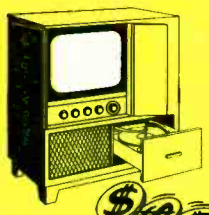
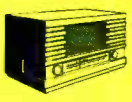
TECHNICIAN

& Circuit Digests



In 1954

28,000,000 TV Sets
118,000,000 Radios



Each TV SET represents $20.00 in servicing business for you per year

Each RADIO represents $4.00 in servicing business for you per year

MR. TECHNICIAN

How the TV Service Market Is Expanding

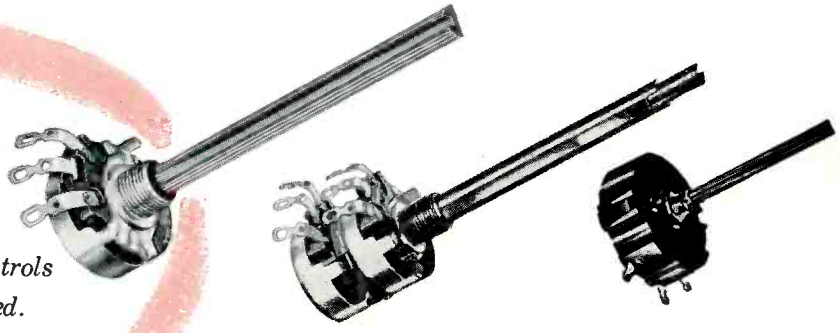
January • 1954

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

425 N. Broad Street, Philadelphia 8, Pa.

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

TECHNICIAN*
& Circuit Digests

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TECHNICIAN, January 1954, Vol. 59, No. 1. 50 cents a copy. Published monthly by Caldwell-Clements, Inc., Publication Office, Emmett St., Bristol, Conn. Editorial, Advertising and Executive Offices, 480 Lexington Ave., New York 17, N. Y. Entered as second class matter at the Post Office at Bristol, Conn., Nov. 4, 1953. under the act of March 3, 1879. M. Clements, President; Orestes H. Caldwell, Treasurer. Subscription rates: United States and Canada, $4.00 for one year; $6.00 for two years; $8.00 for three years. Pan-American and Foreign countries: $7.00 for one year; $10.00 for two years; $14.00 for three years. Printed in U.S.A.

JANUARY, 1954

TECHNICIAN'S COVER provides a chart that should reassure most any "gloomy Gus" that the big TV-radio service business will get bigger still in the future. See interpretation on Editorial page.

***CIRCUIT DIGESTS** (See page 73 and the following sheets)*

CROSLEY: Chassis 412 & 416
DUMONT: RA-306, 307
SENTINEL: Models IU-581, 2, 4, 5
STEWART-WARNER: Models 24C-9370A, AB
STROMBERG-CARLSON: 612A series

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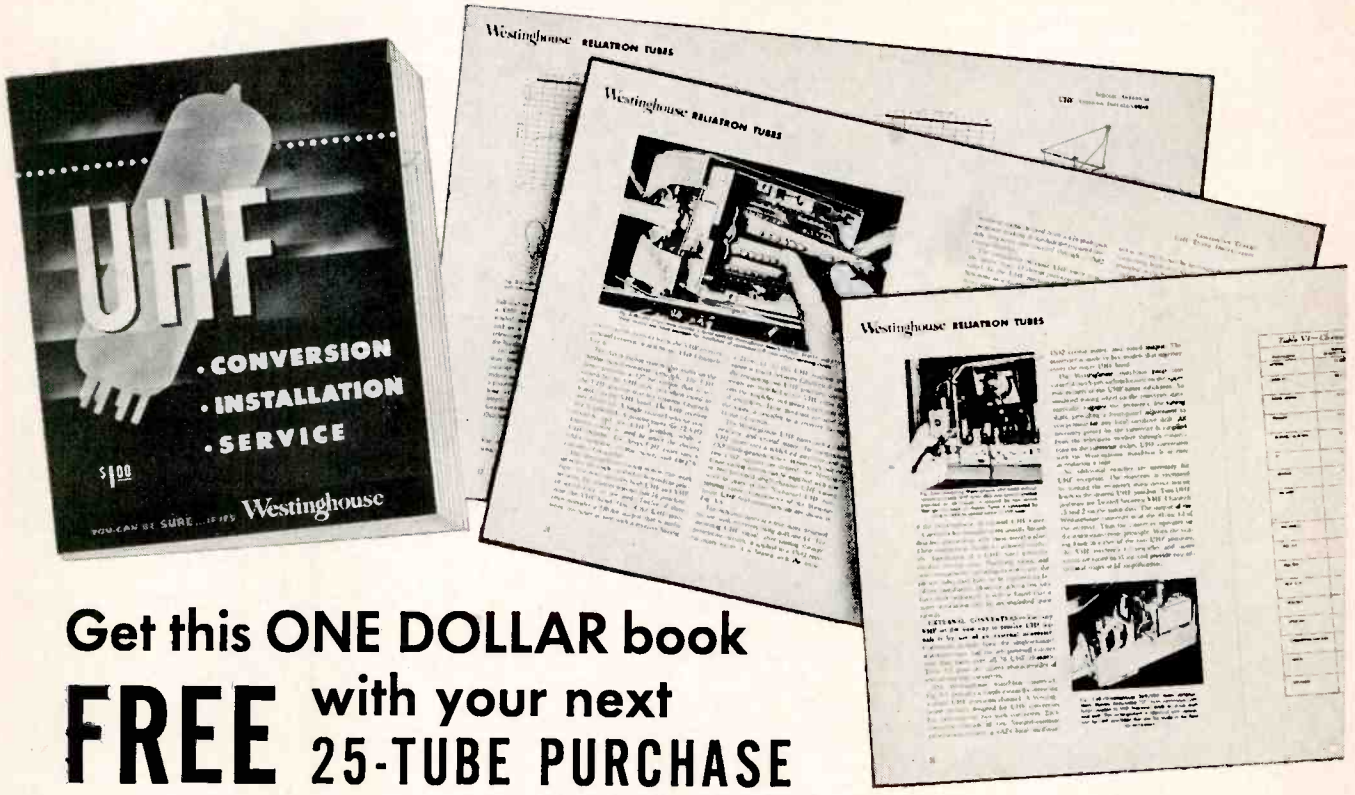

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This newest, most helpful book on UHF conversions is yours free when you buy 25 RELIATRON receiving tubes or one picture tube from your Westinghouse Distributor.

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There's a gold mine in UHF conversions. And this book will help you make the most out of the biggest profit opportunity since television came alive.

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See Westinghouse Tube Listings in 1954 Photofact Folders.

ET-95046

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ARKANSAS
Little Rock — Southern Radio Supply

CONNECTICUT
Bridgeport — Hatry of Bridgeport
Danbury — Pilgrim Electronics Co.
Hartford — Hatry of Hartford
New Haven —Hatry of New Haven
Stamford — Hatry of Stamford
Waterbury — Hatry of Waterbury

DELAWARE
Wilmington — D & M Radio Sales & Service Co.

DISTRICT OF COLUMBIA
Washington — Electronic Wholesalers, Inc.
— Silberne Radio & Electronics Co.

FLORIDA
Jacksonville — Bay Co.
— Thurow Distributors Inc.
Miami — Herman Rodio Supply Co.
— Thurow Distributors Inc.
Orlando — Thurow Distributors Inc.
Pensacola — Grice Radio & Electronics Supplies
St. Petersburg — Thurow Distributors Inc.
Tallahassee — Thurow Distributors Inc.
Tampa — Thurow Distributors Inc.
West Palm Beach — Thurow Distributors, Inc.

GEORGIA
Atlanta — Herndon-Thomas Electronics
— Specialty Distributing Co.
— Yancey Co., Inc.
Albany — Specialty Distributing Co.
Augusta — Specialty Distributing Co.
Macon — Specialty Distributing Co.
Savannah — Specialty Distributing Co.
— Yancey Co., Inc.

ILLINOIS
Alton — Radonics Alton, Inc.
Chicago — Broadwin Radio & TV, Inc.
— Chauncey's, Inc.
— Clayton Radio Parts
— Irving Joseph, Inc.
— J. G. Bowman & Co.
— Radio Parts Co.
— Walker-Jimieson, Inc.
Danville — Bud Electronic Supply Co.
Elgin — Elgin Electronic Supply
Joliet — Joliet Radio Supply
Kankakee — Radio Doctors Supply House
Oak Park — Melvin Electronics, Inc.
Peoria — Warren Radio Co.
Rockford — Superior Radio Co.
Rock Island — Tri-City Radio Supply, Inc.

INDIANA
Angola — Shaw Engineering Co.
Columbus — H. A. Williams & Co.—Radio Parts
Evansville — Hutch and Son
Ft. Wayne — Wall Distributing Co.
— Warren Radio Co.
Hammond — Broadwin Television & Radio, Inc. of Indiana
Indianapolis — Graham Electronics Co. Inc.
— Meunier Radio Supply Co.
— Warren Radio Co.
Marion — Mobile Radio Supply Co.
Terre Haute — Archer & Evinger
Valparaiso — Jess Bowman & Assoc.

IOWA
Cedar Rapids — Gifford-Brown, Inc.
Council Bluffs — World Radio Laboratories
Davenport — Tri-City Radio Supply
Des Moines — Gifford-Brown, Inc.
— Radio Trade Supply Co.

KANSAS
Pittsburg — Pittsburg Radio Supply
Topeka — Overton Electric
Wichita — Radio Supply Co.

KENTUCKY
Lexington — Lex-Tranics
Louisville — Peerless Electronic Equipment Co.
— Universal Radio Supply Co.
Paducah — Warren Radio Co.

LOUISIANA
Baton Rouge — 'Ole Miss Supply
New Orleans — Atlas Radio Supply
— Crescent Radio & Supply Inc.
— 'Ole Miss Supply
— Pelican Radio Supply
Sulphur — General Electronic & Engineering Service Corp.

MAINE
Hallowell — Powell Radio Supply

MARYLAND
Baltimore — Wholesale Radio Parts Co. Inc.

MASSACHUSETTS
Boston — Commercial Radio Corp.
— Gerber Radio Supply Co.
— Lincoln Electronic Supply Corp.
— Radio Wire Television, Inc.
Lynn — Essex Electrical Supply Co. Inc.
Natick — Willett Radio Supply
New Bedford — E. A. Ross & Co.
Springfield — Regent Sales, Inc.

MICHIGAN
Battle Creek — Electronic Supply Corp.
Benton Harbor — Benton Electronic Supply Co., Inc.
Detroit — Glendale Electronic Supply
Flint — Lifsey Distributing Company
Grand Rapids — Radio Parts, Inc.
Wholesale Radio Co.
Highland Park — Hi-Park Distributor
Jackson — Matteson Electronics, Inc.
Muskegon — Bell Laurim Electronics, Inc.
Pontiac — Electronic Supply Co.

MINNESOTA
Duluth — Lew Bonn Co.
Minneapolis — Electronic Center, Inc.
— Lew Bonn Co.
St. Paul — Lew Bonn Co.

MISSOURI
Kansas City — Manhattan Radio Supply
— Radiolab
St. Louis — Van Sickle Radio Co.
— Radonics Co.

NEW JERSEY
Hackensack — American Distributing Co.
Hillside — Sherwood Distributors, Inc.
Jersey City — Hallmark Electronics Corp.
Manville — Masters TV Supply Co.
Newark — Emerson-New Jersey, Inc.
— Radio Wire Television, Inc. of N.J.
— Variety Electric Co., Inc.
North Bergen — American Distributing Co.
Paterson — Jersey Electronic Distributing Co.
Perth Amboy — Bennett's Radio Supply
Teterboro — Van Dusen Aircraft Supplies
Trenton — Allied Electrical Appliance Parts, Inc.

NEW YORK
Albany — Air Waves Electronic-Radio Dist. Co.
Binghamton — Stack Electronic Supply Co.
Brooklyn — Ace Electronics
— Bay Electronic Distributors
— Benray Electronics Corp.
— Hygrade Electronics, Inc.
Buffalo — Buffalo Electric Co. Inc.
— Radio Electric Products, Inc.
Elmira — Le Valley McLeod, Inc.
Fredonia — Barker-Higbee, Inc.
Ithaca — Stallman of Ithaca, Inc.
Mineola — Emerson-Long Island, Inc.
Monticello — Fleisher Distributors, Inc.
Newburgh — Chief Electronics, Inc.
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— Emerson-New York, Inc.
— House of Electronics
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— Midway Radio & Television Corp.
— Milo Radio & Electronics Corp.
— Radio Wire Television, Inc.
— Sanford Electronics Corp.
Patchogue — South Bay Radio Distributors
Poughkeepsie — Chief Electronics, Inc.
Rochester — Maseline Radio & Electronic Equipment, Inc.
Rome — Rome Electronic Supply
Staten Island — B & D Distributing Co.
Syracuse — Karl-Williams Co., Inc.
Troy — Troy Electronics Distributing
Utica — Electronic Laboratories & Supply Co.
White Plains — Emerson Radio Westchester, Inc.

NORTH CAROLINA
Charlotte — Dixie Radio Supply Co.
— Westinghouse Electric Supply Co.
Greensboro — Westinghouse Electric Supply Co.
Hickory — Victor Radio TV Supply Co.
Raleigh — Raleigh-Allied Electronics, Inc.
— Westinghouse Electric Supply Co.
Salisbury — Leonard Electronics of Salisbury, Inc.

OHIO
Akron — Sun Radio Co.
Canton — Burroughs Radio, Inc.
Cincinnati — Holub & Hogg
— Mytronic Co.
— Radio TV & Refrigeration Supply, Inc.
Cleveland — Radio Electronic Parts Corp.
Columbus — Buckeye Electronics
— Electronic Supply Corp.
— Whitehead Radio Co.
Daytan — Allied Supply Co., Inc.
— Stotts-Friedman Co.
Lima — Allied Supply Co., Inc.
Mansfield — Burroughs Radio Inc.
Marion — Servex Distributing Co.
Toledo — Lifetime Electronics
— Warren Radio Co.
Warren — Radio Specialties
Youngstown — Radio Parts Co.

OKLAHOMA
Oklahoma City — Dulaney's
— Electronic Supply Co.
Tulsa — S & S Radio Supply

PENNSYLVANIA
Allentown — Radio-Television Supplies
Braddock — Marks Parts Co.
Erie — B & D Wholesale Distributing Co.
Harrisburg — Harrisburg Radio Laboratory Supply
Hazelton — Moyer Electronic Supply Co., Inc.
New Brighton — Television Parts Co.
Philadelphia — Allied Elec. Appliance Parts, Inc
— Almo Radio Co.
— Barnett Bros. Radio Co.
— Herbach & Rademan Co.
Pittsburgh — Cameradio Co.
— Radio Parts Co. Inc.
— Tydings Co.
Scranton — General Radio & Refrigeration Co.
— Penn Electrical Engineering Co.
Wilkes-Barre — General Radio & Electronic Co.
York — York Radio & Refrigeration Parts

RHODE ISLAND
Providence — Television Accessory House

SOUTH CAROLINA
Columbia — Dixie Radio Supply Co.
— Westinghouse Electric Supply Co.
Florence — Dixie Radio Supply Co.
Greenville — Dixie Radio Supply Co.
— Westinghouse Electric Supply Co.
Spartanburg — McElhanney Co., Inc.

TENNESSEE
Chattanooga — Mills & Lupton Supply Co.
— Specialty Distributing Co.
Kingsport — Chemcity Radio & Electric Co.
Knoxville — Chemcity Radio & Electric Co.
Memphis — Electronic Supply, Inc.
— McGregor's, Inc.
— W & W Distributing Co.
Nashville — Currey's Wholesale Distributors
— Electra Distributing Co.
— Moore-Handley Hardware Co., Inc.

TEXAS
Amarillo — Dulaney's Co., Inc.
Beaumont — Covington Distributing Corp.
Corpus Christi — Hayes Radio Supply Co.
Dallas — Adleta Co.
— Crabtree's Wholesale Radio Co.
Denison — Denison Radio Supply
Ft. Worth — Sutton's Wholesale Electronics
Houston — Angie Radio & Supply Co.
— Electro-Mechanical Products Co.
— Hall, Inc.
Midland — Henderson-Hoff
San Antonio — Mission Radio, Inc.
— Modern Radio Supply
Tyler — Radio Service Supply Co.

VIRGINIA
Bristol — Bristol Radio Supply Corp.
Fredericksburg — J & J Appliance Co.
Lynchburg — Eastern Electric Co.
Newport News — Noland Co., Inc.
Norfolk — Radio Parts Distributing Co.
Richmond — Meridan Electronic Equipment Co.
Roanoke — Leonard Electronics of Roanoke, Inc.
Winchester — Leonard Electronics of Winchester, Inc.

WEST VIRGINIA
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Huntington — TV Supply Co.

WISCONSIN
Madison — Superior Radio Co. of Madison
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The above listing was closed as of November 10, 1953. Watch for new Westinghouse Distributor Appointments in your area.

ET-95046

FROM COAST TO COAST —

the nation has seen the Regency Remote TV Control on television. Garroway sold it for you to a fresh market. Now, 20,000,000 TV set owners can adjust the TV picture from where it is seen with the Regency Remote TV Control.

TODAY'S GREAT OPPORTUNITY IN TELEVISION ACCESSORIES —

close the sale Garroway started

A NEW PRINCIPLE in Remote Universal Control Devices!

- It works on as much as 100 feet of cable (permits running cable around room periphery!)
- Changes channels!
- Sharpens contrast!
- Brightens the picture!
- Controls volume!

MODEL RT-700 $69.95 LIST

Regency

DIVISION OF I.D.E.A., INC.

Makers of VHF Boosters, FM Boosters, U-H-F Converters, Professional High Fidelity Equipment and Television Remote Control.

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by

WESTON

with new features for greater accuracy and time-saving facility in all testing

- Provides accurate meter measurement of leakage resistance as high as 5 megohms between tube elements.
- Permits high transconductance measurements, with ranges 3000/6000/12000/24000 micromhos.
- Multiple switching protects against early obsolescence, allows making any combination of tube connections.
- Element switching permits checking and comparing individual sections of twin-section tubes without changing selector switch.
- Only *one* socket for each type tube base eliminates plugging tubes into wrong sockets.
- Sockets for all type bases . . . including acorn and 7 and 8 pin subminiatures.
- 19 filament voltage settings—.65 to 115 volts. 5 plate voltages — 20 to 177 volts. A 45-volt source for testing subminiature types.
- Grid bias, plate voltage and meter sensitivity adjustable.
- Large, readable fan-shaped meter . . . new roll chart with complete, up-to-date data on all tubes.

Complete data on the new Model 981 Type 2 available in bulletin form. Write . . . WESTON Electrical Instrument Corporation, 614 Frelinghuysen Avenue, Newark 5, New Jersey.

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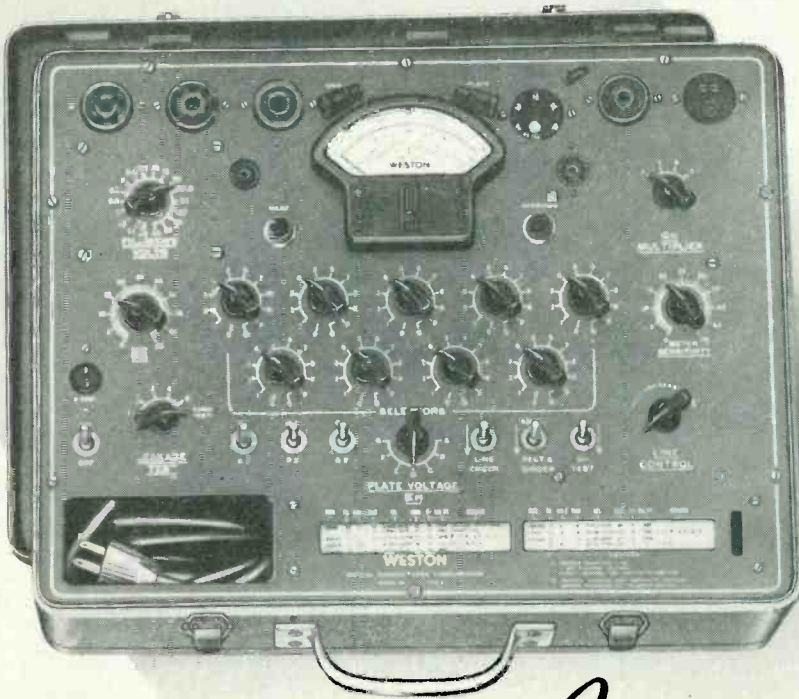
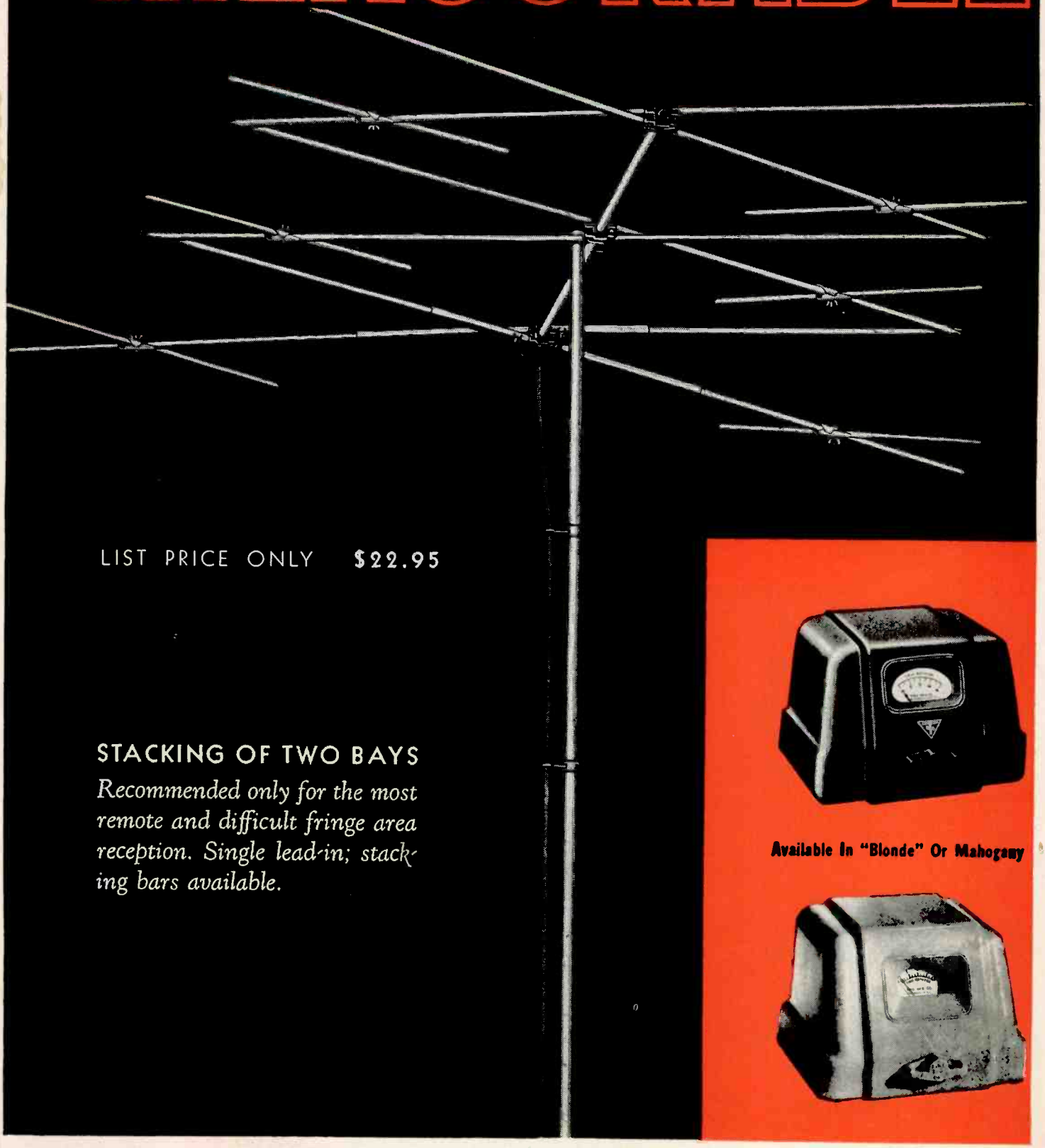
Available through leading distributors



WESTON
Model 981 Type 2

WESTON *Instruments*

MEASURABLE



LIST PRICE ONLY **$22.95**

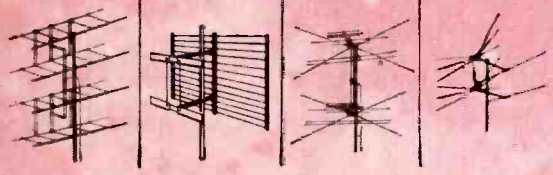
STACKING OF TWO BAYS

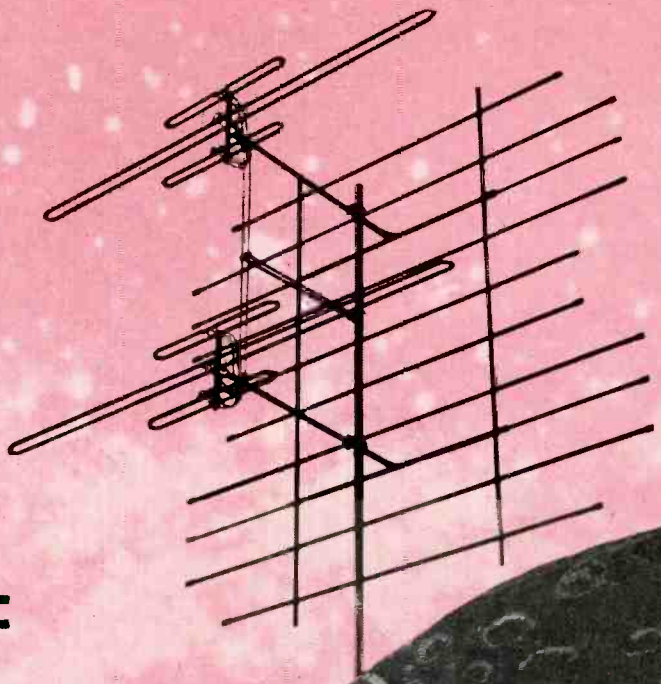
Recommended only for the most remote and difficult fringe area reception. Single lead-in; stacking bars available.

Available In "Blonde" Or Mahogany

THIS ANTENNA OUT-PERFORMS:

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





the AMAZING VHF CHAMPION*

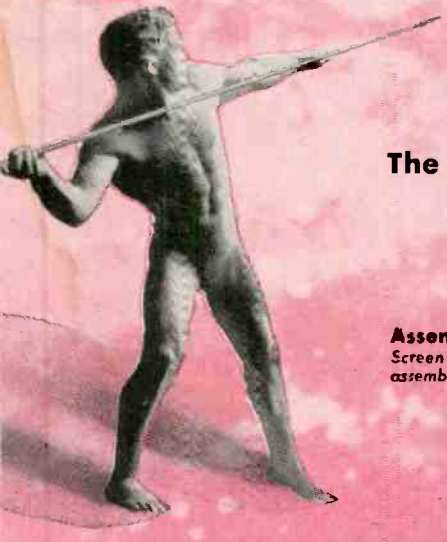
a NEW KIND of Antenna that out-performs every all-channel VHF antenna ever made — — and many Yagis, too!

America's servicemen have spoken! In only 3 months, they've made the CHAMPION the nation's top-selling VHF antenna! It's the highest gain all-channel VHF antenna ever developed, and its performance has now been proven by over 50,000 outstanding installations.

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

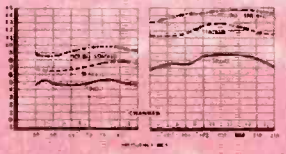
Folded dipoles throughout give close to 300 ohms impedance across entire band. Lightweight, all-aluminum construction. Available in one, two, or four-bays.

CHANNEL MASTER CONQUERS SPACE!

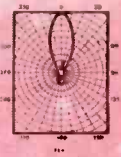


The stacked CHAMPION provides:

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



horizontal polar pattern (relative voltage)



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

model no.		list price
325	single bay	$20.[illegible]
325-2	two bay	42.[illegible]
325-4	four bay	88.[illegible]
Separate Stacking Harnesses		
325-3	2 bay harnesses	$2.[illegible]
325-5	4 bay harnesses	4.[illegible]

CHANNEL MASTER CORP.
ELLENVILLE, N. Y.

*Pat. Pend.

3 great, new UHF antennas

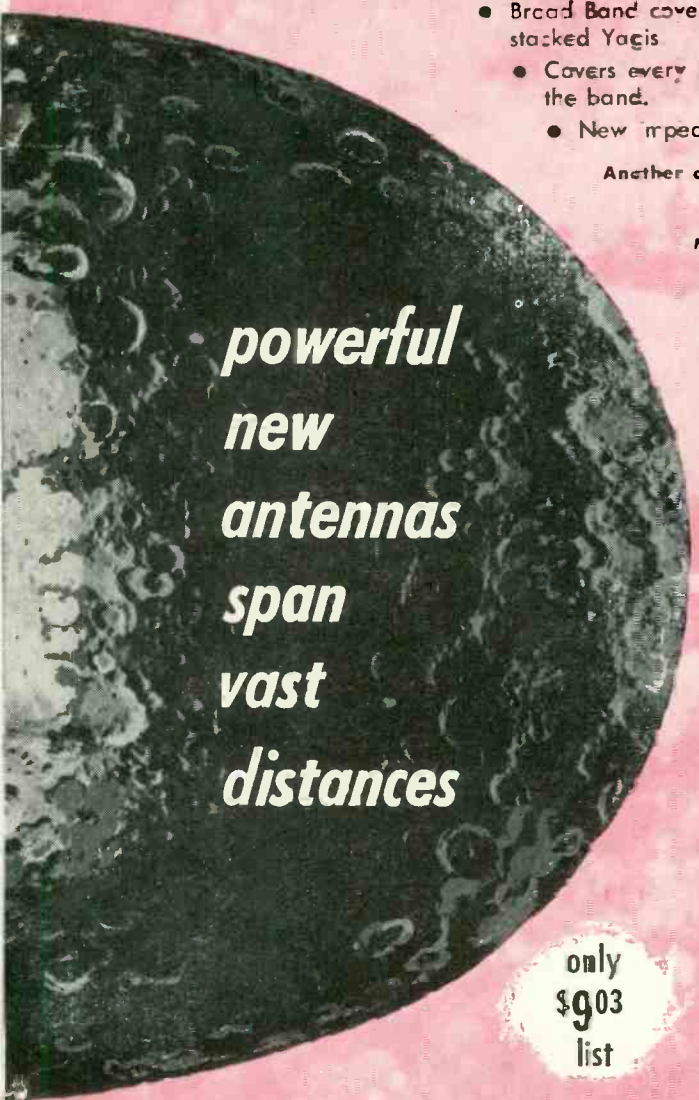
by CHANNEL MASTER

STACKED TWIN CORNER REFLECTOR model no. 406-2

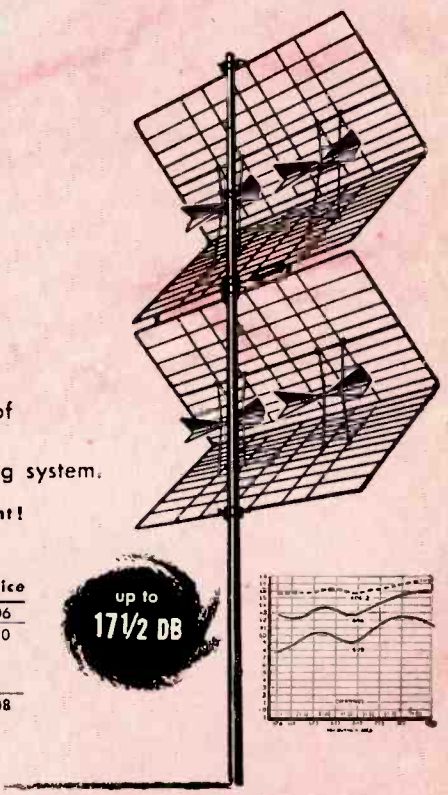
The most powerful UHF fringe area installation you can make today!

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

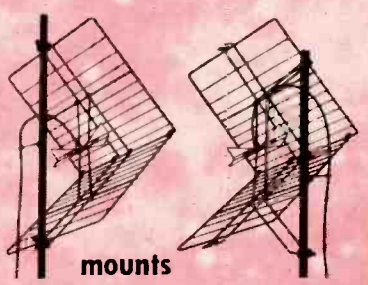
Another original Channel Master development!



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



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



model no. 409

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

only $9.03 list

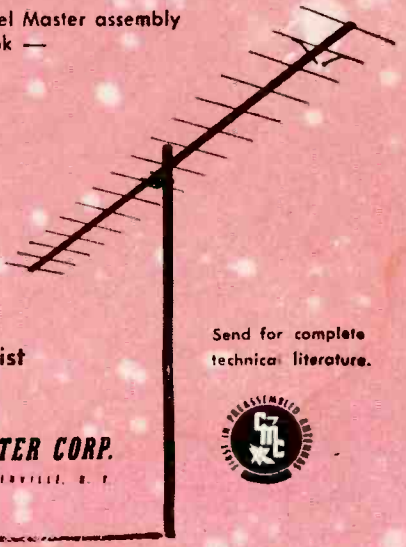
Installs instantly! Original Channel Master assembly feature: Screen swings open like a book — dipole assembly snaps into place.

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

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

model no. 420

$8.20 list



Send for complete technical literature.

CHANNEL MASTER CORP.
ELLENVILLE, N. Y.

None... in a Million

A well-known TV and radio set manufacturer reports not one field reject during a 12-month period in which he used over 1,000,000 Mallory FP Capacitors. Yes, it's hard to believe but it happened. And it's

Proof Positive of Mallory Capacitor Dependability

Odds are staggering against such a record but they are all on your side . . . if you use Mallory Capacitors.

You can bet your bottom dollar that jobs *stay* done when you install Mallory Capacitors. That means no loss of time and money on call-backs!

Don't miss a sure thing. The Mallory FP Capacitor line is complete. There's a rating for every set. They are the only Fabricated Plate Capacitors on the replacement market. And they cost no more than ordinary capacitors.

And be sure to use Mallory Plascaps® for plastic tubular replacements. Permanently secured leads . . . no off-center cartridges . . . no premature shorts.

Prove to yourself what manufacturers and thousands of servicemen know—
YOU CAN ALWAYS DEPEND ON MALLORY CAPACITORS.

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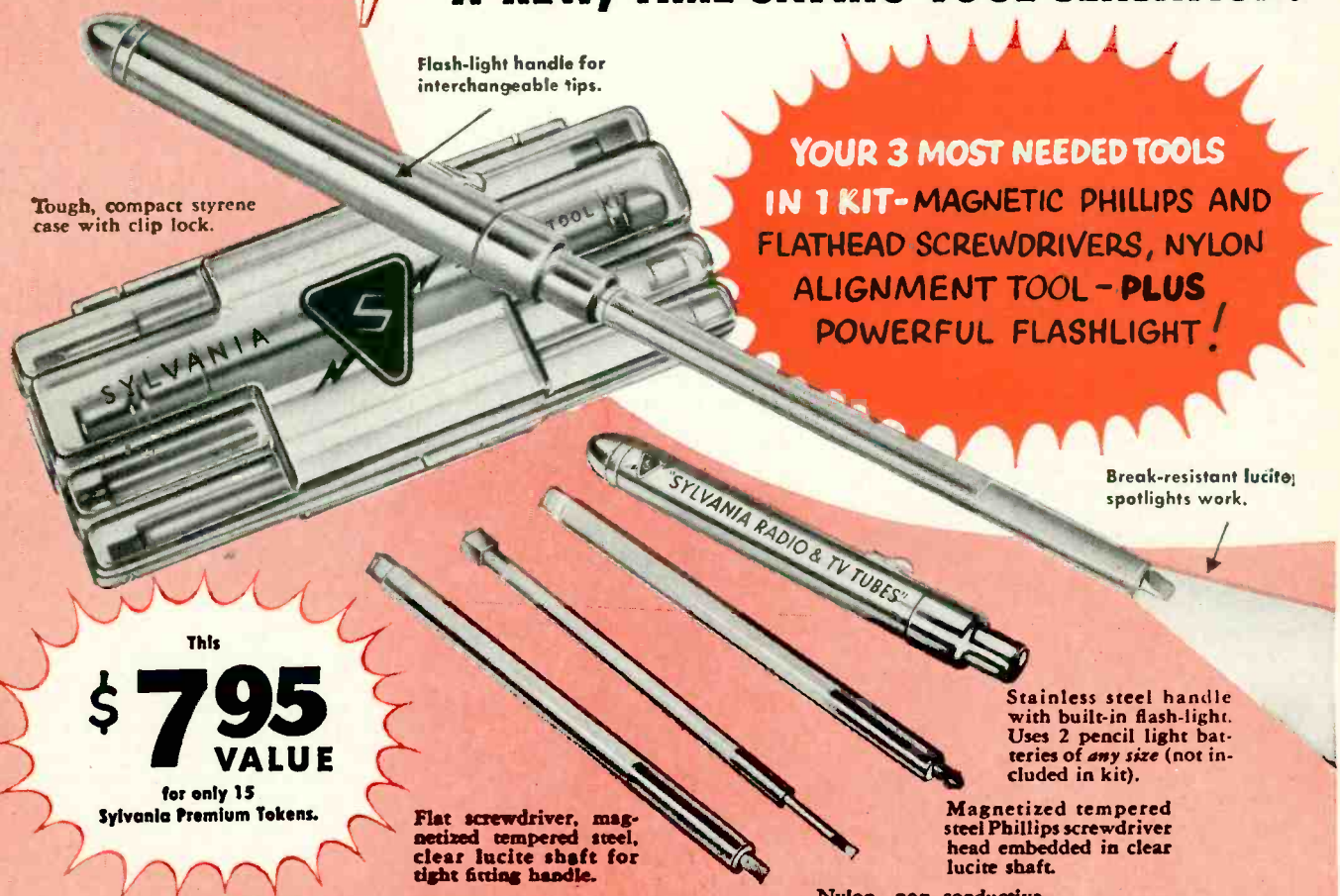
SYLVANIA'S SEE-WELL TOOL KIT

A NEW, TIME-SAVING TOOL-SENSATION!



YOUR 3 MOST NEEDED TOOLS IN 1 KIT - MAGNETIC PHILLIPS AND FLATHEAD SCREWDRIVERS, NYLON ALIGNMENT TOOL - PLUS POWERFUL FLASHLIGHT!

This **$7.95 VALUE** for only 15 Sylvania Premium Tokens.

NO MORE FUMBLING inside dark radio and TV cabinets. At the flick of a switch, a bright light automatically focuses right at the spot you're seeking. Saves your time . . . improves your work.

3 Handy Tools in 1. Magnetized Phillips and Flathead screwdrivers, nylon alignment tool — all 3 built into break-resistant lucite shafts perfectly fitted to flashlight handle.

Without doubt, this SEE-WELL Tool Kit is one of the slickest, quickest service tools ever built!

See your Sylvania Distributor Today! He has this remarkable tool kit for you now — you need only 15 Sylvania Premium Tokens. The time to get this valuable Sylvania See-Well Tool Kit is NOW — so don't delay, order high quality Sylvania tubes TODAY.

Remember, you get 1 token with every 25 Sylvania Receiving Tubes or every Sylvania TV Picture Tube you buy.

SYLVANIA

Sylvania Electric Products Inc. Dept. 4R-4201 1740 Broadway, New York 19, N. Y.

In Canada: Sylvania Electric (Canada) Ltd.
University Tower Bldg., St. Catherine Street, Montreal, P. Q.

LIGHTING • RADIO • ELECTRONICS • TELEVISION

LETTERS
To the Editors

Will Enhance Knowledge and Standing of Servicer

EDITORS, TECHNICIAN:

I have examined with considerable interest your new magazine TECHNICIAN. I am sure that it will meet with ready acceptance on the part of radio-TV servicemen throughout the Country.

Its opportunity, scope and editorial plans, as contained in your statement, leave little unsaid on this subject and bring into sharp focus the responsibilities of the radio serviceman to his community as well as his need to keep pace with the rapid advancements that are being made in the art and industry.

The coming of color television will require him to increase his over-all knowledge of television circuitry and maintenance of service. Coupled with this is the need for ethical practice and the right of the serviceman to a fair return for services rendered.

TECHNICIAN can also serve as a vehicle whereby the radio-TV serviceman can bring his points of view to the attention of the manufacturer. I note in current issues several service readers have forcibly expressed their views concerning certain problems they have encountered in the servicing of television receivers. Manufacturers could well give heed to the experiences of these radio servicemen.

Finally, I would like to state that I am sure TECHNICIAN will serve to enhance the over-all knowledge of the radio serviceman and as a result his standing in the community in which he practices.

GEO. E. STERLING
Commissioner
Federal Communications
Commission
Washington, D.C.

Reader Questions "Tough Dog"

EDITORS, TECHNICIAN:

Special attention of "Whom do you think you are kidding" dep't.

Did the 1B3 mentioned in the "Tough Dog" corner of the November issue, under the heading "Cracked 1B3" have a self-contained vacuum pump, so that the air which entered and "cut off" the tube after one hour of operation could be evacuated, putting it back in condition to play for an hour next time the set was turned on?

HERB TELLING
Box 233
CLEMENTON, N. J.

The tube may not have a vacuum pump, but it certainly has a "getter". This is a material that enters into combination with incoming gases. Since the crack was so fine that a jeweler's eye-piece was required to reveal it, it seems reasonable to assume that the tube remained sealed while it was "cold." During this time, "getter" action disposed of gases that had entered previously. As the tube heated, however, expansion opened the crack, permitting a slow re-entry of gases, until the tube was once more cut off.

Of course, this is only speculation. Nevertheless, whatever the cause, the fact remains that the symptom was observed—and not by Gelman alone. One of our editors had a similar experience with a 1X2A some months ago. High-voltage rectifiers aside, defective tube operation due to air leakage is not an unheard-of thing. Ghirardi and Johnson, for example, in Radio and Television Receiver Troubleshooting and Repair, make reference to the effects of such leakage on tube output.

In the light of supporting evidence, there seems little reason to doubt the authenticity of Gelman's Tough Dog.—Editor

Correspondence on UHF Strip Interference

EDITORS, TECHNICIAN:

Reference is made to an item on page 27 of the November 1953 issue of TECHNICIAN. This item concerns reported amateur interference to television receivers utilizing UHF channel strips.

No brand names or tuner types are indicated in this article—reference is merely made to "strips." This article assumes that all UHF strips are double-conversion types and therefore susceptible to amateur interference. All UHF strips used in Zenith receivers are of the single conversion type which do not require a "first intermediate frequency" and are therefore not subject to such interference.

Combining all "strips" into a single group as reported in your article is quite inaccurate, since considerable difference exists in the design and performance of Zenith UHF strips and those made by other manufacturers.

Operation of Zenith UHF strips utilize conversion of the radio frequency directly to the receiver i-f without any intermediate steps. This is exactly the same method as employed in television receivers on VHF operation. Such design minimizes the possibility of beats, and eliminates tuned circuits responsive to signals other than those desired.

Your article, therefore, may be considered as inaccurate since no exception to Zenith strips is mentioned. Since Zenith was the first to introduce the simplicity of UHF operation using inexpensive UHF strips, and since several hundred thousand of Zenith strips are presently performing to the complete satisfaction of Zenith owners, your article offers an erroneous impression to those unfamiliar with the design and performance of Zenith UHF strips.

Clarification of this item in a future issue is respectfully suggested.

HARRY TELLIS
Field Service Engineer
Zenith Radio Corp.
Bridgeport 10, Conn.

TECHNICIAN's editors referred Tellis' letter to A. L. Budlong, General Manager of the American Radio Relay League, since the article objected to had been based on some ARRL releases. Budlong comments as follows:

EDITORS, TECHNICIAN:

Both our releases and your item make it reasonably clear, it seems to me, that what is under discussion is the type of strip using the dual conversion system. At the same time we can easily see where a hurried reader might gain the impression that all channel strips are inherently the dual-conversion type, and we are sorry if any problem has been caused the Zenith people thereby.

A. L. BUDLONG,
General Manager
American Radio Relay League
West Hartford 7, Conn.

Circuit Digests Up to Date

Editors, TECHNICIAN:

I have found your magazine, TECHNICIAN, a useful tool in both our Engineering and Service Departments. The "Circuit Digest" is a timely solution to the old problem of keeping technical information up to the minute on the ever increasing number of new model receivers.

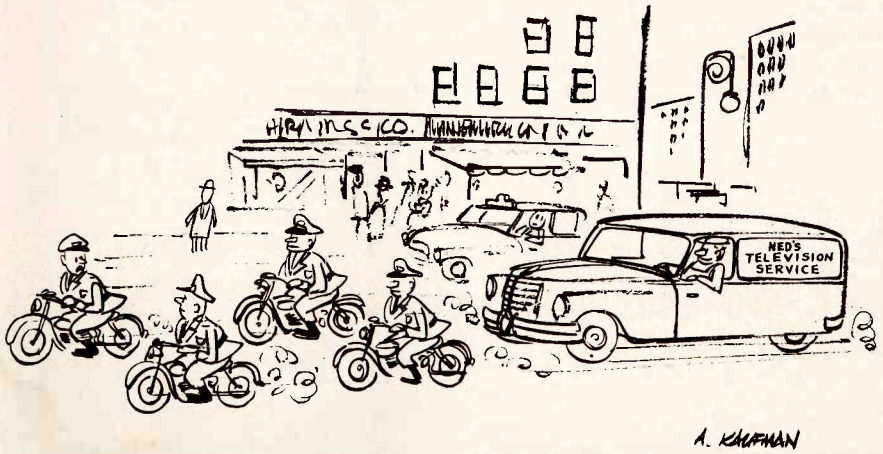
S. S. MILLER
Chief Engineer
Tech-Master Products Co.,
443-445 Broadway,
New York 13, N. Y.

Color TV Article Outstanding

EDITORS, TECHNICIAN:

The article on color television by Schulman is an outstanding article, and for a tough subject like this does a wonderful job of explanation.

M. G. GOLDBERG
St. Paul, Minn.



"I wonder what's wrong with the Chief's set?"

SOLVED! Your TV tuner small parts problem!

THE STANDARD TUNER
(not included in kit)

Get the handy, all-new STANDARD Tuner Replacement Parts Kit No. 1011

IN TV IT'S STANDARD

Now . . . 104 small TV tuner parts are at your fingertips in one convenient, low-cost kit that's sturdy, compact, fully labeled for quick reference. You get the most-called-for parts servicing Standard tuners series TV-200, TV-1500, TV-2000 and TV-2200. Each item is individually boxed, except the very small.

More Profit—$25.03 worth of tuner parts for only $22.50.

Save Time—Hard-to-find tuner parts right at hand for quick, sure selection.

Build Customer Goodwill—Replace tuner parts direct from your Standard kit, so your customer will *know* each part is completely new.

Plan now to speed up your service work, bring new order and efficiency to every job. Get your Standard tuner replacement parts kits today! Call, write or wire your parts jobber, or address Standard Coil Products Co., Inc., 2085 N. Hawthorne Ave., Melrose Park, Ill.

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COIL PRODUCTS CO., INC.
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NEW *Certified* Quality Service Business Builders

SIGNS...POSTALS ...AD MATS

GET THIS CATALOG

TIE IN even stronger with your *Certified* Quality Service campaign in LIFE and POST. Tell your customer again and again. *You* offer him the quality service and fair charges that spell C...Q...S. Win his confidence and you win his business. Along with your CQS tags and displays, use your new CQS illuminated indoor sign . . . flange sign . . . postals . . . and ad mats. You'll be proud of them. They are modern, dignified, economical . . . and their CQS message sells *hard*. See them at your CBS-Hytron distributor's. Or write for CQS-10 catalog. But act now!

NEED MORE CQS TAGS?

With your 3-line imprint, they are priced low: 250 for $2.25, 500 for $3.50, 1000 for $6.00. Order from your distributor . . . or direct.

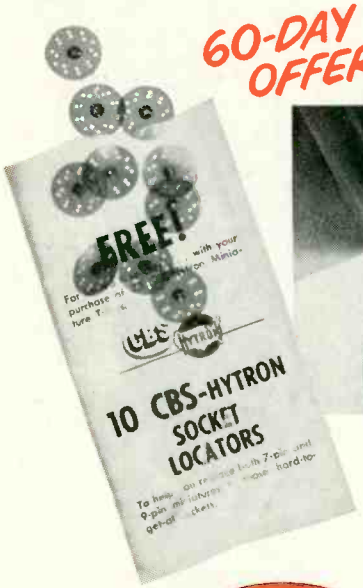
4 MORE CQS Sales Aids

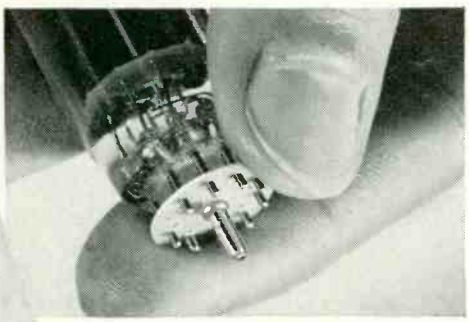
IDENTIFY YOU AS A...

Certified QUALITY SERVICE DEALER

CQS-10 Catalog also features 3 direct-mail postals . . . 9 ad mats.

60-DAY OFFER! 10 SOCKET LOCATORS with 20 miniature tubes





During January and February. Order 20 CBS-Hytron miniature tubes. Your distributor will *give* you this package of 10 new CBS-Hytron Socket Locators. With them, plugging miniatures into hard-to-locate sockets is easy. Socket Locator slips over pins of tube (7-pin or 9-pin). Key of Locator finds socket . . . guides tube into it, quickly. Save time and temper . . . take advantage of this limited offer. See your CBS-Hytron distributor.

NEW... FREE CBS-HYTRON CRYSTAL DIODE MANUAL

Complete, down-to-earth, 8-page manual on crystal diodes. Three parts: 1. Advantages and construction. 2. Complete data, 38 types. 3. Selection and application. Profusely illustrated. Ten basic circuits. Gives you *all* the crystal-diode information you have been seeking. FREE . . . from your CBS-Hytron distributor . . . or write direct.

CBS HYTRON

Manufacturers of Receiving Tubes Since 1921

CBS-HYTRON Main Office: Danvers, Massachusetts

A Division of Columbia Broadcasting System, Inc.

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

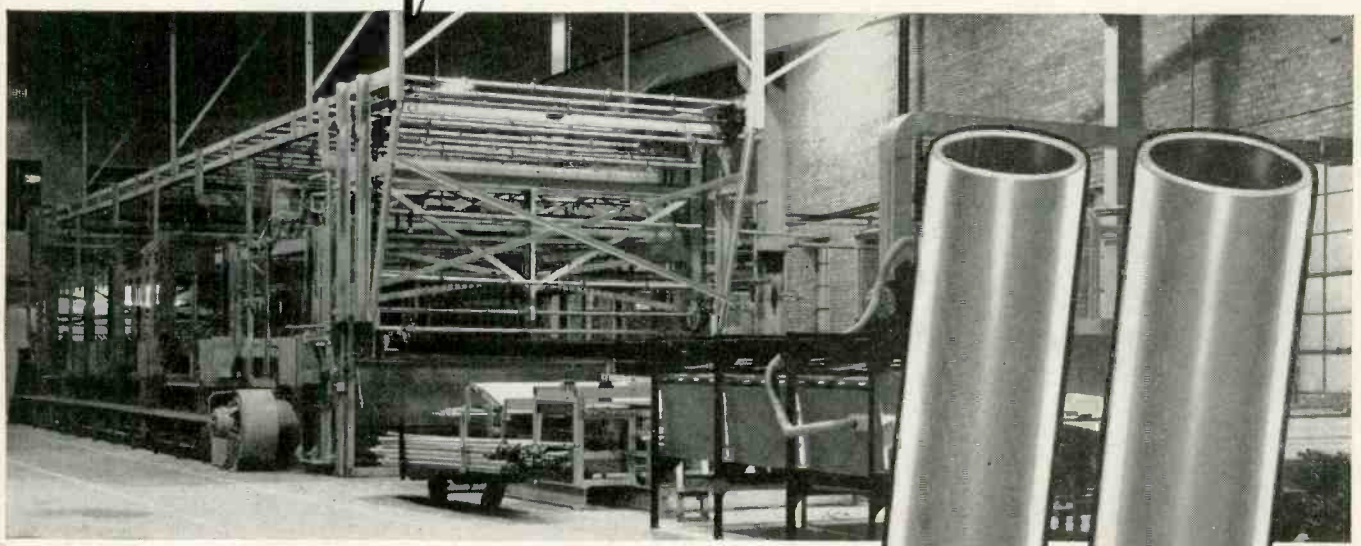
RECEIVING . . . TRANSMITTING . . . SPECIAL-PURPOSE AND TV PICTURE TUBES • GERMANIUM DIODES AND TRANSISTORS

5 ft. and 10 ft. self-coupling

MASTS

Television

prompt delivery from your Admiral distributor



Admiral's huge production brings you these 5 and 10 foot masts at the industry's lowest prices. Finest quality, too . . . made of cold-rolled seamless steel tubing, heavily electrogalvanized. For added rust resistance the inside of each tube is plastic coated throughout its entire length. Both 5 and 10 foot masts are available with one end flared to take extensions . . . eliminates the need for separate mast couplers. Order from your Admiral Distributor by part number:

	20 gauge	*18 gauge*	*16 gauge*
5 ft. plain end	M 40		
5 ft. flared end	M 40A		
10 ft. plain end	M 41	M 42	M 43
10 ft. flared end	M 41A	M 42A	M 43A

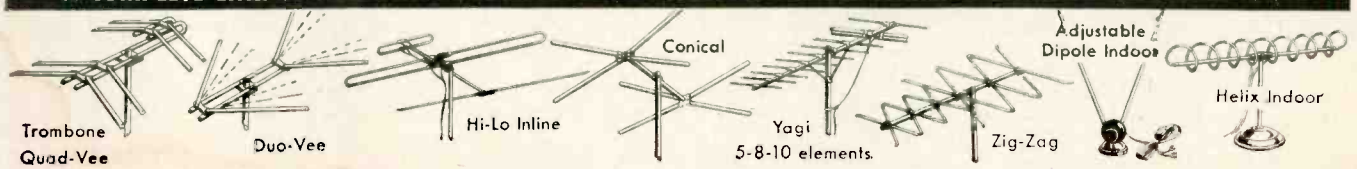
Ask your *Admiral* Distributor for

FREE CATALOG

of antennas and accessories

Admiral **Corporation,** Accessories and Equipment Division, Chicago 47, Illinois

A COMPLETE LINE OF ADMIRAL TV ANTENNAS . . . NOW AVAILABLE FROM YOUR ADMIRAL DISTRIBUTOR



It was way back in 1945 that Raytheon, the first tube manufacturer to recognize the Service Dealers' need for help in combating public mistrust, provided that help through the *Raytheon Bonded Electronic Technician Program.*

For the past nine years this Raytheon support has helped many thousands of Service Dealers gain customer confidence and good will — substantially increase their volume and profit.

Today, with the addition of television, the Raytheon Bond is more important than ever. And today, as always, if you can qualify for it, your status as a Raytheon Bonded Electronic Technician *costs you not one cent.* It is *Raytheon's* investment in *your* future.

If you're interested in making more money, ask your Raytheon Tube Distributor to tell you about the Raytheon Bonded Program. He'll be pleased to tell you how this powerful sales stimulator can help you.

RAYTHEON

Excellence in Electronics

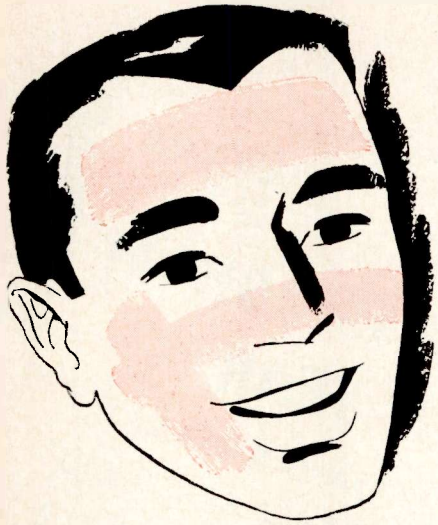
RAYTHEON MANUFACTURING COMPANY

Receiving Tube Division

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

RAYTHEON *MAKES ALL THESE:*

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



join the Jensen one-a-day club

MAKE EXTRA PROFIT OF $240.00 AND UP ON JENSEN PHONOGRAPH NEEDLE SALES IN 1954!

There's a golden opportunity to earn fast, extra profit every time you make a radio or TV Service Call. Here's how:

1. Simply say, "As long as I'm here, may I check your phonograph needle? If it hasn't been changed for the last 60 hours of play, it will absolutely *ruin* your records—*every time it plays.*"

2. Tell your customer you recommend a new Jensen and take the proper needle out of your Jensen kit and install it in just 2 or 3 minutes. *Pocket the profit at not one cent of extra sales cost to you* because you're there in the customer's house anyway!

A service dealer in California just reported selling 50 needles per week by this method. Previously he sold only 1 or 2 needles a week!

important!

93% of your customers are using worn needles. It stands to reason that you can easily sell at least 1-needle-a-day out of the 8 or 10 calls you make. Selling just 1 out of 8 customers a new Jensen will average $240.00 extra profit in a single year. And to net an extra $1000 profit a year from your regular service call business, you only need to sell *every other* customer.

GET READY TODAY for those extra profits tomorrow. See your distributor for the Jensen Phono-Needle Caddy No. 300 and One-A-Day folders for your service men and join the money-making Jensen "One-A-Day" Club now!

the Jensen
PHONO NEEDLE CADDY NO. 300

. . . THE SALES TOOL THAT MAKES FAST, EASY NEEDLE PROFITS FOR YOU . . . THE JENSEN PHONO-NEEDLE CADDY!

This sensational Jensen Phono-Needle Caddy holds 12 replacement needles—the right needles to meet record player requirements in over 50% of your service calls. The novel accordian type plastic case folds down to only 5" by 2" and is only 1" thick. Slip it into your coat pocket or kit—takes hardly any space!

ONLY $9.75 TO DEALERS (complete installation tools included at no additional cost) RESALE VALUE OF NEEDLES $19.50.

JENSEN INDUSTRIES • 329 SOUTH WOOD ST. • CHICAGO 10, ILLINOIS

famous telrex 4-BAY

"CONICAL-V-BEAMS"®

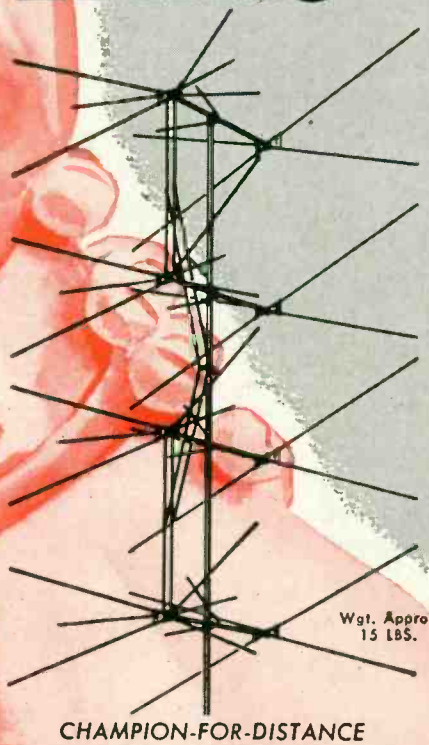
—the acknowledged champion in 1948 and STILL CHAMPION!

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

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

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

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

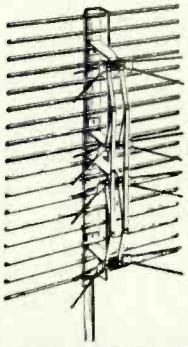


Wgt. Approx. 15 LBS.

CHAMPION-FOR-DISTANCE

MODEL 8X-TV*

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



ULTRA-HI GAIN UHF

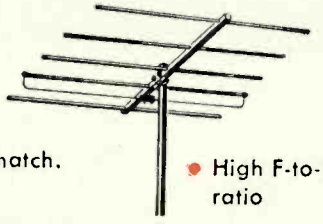
"CONICAL-V-BEAM" MODEL 84

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

PRE-ASSEMBLED, PRECISION TUNED

5-ELEMENT YAGI

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



- High F-to-B ratio

WRITE FOR COMPLETE TELREX BULLETINS, TODAY!

telrex INC. BETTER BY DESIGN

"CONICAL-V-BEAMS"

*PATENTED

ASBURY PARK 2, NEW JERSEY

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

TECHNICIAN
& Circuit Digests

CALDWELL-CLEMENTS, INC., 480 LEXINGTON AVENUE, NEW YORK 17, N. Y.

How the TV-Maintenance Market Is Expanding!

And What Color-TV Will Mean to Technicians

The chart on the front cover of this issue gives an accurate picture of the tremendous expansion in the number of black-white television sets in U. S. homes, from the late 1940's to the present time.

Now, with 1954 we start a stirring new chapter in TV—the beginning of color! Expected to be small at first (100,000 to 200,000 color sets in '54, or around 2% of the total predicted 5½-million TV output), the ratio of color-receivers will probably increase as follows: 1955, 25% color; '56, 35%; '57, 66%; '58, 90 to 95%.

The topmost dotted graph on the front cover shows the total cumulative TV production. But as time goes on, a lot of black-white sets will be junked; numerically this may amount to 2% to 4% of the figure representing each year's output.

Future TV Sets in Use, by Years

Allowing for this obsolescence and abandonment of old sets, the middle dotted curve shows the actual numbers of TV sets (both black-white and color) expected to be in use each year from '54 to '58 inclusive.

Next below, on the chart, this all-sets-in-use total is broken down to show the number of operating black-white sets in use during each year, as the black-white total levels off.

The color-TV curve at the bottom shows the rapid expected rise in color sets—reaching by 1958, about 28% of the total sets in use.

So we see that even with the phenomenal rise of color-TV production in the next five years, black-white receivers will continue overwhelmingly in the majority for many years to come.

What All This Means to Your Business

To the individual technician and servicer, what does this future expansion mean? As the number of TV sets in his community grows, his business may be expected to expand proportionately.

Surveys have shown that for each TV set in the community, a maintenance income of $20 per year may be expected by the servicer. (Of course individual jobs will run much more than this; other sets will not need repairs, so that the $20 average will stand up as a conservative yard-stick.)

Meanwhile the technician has some good old bread-and-butter coming from each radio set in his area,—say $4 yearly.

In 1954, for black-white TV sets, $20 per year per TV set is a safe average. But for color sets, with their doubled number of parts and components, and greater delicacy of adjustment, the average annual maintenance revenue per set may rise to $40 or more.

But whether black-white or color, the TV service business is likely to experience no slump, whatever the temporary set-backs in TV merchandising. The business of the TV technician is bound to grow—and grow—and GROW!

Tuning In the

$1.3 BILLION is the annual radio-TV service bill of the nation, as we figure it, made up as follows: Labor, $600,000,000; 85,000,000 replacement receiving tubes, $250,000,000; 2,500,000 replacement picture tubes, $100,000,000; parts and accessories, $350,000,000. This total checks well with our front-cover estimate of $20 per TV set for 28 million TV receivers plus $4 per radio for 118,000,000 radio sets. Combining these plus $168,000,000 for service on 26 million phono players and tape recorders, and $100,000,000 for industrial and institutional service jobs, miscellaneous, etc., it all adds up again to $1,300,000,000.

RADIO PLUGS AHEAD—In spite of TV's glamour, good old radio is still expanding mightily, with nearly 13½ million radio sets sold in 1953. This brings total U. S. radio sets in use to 118 million receivers in 48 million homes and in 29 million cars. All the rest of the world has only 114,000,000 radio sets (Europe, 69 million), making a world total of 232 million radio sets.

TV's GROWTH—Here are the figures for television-receiver production and total sets in use at end of year, for recent annual periods:

	Sets Made	*Total in Use*
1950	*6,500,000*	*9,800,000*
1951	*5,400,000*	*15,000,000*
1952	*6,000,000*	*21,000,000*
1953	*7,300,000*	*28,000,000*

"Mom—now I remember where I put that mousetrap."

659 FM'S ON AIR—ONLY 15% DROP—The maximum number of FM stations on the air, occurred in October, 1949, when 784 FM stations were operating. At the present time, 659 FM stations are operating, or a net loss of 15.8%. At the time the maximum number of FM stations were on the air, many of them were working on low power and the services rendered by them were quite restricted. At present, the majority of FM stations are operating at full power under regular license conditions. The FM service to the public, therefore, even with a somewhat smaller number of stations, is now believed far better, since the listener hears many more signals in his territory than ever before.

TRAINING TECHNICIANS—W. L. Parkinson, GE service manager, reports plans to publish the RETMA "A" course for upgrading television service technicians based on the pilot course now being conducted at the New York Trade School. He said there would be three publications, consisting of a text book, a laboratory manual and an instructor's manual. These text books will be made available to trade schools throughout the country. A "B" course to upgrade less skilled technicians will be developed during the next year with the view of instituting a pilot course in September, he said. The service committee has also approved plans to hold a three-week "Teacher Training Seminar" for television service instructors this coming summer. Mr. Parkinson explained that the seminar will be based on teaching technique and subject material of the RETMA "A" pilot course.

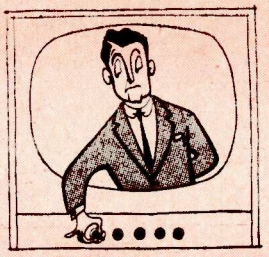
"Yes sir, it's in fine shape! Been used only one year by an 80-year-old lady with poor eyesight."

TWO MILLION UHF SETS are in operation as 1954 opens. Of these, 40% were factory-equipped with UHF tuners; 40% employ converters, external or internal; and the remaining 20% were adapted to UHF by installing sets of strips. Of 1953's total TV-set production, about one set in seven was UHF-equipped at the factory. Half as many more were converted in the field, 40% by addition of strips.

"BIG HEADACHE is yours if you haven't good TV service for your set," advertises Wilson, of Hamilton, Ont. "Buying a TV is only your first step,—anyone can sell you a TV. But when your set needs service—and it will—your big deal becomes your big headache! Wilson's has an organization devoted exclusively to TV, has trucks and testing equipment, has skilled technicians, and has skilled aerial crews."

FIX-IT-YOURSELF BOOK IN FIX—Gadgeteers making wild claims for their fix-it-yourself tomes are feeling the wrath of aroused Better Business Bureaus. In a full-page ad, one miracle-pedlar, in addition to smearing reliable servicemen, claimed to show the set-owner how to repair the receiver IN MINUTES "no matter what goes wrong." Examination of the product showed that it recommended some fairly simple adjustments, some procedures much more complicated than the ad implied, and confessed that some "can only be made by a qualified serviceman." When the BBB complained, the advertiser grumbled—but withdrew the ad.

Picture.....



"Hey, we pay you three walrus tusks to fix TV, but Nanook still see snow when no snow outside!"

HOW SAFE IS YOUR TRUCK while you're in the customer's home or on his roof adjusting the antenna? Thefts of trucks or their contents have become a big biz, with losses rising from $21 million in '44 to an expected $100 million in '53—almost a 400% increase in a decade. Present average in U. S.: more than one hijacking or pilferage every hour. Installing a truck alarm system will protect your valuable properties and slash your insurance rate. One maker of truck alarms (Babaco) says the average cost of installation and first-year service for TV service trucks is $85, and $33 per year thereafter. System operates off truck battery.

SINCE TV STATIONS "ENGINEER" the direction and coverage of their signals, and because most broadcasters are quite cooperative, smart technicians take the time to phone stations when they run into trouble in certain areas, claiming this is much better than "consulting" set owners in the localities where reception grief exists. Nowadays, broadcast engineers are thoroughly familiar with how their TV signals are received in their territories.

ANTENNA HI-JINKS are reported by a Florida servicer-reader. "In the fringe area where we operate," he states, "our customer insisted his television aerial be mounted atop his seventy-foot metal flagpole, and nobody in our shop is a steeplejack or flagpole sitter. We finally hired a retired trapeze artist here, and rigged up a bosun's chair for him. With a safety belt around him and the pole, and a sling around his feet like those used by flagpole painters, he made his way to the top. The steel cap on top of the pole was turned off, a hole was drilled through its middle, and a stud brazed in to act as the antenna support. The aerial provides optimum reception; its control turns it in any direction, and it cannot be entangled in the folds of the flag."

FELLOWS, YOU'RE REALLY GOING TO have a time for yourselves when Color-TV hits the home market. Numbers of folk who visit TV show-rooms these days are asking about "converting" b&w sets. Seems they're mixed up about the term "compatible," thinking it means "convertible."

GOING INTO BUSINESS? Many good technicians who are working for others, or performing radio and TV repairs on a part-time basis, from a bench in the attic, garage or basement at home, have thought about going into business for themselves. At this time, particularly, when new UHF and VHF stations promise to provide TV coverage where it was formerly only a dream, this idea is being given serious consideration. However, few of these men have sat down with a pencil and several sheets of paper to calculate their needs, in money and material, before they can open their own shop doors. They will have some surprises coming to them when they figure up the money costs of operating a business, as reviewed in the article "Checklist" in this issue.

ALL THESE THINGS HAVE THEIR EFFECT ON YOUR SERVICE BUSINESS

Factors BAD for your Service Volume

- Free service and call-backs
- Less radio usage in TV homes
- Color-TV false alarms
- Increased station power
- Landlord's ban on roof antennas
- Sets scrapped
- Better set construction
- Increased taxes
- Mild climates
- TV ban on games & fights
- Overcharging
- Activities of surplus houses
- Service rackets
- Men absent in military service
- High living costs
- Fix-it-yourself books
- Unseasonable weather
- Tight credit on new set purchases
- Upped number of home "tinkerers."

Factors GOOD for your Service Volume

- Increase in Sets in use
- Population
- Homes with radio & TV
- Wired homes
- Manufacturing capacity
- Stations on air
- Coast-to-Coast telecasts
- Material prices
- Labor earnings
- New TV areas opening
- Storm damage
- Change in antenna
- Growth of UHF-TV
- Change in antenna types
- Color-TV in homes
- Multi-set TV purchases
- Big events on air
- Consumer interest in Hi-Fi

Eliminating Television

Practical Methods of Attack on Spurious Oscillation

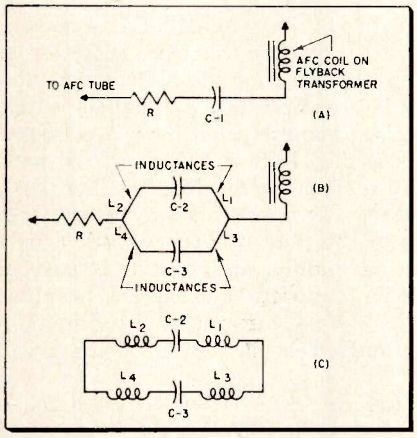


Fig. 1A—Schematic sketch of afc feedback loop. B—Parasitic circuit formed by the two ceramic capacitors used to replace C-1. C—Circuit of (B) showing leads as inductances.

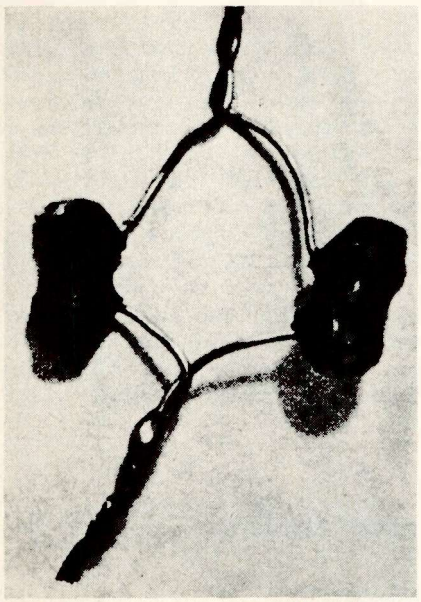
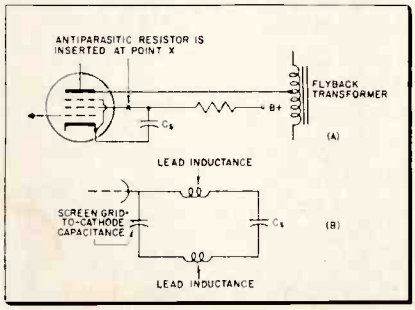


Fig. 2—Photo of two ceramic capacitors used to replace C-1 (schematically shown in 1A).

Fig. 3A—Portion of horizontal output tube circuit. B—Parasitic that may develop here.



By James A. McRoberts

• In this second article on parasitic oscillation, we will consider some typical case histories. Before we do so, however, let's briefly sum up some pertinent information presented in our preceding pieces.

Parasitic oscillation produces the same aural and visual symptoms as any other interfering signal. The TVI must first be proven to originate in the receiver, rather than outside of it. Further localization by an exploring probe in conjunction with a signal tracing set will localize the trouble to a definite area of the chassis.

The technician must inspect the chassis, as well as study the set schematic, to help him determine whether parasitic or ordinary oscillation is present. Just as a chess player visualizes moves, the technician must visualize parasitic circuits that do not appear on his schematic.

Typical cases of parasites are those due to paralleled condensers, paralleled tubes, paralleled interelectrode capacitances, parasitic self-capacitance, parasitic capacitance of one coil in series with another coil's inductance, and combinations of the preceding. Remedies consist of elimination of the parasitic resonant circuit, over-damping by the addition of resistance, reduction of transmission and/or radiation, frequency shifting to an unused channel or band, excitation reduction, and combinations of these procedures.

Case of the Paralleled Condensers. The first serviceman to work on this set had pulled the chassis, which was subsequently serviced in the shop. The finding was that C-1, a 390 mmfd capacitor (see Fig. 1A) was short-circuited. Since no 390 mmfd condenser was in stock, two capacitors of 100 and 180 mmfd, respectively, had been tied in parallel, and inserted in place of the original unit—a common enough practice. Replacement of C-1 with the equivalent condenser combination shown in Fig. 2 had resulted in normal operation on all channels except Channel 11. Heavy bars appeared in the picture at this channel setting.

The author, who didn't learn about these doings until some time after he had located the trouble, was next called in to service the set. Other sets, it was discovered, did not exhibit the TVI present on the receiver being serviced when they were connected to the same antenna and power line. The conclusion was therefore reached that the source of the TVI lay inside the set.

Our second step was to signal-trace the TVI to the area where its intensity was maximum, as indicated on another set used as a signal tracer, in conjunction with a signal-tracing probe.

The "dog" and the tracer were turned on. ("Dog" refers to the set with the TVI trouble; *tracer* refers to the auxiliary TV set with probe and cable used as a TVI locater, as described in *Tracking Down TVI to its Source,* in the Nov. '53 issue of TECHNICIAN.) The rear end of the probe cable was connected to the antenna of the tracer. The probe was placed near the feed from the mixer to the video i-f, to pick up the interference, as well as the Channel 11 signal on which the interference existed.

Exploring with the probe by moving it about gave increasing interference on the tracer screen as the probe came into the vicinity of the flyback transformer, the afc section and the afc feedback lead (see Fig. 1A). The ground clip of the probe was now attached to the chassis, to reduce probe pickup and thus permit a more precise determination of where the intensity of the TVI was greatest. The search for the point of maximum intensity was narrowed down to the locality where the two parallel condensers had been installed. The replacement of these two units with a single capacitor resulted in the elimination of the parasitic circuit that the two condensers, in conjunction with their pigtails, had formed (see Fig. 1B, C).

Parasite at Horizontal Output Tube Screen Grid. Fig. 3A illustrates this (horizontal) circuit; in 3B, the parasitic components are schematically shown. The inductance of the bypass

Interference Due to Parasitics

in Sweep, Sync and Other Circuits. Case Histories

condenser leads, tube and socket lead inductances, etc., provide the inductance of the resonant circuit present, while the effective capacitance is approximately the screen grid-to-cathode capacitance.

Symptoms of the interference produced by such a parasite are generally vertical bars at the left hand side of the raster—the most intense bar being farthest to the left, with succeeding bars of lesser intensity, at uniform spacings. The interference appears on all channels, as its frequency is approximately 25 mc. The second harmonic of this TVI signal may cause trouble on newer sets with 40 mc video i-f stages.

If this form of TVI is not readily identified by its appearance, the signal tracing procedure previously cited will unmask it. The ring or oscillation present is started by the sudden cutoff of the screen grid current of the tube at the onset of horizontal retrace, which periodically re-starts the in-phase oscillation.

The typical cure for these cases of parasitics due to interelectrode capacitance is the insertion of a resistance in series with the parasitic circuit, at the point indicated in Fig. 3A. (In many recent sets, a 47-ohm antiparasitic resistor has been incorporated into the circuit at the factory.) This antiparasitic resistor prevents oscillation by overdamping the circuit.

Excessive drive may cause such a parasitic to occur. The overdriving may be the result of another trouble such as an old tube, excessive tube loading due to condenser leakage, etc., necessitating increased drive to maintain deflection and high voltage. The insertion of an antiparasitic resistor (when one is not already present) will suppress parasitic oscillation in such instances; removal of the primary trouble is, however, a better service procedure.

The preceding discussion applies with equal force to all cases of interelectrode capacitances paralleling circuit capacitances. Parasites may appear at the grid and plate of the horizontal output tube, for example. Other tubes may harbor a parasite if a parasitic circuit is present and the excitation is great enough.

In two instances the author knows about, oscillation in the horizontal output tube was due to feedback from a parasitic plate or screen circuit, to a parasitic grid circuit. The oscillation in the horizontal output tube, interestingly enough, furnished sufficient grid drive to the tube itself to enable it to function without the horizontal oscillator. Both high voltage and horizontal deflection were present, although the deflection was not synchronized. The cure consisted, of course, of inserting an antiparasitic resistor in the grid circuit.

Parallel Tubes. Whenever a tube is placed in parallel with another one to provide additional output, antiparasitic resistors are or should be inserted in the leads between the plates, screen grids and control grids of the two tubes. Otherwise a pair of these elements may form a complex parasitic circuit with the cathodes. As an example, consider the two 6BG6G's strapped together to form a parallel circuit in Fig. 4A. Fig. 4B shows the parasitic circuit. Present in this circuit are the screen-to-cathode capacitances of the two tubes; the leads between screen grids plus the internal screen leads form one inductance, while a similar inductance is made up of the cathode-to-cathode lead, plus the internal tube leads to the two cathodes.

Similar parasitic trouble may develop due to grid-to-cathode and connecting lead capacitance, in which case resistor insertion in the grid-to-grid lead is proper. Similarly, the plate circuit may develop a parasite; a resistor in the plate-to-plate lead is employed to prevent this. Usual practice places a resistor in each lead excepting the cathode-to-cathode lead, although one may be placed here; the points where the resistors go are marked "x" in Fig. 4A.

All paralleled tubes should be objects of suspicion relative to possible parasitics if the precautionary antiparasitic resistors are not present. (Even when they are present, they may have decreased in value and

(*Continued on page 55*)

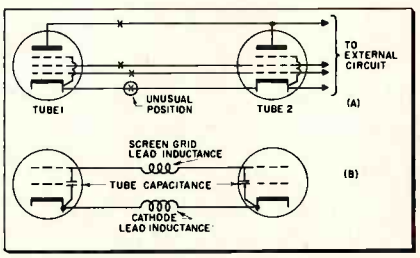


Fig. 4A—Simplified circuit of two tubes in parallel. Antiparasitic resistors are inserted at points indicated by X. B—Circuit of (A) re-drawn to show parasitic network present.

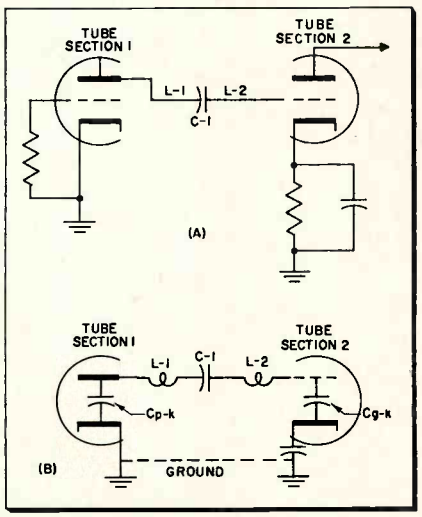
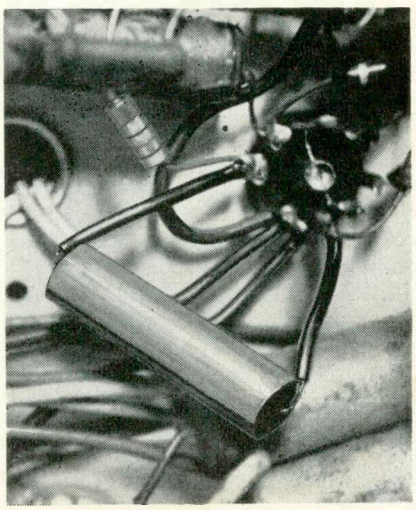


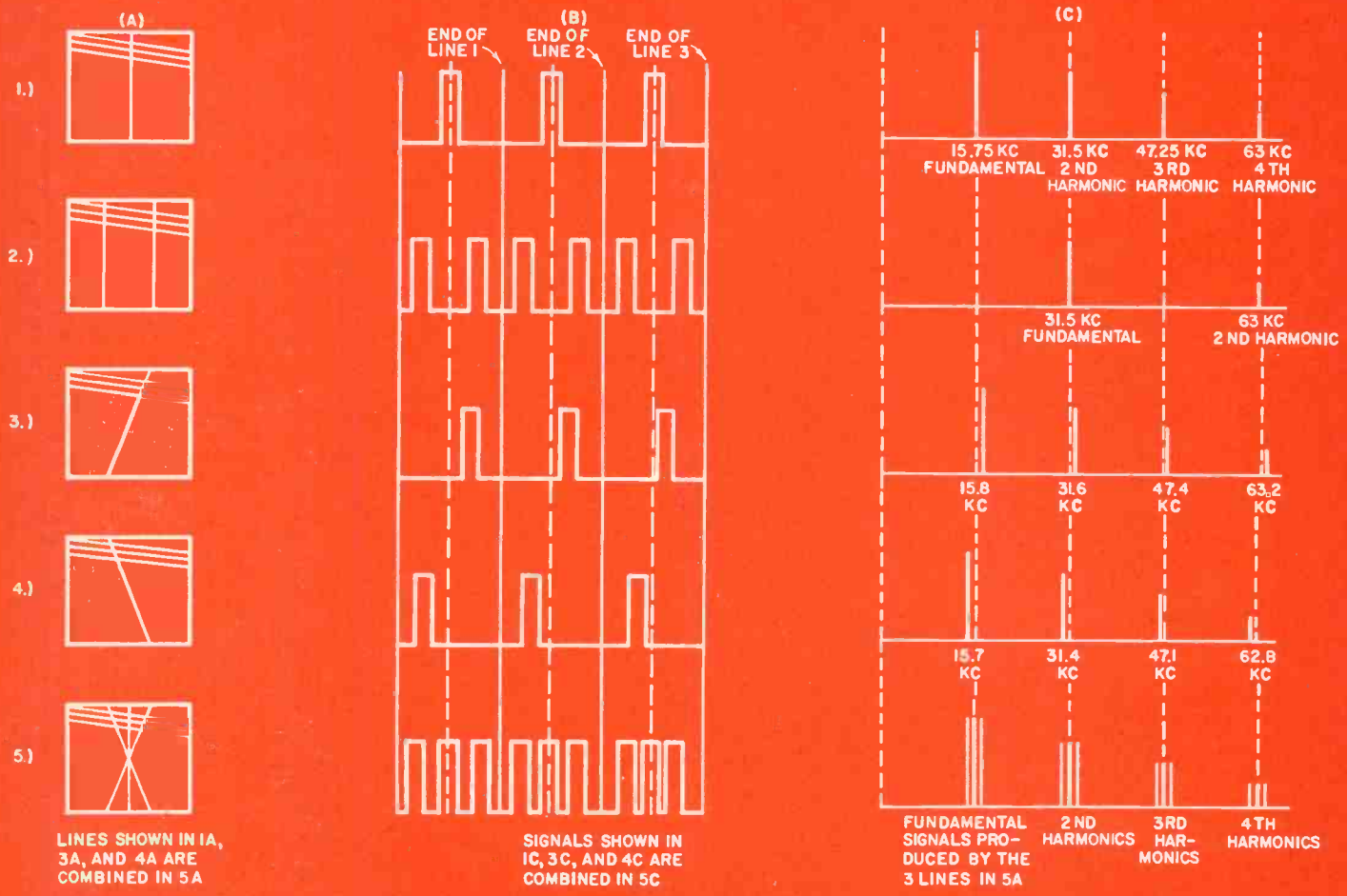
Fig. 5A—Section of sync circuit. B—Parasitic circuit of (A). Cp-k and Cg-k are the plate-cathode and grid-cathode capacitances.

Fig. 6—Photo illustrating circuit components shown in Fig. 5. Large condenser is C-1.



How Color Signals are Squeezed

Mysteries of Band-Sharing Considered in Detail.



Figs. 1 to 5—Pictures discussed in text are shown in column A (three scanning lines are assumed); video signal waveshapes they produce are drawn beside them in column B (sync signals are omitted); the frequency spectrum produced by the video signals is shown in column C. Note that in all cases illustrated in (C), the video information clusters around line-frequency signals or harmonics of line-frequency signals.

By Peter W. Orne
and
Sol Heller
Managing Editor, TECHNICIAN

Since it is important to get a good grasp of color fundamentals to understand the complexities of color receiver circuitry, a number of points discussed in TECHNICIAN's first color article will be reconsidered in much greater detail in this piece and others to follow.

Bandsharing is a subject that is apt to mystify many readers. This article will analyze it in detail.

Bandsharing is necessary because the FCC requires that color transmissions be confined to black-and-white channel allotments. As the first article pointed out, most of the intelligence present in a monochrome signal is concentrated in narrow frequency bands that have unoccupied spaces in between them. We'd like to analyze why such a condition exists, since we have not yet seen a detailed explanation of this matter in print.

Let us assume that one vertical sharp line is being scanned (Fig. 1A). The same information is reported on during every horizontal line by the scanning beam in the camera tube, since the line does not vary along its length. If the sync pulses are omitted, the line could be represented by the signal shown in Fig. 1B. (Omission of the sync signal is unimportant, since sync information is normally not visible on the screen.)

Now, the line being scanned produces a square-wave signal. Every square-wave signal contains a large number of harmonics that diminish in amplitude the further away they go from the fundamental (Fig. 6). A sketch showing the fundamental and some harmonics produced by the line of Fig. 1A is shown in Fig. 1C.

The sharper the line, the better (or *squarer*) the square-wave signal

into the B & W TV Spectrum

Why "Holes" Exist in Monochrome-Frequency Channels

resulting, and the greater the number of harmonic frequencies the latter will contain.

If two lines are being scanned (Fig. 2A), the repetition rate of the resultant signal will be twice as great (Fig. 2B). The fundamental frequency of the signals will now be 31.5 KC, instead of 15.750 KC, as in the preceding case.

The important thing to note is that this fundamental is a harmonic or multiple of the 15.750 KC line frequency; the harmonics of the fundamental are, in turn, higher harmonics of line frequency. In other words, *the video signal, including its harmonics, tends to cluster at line frequency points or harmonics thereof (see Fig. 5C).*

"All right," you say. "But you've just considered one special case in which vertical lines are being scanned. What about other cases, when complex pictures rather than simple lines appear on the screen?"

Combinations of Lines

Well, let's consider the slanted lines shown in Figs. 3A and 4A. These lines produce signals that are not exactly at line frequency, but slightly higher or lower, depending on whether they slant down to the left or right, respectively. (Similar slanted lines are seen in the picture, when the receiver is slightly out of sync horizontally. The lines in this case are formed by sync pulses that are slightly higher or lower in frequency than the horizontal sweep.) Figs. 3C and 4C show that the signals produced by the lines of Figs. 3A and 4A are *near* line frequency harmonics.

Fig. 5A shows a combination of straight and slanted lines. As can be seen in Fig. 5C, the resultant spectrum is a cluster of signals near line frequency, between which empty spaces are present. Basically, any picture is made up of straight or slanted lines.

Let us now assume that video information falls at the mid-point between line frequency harmonics. We would like to prove *that even when it does, the information will not be visible, and the spectrum space occupied by such signals will still remain available* (for signals that must be transmitted, but should not be seen on the screen of a black and white set).

The signals referred to would have to be *odd harmonics of half the line frequency,* since even harmonics of half line frequency are also simply harmonics of line frequencies.

Suppose we try to find out what kind of picture would result from a signal, say, of the third harmonic of half line frequency (23,625 cycles). Suppose a sine-wave signal of this frequency (see Fig. 7) is applied to the grid of a crt while the face of the tube is being scanned in the normal manner. The sine-wave signal will rise to maximum amplitude at the center of the line, when the first line of frame 1 is being scanned. During the scanning of the second line, the amplitude at the center will be minimum. The third line will be maximum again at the center, the fourth minimum, and so on. The resulting picture will be checkerboard-like in nature. *It will be hardly noticeable if we view the picture from the proper distance* (i.e., when the lines blend together and a so-called flat field results), since the dark areas, of one line seem to fall right beside the dark areas of the adjacent line at such a distance.

Conditions in Second Frame

And this is not all. What happens when we get to the second frame? The first line of the second frame is line 526, counting from frame one. As we just pointed out, the even lines contain opposite information from the odd lines. In other words, the two frames represent exactly opposite information, and the net result to the eye is no information at all. Except for possibly a slight flicker, we get a uniformly gray picture when a signal of an odd harmonic of half line frequency is present.

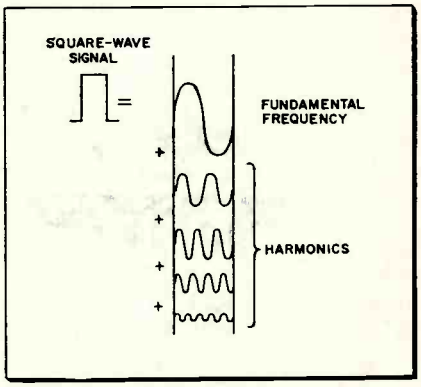


Fig. 6—If a square wave signal is analyzed, it is found to consist of fundamental and harmonic frequencies. The higher the harmonic, the smaller its amplitude.

So then—since unused spectrum space is available at the mid-points between line-frequency or line-frequency harmonic signals, color signals can be added into this space, without interference to black and white information.

What is required is a way of taking color information and changing it to frequencies that fall into the empty spectrum spaces available. This is accomplished by the use of a color subcarrier.

The frequency of the subcarrier must be such that the sideband color signals it helps produce will fall into the correct portions of the band. The frequency chosen is the 455th harmonic of the half-line frequency, or 3.579545 mc. If color information, which consists of signals of even harmonics of half-line frequency, is modulated onto the carrier, a series of sideband frequencies, all of them near the *odd* harmonics of half-line frequency, results. These odd-harmonic frequency points are, of course, the "holes" of the black and white signal.

Readers curious enough to inquire why odd harmonics of half-line frequency should result from the modulation process just discussed can look at it this way: Modulation or mixing is effectively an adding or subtracting process that creates sum and difference frequencies. Now, the color signals are *even* numbers, while the subcarrier is *odd*. When an even and an odd number are added

or subtracted, the result is always an odd number. Thus *odd* harmonics or sideband signals are created in modulation.

Anyone ambitious enough to check on the frequency previously cited for the color subcarrier will find that it is not exactly the 455th harmonic of the present black and white line frequency. This line frequency has been changed (in color sets) to 15,734.264 cps, which is well within the tolerance of black and white standards. This slight change was made so that the beat produced by the (undesired) heterodyning of the sound carrier against the color subcarrier would be an odd harmonic of half line frequency, and therefore as little noticeable as possible.

As can be readily figured out, 4.5 mc (sound carrier frequency)—3.579545 mc (color subcarrier frequency) = 920,455 cycles, which is the 117th harmonic of the (new) half line frequency.

The long strings of decimals are due to the much tighter tolerances imposed at the color transmitter. The color receiver may have crystal-controlled subcarrier generators; the transmitter must, as a result, maintain close tolerances, so that the frequencies of its output signals do not drift outside the limits established by the crystal in the receiver.

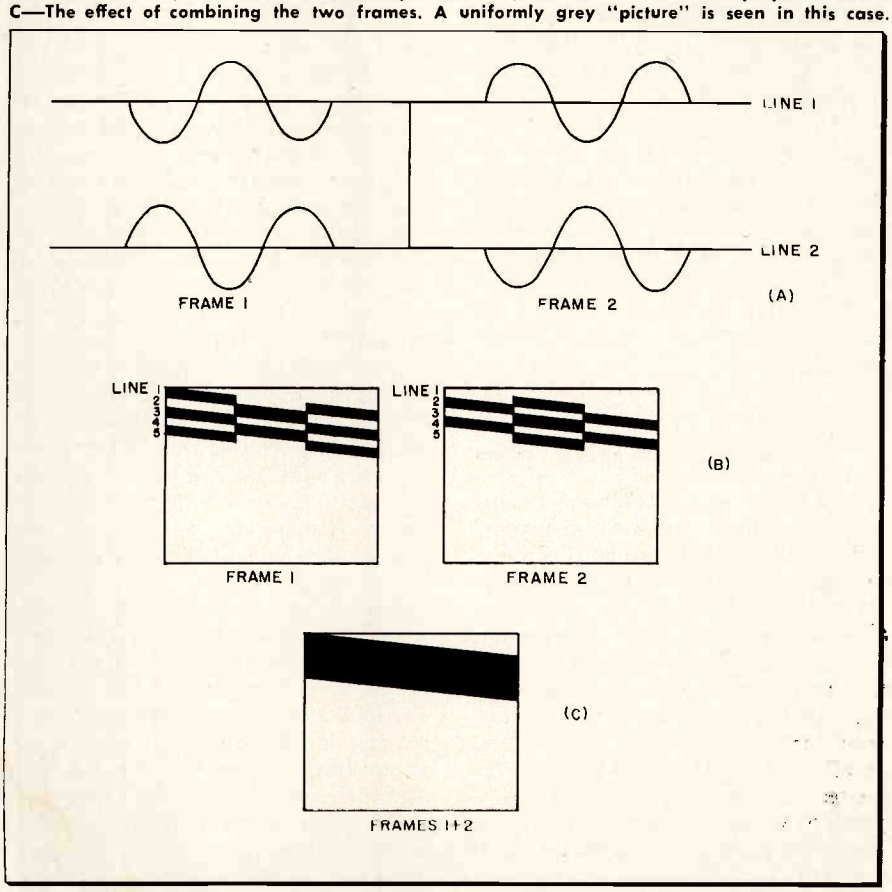
In line with this is the fact that the field frequency in the color system is 59.94 cps, rather than exactly 60 cps. The 59.94 comes from the fact that the number of fields per second is equal to the horizontal lines transmitted per second divided by 262.5 (number of lines in one field). For the color system, the equation becomes 15,734.264 cps (line frequency) ÷ 262.5 = 59.94 cps.

It has been the practice in monochrome transmitters to synchronize the vertical frequency to the power line frequency; it is also customary in these transmitters to keep the horizontal and vertical frequencies in the proper relationship to each other by using an automatic frequency control system. This kind of setup is not possible for color, since the vertical frequency is not exactly 60 cps and thus differs from the power line frequency.

The color subcarrier, not the power line, is used at the transmitter for reference or afc control purposes. When we say the subcarrier is used for reference purposes, we mean the vertical and horizontal sync frequencies are obtained from it (by means of frequency dividers). The subcarrier frequency must be maintained within .0003% (app. 10 cps).

For practical purposes, the line and field frequencies are still cited as nominally 15,750 and 60 cps, respectively; the color subcarrier is referred to as 3.58 or even 3.6 mc.

Fig. 7—Sketches illustrating conditions when a sine-wave signal whose frequency is the third harmonic of half line frequency is transmitted. A—Phase of the sine-wave on several different lines. B—Appearance of two successive frames on screen. If each frame could be seen by itself, its checkerboard pattern would be hardly noticeable, when viewed at the proper distance. C—The effect of combining the two frames. A uniformly grey "picture" is seen in this case.



British TV Maintenance Plan

In merrie England where TV dipoles stand up-and-down because polarization is vertical instead of horizontal, where TV impulses produce white instead of black, so that any static appears as bright dots instead of inconspicuous black specs, where TV sets are single-channel, and where service technicians are entitled "radio engineers," they also have interesting ideas on customer payments for TV maintenance.

Following is a letter sent out by a TV "stockist-demonstrator" (which we suppose is the equivalent for "TV dealer").

DEAR SIR,

What is your TV going to cost you?

Are you investing in a TV set? If so, then no doubt you're wisely giving some thought to the cost of the maintenance—just as you would if it were a new car or any other mechanical or electrical device.

The new sets are wonderfully reliable; they carry a general guarantee for one year, tubes for six months, and a valve guarantee for three—the crucial period in which any inherent defect will show itself. But in the course of time, as you know, valves and cathode tubes wear out and have to be replaced. That can be expensive.

One of our customers has had an excellent idea. He has set up a "TV Money Box," into which he puts 2s. 6d. a week, contributed by all the family. In eighteen months, if the set needs repairs or replacements, he'll have nearly £10 with which to pay the bill. If it doesn't—he'll still have the £10!

That's all it's going to cost him—only 2s. 6d. a week for all the host of splendid entertainment TV can give! We think this "Pay As You Go" scheme is good. Perhaps you can use it too.

Yours very truly,

FCC Approves Color-TV

Long-awaited FCC approval of the NTSC color system came December 17. Within an hour of the decision, CBS and NBC were celebrating the occasion with special color shows. However, regular commercial color telecasting will not begin until late this month, when the ruling becomes official.

Tooling up for production of color sets is presently under way. However, commercial receivers will not be available until about four months from now, according to the most optimistic forecast.

Servicing AC-DC Radios

Part 2 of a Series. Alignment Pointers

By M. G. Goldberg

• Technicians making home service calls are often called upon to check a small receiver in the home, perhaps one that the man of the house has messed up by turning all the i-f and tuning gang trimmer screws. Since few technicians carry signal generators around in their cars, the following hints regarding the procedure necessary to quickly bring the set back to reasonably accurate alignment and sensitivity may be helpful.

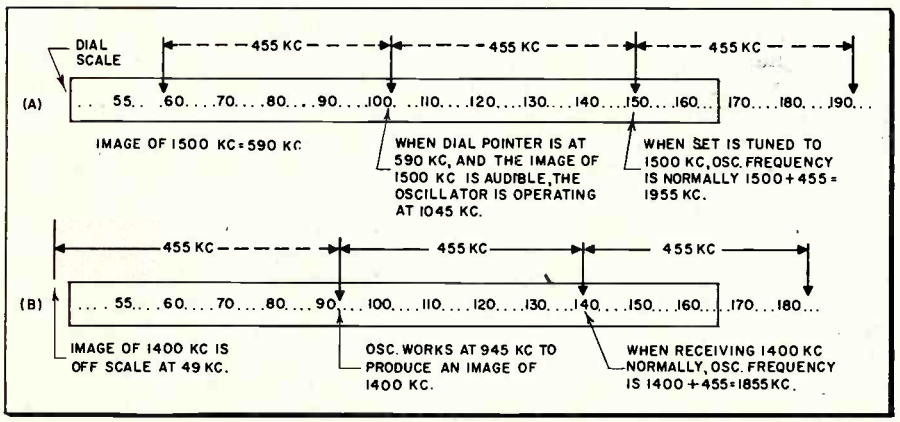


Fig. 1A—The normal relationship of the r-f carrier, oscillator frequency and the image frequency. B—Why images of stations below 1450 kc (app.) cannot usually be received.

First, set the dial pointer on the dial cord so that it travels to the proper end points when the tuning condenser is 1—in full mesh and 2—wide open. If there is any doubt as to just where the extreme points of travel on the slide plate are, examine the front and rear of the plate. In traveling back and forth during tuning, the pointer will have left a path of gummy deposit on the slide plate, and a tiny mound of dirt at each end of its travel. The pointer can be clamped to the cord at such a point that it travels the same path. Before doing this, clean the slide-plate surface with carbon tet.

Now tune in some station between 1450 and 1600 kc on the dial. If the set is so far out of alignment that no station can be received, clip a 5-ft. length of wire to the stator lug on the tuning gang mixer section. This will provide sufficient pickup to permit the necessary adjustments.

If a station that should appear at 1500 kc is picked up at, say, 1570 kc, adjust the oscillator trimmer until it comes in at the correct point on the dial; then peak the i-f's by ear. If the i-f is to be adjusted to 455 kc, the image of 1500 kc should be heard at 1500 minus (2 x 455), or 590 kc, when the alignment is correct. If, however, the station comes in at 560 kc, instead of at 590 kc, it indicates that the i-f trimmers are set to (1500-560)/2 or 470 kc. Turn the screws outward ⅛th turn in such a case, and adjust the oscillator so that the station again comes in at 1500 kc. Re-peak the i-f trimmers for maximum and check the image again. If it is still off a bit, repeat the above procedure until the image is received correctly at 590 kc. We can now remove the extra length of wire and adjust the mixer section trimmer for maximum audible output from the speaker.

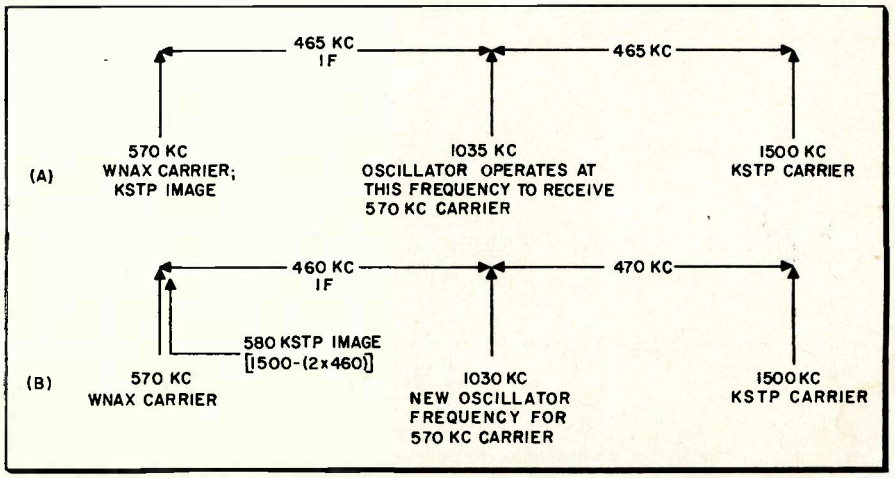
If the receiver has a tuned r-f stage and uses a 3-gang condenser, the attenuation of the image signal is apt to be so great that the latter is not audible, unless the receiver is very close to the transmitting antenna, and direct pickup occurs through the oscillator or mixer wiring. Connecting the short wire to the mixer section temporarily bypasses the r-f stage, preventing such image signal attenuation.

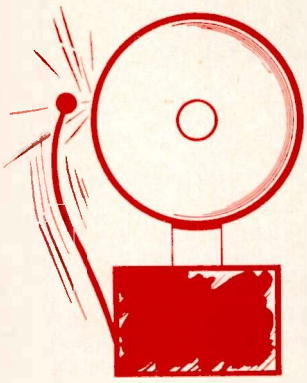
For a final adjustment, tune in a very weak station between 1400 and 1600 kc and peak all trimmers, or tune off station between these settings and peak for maximum noise output. The advantage of the latter procedure is that the avc (automatic volume control) circuit in the receiver is inoperative, and the ear can recognize small changes in noise intensity more readily. The reason for choosing a station in the tuning range between 1450 and 1600 kc is that the image of a station lower than 1450 kc (app.) will fall beyond the range of the dial scale (see Fig. 1 A, B).

Images of strong local stations between 1600 kc and 1400 kc can give rise to objectionable beat interference on 2-gang receivers, when the set is tuned to receive a weak or distant station between the low-frequency end of the dial and 600 kc (see Fig. 2A). Many farmers beyond the limits of the city in which the writer lives tune in on

(*Continued on page 57*)

Fig. 2A—How the image of a 1500 kc transmission heterodynes with a 570 kc station to create beat interference. B—How shift to a new i-f eliminates image of undesired station.





Audible Alarm for

Inexpensive Signal Monitor Helps You Locate

by Edward Kesgen

• To save time in servicing intermittents, the author built this signal monitor alarm system. It may be used in conjunction with several voltmeters and a scope (as described in *Servicing Intermittent Receivers,* Oct. '53 TECHNICIAN) to reduce the time spent in locating intermittent troubles in TV and radio chassis.

The monitor calls attention to an intermittent by audibly indicating an increase or decrease in magnitude of a dc, ac, pulsed or amplitude-modulated r-f signal voltage. With careful adjustment of relays 1 and 2 (see Fig. 1) changes of 50 percent in signal amplitude will cause the relays to be tripped.

Since the apparatus being monitored may or may not be in its intermittent state, the monitor was designed to respond to either an *increase* or *decrease* of signal. Failure of certain components, incidentally, will actually cause a signal increase at the monitored point, even though the output of the monitored stage may decrease.

The signal being monitored must have a constant amplitude; this requires a constant-amplitude signal input (to the chassis under test), such as that provided by a signal generator. Signals of varying amplitude (such as AM broadcast signals) cannot be monitored, as the alarm will ring when the signal amplitude changes. The composite video signal may, however, be monitored, as the sync pulse tips provide a constant-amplitude signal.

Circuit Description. A pair of 3S4's were chosen for this apparatus because of the relatively low drift of this tube. Drift becomes noticeable even in the 3S4 when it is connected as a pentode; therefore, the triode connection was employed. Occasionally, a slightly gassy tube that will operate normally in a radio receiver will nevertheless cause drift when used in the monitor. If drift or inadequate sensitivity is noted, it may be necessary to try several tubes and select the best one.

Battery power was chosen because of its economy. An ac operated supply having the required regulation would be quite expensive, compared to batteries.

The 3S4 tubes are operated at a filament voltage of 1.5v, and a 45-volt plate supply. The voltage seen by the control grids is the algebraic sum of the 6-volt bias battery and the signal voltage. As the grids are parallel-connected, each grid will see the same voltage.

The monitored signal appears across P-1. A portion of this signal (how much depends on the position of the slider) is applied to the 3S4 grids. This signal will always be dc regardless of the waveform of the original signal (since the germanium diode rectifies ac input signals).

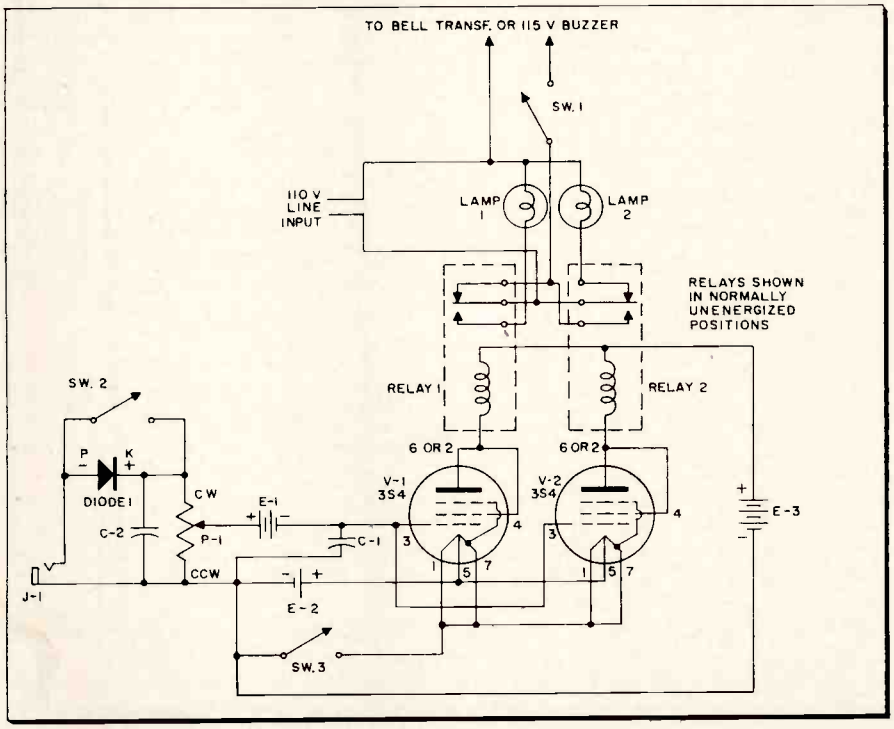
Initial Calibration. Before proceeding with calibration, set differential of both relays as close as possible by adjusting one contact on each relay until it is separated from the other by the thickness of a piece of newspaper. (*Differential* refers to the difference of current between "pull-in" and "drop-out" positions of the relay.) Relays are shown in Fig. 1 in unenergized position.

Temporarily substitute a 115v lamp for the bell transformer during test and calibration. The wattage of this lamp is not important.

Close switches 1, 2 and 3 and allow 5 minute warm-up period. Both lamp 2 and the alarm lamp will light; lamp 1 may or may not light, depending on the setting of P-1.

Connect the dc probe (Fig. 2) to an external 1.5v battery, observing proper polarity. The other end of the probe connects to J-1 (through a PL 55 microphone plug). Connect a vtvm between the CCW terminal of P-1 and its slider. Rotate P-1 full counter-clockwise, and then slowly clockwise, until vtvm indicates .5v. Carefully adjust armature tension

Fig. 1—Schematic diagram of signal monitor for troubleshooting intermittents. A small metal chassis on which monitor components mount may be secured from a parts supply house.



Servicing Intermittents

"On-Again Off-Again" Troubles More Quickly.

screw on relay 1 until relay 1 pulls in. Lamp 1 should now light, while the alarm lamp is extinguished. Lamp 2 remains lit. Rotate P-1 counter-clockwise until relay 1 drops out. The alarm lamp should now burn and lamp 1 should extinguish, while lamp 2 remains lit. The vtvm should indicate .25v at this time.

Now rotate P-1 clockwise until the vtvm indicates .75v. Carefully adjust armature tension spring on relay 2 until relay 2 pulls in. Lamp 2 should now extinguish, while the alarm lamp goes on.

Rotate P-1 counter-clockwise until relay 2 drops out. Lamp 2 should light and alarm lamp should extinguish. Drop-out should occur at about .37 volts. This voltage is not as critical as the drop-out voltage of relay 1, but should not be less than .3v, since relay 2 should drop out before relay 1.

Operating the Monitor. After the unit has been calibrated, substitute a bell transformer or a 115v buzzer for the alarm light. Connect the input through the appropriate probe to the signal to be monitored.

Close switch 2 only if a dc voltage is being monitored. Allow a 5-minute warm-up period whenever the monitor is first turned on.

Rotate P-1 fully counter-clockwise. Switch 2 should be closed, switch 1 open. The alarm should not sound, but lamp 2 should be lit.

Now rotate P-1 slowly until relay 1 is energized and lamp 1 lights. Close switch 1. Lamps 1 and 2 should be lit at this time, while the alarm is silent.

A signal *increase* will have no further effect upon relay 1. Relay 2, however, will become energized if the increase is 50 percent or greater, extinguishing lamp 2 and sounding the alarm.

A signal *decrease* will not affect relay 2, but will de-energize relay 1 if the decrease is 50 percent or greater, extinguishing lamp 1 and sounding the alarm.

Miscellaneous points: The function of C-1 is to bypass ac and thus prevent relay chatter.

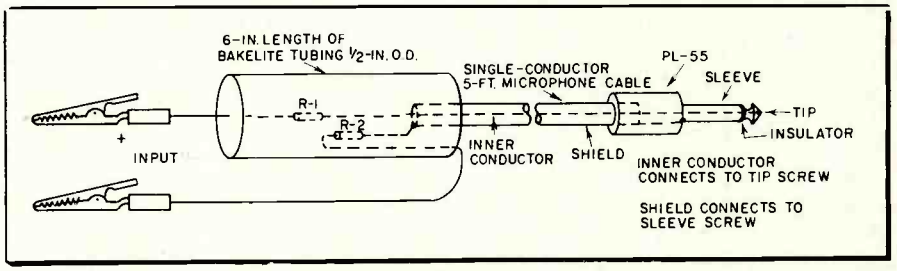
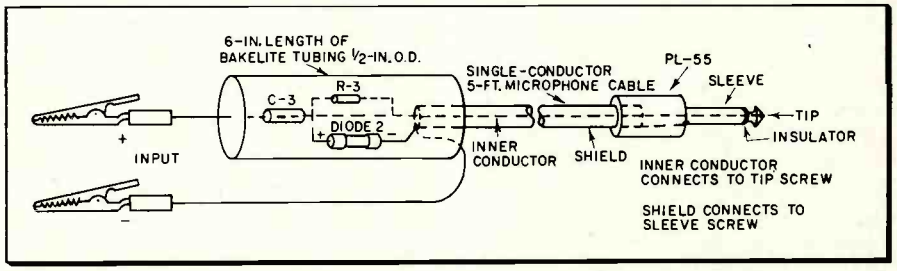


Fig. 2 (Above)—DC probe used with monitor. Fig. 3 (Below)—AC probe used with monitor.



SW-2 is closed when monitoring steady-state dc only; it is open when other signals (ac or pulsating dc) are monitored.

With the ac probe connected, C-3 charges through diode 2 during one alteration of the cycle (refer to Figs. 3, 4). During the next alternation, C-3 discharges through diode 1 charging C-2. C-2 discharges slightly as C-3 charges. Very little energy is taken from the circuit once the capacitors have charged, because of the long discharge time of these capacitors.

R-1, R-2 and R-3 (Figs. 2 and 3) are isolation resistors; their function is to minimize circuit loading due to cable capacitance.

Construction Details. Wiring is not critical if standard wiring techniques are employed. Grid leads should be short; place them as far from plate leads as possible.

The dc and ac probes (Figs. 2, 3) are each six-inch lengths of bakelite tubing, ½-in. OD. A five-foot length of shielded microphone cable connects to one end of each probe. Each cable is attached to a PL 55 microphone plug to mate with J-1. An insulated alligator clip is friction-fitted in the input end of each probe. A second alligator clip is connected to the cable shield inside the probes with a six-inch length of flexible test lead wire. Components are wired as shown in Figs. 2 and 3. Scotch electrical tape no. 33 is used as required, to prevent contact between components.

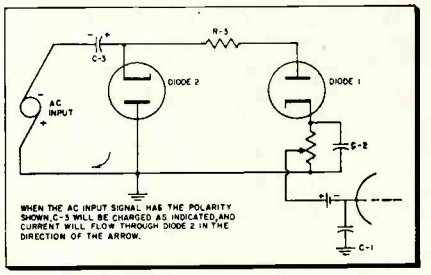


Fig. 4—Audible alarm input circuit, redrawn and simplified to clarify the circuit action of the condensers and crystals.

Probe Notes. The dc probe may be used to monitor voltages up to 300 volts. A standard hv probe should be connected to the input of the monitor when monitoring voltages in excess of 300 v. All other voltages, including amplitude-modulated r-f and pulsating dc voltages, should be monitored with the ac probe.

Plural Units. If a number of units are constructed, several circuit points may be monitored simultane-

(*Continued on page* 58)

Lead Dress Problems in

Incorrect Placement of Wiring Can Cause Buzz, Hum, Poor

By Cyrus Glickstein

• Some TV sets may not look like it, but it can be taken for granted that the wiring layout, especially in critical circuits, has been carefully planned by the engineering department. However, experience has shown that poor wiring (improper lead dress) does creep in, both in the initial manufacture and in subsequent servicing. This produces a wide variety of troubles.

To emphasize the importance of the subject, it might be noted that improper dress of leads, as well as incorrect placement of parts like resistors and condensers, can cause: 1) audio defects such as buzz and hum; 2) video defects such as a weak (snowy) picture, interference, regeneration, poor sync, bending, impaired interlace, and ragged edges on the raster; 3) circuit breakdown as a result of heat and arcing; and 4) interference with other receivers —for instance, AM home radios.

As an aid in troubleshooting, the above symptoms can be reclassified on a more useful basis. Proper lead dress is necessary (see Fig. 1) to avoid:

1) Breakdowns due to heat.
2) Breakdowns due to arcing or corona.
3) Defective operation due to unwanted bypass action.
4) Defective operation due to undesired coupling between stages.

Each of the above classifications, together with the circuits usually affected, will be discussed in turn.

Troubles in the first two categories are familiar to most servicemen. Heat breakdowns can be avoided by routing leads away from hot tubes, resistors, or similar parts which may burn the insulation and eventually cause trouble. It is also necessary to place parts which become hot away from other parts (like condensers) that may change in value or break down more readily because of the heat.

This does not mean that the routing of leads and the placement of small parts should be radically shifted around in every set that comes to the service bench. As will be seen shortly, this would simply be asking for trouble, not preventing it. A good rule to follow is: if the set has been working ok prior to the breakdown, follow the original wiring and parts location as closely as possible in making the replacement, but avoid placing the new part and its connecting wires close to a hot spot. If a wire or part in another section of the chassis is seen to be overheating because of its location, change the location, observing the precautions indicated in the next paragraphs.

Arcing Troubles

Arcing can be caused by defective lead dress in either the low-voltage or the high-voltage circuits; the fault, however, usually occurs in the high-voltage circuit. In low-voltage supply circuits, servicemen are usually careful not to dress a B+ tie-point too close to chassis or a ground wire. Low-voltage B+ wires generally have adequate insulation, so there is no arcing even if they touch the chassis.

In high-voltage circuits, there is a much greater problem. Arcing can take place between points which are not touching if there is a large enough potential difference between them. In addition, corona (ionization of the air) may occur, particularly in the vicinity of a pointed or sharp-edged hv connection.

The following rules summarize the precautions which should be taken in high-voltage circuits:

1—Terminals of the high-voltage rectifier socket should be dressed toward the inside of the corona ring and be free from sharp protrusions.

2—The corona ring should be dressed so that it will function properly; that is, centered, and about ⅛-in. below the socket terminals.

3—All leads in the high-voltage circuit should be kept as far apart from each other as possible. They should be short and direct, but without strain, and dressed as far as possible from the flyback transformer windings. The leads should also be dressed as far as possible from the chassis, and away from low-voltage leads, or leads at or near ground potential. Particular precautions should be taken to keep the high-voltage rectifier and horizontal output plate-cap leads as far as possible from the cage (chassis). It is good practice to wax these leads at both ends, to minimize corona spray.

4—Make certain no sharp points are present, after soldering replacement parts in the high-voltage circuit, to minimize the possibility of corona. It is advisable to operate the receiver in a darkened room after completing the repair, checking for the smell of ozone or audible arcing.

The next important type of trouble caused by incorrect lead and component dress is defective bypass action. This is most likely in r-f, i-f and video amplifier circuits, and can result in defective output because of regeneration, reduced output, or poor high-frequency response.

In video amplifier circuits, coupling condensers and peaking coils are mounted away from the chassis to minimize stray capacitance to ground and possible reduction of high-frequency response.

In video i-f circuits, the leads of i-f coils (because of their length and position) become part of the circuit tuning. The distance of these leads from the chassis helps determine the amount of stray capacitance in the tuned circuit. When a video i-f coil is aligned to a given frequency, the capacitance of the lead dress becomes an integral part of the circuit tuning. Changing the lead dress may therefore change the resonant frequency of the circuit. If done on a wholesale basis, the video i-f section may be sufficiently detuned to make realignment necessary.

Replacement Cautions

Special care must be exercised in replacing bypass condensers in r-f and i-f stages. It is advisable to use the same type of condenser, with the same pigtail length at both ends, as originally present. Furthermore, the condenser should be replaced in exactly the same position.

A condenser in these circuits acts not simply as a condenser, but rather

Television Receivers

Interlace, Improper Holding, and Other Symptoms

as a tuned circuit. The capacitance of the condenser plus the stray capacitance of the pigtails to chassis, together with the inductance of the pigtails, plus the inductance introduced by the internal construction of the condenser, all combine to make any capacitor a resonant circuit at some particular frequency. This affects the bypass action of the condenser at the desired frequencies, and in turn the frequency response of the stage. Changing the type of condenser and its pigtail length may change the response of the stage with which it is associated, possibly causing some degeneration of the incoming signal, or regeneration, because of a peak in the response. In addition, failure to replace the part in its previous position may introduce other problems, which we are going to discuss shortly. It is important to use the same ground points when replacements are soldered in.

To summarize, don't disturb lead dress in r-f and i-f circuits unless there is a reason (say, elimination of undesired coupling) for doing so. When leads must be moved, keep this caution (which applies to all circuits) in mind: When moving leads to find out if they are causing undesired coupling, don't move them around at random. Move only those leads that can possibly cause the defect. Then, if the trouble is not eliminated, *return them to their original position.*

The largest group of lead dress troubles is probably caused by coupling. An unwanted signal may be coupled from one circuit to another *capacitively* (adjacent wires or parts can form the plates of a condenser, functioning like a conventional coupling condenser); *inductively* (ac voltages in one wire may induce a voltage in an adjoining one) or both. In some cases, a signal may be *radiated* from one circuit into another one.

Because of the many possible defects caused by coupling, this condition will be discussed under a) audio effects and b) video effects.

The most common audio troubles caused by improper lead dress are hum and buzz. Since each of these defects may also be caused by other faults, it is important to narrow down the possible sources of trouble before starting to shift leads around.

Troubleshooting Procedure

A suggested troubleshooting procedure to determine whether hum in the sound is due to lead dress may be roughly outlined as follows: First, note if the hum is heard on all channels. If it is, turn the volume control to minimum. If the hum is still heard, the most likely source of trouble is either the low-voltage power supply or an audio tube (in which cathode-to-heater leakage is present). If the hum, on the other hand, is eliminated by turning the volume control down, turn the control up about half way, so the hum can be heard. Now short the "hot" terminal of the volume control to ground. If the hum is still heard, it is no doubt being picked up by the leads to the first audio stage (from the volume control, tone control, etc.).

Carefully move the suspect leads, noting whether hum increases or decreases. If these leads are near filament or line input wires, reroute the appropriate wires, if necessary. In general, ac leads are kept close to the chassis, and away from circuits particularly susceptible to pickup, or whose operation may be affected by pickup.

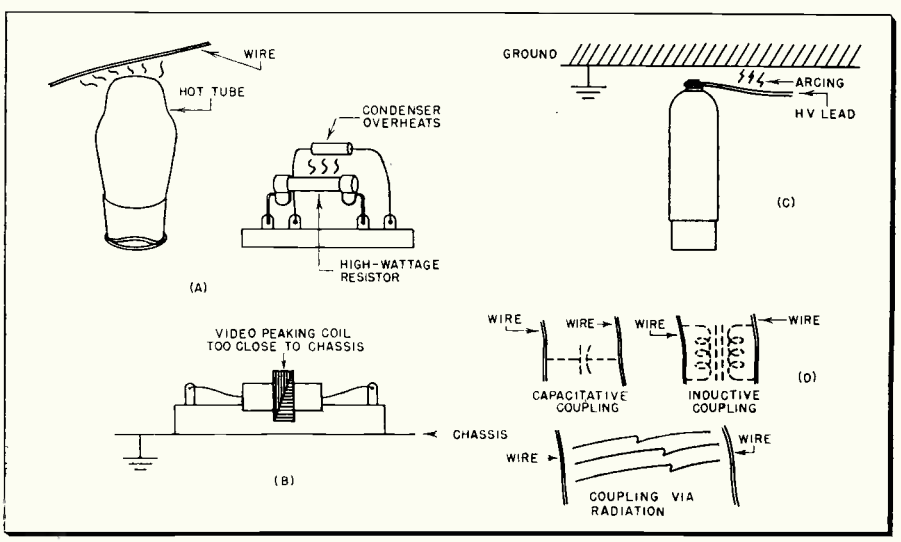
In redressing audio leads to reduce hum, be careful to avoid buzz pickup and regeneration. Regeneration (which often manifests itself as a high-pitched squeal) can result from placing the plate lead of the audio output stage too close to the grid lead or grid circuit of the first audio stage.

When it is not possible to entirely eliminate hum pickup by redressing the leads, it may prove helpful to shield (unshielded) leads going to the volume control and the first audio stage. When a shield is added, not more than ¼ in. of wire should extend from each end of the shield. Both ends of the shield should be well grounded.

If hum is heard on only one or a few channels, try placing a .01 mfd ceramic or mica condenser across the antenna terminals. If this reduces the hum, it is probably being fed into the tuner. The first likely thing to check in this case would be the agc tube and its associated circuit.

Buzz may have many different causes. Common classifications of

Fig. 1A—Placing wires or components too close to units that generate heat, such as high-current tubes or large resistors, invites subsequent breakdowns. B—When an hv lead is too near a ground point, arcing or corona is likely to occur. C—Dressing a video peaking coil too close to chassis will introduce an undesired bypassing effect. D—Undesired coupling between leads.



buzz include sync pulse pickup, intercarrier buzz, vertical sawtooth pickup, and mechanical vibration of laminations in a vertical sweep or power transformer. To determine whether the buzz is caused by the vertical circuit, vary the vertical hold control. If a change in the pitch of the sound is now heard, then the buzz is originating in the vertical circuit.

Tracing Source of Buzz

If there is any question whether the buzz is coming directly from the speaker, or indirectly from a transformer in the vertical sweep circuit, turn down the volume control completely. If the buzz is still audible, it is no doubt being caused by the mechanical vibrations of a vertical transformer (blocking oscillator or output). To eliminate the vibration, crimp the lamination strap of the transformer at fault with pliers.

If, on the other hand, turning down the volume control eliminates the buzz, then there is coupling from the vertical stages to the audio circuit. This is usually the result of faulty lead dress. The most likely causes are: 1—Volume control lead(s) too close to the vertical oscillator or vertical output tube or components (dress volume control lead(s) as far from the vertical circuit as possible, to correct the trouble). 2—Vertical hold control lead too close to the audio tubes, or to the volume control leads.

Other possibilities are: 3—Sync pulses coupled to the first audio tube by means of the cathode (or grid) lead of the crt (dress crt lead away and/or shield the audio tube). 4—Sync buzz in the sound caused by video hash radiated from the leads or the coupling condenser to the first sync amplifier (reroute leads and condenser well away from audio circuit). 5—Vertical retrace suppressor circuit leads passing close to first audio stage (reroute).

To reduce residual hum and buzz after all checks have been made and obvious troubles corrected, it may be helpful in some cases to add a condenser—100 to 500 mmfd—from the grid of the first audio stage to ground.

Wisconsin May Tighten TV Antenna Code

The Industrial Commission of Wisconsin has been conducting a series of public hearings, on the revised state building code provisions regulating outdoor TV and radio antenna. The general provisions of the order, which are accompanied by lengthy technical details, follow:

Order 5222
Television and Radio
Receiving Antenna

1. The requirements of this order shall apply to the outdoor portion of the apparatus, used for receiving television or radio waves.

2. All television and radio antenna systems, including the supporting tower or mast, shall be constructed of galvanized steel or other corrosive-resistant incombustible material. Where approved by the Industrial Commission towers constructed of wood or wood poles set in the ground may be used to support antenna systems but no wood tower or wood pole may be mounted on the roof of any building or structure.

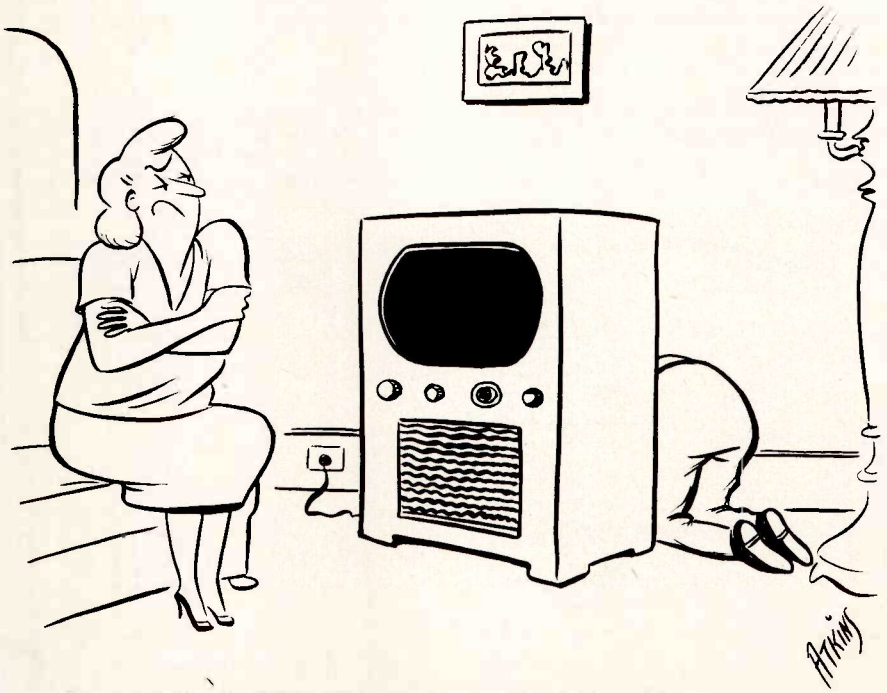
3. The antenna and tower shall be designed to support the dead load of the structure plus an ice load at least ½ inch in radial thickness. The ice load shall be computed only upon the wires, cables, messengers and antenna.
The tower or mast shall be braced or guyed and anchored to resist a horizontal wind pressure of not less than 30 pounds for every square foot (net area) of exposed surface. Guy wires shall not be anchored to a chimney or to any roof ventilator or vent pipe.

4. Antenna systems installed on the roof of a building shall not be supported by or attached to a chimney. All such installations shall be mounted on an independent platform or base and anchored in place. The platform or base of the tower shall be large enough to distribute the weight of the structure over sufficient roof area so the roof construction will safely support the weight of the structure in addition to the required live and dead roof loads.

5. All antenna systems shall be so installed that no part of the structure will be nearer to a street, or other public thoroughfare, than the height of the antenna as measured from its platform or base to the topmost point. No wires, cables, or guy wires shall extend over any street or other public thoroughfare or over any electric power or communication lines.

6. Poles used for electric power or for communication lines shall not be used for supporting or for guying any antenna system. Where antenna installations are so located that damage will be caused to adjacent power or communication lines by the falling of the antenna structure, a separate safety wire shall be attached to top of the tower and secured in a direction away from the power or communication line.

7. Electrical installations in connection with antenna systems, including the grounding of the tower or mast, shall comply in all respects with the requirements of Section 13-810 of the Wisconsin State Electrical Code.



"It's foolish to call in a serviceman, just to connect these two little wires . . . There! Is the picture straight now?"

Present Status

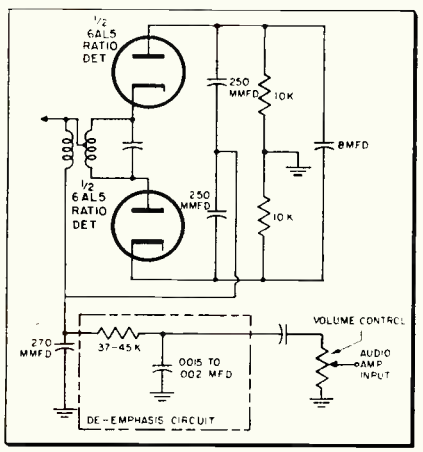
RETMA Service Co-ordinator A. Courmont advices TECHNICIAN that inquiries in Madison, Wis., capital of the state, during December, indicate little activity concerning this bill. The Wisconsin legislature is not in session and no bills are to be acted upon until January, 1955. Several bills of the foregoing type were introduced during 1953 but were quashed shortly, and the legislature is not expected to reconvene until a year from the present time.

Shop Hints to Speed Servicing

Tips for Home and Bench Service Contributed by Readers

De-Emphasis Trouble

Shrill sound with ample volume and an apparent loss of low notes in TV or FM sets indicates possible trouble in the FM detector's de-emphasis circuit. This R-C network, located between the detector output and the volume control (or the grid of the 1st audio amplifier), consists of a series resistor-condenser combination (see sketch). It restores normal tone balance—a measure made necessary by pre-emphasis of high frequencies at the transmitter. New sets often develop the trouble cited, due to excessive heating of the resistor-condenser components during assembly. Sometimes weakness of the internal connections (usually of the condenser) escapes inspection, showing up after a few days service in the set owner's home. The condenser may be tested for a partial or complete open circuit by



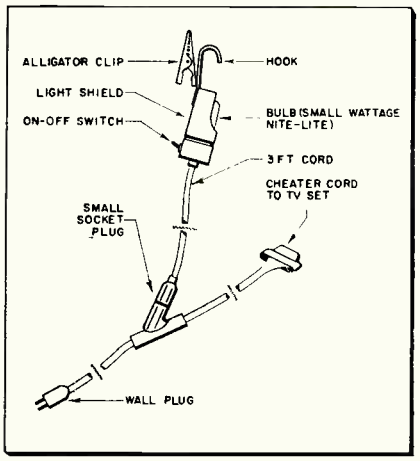
shunting it with another unit. If this check restores the proper tone balance, replace the defective condenser—do not permanently shunt it with another one. If the resistor has changed value—usually the result of aging—the trouble can readily be located with an ohmmeter.—*James A. McRoberts, Brooklyn, New York.*

Easier Soldering

Hammer cored or plain wire solder flat, before use in delicate operations where the solder must be melted instantly to avoid overheating the work. Hammered flat, the solder will flow almost at contact of the soldering iron.—*Harry J. Miller, Sarasota, Florida.*

Light Inside TV Cabinet

When servicing a TV set in a customer's home, it is helpful to have a light inside the cabinet. Advantage may be taken of the fact that, with the back off the receiver, an AC



cheater cord is necessary for inspection of the set during operation. I parallel the cheater cord with another AC line, about three feet long, fixing a small light bulb at the other end of the added line (see sketch). On the small light I fasten an alligator clip and a hook, by either of which the bulb can be attached to any safe and convenient part inside the cabinet or on the chassis.—*Alvin Diedricksen, New Britain, Conn.*

Insufficient Width and Squealing

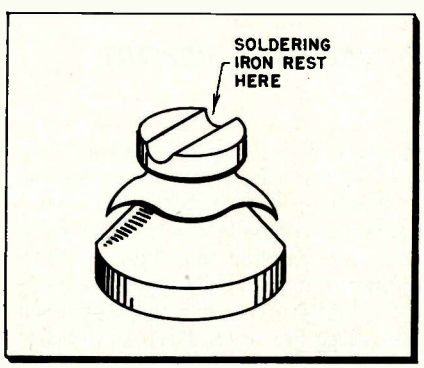
In a number of older TV sets recently serviced, a typical 15,750-cycle sweep signal squeal was audible. An appreciable decrease in width was also present. Visual examination disclosed that the entire horizontal output transformer (flyback) assembly was somewhat loose. The clamping screws were tightened with the following very pleasant surprise: The squeal was reduced to a normal level and the width just zoomed out.

Shorted Tuning Condensers

Locating shorted plates in ganged tuning condensers may be simplified by using a strip of stiff paper, such as a calling card. Pass the paper successively between the different pairs of rotor and stator plates. When the shorted plates are separated, the receiver will resume operation.—*S. Sandler, Providence, R.I.*

Stable Solder Iron Rest

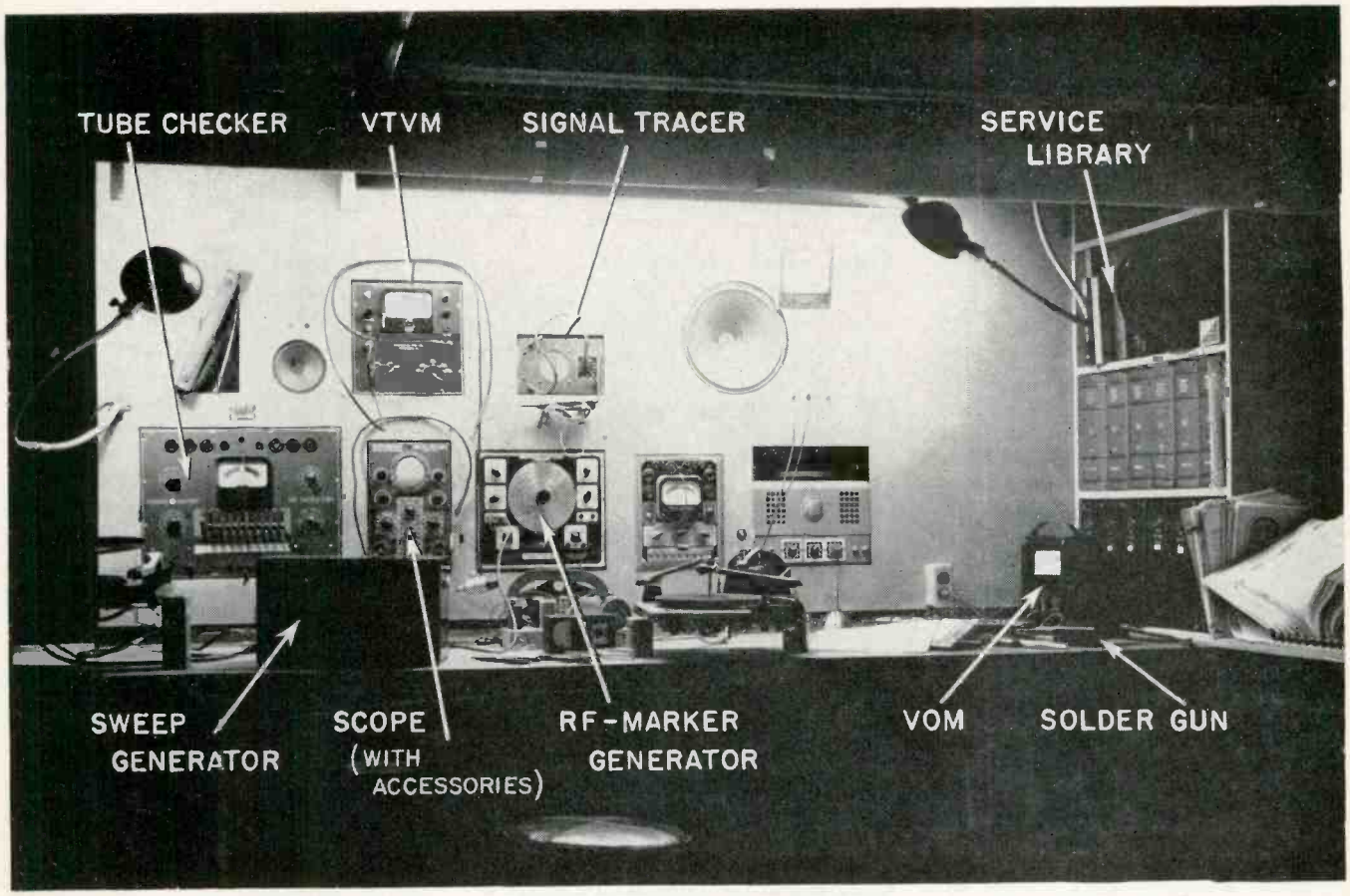
Some rests for soldering irons on the market, and almost all of those made by the home constructor, have a tendency to get hot and burn the insulation from test leads which accidentally touch them. Some of these stands, especially the wire types, have a tendency to tip, spilling the hot iron on schematics, etc. An excellent stand which doesn't heat up and which is very stable is an old



insulator of the type used on telephone poles (see sketch). The depression in the top serves to hold the iron in a natural cradle, and the flanges serve to make an efficient radiator. The porcelain types seem to work the best, although a glass unit may be used. The insulators can be obtained anywhere the telephone company is replacing chipped insulators, or they may be purchased at any electrical wholesale store for a few cents each.—*John A. Cooley, Washington, D.C.*

SHOP HINTS WANTED

TECHNICIAN will pay $5 for acceptable shop hints. We are particularly interested in hints that tell how a technician located a hard-to-find trouble in a TV set, radio, record-changer or similar unit; or how he traced a conventional defect to its source more rapidly than usual by using a short-cut. Unacceptable items will be returned to the contributor. Send your ideas to "Shop Hints Editor, TECHNICIAN, Caldwell-Clements, Inc., 480 Lexington Ave., New York 17, New York."



One version of a service bench. Basic equipment and other shop gear discussed in the article are illustrated. Added requirements may vary. In the set-up shown, for example, a second tube checker, test speakers, and a test record player-amplifier combination have been incorporated.

Check-List on Service Equipment, Costs, and Inventory

SPECIAL REPORT

Every business and professional man likes to take a look into the operation of businesses comparable to his own—to see how competitors in his own community (and in other areas) are conducting their affairs. Every progressive technician wants to know what equipment other shops are using, have on hand or are thinking of buying; what amounts are being paid for rent, labor, vehicle operation, advertising, insurance and other expenses.

But unfortunately, most servicemen are busy from early to late handling their own calls and repairs, so they have little time to go about inspecting other service shops or comparing notes on costs and expenses.

The following special study will provide such an overall glimpse of service operations today, directed particularly at the "small" shop, operated by the owner and one or two service helpers. It gives an intimate analysis of investment, inventory, and expenses from which to make your own comparison—Editors

By Bernard Asch

THE SHOP—Servicers generally agree that a shop for "service only" need not be situated in the busiest, high-rent area of a community. It may be better located on a secondary thoroughfare or even on the outskirts of a town. The shop door or window should, however, be visible to people walking or driving by. Parking space for the servicer's car or truck (sufficient space also for customers' vehicles, if possible) should be easily available during normal business hours. The interior of the shop should have space for a workbench big enough for two men to work on separate TV chassis without crowding each other. The bench should be large enough to permit two or three TV chassis to be set up for operating tests.

There should be sufficient wall space for parts and material storage bins, a desk, filing cabinets, and shelves for holding chassis awaiting repair or delivery. Floor area should be adequate to permit the setting up of a counter for display or other purposes. It is a good idea to plan the counter location so that anyone entering through the door will be prevented by the counter from going into the work area. A rental of from $40 to $125 per month may have to be paid to secure a desirable shop location, depending on regional rental levels and the location desired in the area. Higher—or lower

Compare Your Own Situation with These Averages Collected from Experiences of Many Successful Small Service Shops Across the Nation.

—rentals may, of course, be encountered in a particular situation.

CAR OR TRUCK—Unless the shop operates on a policy of no pick-ups and deliveries, the use of some type of motor vehicle is a practical necessity. This may be a light panel truck, a "station wagon," or a passenger automobile. In some metropolitan and suburban areas, servicemen are using small foreign-built trucks; users like their operating economy, maneuverability in heavy traffic, and ease of parking. Before purchasing any type of vehicle for use on service calls, it is wise to check local motor vehicle laws and regulations.

In some TV fringe and mountainous sections of the country, TV antennas are supported by ground-based towers. Antenna installation men frequently use a collapsible tower mounted on a two-wheeled open trailer; the trailer is normally hitched to the service truck and hauled to proposed antenna sites. A new panel truck of a standard make costs about $2100; used trucks, station wagons or cars may be obtained in all price ranges down to $300. Trailers in various conditions may be purchased for prices ranging from about $300 down to $50.

INSTRUMENTS—There is some difference of opinion regarding the test equipment and instruments which should be readily available in a two-man operation. Many servicemen, however, agree on the following as minimum requirements:

One VOM (20,000 ohms per volt)—approx. $40.

One VTVM (with accessories)—approx. $60.

One 5-inch Oscilloscope (with probes and other accessories)—approx. $200.

One TV-FM Sweep Generator—approx. $150.

One Tube Tester—approx. $75.

One RF Signal Generator (with internal modulation)—approx. $100.

One Line-Voltage Isolation Transformer (with provision for variable output)—approx. $20.

One Storage Battery Eliminator (6- and 12-volt outputs)—approx. $50.

With a basic list of this nature, it must be remembered that there may be many additions to fit into a particular mode of operation or into the requirements of a particular locality. There will also be equipment that, while it is not considered to be as essential as the foregoing grouping, will be kept in mind for gradual acquisition. Such items include: signal tracer, combination wattmeter-voltmeter, square-wave generator, AF generator, calibrating crystals, resistance decade box, high-voltage probe, capacitor checker or bridge, grid-dip meter, field-strength meter, cross-hatch or pattern generator, UHF generator, and test speaker.

The pattern set forth here may also be altered by the trend toward the manufacture of instruments that combine more than one of the necessary functions in a single housing. For instance, combined square-wave and AF generators are on the market; RF generators, available with internal modulation, often provide a variable separate AF output; some sweep generators provide a variable-frequency marker which can function as an RF source.

Also, the investment in service data, manuals, reference and guide books may reasonably be grouped with instruments. A figure cannot be given for this because (1) for a particular establishment, it may vary from nothing more than a tube manual and the schematics of several key receivers, to a full complement of service literature covering AM, FM and TV sets as well as record players and other equipment, plus several reference books, (2) this investment, rather than being made at one time, is one that continues through the life of a servicing establishment.

TOOLS—This list of tools is considered to be a minimum quantity for a two-technician business where operating circumstances will sometimes require one man to be doing bench work while the other is engaged with outside jobs. The list (with approximate costs) includes:

One ½-in. electric drill—$50.

Assortment of drill bits—$10.

One bench vise—$10.

Two tool boxes—$8.

Two sets of open-end wrenches—$4.

Two pairs of diagonal cutters—$5.

Set of alignment tools—$4.

One ¼-in. electric drill—$20.

Two soldering guns—$25.

Two sound-powered phones (one set)—$25.

Two sets of hex nut wrenches—$12.

Two pair of long nose pliers—$4.

Ten screwdrivers—$8.

Set of hex and Bristol wrenches—$2.

In addition to these, almost every servicer has his own pet items which he feels are a must for his mode of operation.

SUPPLIES AND MATERIALS—It would be difficult to present a list, with quantities, of all the supplies and materials which a well-stocked service establishment should carry. For one thing, such a list would have to be shaped to conform to the major type of work which the operator expects to do, and to the area in which he operates. For example, the list would be different for a shop in a metropolitan area with well-established VHF TV service than it would in a brand new UHF locality which is just receiving TV transmissions. The list would be different, too, if a shop is to be located within one-half hour's drive from a parts distributor's stock, than it would if the nearest parts depot is 150 or more miles distant. The following tabulation of material should be considered with these facts in mind.

Kit of ½- and 1-watt resistors.
Volume control assortment.
Electrolytic capacitor assortment.
Assorted pilot light types.
Assorted tube sockets.
Knob assortment.
Several ion trap magnets.
Assortment of detents.
Assorted selenium rectifier types.
Assorted vibrator types.
Assortment of line cords and plugs.
Solder.
Assorted phono cartridges and needles.
Assortment of basic speaker types.
Several mast lengths.
Roll of guy wire.
Roll of 300-ohm lead.
Several types of germanium diodes.
VHF and/or UHF boosters.
Dual-control assortment.
Assortment of paper and mica capacitors.
Stock of 15 fuse types.
Wire-wound resistor assortment.
Several cheater cords.
Several rolls of tape, various kinds.

Universal flyback transformers.
Hook-up wire assortment.
Buffer capacitor assortment.
Dial cable assortment.
General hardware assortment.
Assorted chemicals, lubricants & polishes.
Antenna assortment (indoor and/or outdoor).
Assorted antenna installation hardware.
Roll of co-axial cable.
Antenna rotators.
Several auto antennas.
UHF converters.
Audio output transformers.
Several commonly used vertical output transformers.
Filter chokes.
Line cords and resistor cords.
Line cord plugs.
Coils: r-f, i-f, discriminator, peaking etc., for radio and video applications.
Lightning arresters.
Assortment of phono drive belts.

An estimate of the total cost of minimum quantities of the listed material is $700.

TUBES—A basic assortment of tubes for the servicing of TV, home, portable and auto radio, and hi-fi equipment will include about 100 different types. Depending on the quantities purchased, estimates range from $700 to $1500 to cover tube needs.

SHOP AND OFFICE FURNISHINGS—Before a shop can be thought of as ready to operate, shop and office equipment must be installed. The following is a list of furniture and supplies for a well-equipped repair business shop:

Display counter.
Electrical wiring and fixtures.
Printed letterheads, billheads, business cards.
Kneehole desk with drawers.
Typewriter and table.
Steel or wooden shelving.
Rubber stamps.
Set of books for accounting use.
Two high stools.
Sign and lettering (exterior).
File cabinets.
Small parts storage cabinet.
Workbench.
Cash box or register.
Miscellaneous office supplies.

The average cost of this material (some of it new, some used) at current prices may be about $550.

OPERATING EXPENSES—Before a single dollar of revenue enters a shop, certain operating expenses will have to be incurred. An operator with vision attempts to foresee and estimate as many of these expenses as possible, so that he may budget his resources. The figures quoted here will vary in different areas but they may be taken as average ones.

ELECTRIC SERVICE—About $9 per month is the average light and power bill. Most power companies require a deposit from business establishments before turning on the current.

TELEPHONE—From $15 to $25 per month is a common charge.

VEHICLE MAINTENANCE—About $30 per month (exclusive of insurance) for vehicle fuel, tires, repairs, license, etc. is a typical cost.

INSURANCE—Insurance for the motor vehicle, burglary, fire and lightning protection for the shop, liability for injury to a customer or damage to his property, and employee injury compensation averages $25 monthly. Local conditions may cause this figure to vary widely.

SALARIES—Depending on labor rates in the area, most servicers agree that it will take from $300 to $500 monthly to obtain the services of a really top-notch technician. If a shop owner agrees that his own salary should be at least equal to that of his employees, then $600 to $1000 should be laid aside monthly for this purpose.

ADVERTISING & PROMOTION—Under this heading are lumped all contributions, gifts, etc. and advertising or publicity outlays which tend to expand or otherwise improve business income. This figure was found to be as low as $5 (for telephone directory advertising) to as high as $90 per month for other desirable advertising. The attitudes of shop owners and local community circumstances were the principal factors in setting the exact amount.

ACCOUNTING SERVICE—Many up-to-date shops employ an accountant who comes in at regular intervals to maintain a book- and record-keeping system; he also keeps track of tax law requirements and changes, and prevents the proprietor from running afoul of the law on this score. Such service commands from $20 to $35 monthly.

TAXES—Under this heading come such federal, state and local levies as social security, unemployment insurance, disability, gross business receipts, sales and occupancy taxes, to name just a few. Largely dependent on location and the amount of business transacted, the amount will fluctuate between $10 and $30 per month.

WHAT IT TAKES—Readers who have kept track of the individual figures throughout this discussion must be wondering where all the money comes from. The answer, of course, is that it must be taken in as gross business receipts. The next question that comes to mind, then, is the amount of cash intake which will cover all expenses and still leave a reasonable profit for the technician-proprietor of an electronic service shop.

The precise amount of income which will permit the books to show a profit must be dependent on how much money is laid out each month or year. The reader has seen some average figures for typical monthly expense items and the ranges over which they may vary. It is reasonable to assume, therefore, that estimates of gross income required for profitable business operation will vary just as widely. They do. Servicers have named sums as low as $1300 to as high as $2300 per month as gross income requirements. The reader is left to draw his own conclusions as to which figure most closely approximates the conditions under which he would or does operate.

The chief purpose of this article has been to help those who operate a small two-man (owner and employee, or partnership) repair business, to survey current practices. Some technicians may also find it useful as educational material to put before their customers and others who are prone to criticize servicers as irresponsibles, fly-by-nights, or "robbers."

Facts and figures given here will serve to show that the owner of a service establishment has at least as great a stake in the community, and in serving it properly, as many other local businessmen. The facts here presented should help to gain increased respect and confidence for the hard-working radio-TV technician.

And He's Talking About CIRCUIT DIGESTS! See Page 73

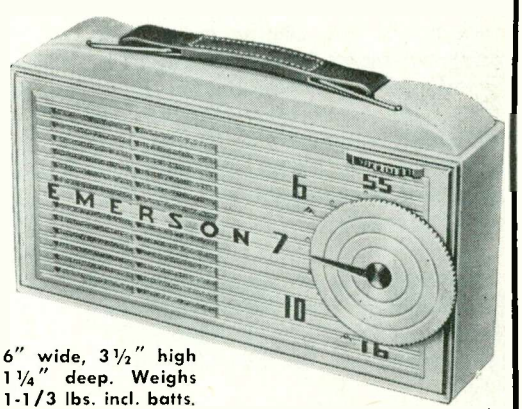
EDITORS: TECHNICIAN

The Circuit Digest section of the magazine is really the answer to a major problem experienced by many servicemen today. The greatest single tool that a serviceman can have is the schematic of the set he is working on.

D. R. CREATO

"Pocket Radio" Schematic

Diagram of Emerson 747 Will Help You Service This Tiny Battery Portable



6" wide, 3½" high
1¼" deep. Weighs
1-1/3 lbs. incl. batts.

CHASSIS NO. 120178

NOTE:
PIN NO. 1 IS NEXT TO THE RED DOT ON THE TOP SIDE OF TUBE SOCKET.

SYMBOL	TUBE	PIN 1.	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V1	1V6	22*	0*	6 meg.	0	1 meg.	1.6 *	8
V2	1AH4	22*	0*	0	10 meg.	8		
V3	1AJ5	1 meg*	4 meg*	1 meg.	0	6 meg.	8	
V4	1AG4	650*	0*	8	10 meg.	0		

To take voltage or resistance readings or service underside of chassis follow steps 1 to 5, page 5, then remove "A" battery connector clip from cabinet and roll top part of chassis over top of cabinet (handle). The underside of chassis can then be checked while set is "ON" by connecting batteries. Use clip leads to connect "A" battery to set.
NOTE: It is perfectly normal for the "B" battery to initially measure slightly low in output voltage. However, this working voltage will remain fairly constant over a much longer period than conventional type of "B" batteries.

Servicing a UHF Converter

• *The following data, made available by the service department of Magnavox to aid technicians in troubleshooting the Magnavox 700359 converter-tuner, is, we feel, so readily adaptable to the servicing of other UHF converters, that we are publishing it in full. The tuning unit present in the 700359 is a Mallory type, used in the converters of many manufacturers.*

To assist you in troubleshooting the Magnavox 700359 UHF converter-tuner (refer to schematic) the following check list has been prepared.

Make sure the VHF portion of the chassis is operating properly by tuning in a VHF station (if available), or by the use of a cross-hatch generator or similar test equipment.

If UHF reception is absent, set VHF tuner on Channel 6 (or Channel 5, if the converter has been adjusted to operate at this setting, because of local conditions) and turn function switch to "UHF." There should be a very noticeable increase in snow on picture tube. If this is so, it indicates that the wiring through the function switch is ok, and the 6BK7 i-f amplifier is operating. *If there is no increase in snow,* make the following checks in the order listed:

a. See that 6BK7 and 6AF4 (or 6T4) filaments are lit.

b. Check for +250 volts at the B+ terminal on the converter. (This checks wiring through switch.)

c. Check for +240 volts on pin no. 1 of 6BK7. (This checks T601 and decoupling resistor.)

d. Check for +120 volts on pin no. 2 of 6BK7.

e. Check for +1.5 volts on pin no. 8 of 6BK7. (This is a check on the tube plate current and the tube itself.)

f. Check wiring on function switch to see that the converter output is connected to the VHF tuner input.

If there is an increase in snow (when the function switch is set for UHF), the i-f is working, but not necessarily the oscillator or mixer. Tune the converter over the band and note whether i-f harmonic beats or "birdies" appear at several points. If they do, the oscillator is operating. If there are no beats, make the following checks:

a. See that oscillator (6AF4 or 6T4) filament is lit. (This is a check on the three filament chokes, and also indicates whether or not filament shorts are present at the tube socket.)

b. Check oscillator grid voltage on pin no. 2. This check must be made with an electronic dc voltmeter, and there must be a ½ watt resistor of about 470,000 ohms between pin 2 and the voltmeter probe. If the oscillator is operating, the grid voltage will be between −4 and −8 volts, and will vary across the band. If there is no grid voltage, check for the following faults:

1. The oscillator trimmer has long leads and sometimes shorts to the chassis cut-out, or the screw lies against one of the tube socket lugs because the trimmer is tilted. The trimmer referred to is made up of a few turns of wire placed on a cardboard tube. The bottom of this winding is soldered to one of the tabs on the tuning unit. As this tab is its only support, the trimmer must be held tightly against the tab, and soldered in place with enough solder to hold the trimmer rigid, so that it will not be disturbed during adjustment.

2. R602 and R603, two 15,000 ohm resistors at the oscillator tube socket, are connected together without a tie point. The leads at this junction might be shorting to the shield. They should be cut short, and the junction dressed away from the front of the tuner, to avoid shorts to the shield.

3. Too much solder may be present on oscillator tube socket lugs, causing adjacent lugs to short together.

4. The ribbon on C614, coupling condenser mounted on pins 2 and 6 of oscillator socket, may have broken loose from the silver band on the condenser. This will cause oscillator to be inoperative or intermittent. (The ribbon on C614 is the inductor for this capacitor; its inductance can be changed by moving it slightly. This ribbon is connected to the silver band on the condenser. The band forms one of the plates of this small capacitor.)

5. Poor contacts may be present in oscillator tube socket. The contacts can be compressed with a sharp, pointed tool.

6. One of the oscillator filament chokes may be open, or the enamel wire to the lead on the coil form may not be soldered.

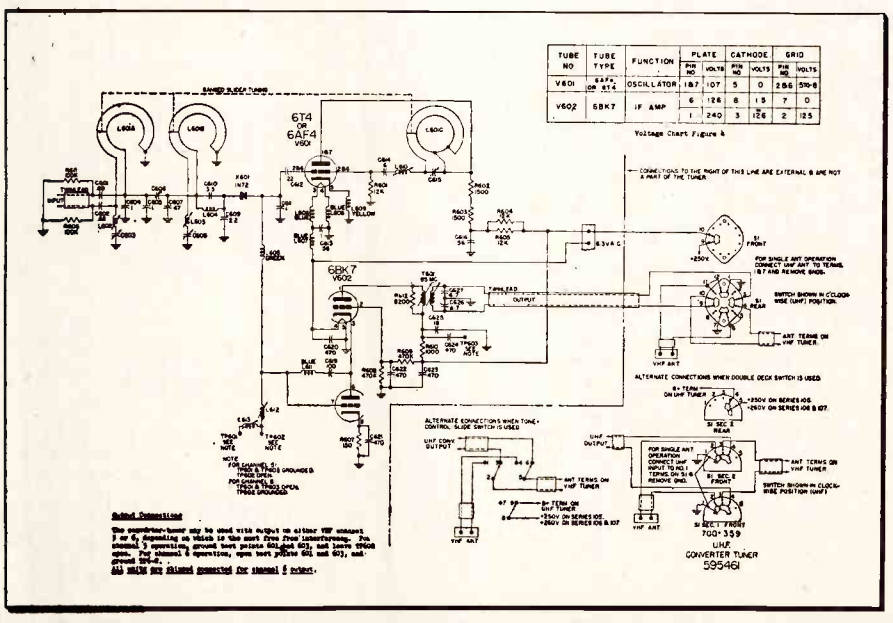
7. Oscillator tube may not be seated properly in socket.

8. Oscillator tube may be defective.

If the i-f and oscillator are both operating, as evidenced by the snow and beats, and yet a picture cannot be received with a reasonable signal input, make the following checks:

a. Replace crystal (IN124).

b. Check antenna input lead to converter tuner for shorts to chassis.



Procedures for Troubleshooting a Device that is Still Unfamiliar to Many Technicians

c. Check for any visible shorts or broken parts around preselector circuits.

d. Check continuity from each side of crystal holder to ground, with crystal removed.

e. Check oscillator injection condenser (.22 mmfd unit going from pin no. 2 of oscillator socket to crystal holder).

f. Remove bottom shield cover and see if a rotor in the tuning unit is loose on the shaft, preventing it from turning. If so, align the rotor with the other two present, and push in the brass thimble which holds rotor to the shaft. (The tuning unit is composed of three rotor sections which are mechanically aligned opposite each other, and held in place by a thimble forced into the rotor. If one of these thimbles becomes loose, it must be aligned as indicated.)

g. Check crystal excitation by removing ground from tie point TP6-2 and inserting a milliammeter in series with the tie point and ground. It should read at least 0.5 ma.

Further Tuner Tests

If converter-tuner operates but is insensitive, intermittent or microphonic—

a. Check items 1 through 8 under b, in paragraph beginning *If there is an increase in snow.*

b. The crystal holder may not be holding the crystal securely. This may be due to spreading of the clips, or wax on the crystal pins. A repair in the one case may be effected by removing the crystal and compressing the clips; in the other, by cleaning the wax from the pins.

c. Input antenna lead may have its insulation removed too far back, causing it to short to the chassis.

d. The crystal may be defective.

e. The i-f circuits may be out of alignment.

f. The r-f circuits may be misaligned.

g. The 470 mmfd bypass condenser (C622) connecting to pin no. 2 of the 6BK7 socket may have open-circuited, or pin no. 2 may be shorted to ground.

h. I-F output transformer T601 may be incorrectly wired.

i. L604 (5 turns wound on C610) may be open.

There is evidence which indicates that servicemen have tried several oscillator tubes in a tuner, finally finding one that works. The trouble, however, was not in the tube, but in an intermittent connection or short which was accidentally cured by the movement of the socket lugs that occurred when another tube was inserted.

When replacing the oscillator tube, bear in mind that some manufacturers' tubes may not operate in this converter; Magnavox has found that a GE 6AF4 and a Sylvania 6T4 will, however, perform satisfactorily.

If the oscillator tube is replaced, the oscillator may fall out of alignment. To check on this, tune the selector to a known channel. If the station comes in within 6 mc (1 channel) of the correct setting, it will not be necessary to adjust the alignment. If possible, try a number of tubes, until one is found to satisfy this condition. If such a procedure is not possible, it may be necessary to align the oscillator in accordance with instructions presented in our maintenance manual on the 700359.

If the converter-tuner operates, but is very weak or has a poor signal-to-noise ratio, compared with other tuners, do the following:

1. Replace the crystal, making sure that the crystal holder is making good contact with the crystal. Replace with a IN124.

2. Check oscillator operation as previously described. The grid voltage should not be less than −4 v.

3. Make sure the VHF tuner is set to the correct channel. This will be Channel 6, unless the tie points have been changed to permit operation on Channel 5.

4. Check UHF antenna input twin-lead for shorts to chassis.

5. Check grid bypass condenser C622 leading to pin 2 of the 6BK7.

6. Check crystal current as previously described.

7. Check operation of the i-f section. Approximately +1.5 volts should appear between pin 8 of the 6BK7 and ground, for 10 ma of plate current. Try changing the 6BK7 if current is too low.

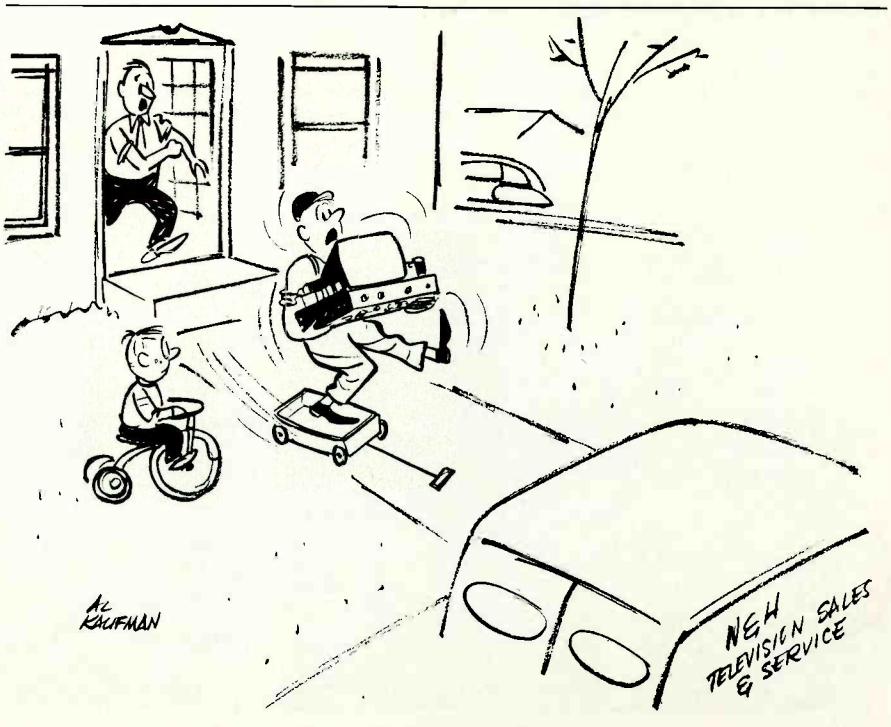
8. Check, visually, components around the i-f socket.

9. Check, visually, components in the preselector circuits.

10. Try realigning i-f input and output circuits for best picture.

11. Check for bad contacts in preselector tuning elements.

12. It is practically impossible to realign r-f circuits without a UHF sweeper. If only one station is available, you can adjust the two r-f trimmer screws for best picture on that one station. *This is not recommended, however,* because it will throw the tracking off in case the converter is subsequently used to tune in a different station at the other end of the band.



Estimating the Right Way

Fast, Profitable Procedure for Determining Repair Charges

• When customers want an estimate on what their service charge is going to be, P. C. Pennington of the City Radio & Electric, 3114 E. Douglas, Wichita, Kansas, uses a combination of speed-plus-plenty-of-test-equipment, and finds that the idea works.

Actually, the Pennington plan is a blend of science and dispatch, and has turned out to be a sweetly profitable affair. City Radio never makes an estimate on a repair job, until it has been brought to the shop, and has been gone over at the test bench. The guessing is eliminated. Detailed testing and diagnosing is done quickly, and then the customer is called and given the estimate.

Rapid Reports to Customers

In the case of a floor model in a home, the chassis is removed from the cabinet and taken to the shop. When a set comes in off the street, and the customer wants an estimate, the receiver gets a quick going-over then and there; if the trouble is a complicated one that requires time to check, the customer is phoned later, like the sets picked up in homes.

In either case, City Radio makes a point of trying to phone the customer the same day. Never is more than 12 hours taken for the estimate.

With the advent of TV in Wichita, Pennington and his crew continued as technicians and did not go into sales. The shop does a heavy volume of TV work for stores which farm-out this service.

Good Work, Prices

When the customer is phoned and is given the estimate, City Radio is pleasant and courteous, and somewhat specific about what's wrong with the radio. A man can always make his charge seem a lot more reasonable, if he knows exactly what repairs he has to make. And a customer is never addressed as if he were the owner of a piece of junk; City Radio is tactful and human.

"The jobs we miss are only a darn small per cent of those we handle in this way," Pennington says. "When we do miss one—that is, when the customer says that the charge is too high, it is nearly always a case where the set is not worth fixing. Nobody gets it."

City Radio is trained for the quick and efficient removal of the chassis in the home. Taking the chassis and leaving the cabinet has several advantages, Pennington believes. It does not upset the customer's room, and it does not disturb the family by the moving of a major piece of furniture. Besides, in hauling a cabinet around one is apt to scratch it, no matter how careful you are. One man, properly equipped and trained, can quickly remove the chassis and bring it in. Hauling cabinets takes more men.

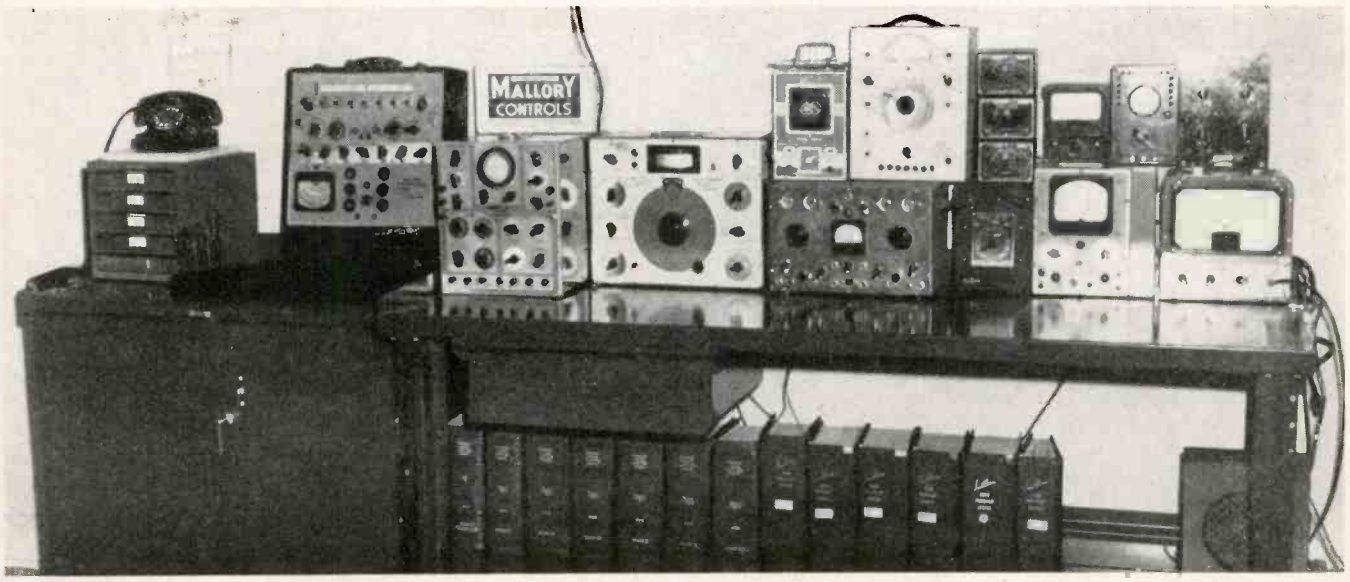
"And once we make an estimate," Pennington says, "it is then the law and the gospel." City Radio never attempts to jack up the charge in emergencies, even if the shop loses money on the deal. The store has tried consistently to identify itself with a good job at an honest price, and will not budge one inch from that policy. It pays off for Pennington, in the long run.

Consistent Advertising

For promotion, City Radio uses a modest amount of newspaper advertising, some spot announcements on local radio stations, and a listing in the yellow pages of the phone book. The rest of it is reputation and word-of-mouth. The shop uses the name-imprinted tape to stick to the back of the cabinet, when a job is finished, for promoting repeat business.

Pennington has been in radio for 20 years. When TV arrived, he simply applied the established policies to the greater set volume, up by 75%.

For this picture, P. C. Pennington of Wichita, Kansas, has cleaned the sets off the test bench. Quick use of this equipment is what gives him his profitable handling of repair estimates.



COLOR SHORTS

SERVICING INFO ON COLOR—Early dissemination of technical information on the servicing of color receivers is planned by the RETMA Service Committee, under Chairman H. J. Schulman, DuMont. Following a thorough discussion on methods of distributing such data to servicemen in the field, two subcommittees have been appointed to work out procedures. Former Service Committee Chairman Ray J. Yeranko, Magnavox, was named Chairman of a midwestern subcommittee, and John H. Craft, Jr., of Stromberg-Carlson, of an eastern subcommittee. Besides developing methods and procedures, the two groups were authorized to request a special meeting of the full Service Committee when they are ready to report. Initially, the program will be carried on by manufacturers' field representatives who will be furnished technical information by RETMA.

NTSC TO DISSOLVE—The National Television System Committee, made up of representatives from all branches of the television industry, which has prepared the specifications of standards on which future American color-TV is expected to operate, will be dissolved after the FCC has given its approval to the NTSC standards. Dr. W. R. G. Baker, chairman of NTSC, explains that whatever further standardization work is required, will be carried on by a TV Systems Committee of the RETMA Engineering Department of which Dr. Baker is chairman, and Ralph R. Batcher is chief engineer.

AFTER WATCHING three network color-TV programs in his own home—(1) "Carmen," (2) Mike Wallace variety, and (3) the "Comedy Hour," Jack Gould, radio-TV editor of the N. Y. Times, has come to one inescapable conclusion. If the quality of the color program is either second rate or not to individual taste, the owner will have no reluctance to turn the color off and look for something better in black and white. Even after a very short time of sustained looking at color under normal home surroundings it is surprising how quickly the color is accepted as a matter of course and interest shifts to the older and more familiar program values, i.e., quality.

DOUBLE TROUBLE—Color-TV receivers will require approximately twice as many components as standard black-white sets, according to a color-TV expert, W. D. Swinyard, chief engineer of Hazeltine Research. Whereas an average black-white set has 20 tubes, with 5 resistors and 5 condensers per tube, a color receiver will have 36 tubes, with 7 resistors and 6 capacitors per tube. In addition several new mechanical and electrical parts are required. As time goes on the tube complements of color sets are expected to be reduced to 25 or 30 units. New pieces of test equipment will also be required to service color sets.

COLOR-PICTURE DETAIL— In commenting on the picture quality under the NTSC standards, Mr. Swinyard said that detail in a monochrome picture received on a color-television receiver is only about one percent less than that achieved by a black-and-white set. UHF color transmissions are received with the same degree of quality as VHF color signals. Interference is no more harmful to color pictures than it is to black-and-white pictures, he said, except when the interference is from a frequency very close to the color sub-carrier frequency. In answer to questions, Mr. Swinyard pointed out that color television will require additional "know-how" on the part of servicemen.

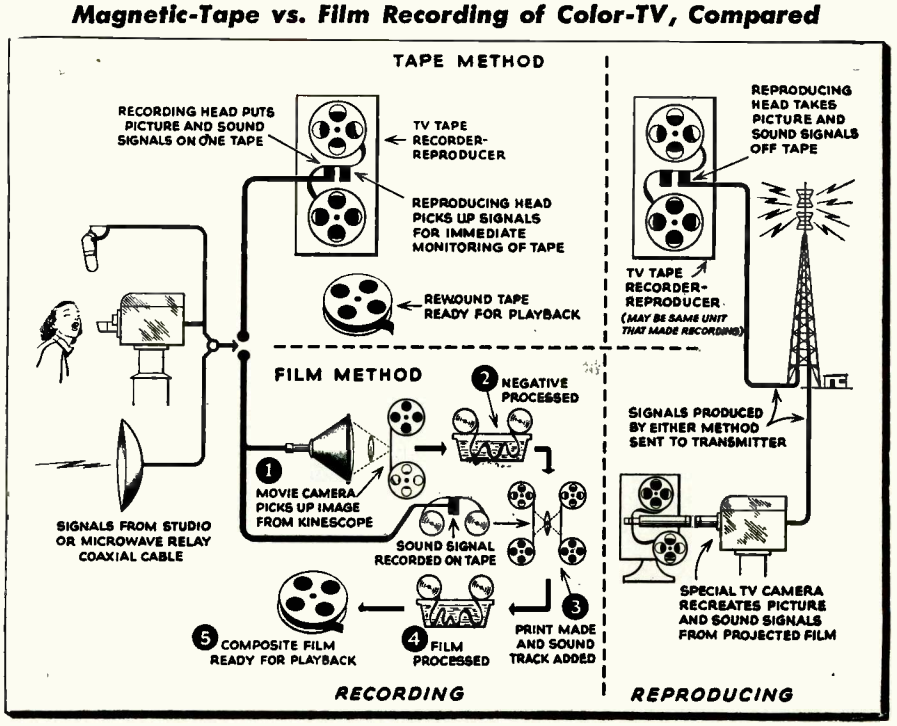
COLOR TV SERVICE PROBLEMS are getting early consideration. Dan R. Creato, vice-president of the RCA Service Co., says a practical book for the service industry on color TV is near completion. The text will be the basis for intensive nationwide training courses, RCA-sponsored, as soon as FCC gives the green light on color.

PRESENT TEST EQUIPMENT, says Creato, should continue to be usable, but a crosshatch or dot generator will probably have to be added. Where a color TV signal is not always available, a color bar signal generator will also be needed.

MOST ANTENNA INSTALLATIONS now in successful use will be adequate for color reception, but multiplex systems are likely to give trouble. To allow proper use of the color signal, antennas, boosters, distributor systems and the like will have to provide flat response.

COMPONENT REQUIREMENTS for color receivers are also being anticipated. Crest Laboratories, Rockaway Beach, N. Y., has introduced a line of variable inductances designed for the new circuitry, as shown in NTSC schematics already released.

Magnetic-Tape vs. Film Recording of Color-TV, Compared



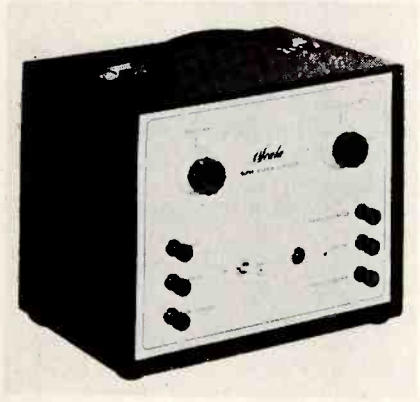
New RCA developments in 3-megacycle magnetic recording, open way to reproduce TV and color-TV pictures from magnetic tape, like sound.

TV-Electronic Technician

New Generators, Meters and Other Test Instruments

Scala MARKER INJECTOR

A bypass injector to provide uniform markers at any point on visual-response curves, in traps, or along the base line of a curve, the SMI-53 Super Marker Injector is designed to operate with any service-type



sweep generator. It mixes a sample of the sweep voltage with a sample of the marker voltage. The mixed frequencies are amplified, demodulated, filtered, and reamplified, following which a large, stable "pip" ("birdie" or "bug") is electronically mixed with the sweep-wave envelope from the picture detector. The marker is always the same size, wherever it occurs on a response curve. For application at video, IF, and RF frequencies through 200 MC. Also useful in signal-tracing and other kinds of troubleshooting. $67.50. Scala Radio Co., 2814 19th St., San Francisco 10, Calif.—TECHNICIAN

Weston TUBE CHECKER

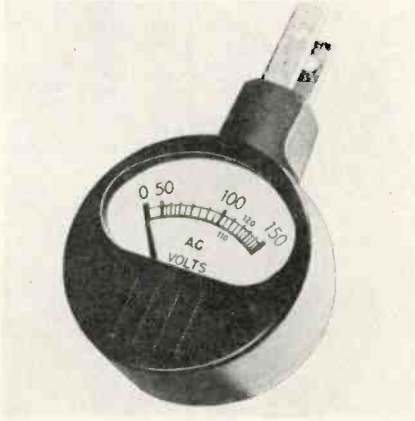
Model 981 Type 2 provides for the accurate, rapid measurement of proportional mutual conductances, emission characteristics of rectifiers and diodes, and the firing potential limits of voltage regulators and low-power thyratrons. An important feature is the provision for accurate meter measurement of leakage resistance, as high as 5 megohms, between tube elements. In addition, the checker measures trans-conductance up to 24,000 micromhos. To safeguard against obsolescence, multiple switching permits any combination of tube connections to be made. Weston Electrical Instrument Corp., 614 Frelinhuysen Ave., Newark 5, N. J.—TECHNICIAN

RCA TV GENERATOR

Indicative of its wide range of test applications, the new instrument, Model WR-89A generator, combines the functions of a marker generator, a vertical or horizontal bar-pattern generator, a re-broadcast transmitter, and a heterodyne frequency meter. The instrument provides an r-f output signal on fundamental frequencies from 19 to 260 mc. A built-in crystal-controlled oscillator also provides an output signal at 4.5 mc. Other provisions: picture and sound carrier frequencies for all VHF-TV channels marked directly on dial; 96 different crystal-calibrating points for checking scale calibration. When used as a re-broadcast transmitter, the r-f output is modulated by a video signal from an operating receiver to provide an r-f carrier complete with video and sync information. Output signal can then be used to check other TV receivers on any VHF channel. RCA Victor, Harrison, N. J.—TECHNICIAN

EMI AC VOLTMETER

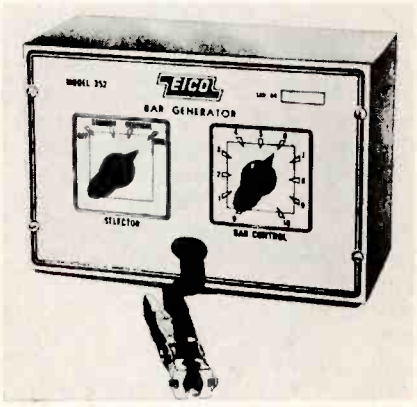
Compact meter for testing AC voltage right at the electric receptacle. Has no wires and needs no assembly. Equipped with prongs; can be plugged into any standard 117-volt receptacle. The prongs have a swivel arrangement permitting the meter to be read from any position. Calibrated from 0 to 150 volts; accuracy



to ±5%. Dealers net $3.00. Electro Mechanical Instrument Company, 813 Chestnut Street, Perkasie, Pennsylvania.—TECHNICIAN

EICO BAR GENERATOR

Model 352 bar generator, available in kit or factory-wired form, is lightweight and simple to operate. It provides a series of vertical or horizontal bars on the TV screen when connected to the antenna terminals of



any TV set. The instrument also indicates overall picture size and vertical and horizontal sync circuit stability. Operates on TV Channels 3, 4 or 5. Model 352-K, kit, is $14.95. Model 352, factory wired, is $19.95. Electronic Instrument Co., Inc., 84 Withers Street, Brooklyn, New York.—TECHNICIAN

Precise CAPACITY DECADE BOX

Model 478 offers four decades from 100 mmfd to 1.111 mfd (100 steps), the equivalent of 10,000 capacitors, with 1 per cent accuracy. Available in kit or wired form, the compact decade box sells at $18.95 in kit form and at $24.95, factory wired. The instrument is useful as a substitution box for experimenting or servicing. Precise Development Corp., 999 Long Beach Road, Oceanside, N. Y.—TECHNICIAN

Hexacon SOLDER IRON

This iron is a plug-tip type, rated at 100 watts, but with a ¼-in. tip instead of the conventional ⅜-in. diameter tip. It is said to reach and maintain a temperature considerably beyond that of the conventional 100 watt iron, and its large reservoir of heat speeds the soldering operation. Because less copper is used, there is a saving in the tip replacement cost. Model No. P-114, list price $8.25. Hexacon Electric Co., W. Clay Ave., Roselle Park, N. J.—TECHNICIAN

New Shop Equipment

Handy Items for Use in the Shop and on the Job.

Hickok MARKER CONTROL

Designed to facilitate alignment techniques involving a marker generator and sweep generator, model 691 provides a constant amplitude marker visible at all points of a response curve, including trap points and baseline points. Response-curve distortion is also blocked. Usable with marker equipment whose output is .05 v or more. Specifications: Marker voltage up to 3 v; variable marker attenuation, 0-60 db; variable response-curve attenuation, 0-20 db; input impedance, 90 ohms. Hickok Electrical Instr. Co., 10606 Dupont Ave., Cleveland 8, Ohio.—TECHNICIAN

RCP FLYBACK CHECKER

Model 123 Flybacker tests the condition of flyback transformers and yokes. The manufacturer states this instrument is capable of detecting a single shorted turn. A good-bad scale on a front-panel meter indicates conditions that cannot be revealed by an ohmmeter continuity test. The device can be used on

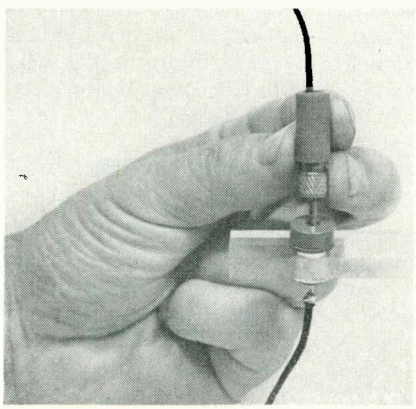
transformers or yokes still connected in the receiver. Radio City Products Co., 152 W. 25th St., N. Y.—TECHNICIAN

Elliot VTVM

Model 940 VTVM reads peak-to-peak or RMS voltages with a frequency response of 25 to 100,000 cycles. High input resistance of 16.5 megohms prevents circuit overload. Features six AC or DC ranges: 3, 15, 30, 150, 300, and 1,500 volts. Center position for discriminator alignment. Resistance in 5 ranges from 0—1000 Ω, 10,000 Ω, 1 megohm, 10 megohms, 1000 megohms. Included are 5 decibel ranges covering from −24 to +55 db. Elliott Laboratories, 50-34 201st St., Bayside, N. Y.—TECHNICIAN

Insuline CONNECTORS

Locking-type tip jacks and solderless phone tips to fit them, intended primarily for electronic test equip-



ment; useful also for experimental wiring, extension cords, and other applications requiring temporary but jerk-proof connections. The tip jack has a Bakelite end cap and a one-piece contact spring that accommodates standard phone tips as well as the locking tips. The No. 432R jack and the No. 7530R phone tip are red; the No. 432B jack and the No. 7530B tip are black. Insuline Corp. of America, 3602 35th Ave., Long Island City, N.Y.—TECHNICIAN

Insl-X INSULATING SPRAY

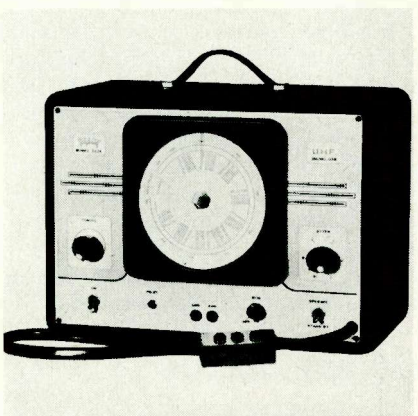
Available in 12-oz. aerosol dispensers, Insl-X spray is said to insulate safely all chassis components except moving parts and tubes. Characteristics: high dielectric strength, excellent hardness qualities, and adherence to all conventional assembly surfaces. Resistant to salt spray, moisture and chemicals, it may be used as a protective antenna coating. Available in clear, aluminum or black. Insl-X Sales Co., 26 Rittenhouse Place, Ardmore, Penna.—TECHNICIAN

Simpson HI-SENSITIVITY VOM

High sensitivity of 100,000 ohms-per-volt on dc is provided by model 269 VOM-microammeter. The high input impedances make the meter useful for measuring avc, agc and bias voltages, ordinarily measured with vtvm's. Sensitivity on ac, 5,000 ohms-per-volt. A total of 33 ranges afford measurements as follows: ac up to 800 volts; a-f output up to 160 v; decibels from minus 8 to plus 45.5; resistance to 200 meg; current up to 16 amps. Includes 4,000-volt dc probe and batteries. Net, $86.24. Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill.—TECHNICIAN

Triplett UHF GENERATOR

Model 3436 is a UHF marker and signal generator with the following features: provides fundamentals on Channels 14-83 (470-900 mc.); large dial with uniform frequency graduations; markings in both frequencies and channels, hand drawn for accuracy; r-f average output, .3 volt; output impedance 150 and 300 ohms; triple shielding; high stability; voltage-regulated power supply; adjustable modulation of r-f signal at approximately 1000 cycles; 0-20 volt audio output at panel. Uses: As a signal or marker generator for adjusting UHF TV receiver front ends and UHF converters; to set end limits of UHF converters and receivers;



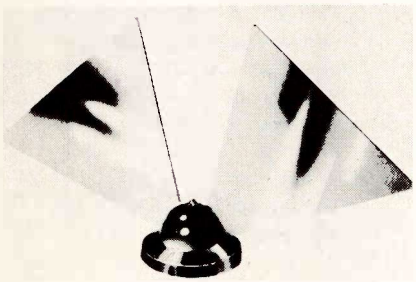
to pre-set fixed-channel converters, especially in fringe areas; as a signal source to compare gain of UHF receivers and converters. Suggested dealer net, $169.50. Triplett Electrical Instrument Co., Bluffton, Ohio.—TECHNICIAN

New Antennas and

Indoor, Outdoor, UHF, VHF Models: Mounting Hardware,

Telco UHF ANTENNA

The Telco UHF indoor butterfly antenna is made of aluminum and is mounted in a walnut plastic base. Wings are fully adjustable. The an-



tenna has a list price of $4.75. Television Hardware Mfg. Co., (Div. of General Cement Mfg. Co.) 919 Taylor Ave., Rockford, Ill.—TECHNICIAN

Plymouth UHF-VHF SWITCH

A low-loss UHF-VHF transfer switch for antenna wires features widely separated contacts with positive make-break characteristics to keep dielectric losses low. The 2-position switch can be mounted in back of the TV receiver so that the handle protrudes, thus allowing quick change-over. Plymouth Electronics Corp., Kingsbury St., Worcester 10, Mass.—TECHNICIAN

Kenwood CHIMNEY MOUNT

One-piece chimney mount, model 5C-SS, is of welded construction and is hot-dip galvanized to provide maximum rust protection. A single heavy-gauge stainless steel strap secures the mount to the chimney. Included with the mount are three aluminum corner guards for uniform tightening and protection of the band. The list price is $5.95. Kenwood Engineering Co., Inc., Kenilworth, N.J.—TECHNICIAN

Ryan ANTENNA CLIP

This ruggedly constructed antenna clip, model 120, is said to be half an inch shorter than standard clips. Need for stripping 300-ohm wire is eliminated; wire is inserted and grip screws are tightened. Fits RCA, Philco and standard connections. Distributors' prices: 20¢ ea., 16¢ for 100 or more, 15¢ for 500 or more. Ryan Industries, 10910 So. Vermont Ave., Los Angeles 44, Calif.—TECHNICIAN

Masco VHF BOOSTER

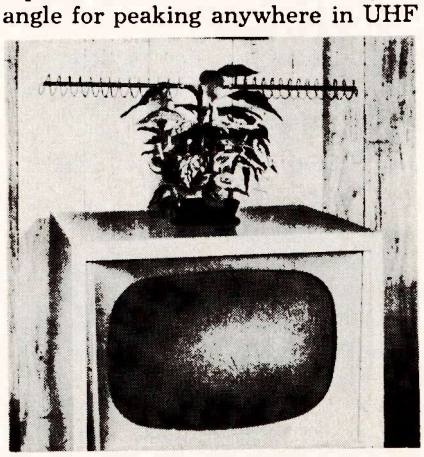
The Cascadian booster is reported to increase signal strength an average of 56 times (35 db) on VHF channels. Intended for noise-free reception with newer low-noise high-gain TV receivers, it also gives superior results with older sets. Other features: good bandwidth, stable permeability tuning, automatic on-off switching controlled by the TV receiver, single-knob control. List price, $42.50. Mark Simpson Mfg. Co., Inc. 32-38 49th St., Long Island City 3, N. Y.—TECHNICIAN

Trio BROAD-BAND ANTENNA

The zig-zag Twin-Six antenna, designed for high-gain 11-channel VHF reception, may also be used for UHF in primary areas. Light-weight, rugged construction and single lead-in operation are featured. Trio Manufacturing Co., Griggsville, Ill.—TECHNICIAN

Naturlite INDOOR ANTENNA

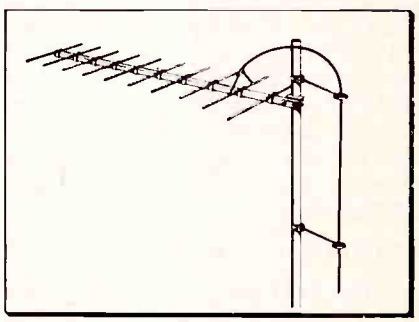
The Decor-Tenna is an adjustable indoor antenna with telescoping horizontal elements that rotate 180 degrees. Tunable over entire UHF and VHF bands, the rotating dual dipoles can be locked into any V angle for peaking anywhere in UHF



spectrum. Holes in hardwood base accommodate floral or foliage arrangements for decorative effect. Midwest Naturlite Co., 228 West Kinzie St., Chicago 10, Ill.—TECHNICIAN

Walsco ANTENNAS

Yagi with a gold-plated dipole and a conical that is said to be immune from short-circuits are each guaranteed for three years by the manufacturer. The 10-element UHF yagi, available in either single-chan-



nel or broadband (15 channels) models, uses gold plate on the receiving dipole to resist corrosion and maintain gain in all weather conditions. The conical uses barrier discs and two inches of air space between terminals. Dirt, moisture, salt, etc. do not affect the insulator. Walsco Electronics Corp., Los Angeles, Calif. —TECHNICIAN

Silver Bee MAST HOLDER

Only three feet high, the SB5 tripod mast holder supports a 10-foot mast without guy wires. Of all-welded construction, the holder attaches to roof, accommodates masts of 1¼-in. diameter. Model SB5A is intended for 1½-in. masts. Models SB6 and SB6A also available with detachable legs for easy shipment and storage. D. Hale Darnold Co., 914 Kentucky Street, Racine, Wisconsin.—TECHNICIAN

Insuline ANTENNA COUPLERS

Operation of more than one TV receiver on a single antenna is possible with either of these two antenna couplers. Model 6093 permits the use of two receivers; model 6094 feeds as many as four sets simultaneously. There is no interaction between receivers or loss of signal strength, the manufacturer claims. Model 6093 sells for $3.50; model 6094 for $4.75. Insuline Corp. of America, 3602 35th Ave., L. I. City 1, N.Y.—TECHNICIAN

Installation Gear

Transmission Lines, Tools and Related Items

Meissner TVI FILTER

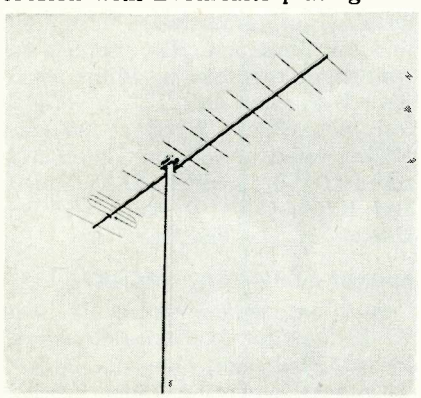
These two high-pass filters are intended to reject all types of interference, rather than TVI from just one or two sources. Rejection is over the band from 0-50 MC; insertion loss is very low. Model 15-1003, for 300 ohms; model 15-1072, for 72 ohms. List price for either, $5.50. Thordarson-Meissner, Mt. Carmel, Ill.—TECHNICIAN

Saxton TRANSMISSION LINE

Open-wire transmission line, plain or formvar covered, in both 300- and 450-ohm sizes is being produced by Saxton. The line is available in spoolings of 100, 250, 500 or 1,000 ft. A stand-off insulator, window-strap, rotor-strap and a device to permit the wire to be used where sharp turns are necessary, are also being made. Saxton Products, Inc., 2101 Grand Concourse, New York 53, N. Y.—TECHNICIAN

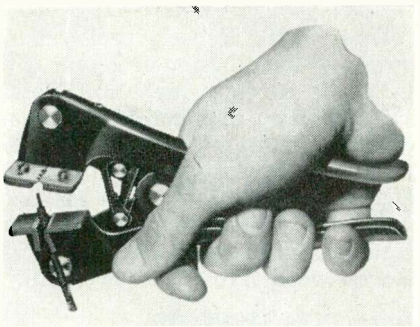
JFD UHF YAGIS

Model UHF312 Golden Ultra Yagis, cut for fringe reception of single channels, also have high adjacent-channel pickup. A 2-bay array provides 13.75 db gain on channel for which unit is cut, with 11.5 db gain on most remote adjacent channel it can receive. Gain of single unit: 10.78 db on channel for which cut, 8.5 db on most remote adjacent channel. One-piece welded construction requires no assembly or adjustment. Protected against rust and erosion with Bronzidite plating. List



price, $7.65 per single unit with half-wave jumper. Order two for array. JFD Manufacturing Co., 6101 16th Ave., Brooklyn 4, N. Y.—TECHNICIAN

Rockford WIRE STRIPPER



An improved wire stripper with interchangeable cutters for stripping 12 to 24 gauge solid or stranded wire, or 300 ohm twin lead-in wire, is being marketed under the trade name, Whiz Wire Stripper. It is light in weight and has a lock-open feature that holds the jaws open automatically so the wire can be removed after stripping without crushing. Available through wholesale electrical outlets. Net price is $3.95 with one set of blades. Extra blades are priced at 75¢ per pair. Rockford Wire Stripper Co., Rockford, Ill.—TECHNICIAN

Holub WIRE STRIPPER

An automatic stripper that eliminates triggers, cocking or other holding devices is called the "Hi-Speed" wire stripper. It is designed to strip all kinds of wire with a single squeeze of the handles. A concealed cam holds the jaws open until the wire is removed. This prevents crushing of the wire. A blade adjustment screw increases the wire range and compensates for variations in insulation thickness and adhesive properties of wire. The stripper is made in seven sizes for handling Nos. 8 to 30 solid and stranded wires. Units available that can accommodate parallel wire and 300-ohm flat twin lead wire. An adjustable stop is furnished with each tool. Holub Industries, Inc., Sycamore, Illinois.—TECHNICIAN

Synkote TWIN LEAD

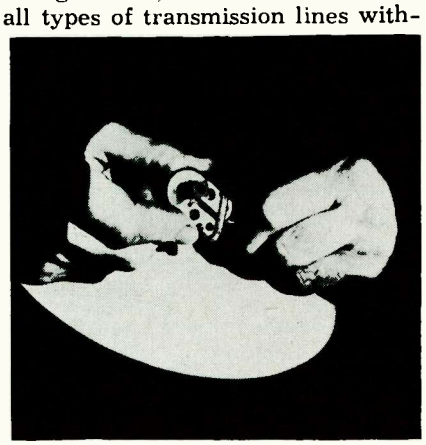
Foamline, a twin-lead antenna wire, is designed for use in sensitive UHF and VHF applications. Protected against moisture and salt air, the lead-in prevents losses under adverse conditions. Plastoid Corp., Long Island City, N. Y.—TECHNICIAN

B-T REMOTE CONTROL UNIT

With this two-piece remote control unit, model RC-1, any TV booster, UHF converter or distribution unit may be operated from the TV set on-off switch. The power control unit of the RC-1 plugs into any 117 volt AC outlet and receives the TV set line cord. The remote portion at the unit to be controlled feeds AC power and accepts TV signals. For outdoor installations, the remote section may be mounted in a weatherproof housing, along with the amplifier or other unit. A single heavy-duty 300-ohm line is used between the two component parts to carry AC power *out* and bring TV signals *in*. Any unit drawing up to ½ amp. at 117 volts AC can be operated at distances of 1,000 ft. or more with this remote control system, according to the manufacturer. Lists at $19.50. Blonder-Tongue Laboratories, Inc., 526 North Ave., Westfield, N. J.—TECHNICIAN

Argyle UNIVERSAL STANDOFFS

Development of standing waves and signal losses are overcome in this UHF-VHF standoff by elimination of a metal ring surrounding the transmission line. This all-polyethylene grommet, which accommodates all types of transmission lines with-



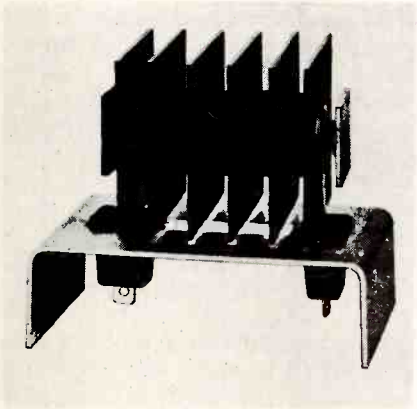
out the need of threading, approximates a free-space condition around the lead-in. Available in wood-screw or mast types. Argyle Electronic Co., 8 W. 18th Street, New York 11, N. Y. —TECHNICIAN

New Products for

Replacement Parts, Service Aids,

Cinch SELENIUM SOCKET

This development in the selenium rectifier field facilitates field replacement of selenium rectifiers, particularly in radio and television receiv-



ers. The rectifier lugs are polarized for proper circuit connection and are so designed that vibration or shock will not cause the rectifiers to fall out of the socket. It is possible to mount the plug-in rectifier in a conventional manner and solder to the lugs. Sockets are available from the Cinch Manufacturing Company, Chicago, Ill.—TECHNICIAN

Arc VOLTAGE BOOSTER

The Pix Expander is a long-life low-loss direct replacement for the 5U4 rectifier tube used in most TV receivers. It delivers maximum output from the low-voltage supply, helping to overcome inherent receiver deficiencies such as shrunken picture size. Arc Equipment Co., Paterson, N. J—TECHNICIAN

Stancor TRANSFORMERS & COILS

Five new TV replacement components have been added to the Stancor line. They include a replacement flyback transformer, A-8137, for use in 25 Hoffman models, and A-8126, vertical blocking oscillator transformer replacement. The A-8126 can be used in all Philco TV models built before the spring of 1953. Two width controls, WC-1 and WC-4, and a tapped linearity coil, WC-2, have also been added. Chicago Standard Transformer Corp., Standard Div., Addison & Elston, Chicago 18.—TECHNICIAN

Halldorson FLYBACKS

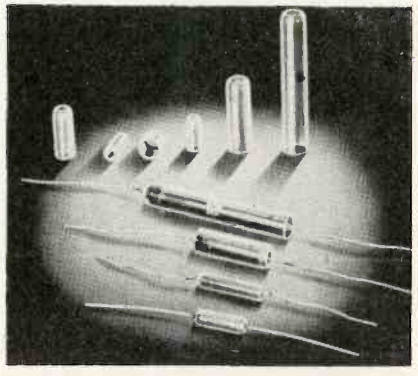
Units offer flyback replacement coverage for all popular Muntz TV. FB413 is a replacement for Muntz TO-0031 used in hundreds of thousands of Muntz TV sets. For earlier Muntz models, servicemen can get Halldorson FB403, an exact replacement for Muntz TO-0024 flyback. Halldorson Transformer Co., 4500 Ravenswood Ave., Chicago 40, Ill.

Doc's DIAL STRINGER

A tool is available for speeding installation of dial cords. Called String-Aid, the slender, five-in. steel tool has a hook on one end, a slotted eyelet on the other—both designed to facilitate putting cord over pulleys, securing springs, and other such operations in narrow or inaccessible places. According to the maker, the tool is specially suited for servicing automobile radios. Available from jobbers, or direct from Doc's Radio Tools, 509 Fisk Avenue, Brownwood, Texas. Serviceman's net, 75¢.—TECHNICIAN

Garrison RESISTOR SLEEVES

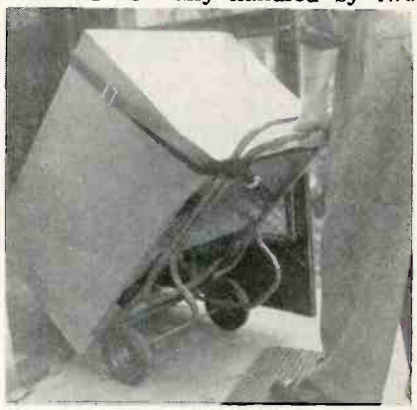
Transparent protective sleeves, extruded from plastic; non-flammable and non-carbonizing at high temperatures. These units also prevent resistor damage due to a slip of the tool during service. Sleeves resist cracking and abrasion, and retain transparency after long periods of service, enabling resistor identification without sleeve removal. Useful in solving "bugs" due to re-



sistor heat and damage. Available for standard resistor sizes. Garrison Co., 1 Columbus Ave., Kenilworth, N. J. —TECHNICIAN

USP TV HAND TRUCK

This hand truck designed for easy handling of TV sets makes it possible for one man to handle large TV receivers normally handled by two



men. A stair-climbing feature is incorporated for safe, easy movement on steps. Safeguards cabinets against damage. Made of high-carbon steel, the truck is sturdy but light. It uses semi-pneumatic ball-bearing wheels. U.S. Products, Inc., Columbus, Ind.—TECHNICIAN

Federal SELENIUMS

A line of universal selenium rectifiers, designed for replacement in any radio or television receiver now equipped with this component, permits the serviceman or technician to replace any rectifier of the same current rating with a Federal rectifier, regardless of the make of the original. Universal rectifiers are of eyelet construction and come equipped with mounting hardware for simplified installation. Code numbers and ratings of the four selenium rectifiers in the line are: 1236A, rated at 300 ma; 1238A, rated at 350 ma; 1241A, rated at 400 ma; and 1237A, rated at 500 ma. Federal Telephone and Radio Co., 100 Kingsland Rd., Clifton, N. J.—TECHNICIAN

Lowell REAR-SEAT SPEAKER

Auto extension speaker kit model R7-K includes oval speaker, 3-way switch, knob, dial plate, baffle plate with metal screening, 15 feet of cable and complete mounting instructions. Available with or without the speaker. Lowell Manufacturing Co., 3030 Laclede Station Road, St. Louis, Missouri.—TECHNICIAN

Service and Sales

Audio and TV Components and Chassis

Sprague CAPACITOR GUIDE

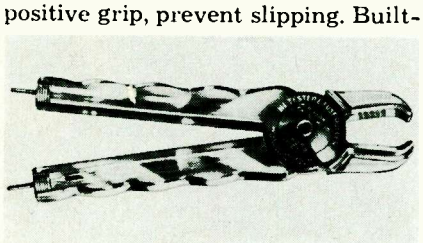
A capacitor temperature-coefficient slide rule speeds and simplifies ceramic capacitor installation problems. Values of stock N750 and NPO type ceramic capacitors to be connected in parallel to equal a capacitor of intermediate temperature coefficient of the required capacitance can be found with the C-753 slide rule. Required values can be read directly from the scales without consulting complicated charts or tables. Value of the required NPO capacitor may be determined by simple subtraction. The back of the rule is a useful key to ceramic capacitor color codes. Color bands and dots and their positions on each capacitor type are indicated for temperature coefficient, capacitance, tolerance and voltage. May be obtained for 15¢. Sprague Products Company, Marshall Street, North Adams, Mass. —TECHNICIAN

Wheeler SOUND-POWER PHONE

These sound-powered phones in cradle-type desk sets require no batteries or connection to outside power sources, minimizing maintenance. Clear voice reproduction is attainable with two other stations on a common-code-ringing common-talking basis. Handy for emergency use during power failure of regular system. Wheeler Insulated Wire Co., Waterbury, Conn.—TECHNICIAN

Holub FUSE PULLER-TEST LIGHT

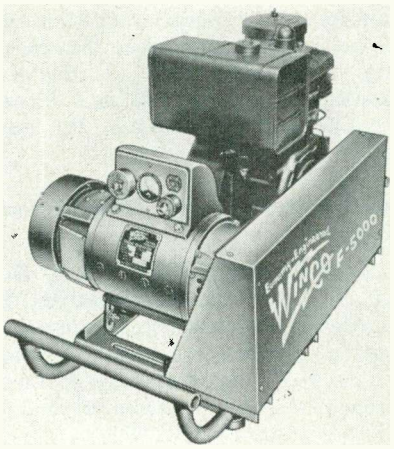
Made of high-dielectric plastic, the jaws of this fuse puller are designed for all cartridge fuses up to 100-amp size. Finger-fitted handles assure positive grip, prevent slipping. Built-



in neon test light is easily replaceable. The instrument averts dangers involved in replacing fuses by hand. May be used for handling live electrical parts up to 600 v, ac-dc. Holub Industries, Inc., Sycamore, Ill.—TECHNICIAN

Wincharger AC GENERATOR

Winco F series AC generators are useful for standby service during power-line failure in establishments where such failure may result in time losses. Models are available with 115-volt and/or 230-volt outlets, from 700 to 12,000 watts capac-



ity. Also available with automatic line-transfer switch to start flow from generator when power line fails. Wincharger Corp., Commerce Building, Sioux City, Iowa.—TECHNICIAN

Mattison REVISED 630 TV

The Silver Rocket 630 chassis line is available with synchronized picture-and-sound tuning. Use of intercarrier design prevents drifting apart of sound and picture on weak signals, UHF stations, and during warm-up of receiver. Available with tunable built-in booster or UHF tuner. Chassis with or without cabinets. Mattison TV and Radio Corp., 10 W. 181st St., New York 53, N.Y.—TECHNICIAN

Clough AUDIO OSCILLATOR

Model 411 oscillator is suitable for measurements requiring a sine-wave signal over the range from 20 cps to 1 mc. A resistance-capacitance tuned oscillator and a cathode-follower in the output system are employed to provide uniform response. Accuracy is maintained by the use of deposited carbon resistors in the frequency determining network. Low level measurements are facilitated by a panel switch which reduces output voltage, distortion and hum output. Other features: good case ventilation, a well-spread dial calibration for ease in reading, and compact size with light weight. Clough-Brengle Co., 6014 Broadway, Chicago 40, Illinois. —TECHNICIAN

Kentrol PRIVATE EAR

One or more persons can listen to TV programs while others in the same room hear nothing, with a Kentrol unit connected to the receiver. May be used on radio or phonograph, as well as on TV set. A 25-foot wire allows listener freedom of movement away from receiver. Attaches to set without wire cutting, splicing or tools. Does not prevent use of regular speaker when the latter is desired. Kentrol Corp., Philadelphia 44, Penna.—TECHNICIAN

Scott HI FI AMPLIFIER

A compact 10-watt amplifier and control unit, model 99-A features separate 3-position turnover and roll-off controls to provide 9 record-equalization curves; separate bass and treble tone controls (boost and cut); loudness-compensated volume control plus an input level control; rumble filter. Frequency response: flat from 20-30,000 CPS. Hum level: 80 db below full output. Input selector for magnetic or crystal phono, tuner, tape and TV. Output impedances: 4, 8, 16, and 500 ohms. Harmonic distortion less than .3% at full output. H. H. Scott, Inc., 385 Putnam Ave., Cambridge 39, Mass. —TECHNICIAN

Bell HI FI AMPLIFIER

Model 2199 provides response from 20-20,000 CPS plus or minus ½ db at 12 watts output with less than 1 per cent distortion. Peak output, 16 watts. Inputs for magnetic and crystal pickups, tuner, tape recorder and TV receiver. Outputs: 4, 8, and 16 ohms plus high impedance for recorders. Six controls include loudness, record equalization and input selector, bass and treble tone controls (boost and cut), motor-rumble suppressor, and a switch to cut out loudness compensation. A master on-off switch permits control of external units through three AC outlets. Bell Sound Systems, Columbus, Ohio.—TECHNICIAN

SERVICE ASS'N REPORTS

Big Convention Plans for NATESA, 1954

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

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

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

FRSAP Plans for Eastern Conference

At the Pennsylvania State Federation Radio Servicemens Associations meeting held in Harrisburg, Pa. November 22nd, plans were furthered for the Federations part in the proposed Eastern Conference which is scheduled for Philadelphia in early Spring. Final dates are April 2nd, 3rd, and 4th. In conjunction with the conference will be a three day TV Color Symposium which will include TV Lectures by eminent speakers and feature the first lecture on a 3 D Screen. All servicing groups in the East are to be invited as well as both NATESA and NETSDA, two national organizations. Mr. Bert Bregenzer of the Pittsburg Chapter announced at the meeting that the Washington, Pa. Association had voted for Federation affiliation. The Luzerne County Chapter was appointed to act as Nominating Committee. Joseph Zapracki heads the Committee. Election for new Federation Officers will be held on the December 13th Meeting, with installation on the first meeting in January. Milan J. Krupa, President, Wilkes-Barre, Pa. presided.

Northwest TV Assn. Hears about Color-TV

At the Seattle Yacht Club, Nov. 17, the Northwest Appliance and TV Association members enjoyed a varied program of movies, reports on color-TV, and estimates of the effects of the higher power granted local TV station KING-TV.

Program chairman Bill Almvig presented a color movie, with sound, "The Antenna Is the Payoff" a Channel Master film.

Sid Crysler, of Seattle Hardware, reported on his color-TV observations in Los Angeles and Hollywood.

Bob Priebe of Station KING-TV had engineers present to report on audience results from increasing the station's power.

Nominations for next year's officers were proposed for the benefit of Chairman Ward Davidson and his nominating committee.

Calendar of Coming Events

Jan.	10-12: National Appliance & Radio TV Dealers Association, Conrad Hilton Hotel, Chicago, Ill.
Feb.	4-6: The Audio Fair, Alexandria Hotel, Los Angeles, Calif.
Feb.	4-6: Southwestern IRE Conference and Electronics Show, Tulsa, Okla.
Feb.	8-12: Western Winter Radio-Television & Appliance Market, Western Mart, San Francisco, Calif.
March	22-25: Institute of Radio Engineers National Convention, Waldorf-Astoria Hotel, New York. Exhibits, Kingsbridge Armory, Bronx, N. Y.
May	7-8: New England Radio Engineering Meeting (NEREM), Sheraton-Plaza Hotel, Boston, Mass.

Long Island Group Elects

The annual election of officers of the Long Island Television and Radio Technicians Guild took place November 24th, in the American Legion Hall, East Williston, N. Y. Officers elected for the next year are: pres., Henry Wawryck; v.p., Arthur Cyr; treas., John Wheaton; corres. secretary, Murray Barlowe; recording secretary, Al. Weil; sergeant-at-arms, Earl Horton. Trustees were added to the Executive Board for the first time, in the election of Jack Buck, for 3 years; Dick Bishop, for 2 years, and Bill Allen and Ralph Milne for 1 year each.

Raytheon Service Meetings

Raytheon Manufacturing Company, Receiving Tube Division, Newton, Mass., reports that 600 service dealers attended recent "Service Saver" meetings held in Florida, Georgia and South Carolina, while

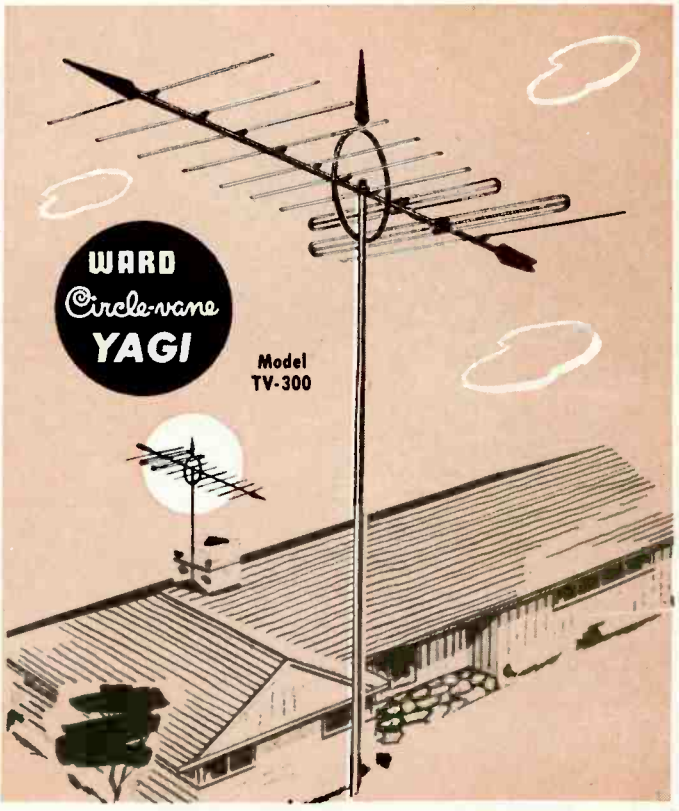
(*Continued on page* 69)

Echoes from NATESA convention, Chicago. At left—Frank J. Moch, president NATESA, Dan Creato, RCA-Victor and John Cecich, chairman convention committee. At right—Milton Stone, TISA, Chicago; Russ Hanson of Motorola, and T. Alexander, also Motorola. Hanson is editor of Motorola's new company service magazine.

WARD TELE-VANES

styled for **NEW BEAUTY on the housetops**

INCREASED SALES of TV antennas



Sell the antennas that are "selling" for you. Ward is promoting their new line of Tele-vane Antennas right to the consumer with national advertisements in:

- The American Home
- Architectural Forum
- Better Homes and Gardens
- Business Week
- House Beautiful
- Popular Mechanics Magazine
- Popular Science Monthly
- Time
- House and Garden Book of Building
- Newsweek

Write today for the giant Tele-vane Sales Kit that gives you the complete schedule plus many, many more selling aids. Tie-in with this gigantic selling campaign for the newest, most revolutionary idea in TV antennas yet.

THE WARD PRODUCTS CORP.

DIVISION OF THE GABRIEL COMPANY

1148 Euclid Avenue, Cleveland 15, Ohio

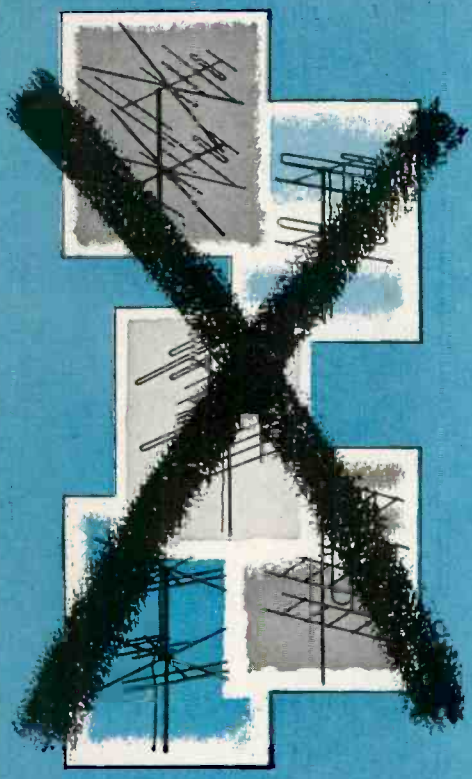
In Canada: Atlas Radio Co., Ltd., Toronto, Ont.

KAY-TOWNES Announces

the new Super "KATYS"

(PATENTS PENDING)

Highest Gain ALL-CHANNEL VHF ANTENNAS EVER DESIGNED!



GUARANTEED

TO *OUT-PERFORM* ANY OTHER ALL-CHANNEL VHF ANTENNA ON THE MARKET

Practically every TV Antenna maker in America has made just such statements as these . . . *but, there is a big difference in making these broad claims and then being able to back them up!*

WE CAN! We are prepared to run a PERFORMANCE TEST with *anyone . . . anywhere . . . anytime* . . . to prove the vast superiority of the new SUPER "KATYS" *over all other all-channel VHF antennas* . . . regardless of manufacture, design, type or number of bays!

IN FACT, WE WILL POSITIVELY AND ABSOLUTELY GUARANTEE THAT OUR SINGLE-BAY SUPER KATY WILL OUTPERFORM ANY VHF 4-BAY ANTENNA MADE TODAY!

Our 2-Bay SUPER KATY is designed for *extremely difficult* reception areas. It has been tested in many practically impossible locations . . . *AND HAS NEVER FAILED TO BRING IN A PICTURE RATED EITHER "VERY GOOD" OR "EXCELLENT"!*

4½ Years IN DEVELOPMENT...

THE AMAZING SUPER KATY DESIGN MAKES OTHER VHF ALL-CHANNEL ANTENNA DESIGNS AS OBSOLETE AS THE HORSE AND BUGGY! WE CHALLENGE YOU TO TEST IT . . . *ANYWHERE!*

Super KATY-2

2-BAY

Super KATY-1

SINGLE-BAY

Now THE WORLD'S FINEST ALL-CHANNEL VHF RECEPTION!

The SUPER KATY all-channel VHF antennas feature a twin-driven array with a combination of special cut elements for a close 300 OHM impedance across the entire VHF Band. This feature in conjunction with the long, accumulative fan dipoles, with directors and reflectors properly cut and spaced, results in performance never before obtained by any antenna design . . . *including our own "BIG JACK", whose design has been so widely "hijacked".*

Actual tests show that the Single-Bay KATY-1 will outperform any 10-element Yagi on every channel, 7 through 13 . . , and will perform as well as any 10-element Yagi on every channel, 2 through 6.

	List Price
SUPER KATY-1 Single-Bay	**$25.00**
SUPER KATY-2 2-Bay	**$50.00**

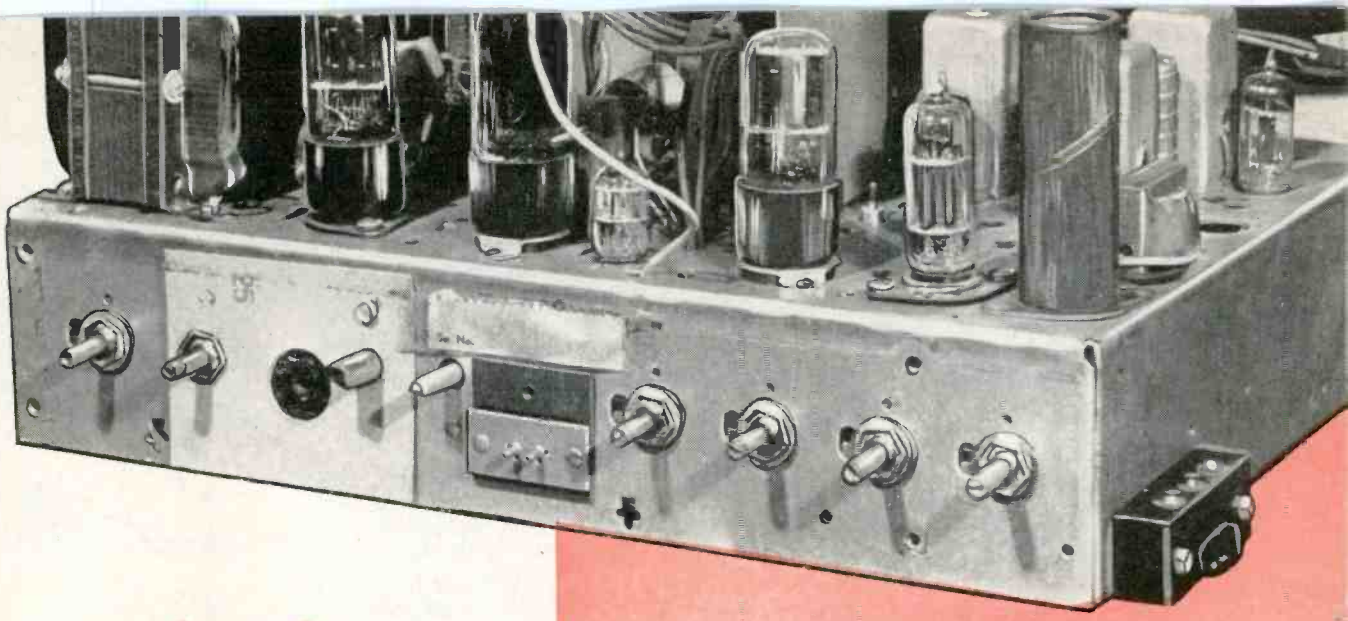
K-T Antennas are sold through selected distributors only . . . write for name of your nearest jobber.

KAY-TOWNES

ANTENNA COMPANY

ROME, GEORGIA

Recognized leaders in the field of fringe area antenna design

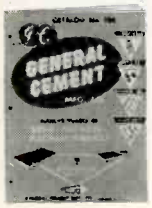


precision

tools for precision servicing . . . G-C Alignment Tools

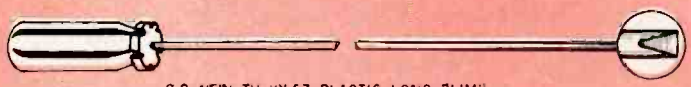
G-C Alignment Tools—more than 60 of them—are precision engineered for faster, more effective TV servicing . . . and service developed to be sure they're what you need.

Besides those alignment tools you see here, G-C has many others . . . part of the more than 3,000 G-C service items designed specifically for better service work. Remember, too, that there are a dozen G-C Alignment Tool Kits . . . matched instrument sets to meet most service requirements and priced surprisingly low for top quality tools!

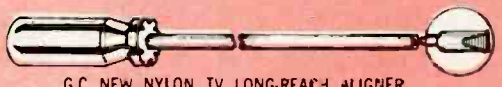


YOUR COPY of the big, new illustrated G-C Catalog No. 156. It's free . . . at your favorite jobber or write direct.

GENERAL CEMENT MFG. CO.
902 Taylor Street Rockford, Illinois

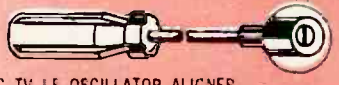


G-C NEW TV "X-57 PLASTIC LONG SLIM" SCREWDRIVER
Rugged 100% insulated.
No. 8989 18¼" long List $2.00



G-C NEW NYLON TV LONG-REACH ALIGNER
Replaceable Nylon Tip.
No. 8607 12¼" long List $1.80

G-C TV CORE ALIGNER
For sets using stud type cores.
No. 8271 List $0.90



G-C TV I.F.-OSCILLATOR ALIGNER
Fits all makes of sets.
No. 8272 List $1.20

G-C TV LONG-REACH ALIGNER
For hard-to-reach iron cores.
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G-C TV DUPLEX ALIGNER
All-purpose, extra-strong.
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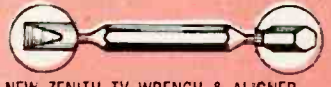
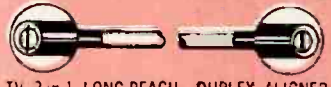
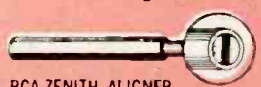


G-C NEW ZENITH TV WRENCH & ALIGNER
Specially made for Zenith TV.
No. 8282 List $0.55



G-C TV 2-in-1 LONG-REACH DUPLEX ALIGNER
For No. 4 and No. 6 studs.
No. 8721 9" long List $1.25



G-C NEW RCA-ZENITH ALIGNER
Aligns strips, etc. on Zenith, RCA.
No. 9050 List $0.30

G-C NEW RCA-ZENITH "SHORTY" ALIGNER
For those tight spaces; only 2" long.
No. 9051 List $0.75

Eliminating TVI (cont. from p. 25)

should be checked, if a parasite seems to exist in the circuit.—Ed.) Paralleled audio output tubes have also been frequent offenders, as have been push-pull oscillators, or paralleled oscillators.

Sync Circuit Parasite. Illustrative of another complex case of parasitic oscillation, is the sync circuit shown in Figs. 5 and 6. The tube is a dual-section 12AT7 employed as sync amplifier-clipper. The TVI produced by the parasitic was noticeable as a mottled bar effect on Channel 7 only. (The parasitic signal was apparently beating against the Channel 7 picture carrier to produce a beat-note of approximately 4 mc.) The interference appeared when the customer moved to a new location.

Localization tests via signal tracing led to the area shown in Fig. 6 becoming suspect. Signal tracing also indicated that the wires passing under condenser C-1 through the metal grommet were "hot"—i.e., they had picked up the TVI from the parasitic circuit by capacitance coupling between them and C-1. The wires were, in turn, radiating the signal to the antenna lead-in to the tuner, on the opposite side of the chassis.

The cure for this parasite consisted of lengthening the condenser leads, to provide additional parasitic inductance. One lead was made into a one-turn coil for this purpose. The resultant increase in inductance decreased the parasitic resonant frequency so that the beat note fell below Channel 7. This is an example of frequency-shifting to an unused channel or band, to eliminate parasitic effects.

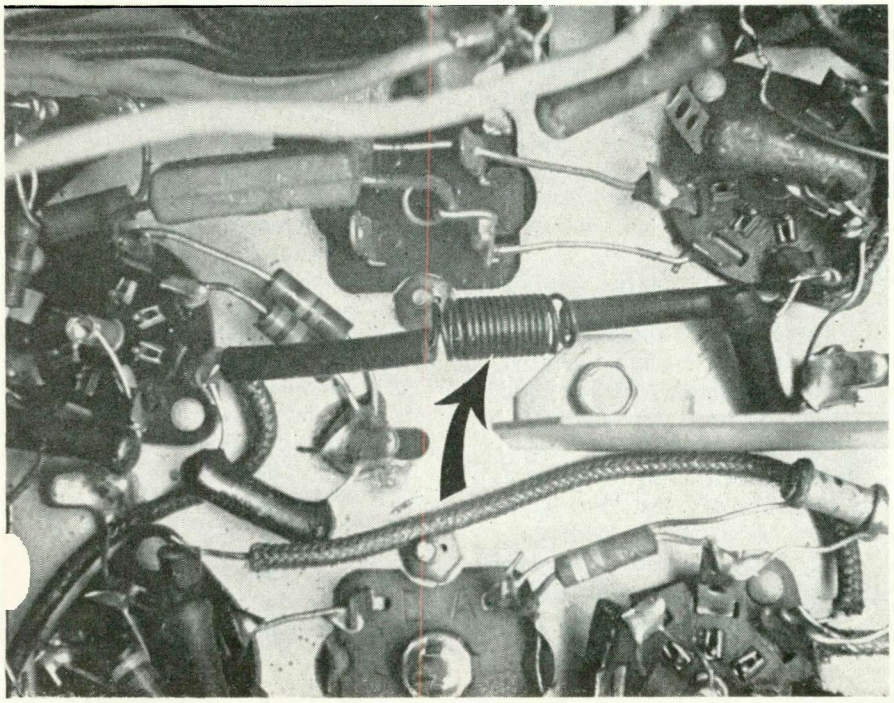
As a further precaution, condenser C-1 was dressed at right angles to the chassis (it is shown in Fig. 6 as *parallel* to the chassis), and away from the wires under it, which acted as transmission lines when they picked up the resonant circuit's energy.

In some cases, the filament or heater wires leaving a tube carry the TVI with them. A bypass to ground with or without a series choke may help. In the case just cited, the reduction in symptoms was so slight when such a remedial measure was tried, that filament bypassing was not added.

Filament Choke and Its Parasite. The photograph in Fig. 7 shows a filament or heater choke which formed the principal inductance of a parasitic circuit. The parasite became noticeable when the customer moved to a weak-signal area. The frequency fell within the i-f band, causing TVI on all channels that were relatively weak. Localization of the fault was effected by using a signal-tracer set and probe.

The cure comprised replacement of the choke with one having about four more turns; this procedure lowered the resonant frequency below the i-f band. As an additional precaution (and to eliminate a trace of TVI on Channel 4 when the new choke was installed) a parallel resistance was installed. This resistor of 150 ohms, inserted in parallel with the choke (and its shunt capacitance) provided overdamping in addition to the frequency shift.

Fig. 7—Photo showing circuit in which filament choke contributed to a parasitic.



The case history just described illustrates an important point, viz., check to see if you have created new TVI whenever you try to minimize or eliminate TVI by the frequency-shifting technique.

Miscellaneous Cases. A capacitance tuner with a band-switch for high and low channels in a Pilot electrostatically-deflected set (see Fig. 8) exhibited a parasite on the high-frequency band. The self-capacitance of the low-frequency oscillator coil,

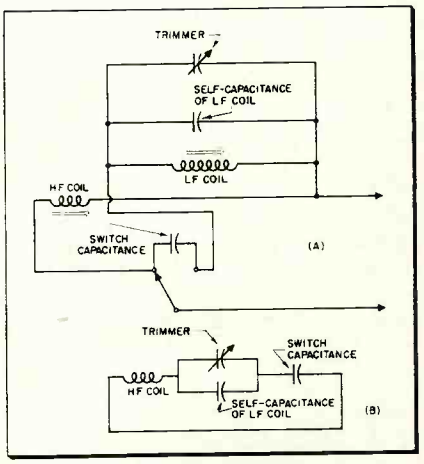


Fig. 8A—Schematic of section of tuner circuit. B—Parasitic circuit of tuner shown in (A).

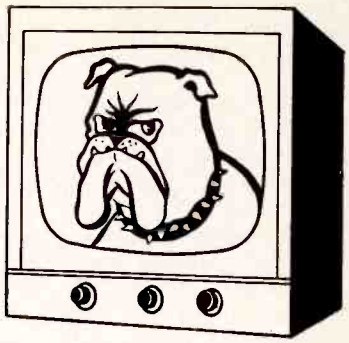
in series with the inductance of the high-frequency coil and the self-capacitance of the band-switch contacts and the wiring, was forming a parasitic circuit. Frequency shifting was used to remedy the trouble.

The shunt capacitance was varied by moving the shunt trimmer on the low-frequency coil slightly, but sufficiently to shift the TVI beyond the point where it could produce interference on the h-f band. The low frequency tuning was restored to normal by another adjustment, that of the inductance slug. The dial calibration was sufficiently broad to permit this procedure. Note that the self-capacitance of the low frequency coil is in shunt with the trimmer capacitance on that coil, which explains why the TVI frequency could be shifted by resetting this trimmer.

In another case, the heater "hot" leg of a 6J6 oscillator tube was bypassed to ground by a condenser. The inductance formed by the heater itself, plus that of the wiring and element leads, produced a parasitic circuit. The cure was a change in the value of the bypass condenser, which shifted the frequency of the TVI, making symptoms invisible.

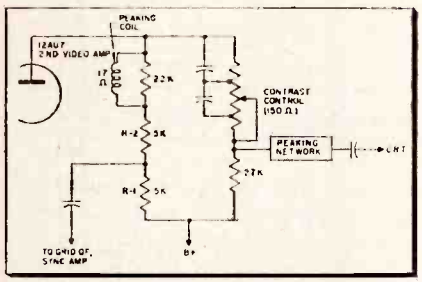
"Tough Dog" Corner

Difficult Service Jobs Described by Readers



Smeared Pix and Ghosts

A puzzling symptom, often difficult to isolate, is the smearing of video information, accompanied by ghosts. The trouble cannot be traced to the antenna or video i-f system, or a defective peaking coil. The output circuit of the video amplifier (in a recently-serviced set in which such symptoms were present) resembles the one shown in the illustration. Notice that the plate load consists of two parallel networks. Consequently, a marked change in the value of one resistor may not bring about a significant change in the dc plate voltage of the video amplifier tube.



Video amplifier plate circuit in Zenith 24H20. Note parallel networks between plate and B+.

If resistor R-1 increases in value to 100k, the signal voltage fed to the crt would essentially be developed across the 27k resistor. The effect of the peaking coil would then be negligible, resulting in smear. The appearance of ghosts is probably due to "halos" on the screen of the picture tube, created by secondary phosphor emission. The condition may be attributed to the fact that the change in plate loading of the video amplifier increases signal gain at this point about threefold.

The defect may be readily localized by measuring the negative voltage on the grid of the sync amplifier tube, which gets its signal from the video amplifier's plate load circuit. This negative value depends on the ratio between resistors R-1 and R-2. Normally, with both resistors equal, the sync tube's grid voltage is about −1 volt. With resistor R-1 increased to 100k and R-2 remaining at 5k, the ratio is 100k/5k, or 20. The grid voltage would now read about −20 volts. Conversely, if resistor R-2 should increase in value while resistor R-1 is unchanged, the negative grid voltage would then be less than −1 volt, probably too small to measure. Of course, there would then be sync instability in addition to deterioration of picture quality in such a case.

The fault described occurred on a Zenith 24H20. The circuit, however, is common to all Zenith 1951 models. I have also had similar trouble in the past six or seven months in Trad, Mattison and Raytheon chassis. (Most RCA 630-type chassis use this form of video amplifier plate load circuit.—Ed.) In any event, when you come across a circuit like this, don't touch the i-f cans until you've checked the video amplifier stage.—*Paul Leichter, Philadelphia, Pennsylvania.*

HV Arcing on Large CRT's

When severe arcing occurs between the aquadag coating of the picture tube and the contact springs, many servicemen will waste time changing picture tubes, hv rectifier tubes and flyback transformers, or even tear down the whole high-voltage system, when all the time an insulator is at fault. The trouble I refer to can often be cured by changing the insulator on the 1B3 rectifier socket to ground. I spent ten hours troubleshooting this condition, before discovering the cause was in the faulty insulator.—*Gelman, Philadelphia, Pennsylvania.*

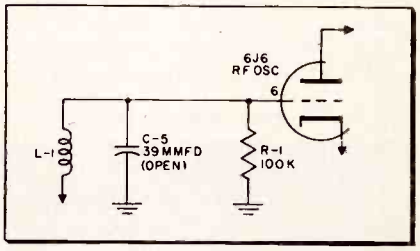
$ For Your "Tough Dog Story"

Have you tangled with a difficult or obscure service problem recently? Write it up, telling us how you licked it, and send it to "Tough Dog" Editor, TECHNICIAN, Caldwell-Clements, Inc., 480 Lexington Ave., New York 17, N.Y. $10 will be paid for usable material. Unacceptable items will be returned to the contributor.

Hard-to-Find Tuner Defect

Here is a tough case of lost sound and picture that should prove of interest. The set was an RCA model 6T74, but the chassis used, the KCS47, is common to many other models. Although the trouble was localized to the front end, all B-plus voltages were found to be normal there. I decided to check for capacitance deviations, particularly in the oscillator circuit.

An often convenient way of doing this, I have found, is with a long thin screwdriver. With my index finger contacting the metal shaft of the screwdriver, I lightly touched the oscillator coils and then the oscillator grid, pin 6 (see sketch). When the latter was contacted, pix and sound came in.



Location of open condenser in r-f oscillator.

When my finger touched the grid through the screw driver, the oscillator frequency apparently shifted because of the change in capacitance effected by the metallic screw driver. This confirmed my suspicion that some capacitance had changed value. The method of checking just outlined has proved useful in many instances, not only in front ends, but also in horizontal sync circuits.

I changed capacitor C-5, 39 mmfd, for it seemed the most likely candidate, and the set worked fine. I had to retune the oscillator channel slugs so that they tracked and brought in the signal when the selector was rotated from one channel to another.—*John L. Mancini, Winthrop, Mass.*

Servicing AC-DC Radios

(*Continued from page 29*)

WNAX, which comes in from about 250 miles away on 570 kc. Some of the receivers are older types with i-f's at 460 to 470 kc. If the i-f's happen to be set to approximately 465 kc, the image of KSTP, a strong local on 1500 kc, will be heard along with WNAX, spoiling the reception of the latter.

The oscillator in this case beats with the frequencies of both stations to produce the same i-f. If the trimmers are repeaked 5 kc either lower or higher than 465 kc, the image of KSTP will move 10 kc away from 570 and the interference will disappear (see Fig. 2B). If the new i-f is chosen as 460, the oscillator will work at 1030 to receive WNAX at 570, and the image of KSTP at 1500 will be 580 kc—too far away to be tuned in at 570 kc.

This remedy can be applied in other localities around the country, where the same problem exists.

To eliminate the possibility of damage to both test equipment and receiver, always use an isolation transformer between the ac line and the ac-dc receiver being serviced. Since most of these sets consume only about 30 watts, any standard transformer will be satisfactory.

RMS Expands

Sidney Pariser, president of Radio Merchandise Sales, Inc., 2016 Bronxdale Avenue, N. Y. 62, announces that RMS has now acquired controlling interest in the Ames Mfg. Corp., manufacturer of a complete line of wire products, and in the JEB Sales Corporation, producers of the JEB rotator.

The sales program for all three companies will be handled by Martin Bettan, present sales manager of RMS, and in almost every instance Mr. Bettan reports that the present RMS representatives have arranged to handle all three lines, RMS, Ames and JEB.

The following new representative appointments have been made.

Delzell-Maynard Sales Co., 3409 Oaklawn Ave., Dallas, Tex., covering Texas, Arkansas, Louisiana & Oklahoma.

J. J. Powers Co., 4938 Irving Park Rd., Chicago 41, Ill., covering Illinois & Eastern Iowa.

H. E. Russell Sales Co., P. O. Box #168, Iola, Kans., covering Kansas, Western Iowa, Missouri & Nebraska.

Audible Alarm

(*Continued from page 31*)

ously, facilitating more rapid diagnosis. The alarm connections of all the units may be conected in parallel, and a single alarm used for all the units.

List of Components

S-1, S-2, S-3: SPST toggle switches
P-1: 1 meg (linear) potentiometer
R-1, R-2: 1 meg, ¼ w. carbon resistors
R-3: 50k, ¼ w. carbon resistor
C-1: .005 mfd, 600v capacitor
C-2: .1 mfd, 600v capacitor
C-3: .01 mfd, 500v ceramicon capacitor
Diodes 1, 2: Sylvania IN39 germanium diodes
J-1: microphone jack (single-circuit) to mate with PL 55 plug
E-1: 6v "C" battery
E-2: 1.5v battery flashlight cell—(Burgess 6F or the equivalent)
E-2: 45v miniature battery (Burgess M30 or the equivalent)
V-1, V-2: 3S4 tubes
Relay 1, Relay 2: Advance 1200 relays, 5500-ohm dc coils
Lamp 1, Lamp 2: 115v, 6-watt lamps, or NE 51 lamps in Dialco 521308-991 socket assemblies

MFRS' Catalogs & Bulletins

Stromberg Hi-Fi Brochure

A 16-page fully-indexed brochure describes the complete Stromberg-Carlson line of Custom 400 high-fidelity components. Included are an FM-AM tuner, combined preamplifier-amplifiers, coaxial speakers, a speaker cabinet, a record changer, and a TV chassis. Extensive technical and physical specifications for each unit are presented. Stromberg-Carlson Co., Sound Equipment Division, Rochester 3, N. Y.

Heathkit Catalog

The 40-page 1954 catalog of Heathkits lists 52 items including test equipment, probes, amplifiers, receivers and amateur radio gear, all in unassembled kit form. Specifications, prices, order blanks and instructions for ordering and shipping are included. Heath Co., Benton Harbor, Mich.

CBS Folder on 6CU6 Tube

A technical information sheet describing the performance of CBS-Hytron's new 6CU6 horizontal deflection amplifier, designed especially for heavy-duty use, is now available. The 6CU6 is the second of CBS-Hytron's CTS-rated tubes . . . tubes rated for continuous television service. It is interchangeable with the older type 6BQ6GT. Although the 6CU6 has electrical characteristics identical with those of the 6BQ6GT, it will stand up much longer, according to the manufacturer, because of its conservative ratings and generous safety factors. Tech sheet may be obtained from CBS-Hytron, Danvers, Mass.

Allied Electronic Catalog

The Allied Catalog, No. 135, lists over 20,000 items including hi-fi units, TV chassis, boosters, rotators and converters, PA and intercom systems, professional and home recording equipment, and industrial electronic items. Request copy from Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill.

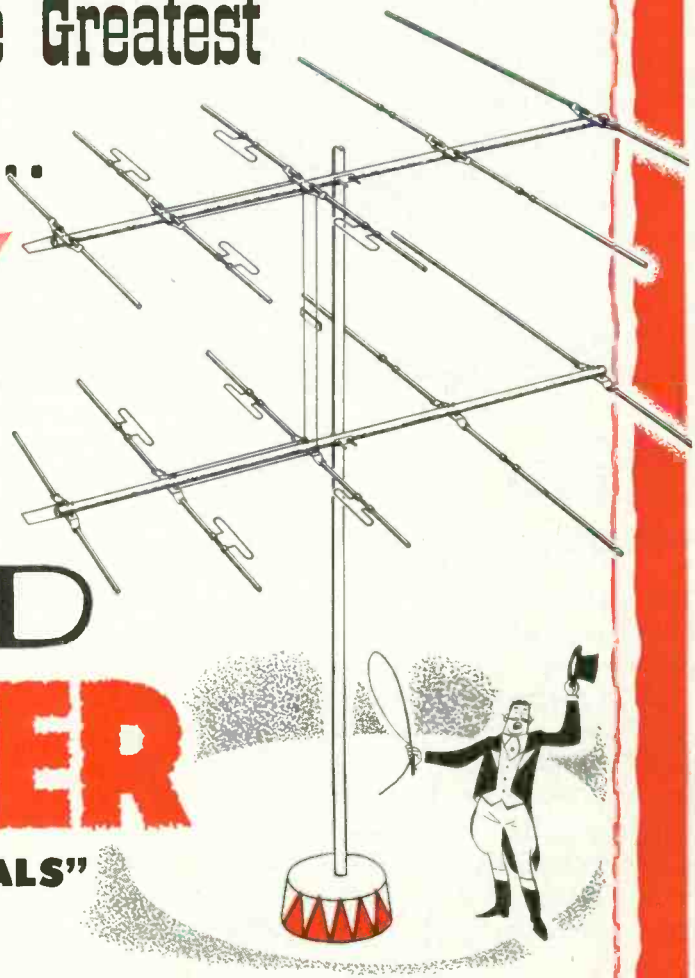
Pyramid Capacitor Catalog

A listing of almost 300 dry electrolytic capacitors added to the Pyramid line are described in catalog DE. Full information and listings are also included for a new type, TDL, a hermetically-sealed dry electrolytic. Pyramid Electric Company, North Bergen, N.J.

Announcing the Greatest Antenna on Earth...

2 thru 13

the TACO TRAPPER



"TRAPS ALL VHF SIGNALS"

★ TRUE BROAD BAND TUNING

★ YAGI DESIGN FOR SUPER YAGI PERFORMANCE

★ RUGGEDIZED DEPENDABILITY

★ TACO CLICK-RIG CONSTRUCTION

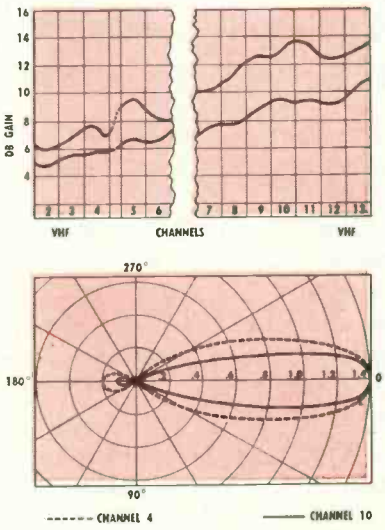
The first high-gain, broad-band colinear-yagi for coverage of all VHF channels. Not a composite of a high-band and low-band antenna but a **basically new development** — DESIGNED SPECIFICALLY TO RECEIVE ALL 12 VHF CHANNELS.

The Taco Trapper ends all questions of antenna selection. One model fills all VHF reception needs. Used singly, the Trapper out-performs all broad-band antennas. Stacked, the Trapper answers all fringe and ultra-fringe requirements.

Packaged — two Trappers per carton to reduce your inventory problem.

Cat. No. 1880 Taco Trapper for Channels 2 thru 13. List $19.75 each

Cat. No. 1882 Twin Trapper Stacking Line. List $1.75 each



TECHNICAL APPLIANCE CORPORATION, SHERBURNE, N. Y.
In Canada: Hackbusch Electronics, Ltd., Toronto 4, Ontario

TACO

High-Voltage

Readily-Built Units

Here is some information on building probes that readers may find useful in their service work.

When troubleshooting high-voltage and horizontal output circuits, it is often desirable to measure the high voltage, or observe the waveforms present at various points in the circuits.

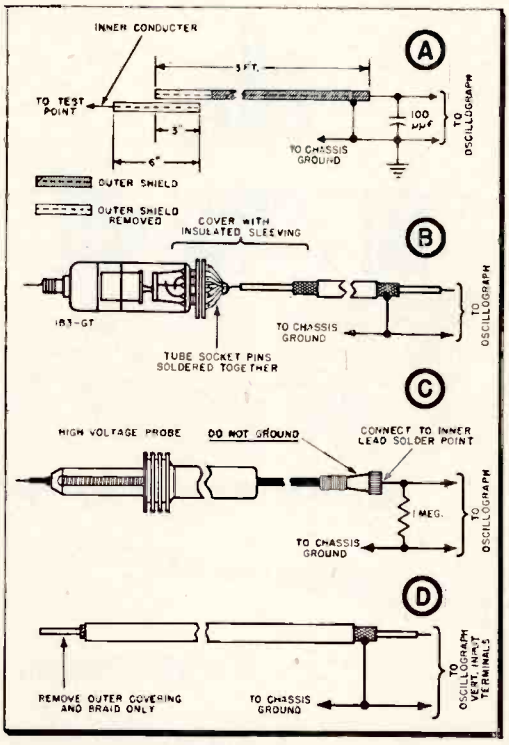


Figure 1. A—Capacitance divider probe to be used with oscillograph when examining waveforms in horizontal output and high-voltage circuits. Stepdown ratio is approximately 100:1. B—Capacitance divider probe which uses a 1X2A rectifier as a high-voltage capacitor. C—Resistance divider probe for use with oscillograph. A regular vtvm high-voltage probe and a 1 meg resistor are employed. D—Gimmick which permits examination of horizontal-sweep waveforms without removing chassis from cabinet.

Ordinary service instruments cannot be used to measure voltages or observe waveforms at many points in these circuits because the instruments are not designed to withstand the high pulse voltages present.

DC measurements in the high-voltage circuits can be made with a vtvm or multimeter, by utilizing a high-voltage multiplier probe. Several suitable probes of this type are available commercially.

To observe waveforms, a capacitance divider should be connected between the oscillograph and the circuit under test. A suitable divider is illustrated in figure 1A. It consists of two lengths of RG-59/U coax cable. All of the outer braid is removed from the shorter length of coax, and approximately 3½ inches of outer braid is removed from the longer length. The two pieces of coax are placed so that they overlap 3 inches and are

Test Probes

Facilitate HV Tests

taped together. Plastic electrical tape should be used for this purpose. A 100 μμf, 500 volt capacitor is connected between the inner and outer conductors of the long piece of coax.

The capacitance divider probe described above gives a stepdown ratio of approximately 100 to 1.

Another type of divider probe for use with an oscillograph is shown in figure 1B. The probe consists of a 1X2A and a short length of RG-59/U coax.

A high-voltage probe of the type designed for use with vtvm's can be used to observe waveforms in the high voltage circuits. The output of the probe should be connected to the d-c input of the oscillograph. If your oscillograph does not have a d-c input, a 1 meg resistor must be provided across the vertical-input terminals as shown in Fig. 1C. If the resistor is not provided, the full pulse voltage may appear across the scope input and the instrument will be damaged.

A convenient gimmick for checking the operation of the sweep and high-voltage circuits is shown in Figure 1D. It consists of a length of RG-59/U coax, connected across the vertical input terminals of an oscillograph. Approximately one inch of the outer braid is removed from the free end of the coax. The oscillograph is adjusted to display waveforms at the horizontal sweep rate. By placing the exposed end of the coax near the envelope of the horizontal oscillator, horizontal deflection amplifier or damper tubes, the waveforms present at the tube plates can be observed, providing a quick check of circuit operation. *Courtesy Allen B. Du Mont Labs. Inc., Du Mont Service News.*

In Focus

POLAROID CAMERA is a help to clear out old TVs and appliances, says a Massachusetts servicer. He snaps a picture of the old cabinet, rushes it to the local newspaper (which etches its halftones by electronic scanning) and soon, with an inviting price, the picture is printed in that evening's paper, and usually finds a purchaser.

COMMUNITY TV VS. SATELLITE STATIONS—A request pending before the FCC to permit commercial operation of satellite (booster) stations has raised a question: Will low-powered satellite transmitters replace community antenna systems as a means of bringing TV to areas out of normal range? A manufacturer of equipment for both methods does not believe a change will take place. Milton J. Shapp, of Jerrold Electronics, says satellites will flourish in Central and South America, possibly parts of Canada, but not in the U.S.A. The problem of obtaining sufficient frequency allocations for many stations without interference is great. Furthermore, while a booster station can bring in a single distant channel, a community system delivers a choice of as many as seven. Shapp believes Americans will want the option of choosing channels.

NEWS of the TRADE

Direct Heathkit Sales

Potential purchasers of Heathkits who live in the New York area may now buy the kits over the counter, instead of ordering through the mail. Rockbar Corporation, 215 E. 37th Street, New York 16, N.Y., has set up an accommodation service for direct sale. Pick-up customers are advised to call Rockbar before coming in for desired kits, since delays in shipment sometimes leave the company temporarily short on some items.

Superex-Rayburne Merger

Superex Electronics Corp., 23 Atherton Street, Yonkers, N.Y., is now operating Rayburne (formerly Grayburne) Corp. of the same city, and is marketing the combined lines of electronic components and equipment under the Superex name. To such items as the Grayburne Ferriloops and Vari-loops, Clear-Pix TV interference filters, Kleer-It line filter, and others, Superex plans to add its CRT Tester-Adapter and other components for distribution through radio and TV parts jobbers.

Raytheon Tech Meetings

Over 1,000 service dealers attended Raytheon "Service Saver" meetings in Springfield, Mass.; Manchester, N.H.; and Boston, Mass. Largest attendance was at the Boston meeting, where 850 dealers heard Bill Ashby's presentation of the "Service Saver" plan. The following Raytheon distributors sponsored the meetings: L. L. Del Padre Associates, De Mambro Radio Supply Co., Electrical Supply Corp., Graybar Electric Co., Hatry and Young, Lincoln Electronic Supply Corp., A. W. Mayer Co., and Willett Radio Supply.

Over 400 service dealers attended a Raytheon Bonded Electronic Technicians meeting held in Buffalo, N.Y. The meeting was sponsored by Standard Electronic Distributing Co. in conjunction with the Buffalo Radio Television Service Association. F. J. Brizdle, attorney, spoke on "Legal Responsibilities of TV Servicemen"; Harold Weber, of the Buffalo Better Business Bureau, spoke on "Common Complaints Against TV and Radio Serv-

icemen." The session also featured a showing of the film, "Electronics In Action."

"Electronics In Action," also currently touring the northwest with recent showings in Idaho Falls, Idaho and Missoula, Montana, is a full-color sound movie presenting the story of the Raytheon Co. from its founding in 1922 to the present. Many facets of the electronics industry, including manufacturing techniques, are shown. Assembly and testing of miniature tubes, subminiature tubes and transistors are depicted. Additional showings have been completed in Portland, Ore.; Yakima, Wash.; and Seattle, Wash.

Sylvania Adds Tube Line

In addition to picture tubes using the Sylvania brand name, the manufacturer has brought out another line known as "Colonial picture tubes, made by Sylvania." The new brand name and the Sylvania name will both appear on the tubes and on their cartons. Colonials, after registration by warranty card and serial number, carry a twelve month in-use guarantee. The new line will be priced lower than the regular Sylvania line. Colonials will be stocked by regular Sylvania distributors.

TV To Replace Prison Guards

The Dallas (Texas), County Commissioners have voted to advertise for bids on installation of a television security net work for watching prisoners in the new county jail, after a closed circuit TV test demonstration in court. Estimates for the TV network would run between $90,000 and $100,000. Under the proposed network, the man in charge of the jail office would have a constant view of the prisoners. There would be 24 stations spotted throughout the jail. And a master control viewer would be set up in the sheriff's office.

Koessler Now in SF

In keeping with plans to expand Koessler services into the Bay Area, Frank B. Koessler, owner of Koessler Sales Company, has announced the opening of his San Francisco branch office, located in the Western Merchandise Mart, 1355 Market Street, San Francisco 3, Cal., under the management of Lloyd F. Larson. Mr. Larson is well acquainted in the Northern California territory, having been a former resident of San Francisco. Koessler Sales Company are manufacturers' representatives handling audio lines for California, Arizona and Nevada.

Service Data

Production Changes,

Replacing 6BQ6GT Screen Resistor in Crosley Sets

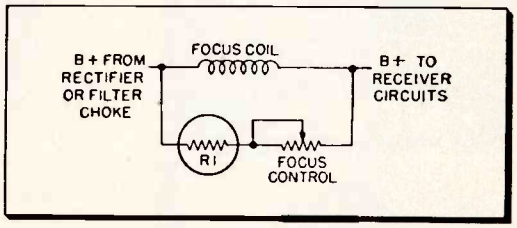
When it is necessary to replace the dropping resistor in the screen circuit of the 6BQ6GT tube (in 17 and 21-in. '54 Crosley TV sets), due to the ohmic value of the resistor becoming changed from overloads, replace the resistor as explained in paragraph "a" or "b". *Do not attempt to use a common type 2-watt resistor as a replacement.*

a. Replace the original resistor with a special 10,000 ohm, 10%, 2-watt resistor (part number 156911-1) which, although rated at 2 watts, is able to withstand overloads for limited periods of time.

b. Replace the original resistor with two standard resistors wired in parallel, one a 33,000 ohm, 10%, 1-watt resistor, (part number 39374-113) the other a 15,000 ohm, 10%, 2-watt resistor (part number 39374-215).

Modifying Focus Circuit

A good general rule to use when adjusting the focus coil is that more current is required as the focus coil is moved toward the base of the tube. Therefore, less current is required to obtain optimum focus as the focus coil is moved toward the face or front of the picture tube. It will seldom be necessary to modify the focus coil circuit. If for any reason a modification of this



Typical Focus Coil Circuit

type is required, however, first determine whether more or less current flow is needed by moving the focus coil, at the same time adjusting the focus control for the clearest line definition. If more current flow is required, the resistance of R1 (see sketch) should be increased. If less current flow is required, the resistance of R1 should be decreased. Be sure to use a resistor with a sufficient wattage rating, preferably of the 5- or 10-watt wire-wound type.—from a G. E. *Technitalk* bulletin.

Magnavox 108 Series Service Data

Horizontal Drive Line. If there is a white line running through the center of the picture from top to bottom, change the value of capacitor C410 (in series with the drive control) from 330 mmfd to 470 mmfd.

Audio Hum and Sync Buzz. The following circuit change has been incorporated in chassis with even serial number 122892 and chassis with odd number 125193, to minimize hum and sync buzz under all signal conditions.

1. Eliminate the 270-volt point in the power supply by disconnecting all leads from C502 and connecting them to the 280 volt bus. Remove R502 (470 ohms).

2. Insert a 470 ohm ½ watt resistor between the bot-

from Mfrs.

Troubleshooting Hints

tom end of R310 (in the plate circuit of the sync splitter) and the 140-volt bus.

3. Connect the positive terminal of C502A (removed in step 1) to the junction of R310 and the 470 ohm resistor (installed in step 2).

Quick Check for Horiz. Amp Cathode Capacitor

Occasionally small (raster) size can be traced to a defective cathode bypass capacitor in the horizontal amplifier stage. A quick check can be made by temporarily connecting the cathode to ground. If the capacitor is defective, there will be an appreciable change in size of the picture. If the capacitor is good, only a very small change will be noted.—*Stromberg-Carlson Current Flashes.*

Increasing Brightness Range in Emerson Sets

This service note applies to chassis 120196-B, 120197-B, 120197-D and 120206-D, models 781A, 781B, 784E, 748K, 784G, 792D and 781E. Depending on such variable factors as line voltage, picture tubes, high voltage transformers, etc., it may sometimes be desirable to increase the amount of reserve brightness on the above sets.

This can easily be accomplished in the field in a matter of minutes, since the chassis does not have to be removed from the cabinet.

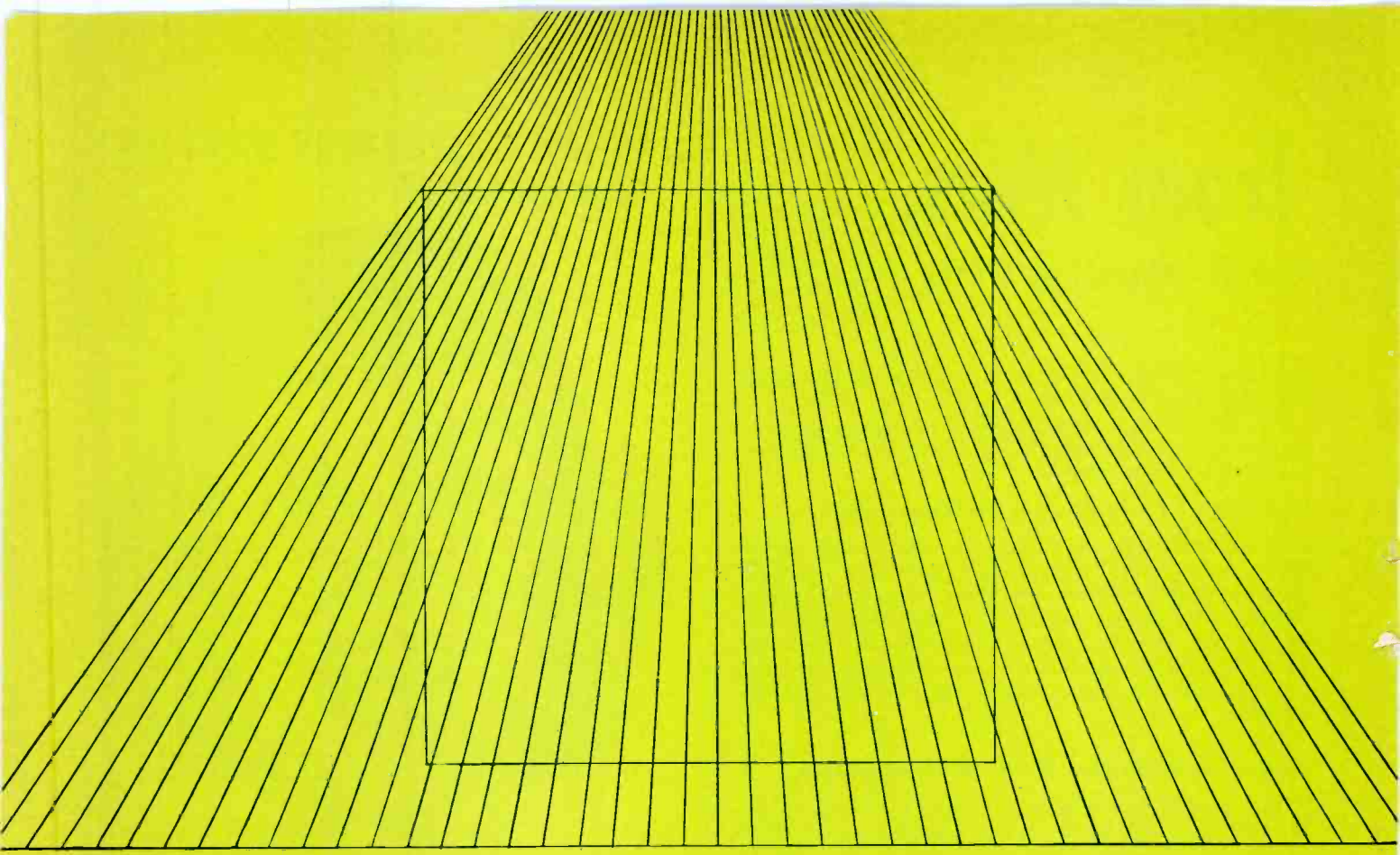
Remove the condenser (.0033 mfd or .0068 mfd) mounted on the horizontal output transformer (pt. No. 738078) between lugs No. 1 and No. 5. This condenser is electrically connected across the horizontal width coil.

On some chassis, a 100 mmfd, 4000-volt condenser is used in place of the above, but is connected between lugs No. 5 and No. 7 of the horizontal output transformer. This condenser should be removed from those chassis which incorporate it.

In low line voltage areas, the removal of the above condensers may result in insufficient width even after readjustment of the horizontal width coil. If this is the case, replace the 6BQ6 horizontal output tube. Several of these tubes may have to be tried for best results. Those 6BQ6 tubes that do not afford maximum width, however, should not be considered defective.

Company Pays for Study Courses

FORWARD-LOOKING ATTITUDE of some manufacturers in the TV field, with respect to winning community good-will and advancing good men in the industry, deserves kudos. Channel Master Corp., of Ellenville, N. Y., will reimburse any employee in full for expenses incurred in undertaking job-related courses of study. The antenna manufacturer's program covers tuition, books and lab fees at any school in the country. Plan is to raise employee morale and skill while encouraging local talent. Technical Appliance Corp. (Taco), of Sherburne, N. Y., awards annual Taco Scholarship to most promising local science student. Winners, who must measure up to a rigid list of qualifications, spend their out-of-school summers in the Taco labs.



THINGS ARE NOT AS THEY SEEM...

This *is* a perfect square.
It is an optical illusion that the sides bend.

3 amps fuse will not blow at 3 amps.

Fuses are not rated by the current at which they blow. Fuses are rated by the maximum current they should carry indefinitely.

Each type of fuse blows according to the requirements of the equipment it was designed to protect.

Littelfuse has cooperated with NEC, Underwriters, Armed Forces MIL Specs Committees in establishing the characteristics of the various fuse types.

Littelfuse holds more design patents on fuses than all other manufacturers combined.

3 AG "SLO-BLO"

3 AB

8 AG U/L

1 AG

4 AG ANTI-VIBRATION

LITTELFUSE

DES PLAINES, ILLINOIS

Complete Index of

ALL "CIRCUIT DIGESTS" TO DATE

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(Continued on page 68)

Circuit Digest Index

(*Continued from page 67*)

Exact-Duplicate TV Control Replacements in Demand

The TV replacement parts business is, at long last, hitting its stride, according to Fran J. Chamberlain, distributor sales manager of Clarostat Mfg. Co., Inc., Dover, N. H.

"I must admit that Clarostat has been pretty optimistic about this TV replacement parts business for several years past. We are, in fact, ahead of time, when we invested a fortune in compiling and printing elaborate control replacement manuals and got our distributors to stock a complete line of exact-duplicate numbers. The second edition of our TV Control Replacement Manual, issued in 1952, contained 262 pages of solid listings, whereby a serviceman and his jobber could replace any given TV control in a jiffy.

Dave Garroway Promotes Regency Remote Control

Dave Garroway, NBC TV star, is shown with the Regency RT-700 remote control which he has been promoting on his two-hour morning television program, "Today." The

unit will handle the selection of stations, adjust fine tuning and control contrast and volume from as far away as 100 feet. The Regency remote control can be installed by an experienced serviceman in 15 minutes and may be used with any existing television set.

"Wake up, Senator. The playback of your speech is finished."

Rider Manuals in New England

John F. Rider Publisher, Inc., announces that Robert S. MacArthur has been appointed sales representative to cover the electronic parts distributing industry in Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. He will represent the Rider organization on radio and television manuals, Tek-Files, and books.

Assoc. News

(*Raytheon Meetings—cont.*)

400 other Servicers attended a Buffalo, N. Y. meeting.

Sponsoring the southeastern meetings were the following Raytheon tube distributors: Southeastern Radio Parts Co. and Herndon-Thomas Electronics, Atlanta, Ga.; Horlacher and Barrett, Columbia, S. C.; Radio Accessories Co., Tampa, Florida; Radio Sales and Service Co., Columbus, Ga.; and Hopkins Equipment Co., Savannah, Ga., distributor of Raytheon TV sets.

Attending dealers were enthusiastic in their response to the informative and educational talk presented by Bill Ashby, Raytheon TV's popular staff lecturer. At the "instruction clinic" Mr. Ashby developed the "Service Saver" plan, illustrated bv slides, built around the Raytheon TV Owner's Guide and dealer's Service Saver Manual and Wall Chart.

BBB "Color Facts" Pamphlet

To help clear up public confusion on color-TV, the National Better Business Bureau has polled the nation's TV manufacturers on the subject through a questionnaire-survey and has compiled a consensus of their opinions in a new booklet, "The Facts About Color Television," just published. The booklet indicates set makers are agreed that production of color sets during 1954 will be extremely small; that color TV receivers will be relatively expensive —between $700 and $1,000; that picture sizes of the first color sets will be relatively small; that color programs will be infrequent until enough sets are sold to make such programs worthwhile to sponsors, and that black-and-white programs may always outnumber color telecasts.

An advertisement on the backs of matchbooks distributed in local stores will bring your service message into many homes cheaply and effectively.

New Field Engineer

The JFD Manufacturing Company, Inc., Brooklyn, N. Y., has appointed Simon Holzman to the new post of field engineer. His duties will include the field testing of antennas and other electrical television accessories in key television areas throughout the country, as well as speaking at dealer antenna clinics. Mr. Holzman was formerly associated with the Federal Radio and Engineering Corporation where he did research work on U. S. Government projects involving UHF equipment.

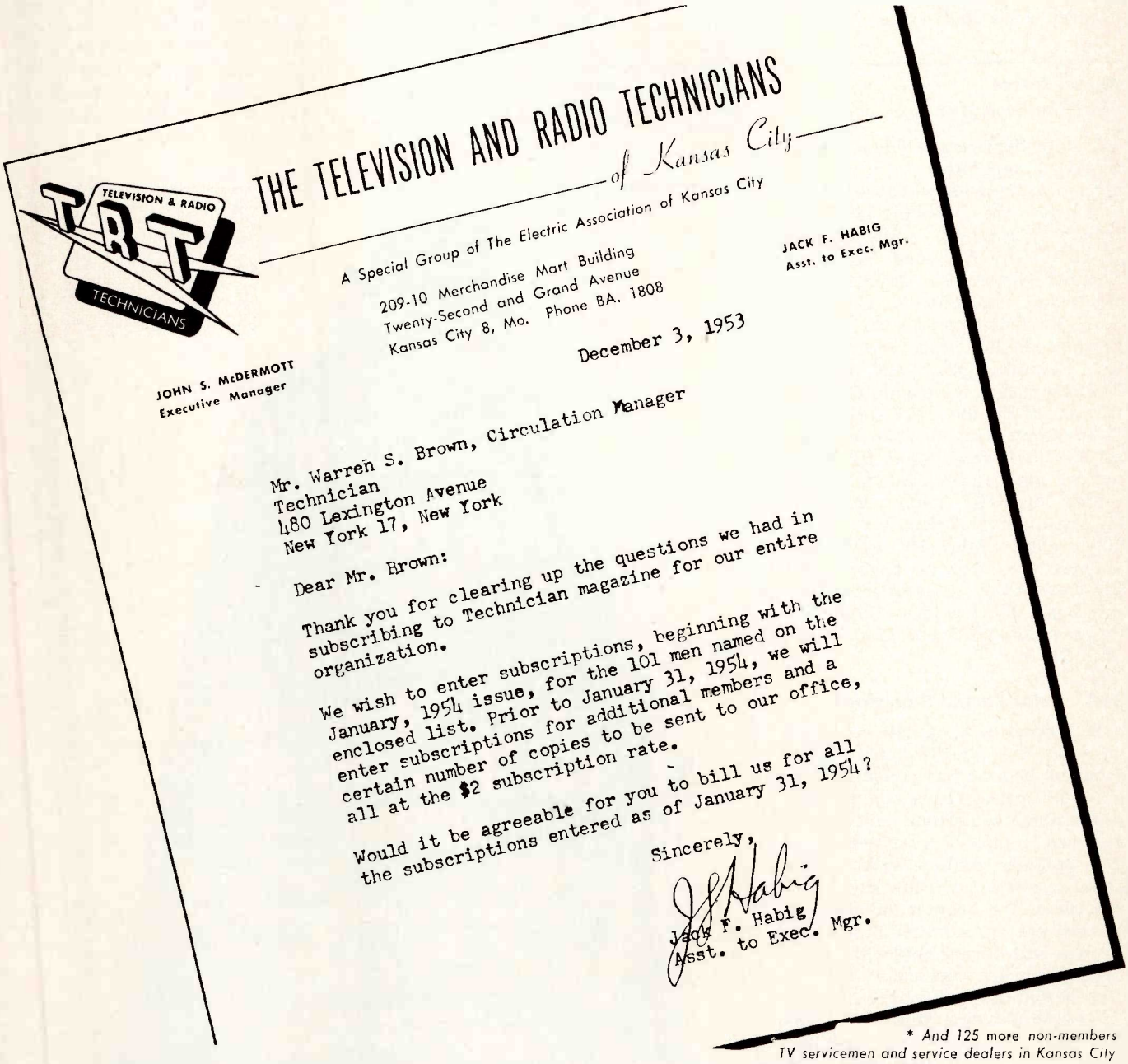
Complete Index to All CIRCUIT DIGESTS Starts on page 67.

Ginsberg with Ben Joseph

Henry Ginsberg, formerly sales manager with Imperial Radar and Wire Corp., has joined the staff of Ben Joseph, manufacturers' representative of 509 Fifth Ave., New York. Mr. Ginsberg, has been in the electronic parts field for many years and will call on jobbers and industrialists for Mr. Joseph.

ALL THE TV SERVICEMEN READ "TECHNICIAN" IN KANSAS CITY

*—thanks to Jack F. Habig, Assistant to the Executive Director, THE TELEVISION AND RADIO TECHNICIANS OF KANSAS CITY, who has ordered subscriptions at TECHNICIAN'S regular rates for his entire membership.**



THE TELEVISION AND RADIO TECHNICIANS of Kansas City

TELEVISION & RADIO TRT TECHNICIANS

A Special Group of The Electric Association of Kansas City

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Twenty-Second and Grand Avenue
Kansas City 8, Mo. Phone BA. 1808

JOHN S. McDERMOTT
Executive Manager

JACK F. HABIG
Asst. to Exec. Mgr.

December 3, 1953

Mr. Warren S. Brown, Circulation Manager
Technician
480 Lexington Avenue
New York 17, New York

Dear Mr. Brown:

Thank you for clearing up the questions we had in subscribing to Technician magazine for our entire organization.

We wish to enter subscriptions, beginning with the January, 1954 issue, for the 101 men named on the enclosed list. Prior to January 31, 1954, we will enter subscriptions for additional members and a certain number of copies to be sent to our office, all at the $2 subscription rate.

Would it be agreeable for you to bill us for all the subscriptions entered as of January 31, 1954?

Sincerely,

Jack F. Habig
Asst. to Exec. Mgr.

** And 125 more non-members TV servicemen and service dealers in Kansas City subscribe to TECHNICIAN.*

TECHNICIAN—*A professional publication for professionals*

Of all the TV-service publications in the field, TECHNICIAN—and only TECHNICIAN—refuses to accept subscriptions from students and amateurs. Newsstand magazines satisfy the requirements of readers of that type. TECHNICIAN's circulation is to professionals and is never diluted.

50,000 audited circulation! If anyone tells you differently - - tell us!

TECHNICIAN CALDWELL-CLEMENTS, INC., 480 Lexington Ave., New York 17

ADVERTISERS INDEX

JANUARY, 1954

While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.

NEW BOOKS

HIGH FIDELITY TECHNIQUES, by John H. Newitt. Rinehart & Co., Inc., 232 Madison Ave., New York 16, N. Y. 512 pages. $7.50.

Primarily intended as a text and reference work for service technicians, experimenters, and audio men, this book also contains data useful to the non-technical Hi Fi fan. The emphasis is on facts rather than on the author's personal judgments. Practical information and design data are presented. Some topics considered: standards and definitions for high fidelity, sound and hearing; analysis of Hi Fi components; special circuits; evaluation of Hi Fi systems in terms of individual listener requirements; custom installation techniques (discussed from both business and technical viewpoints).

RADIOTRON DESIGNER'S HANDBOOK. Fourth edition, edited by F. Langford-Smith. Published by the Radio Corporation of America, Harrison, N. J. 1522 pages. $7.

This new fourth edition thoroughly covers the design of radio and audio circuits and discusses in detail, from the viewpoints of theory and practice, the design considerations necessary for the proper use of electron tubes and circuit components. It includes 1000 illustrations, bibliographies and references totaling more than 2500 items, and an extensive 50-page index containing 7000 entries.

Servicemen whose background of theory is good, will find this a valuable reference book. Technicians whose theoretical background is spotty can pick up a great deal of useful information from the book by skipping the mathematics present and judiciously selecting topics of interest to them.

Swanson Heads Wisconsin Distributors

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

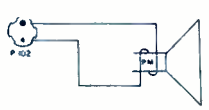
New president of the group is John A. Swanson, Standard Radio Parts Company, Racine. Other officers elected are Harris E. Sterman, Harris Radio Corporation, Fond du Lac, vice president; Byron C. Deadman, Northern Radio & Television Co., Green Bay, secretary; and Charles B. Deadman, Radio Distributors,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

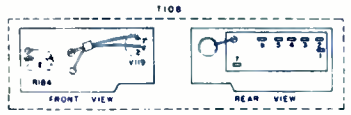
January • 1954

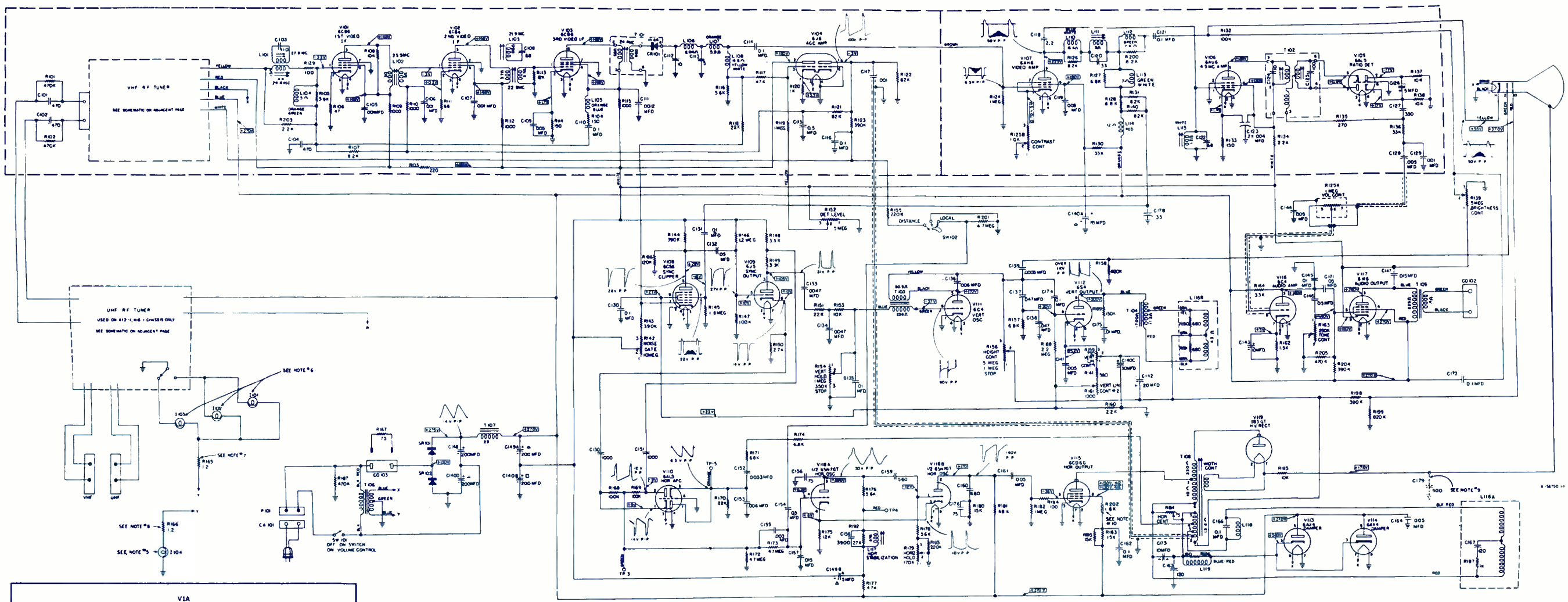
TECHNICIAN
CIRCUIT DIGESTS

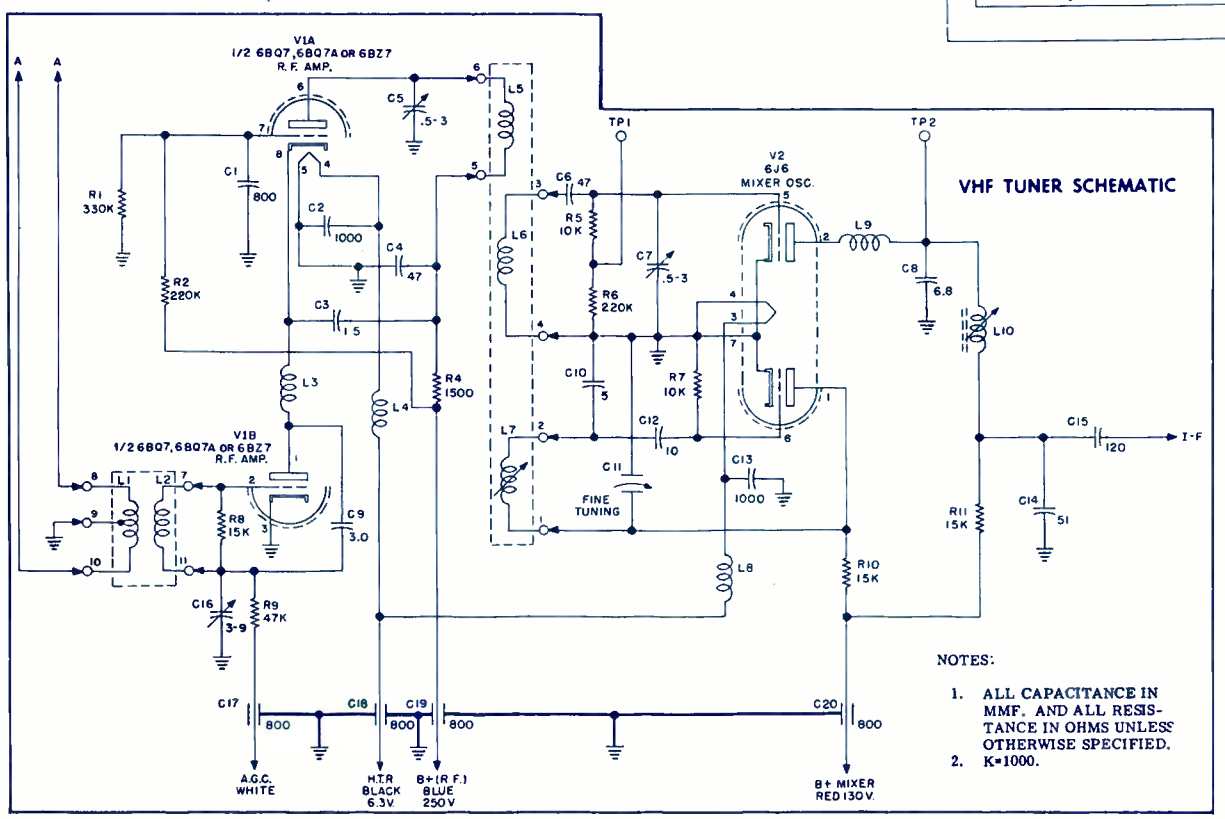
PICTURE TUBE	
VIEW	
412	24CP4
412-1	24CP4
416	27MP4
416-1	27MP4

SPEAKER	USED ON
5" PM	ALL MODELS





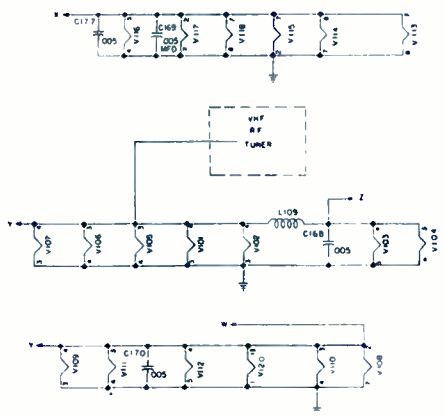




VHF TUNER SCHEMATIC

NOTES:

1. ALL CAPACITANCE IN MMF. AND ALL RESISTANCE IN OHMS UNLESS OTHERWISE SPECIFIED.
2. K=1000.



NOTES:

1. ALL VOLTAGES MEASURED WITH AN ELECTRONIC VOLTMETER CONNECTED FROM SOCKET LUG TO CHASSIS.
2. SUPPLY VOLTAGE 117 VOLTS 60 CYCLE AC.
3. K=1000
4. ALL CAPACITANCE VALUES IN MMF. AND ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE NOTED.
5. T-104 IS USED ON 412 & 416 CHASSIS.
6. T-101, T-102, T-103, USED ON 412-1 & 416-1 CHASSIS.
7. R165 USED ON 412-1 & 416-1 CHASSIS.
8. R166 USED ON 412 & 416 CHASSIS.
9. C179 USED ON 416 & 416-1 CHASSIS.
10. R202 USED ON 412 & 412-1 CHASSIS.

*Note: Chassis schematic printed here is for chassis coded as follows: 412 (Code D)
412-1 (Code B)
416 (Code C)
416-1 (Code A)

Chassis 412: Models F-24CDMH, F-24CDBH
Chassis 412-1: Models F-24CDMU, F-24CDBU
Chassis 416: Models F-27COMH, F-27COBH
Chassis 416-1: Models F-27COMU, F-27COBU

HORIZONTAL HOLD ADJUSTMENT

1. Tune in a local television signal and adjust contrast control for normal picture.
2. Connect electronic voltmeter between TP-3 (green lead) and chassis.
3. Short TP-5 (orange lead) to chassis and adjust electronic voltmeter to zero.
4. Remove short from TP-5. Do not change zero on electronic voltmeter.
5. Connect a 0.1 mfd. 600 volt capacitor between TP-4 (red lead) and chassis.
6. Adjust Horizontal Hold control for zero reading on the meter.
7. Remove the 0.1 mfd. capacitor from TP-4 and chassis. Do not disturb setting of horizontal hold control.
8. Adjust Horizontal Stabilizer coil (L117) for zero reading on the meter.
9. Remove electronic voltmeter from TP-3.
10. Check horizontal pull-in range. The pull-in range should be approximately 50° of the control's rotation.

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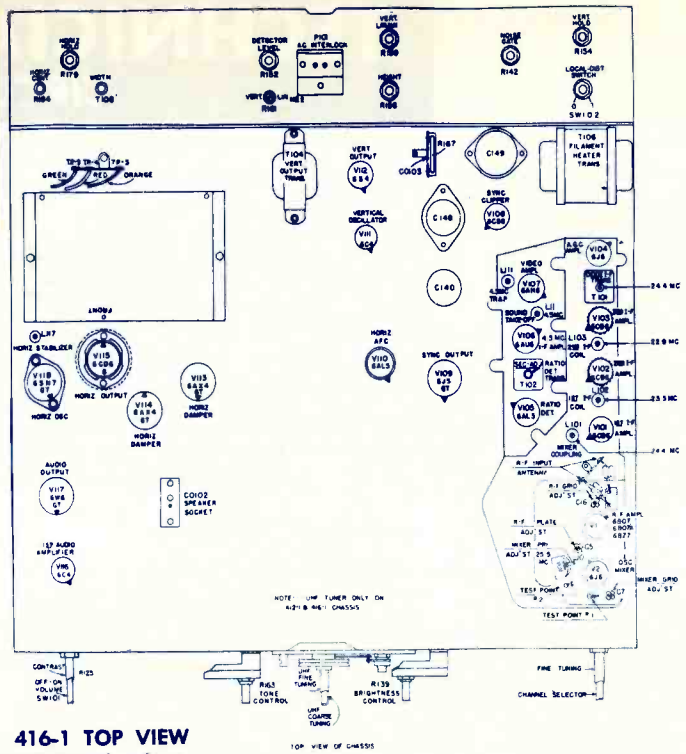
CROSLEY
Chassis 412, 412-1, 416, 416-1

Technician CIRCUIT DIGEST 106

CROSLEY
Chassis 412, 412-1, 416, 416-1
Television
CIRCUIT DIGEST
106



VHF CHASSIS 412-1 416-1 TOP VIEW
(Tube and Alignment Locations)

UHF ALIGNMENT

ALIGNMENT NOTES:

CAUTION: This UHF converter unit is used with a VHF receiver that has one side of the chassis connected to the power line. DO NOT CONNECT TEST EQUIPMENT TO ANY PART OF THE RECEIVER OR GROUND THE CHASSIS UNLESS AN ISOLATION TRANSFORMER IS USED BETWEEN THE POWER LINE AND RECEIVER.

1. Remove the UHF Converter from the VHF receiver chassis.
2. In order that the converter will operate with the tuning shaft in maximum CCW* position, it will be necessary to disengage the function switch shaft from the linkage which operates it and manually set the switch to the UHF position. To accomplish this, loosen the two set-screws which secure the arm and hub assembly to the shaft. Turn the switch clockwise to the UHF position and leave it in this position while aligning.
3. Connect the output leads of the UHF converter to the R. F. input terminals of the VHF Tuner.
4. Reconnect the B+ and filament leads of the tuner to the same points on the VHF receiver from which they were disconnected. Connect UHF Converter chassis to B- (VHF receiver chassis).
5. Keep all leads as short as possible. One suggested way of doing this is to mount the UHF converter at right angles to the TV chassis with one mounting screw. Most of the leads on the UHF converter will then be of sufficient length that no additional length will need to be added.
6. Set VHF Tuner to Channel 6.
7. Alignment should be followed in the order shown.

I-F ALIGNMENT

1. Connect an electronic voltmeter or an oscilloscope across the second detector load resistor.
2. Turn on the power.
3. Apply an 82 mc. signal (amplitude modulated if a scope is used) to the crystal terminal (B) at the junction of C13 and L9 through the resistor network shown in Sketch A.

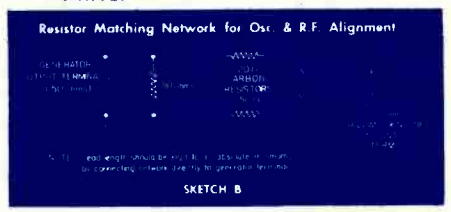
SKETCH A

4. Adjust plate coil (T1) and grid coil (T2) for maximum indication on the electronic voltmeter or scope.
5. Disconnect the resistor network from the crystal terminal.

* CW = Clockwise
CCW = Counter-clockwise

OSCILLATOR ALIGNMENT:

1. With the electronic voltmeter or scope connected across the second detector load resistor, apply a 460 mc. signal (amplitude modulated if a scope is used) to the UHF antenna terminals through the resistor network shown in Sketch B.



SKETCH B

2. With the tuner shaft at maximum CCW* position, adjust the oscillator trimmer C6 for peak reading on the electronic voltmeter or maximum indication on the scope (oscillator frequency is set to 84 mc. below the carrier frequency).
3. Set the signal generator to 904 mc.
4. Rotate the tuner shaft to the maximum CW position and adjust the oscillator end inductor L4 up or down for maximum reading on the voltmeter.
5. Open the ground connection on L10 and connect an 0-10 ma. D.C. meter between the open end of the crystal return choke L10 and ground.
6. Adjust the oscillator coupling coil L11 for maximum crystal current when the tuner shaft is rotated to the maximum CW position. When operating at normal line voltage (117 volts, 60 cycles), the maximum current should not exceed 5 ma. at any setting of the tuner shaft. When operating at low line voltage (105 volts, 60 cycles), the minimum crystal current must not be less than 0.3 ma. at any setting of the tuner shaft.
7. Repeat steps 1 through 4 until maximum reading is obtained.

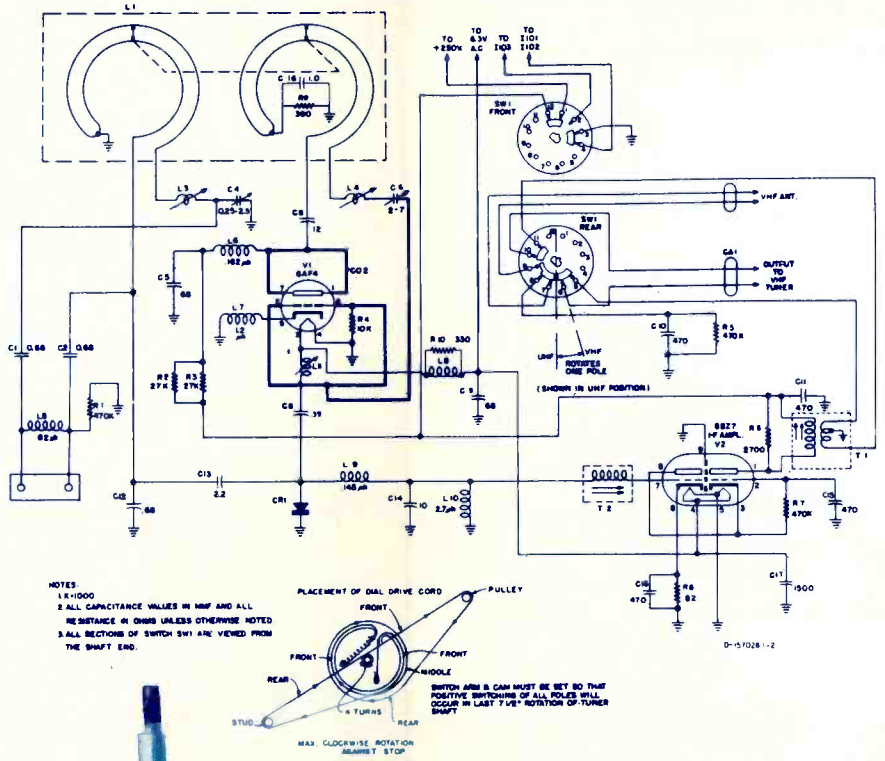
R-F CIRCUIT ALIGNMENT

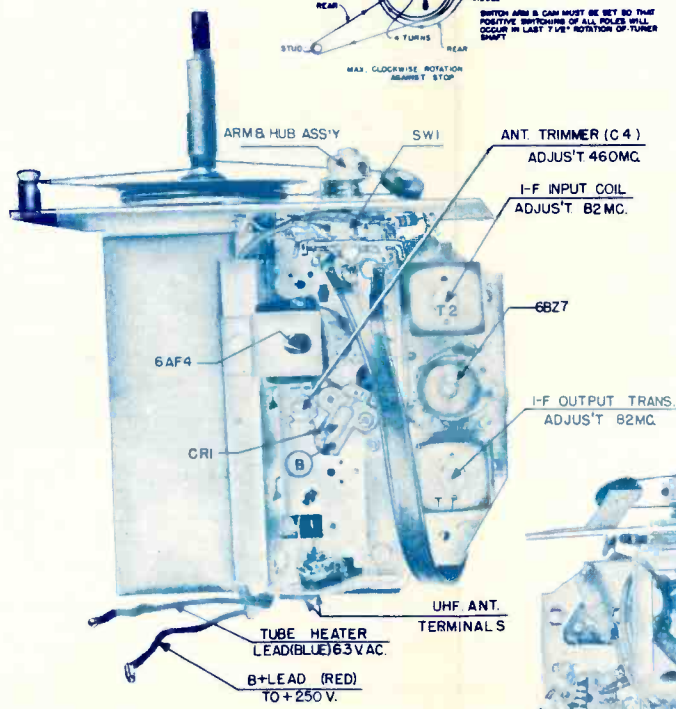
1. With the electronic voltmeter or scope connected across the second detector load resistor of the VHF receiver, apply a 460 mc. signal (amplitude modulated if a scope is used) to the UHF antenna terminals through the resistor network shown in Sketch B.
2. With the tuner shaft at the maximum CCW position, adjust the antenna trimmer C4 for maximum meter reading or for maximum scope indication.
3. Reset signal generator to 904 mc.
4. Rotate the tuner shaft to maximum CW position. Adjust the antenna end inductor L3 by forming larger or smaller loop until maximum reading on the meter (or scope) is obtained.
5. Repeat steps 1 through 4 until maximum reading is obtained.

UHF ALIGNMENT (Cont'd)

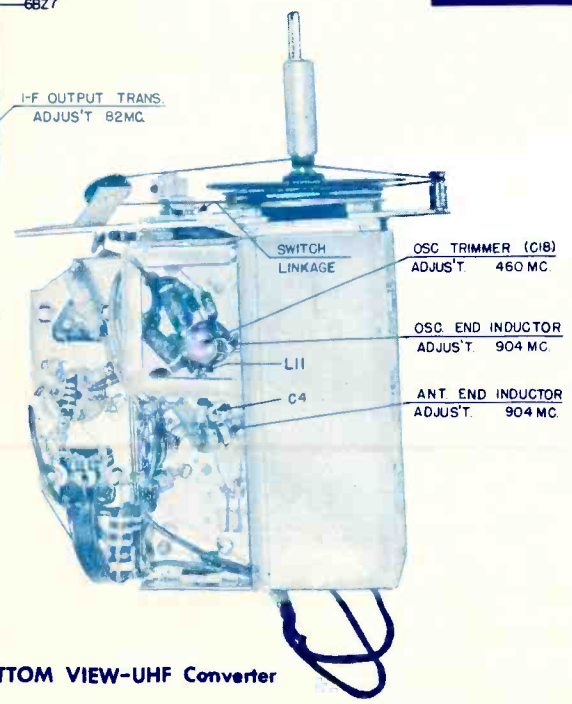
6. Turn the power switch to the "OFF" position.
7. Disconnect the generator, the electronic voltmeter or scope, and the resistor network. Disconnect the 0-10 ma. meter, and solder the open lead of L10 to the chassis.
8. Re-engage the toggle coupling in the pin on the arm and hub assembly and tighten the set-screws that secure the collar to the switch shaft.
9. The Function Switch should be checked for proper operation under conditions of customer use. At full CCW rotation of the tuner shaft, all VHF position contacts must be fully and firmly made and all UHF position contacts must be fully broken. All UHF position contacts must be fully and firmly made and all VHF position contacts must be fully broken, when the tuner shaft is 7 1/2° or more from full CCW, as tuner shaft is rotated in a clockwise direction.
10. Replace the UHF Converter on the VHF receiver chassis.

UHF CONVERTER SCHEMATIC





TOP VIEW-UHF Converter



BOTTOM VIEW-UHF Converter

CODE LETTER CHANGES

CHASSIS 412, 412-1, 416 & 416-1

IMPORTANT

Chassis 412 (Code A) and 412-1 (Code A) are furnished with a double cathode 6CD6G tube. In all later models a single cathode type 6CD6G is used. It has since been found that some manufacturers' single cathode types will not perform as satisfactorily as those tubes used in factory production. Therefore, when replacing the 6CD6G in these chassis, use only the double cathode type. Crosley Service Parts Department will stock only 6CD6G's with double cathodes.

Chassis 412 (Codes A & B), 412-1 (Code A)

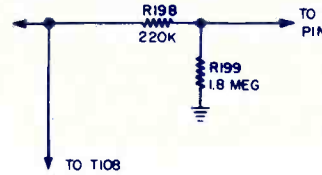


Fig. 1

The circuit shown in Fig. 1 appears in the chassis listed above the figure. To improve the contrast ratio, all later production chassis use the resistor values shown in the full chassis schematic.

Chassis 412 (Codes A & B), 412-1 (Code A)

In these chassis, R202 is omitted in the screen circuit of the 6CD6G. It is added in later production chassis to reduce excessive high voltage.

On chassis 412 (Code A & B), 412-1 (Code A), and 416 (Code A), capacitor C146 is connected as shown in Figure 2. The change from this circuit to that shown in the full chassis schematic is made in later production sets to eliminate the possibility of oscillation in the Audio Amplifier. Figures 3 and 4 also show circuits used on chassis 412 (Code A & B), 412-1 (Code A), and 416 (Code A). In later production sets the .01 mfd. capacitor (see Fig. 3) is omitted to reduce horizontal distortion at high brightness levels. At the same time a 4.7 megohm resistor (see full chassis schematic) was added to improve sync stability with action of the AGC switch.

Chassis 412 (Codes A, B & C), 412-1 (Code A) 416 (Codes A & B)—See text at right

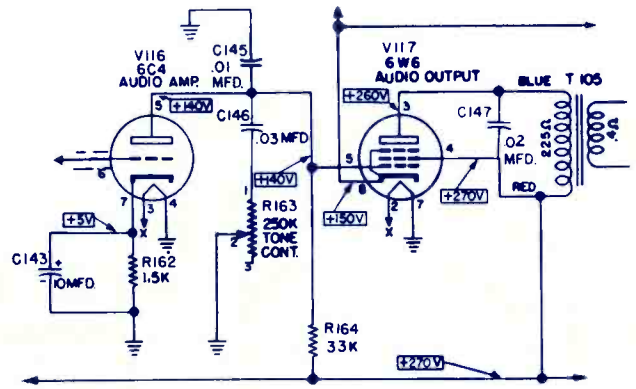


Fig. 2

On chassis 412 (Codes A, B, & C), 412-1 (Code A), and 416 (Code A & B), the coupling between the Audio Amplifier and Audio Output stages is direct coupling, as shown in Fig. 2. The circuit which appears in later production sets (shown on the complete schematic) is a production change only, not a design improvement.

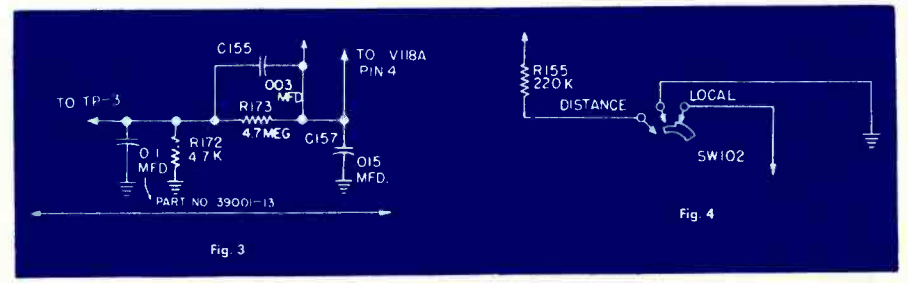
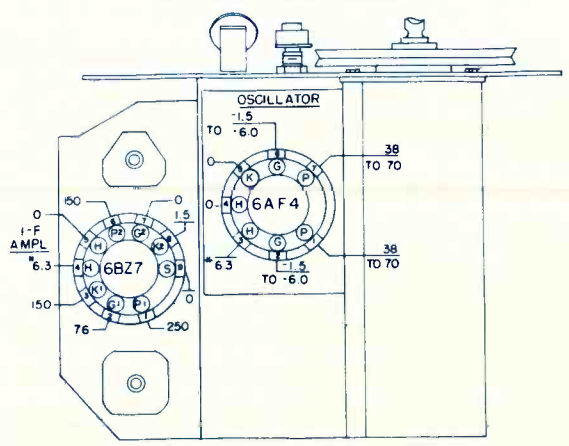


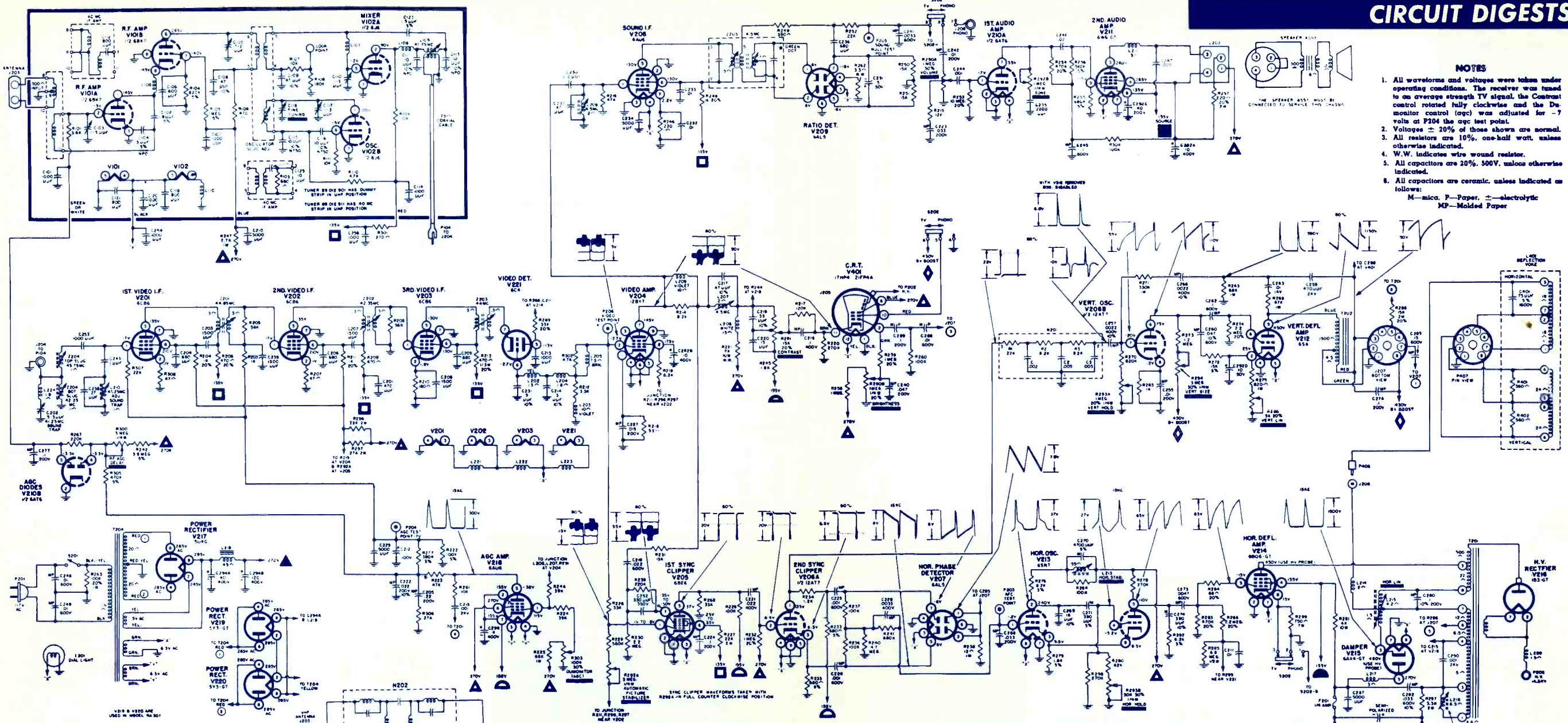
Fig. 3 Fig. 4

UHF SOCKET VOLTAGE CHART

NOTES
1. BOTTOM VIEW OF TUBE SOCKETS.
2. VOLTAGES MEASURED WITH AN ELECTRONIC VOLTMETER CONNECTED FROM SOCKET LUG TO CHASSIS WITH THE FUNCTION SWITCH IN "UHF" POSITION.
3. ~ = AC VOLTAGES.
   NC = NO CONNECTION
4. OSCILLATOR SOCKET VOLTAGE VARIES WITH FREQUENCY, OTHER VOLTAGES ± 10%.
5. LINE VOLTAGES, 117 V, 60 ~ AC.
6. MINIMUM CRYSTAL CURRENT FOR PROPER OPERATION OF THE OSCILLATOR, 300 μa.



TECHNICIAN
CIRCUIT DIGESTS



UHF TUNER 89 013 291

NOTES

1. All waveforms and voltages were taken under operating conditions. The receiver was tuned to an average strength TV signal, the Contrast control rotated fully clockwise and the Dc-monitor control (agc) was adjusted for −7 volts at P204 the agc test point.
2. Voltages ± 20% of those shown are normal.
3. All resistors are 10%, one-half watt, unless otherwise indicated.
4. W.W. indicates wire wound resistor.
5. All capacitors are 20%, 500V, unless otherwise indicated.
6. All capacitors are ceramic, unless indicated as follows:
   M—mica, P—Paper, ±—electrolytic
   MP—Molded Paper

RESISTANCE MEASUREMENTS

All Readings to Ground

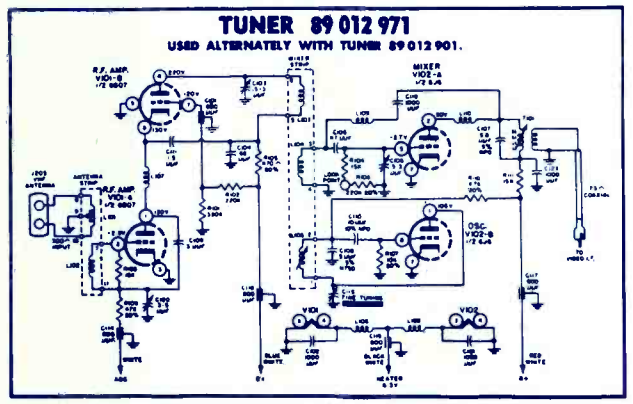
		1	2	3	4	5	6	7	8	9
V201	6CB6	130K	47	.3	0	INF	40K-65K	0		
V202	6CB6	100K	47	2	0	INF	40K-65K	0		
V203	6CB6	.4	180	.05	0	INF	INF	0		
V204	12BY7	33	3.3K	0	0	0	.05	30K-50K	50K-70K	0
V205	6BE8	37K	0	.05	0	28K	INF	2.5M		
V206	12AT7	30K-50K	1.2M	680	.05	.05	INF	820K-1.8M	1K	0
V207	6AL5	12	12	.05	0	4.8M	0	4.8M		
V208	6AU6	2	0	0	.05	INF	INF	220		
V209	6AL5	INF	INF	.05	0	15K	0	15K		
V210	6AT6	10M	0	0	.05	1M	800K	600K		
V211	6W6-GT	NC	.05	28K-50K	28K-50K	350K	120K	0	INF	
V212	6S4	NC	820-5.8K	NC	0	.05	2.2M	NC	NC	INF
V213	6SN7-GT	5.3M	35K-55K	1.8K	62K-90K	300K	1.8K	0	.05	
V214	6BQ6-GT	0	0	470K	30K-50K	470K	NC	.05	150	Cap INF
V215	6AX4-GT	NC	NC	INF	NC	28K-50K	NC	0	.05	
V216	1B3-GT	NC	INF	NC	INF	NC	INF	INF	NC	Cap INF
V217	5U4-G	NC	28K-50K	NC	20	NC	20	NC	28K-50K	
V218	6AU6	28K-50K	28K-50K	.05	0	500K	28K-50K	28K-50K		
V219	5Y3-GT	NC	28K-50K	NC	20	NC	20	NC	28K-50K	
V220	5Y3-GT	NC	28K-50K	NC	20	NC	20	NC	28K-50K	
V221	6C4	NC	NC	2	0	3M	3.3K	3		
V401	CRT	0	1M-1.5M				28K-50K			

*10	11	12
INF	120K	.05

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

TUNER 89 012 971

USED ALTERNATELY WITH TUNER 89 012 901.



▲ ▲ ▬ USE OF SYMBOLS

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

Chassis RA-306, 307
Models

Summit RA-306A1, RA307A1	Hartford RA-306A7, RA-307A7
Warren RA-306A2, RA307A2	Sheffield RA-306A8, RA-307A8
Hampton RA-306A3, RA307A3	Westbrook RA-306A9, RA-307A9
Bristol RA-306A4, RA307A4	Windsor RA-306A10, RA-307A10
Newport RA-306A5, RA307A5	Bradford RA-306A11, RA-307A11
Rutland RA-306A6, RA307A6	Warwick RA-306A12, RA-307A12

DUMONT
Chassis RA-306, 307

Technician
CIRCUIT DIGEST
107

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DUMONT
Chassis RA-306, 307

Technician
CIRCUIT DIGEST
107

PARTS LIST

CHASSIS

Symbol	Part No.
C201	03 121 560
C202	03 137 300
C203	03 017 850
C204	03 121 520
C205	03 126 880
C206	03 121 520
C207	03 017 850
C208	03 017 850
C209	03 121 520
C210	03 015 610
C211	03 015 920
C212	03 122 830
C213	03 102 490
C214	03 014 610
C215	03 122 420
C216	03 127 620
C217	03 015 760
C218	03 128 180
C219	03 131 330
C220	03 117 310
C221	03 127 580
C222	03 126 540
C223	03 126 560
C224	03 126 860
C225	03 128 100
C226	03 128 100
C227	03 126 810
C228	03 127 530
C229	03 015 610
C230	03 014 540
C231	03 014 610
C232	03 015 920
C233	03 015 920
C234	03 015 610
C235	03 124 190
C236	03 121 520
C237	03 015 760
C238	03 131 320
C239	03 017 850
C240	03 126 840
C241	03 128 130
C242	03 126 800
C243	03 012 150
C244	03 100 490
C245	03 128 220
C246	03 122 430
C247	03 015 610
C248	03 125 780
C249	03 125 780
C250	03 122 420
C252	03 014 390
C253	03 100 490
C254	03 100 490
C255	03 126 800
C256	03 100 490
C257	03 127 040
C258	03 122 440
C260	03 127 900
C262	03 128 220
C263	03 119 630
C266	03 127 040
C268	03 126 830
C269	03 121 530
C270	03 033 340
C271	03 021 110
C274	03 020 500
C275	03 128 140
C277	03 126 860
C278	03 126 860
C280	03 126 620
C282	03 127 880
C285	03 141 830
C287	03 015 810
C288	03 128 180
C289	03 126 860
C291	03 120 960
C292	03 124 180
C293	03 250 421
C294	03 121 080
C296	03 115 080
C401	03 122 464
F201	11 000 720
I201	12 001 310
J202	09 022 690
J203 (306)	40 016 161
J203 (307)	40 016 151
J204	09 031 070
J205	34 003 462
J206	40 016 131
J207	34 003 570
J208	09 031 070
L202	21 011 301
L203	21 006 628
L204	21 011 082
L205	21 006 622
L206	21 006 629
L207	21 010 962
L208	21 012 211
L209	21 006 628
L210	21 012 201
L211	21 006 230
L213	21 010 991
L214	21 006 280
L215	21 011 001
L216	21 011 011
L217	21 006 520
L218	21 010 951
L220	21 006 280
L221	21 008 972
L222	21 008 972
L223	21 008 972
L224	21 012 011
L401	89 013 321
N201	88 000 631
N202	88 000 731
P201	09 036 920
P202	50 093 801
P408	51 013 830
P407	09 015 590
R203	02 031 770
R204	02 032 420
R205	02 031 980
R206	02 032 400
R207	02 031 610
R208	02 031 980
R209	02 032 400
R210	02 031 680
R211	02 032 420
R212	02 031 830
R213	02 201 700
R215	02 031 900
R216	02 031 880
R217	02 032 020
R218	02 031 590
R219	02 031 880
R220	02 032 060
R221	02 113 090
R222	02 030 960
R223	02 031 970
R224	02 031 960
R225	02 034 990
R226	02 032 010
R227	02 032 930
R228	02 031 950
R229	02 032 100
R230	02 032 170
R231	02 031 910
R232	02 032 600
R233	02 030 440
R234	02 031 780
R235	02 030 440
R236	02 032 010
R237	02 032 010
R238	02 034 540
R239	02 032 050
R240	02 032 210
R241	02 032 110
R242	02 031 340
R243	02 034 990
R244	02 031 960
R245	02 031 800
R248	02 031 690
R247	02 034 820
R248	02 032 420
R249	02 031 720
R250	02 031 910
R251	02 031 910
R252	02 031 930
R253	02 032 660
R254	02 032 580
R255	02 031 160
R256	02 031 130
R257	02 038 380
R258	02 032 130
R259	02 032 600
R260	02 032 010
R261	02 031 890
R262	02 100 770
R263	02 035 540
R264	02 032 010
R265	02 031 770
R266	02 032 620
R267	02 032 050
R268	02 031 950
R269	02 034 970
R270	02 032 120
R271	02 035 070
R272	02 030 760
R273	02 032 140
R274	02 032 620
R275	02 034 760
R278	02 030 700
R277	02 031 100
R278	02 032 060
R279	02 030 540
R280	02 032 000
R281	02 113 050
R282	02 030 670
R283	02 032 580
R284	02 032 350
R285	02 032 650
R286	02 058 490
R287	02 037 830
R289	02 032 510
R290	01 053 132
R291	01 057 300
R292	01 038 347
R293	01 056 001
R294	01 051 010
R295	01 058 601
R296	02 037 930
R297	02 037 940
R298	02 032 060
R299	02 121 340
R300	01 051 010
R301	02 031 700
R302	02 031 850
R303	01 053 800
R304	02 032 010
R305	02 031 120
R306	02 031 940
R307	02 031 930
R308	02 031 610
R401	02 031 740
R402	02 031 740
S201	01 058 500
S202	05 005 120
T201	20 008 402
T202	20 008 481
T204	20 008 771
V201	25 002 670
V202	25 002 670
V203	25 002 670
V204	25 007 380
V205	25 000 250
V206	25 001 530
V207	25 000 020
V208	25 000 050
V209	25 000 020
V210	25 000 040
V211	25 002 680
V212	25 003 010
V213	25 000 110
V214	25 001 830
V215	25 007 780
V216	25 000 150
V217	25 000 060
V218	25 000 050
V219	25 000 220
V220	25 000 220
V221	25 000 790
V401 (17")	25 007 710
V401 (21")	25 007 720
Z201	20 008 731
Z202	20 008 731
Z203	20 008 731
Z204	20 008 741
Z205	20 008 761

TUNER
89 012 901 - 89 012 911

Symbol	Part No.
C101	03 125 500
C102	03 125 010
C103	03 019 840
C104	03 124 780
C105	03 124 770
C106	03 124 790
C107	03 125 500
C108	03 119 170
C109	03 119 170
C110	03 019 840
C111	03 125 110
C113	03 125 110
C114	03 125 500
C115	03 126 010
C118	03 126 010
C117	03 019 840
C118	03 126 191
C119	03 124 790
C120	03 125 500
C121	03 124 790
C123	03 125 000
L106	21 011 811
L107	21 011 571
L108	21 011 581
L109	21 011 801
L110	21 011 561
P104	09 018 810
R101	02 031 840
R104	02 041 180
R105	02 041 200
R108	02 041 730
R107	02 031 890
R108	02 032 040
R109	02 031 890
R110	02 031 850
R111	02 031 890
V101	25 007 341
V102	25 000 190

89 012 911 Only

C112	03 124 790
C125	03 115 000
R103	02 031 750
$101	05 007 371

TUNER STRIPS
89 012 901 - 89 012 911

Channel	Part No.
2	40 014 881
3	40 014 882
4	40 014 883
5	40 014 884
6	40 014 885
7	40 014 886
8	40 014 887
9	40 014 888
10	40 014 889
11	40 014 891
12	40 014 892
13	40 014 893
40 mc IF	40 014 896

UHF TUNER
89 013 291

Symbol	Part No.
C151	03 126 130
C152	03 125 180
C153	03 125 500
C154	03 125 500
C155	03 125 500
C156	03 126 140
C157	03 126 140
C158	03 125 460
C159	03 125 110
C160	03 014 560
CR101	26 001 082
CR102	26 001 082
L151	21 011 821
L154	21 011 831
L155	21 011 841
R151	02 031 640
R152	02 031 730
R153	02 031 890
R154	02 031 700
V151	25 000 190

TUNER
89 012 971

Symbol	Part No.
C101	03 124 790
C102	03 100 490
C103	03 119 150
C104	03 119 190
C105	03 119 170
C106	03 119 150
C107	03 138 130
C108	03 123 010
C109	03 123 020
C110	03 119 210
C111	03 123 030
C114	03 124 790
C115	03 124 790
C116	03 124 790
C117	03 124 790
C118	03 100 490
C119	30 039 231
C120	03 119 160
C121	03 100 490
C122	03 100 490
L106	21 010 460
L107	21 012 041
L108	21 010 470
L109	21 010 440
L110	21 012 051
R101	02 032 070
R102	02 032 050
R104	02 031 910
R105	02 032 400
R106	02 032 560
R107	02 032 480
R108	02 031 910
R109	02 032 520
R110	02 032 460
R111	02 031 910
T101	20 008 541
V101	25 007 000
V102	25 000 190

TUNER STRIPS
ANTENNA
89 012 971

Channel	Part No.
2	40 015 401
3	40 015 402
4	40 015 403
5	40 015 404
6	40 015 405
7	40 015 406
8	40 015 407
9	40 015 408
10	40 015 409
11	40 015 411
12	40 015 412
13	40 015 413

MIXER
89 012 971

2	40 015 381
3	40 015 382
4	40 015 383
5	40 015 384
6	40 015 385
7	40 015 386
8	40 015 387
9	40 015 388
10	40 015 389
11	40 015 391
12	40 015 392
13	40 015 393

MECHANICAL PARTS
CHASSIS

Part No.	Description
11 000 600	Fuse Holder
12 006 230	Lampholder
12 006 700	Jewel Light
34 001 100	Socket Octal Wafer
34 001 220	Socket 7 Prong Min Mold'd
34 001 300	Socket 7 Prong Min Wafer
34 001 670	Socket 9 Prong Min.
34 002 380	Socket Octal Molded
34 003 193	Socket Octal V215
34 003 570	Socket Octal Shock Mtg.
34 003 671	Socket Octal V216
36 003 720	Plate Contact V214
38 001 310	Grommet Rubber
42 002 860	Shield Tube Min
42 006 611	Shield Corona V216
42 007 110	Base, Tube Shield Min.
50 002 900	AC Line Cord

TUNER
89 012 901 - 89-012 911

30 035 020	Detent Roller and Spring
30 035 030	Spring Shaft Support
30 035 040	Snap Ring
35 025 600	Bearing Plate
42 002 900	Tube Shield V101
42 003 400	Tube Shield V102
42 007 930	Bottom Shield
42 007 940	Side Shield
60 408 200	Screw Bottom, Side Shield
60 409 600	Screw Bearing Plate

89 012 911

30 008 310	Dial Cord
30 033 611	UHF Dial Sleeve
30 033 621	Backlash Gear and Pulley
30 033 641	Shaft Backlash Gear
30 033 651	Ring Bearing
30 033 661	Bearing Bracket
30 035 011	Extension Shaft
30 035 100	Pulley Dial Cord
30 035 262	Coupling
30 035 461	Spring Dial Cord
30 036 621	Cam
30 036 631	Gear Tuning Shaft

Part No.	Description
43 005 011	Spacer, Shaft
60 057 501	Screw Bearing Plate
60 408 420	Screw, Coupling
60 806 101	Set Screw
61 025 200	Lock Nut Flat
62 403 721	"C" Washer, Shaft

89 013 291

42 002 900	Tube Shield V151
45 005 011	Dial UHF

89 012 971

30 029 440	Spring Retainer
30 029 460	Spring Fine Tuning
30 029 470	Spring Detent
30 029 480	Roller Detent
42 003 400	Shield, Tube V102
42 006 210	Shield, Tube V101
60 052 800	Padder Screw
62 005 880	Washer Fiber
62 103 100	Padder Spring Nut

CABINET PARTS

18 003 511	Speaker Assy 10"
18 003 522	Speaker Assy 5"
22 001 941	Antenna Loop
28 001 391	L Shunt Ion Trap
29 000 651	Positioning Magnet
29 001 661	Ion Trap Magnet
30 014 011	Back Panel Cup 17" CRT
30 027 963	Yoke Spring
30 027 971	Yoke Retainer
30 031 282	Back Panel Cup, 21" CRT
32 004 081	Back Panel, 21" Console
32 004 101	Back Panel, 17" Table
35 019 592	Mtg. Bracket, 21" CRT
35 020 491	Mtg. Bracket, 17" CRT
35 022 121	Strap, 21" CRT (Rd Hole)
35 022 122	Strap, 21" CRT (Sq Hole)
35 022 131	Plate, 21" CRT Mtg
35 022 141	Strap, 17" CRT (Sq Hole)
35 022 142	Strap, 17" CRT (Rd Hole)
35 022 153	Plate, 17" CRT Mtg
35 024 921	Dust Shield, 21" CRT
38 010 141	Safety Gl. Cush'n, 21" Con
38 011 921	Control Door Stop
38 014 951	CRT Cushion, 21" Table
38 014 952	Cushion, 17" Table
42 006 662	Control Door, Mah
42 006 661	Control Door, Bl
45 004 001	Safety Glass, 21" Console
45 004 002	Safety Glass, 17" Table
45 004 004	Safety Glass, 21" Table
45 004 437	Selector Knob, Mah. (UHF)
45 004 438	Selector Knob, Bl. (UHF)
45 004 441	Fine Tuning Knob
45 004 442	Brightness, Knob
45 004 451	Volume Knob, Mah
45 004 454	Volume Knob, Bl.
45 004 711	Horiz. Hold, Tone Knob
45 005 121	Contrast Knob
45 005 483	Selector Knob, Mah. (VHF)
45 005 484	Selector Knob, Bl. (VHF)
64 006 783	Gold Mask, 21" Console
64 010 211	Green Mask, 17" Table
64 010 222	Gold Mask, 21" Table

Warren

32 004 091	Back Panel
38 014 961	Mask & Gl. Side Sup., Mah
38 014 962	Mask & Gl. Side Sup., Bl

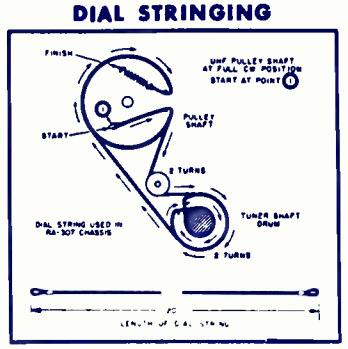
Bradford, Bristol Hampton, Newport Rutland, Windsor & Warwick

32 004 082	Back Panel (Warwick)
38 014 821	Mask & Gl. Top Sup., Mah
38 014 822	Mask & Gl. Top Sup., Bl.
38 014 831	Mask & Gl. Bot. Sup., Mah.
38 014 832	Mask & Gl. Bot. Sup., Bl.
38 014 843	Mask & Gl. Side Sup., Mah.
38 014 844	Mask & Gl. Side Sup., Bl.

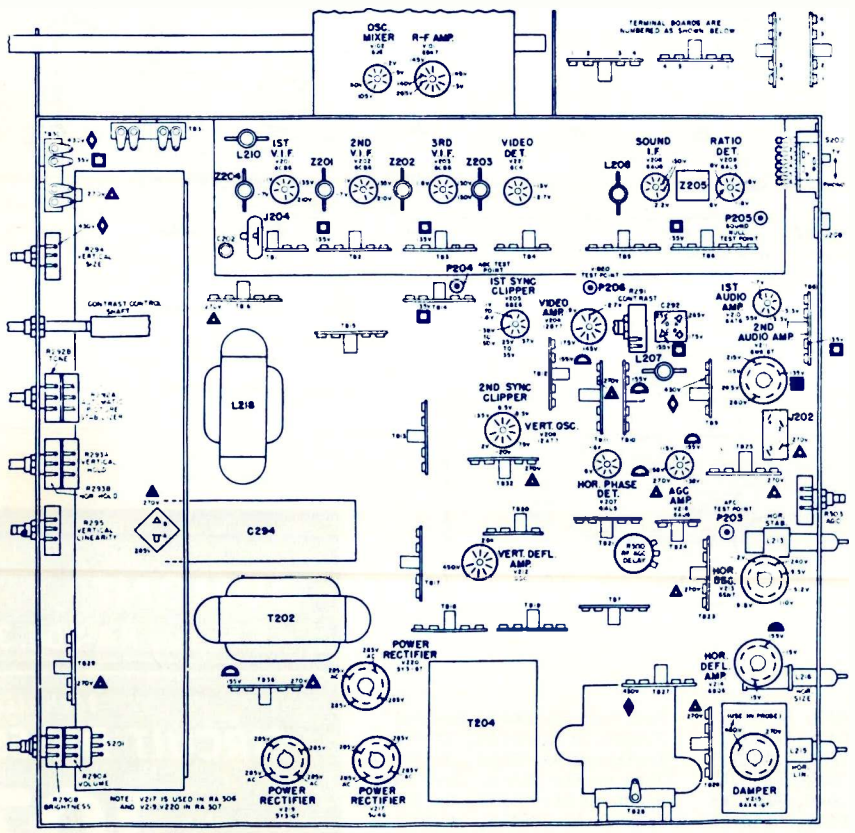
Hartford, Sheffield Westbrook

35 025 821	Safety Glass Mtg. Bracket
38 012 541	Mask & Gl. Bot. Sup., Mah
38 012 542	Mask & Gl. Bot. Sup., Bl.
38 009 841	Mask & Gl. Side Sup., Mah
38 009 842	Mask & Gl. Side Sup., Bl.

DIAL STRINGING



UNDERCHASSIS VOLTAGE POINTS



ALIGNMENT TEST POINTS

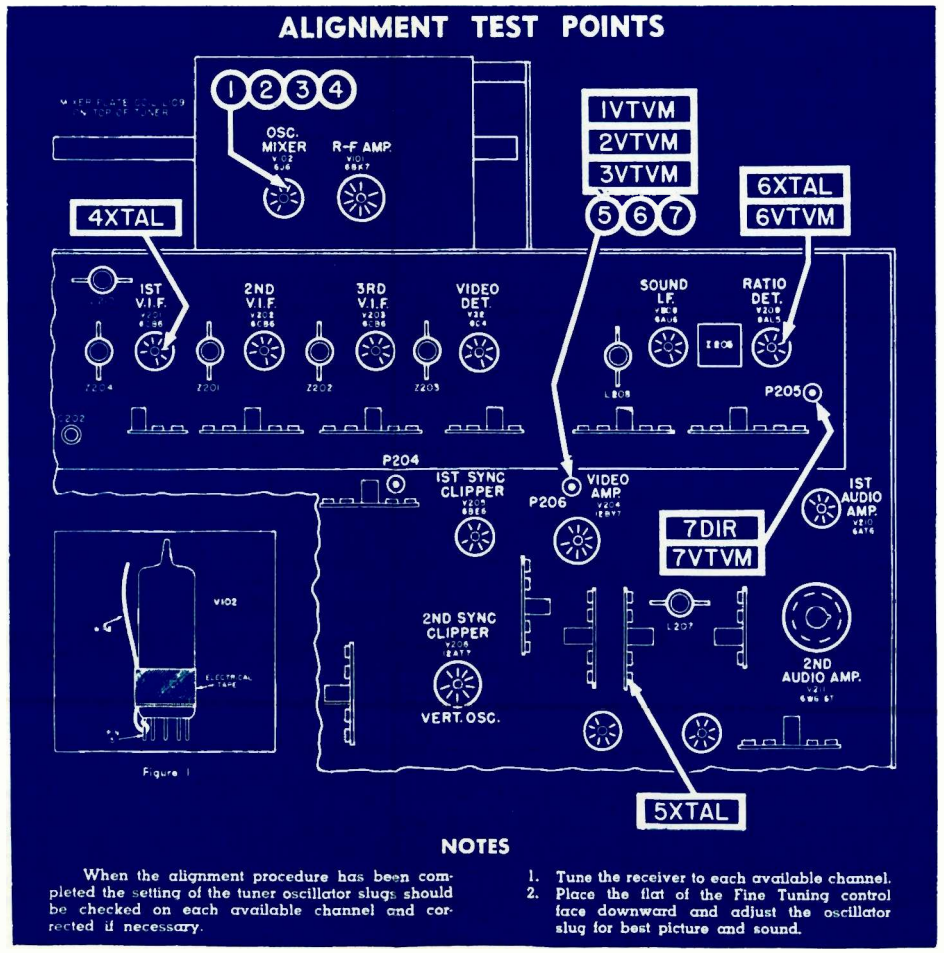


Figure 1

NOTES

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

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

VIDEO IF ALIGNMENT RA-306/307

Place STATION SELECTOR between channels to disable oscillator. Remove the Horizontal Deflection Amplifier, V214, and Damper, V215. Connect a short length of wire to pin 5 of V102 (see figure 1). Use the lowest VTVM range for all steps.

Step	Signal Generator Frequency	Signal Generator Connect to	Output Indicator	Connect to	Adjust
1	44.0 MC No Sweep	Pin 5, V102 (1)	VTVM	P206 (Pin 2, V204) 1VTVM	Z203 for maximum reading. Set signal generator output to maintain reading on lowest range of VTVM.
2	42.35 MC No Sweep	As Above (2)	VTVM	As Above 2VTVM	Z202 for maximum reading.
3	44.85 MC No Sweep	As Above (3)	VTVM	As Above 3VTVM	Z201 for maximum reading.
4	43.5 MC Center Freq. 10 MC deviation	As Above (4)	Oscillograph through XTAL	Pin 5, V201 4XTAL	C202 for 41.25 MC trap. Mixer plate coil (L109) and Z204 (top) for 45.75 MC marker. Z204 (bottom) for 42.25 MC marker. L210 for 47.25 MC trap.
5	4.5 MC 400 CPS AM	P206 (Pin 2, V204) (5)	Oscillograph through XTAL	Junction of R217, R220, and C216. 5XTAL	L207 for minimum reading.
SOUND IF ALIGNMENT					
6	4.5 MC 1 MC Sweep	P206 (Pin 2, V204) (6)	Oscillograph through XTAL	Pin 5, V209 6XTAL	L208 and Z205 (bottom) for waveform.
7	As Above	As Above (7)	Oscillograph DIRECT	P205 (Junction of C241 & C242) 7DIR	Z205 (top) for waveform.
ALTERNATE SOUND IF ALIGNMENT — USING TV SIGNAL					
6	TV Signal. Teleset must be tuned for best picture.		VTVM	Pin 5, V209 6VTVM	L208 and Z205 (bottom) for maximum reading.
7	As Above		VTVM	P205 (Junction of C241 & C242) 7VTVM	Z205 (top) for null point.

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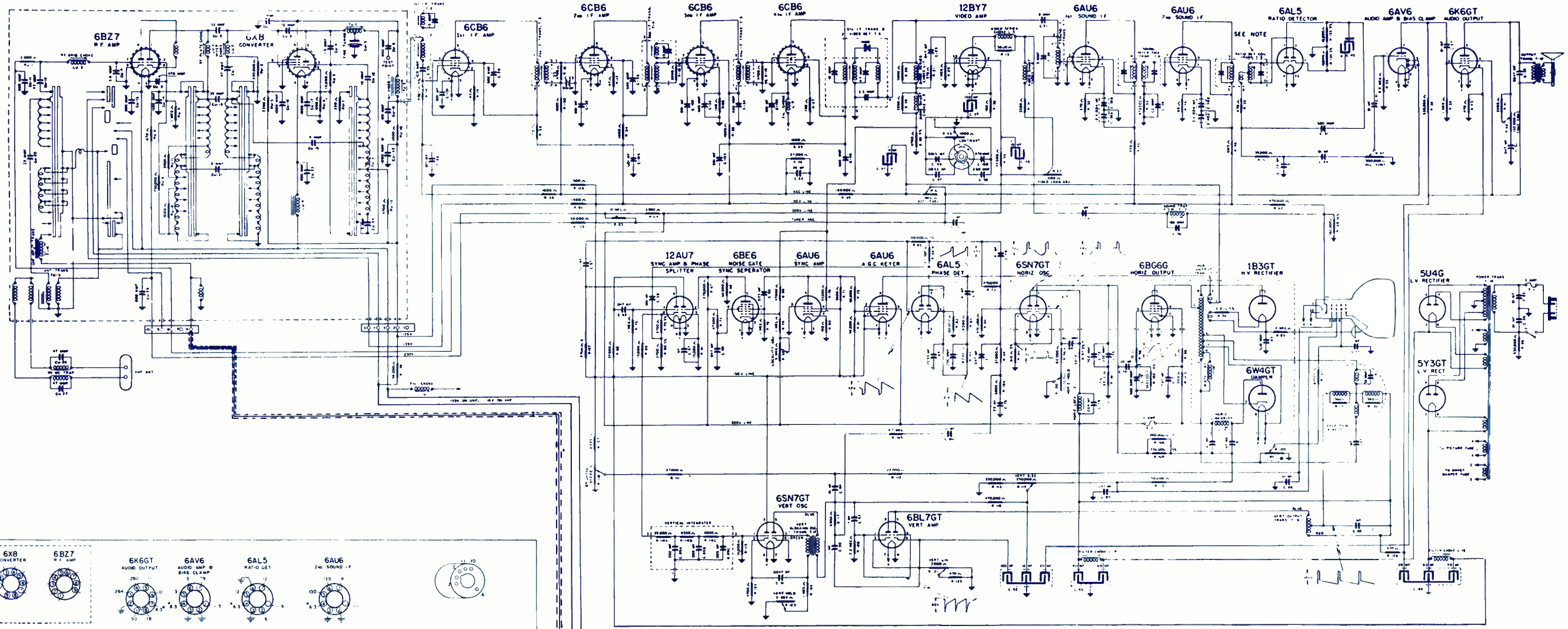

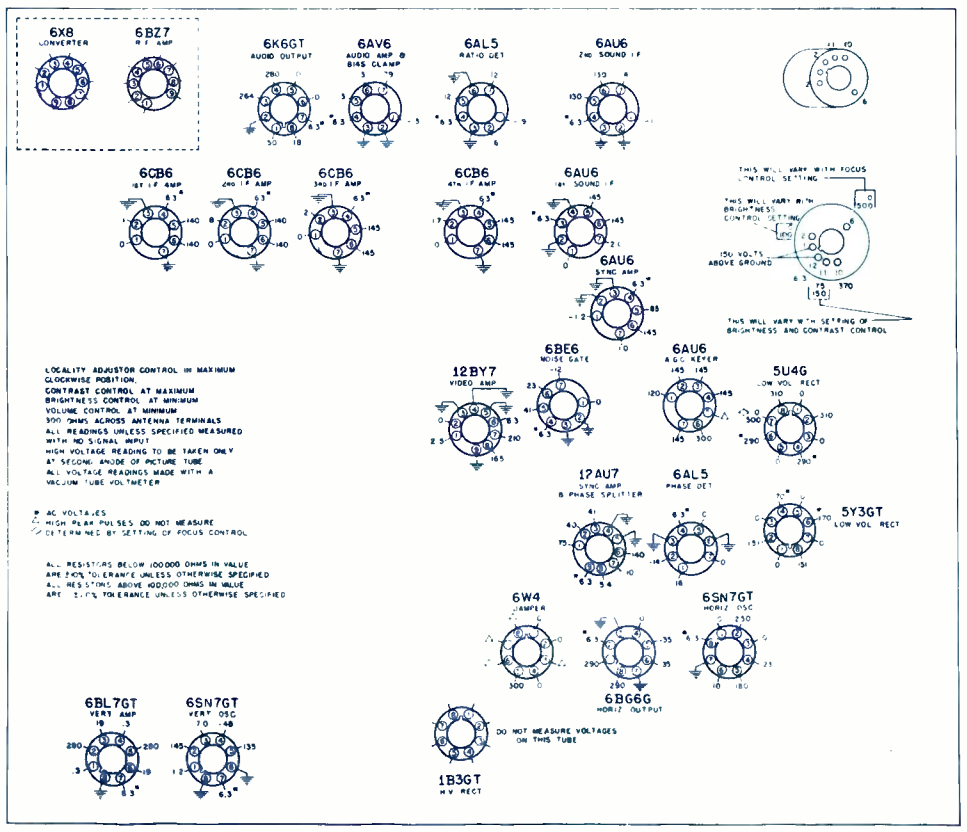

STRINGING OF UHF PULLEYS

BOTH UHF pulleys must be in the extreme clockwise position before stringing pulley.

The string should be fastened to the ends of the spring so that it measures 34¾ inches end to end with no tension on spring.

Stringing is simplified by using both hands. Place center of tension spring into notch of UHF pulley No. 1. Bring string out of opening of pulley. Grasp the string with right and left hand as indicated in figure 7.

With the right hand make a complete turn around UHF pulley No. 1 in a counter-clockwise direction, then make a half turn around UHF pulley No. 2 in a counter-clockwise direction, then continue in a clockwise direction around the idler wheel shaft making 3½ turns, follow back around the UHF pulley No. 2 in a counter-clockwise direction making 1½ turns, to complete the stringing.

Turn the FINE TUNING SHAFT only until the strings are properly seated.

If the UHF pulleys do not come to a stop in the opposite directions simultaneously, turn the UHF pulley No. 2 until it does so.

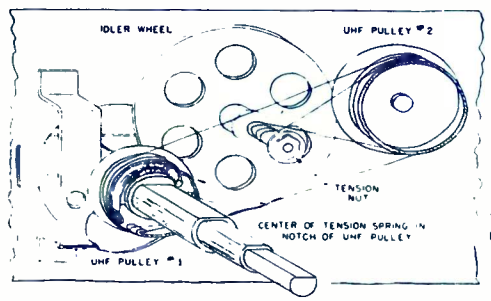

FIG. 7

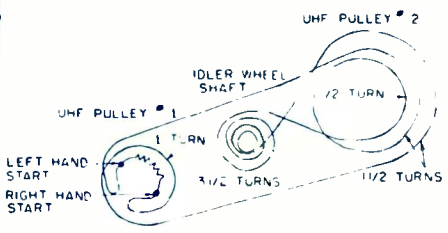

FIG. 8

Models: 1U-581, 1U-582, 1U-584, 1U-585

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SENTINEL
Models 1U-581, 2, 4, 5

Technician
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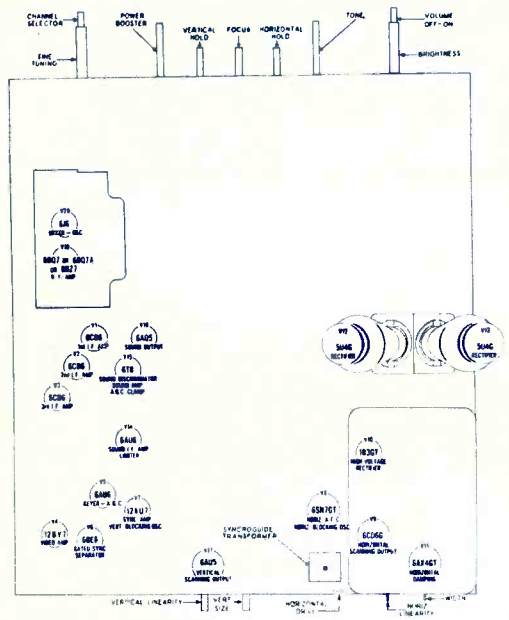
January • 1954



REAR OF CHASSIS

VOLTAGE MEASUREMENTS

All voltages measured with a 20,000 Ohm per volt meter with the receiver connected to a 117 volt 60 cycle power supply.

Tuner set to an inactive channel with antenna terminals shorted and connected to ground.

Controls set for normal reception—Power Booster control completely counterclockwise.

Voltages marked with an asterisk (*) will vary widely with control settings.

No voltage reading at a tube element indicates zero voltage or voltage which cannot be accurately measured with a 20,000 Ohm per volt meter.

PRODUCTION CHANGES

The following tabulation furnishes complete details on changes which occurred during receiver production. The receivers incorporating these changes are identified by coding stamped on rear surface of chassis. The coding consists of one or more letters following the word SERIES, as SERIES B, SERIES AC, etc., and corresponds to similarly lettered changes shown below. Chassis incorporate only that change indicated by letter designation; i.e., chassis stamped "SERIES BE" does not include changes "A" or "C" or "D".

The circuit shown on this page applies to "SERIES ABCD" chassis

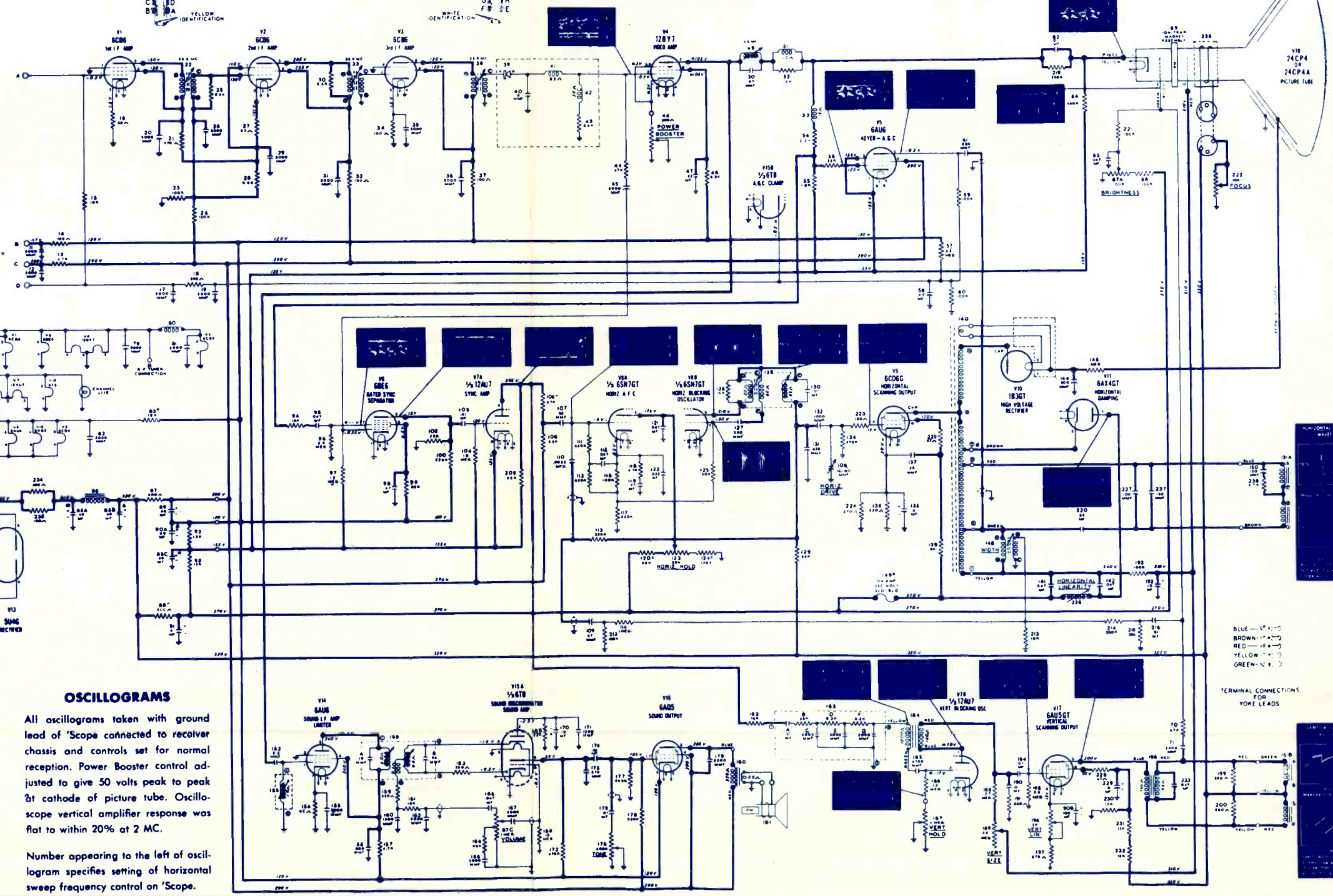
A letter following the component circuit diagram number thus—201A, indicates that this particular item was affected by a circuit change. The letter corresponds to the series code letter listed in the production change column, from which complete change information can be obtained.

LETTER DESIGNATION	DESCRIPTION OF CHANGE
UNCODED	INITIAL PRODUCTION
"A"	The following change was incorporated to improve sync. stability in the presence of electrical interference or weak signal. 1. Disconnect resistor 94 (18,000 Ohms) from the plate of tube V4-12BY7 (Video Amp.) and reconnect it to the junction of rasistors 54 (2200 Ohms) and 55 (1800 Ohms) located in plate load circuit of tube V4. Note: The sound take-off for tube V14 (Sound I.F. Amp.) remains connected to the plate of tube V4 (Video Amp.) The following change was incorporated to provide for adequate width of the picture under the condition of low line voltage. 1. Change resistor 88 in 270 volt supply from 400 Ohms to 200 Ohms. The following change was incorporated to provide a greater margin of safety for the plate load resistor of tube V7A (12AU7). 1. Change resistor 105 located in plate circuit of tube V7A (Sync. Amp.) from 4700 Ohms ½ watt to 4700 Ohms 1 watt.

LETTER DESIGNATION	DESCRIPTION OF CHANGE
UNCODED	INITIAL PRODUCTION
"B"	The following change was incorporated to protect resistor 88, located in the 270 volt supply, in the event of abnormal current drain in the high voltage system. 1. Change fuse 149 in the horizontal sweep circuit from a ½ Amp. 250 volt to a ¼ Amp. "Slow Blow" 250 volt.
"C"	The following changes were incorporated to improve the range of the horizontal hold control. 1. Change resistor 120, located in the plate circuit of tube V7A (Horiz. A.F.C.) from 22,000 Ohms to 68,000 Ohms. 2. Change resistor 124 located in the plate circuit of tube V7A (Horiz. A.F.C.) from 68,000 Ohms to 120,000 Ohms. The above change should only be undertaken when the letter "A" is included in the SERIES designation at rear of chassis.
"D"	The following change was incorporated to protect the filament winding of power transformer 76 that connects to the 6AX4GT (Horiz. Damping) in the event this tube develops a cathode to filament short. 1. Change resistor 83, located in filament supply, from 100,000 Ohms to 18,000 Ohms.

1st & 2nd I.F. Coil 520977

3rd I.F. Coil 520979



OSCILLOGRAMS

All oscillograms taken with ground lead of 'Scope connected to receiver chassis and controls set for normal reception. Power Booster control adjusted to give 50 volts peak to peak at cathode of picture tube. Oscilloscope vertical amplifier response was flat to within 20% at 2 MC.

Number appearing to the left of oscillogram specifies setting of horizontal sweep frequency control on 'Scope.

STEWART-WARNER
Models 24C-9370A, 24C-9370AB

Technician
CIRCUIT DIGEST
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TECHNICIAN
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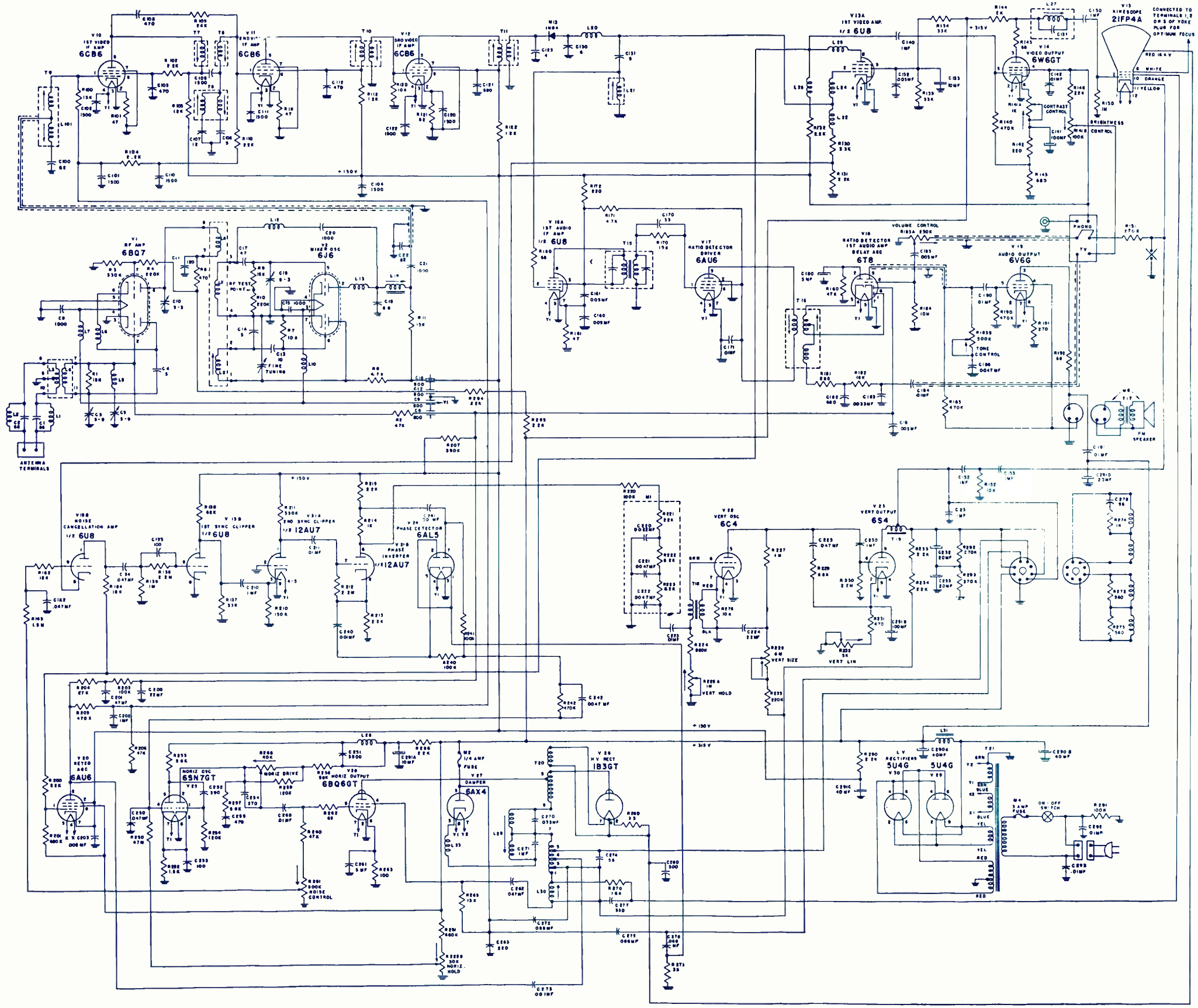

TUBE VOLTAGE CHART

1. Measurements are made at 117 volts line using vacuum tube voltmeter. All voltages are D.C. and are positive with respect to chassis ground except where noted.
2. Contrast and brightness set for normal picture (strong signal area).

			PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V-10	6CB6	1st VIDEO I.F.	—3.66	.09	AC 6.3	AC 6.3	134	144	Gnd		
V-11	6CB6	2nd VIDEO I.F.	—3.46	.08	AC 6.3	AC 6.3	125	144	Gnd		
V-12	6CB6	3rd VIDEO I.F.	0	1.28	AC 6.3	AC 6.3	110	128	Gnd		
V-13	6U8	1st VIDEO AMP. & 1st SYNC. CLIPPER	42.2	—1.32	104	AC 6.3	Gnd	129	Gnd	Gnd	—7.96
V-14	6W6	2nd VIDEO AMP.	9.8	AC 6.3	274	146	9.26	528	Gnd	25	
V-16	6U8	1st AUDIO I.F. & NOISE CANCEL	128	0	141	Gnd	AC 6.3	140	.78	—.36	—21.2
V-17	6AU6	RATIO DET. DRIVER	—11.2	Gnd	Gnd	AC 6.3	107	113	Gnd		
V-18	6T8	RATIO DET.	—15.8	—37.4	—2.46	Gnd	AC 6.3	—3.7	Gnd	—.76	64.4
V-19	6V6	AUDIO OUTPUT	NC	Gnd	234	257	.05	NC	AC 6.3	12	
V-20	6AU6	KEYED AGC	134	144	144	144	—37	316	144		
V-21	12AU7	PHASE INVERTER & 2nd SYNC. CLIPPER	41.8	Gnd	15.6	AC 6.3	AC 6.3	116	13.4	20.6	Gnd
V-22	6C4	VERT. OSC.	NC	NC	Gnd	AC 6.3	128	—28.5	0		
V-23	6S4	VERT. AMP.	NC	23.2	NC	0	AC 6.3	.11	NC	NC	458
V-24	6AL5	PHASE DET.	0	0	Gnd	AC 6.3	14.8	NC	—13.6		
V-25	6SN7	HORIZ. OSC.	—14.6	156	11.6	1.64	264	11.6	AC 6.3	Gnd	
V-26	6BQ6	HORIZ. AMP.	161	Gnd	NC	139	—23.4	—23.4	AC 6.3	10	
V-27	6AX4	DAMPER	NC	NC	565	NC	316	563	AC 6.3	Gnd	
V-29	5U4	L.V. RECTIFIER	NC	335	NC	Plate	NC	Plate	NC	335	
V-30	5U4	L.V. RECTIFIER	NC	335	NC	Plate	NC	Plate	NC	335	
V-15	21FP4A	KINESCOPE	Gnd	313	474	BF	522	Gnd	468	465	—

TUNER Blue Lead — Plate RF 245 Volts
TUNER Red Lead — B+ to Conv 115 Volts

Note — NC No connection

GENERAL ASSEMBLY

DESCRIPTION	TM	TO	CM	CO	CDM	CDO	CSM
BACK PANEL ASSEMBLY	101230	101230	101230	101230	101230	101230	101230
BRACKET—SPEAKER	105396	105396					
BULLET CATCH					81889	81889	81889
CABINET	108306	108307	108304	108305	108302	108303	See Table I
CASTER			147047	147047	147047		147047
CHASSIS ASSEMBLY	112163	112163	112163	112163	112163	112163	112163
CLAMP—LENS	113090	113100	113090	113100			
DECAL	121076	121076	121076	121076	121075	121076	121075
DOOR PULL						132223	
GLIDER—FEET	81890	81890	81890	81890	81890	81890	81890
GRILLE CLOTH	81897	81896	81898	81899	81902	81903	See Table I
HINGE—R. H. DOOR					132186	132186	132083 Upper 132091 Lower
HINGE—L. H. DOOR					132187	132187	132084 Upper 132092 Lower
KNOB—TUNING	134195	134195	134195	134195	134195	134195	See Table II
KNOB—CHANNEL INDICATOR	134198	134206	134198	134206	134198	134206	See Table II
KNOB—TONE	134196	134196	134196	134196	134196	134196	See Table II
KNOB—VOLUME	134199	134207	134199	134207	134199	134207	See Table II
KNOB—OUTER	134202	134204	134202	134204	134202	134204	See Table II
KNOB—INNER	134201	134203	134201	134203	134201	134203	See Table II
LENS	138037	138037	138037	138037	138037	138037	138037
MASK	174042	174043	174042	174043	174042	174042	174044
NUT—SPEAKER MTG.			163182	163182	163182	163182	163182
NUT—"T"—LENS CLAMP	163113	163113	163113	163113			
ORNAMENT—DOOR						132220	
PAD	133126	133126	133126	133126	133126	133126	133126
SCREW—CHASSIS MTG.	203549	203549	203549	203549	203549	203549	203549
SCREW—LENS CLAMP	163202	163205	163202	163205			
SCREW—BACK PANEL	521076	521076	521076	521076	521076	521076	521076
SCREEN—CHASSIS SHELF	130194	130194	130194	130194	130194	130194	130194
SOCKET—CASTER			81905	81905	81905	81905	81905
SPEAKER ONLY	155730	155730	155730	155730	155730	155730	155730
SPEAKER ASSEMBLY	155734	155734	155735	155735	155735	155735	155735
STRIP LENS EDGE	105411	105411	105411	105411	105411	105411	See Table I
TABS	146563	146581	146563	146581	146563	146581	See Table I

Table I

Cabinet		Doors	Grille Cloth	Mask	Tabs	Strip Lens Edge
CSM	108308		81900	174042	146562	105411
CSO	108309		81901	174043	146581	105411
CSE	108310		81906	174044	146582	105413
CS1	108330		81904	174044	146582	105413
CS8	108329		81904	174044	146582	105413

Table II

Knobs	Yellow	Brown	Black
Tuning	134195	134195	134195
Channel Ind.	134206	134198	134209
Tone	134196	134196	134196
Volume	134207	134199	134210
Outer	134204	134202	134212
Inner	134203	134201	134211

STROMBERG-CARLSON
Chassis 621A series

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CIRCUIT DIGESTS

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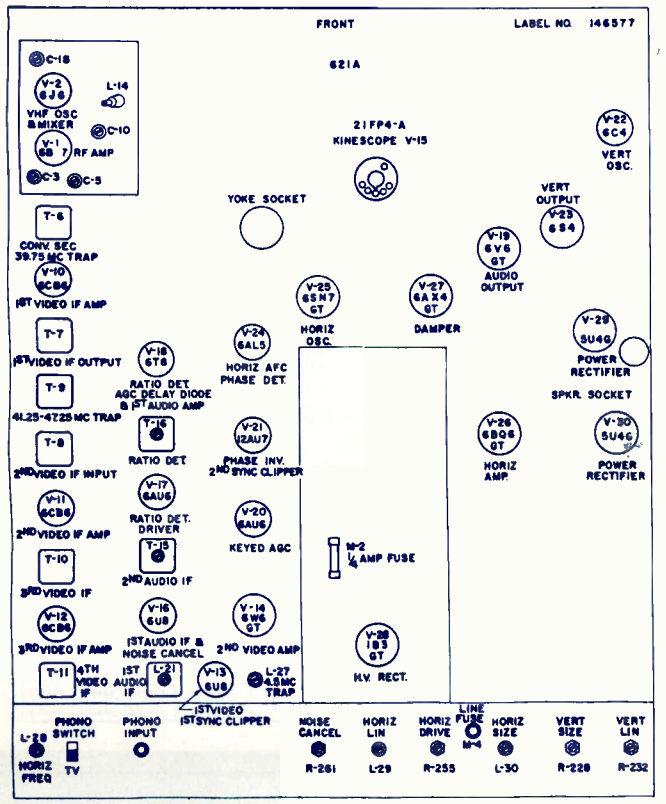

ALIGNMENT PROCEDURE

Apply A.G.C. bias of approximately—2 V to A.G.C. line (across C-202). Maintain the output level of the sweep generator such that the second detector output is 2 volts peak to peak. Scope Cal. 1-V per inch.

NOTE—USE A NON-METALLIC ALIGNING TOOL AND LIGHT PRESSURE ON ALL SLUGS.

Signal Generator Connection	Oscilloscope or VTVM Connection	Adjustments
1. Output of 40mc Sweep Generator to grid of 3rd I.F. Tube, pin 1 of 6CB6 V-12 thru 100 MMF isolating capacitor	Input of scope to grid of Video Amplifier pin 2 of 6U8 V-13 thru 47K ohm isolating resistor	1. Adjust top and bottom of T-11 for marker positions as shown on curve Figure 1.
2. Output of 40mc Sweep Generator to grid of 2nd I.F. Tube, pin 1 of 6CB6 V-11 thru 100 MMF isolating capacitor	Same as Step #1	1. Adjust top and bottom of T-10 for marker positions as shown on curve Figure 2.
3. Output of 40mc Sweep Generator to grid of 1st I.F. Tube, pin 1 of 6CB6 V-10 thru 100 MMF isolating capacitor.	Same as Step #1.	1. Adjust top of T-9 for marker position of 47.25mc. 2. Adjust bottom of T-9 for marker positions of 41.25mc. 3. Adjust bottom of T-8 for marker position at 39.75mc. 4. Adjust bottom of T-7 and T-8 to produce curve as shown on Figure 3.
4. Raise converter tube shield from ground and connect output of 40mc. sweep generator to the shield.	Same as Step #1.	1. Adjust top of T-6 and L-4 on tuner (L-14 on standard coil tuner) assembly to produce a curve as shown on Figure 4.
5. Connect a 400 cycle modulated 4.5mc. signal to the junction of Video detector M-13 and C-130. Adjust generator output to a level to indicate 1.5 Volts on VTVM.	Connect 2-100 resistors in series from plate of ratio detector pin 2 of V-18, 6T8 to ground. Connect VTVM from junction of the 2-100K resistors to ground.	1. Adjust L-21, T-15 and bottom slug of T-16 for maximum indication.
6. Same as Step #5.	Connect — VTVM ground lead to the junction of the 2-100K resistors (see 5 above). Connect VTVM D.C. lead to the junction of C-165 and R-188.	1. Adjust the secondary (Top slug) of T-16 for zero volts between the positive and negative excursions. (Increase Generator output for good deflection).

FIG. 1 — 45.75 / 41.90 / 90%

FIG. 2 — 45.75 / 41.90 / 80% / 90%

FIG. 3 — 49.25 / 39.75 / 41.25 / 45.75 / 41.90 / 50%

FIG. 4 — 45.75 / 41.90

Alternate Trap Alignment

IF THIS METHOD IS USED, IT SHOULD BE PERFORMED BEFORE THE I.F. CURVE ALIGNMENT

Signal Generator Connection	Oscilloscope or VTVM Connection	Adjustments
1. Connect a modulated (400 cycle) 39.75mc. signal to grid, pin 1 of the 1st video I.F. Tube—V-10.	Same as Step #1.	1. Adjust bottom of T-6 for minimum response on scope.
2. Connect a modulated (400 cycle) 41.25mc. signal to the grid, pin 1 of 1st video I.F. Tube 6CB6—V-10.	Same as Step #1.	1. Adjust bottom of T-9 for minimum response on scope.
3. Connect a modulated (400 cycle) 47.25mc. signal to grid, pin 1 of 1st video I.F. Tube 6CB6—V-10.	Same as Step #1.	1. Adjust top of T-9 for minimum response on scope.

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STROMBERG-CARLSON 621A TELEVISION RECEIVER

PARTS LIST

TUBES

Circuit Symbol	S-C Part No.	Description
V-1	162100	6BQ7 RF Amplifier
V-2	162118	6J6 Converter
V-3		
V-10	162092	6CB6 1st I.F. Amplifier
V-11	162092	6CB6 2nd I.F. Amplifier
V-12	162092	6CB6 3rd I.F. Amplifier
V-13	162171	6U8 1st Video Amplifier and 1st Sync Clipper
V-14	162101	6W6GT Video Output
V-15	162169	21FP4A Kinescope
V-16	162171	6U8 1st Audio I.F. Amplifier and Noise Cancellation Amp.
V-17	162033	6AU6 Ratio Detector Driver
V-18	162077	6T8 Ratio Detector and 1st Audio Amplifier
V-19	162136	6V6GT Audio Output
V-20	163032	6AU6 Keyed AGC
V-21	162042	12AU7 2nd Sync Clipper and Phase Inverter
V-22	162030	6C4 Vertical Oscillator
V-23	162173	6S4 Vertical Output
V-24	163022	6AL5 Phase Detector
V-25	162018	6SN7GT Horizontal Oscillator
V-26	162174	6BQ6GT Horizontal Output
V-27	162161	6AX4 Damper
V-28	162029	1B3GT H.V. Rectifier
V-29	162107	5U4G L.V. Rectifier
V-30	162107	5U4G L.V. Rectifier

COILS

Circuit Symbol	S-C Part No.	Description
L-1	171280	40Mc Trap
L-2	171280	40Mc Trap
L-3	See T-1	VHF and UHF Antenna Coil
L-4	See T-1	VHF and UHF Antenna Coil
L-5	171281	40Mc Trap
L-6	171224	Cathode Choke
L-7	171220	Filament Choke
L-8	See T-1	VHF and UHF Oscillator Coil
L-9	See T-1	VHF and UHF Oscillator Coil
L-10	171227	Filament Choke
L-11	See T-1	VHF and UHF Oscillator Coil
L-12	171282	Neutralizing Coil
L-13	171283	Mixer Plate Coil
L-14	171284	I.F. Output Adjust
L-15		
L-16		
L-17		
L-18		
L-19		
L-20	114747	40Mc Rejection
L-21	114400	1st Audio I.F.
L-22	114748	Peaking Coil
L-23		
L-24	114749	Peaking Coil
L-25	114750	Peaking Coil
L-26	114751	Peaking Coil
L-27	114415	4.5Mc Trap
L-28	114069	Horizontal Oscillator
L-29	114084	Horizontal Linearity
L-30	114083	Horizontal Size
L-31	161030	Filter Choke
L-32	114741	Deflection Yoke
L-33	114693	2.2uh Choke
L-34		
L-35		
L-101	See T-6	39.75Mc Trap
L-102	See T-9	41.25Mc Trap
L-103	See T-9	47.25Mc Trap
L-104		

TRANSFORMERS

Circuit Symbol	S-C Part No.	Description
T-1	171502 thru 171583	VHF and UHF Antenna and Oscillator Trans.
T-6	171246	Converter Secondary and 39.75Mc Trap
T-7	171247	1st Video I.F. Output
T-8	171248	2nd Video I.F. Input
T-9	171249	41.25Mc and 47.25Mc Trap
T-10	171250	3rd Video I.F.
T-11	171251	4th Video I.F.
T-12		
T-13		
T-14		
T-15	114401	2nd Audio I.F.
T-16	114375	Ratio Detector
T-17	See M-8	Audio Output
T-18	161254	Vertical Blocking
T-19	161252	Vertical Output
T-20	161046	Horizontal Output
T-21	161445	Power Transformer

MISCELLANEOUS

Circuit Symbol	S-C Part No.	Description
M-1	128200	Circuit Network
M-2	128003	Fuse, ¼ Amp.
M-3	158037	Slide Switch
M-4	128007	Fuse, 5 Amp.
M-5		
M-6	34421	Phono Jack
M-7	128203	I.F. Strip
M-8	155734	Speaker Assembly
M-9		
M-10		
M-11	164022	Tuning Unit
M-12		
M-13	162157	1N64 Crystal Diode
M-14		

RESISTORS

Circuit Symbol	S-C Part No.	Resistance	Watt	Tol.
R-1	28172	15K ohms	½ W	10%
R-2	149111	47K ohms	½ W	20%
R-3	28185	330K ohms	½ W	10%
R-4	28183	220K ohms	½ W	10%
R-5				
R-6	149099	470 ohms	½ W	20%
R-7	28170	10K ohms	½ W	10%
R-8	28166	4.7K ohms	½ W	10%
R-9	28172	15K ohms	½ W	10%
R-10	149115	220K ohms	½ W	10%
R-11	28172	15K ohms	½ W	10%
R-12				
R-13				
R-100	28170	15K ohms	½ W	10%
R-101	28142	47 ohms	½ W	10%
R-102	149103	2.2K ohms	½ W	20%
R-103	28159	1.2K ohms	½ W	10%
R-104	149103	2.2K ohms	½ W	20%
R-105	171238	24K ohms	½ W	5%
R-106				
R-110	149384	22K ohms	½ W	10%
R-111	28142	47 ohms	½ W	10%
R-112	28159	1.2K ohms	½ W	10%
R-120	28170	10K ohms	½ W	10%
R-121	28145	82 ohms	½ W	10%
R-122	28159	1.2K ohms	½ W	10%
R-130	28164	3.3K ohms	½ W	10%
R-131	28162	2.2K ohms	½ W	10%
R-132	28162	2.2K ohms	½ W	10%
R-133	149404	33K ohms	1 W	10%
R-134	149012	82K ohms	2 W	10%
R-135	149119	1 Megohm	½ W	20%
R-136	149121	2.2 Megohms	½ W	20%
R-137	28175	33K ohms	½ W	10%
R-138	28179	68K ohms	½ W	10%
R-139				
R-140	149117	470K ohms	½ W	20%
R-141	145140	1K-100K ohms	Dual Pot.	
R-142	149134	220 ohms	1 W	20%
R-143	149094	68 ohms	½ W	20%
R-144	149411	2K ohms	7 W	10%
R-145	149075	680 ohms	2 W	20%
R-146	149109	22K ohms	½ W	20%
R-147				
R-150	149119	1 Megohm	½ W	20%
R-151	28184	270K ohms	½ W	10%
R-152	149107	10K ohms	½ W	20%
R-153				
R-154				
R-160	149094	68 ohms	½ W	20%
R-161	149093	47 ohms	½ W	10%
R-162	28173	18K ohms	½ W	10%
R-163	149120	1.5 Megohms	½ W	20%
R-164	28173	18K ohms	½ W	10%
R-165				
R-170	149108	15K ohms	½ W	20%
R-171	149142	4.7K ohms	1 W	20%
R-172	149097	220 ohms	½ W	20%
R-173				
R-180	149111	47K ohms	½ W	20%
R-181	149097	220 ohms	½ W	20%
R-182	28173	18K ohms	½ W	10%
R-183	145148	250K-500K ohms	Dual Pot.	
R-184	149125	10 Megohms	½ W	20%
R-185	149117	470K ohms	½ W	20%
R-186				
R-190	149117	470K ohms	½ W	20%
R-191	149014	270 ohms	2 W	10%
R-192	149094	68 ohms	½ W	20%
R-193	149420	1250 ohms	5 W	10%
R-194				
R-200	149384	22K ohms	½ W	10%
R-201	28189	680K ohms	½ W	10%
R-202				
R-203	149113	100K ohms	½ W	20%
R-204	149403	27K ohms	1 W	10%
R-205	28187	470K ohms	½ W	10%
R-206	149111	47K ohms	½ W	20%
R-207	28186	390K ohms	½ W	10%
R-208				
R-210	149114	150K ohms	½ W	20%
R-211	28185	330K ohms	½ W	10%
R-212	149121	2.2 Megohms	½ W	20%
R-213	28162	2.2K ohms	½ W	10%
R-214	28158	1K ohms	½ W	10%
R-215	28162	2.2K ohms	½ W	10%
R-216	149114	150K ohms	½ W	20%
R-220	149113	100K ohms	½ W	20%
R-221	See M-1	22K ohms		
R-222	See M-1	8200 ohms		
R-223	See M-1	8200 ohms		
R-224	28190	820K ohms	½ W	10%
R-225	145146	1 Megohm-50K ohms	Dual Pot.	
R-226	149107	10K ohms	½ W	20%
R-227	28191	1 Megohm	½ W	10%
R-228	145100	6 Megohms	Pot.	
R-229	28168	6.8K ohms	½ W	10%
R-230	149121	2.2 Megohms	½ W	20%
R-231	149136	470 ohms	1 W	20%
R-232	145079	5K ohms	Pot.	
R-233	149078	2.2K ohms	2 W	20%
R-234	149078	2.2K ohms	2 W	20%
R-235	149115	220K ohms	½ W	20%
R-236				
R-240	149385	100K ohms	½ W	10%
R-241	149385	100K ohms	½ W	10%
R-242	149117	470K ohms	½ W	20%
R-243				
R-250	149123	4.7 Megohms	½ W	20%
R-251	28189	680K ohms	½ W	10%
R-252	149287	1.5K ohms	½ W	5%
R-253	149184	5.6K ohms	1 W	10%
R-254	28181	120K ohms	½ W	10%
R-255	145150	40K ohms	Pot.	
R-256	28179	68K ohms	½ W	10%
R-257	28167	5.6K ohms	½ W	10%
R-258	149103	2.2K ohms	½ W	20%
R-259	28181	120K ohms	½ W	10%
R-260	149111	47K ohms	½ W	20%
R-261	145147	500K ohms	Pot.	
R-262	149094	68 ohms	½ W	20%
R-263	149070	100 ohms	2 W	20%
R-264	149094	68 ohms	½ W	20%
R-265	33912	15K ohms	5 W	10%
R-266				
R-270	28161	1.8K ohms	½ W	10%
R-271	149161	33 ohms	1 W	10%
R-272	28155	560 ohms	½ W	10%
R-273	28155	560 ohms	½ W	10%
R-274	149101	1K ohm	½ W	20%
R-275				
R-280	149419	3.3 ohms	½ W	20%
R-281				
R-290	149433	2.2K ohms	25 W	10%
R-291	149113	100K ohms	½ W	20%
R-292	28184	270K ohms	½ W	10%
R-293	28184	270K ohms	½ W	10%
R-294	149078	2.2K ohms	2 W	20%
R-295	149078	2.2K ohms	2 W	20%

CAPACITORS

Circuit Symbol	S-C Part No.	Capacity	Type	Voltage
C-1	171277	68 MMF	Ceramic	
C-2	171277	68 MMF	Ceramic	
C-3	171213	3-9 MMF	Trimmer	
C-4	171225	3 MMF	Ceramic	
C-5	171213	3-9 MMF	Trimmer	
C-6	171218	800 MMF	Ceramic	
C-7	171226	800 MMF	Ceramic	
C-8	171227	1000 MMF	Ceramic	
C-9	171218	800 MMF	Ceramic	
C-10	171212	.5-3 MMF	Trimmer	
C-11	171278	120 MMF	Disc Ceramic	
C-12	171218	800 MMF	Ceramic	
C-13	171233	10 MMF	Ceramic	
C-14	171231	5 MMF	Ceramic	
C-15	171233	1000 MMF	Ceramic	
C-16	171218	800 MMF	Ceramic	
C-17	171230	47 MMF	Ceramic	
C-18	171212	.5-3 MMF	Trimmer	
C-19	171234	6.8 MMF	Ceramic	
C-20	171233	1000 MMF	Disc Ceramic	
C-21	171233	1000 MMF	Disc Ceramic	
C-22	171279	82 MMF	Ceramic	
C-23				
C-100	171239	8.2 MMF	Ceramic	
C-101	171240	1500 MMF	Ceramic	
C-102	171240	1500 MMF	Ceramic	
C-103	171241	470 MMF	Ceramic	
C-104	171240	1500 MMF	Ceramic	
C-105	171241	470 MMF	Ceramic	
C-106	171240	1500 MMF	Ceramic	
C-107	171242	12 MMF	Ceramic	
C-108	171243	5 MMF	Ceramic	
C-109				
C-110	171240	1500 MMF	Ceramic	
C-111	171240	1500 MMF	Ceramic	
C-112	171241	470 MMF	Ceramic	
C-113				
C-120	171240	1500 MMF	Ceramic	
C-121	171244	680 MMF	Ceramic	
C-122	171240	1500 MMF	Ceramic	
C-123	171245	4 MMF	Ceramic	
C-124				
C-130	110598	5 MMF	Ceramic	350
C-131	110598	5 MMF	Ceramic	350
C-132	110586	.005 MF	Disc Ceramic	450
C-133	111106	10 MF	Electrolytic	250
C-134	110722	.047 MF	Tubular	400
C-135	110480	100 MMF	Ceramic	500
C-136				
C-140	110724	.1 MF	Tubular	400
C-141	111107	100 MF	Electrolytic	50
C-142	110672	.01 MF	Disc Ceramic	450
C-150	110724	.1 MF	Tubular	400
C-151	110459 (See L-27)	68 MMF	Ceramic	500
C-152	110743	.1 MF	Tubular	600
C-153	110724	.1 MF	Tubular	400
C-154				
C-160	110586	.005 MF	Disc Ceramic	450
C-161	110586	.005 MF	Disc Ceramic	450
C-162	110708	.047 MF	Tubular	200
C-163				
C-170	110486	33 MMF	Ceramic	400
C-171	110672	.01 MF	Ceramic	450
C-172				
C-180	111093	5 MF	Electrolytic	30
C-181	110586	.005 MF	Disc Ceramic	450
C-182	110465	680 MMF	Ceramic	350
C-183	110715	.0033 MF	Tubular	400
C-184	110718	.01 MF	Tubular	400
C-185	110586	.005 MF	Disc Ceramic	450
C-186	110735	.0047 MF	Tubular	600
C-187				
C-190	110737	.01 MF	Tubular	600
C-191	110737	.01 MF	Tubular	600
C-192				
C-200	110707	.22 MF	Tubular	200
C-201	110533	.47 MF	Tubular	200
C-202	110823	1 MF	Tubular	100
C-203	110586	.005 MF	Disc Ceramic	450
C-204				
C-210	110724	.1 MF	Tubular	400
C-211	110718	.01 MF	Tubular	400
C-212				
C-220	See M-1	.0022 MF		
C-221	See M-1	.0047 MF		
C-222	See M-1	.0047 MF		
C-223	110718	.01 MF	Tubular	400
C-224	110745	.22 MF	Tubular	600
C-225	110741	.047 MF	Tubular	600
C-226				
C-230	110743	.1 MF	Tubular	600
C-231	110743	.1 MF	Tubular	600
C-232	111089	20 MF	Electrolytic	300
C-233	111089	20 MF	Electrolytic	300
C-234				
C-240	110534	.001 MF	Tubular	400
C-241	110534	.001 MF	Tubular	400
C-242	110716	.0047 MF	Tubular	400
C-243				
C-250	110722	.047 MF	Tubular	400
C-251	110309	3900 MMF	Mica	500
C-252	110262	390 MMF	Mica	500
C-253	110291	100 MMF	Mica	500
C-254	110260	270 MMF	Mica	500
C-255	110263	470 MMF	Mica	500
C-256				
C-260	110737	.01 MF	Tubular	600
C-261	111093	5 MF	Electrolytic	50
C-262	110741	.047 MF	Tubular	600
C-263	110207	220 MMF	Mica	500
C-264				
C-270	110721	.033 MF	Tubular	400
C-271	110724	.1 MF	Tubular	400
C-272	110723	.068 MF	Tubular	400
C-273	110562	.001 MF	Tubular	1KV
C-274	110819	56 MMF	Ceramic	7KV
C-275	110723	.068 MF	Tubular	400
C-276	110573	.068 MF	Tubular	1KV
C-277	110454	330 MMF	Ceramic	350
C-278	110286	56 MMF	Ceramic	1.5KV
C-279				
C-280	110821	500 MMF	Ceramic	20KV
C-281				
C-290	111095	40-40 MF	Electrolytic	450
C-291	111104	40-20-10 MF 100 MF	Electrolytic	450 50
C-292	110568	.01 MF	Tubular	1KV
C-293	110568	.01 MF	Tubular	1KV

CHASSIS ASSEMBLY

Description	S-C Part No.
Base—Chassis	104072
Beam Bender	114645
Bracket—Tuner Shaft	105325
Bracket—Chassis Mounting Foot	105291
Bracket—H. V. Rectifier—V-28	105400
Bracket—Horizontal Lin. Coil Mounting	105401
Bracket—Horizontal Osc. Coil Mounting	105415
Bracket—Yoke Support	105416
Bracket—Deflection Yoke	105418
Centering Device	114117
Clamp—Tube—2U4G	113043
Connector—Anode	165040
Fastener Unit	163554
Fuse Holder—8 " Line	128006
Fuse Holder—Line Fuse	128008
Grommet—3/8 x 17/64"	131012
Insulation	133120
Nut—Retainer	163134
Nut—Retainer—3/8"-32	163160
Nut—Wing Nut	163175
Nut—#8-32 Steel	525152
Phono Jack	34421
Receptacle—AC	165008
Rivet—.086" x 1/8"	530003
Rivet—.125" x 9/64"	530034
Rivet—.125" x 5/32"	530036
Rivet—.125" x 3/16"	530040
Sems Unit—#8-32 x 1/4"	35746
Screw—#6 x 1/4" Self Tapping	530103
Screw—#8 x 1/4" Self Tapping	530105
Screw—#8 x 3/8" Self Tapping	530111
Shield—Tube—V-17	151126
Shield—Tube—V-13, V-16	151139
Shield—Tube	151158
Shield—Top M. V. Power Supply	151153
Shield—Bottom M. V. Power Supply	151157
Shield—Cover	151164
Socket—Tube—V-14, V-19, V-25, V-26, V-27, V-29, V-30,	152014
Socket—Speaker	152033
Socket—Tube—V-18, V-21	152056
Socket—Tube—V-17	152095
Socket—Tube—V-20, V-22, V-24	152098
Socket—Tube—V-28	152108
Socket—Tube—V-16, V-13	152103
Socket Assembly—Kinescope	152124
Socket Assembly—H. V. Rectifier—V-28	152127
Spring—Kinescope—Ground	156061
Strap—Kinescope Mounting	113103
Switch—Phono (Slide)	158037
Terminal Board—2 Lug—Ground	160086
Terminal Board—2 Lug—Ground—2 Lug	160089
Terminal Board—2 Lug—Ground—3 Lug	160095
Terminal Board—3 Lug—Ground—3 Lug	160097
Terminal Board—4 Lug—Ground	160102
Terminal Board—Ground—3 Lug—Ground—2 Lug	160104
Terminal Board—Ground—5 Lug—Ground—3 Lug	160105
Terminal Board—2 Lug—Ground—6 Lug—Ground—2 Lug	160106
Terminal Board—2 Lug—Ground—4 Lug	160107
Terminal Board—Antenna	160103
Terminal Plate—Socket Mounting—V-17	142157
Terminal Plate—Socket Mounting—V-18, V-21	142158
Washer—1/2" x 15/64"	22938
Washer—#8 Screw	525542
Washer—Lock—#8 Screw	526045

capacitor replacements

FOR SETS OF THE MONTH

CROSLEY CHASSIS 412, 416

Symbol No.	Rating MF @ Volts	Crosley Part No.	Sprague Replacement
C126	5 @ 50	154103-1	TVA-1303
C140	10 @ 300/200+200+30 @ 150	155910-1	R-1438
C142	20 @ 600	156021-1	R-1466
C143	10 @ 50	154104-1	TVA-1304
C148	200 @ 150	155911-1	TVL-1431
C149	200+5 @ 150	155426-1	TVL-2444
C173	10 @ 10	156054	TVA-1204

DUMONT CHASSIS RA-306, 307

Symbol No.	Rating MF @ Volts	Dumont Part No.	Sprague Replacement
C291	5 @ 50	03120960	TVA-1303
C292	10+10 @ 400/40 @ 200/10 @ 50	03124180	TVL-4664
C293	10 @ 350 (Semi-Polarized)	03250421	R-1468
C294	120+40 @ 400	03121080	TVL-2679
C296	4 @ 400	03115080	TVA-1702
N201	Integrator Plate	88000631	101C1

SENTINEL MODELS 1U-581, 1U-582, 1U-584, 1U-585

Symbol No.	Rating MF @ Volts	Sentinel Part No.	Sprague Replacement
C45	10 @ 50	25E66	TVA-1304
C47	4 @ 50	25E23	TVA-1402
C48	10 @ 450	25E70	TVA-1705
C92	10 @ 450/100 @ 50/20 @ 25	25E69	R-1295
C93	60+40 @ 450	25E36	TVL-2770
C94	20 @ 450/60+40 @ 250	25E68	TVA-1705 / TVL-2770
C89, R118	Integrator Plate	23E2023-5	101C1

STEWART-WARNER MODELS 24C-9370A, 24C-9370AB

Symbol No.	Rating MF @ Volts	Stewart-Warner Part No.	Sprague Replacement
85	40+40+40 @ 450	508072	TVA-3787
89	40 @ 300	160095	TVA-1611
90	80 @ 250/100 @ 50	509002	TVL-3722
91	4 @ 450	504719	TVA-1702
135	4 @ 150	520921	TVA-1402
170	10 @ 150	505174	TVA-1406
192	10 @ 600	508680	R-1222
229	8 @ 300	507386	TVA-1603
183	Integrator Plate	508062	101C1 / 5HK-S1

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STROMBERG-CARLSON 621A SERIES

Symbol No.	Rating MF @ Volts	Stromberg-Carlson Part No.	Sprague Replacement
C232	20 @ 300	111089	TVA-1608
C233	20 @ 300	111089	TVA-1608
C261	5 @ 50	111093	TVA-1303
C290	40+40 @ 450	111095	TVL-2764
C291	40+20+10 @ 450/100 @ 50	111104	TVL-4747
M1	Integrator Plate	128200	101C1

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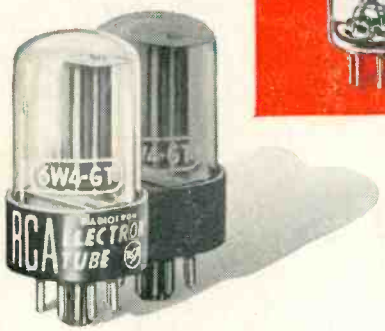

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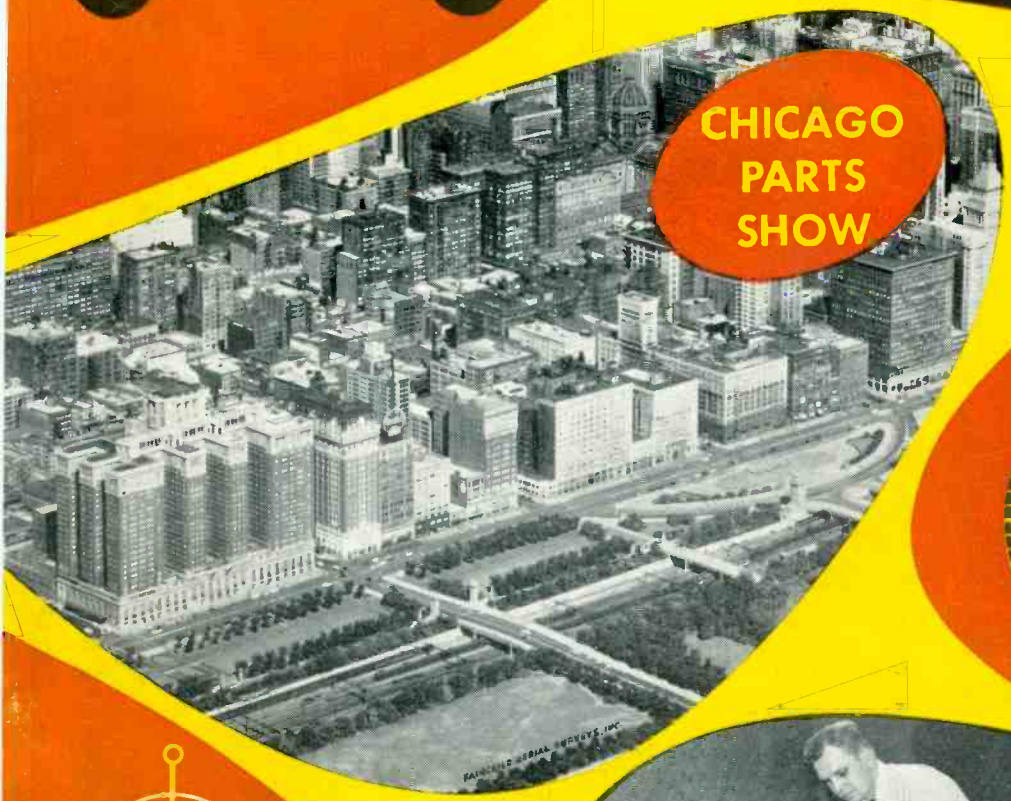

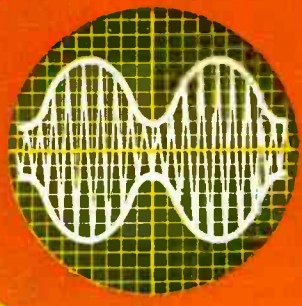

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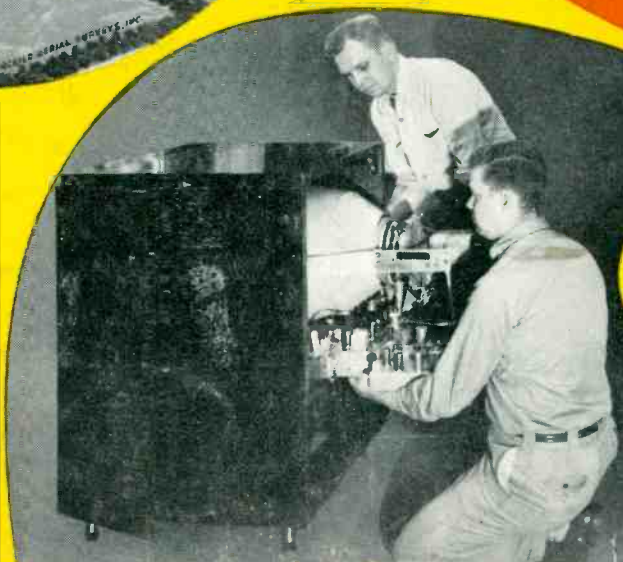

COLOR TV TROUBLES

May • 1954

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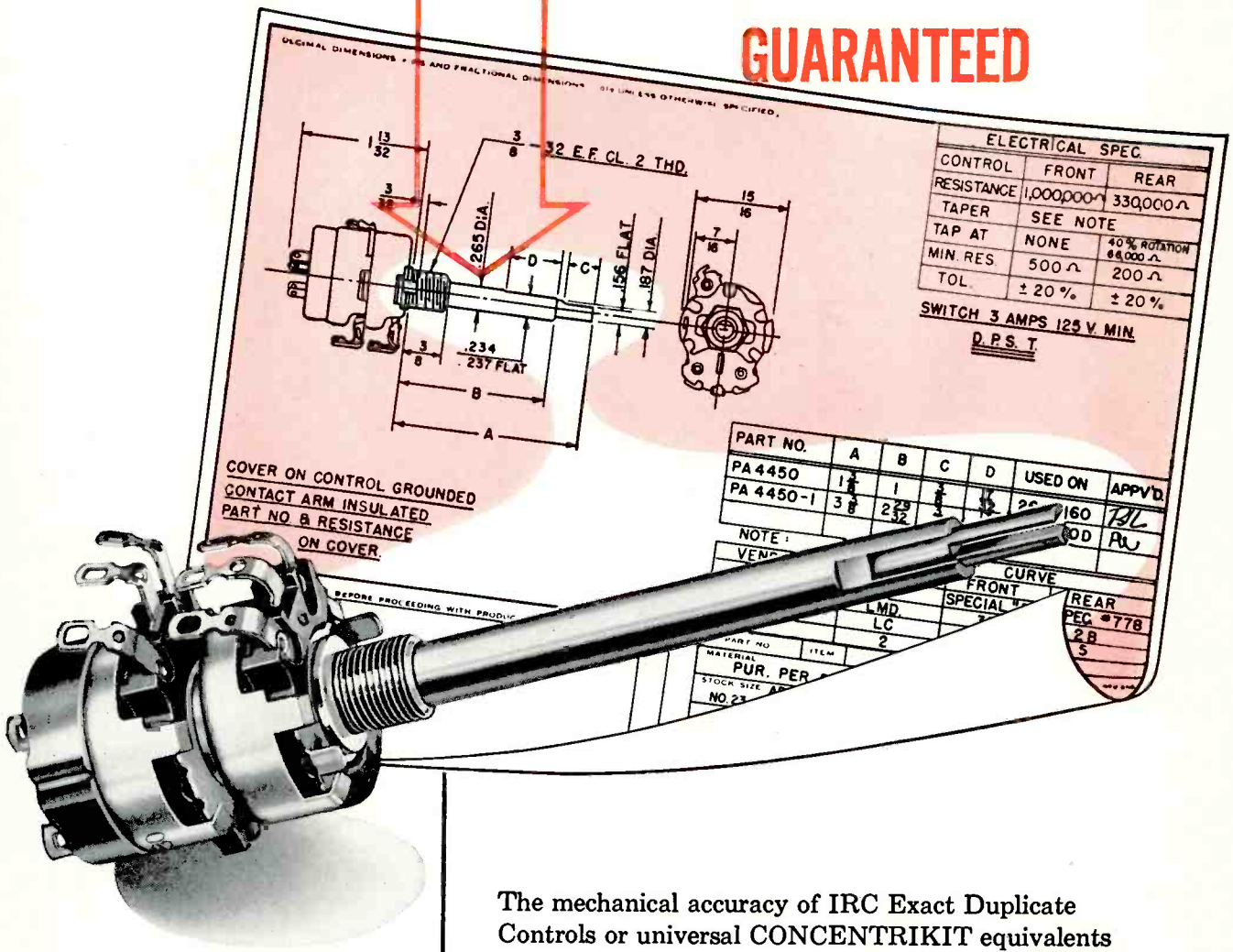

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TECHNICIAN
& Circuit Digests

TELEVISION • ELECTRONIC • RADIO • AUDIO • SERVICE

TECHNICIAN, May 1954, Vol. 59, No. 5. $1.00 a copy. Published monthly by Caldwell-Clements, Inc., Publication Office, Emmett St., Bristol, Conn. Editorial, Advertising and Executive Offices, 480 Lexington Ave., New York 17, N. Y. Entered as second class matter at the Post Office at Bristol, Conn., Nov. 4, 1953, under the act of March 3, 1879. M. Clements, President; M. H. Newton, Assistant to President; John J. Borghi, Vice President and Secretary; Marguarite B. Clements, Treasurer. Subscription rates: United States and Canada, $4.00 for one year; $6.00 for two years; $8.00 for three years. Pan-American and foreign countries: $7.00 for one year; $10.00 for two years; $14 for three years. Printed in U.S.A.

MAY, 1954

TECHNICIAN'S COVER this month reflects the wide diversity of its contents. The photo showing servicemen installing a color TV chassis in its cobinet was made by Westinghouse people at the company's Metuchen, New Jersey plant.

DEPARTMENTS

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H. Thomas
Senior Project Engineer
Federal Telecommunication Labs., Inc.

Here is the down-to-earth explanation of color television in easy-to-understand language. It explains everything about the system—especially the color receiver. Read this book and you'll have a good understanding of color TV. Discusses color wavelengths and frequencies; primary colors and what they mean. Brightness, hue and saturation are defined. Gives basic features of the N. T. S. C. system. Differences between Tri-Color Colortron, and the Chromatron are explained. Discusses circuits used in color TV receivers and gives complete explanations as to their operation—Setting up and adjustment procedure.

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by John R. Locke, Jr.
Radio and Television Department
General Electric Company,
Syracuse, New York

This book introduces color television at a level which will be understandable to persons who are familiar with the black and white television system. All material is based on the recommendations of the N. T. S. C. Since a color television receiver must provide the necessary circuitry to reproduce the color information, the new problem is to understand the nature of these added circuits. Highlights of Color Television supplies this information.

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