is partially across the plate load circuit. By moving the control center arm, a portion of the signal can be picked off. Connected across the taps are C252, C235 and C270. When the center arm is moved, different combinations of these three condensers are connected across the control, and in this way the control compensation for different signal levels are provided.

In order to establish the *dc* voltage at the cathode of the CRT, which sets the bias for the tube, the cathode is returned to a B+ voltage. This is accomplished by returning the cathode through *R222* and the contrast control to a point on a voltage divider consisting of *R292* and *R258*. These two resistors go from +145 to +230. The bias is established by returning the grid to a less positive voltage through *R225* to the voltage divider *R226* and *R257*, and the brightness control.

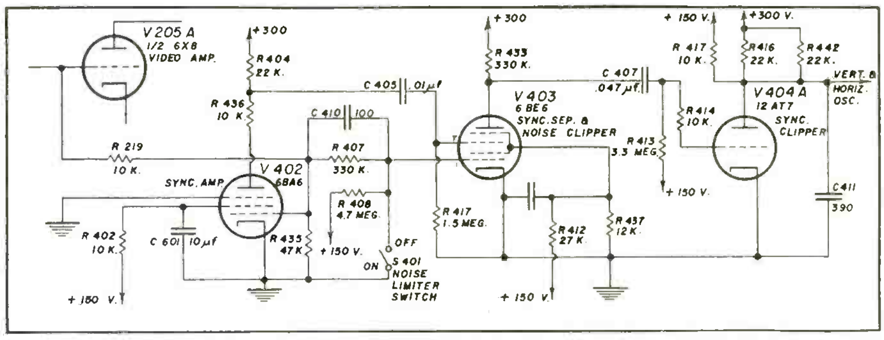


Fig. 2—Capehart CX-36, sync system.

Capehart CX36—Sync System

The Capehart CX36 uses a 6BA6 sync amplifier, a 6BE6 sync separator and ½ of a 12AT7 sync clipper for the multiple purpose of separating the video information from the sync, shaping and amplifying the sync pulses and to eliminate any noise pulses whose amplitude is greater than that of the sync pulse. These noise pulses could upset the sweep stability.

The video signal for the 6BA6 stage is directly coupled from the grid of the first video amplifier through R219. This signal is fed to the sync amplifier in sync phase negative.

The output of the sync amplifier is a signal which is sync phase positive. This signal is coupled to the second control grid (pin 7) of the 6BE6 sync stripper. The coupling condenser C405 charges to the peak value of the sync pulse, through *R417*, the grid leak resistor. The time constant of this combination permits only a small part of this charge to trickle off before the next sync pulse arrives. This charge keeps the tube in a cutoff condition. In this way, the only signal presented to the grid is the peak of the sync pulses, which brings the tube into conduction.

The characteristics of the 6BE6 are such that once the tube is in conduction, the second control grid is the grid which controls the plate current flow. The first control grid (pin 1) by its location close to the cathode can also, however, cause the tube to be cut off. This grid is directly coupled to the grid of the sync ampifier through *R407*. The signal present on the grid of the sync amplifier is, of course, 180° out of phase with the signal at the tube plate. The signals on grid #1 and grid #7 of the sync stripper are, therefore, 180° out of phase. The bias of grid #1 is so set that any signal whose amplitude is

[*Continued on page 63*]

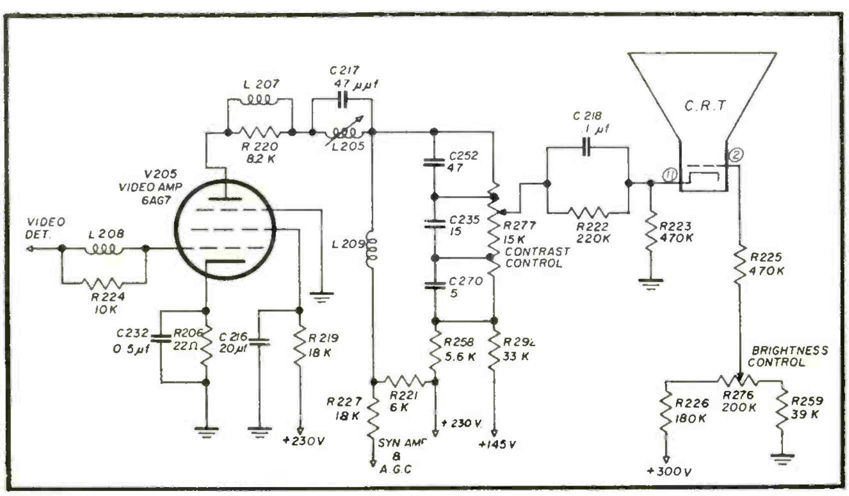


Fig. 1—Du Mont RA 160, video system.

by BOB DARGAN

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

Rhombic Antennas

Dear Answer Man:

Your article on page 40 of the October issue, answering R.W.B. interests me very much as we are fully 200 miles from our closest stations (Bismarck & Billings) which have just come on the air. Of course I have been experimenting with different aerials two-stacked yagis with open lead-in, etc., with meager occasional results.

Could you send me a rough sketch with details for a Rhombic antenna for Channel 5? On my lot I have about 50 to 75 feet of availabe space and if the Rhombic might do the job I would just as soon experiment on it. I would like to know also if I should use aluminum tubing or if it can be made from wire; I also realize that it may require several poles. Anyway, any data you can send me as to aerials for extreme fringe areas will be highly appreciated . . . Channels 2 to 6.

E. T.
Glendive, Montana

Dear E. T.:

The Rhombic antenna is a sensitive type that is undirectional and has excellent broadband characteristics. See "TV Installation Techniques" by S. L. Marshall, published by John F. Rider. One disadvantage is the input impedance which is about 700 ohms. However this can be overcome through the use of a matching stub of one-half wavelength connecting the rhombic to the transmission line. The other end of the diamond is in the direction of the station transmissions to be received and is terminated with a 680 ohm resistor. The rhombic has a broad band-pass characteristic with excellent gain over a frequency range of 2 to 1. For this reason it can be employed for either the upper or lower television channels. Notice in *Fig. 1* how the four lobes all point in the forward direction. Rhombic antennas can achieve a gain of 18db.

The three variables concerned with in the construction of a rhombic are the leg length, the angle of the legs and the slope with respect to the ground of the rhombic.

Concerning the leg length it can be seen that this length can be any multiple of the wavelength desired to be received. The limiting factor here is the practical length that can be strung. Once the length of the leg has been decided upon, and this generally does not exceed ten wavelengths, the other variables become fixed. The angle between the legs and the slope angle is then designated and fixed as well as the possible gain.

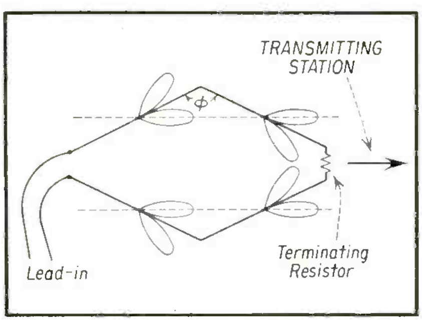


Fig. 1—Four lobes rhombic antenna.

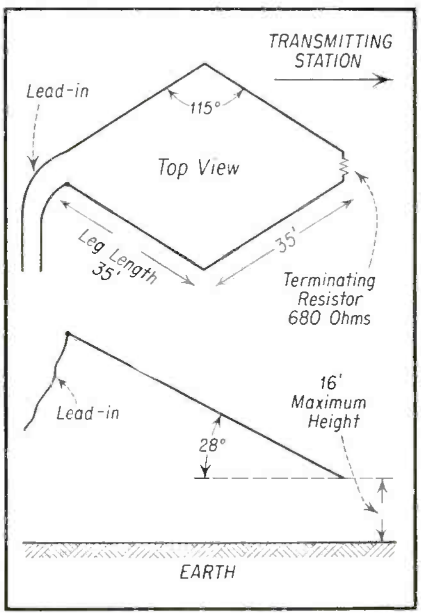


Fig. 2 — Dimensions for constructing rhombic antenna for channel 5.

In the design of this particular rhombic as shown in *Fig. 2* a leg length of three wavelengths has been chosen as this is the largest that can fit in the area specified. Using the formula, whereby wavelength in feet equals 936 divided by the frequency in megacycles it is found that for Channel 5 which has a frequency band of 76 to 82 megacycles the approximate corresponding wavelength is about 11.6 feet.

A leg length of three wavelengths will just fit within the small side dimension of the property. This is therefore three times 11.6 feet or about 35 feet for each leg of the diamond. This leg length specifies the angle of the legs at about 115 degrees and the slope angle at about 28 degrees.

Naturally four poles will be required, one for the support of each point of the diamond. A terminating resistor must be employed of about 680 ohms. Of course the terminating resistor can be divided in half and the junction of the two resistors grounded which will then balance the arrangement to ground. The wire used to form the diamond can be number 12 size or larger. The matching stub can be made by taking two pieces of number 12 wire and connecting them at the rhombic with a separation of about 2½ inches. This stub can be tapered so that at one half wavelength from the antenna it will be about the separation of the leads in the 300 ohm twinex. The length of the one-half wave stub is about 5.8 feet.

Philco 51-T1606--pix pulls

Dear Sir:

Can you advise me about a Philco 51-T1606, code 122 TV set? I am having trouble with the picture pulling such as a man's nose will pull away out, or his eyes or stomach. Any small section of the picture pulls. I have changed the tubes in the horizontal section.

H. E. R.
Havertown, Pa.

Dear H. E. R.:

The trouble you describe is caused by video information passing through the sync clipper stages and therefore modulating the horizontal oscillator so that portions of the picture are pulled. The sync circuits are not performing their designed function of separating the signal voltage and passing only the sync pulses on to lock in the horizontal and vertical oscillators. This can be caused by two reasons: either the grid bias or the plate voltage has changed value.

As in all cases of sync trouble the first check is the tubes and in this case the most common offender is the 12AV7 sync separator tube. This tube should be checked by substitution with a good tube.

Following this step if the trouble is still present the condensers feeding the information into the grid of the 12AV7 sync separator tube should be changed. This condenser is .022 *uf* and is shown in *Fig. 3*. A small intermittent leak in this condenser will be difficult to find. This condenser can cause this type of difficulty very easily as it is in the stage in which a great deal of the sync clipping is performed. It will probably be less expensive to change the condenser than to spend time trying to determine if the condenser is intermittent.

There is one other condenser of this same type that should also be changed and that is the .015 *uf* condenser that couples the signal from the noise gate circuit. It may pay to change this condenser also as a matter of course.

From the plate of the 2nd sync separator tube to the grid a 6.8 megohm resistor is connected which can cause this trouble if it has changed value and therefore this resistor should be checked by substitution.

Portable Field Strength Meter

Dear Answer Man:

Would you please send me information about converting a 7″ portable television receiver into a field strength meter? If I am not mistaken I have read an article to that effect in one of your magazines at one time, but I have checked thru all issues from Dec. 1951 thru the latest issue and I can't seem to find the article.

Any information you can give me will be greatly appreciated.

M. E.
Rossmoyne, Ohio

Dear M. E.:

In the October, 1953 issue of *Radio Television Service Dealer* there is an excellent article dealing with the Philco field strength meter. Otherwise, there has been no other article in this magazine covering field strength meters or converting a 7 inch portable television receiver into a field strength meter.

A 7 inch portable TV receiver can easily be used to obtain a relative signal strength indication by measuring the *agc* voltage. The *dc* voltmeter is connected to the *agc* line as in *Fig. 4* and the negative voltage generated due to the signal is the relative indication of the strength of the signal.

Of course the TV receiver can be calibrated with a generator that has provisions for indicating the amount of signal output voltage. The calibration can also be accomplished by measuring the signal strength with a field strength meter and then drawing up a chart that will show microvolts field strength obtained with the field strength meter versus *agc* voltage obtained on the TV receiver. There is one disadvantage to this method, and that is the negative *dc* voltage will be a rather rough indication because a change in signal strength of several thousand microvolts will not cause an appreciable change in *agc* voltage. A circuit can be added to the receiver so that the negative *dc* voltage when applied to the tube grid will allow plate current to flow. In the plate circuit the current can pass through the meter which will reveal an indication corresponding to the negative grid voltage. Thus a high impedance circuit can be achieved and by the choice of a good tube the meter will indicate small changes in plate current due to different *agc* voltages. The small changes of negative *agc* voltage will provide a better indication and the meter in the plate circuit can then be calibrated in microvolts.

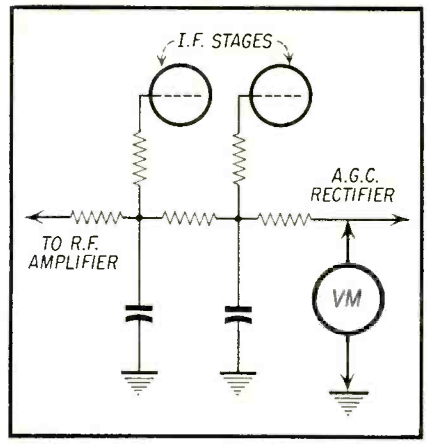


Fig. 4—The AGC voltage is used to indicate signal strength.

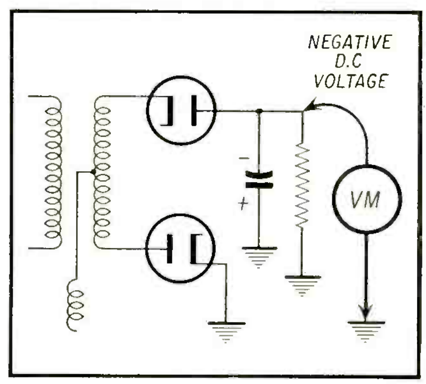


Fig. 5—The FM detector output is used to indicate signal strength.

There is one other way in which a comparative voltage indication can be obtained easily. This is by making use of the FM detector voltage which can be made to vary directly with signal strength. The advantage of using this voltage is that a wider range of voltages will be obtained as the result of the

[*Continued on page 61*]

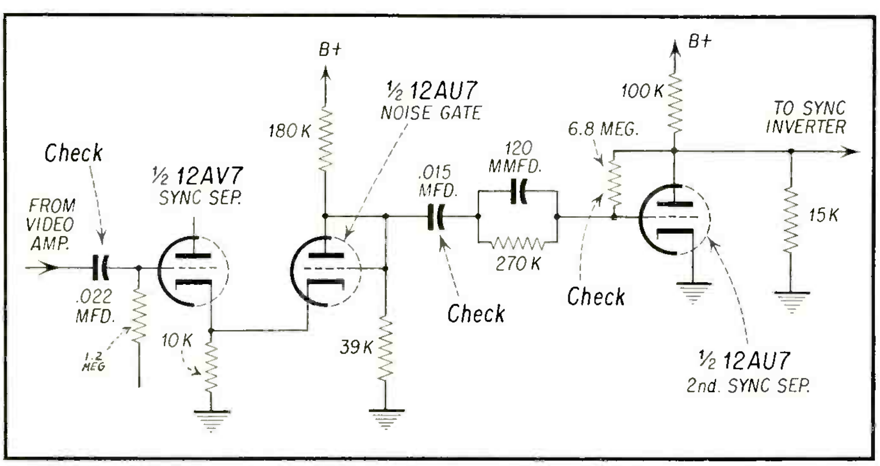


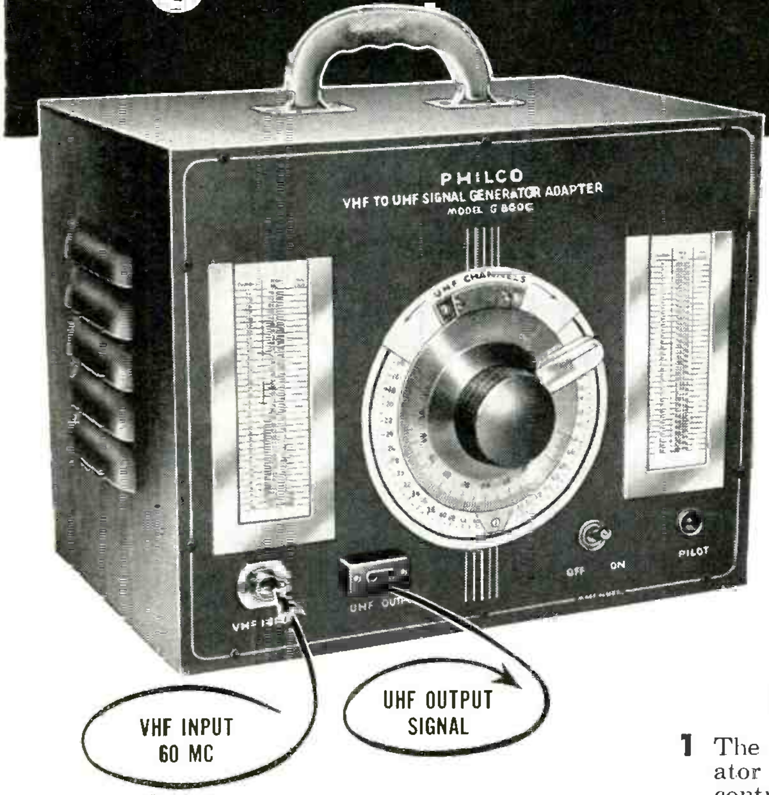
Fig. 3 — Sync circuits, Philco 51-T1606 chassis showing points to be checked to correct pix pull.

NOW! Use Your Present Signal Generator *for UHF!*

NEW!

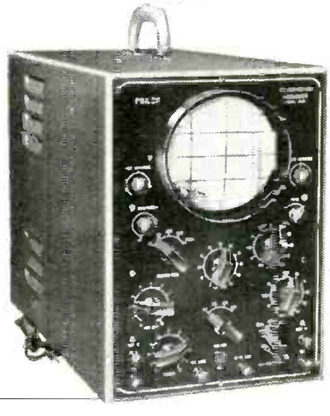
PHILCO Signal Generator Adapter

(VHF to UHF)



Individually Calibrated For Extreme Accuracy

Now produce UHF signals for TV receiver tests at a fraction of the cost of a UHF generator. Individual calibration guarantees extreme accuracy of UHF frequency. Any VHF signal generator output at 60 MC is converted by the PHILCO Model G-8000-C to UHF. The VHF sweep or marker signal beats against the UHF oscillator, producing UHF signals with the same characteristics as the VHF input signal. It's economical . . . *it's a PHILCO exclusive!*



5" High Gain Oscilloscope Model S-8202.

Gives rugged, general purpose performance. 60 CPS phasing of sweep generator presentations. Wide sweep range (up to 100KC) gives extreme flexibility in sweep circuit trouble shooting.

Look at These Philco Features . . .

1. The VHF signal generator output attenuator controls the UHF output signal level.
2. Precision Vernier Dial for accurate re-settings.
3. Each unit is hand calibrated.
4. Functions as an external UHF converter by connecting UHF antenna transmission line to generator's output terminal and connecting lead to TV receiver tuned to 60 MC Channel 3.
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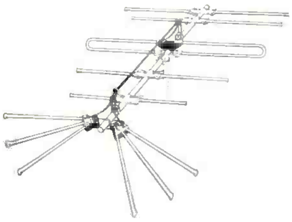
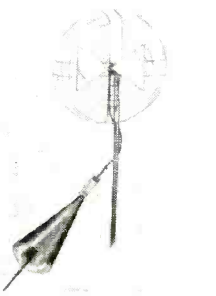


Snyder's New Conical-Yagi

Snyder's new conical-yagi combination TV antenna (the "AX-670") is designed for ultra-fringe area reception and may be used for Y VHF and UHF when stacked with a UHF antenna. Recommended stacking is Snyder model UHF-6 Corner Reflector together with crossover network. Literature on the AX-670 may be obtained by writing to Dick Morris, **Snyder Mfg. Co., Philadelphia 40, Pa.**

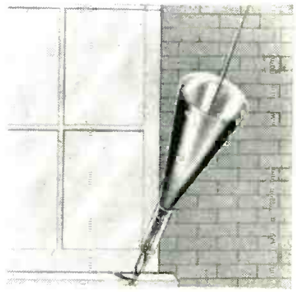
Stancor Flybacks

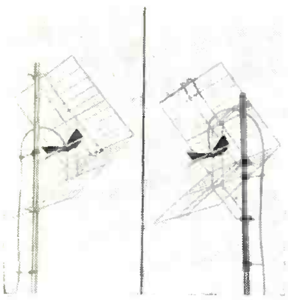
These exact replacement flybacks, A-8227, A-8228, A-8229, cover almost 90% of all Sylvania production up to 1953. They are supplied as coil and core for installation to the original brackets which are a permanent part of the chassis. Stancor Bulletin 478 lists over 170 Sylvania models and chasses using these transformers. Available from **Chicago Standard Transformer Corp., Standard Division, Addison and Elston, Chicago 18, Ill.**



Bogen "G-Line" for U.H.F.

The "G-Line," a single-wire transmission line consists of an impedance-matching unit at each end called "Launchers" which match the usual 300-ohm balanced line connection at the antenna to the single wire which carries the signal to the TV set. Near the TV set, usually at the window a second launcher matches the single wire to a short length of 300-ohm twin line which is attached to the receiver. The "G-Line" will greatly extend the range of UHF television because it exhibits unusually-low losses. It has very-low radiation and conversely it is not susceptible to noise. Swinging of the line does not affect the signal so intermediate supports are unnecessary. Frequencies below 100 mc are attenuated highly because of the design characteristics — this further reduces noise pickup. **David Bogen Co., Inc., 29 Ninth Avenue, New York 14, N. Y.**



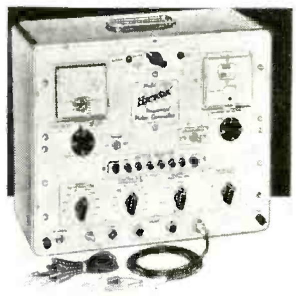


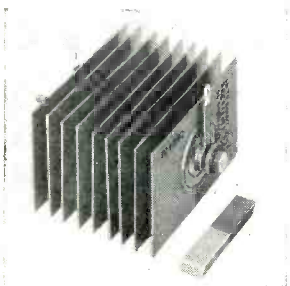
Channel Master Corner Reflectors

Model No. 409 can be adapted to any UHF installation with or without VHF. It installs instantly on any type structure and has high gain across the entire UHF band. The twin corner reflector, Model No. 406 can now be stacked because of a new Z-matching system with high gain over a greater band width than is possible with conventional stacking rods. **(Channel Master Corp., Ellenville, N. Y.)**

White-Dot Generator For Color TV

The Model 650C Hickock Universal Video Generator provides accurate registration adjustment of the three color guns in the tube of new color TV receivers, as well as the means for other adjustments in color and black-and-white TV. Complete details are available from The **Hickock Electrical Instrument Co., 10533 Dupont Ave., Cleveland 8, Ohio.**



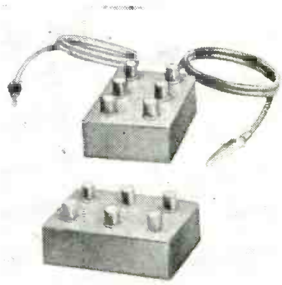


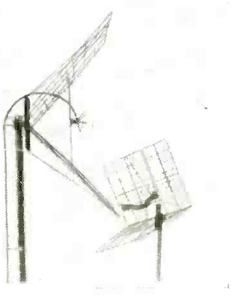
Color TV Rectifiers

I.R.C. announces a series of selenium rectifier stacks for color TV sets. The photo shows Type RS609S which is rated for 195 volts RMS input and 600 *ma* output. Bulletin ER-178 Supplement covers electrical and mechanical specifications of all the units in this series. Write to **International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif.**

TV Antenna "Orienter"

As an aid in TV installation, the "Orienter" permits the single transmission line to carry the signal to the TV set and return the video signal whose strength can then be read on an ordinary volt-ohmmeter. Requires no power and is easy to use. Descriptive folder, Form 903, is available from **Mosley Electronics, Inc., 8622 St. Charles Rock Road, St. Louis 14, Missouri.**





JFD "Golden Rig"

JFD announces the new "Golden Rig" Corner Reflector for UHF channels 14 to 83 in fringe areas. Designated Model UHF415, the "Golden Rig" is braced four ways to eliminate ghost-producing vibrations. Pre-assembled construction permits 35-second average installation time. The "Golden Rig" is gold colored due to JFD "Bronzidite" anti-corrosion plating. **(JFD Mfg. Co., Inc., Bklyn, N. Y.)**

Perma-Power Horiz. Bar Generator

The new Horizontal Bar Generator provides a series of equally spaced horizontal lines to indicate picture linearity. The "HBG" provides precise setting of yoke, accurate positioning of focus coil or magnet and quick adjustment of vertical linearity, height and centering. For details, contact the **Perma-Power Co., 4727 North Damen Ave., Chicago 25, Ill.**

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

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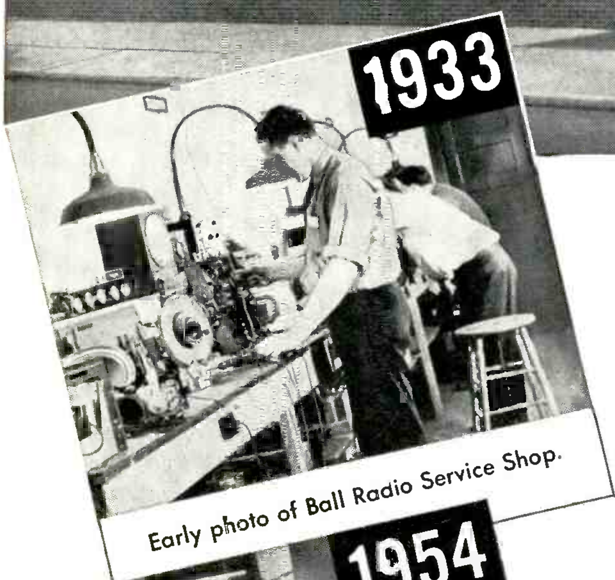
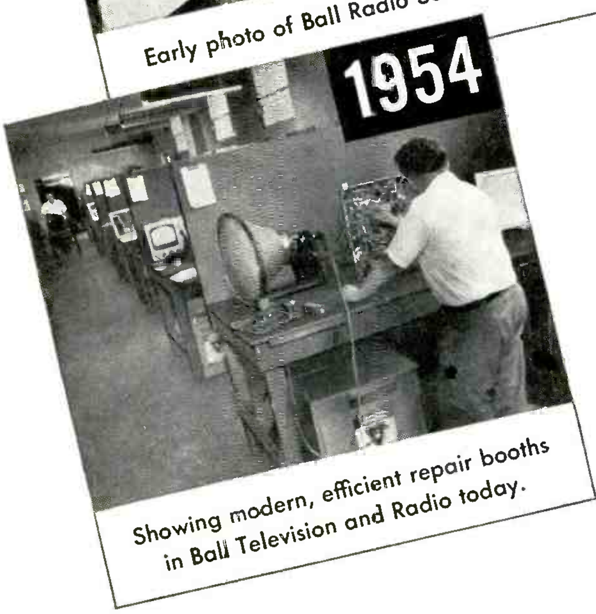


Early photo of Ball Radio Service Shop.



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LIGHTING · RADIO · ELECTRONICS · TELEVISION

ASSOCIATION

[*from page 17*]

CRTSA (Phila.)

The Council of Radio and Television Service Associations has elected Albert Haas, of the Television Contractors Association, as President. Mr. Haas succeeds Samuel Brenner, President of the Philadelphia Radio Servicemen's Association, the group's temporary President.

Other officers, elected to serve one year terms, were: Vice-President, Ray Cherrill of the Northeast Television Service Dealers Association; Secretary, William Wile, Jr. of the Television Service Dealers Association of Philadelphia: Treasurer, Louis J. Smith of the Television Service Dealers Association.

Mr. Haas reviewed the progress made by the Council, especially its public relations program over station WFIL and WFIL-TV here. Council is in process of completing arrangements with *TV Guide* magazine in promoting the Council's public relations program. Dave Krantz was named chairman of the Public Relations Committee.

NATESA Awards President's Cup

First annual award of the President's Cup of the National Alliance of Television-Electronics Service Associations goes to Fred Colton, chairman of the board of the Associated Radio & Television Service Dealers of Columbus, Ohio, shown receiving the coveted cup

from Frank J. Moch (right) of Chicago, president of NATESA, at a luncheon in Colton's honor.

The NATESA President's Cup, to be awarded annually hereafter at the Alliance's conventions, was presented to Colton "because of his zealous work on behalf of NATESA during the year 1953, especially for his efforts in the interest of the NATESA annual convention in Chicago," Moch said.

Colton, who is Eastern Central Vice President of NATESA, headed the largest visiting delegation to the Convention.

ARTSD (Columbus, O.)

Installation of new officers for the Associated Radio-Television Service-Dealers of Columbus, Ohio, took place recently. 1954 officers are: President, Fred Oberle; Vice-President, Harry Walcutt; Treasurer, Jim Cumbow; Secretary, Bob Duckworth.

SERVICE MAN'S DREAM

. . . the most compact TV set ever made!

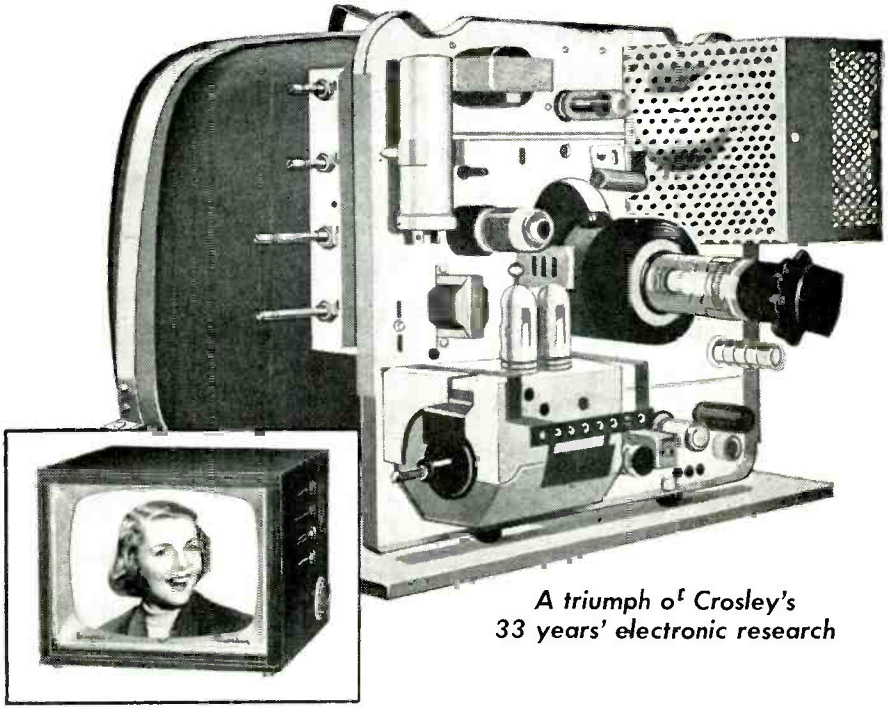
(Yet easily accessible)

CROSLEY SUPER-V IS DRAMATICALLY DIFFERENT INSIDE

Here's one set that is designed with the TV service man in mind. Removing the back of the Super-V plainly exposes all secondary controls and every tube in the set. And as you know, 9 out of 10 service calls merely require the change of a tube.

For any other service job, it's as simple as opening the hood of your car, no chassis to pull, just slide the entire Super-V cabinet up off the chassis. More repairs can be made in the home. You can get at the works immediately and without obstruction, service the Super-V in lots less time than you'd spend on an ordinary set.

The Super-V is a cinch to install. It's compact, weighs only 53 pounds. And in many places, you'll find its built-in antenna is all you need for perfect reception. Service men who've seen the Super-V call it the greatest forward step ever taken in TV chassis design.



A triumph of Crosley's 33 years' electronic research

CROSLEY

17-INCH Super-V

- TAKES UP TO 1/3 LESS SPACE THAN OTHER 17" TVs—FITS WHERE OTHER SETS WON'T
- FRONT ALL SCREEN—CONTROLS ON THE SIDE
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- ROLLING OFF CROSLEY PRODUCTION LINE IN VOLUME—PRICED FOR PROFIT AND ACTION NOW!

Suggested retail prices start at

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(Walnut-finished)

FOR MORE INFORMATION ON THE SUPER-V CALL YOUR CROSLEY DISTRIBUTOR NOW!

You can SELL them better on a CROSLEY

Division AVCO Cincinnati 25, Ohio

VIDEO AMPLIFIERS

[*from page 29*]

high-frequency tests, simply because the top of the reproduced square wave then represents such a small section of the tilted waveform, that a cursory glance leads to the conclusion that tilt is absent.

These are the chief reasons why video-amplifier tests must be carried out at a minimum of two square-wave frequencies, such as 60 *cps*, and 100 *kcs*. It is understood that in tests at any frequency, the rise time of the square-wave generator must be faster than the rise time of the video amplifier. In practical work, this means that the generator should have a rise time of not more than 0.05 microsecond. All good service generators meet the risetime requirement.

It is usually considered that a video amplifier which develops more than 10% overshoot at a square-wave repetition rate of 100 *kc* is unsuitable for good-quality picture reproduction. When two video stages are cascaded, the overshoots are additive, and the overshoot of each stage must be held to 5%. It sometimes happens that the first stage develops overshoot, while the second stage develops a rounded corner; in such case, the combined response is that of a notched corner, as seen in *Fig*. 7.

Horizontal Pull Can Be Caused by Cross-Talk of Video Amplifier With Sweep Circuit

Horizontal pull is sometimes observed in the picture when the cage is open to the high-voltage compartment, which permits the strong fields from the sweep-circuit network to escape and energize the grid or cathode leads of the picture tube. The sweep-circuit voltages are picked up by stray coupling, enter the output circuit of the video amplifier, and thence travel to the sync circuits, where the spurious waveforms in the phase-detector circuit cause horizontal pull.

Picture hooking is a closely related type of trouble, and consists of a displacement of the top of the picture (not the raster), and is usually caused by overload in the video amplifier, with resulting sync compression. In consequence, the sync circuits are forced to operate with subnormal sync-voltage, as well as being subjected in many cases to spurious transients from clipped pedestals and camera-signal peaks, as well.

In the majority of cases, this difficulty can be overcome by reducing the signal to the video amplifier by changing the *agc* threshold level. However,

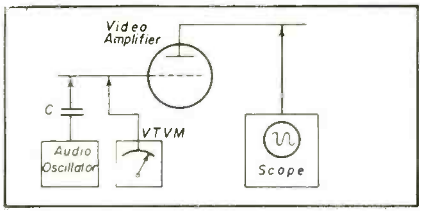

Fig. 8—To check operating point of video amplifier tube, apply audio signal to grid via blocking condenser. Advance audio oscillator output until distortion appears in display. Adjust operating point for maximum undistorted output.

in some cases, the signal level from the antenna may be uncontrollable. Pads should be switched into the *hf* input circuit in such case, to attenuate the signal to a usable level. If printed-circuit H pads are used, they can be permanently installed inside the tuner turret, and automatically switched in or out, as required.

Overload Distortion in Video Amplifier Must Be Checked with Audio Oscillator

It is apparent that the overload-voltage point of a video amplifier is a matter of some concern, not only from the standpoint of obtaining adequate picture contrast without tonal distortion in the gray ranges, but also to avoid certain types of sync trouble. It would be convenient if an overload check could be made as part of the square-wave test, or as part of a sweep-frequency test. However, due to the somewhat limited output of most square-wave and sweep-frequency generators, an audio oscillator is usually found better adapted to this test, as shown in *Fig. 8*.

A picture detector develops from 1 to 2 peak-to-peak volts output, in normal operation. The output from the audio oscillator can be readily measured with the aid of a peak-to-peak indicating VTVM, as shown in *Fig. 8*, and the output waveform should not show distortion when this value of input voltage is utilized.

It is just as important that when the video amplifier does finally drive into overload, that it do so in a symmetrical manner: if the waveform becomes flattened on the bottom, for example, but not on the top, the full signal-handling capability of the video amplifier is not being realized. The grid bias should be adjusted so that flattening appears simultaneously at the top and bottom of the reproduced sine wave, when driving into overload.

SUPPORT THE RED CROSS

ANSWER MAN

[*from page 54*]

different signals. The *agc* system can be switched and grounded so that it does not limit or govern the amplification of the FM signal. The output voltage of the FM deetctor can then be used as the signal strength indication as shown in *Fig. 5*. The advantage of using this voltage is that larger voltages are provided that will reveal more indication of different signal levels.

If only a field strength meter is used to measure signal strength there is no means of determining the quality of the picture. Standing waves on the antenna transmission line, noise and ghosts can cause a false indication as to the correct antenna orientation. Therefore it is very desirable to view the picture at the same time as measuring the signal strength. A 7 inch portable TV receiver converted to function as a field strength meter is a very desirable piece of equipment. It can be transported easily to the roof where the orientation is being performed and the picture watched as the job is being done. At the receiver the amount of pickup in the antenna lead-in can be determined by disconnecting the antenna on the roof and measuring the signal at the receiver end.

WORK BENCH

[*from page 34*]

setting of the contrast control, as the vertical sync held momentarily, the vertical sync and blanking pulses were visible beneath the picture portion.

First we changed all the tubes that affected the vertical sync, namely 6SL7 (V20) 12 SN7 (V10). This did not cure the trouble. We then took a waveform check with the scope at point "Z" and found the vertical sync pulse very weak. All components in the integrating network were found to be functioning properly. We then measured voltages at the 6SL7 sync amp and clipper tube. The voltages were also correct. As the sync pulses were taken off at the plate of V8B, 12AT7, there was a possibility of a defective CRT. A new pix tube was substituted, but this did not solve the problem.

We then studied the diagram in order to find a component in the video amp that might squash the vertical sync pulses without affecting pix quality and horizontal sync. There was a possibility that C257, 10 *mf*, could cause the trouble. Sure enough, on substituting a new 10 *mf* condenser, the vertical sync immediately popped in and that was that. In checking the bad one, we found it to be open.

In analyzing this problem, we see that C257 is the normal path from B-minus for the vertical sync pulses. With C257 open the 60 cycle vertical sync pulses are forced to choose the comparatively high reactance of C267, .05 *mf* in parallel with the resistance R280 (18K). Naturally, to the horizontal sync pulses and video information, these components offer low impedance. Thus with C257 open, the remaining impedance is high enough to attenuate the vertical sync pulses.

CIRCUIT COURT

[*from page 52*]

greater than that of the sync pulse will drive this grid beyond cutoff. When this grid is biased beyond cutoff, the entire plate current is cutoff and the signal on grid #7 of course is not present in the output. In this way, any signal whose amplitude is greater than the sync pulse, which might result in starting the sweep oscillators at the wrong time, is kept out. The result is greater stability of the set in the presence of heavy noise in the signal.

When the set is operated in areas of strong signal strength the possibility of strong noise pick-up is unlikely. Since in these areas the sync pulse itself might be strong enough to drive the first grid into cutoff, a *"local-distance"* switch is incorporated. In this set, the switch is called a *"Noise Limiter."* In local reception areas, this switch is turned to the "off" position. In this position, the first grid of the 6BE6 is grounded and its noise inverting function is eliminated.

The output of the sync stripper stage is fed to the grid of the 12AT7 triode sync clipper. The output of this stage is applied to the horizontal and vertical sweep circuits.

TEST CONNECTORS

[*from page 32*]

be sure to remove all the clips from the set before returning it to the customer. We have lost two sets of clips in this manner.

Bench Antenna System

A proper antenna system for the service bench should provide two immediate services.

(1) It should enable rapid connection of the television set to the antenna.

(2) It should provide for simultaneous operation of at least 3 sets.

When an antenna is available we can expand it with an efficient multi-set antenna coupler. Several units were tried amongst which we selected an EPCO 4 set coupler Model #TS4. We only use three of the taps for the service bench and the fourth for the shop set. The arrangement for the bench wiring is shown in *Fig. 7*.

The three antenna plugs are strategically located on the bench. The connecting cables for the sets were made to fit as many types of receivers as possible. Only two special connectors were made. One for the Dumont line includes a matching transformer. This is optional, for very little improvement has been noticed with it. The second is for the early Philco receivers. These are shown in *Fig. 8*. The connectors most often used are the clothespin connector and a pair of alligator clips which can be connected to almost any receiver.

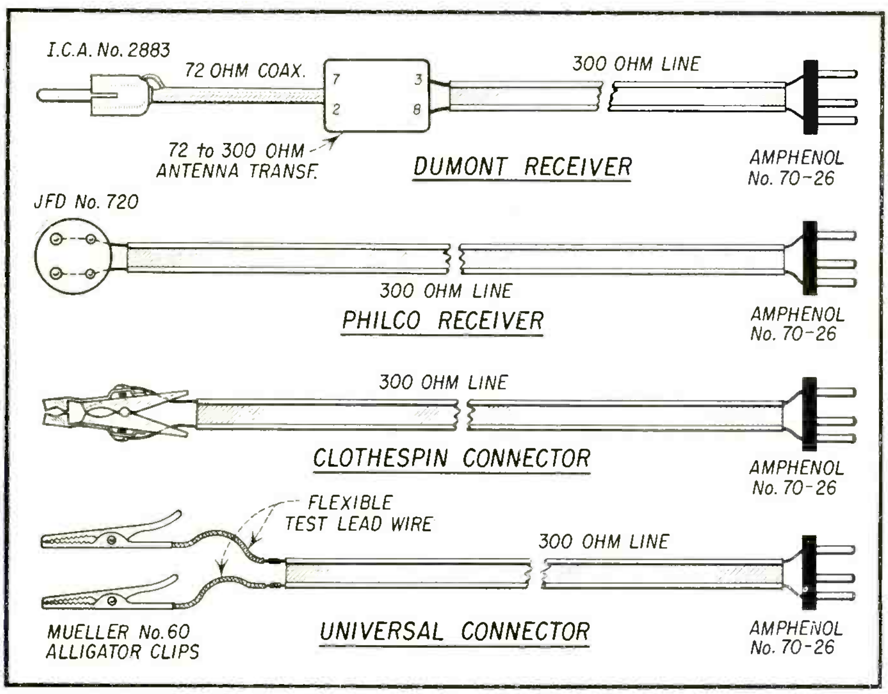

Fig. 8—Universal connectors.

Advertising Index

Admiral Corporation 13
American Phenolic Corp. 25
Audel Publishers 64

Bussmann Manufacturing Co. 26

CBS-Hytron 7
Century Electronics Co. 62
Channel Master Corp. 4, 5
Chicago Standard Transf. Corp. 17
Clarostat Mfg. Co., Inc. 60
Crosley Div., Avco Mfg. Co. 59

Delco Radio 18

Electronic Instrument Co. Inc. (EICO) 64
Esse Radio Company 58

Guardian Elec. Mfg. Co. 62

Hickok Electrical Instrument Co. 60

Insl-X Sales Company 1
International Resistance Co. Cover 2

Jensen Industries, Inc. 64
JFD Manufacturing Co., Inc. 10, 11

Mosley Electronics 61

National Union Radio Corp. 23
Noll, Edward M. 64

Philco Corporation 55
Pyramid Electric Company 9

Quam-Nichols Company 12

Radiart Corporation 15
Raytheon Mfg. Company 2
RCA Institutes, Inc. 21
RCA Tube Dept. Cover 4
Regency 16
Rider, John F. Publisher 51
Rogers Electronic Corp. 62

Sams, Howard W. & Co. 8
Sangamo Electric Company 14
Simpson Electric Company 29
Smith Heat Treating Company 63
Snyder Manufacturing Co. Cover 3
South River Metal Prods. Co. 60
Sylvania Electric Products, Inc. 57

Waldom Electronics 28

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