ELECTRONIC TECHNICIAN

Including **SERVICE** Magazine

Servicing

HEARING AIDS

60¢

February • 1961

Make your profit picture

"BRIGHT AND WIDE"

with Sylvania 6DQ6A and 6BQ6GTA

New improvements provide long life, high output, excellent high voltage cutoff.

Tube performance and life can mean the difference between a bright and dismal profit picture. Let's look at some of the proved-in-the-set Sylvania features:

Plate current capabilities have been increased. Plate to screen current ratio has been improved. A special screen-grid coating provides excellent heat dissipation eliminating interelement shorts without causing cathode "oisoning"—a major cause of short be life. Tests for voltage breakdown, heater and tube life add up to extra quality assurance. The famous Sylvania "Automount" construction is used for the 6DQ6A.

Result: Sylvania 6BQ6GTA and 6DQ6A

- Deliver the horizontal output essential to full picture width.
- Increase picture tube light output.
- Offer extra-long life in TV set.

Here's a servicing plus: tapered pins provide easy insertion in hard-to-get-at sockets.

Make your servicing profits brighter . . . right now. Specify Sylvania 6BQ6GTA and 6DQ6A on your next tube order.

Electronic Tubes Division, Sylvania Electric Products Inc., Dept. 212 1740 Broadway, New York 19, N. Y.

SYLVANIA

Subsidiary of GENERAL TELEPHONE & ELECTRONICS

ELECTRONIC TECHNICIAN

Including SERVICE Magazine

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Printed in U.S.A. by Rumford Press, Concord, N. H.

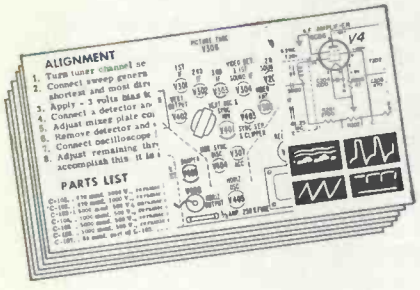
February, 1961

FRONT COVER Since transistorized hearing aids are essentially miniature transistor amplifiers, experienced service techs should not encounter great repair difficulties. Though many replacement parts are available from regular electronic distributors, some special parts must be ordered from specialty distributors or manufacturers. Circuit operation, servicing, and special parts sources are discussed in the article starting on page 30.

FEATURES and ARTICLES

DEPARTMENTS

CIRCUIT DIGESTS



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(16 pp. latest schematics & data)

ELECTROHOME: TV Model "Selkirk"
EMERSON: Air Purifier Ionizer Model EP-40
GENERAL ELECTRIC: Transistor Radio Models CT110, CP775
MONTGOMERY WARD: TV Models WG-4225A, WG4325A
MOTOROLA: TV Chassis TS-STS & WTS-435
RCA: Reverberation Amplifier Chassis RS-194A
ZENITH: TV Chassis 16F23, 16F23Q

Editor's Memo

As long as you know you are right, it pays to stick to your guns, even when the majority says you are wrong.

Some of the greatest successes were the very people who were dissenters by nature, and perhaps even a bit cantankerous. People who see the significance of new trends and new ideas and act effectively, are way out ahead.

We have been talking with a TV-appliance dealer who is also in communications service. When he started his business back in the '30s, many people told him that it would never come to much. Perhaps these very people are among those who heap envious praise and follow behind him today.

When you see an opportunity which demands only moderate risk, grab it. Trying to mimic a competitor who is trying at the same time to mimic you, is no avenue for success.

The more initiative an employee shows, the more responsibility will come his way. That's what supervisory people are really paid for—responsibility. Of course, before a man can be a top-notch manager, he should have a solid background of practical experience. That way he will know what to expect from the people working under him.

Among the responsibilities assumed by growth-minded firms is to have faith in its own aspirations, and to fight for them boldly. It's amazing how the doubters and detractors become your boosters . . . once you've proved yourself.

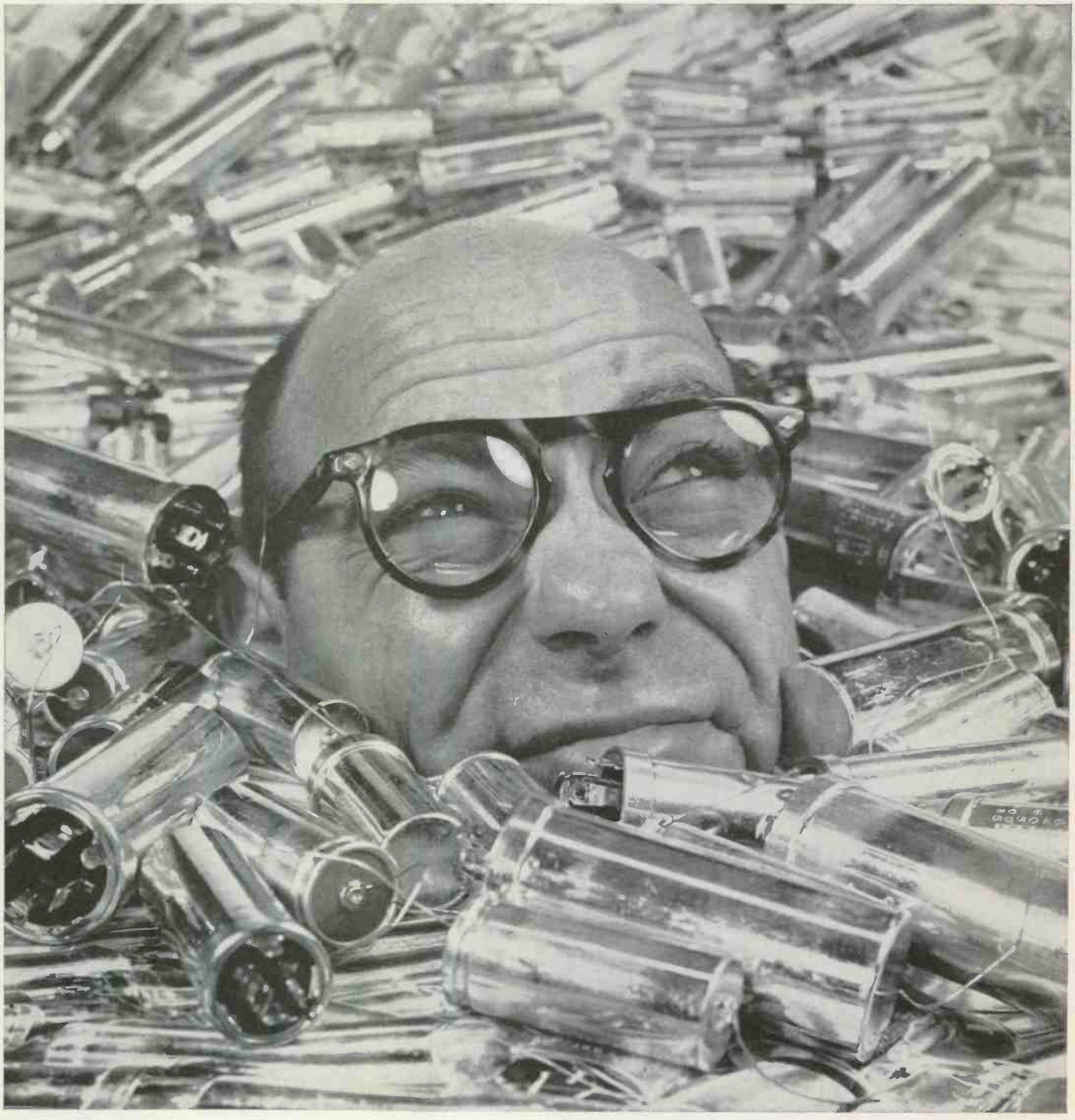
An interesting story is told about a famous fighter of yesteryear.

Some fifty-odd years ago, when "Gentleman" Jim Corbett had turned to entertaining after a notable prize fighting career, and made a greater financial success of the stage than the ring had ever afforded, he used to tell this story.

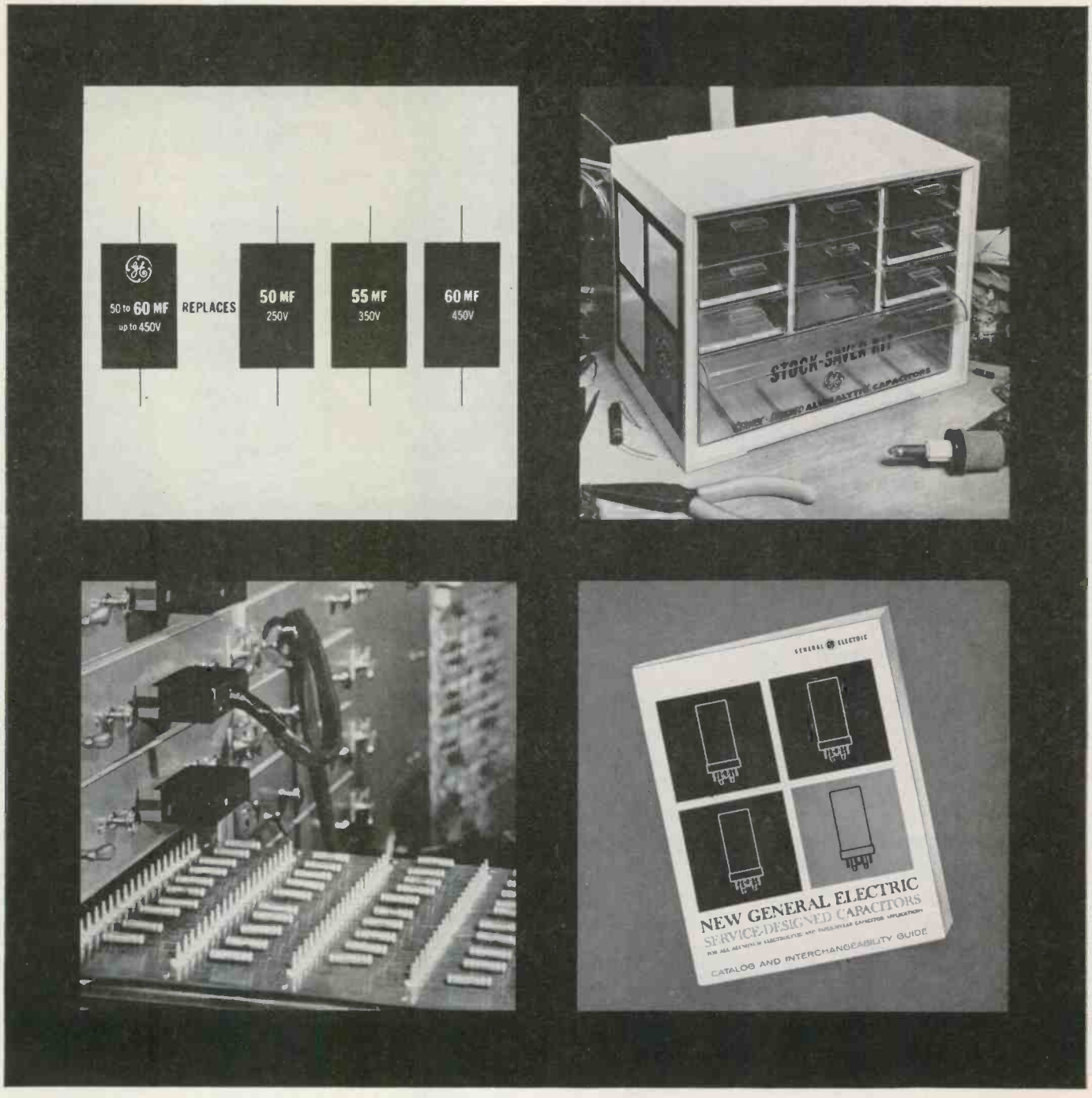
"When I first started to fight, and the chances for success looked very remote, Dad would admonish me to quit the ring and find a steady job so that I could settle down. He used to say, 'Son, remember this, a rolling stone gathers no moss.'

"On the night I won the championship, Dad was seated at ringside. As soon as the fight was over, he jumped into the ring. He was beaming. He grabbed me and slapped me on the back. 'My boy,' he said, 'tis just like I always told you. It's the roving bee that gets the honey.' "

Al Forman



GENERAL ELECTRIC TAKES THE CONFUSION OUT OF THE CAPACITOR BUSINESS!



NEW G-E SERVICE-DESIGNED CAPACITORS

1. CUT NUMBER OF TYPES BY 75%! You can meet all your needs with fewer types because every G-E capacitor meets not just one, but a range of capacitance and voltage requirements. One G-E capacitor rated "50-60 mfd up to 450 V," for example, will replace any capacitor rated 50, 55 or 60 mfd at *any* voltage up to and including 450 V.

2. MEET MOST NEEDS WITH SMALL STOCK! For the first time it's possible to meet most replacement needs with a small number of units. The 14 tubular types in this Stock-Saver Kit, for example, will meet 9 out of 10 tubular electrolytic replacement needs! And you can buy this kit now from your G-E capacitor distributor at a greatly reduced introductory price!

3. LAST LONGER ON SHELF AND IN SERVICE! Because all G-E Alumalytic ® capacitors are made with 99.99% pure aluminum foil, their lower-leakage currents reduce the chances that you'll ever get a "dud" from your distributor! G-E leadership in advanced-design capacitors for critical military applications brings you unmatched quality.

4. FREE 100%-COMPLETE REPLACEMENT GUIDE! The most complete catalog and replacement guide ever published shows you in a flash which G-E capacitor replaces *any* capacitor used in *any* radio or TV set in the past ten years! For your free copy, see your G-E capacitor distributor or write General Electric Company, Electronic Components Division, Owensboro, Kentucky.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more data, circle 2-5-1 on coupon, p. 46

LETTERS
To the Editor

Is Tele-Vue For You?

Editor, ELECTRONIC TECHNICIAN:

In reply to Mr. Joseph Obiecunas' Dec. letter asking how good Tele-Vue Trouble-Shooter charts are, we have used these charts for about a month. Briefly, they break down into a series of symptoms concerning such common difficulties as snowy picture, loss of sync on strong station, loss of sync period, picture pull, etc., etc. They list a series of checks to make, starting with the most obvious and progressing to the more complicated. Each chart also contains a typical portion of a schematic of the circuit most likely to be affected by the trouble concerned. Each chart also has a picture showing the screen as a picture would appear when this difficulty is present.

I would say, from a technician's viewpoint, that they are helpful, but they are not a substitute for a good background of technical knowledge. They do not in short, say, replace this condenser or that resistor, but rather take this resistance check or that voltage check, or make this alignment. I personally believe they are worth the money.

STANLEY J. PEPERA,
Service Manager

Video TV & Appliance
Saginaw, Mich.

. . . The system is decidedly worthwhile. I have a set of 50 cards and convenient holder and the day it arrived, I was working on a real "dog". I had spent an hour, and the card found the trouble in less than 10 minutes.

JOHN B. DOWDEN

Glen Cove, N. Y.

. . Tele-Vue Trouble-Shooter is a series of antiquated and certainly over priced charts. There are others on the market that are more informative and less expensive.

MONAHAN TV

Bayonne, N. J.

. . . I like my Tele-Vue.

WALTER BERTUCCELLY

Bert's Radio & TV Repair
Linden, N. J.

. . . It is ok as far as it goes.

W. H. HOLLEY

Atkinson, N. C.

. . . I have a set that he can have for half price It would be like a gift for me to get that. There is nothing that takes the place of experience.

FRANK LONG

Frank's TV Service
Vancouver, Wash.

. . . Mr. Obiecunas need have no qualms as to the worthiness of this troubleshooting method.

HAROLD H. RADINZ

Green Bay, Wisc.

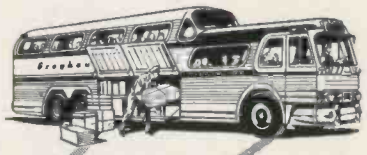
. . . I have been using it for some time now and keep it handy at the workbench. It refreshes your memory and gives you over a dozen things to do to solve some tough problems. I find it most helpful.

RUSSELL G. MARSHALL

Chicago, Ill.

(Continued on page 10)

TUBES GET THERE FASTER



Shipping parts or entire sound units? Remember, speedy shipment of delicate goods is a specialty of Greyhound Package Express. Shipments going hundreds of miles can arrive *the same day they're sent!*

Whatever the destination of your shipment, chances are, a Greyhound is going there anyway... *right to the center of town.* Greyhound travels *over a million miles a day!* No other public transportation goes to so many places—so often.

You can ship anytime. Your packages go on regular Greyhound passenger buses. Greyhound Package Express operates twenty-four hours a day... seven days a week... *including weekends and holidays.* What's more, you can send C.O.D., Collect, Prepaid ... or open a charge account.

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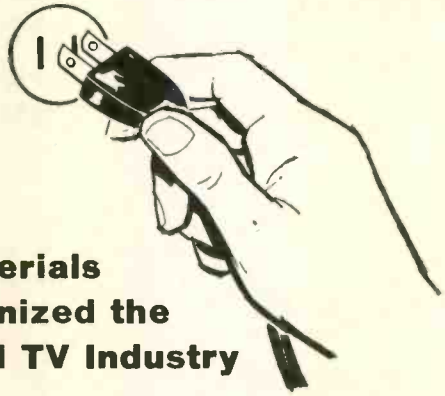
IT'S THERE IN HOURS... AND COSTS YOU LESS!

For more data, circle 2-7-1 on coupon, p. 46

The growth of the entire Electronic Service Business is reflected in famous

PHILCO Industry Firsts

Just Plug in and Play!



Philco Built-In Aerials Revolutionized the Radio and TV Industry

In 1949, Philco introduced the first built-in aerial for television. Overnight, it took the aerial off the roof and the roof off of TV sales, and came just 10 years after Philco's famous built-in aerial for radio. These developments opened up vast new markets, with increased profit opportunities for you. Similarly, the proven reliability of Philco parts, tubes and accessories protects your profits, and builds good will.

For all your servicing needs, look to PHILCO
THE FIRST NAME IN ELECTRONICS . . . THE LAST WORD IN QUALITY

SEE YOUR PHILCO DISTRIBUTOR

PHILCO Accessory Division
WORLD-WIDE DISTRIBUTION
Service Parts • Power-Packed Batteries • Universal Components • Long-Life Tubes • Heavy-Duty Rotors • Star-Bright 20/20 Picture Tubes • Long-Distance Antennas • Appliance Parts • Laundry Parts • Universal Parts and Accessories

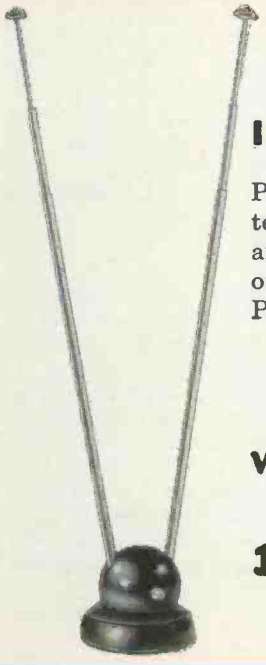
PHILCO
Famous for Quality the World Over

For more data, circle 2-8-1 on coupon, p. 46

DON'T MISS THESE

FREE BONUS OFFERS

with your purchases of quality-first PHILCO® receiving tubes



DELUXE INDOOR ANTENNA

Philco 3-section telescoping antenna on non-tilting base. Every antenna you get on this bonus offer means extra profits for you. Part No. 426-0014.

FREE
with your purchase of just
15 PHILCO TUBES

DELUXE ROTARY SWITCH ANTENNA

A real Philco profit-maker for you! 3 brass elements; 6-position switch. Non-tipping, heavy, cast iron base. Part No. 426-0019.

FREE
with your purchase of just
25 PHILCO TUBES

$3.50 NET VALUE TRACE KIT

Revolutionary Philco development simplifies transistor radio servicing—pinpoints faults in 3 easy steps. Kit includes 9 panels for current Philco models.

FREE
with your purchase of just
35
PHILCO
TUBES

PHILCO $79.50 NET VALUE TUBE TESTER

Philco Model 9200. Checks emission, leakage, and continuity. Includes 10-position selector for checking all tube types, pin straightener, and handy roll chart. Made in U.S.A.

FREE
with your purchase of just
500
PHILCO TUBES

LIMITED TIME ONLY

SEE YOUR PHILCO® DISTRIBUTOR

(Continued from page 6)

Readers React

Editor, ELECTRONIC TECHNICIAN:

In your letters to the editor column, Dec. issue, one R. M. Thorson wrote "After 10 years in this business, I know almost everything there is to know." He shattered a long cherished illusion of mine, namely that I am just as bright as the next guy, and may even have a slight edge. Yet I have been in the TV business for over 12 years, and was in radio before that, and I still can't claim to know "almost everything there is to know" in this business! Certainly an ego-shattering letter.

Incidentally, your mag is my favorite of the "big 3" electronic mags to which I subscribe and I very enthusiastically welcome your new TV Manufacturers Digest section. It cannot help but be of great value and a natural tie-in with your Circuit Digests. Congratulations.

LES HUCKINS
Les Huckins TV Service
South Gate, Calif.

. . . Congratulations are in order to Mr. Thorson. It is indeed heartwarming to read that it is possible to learn all there is to know after a mere 10 years in this business. Obviously, you have the Einstein of the electronics industry on your mailing lists. I suggest he procure an accurate meter and place the leads between the plate of his Intelligence Quotient and the grid of his Modesty Amplifier and he will undoubtedly arrive at the conclusion of a direct short.

BUD WILSON
Canton, Ohio

. . . I find letters to the editor interesting, informative, and sometimes humorous, such as the letter by R. M. Thorson of Palo Alto. I presume it was written in that vein.

E. S. TANTON
Prince Edward Island, Canada

License S.O.S.

Editor, ELECTRONIC TECHNICIAN:

This letter is an S.O.S. to all servicemen in the state of New York. As you know, petitions have been circulated for licensing, but the response so far has been spotty. The bill to license has been introduced. It is the moment when success or failure hangs in the balance. A sponsor has been obtained from the Assembly, The Honorable William E. Adams of Kenmore. But he needs your help. I urge each serviceman to see his State Senator and Assemblyman personally. This bill is fair, it discriminates against no one and will raise the standards of our industry.

DOUGLAS COOK
Douglas Electric & Heating Co.
Kenmore, N. Y.

(Continued on page 12)

(Continued from page 10)

Speedy Distributor

Editor, ELECTRONIC TECHNICIAN:

How's this for fast service. Hal Havens Appliance Co., Hamilton, Texas, in connection with their "Going Out FOR Business Sale" called us for a picture tube and some TV parts. The call was received at 1:34 PM and at 2:52 PM we had delivered the parts and picture tube 120 air miles distant. We were happy to cooperate and help out this good service dealer.

LYLE HAMMER
Electronic Headquarters
Austin, Texas

Current Vs. Electron Flow

Editor, ELECTRONIC TECHNICIAN:

I am plagued with the harassing question on the subject of current flow. What is the difference between Conventional Current flow and Electronic Current flow?

RICHARD MAHLMEISTER
Dayton, Ohio

• *It doesn't make much difference whether one talks about Conventional Current flow (plus to minus) or Electronic Current flow (minus to plus). It's a question of semantics. Conventional Current flow came first, thanks to power generation. It may very well be obsolete in view of the more proper application of electron flow in electronic circuits.*—Ed

Helpful "Tough Dog"

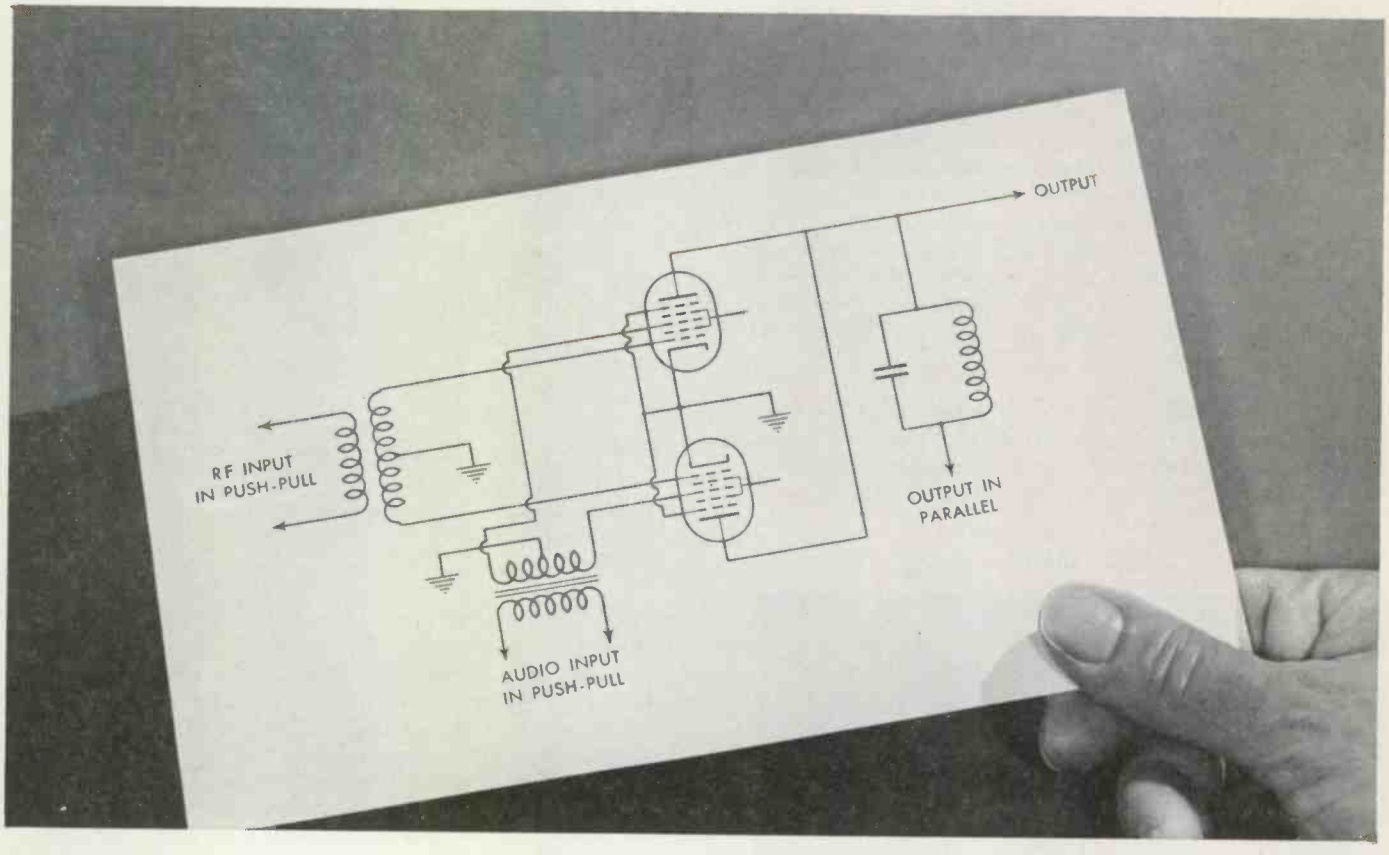
Editor, ELECTRONIC TECHNICIAN:

The "Tough Dog" article of Mr. Fred J. Will on the motorboating Philco portable radio, Model E676, really helped me out of a spot. I just happened to have one of these on the bench with the same problem when I read the article in Dec. issue. I really enjoy your publication and the Circuit Digests have many times paid for the cost of my subscription. Keep up the good work!

W. L. BUSH
Bills Radio-TV Service
Kent, Ohio

"Lady, the knobs are fake."

Latest issue of
TUNG-SOL TIPS
tells you what you should know about
SINGLE SIDE BAND



The two-tube balance modulator circuit is an important element in single side band transmission. It's discussed in the latest issue of Tung-Sol Tips.

MONTH after month Tung-Sol has been delivering to the industrial serviceman one important issue of *Tung-Sol Tips* after another. Specially written for the service dealer who wants to devote his talents to servicing industrial equipment, every issue of *Tips* is crammed full of vital information to help him in his work. This latest issue is no exception.

Issue #14 offers in down-to-earth, on-the-job terms a full-scale treatment of single side band transmission. It discusses its advantages over conventional AM signals — and these advantages are considerable. You'll discover how the elimination of the carrier signal and one-side band are accomplished without any reduction of signal quality and intelligence. You'll be introduced to a whole series of typical modulator circuits which are used to suppress the carrier. In addition, there's a thorough explanation of the filtering and phasing methods for eliminating sidebands.

So, if you're a serviceman who still hasn't signed up to get his issues of *Tung-Sol Tips* free every month, now is the time to do it. You won't want to miss this issue and the important issues planned for the future. All you have to do is drop in to see your local Tung-Sol distributor and ask him to put you on the *Tung-Sol Tips* mailing list. Or write directly. Tung-Sol Electric Inc., Newark 4, N. J.

TUNG-SOL®

Sales Offices: Atlanta, Ga.; Columbus, Ohio; Culver City, Calif.; Dallas, Texas; Denver, Colo.; Detroit, Mich.; Irvington, N. J.; Melrose Park, Ill.; Newark, N. J.; Philadelphia, Pa.; Seattle, Wash. Canada: Abbey Electronics, Toronto, Ont.

For more data, circle 2-13-1 on coupon, p. 46

Tuning In the

BUSINESS FORECAST. According to L. Berkley Davis, General Electric vp, 1961 electronic component sales will continue at high volume despite a leveling effect during the first half of the year. Factory sales of tubes should total $827 million, and semiconductors $626 million. This includes 385 million receiving tubes (down 4% to $340 million), power tube sales $300 million (up 4%), 11 million TV picture tubes unchanged at $205 million, and industrial-military crt's. The semiconductor figure includes 180 million transistors (up 38% to $360 million), and rectifiers $136 million (up 16%). According to GE's Hershner Cross, distributor TV set sales should be equal to 1960, down 5% from 1959.

COLOR TV set sales by RCA were up 30% in 1960, reports Chairman David Sarnoff. Profit on color receivers was measured in seven figures, holding out hope for a stronger, growing market.

BIG GUN

This giant cathode ray gun, similar to those found in TV picture tubes, is a tool for studying electron beams. Developed by Westinghouse advisory engineer Dr. Hilary Moss, the gun is used to learn how closely beams can be focused to give images of the greatest density.

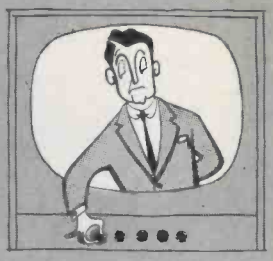
"There's no picture madam because that's an electric oven."

CONSENT ORDER (7820) approved by the FTC forbids United Electronics Labs., Inc., 3947 Park Dr., Louisville, Ky. to sell its correspondence and residence course in electronics through false employment offers, exaggerated earnings claims, and other deception. The complaint charged that the real purpose of United's "Men Wanted" advertisements is to obtain purchasers for its course and not to offer jobs, as implied. It further alleged that starting salaries for electronic technicians trained by United often are less than the $90 to $160 weekly claimed by United's salesmen. The respondents' agreement to discontinue the challenged practices is for settlement purposes only and does not constitute an admission that they have violated the law.

MARCH 20-23 are the dates for the 1961 IRE International Convention at New York's Waldorf-Astoria and Coliseum. More than 70,000 technical people from 40 countries are expected to attend, making it the world's largest technical meeting. There will be 850 exhibitors at the Coliseum displaying $15 million of the latest electronic equipment.

KING-SIZE RADIO HUM has been detected by MIT scientists. The world-girdling air space between the earth's surface and the lower ionosphere acts as a resonant cavity resonating at 7.8 cps. The giant cavity is excited by electrical discharges during thunderstorms.

Picture .....



MOST SERVICE DEALERS have mixed feelings when the few gyps in the trade are brought to justice. It's satisfying to see shady operators get their just reward, but we feel a bit uneasy that some portion of the public may not understand that crooks are a tiny minority—as they are in most businesses. These somber thoughts were brought to mind by the arrest of two Los Angeles brothers for padding repair bills. New sets in perfect condition, except for one faulty tube, were set up. The culprits replaced new tubes with used ones . . . and charged over $40 in the bargain.

"OPERATION SNOWBALL," a 12-month industry-wide TV set sales promotion program launched in January by Corning, emphasizes the benefits in new sets resulting from technological advances. Objectives are to expand the TV market, encourage more trade-ins, and stimulate demand for higher priced sets. Co-operating companies will underwrite promotions for small and large dealers.

NEW SERVICE POLICY announced by Philco guarantees service labor, as well as parts, on TV repairs during the standard 90-day warranty period. More than 30,000 independent factory authorized service technicians are said to be available to carry out the new service policy. Service costs paid for by Philco are included in the list price of the product. For 17" and 19" portables, "carry-in" service is $1.75; "in-the-home" costs for portables and consoles are covered for $4.00. A similar warranty policy has been in effect for radios.

OCTOPHONE is the name of an electronic reader which converts printed letters into musical sounds, thereby eliminating the need for Braille or special tape recordings for the blind. The English development uses a light beam to scan a printed page, producing a pitch that varies with the shape of the letters.

REMOTE-CONTROL TV supervises building of a road near the New York City approach to the George Washington Bridge. A closed-circuit TV camera, mounted on a five-story building's roof, transmits closeup shots of construction activities to a monitor screen in the project manager's office. He keeps the job running smoothly by communicating with his men through a two-way radio.

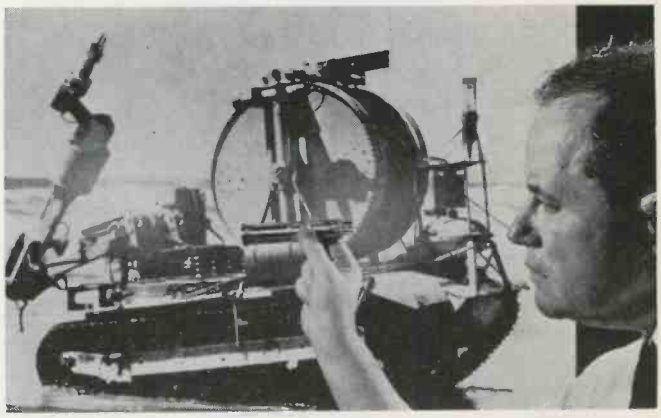
CALENDAR OF COMING EVENTS

Feb. 26-Mar. 1:	Pacific Electronic Trade Show, Great Western Exhibit Center, Los Angeles, Calif.
Mar. 20-23:	IRE International Convention, The Coliseum and Waldorf-Astoria Hotel, New York, N. Y.
Apr. 4-9:	1961 Los Angeles High Fidelity Music Show, Ambassador Hotel, Los Angeles, Calif.
Apr. 7-9:	NATESA Spring Directors Meeting, Albuquerque, New Mexico
Apr. 19-21:	13 Annual Southwestern IRE Conference & Electronics Show, SWIRECO, New Memorial Coliseum and Baker Hotel, Dallas, Texas
Apr. 26-28:	7th Region Technical Conference & Trade Show, Westward Ho Hotel, Phoenix, Ariz.
May 22-24:	1961 Electronic Parts Distributors Show, Conrad Hilton Hotel, Chicago, Ill.

U.S. WEATHER BUREAU has put into operation an electronic computer-plotter which draws a complete weather map of the Northern Hemisphere in less than three minutes. Data on magnetic tape is fed to a digital-to-analog converter, which in turn instructs the Weather Plotter's mechanical hands to draw contours or isobars automatically. Information is gathered from 500 weather observation stations by teletype.

MICROMINIATURE CIRCUITS that are swallowed or injected into the body to aid disease diagnosis is envisioned by Dr. Edward Witting, deputy director of Army research. The circuits could be used to telemeter physiological data to the examining physician.

UNDERSEA TV



With this RCA vidicon tube, the Navy's new tank-like vehicle (in background) can see as it crawls along the ocean floor. Signals from the nautical TV cameras are transmitted to a land station via a special cable from the large reel. The vehicle is called RUM for Remote Underwater Manipulator. It was developed by U. of Cal.

News of the Industry

SYLVANIA announces production of its two billionth electronic receiving tube at Emporium, Pa.

EMPIRE STATE reports its appointment as an authorized service station for EICO.

SOUTH RIVER METAL PRODUCTS Sales Mgr., Marty Roth, reigns to take a position with another electronic company.

WESTINGHOUSE has named ARIBERT A. BOMBE as sales rep for the Electronic Tube Div. in N.D., S.D., Minn., Wisc., Mich., and No. Ohio.

DELCO RADIO opens a distributors program for its semiconductor products with the appointment of TED HAYES as Mgr. of Distributor Sales.

ZENITH has announced more than one million TV receivers were produced and sold during 1960, the company's second successive million-plus TV set year.

CBS ELECTRONICS announces two appointments to new posts: HERBERT L. REICHERT, Mgr., Dealer Products Sales; and JOHN H. HAUSER, Gen. Mgr., Distributor Sales.

TEXTRON has elected GEORGE H. METTLER as a Vice Pres., to coordinate and assist in development of international business. MB ELECTRONICS, div. of Textron, appoints CHARLES D. BROWN as Pres.

PHILCO International Div. has reached an agreement with JOHN M. OTTER CO., N.Y., N.J. and Philadelphia distributor of domestic Philco Products, to test market the British Philco home electronics in that area.

MALLORY announces Grand Prize winners (all expense jet trip to Montego Bay, Jamaica) of the "Cool Deal" Contest as follows: VERN W. MAXWELL of Cantrall, Ill.; and WOODBUR D. RYAN, salesman for Bruce Electronics, Springfield, Mass.

UNITED CATALOG reports a series of free sales aids available to distributors of THE RADIO-ELECTRONIC MASTER, including a 2-color counter card, sales messages for imprinting on letterhead at no charge, free use of industrial mailing list in distributors' territory. The 1961 edition of the MASTER is the silver anniversary issue cataloging in 1600 pgs. over 175,000 electronic items manufactured by more than 330 companies.

What type of TV Lead-in Cable do you need?

Your Belden Jobber has it!

Convenient lengths in coils and spools

WELDOHM . . two and a half times the flexing life and one and a half times the breaking strength of ordinary lead-in. Resists pulling, whipping, twisting. 300 Ohm. No. 8230.

PERMOHM* . . for use under conditions of extreme salt spray, industrial contamination, rain, and snow. Gives stronger, clearer signals. 300 Ohm. No. 8285.

STANDARD 300-OHM LINE . . offers low losses at high frequencies. Also ideal for use with FM receiving antennas. No. 8225.

DECORATOR CABLE . . this new 300-ohm lead-in cable is of ivory color—blends into any interior decorating arrangement. No. 8226.

Belden
WIREMAKER FOR INDUSTRY
SINCE 1902 — CHICAGO

Cord Sets and Portable Cordage • Electrical Household Cords • Magnet Wire • Lead Wire • Automotive Wire and Cable • Welding Cable

CELLULINE* . . excellent resistance to sun, abrasion, and wind. Installation easy . . no end-sealing necessary. Gives strong UHF and VHF TV pictures. 300 Ohm. No. 8275.

WELDOHM, PERMOHM, CELLULINE are Belden Trademarks Reg. U.S. Pat. Off.
*Belden Patents U. S. 2782251 and 2814666

8-1-1

Reps & Distributors

ERA's nine National Committees met on Feb. 1 to lead off the 2nd annual Electronic Representatives Assoc. Convention in the Los Angeles Ambassador Hotel.

ELECTRONIC ENTERPRISES, INC. is the new name announced by the firm which has operated as MILWAUKEE ELECTRONIC EXPEDITORS, INC., Milwaukee, Wisc.

ELECTRONIC PUBLISHING has announced publication of Catalog No. 102 for MERQUIP ELECTRONICS, INC., Chicago, Ill., containing 196 pages of product and price information for 99 manufacturers.

SENCORE announces PEOPLES RADIO & TV SUPPLY CO., Roanoke, Va., sponsored a SENCORE Clinic with more than 50 TV technicians attending. An educational film was shown featuring the new Mighty Mite Tube Checker, the TC-109.

MARK MOBILE reports the appointment of three reps for its line of Heli-Whip and Beacon antennas: ATHANS SALES CO., Dallas, Tex.; DIXIE ELECTRONIC ASSOC., Madison (Nashville), Tenn.; and WES ALDERSON CO., Los Angeles, Calif.

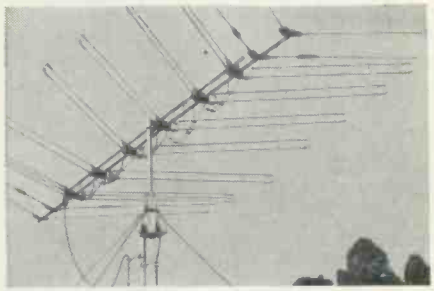
ARCO ELECTRONICS announces Western industrial distributors to handle the new line of HST DIV. transformers, to which Arco holds exclusive distribution rights to jobbers and distributors in the U.S. and Canada: RADIO SPECIALTIES & APPLIANCE CORP., Phoenix, Ariz.; BRILL ELECTRONICS, Oakland, Calif.; PACIFIC WHOLESALE CO., San Francisco; HOLLYWOOD RADIO & ELECTRONICS, Hollywood; R. V. WEATHERFORD CO., Glendale, Calif.; SHANKS & WRIGHT, San Diego; SHELLEY RADIO CO., Los Angeles; DENVER ELECTRONIC SUPPLY CO., Denver, Colo.; CARTER SUPPLY CO., Ogden, Utah; and C & G ELECTRONICS CO., Seattle, Wash.

For more data, circle 2-19-1 on coupon, p. 46 ➔

CHANNEL MASTER harps on one theme: PERFORMANCE!

To make the most, feature the best — sky-high quality products by Channel Master. Channel Master moves the goods because it delivers the goods. It's the brand that gives you those heaven-sent little "extras". Top quality and top performance for your customers — maximum volume and profits—you get the best of both. Just follow your "growth line" — Channel Master.

CHANNEL MASTER SUPER 10 T-W ANTENNA

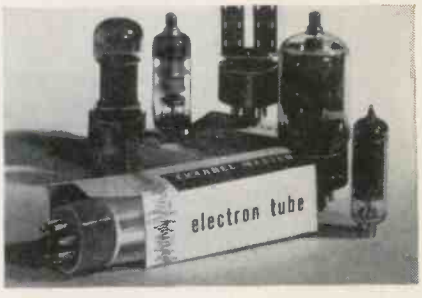


The most powerful super-fringe antenna yet developed. Based on Channel Master's unique Traveling Wave principle, it has 10 elements and offers up to **78% more power** for picture-poor homes.

CHANNEL MASTER TENN-A-LINER ROTATORS

The only automatic rotator that can be aimed within **one degree** of the required direction. Unsurpassed accuracy, plus great repeatability and easier, quieter operation.

CHANNEL MASTER PREMIUM QUALITY TUBES



America's fastest growing line! Longer-lasting, uniformly dependable, with minimum call-backs. No other tube make offers greater opportunity for profits than these fully proved performers.

CHANNEL MASTER works wonders in sight and sound

ELLENVILLE, N. Y.

Catalogs & Bulletins

TECHNICAL BOOKS: 38-page, 1961 catalog of technical books and business books is available. The Macmillan Co., 60 Fifth Ave., New York 11, N. Y.

For more data, circle 2-20-2 on coupon, p. 46

FLASH-TEST: Circular covers combination continuity-tester and flashlight. Tests all types of fuses and appliances plus regular spotlight coverage. Selcin Corp., Box 88, Medford 55, Mass.

For more data, circle 2-20-3 on coupon, p. 46

FUSE KIT: Literature describes a general purpose kit. Contains assortment of 60 fuses of the 16 most popular types and substitution chart packed in plastic box. Sightmaster Corp., 50 Aleppo St., Providence, R. I.

For more data, circle 2-20-4 on coupon, p. 46

ANTENNAS: Literature describes model HK-1 home TV/FM System Kit, featuring new type indoor antenna that provides reception on up to four TV or FM sets. Blonder-Tongue Labs., 9 Alling St., Newark 2, N. J.

For more data, circle 2-20-5 on coupon, p. 46

MICROPHONES: 6-pg color brochure covers Vega-Mile wireless microphone system and also carries specs of the complete line of the firm's accessories. Illustrates suggested applications. Vega Electronics Corp., Cupertino, Calif.

For more data, circle 2-20-6 on coupon, p. 46

TRANSISTORS: "The 2N741 Mesa Transistor as a Power Oscillator and Class C Amplifier," is the title of Application Note AN 124. Circuit schematics, performance curves, and illustrations included. Technical Information Center, Motorola Semiconductor Products Inc., 5005 E. McDowell Rd., Phoenix, Ariz.

For more data, circle 2-20-7 on coupon, p. 46

EQUIPMENT FOR TV SYSTEMS: Available are 10 two-color specification sheets covering electronic and electrical equipment for closed-circuit and community TV systems. The series cover modulators, amplifiers, preamplifiers, converters, all-weather housings, plus accessories. Ameco Div., Antennavision, Inc., P. O. Box 11326, Phoenix, Ariz.

For more data, circle 2-20-8 on coupon, p. 46

TUBES: Two new Application Notes are: AN-189, "New 100-Milliampere Tubes for 120-volt Series-Heater-String Home Radio Receivers"; and AN-190, "AC/DC Stereo Amplifiers Using Output Tubes having 100-Milliampere Heaters." For copies, write on your letterhead to RCA Commercial Engineering, Electron Tube Div., Harrison, N. J.

Prove how CBS design for Total Reliability

CUTS BACK YOUR CALLBACKS

Are callbacks stealing away your profits? CBS Total Reliability tubes can keep them in your pocket. Take the CBS 5U4GB, for example.

This improved CBS tube has been specifically engineered with advanced features for utmost dependability. And its extra quality and longer life will build customer confidence—important for your continued success.

Now you can prove this to yourself right on the job—at CBS Electronics' expense. For a limited time only, you get a free trial CBS 5U4GB when you buy nine. You get a full "10-pack" *but you pay for only 9 tubes.* Order now from your CBS Electronics distributor. Offer expires March 15.

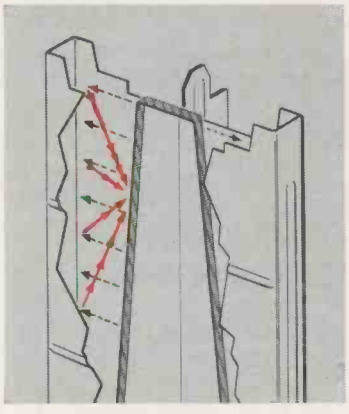
CBS ELECTRONICS

Danvers, Massachusetts

A Division of Columbia Broadcasting System, Inc.

Receiving, industrial and picture tubes • transistors and diodes • audio components • and phonographs

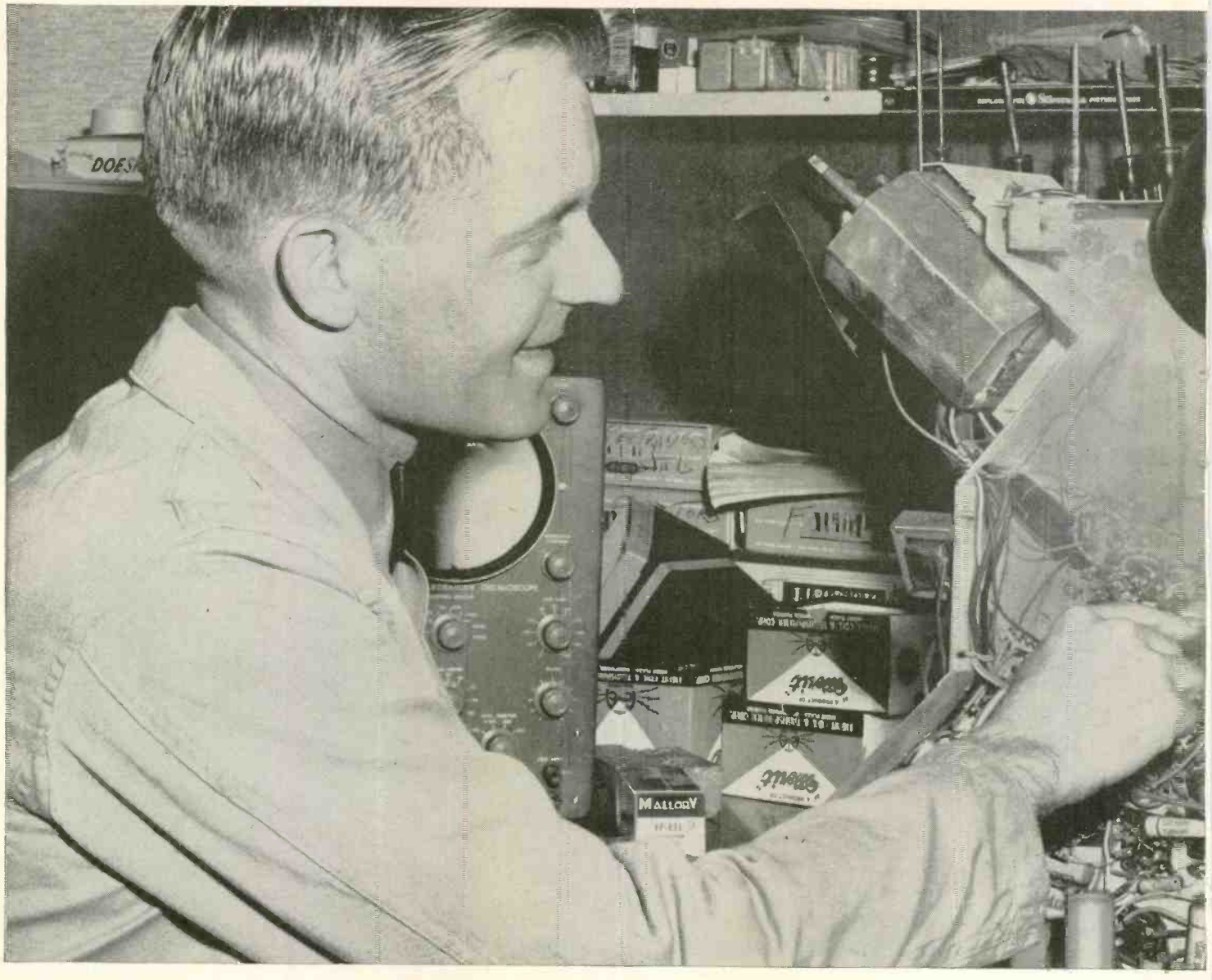
How design for Total Reliability prevents filament failure in the improved CBS 5U4GB



In ordinary rectifier tubes, filaments burn out when they overheat from a rise in reverse current. CBS eliminates this "back emission" in the 5U4GB with larger plates of non-emissive material that permit cooler operation and longer tube life.

CBS proved this by submitting the 5U4GB to dynamic "blast" tests that brutally cycled the tube between 4 and 6.8 volts with 800 volts plate potential. Meter readings showed "back emission" to be barely measurable – less than one ma.

For more data, circle 2-21-1 on coupon, p. 46



Roger Hefner owns and operates Hefner Television & Radio Service in Lima, Ohio. He attended DeVry School in Chicago, worked with a major radio-TV manufacturer, then went into business for himself. Roger now has two technicians helping him with sales and service on home and auto radio, TV and hi-fi.

Stop call-backs with these quality Mallory components . . . .

TC TUBULAR ELECTROLYTICS

Economical filter capacitors. Hermetically sealed. Also special TCX type for —55°C. Twin-pack keeps leads free from kinks.

FP ELECTROLYTICS

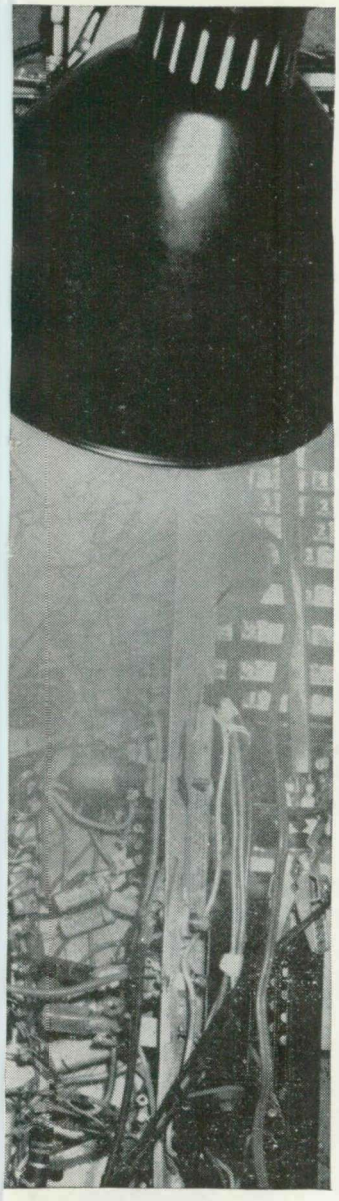
Original 85°C capacitor, now better than ever. Etched cathode gives hum-free performance. Chassis or printed circuit mounting.

STA-LOC® CONTROLS

End searching and waiting. Your distributor can custom-build, in just 30 seconds, any of over 38,000 single or dual controls.

GOLD LABEL® VIBRATORS

Quietest ever made . . . for the best in auto radio servicing. Buttonless contact design gives longest trouble-free service.



Radio-TV Serviceman Roger Hefner tells how:

"Mallory quality components protect my reputation for quality service"

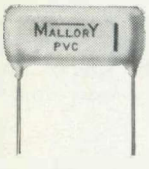
"My service reputation is founded on quality—in products and in workmanship—and I'll never jeopardize it by using cheap 'specials' that are sold as 'just as good'. In replacement components, only the best will do. This means Mallory—and no substitutes!"

In ceramic capacitor replacement, Roger Hefner, like thousands of other technicians, has found Mallory RMC Discaps® tops for customer satisfaction. Long the quality standard in original equipment, Discaps have the built-in quality that ends call-backs . . . provides the margin between just *service* and genuine *quality service*. On handy 3 x 5″ file card five-packs. Whatever your need, see your Mallory distributor—for highest quality components . . . widest selection . . . sensible prices.

® *Trademark Radio Materials Company, a Mallory division.*

Distributor Division, Indianapolis 6, Indiana

P.R. MALLORY & CO. Inc.
MALLORY



MALLORY PVC CAPACITORS

New, blue Mylar* coupling and by-pass capacitors. Dunk 'em, bend 'em, overload 'em, overheat 'em . . . they can take it.

*Reg. Trademark E. I. du Pont de Nemours & Co., Inc.

MALLORY MERCURY BATTERIES

Tops for transistor radios. Steady power, up to 3 times longer service . . . they "live" for years when idle. Guaranteed leakproof.

GEMS

Rugged, moistureproof tubular capacitors, unmatched in filter, buffer, by-pass and coupling service. Handy five-pack keeps stock clean, leads kink-free.

For more data, circle 2-23-1 on coupon, p. 46

Audio NEWS LETTER

FEDERATED INDUSTRIES announces its new "MAX-FLX" auto radio speaker line with as much as 33⅓% more field strength with the same magnet weight.

UNITED AUDIO introduces the Dual-1006 Custom turntable/changer, superseding previous model. It trips and tracks as low as 1½ grams. $79.95.

BELL SOUND introduces its first bookshelf stereo speaker, having 2-way speaker system featuring 8" woofer, 3½" tweeter, walnut veneer cabinet; $60.00 each.

ALLIED RADIO introduces the Knight KN-150 Hi-Fi FM Tuner with Dynamic Sideband Regulation. IM distortion is below 0.25% at signal levels over 10 μv. $119.95.

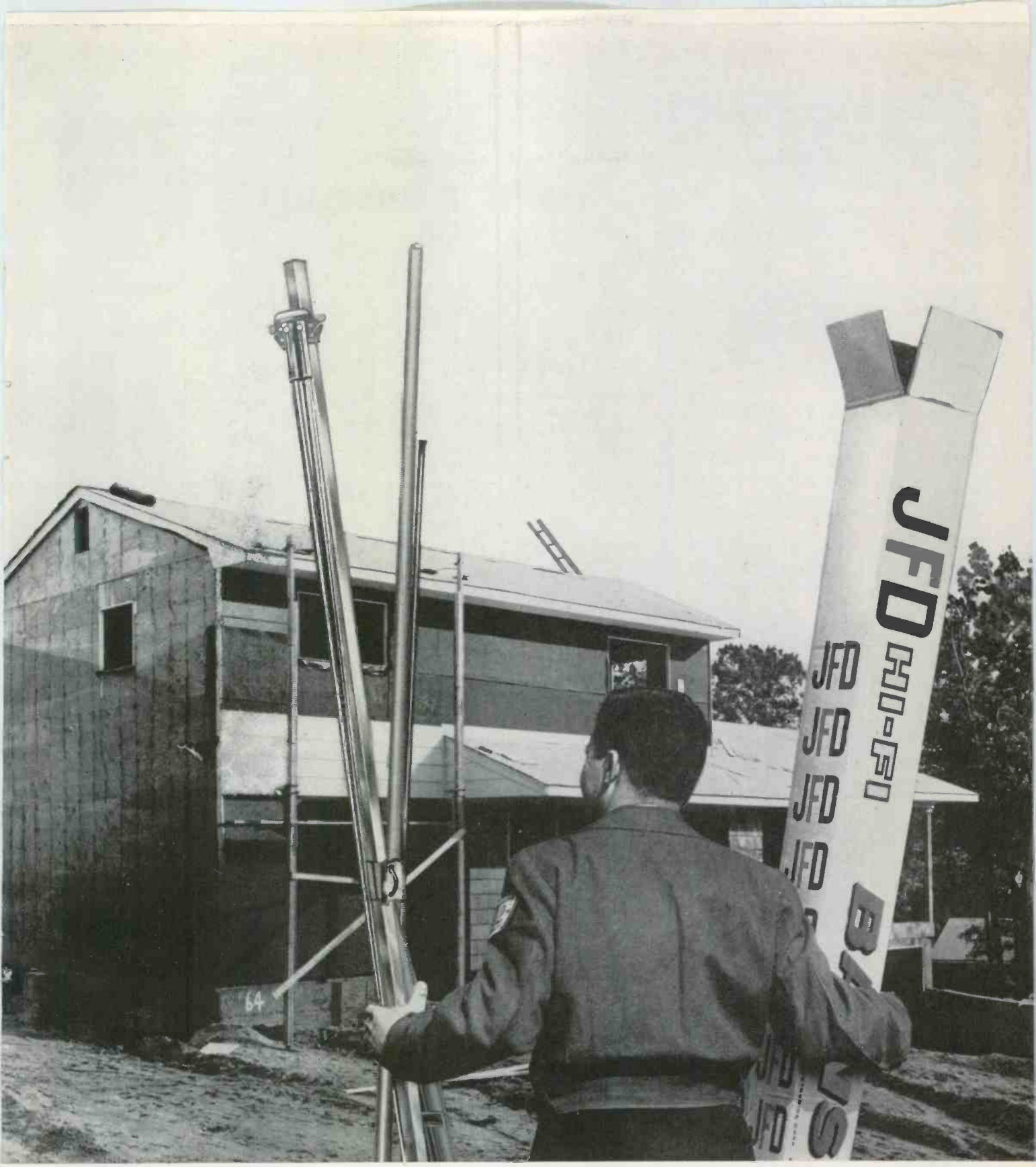
ROBINS INDUSTRIES reports new products: Model 5Q17-105 M/M quarter-track stereo record/playback tape head, @ $30; Model SD-4 4-speed strobe disc, @ 50¢.

NESHAMINY reports introduction of a speaker installation kit, JAN KIT Model 41, for built-in installations. The JansZen electrostatic two-element mid/high range driver and Model 350 woofer are both mounted on a single panel board. Price is $99.95.

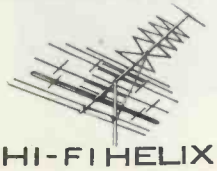
POLAR ELECTRONICS announces an all-transistor stereo preamplifier-amplifier unit offering 15 watts/channel with frequency range of 20–20,000 cps. The unit features complete circuit encapsulation and is guaranteed for 30 months. $96.50.

LAFAYETTE announces a 4-speed turntable with integrated 12" tone arm @ $49.50. Turntable features a 4-pole motor, 3 lb 12" aluminum table, speed control varies each speed ±7%. Technical specs: noise and rumble —50 db, wow and flutter less than 0.2%.

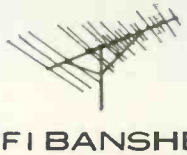
BENJAMIN ELECTRONIC SOUND introduces a new magnetic phono cartridge, Model ST-310D, for stereo records *only*. Called the "Studio," it is used by European broadcast studios. Features include: 0.52 mil diamond stylus, 20–20,000 cps frequency response, 3 to 5 grams tracking force. Priced at $45.00.



The Businessman in the Serviceman suit knows 1,400,000 new houses* mean unlimited opportunities in new antenna installations. He intends to get his share of this profitable business. His antenna brand? . . . JFD, of course—for performance that delights his customers and confirms their confidence in his technical ability.



HI-FI HELIX



HI-FI BANSHEE

HI-FI FIREBALL

THE BRAND THAT PUTS YOU

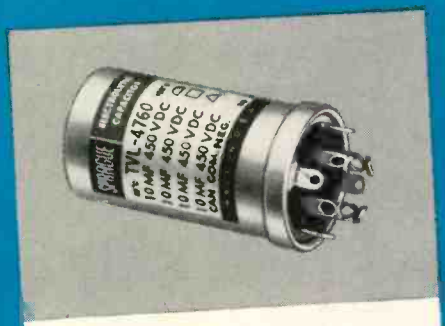
JFD

IN COMMAND OF THE MARKET

JFD ELECTRONICS CORPORATION
BROOKLYN 4, NEW YORK

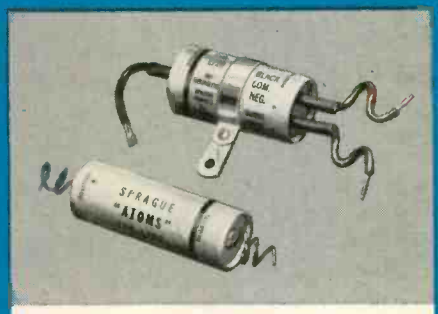
Source – American Builder

For more data, circle 2-25-1 on coupon, p. 46



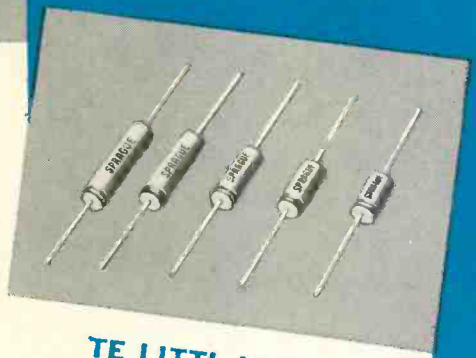
TVL TWIST-LOK® CAPACITORS

These 'lytics take on the toughest TV and radio duty, give maximum trouble-free service, *without HUMMM!* They are dependable at extremely high and low temperatures. Cathodes are etched to meet the needs of high ripple currents, high surge voltages.



TVA ATOM® CAPACITORS

Atom tubulars are service favorites because they fit anywhere, work anywhere. They're the *only* small size 85 C (185 F) capacitors in ratings up to 450 WVDC. They have low leakage current, long shelf life, and withstand high ripple currents, high surge voltages.



TE LITTL-LYTIC® CAPACITORS

The very best ultra-miniature replacements for transistor circuits, offering unusual reliability through all-welded construction. No pressure joints to cause "open" or intermittent circuits. Long shelf life—extremely important in sets used only part of the year.

VL VERTI-LYTIC* CAPACITORS

These single-ended molded tubulars are the ideal replacement for units of this type found on printed wiring boards.
Keyed terminals assure fast manual mounting and correct polarity. Resin end fill protects against drying of electrolyte or entrance of external moisture.

EVERY 'LYTIC YOU NEED...

- every value
- every rating
- every style

Shown here are the more popular of Sprague's big family of Electrolytic Capacitors, the broadest in the industry. Other types include Metal-encased Screwbase; Plastic-encased High-MF; Metal-encased Octal-base; Ultra-low leakage Photoflash. All are listed and described in Sprague's NEW Catalog C-613A. Get your copy from any Sprague distributor, or write Sprague Products Company, 65 Marshall Street, North Adams, Massachusetts.

PCL PRINT-LOK® CAPACITORS

The printed circuit version of the Twist-Lok. Universal base replaces any of the printed circuit 'lytics in use today. No makeshift mounting adapters to damage capacitor or add extra height . . . no possibility of high resistance contacts.

*TRADEMARK

SPRAGUE®
THE MARK OF RELIABILITY

WORLD'S LARGEST CAPACITOR MANUFACTURER

For more data, circle 2-26-1 on coupon, p. 46

ELECTRONIC TECHNICIAN
Including SERVICE Magazine

Improving TV Set Serviceability

We have been pleased to note the improvement being made in TV receiver designs. Those portables (some of which are barely toteable) have become more compact. The laminated or bonded faceplate in place of the separate safety glass should improve accessibility, simplify dust removal, and provide greater flexibility in the set's physical design.

Most heartening are the improvements to make sets more serviceable. Along with thousands of service technicians across the country, we complained about early printed circuits which were not as reliable in performance or easy to service as they should have been. Current models use tracing patterns which simplify the trouble shooter's job in locating defective components.

We hope set designers will not slacken their pace in designing greater serviceability into TV receivers. On some sets, certain controls are either inaccessible or nonexistent. On others you have to remove the entire chassis before you can take out the safety plate. Happily, such shortcomings are not typical of most sets.

There's progress in serviceability.

Those Long Warranties

A TV set buyer has a right to expect proper performance for a reasonable time. Warranties should continue to assure free replacement of defective parts.

However, the very nature of TV sets demands periodic maintenance. To set out a warranty that is unreasonably long—five years, for example—confuses the consumer and places an excessive burden on the service dealer. Warranties should protect against unexpected failures, not normal long-term wear. A five-year warranty incorrectly implies to the consumer that failure should not be expected before that time. The set performing well after five years without service is a rarity among rarities.

As a sales gimmick, unreasonably long warranties can backfire. Competitors will be pushed into matching or surpassing existing warranty periods. Ten-year warranties, anyone? It could happen, saddling the industry with an unnecessary, obnoxious burden.

We are pleased to see the January 1961 report by *Consumers Union* inform consumers about the difficulties such a guarantee encourages:

"The Admiral set is worth a brief discussion. The five-year guarantee of its particular printed-circuit board should ease the serviceman's fear of the sort of hairline cracks that drove him to despair when they appeared in the boards of many of the early printed-circuit sets. However, the unusual Admiral guarantee is somewhat less of a help than it purports to be: The many parts on the board are only guaranteed for the usual 90 days. To replace the board under the guarantee, the serviceman will have to transfer all of the parts from the old board to the new one, a time-consuming and costly process."

We hope that set manufacturers will give the same careful thought to service warranties as they have been giving to serviceable designs.

TV MANUFACTURERS

ELECTROHOME (Canadian)

Vertical lines in the background may appear slightly curved due to power supply hum affecting the picture's horizontal linearity.

To correct this condition install a ceramic capacitor whose correct value my vary from 2K to 4.7K $\mu\mu$f (3000 $\mu\mu$f is correct for most sets) from B+ to the junction of R407 and C408. This capacitor may be conveniently connected across pins one and two on the yoke socket. Future production runs will include this modification.

GENERAL ELECTRIC

Chassis M4, M5, early M6—Interference Bars

Some of these chassis may display an interference pattern resembling two hum bars when receiving extremely weak signals. This condition will not be apparent on normal or strong signal operations.

Interference has been traced to the re-radiation of the r-f signal from the receiver's power supply. To eliminate this effect, disconnect the grounded end of capacitor C405 connected to pin 4 of the low-voltage rectifier (5U4GB) and connect it to pin 2. This change has been incorporated in recent M6 chassis.

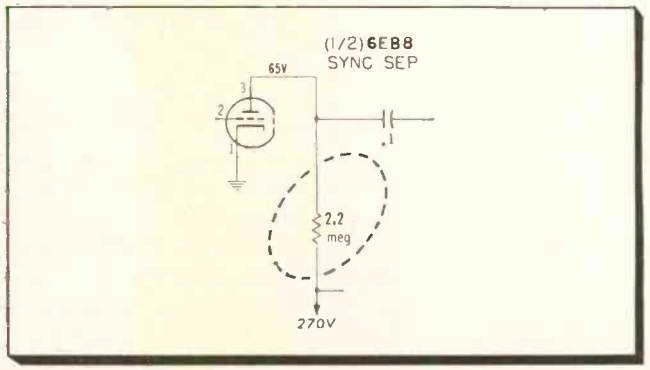
Chassis M5, U4—Remote Control Tube Replacement

When it becomes necessary to replace the 6EA8 tube in wireless remote receivers, replace the defective tube with a 6GH8 tube. The 6GH8 tube is an improved tube to replace the 6EA8 when gain is a factor. (However, direct replacement is recommended for *this* application only, not for replacement as a chassis tuner tube).

MAGNAVOX

Chassis 33 Series—Vertical Sync Stability

To improve vertical sync stability, the plate load resistor in the sync separator circuit (½ 6EB8 tube) has been changed. The original value of R39, 2.2 meg,



A critical vertical hold control condition in excessive noise areas on some Magnavox series 34 TV chassis, can be corrected by reducing the value of a plate resistor in the sync separator (½ 6EB8 tube) from 2.2 megs to 1.8 megs.

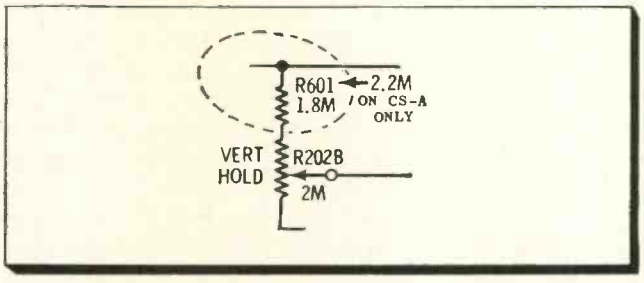
has been changed to 1 meg. This modification is being incorporated in current production.

MOTOROLA

Chassis TS-435 Code A-01, CS-B—Production Changes

(See ET Circuit Digest #528 10/59 and #551 2/60)

To prevent damage to the filament string in the



To recenter the vertical hold control's lock-in position on a Motorola TS-435 TV chassis, change the value of the resistor in series with the control from 2.2 megs to 1.8 megs.

event the CRT arcs, the following production change was made: *Code A-01*—A 0.01 μf, 1400V capacitor (C508) was added to prevent other component breakdown if the CRT should arc. The capacitor is connected between B+ boost and ground. Physically, this is between pin #1 (ground) of the 8GN8 vertical

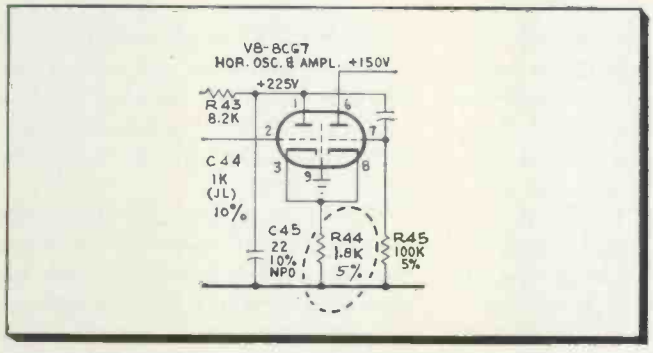
TECHNICAL DIGEST

oscillator tube and the boost connection of C505. *Code CS-B*—To center up the vertical hold control, a 1.8 meg resistor is used in series with the control, replacing a 2.2 meg resistor (R601).

PACKARD BELL

Chassis V8-7, V8-9—Christmas Tree Effect

To overcome a horizontal lock-out condition, appearing as a Christmas tree effect, change the horizontal oscillator tube's (8CG7) cathode resistor from 2200 ohms to 1800 ohms (±5%, ½W). Sets stamped 2962 or higher incorporate this change.



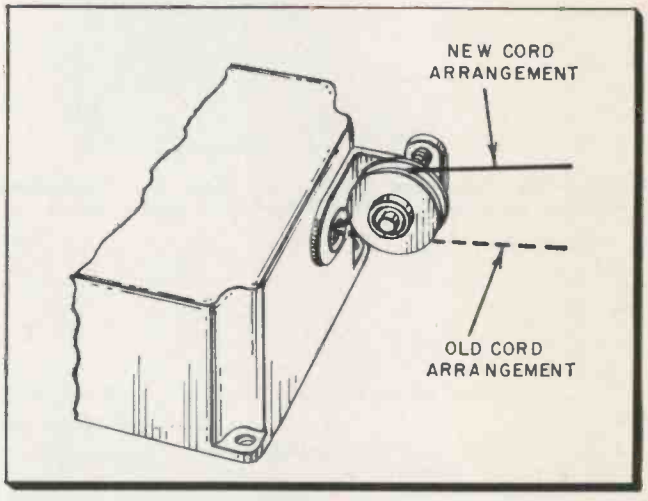
To eliminate a "Christmas Tree" effect in some Packard Bell V8-7 & -9 TV chassis, the circled 8CG7 horizontal oscillator's cathode resistor has been changed from 2200 ohms to 1800 ohms.

RCA

VC-18, -24 Series—FM Dial String Revision

It was found that mechanical vibrations reaching the FM tuner drive were being transmitted to the tuner's oscillator core. This resulted in a "howl" on FM reception.

To eliminate this condition, the FM tuner string arrangement has been revised. The string now makes a bend at the eyelet where it leaves the tuner and is passed over the top of the pulley, rather than under it, and then continues to the underside of the tuning drum shaft. If this change is made in an earlier production run tuner it will be necessary to reposition the FM tuner string drive collar for correct alignment.

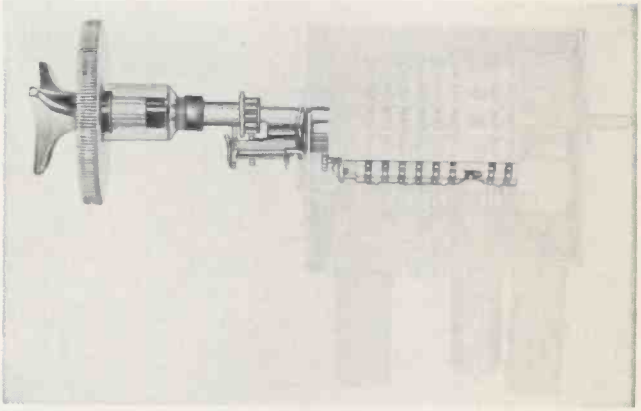


The RCA FM tuner dial string modication illustrated here, eliminates mechanically-induced reception howl.

ZENITH

New Turret Tuner—Oscillator Slug Alignment

The *Gold Video Guard* tuner employs a channel selector knob with a mechanism that permits front panel adjustment of each channel's oscillator slug without disturbing alignment to the other channels. Rotating the tuning knob causes a nylon gear to engage the oscillator adjustment screw of the channel being viewed.



Zenith's turret tuner uses the front panel selector knob to adjust each channel's oscillator slug. The "fine tuner" engages each slug through a shaft gear arrangement when rotated.

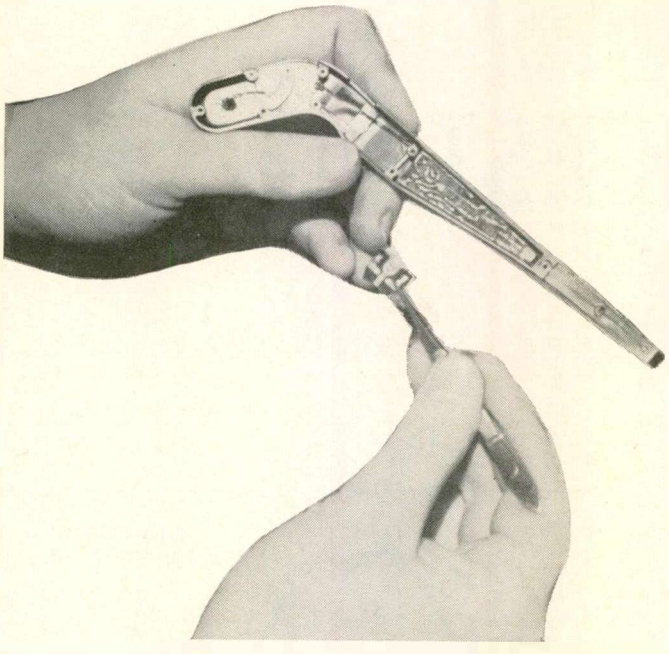


Fig. 1—The "eyeglasses" hearing aid shown here incorporates an electronic amplifier and volume control in its temple frame.

Servicing Transistorized Hearing Aids

- *How They Work*
- *Repair Methods*
- *Obtaining Parts*

LEO G. SANDS

• The public spends around $60,000,000 for 300,000 new hearing aids every year. Many different types are available, such as the eyeglass temple-type shown in Fig. 1. No figures have been published on how much is spent for servicing hearing aids. But, it is a significant number, you can be sure.

The standard price charged by hearing aid repair specialists for repair and overhaul of a transistor hearing aid is $12.50 and $7.50 for tube type aids. These prices include parts, but no batteries. The repair jobs are seldom performed by a hearing aid dealer. Instead, the dealer often ships ailing hearing aids to one of the few specialized shops where this kind of work is done, or to its manufacturer.

Many hearing aid dealers specialize in the *sale* of new hearing aids and confine servicing to replacement of cords, batteries and ear pieces. He chooses to send hearing aids to a distant city for repairs because none of the electronics service shops in his town has *asked* him to farm out his repair business to them.

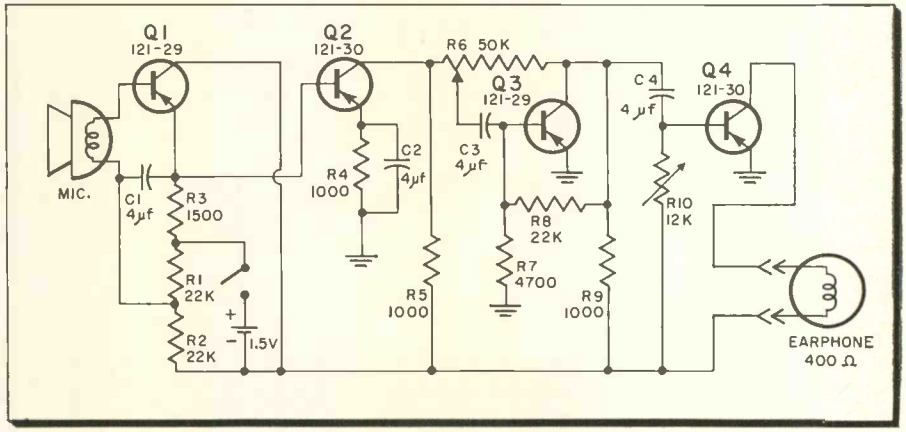
There is nothing mysterious about a hearing aid. It is a very simple PA ("private" address) system consisting of a microphone, an amplifier and an earphone or bone conduction transducer. To see how really simple a hearing aid is, let's examine the circuit of one of the popular makes, a Zenith model 50R, shown schematically in Fig. 2.

The microphone output signal is fed directly to the base of Q1 and to the emitter through C1. Bias is developed across R3 and is augmented by the voltage fed to the base from the junction of the voltage divider R1-R2. The signal developed across R3 is fed directly to the base of Q2, functioning as a common emitter amplifier. The signal developed across R5 is applied through C3 to the base of Q3 whose output signal is developed across R9 and is fed through C4 to the base of Q4. The varying collector current (output) of Q4 passes through the coil of the 400-ohm earphone.

The circuit is conventional except for the manner in which volume is controlled. Fig. 3A shows how the third-stage circuit looks when the volume control is set for minimum gain. Q3 is essentially out of the circuit. The signal voltage developed across R5 is also developed across R6 and R9 which form a 50:1 voltage divider. Hence, there is a 34 db loss through the third stage.

When the volume control is set to

Fig. 2—Schematic diagram of a Zenith Model 50R Hearing Aid.



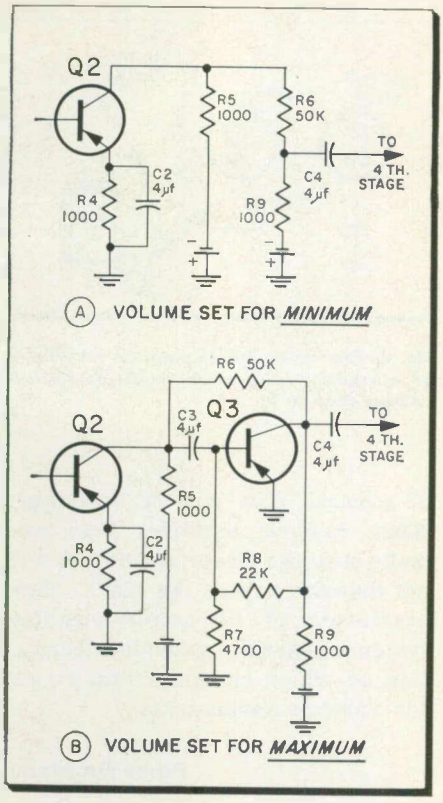


Fig. 3—Equivalent circuits of Zenith Model 50R when volume is set for minimum sound (A) and maximum sound (B). See text!

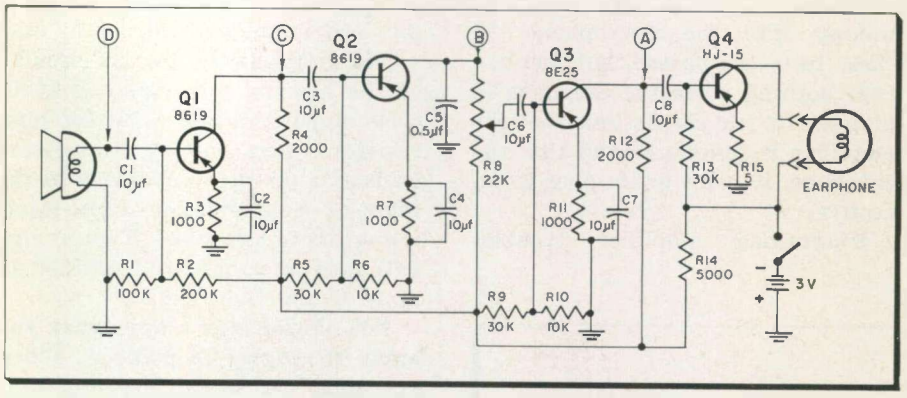


Fig. 4—Conny Model T-2 Hearing Aid that uses a conventionally-wired volume control circuit.

its maximum gain position, the circuit is as shown in Fig. 3B. The transistor Q3 is now in the circuit. The signal voltage developed across R5 is applied to the base of Q3 through C4 and is developed across R7. But, also appearing across R7 is an out-of-phase feedback voltage from the collector of Q3 whose value is determined by the ratio of R7 and R8 as well as the gain of Q3. In addition, the output signal developed across R9 is fed back through R6 to the input of Q3. The magnitude of this feedback voltage is determined by the gain of the transistor as well as the ratio of R6 to R5, which is 50:1. The feedback through R8 is the same at all frequencies while the feedback through R6, which must pass through C4, has less effect as frequency decreases because of the rising reactance of C4.

R7 and R8 also bias the base of Q3 at the desired d-c value. R10 in the input circuit of Q4 affects gain as well as bias.

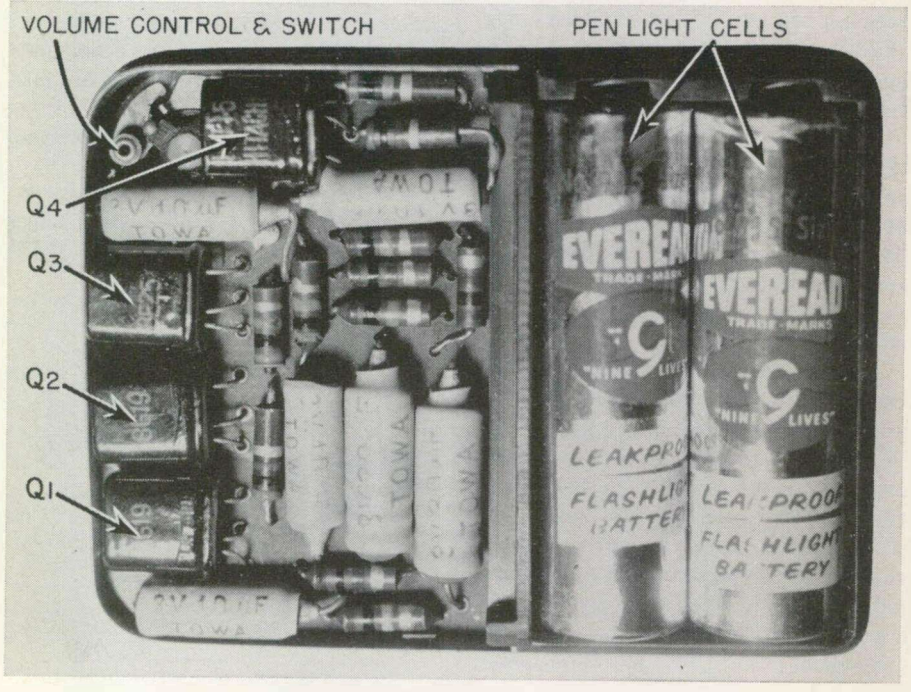
It should now be obvious that there is nothing complex about a hearing aid amplifier. But, let's look at another circuit. Fig. 4 is a schematic of the Conny model T2 hearing aid which also employs a four-stage transistor amplifier. All stages employ the grounded emitter connection. In the fourth stage, feedback is provided by leaving R15 unbypassed and by the loop, consisting of R16 and C8, from the collector back to the base. Power is derived from a pair of 1.5-volt penlight cells. Fig. 5 illustrates the unit pictorially.

Troubleshooting

What can go wrong with a hearing aid? The most common trouble is a dead battery. The easiest way to find out, of course, is to replace the battery. Earphone cords are a common source of trouble. Earphones and microphones can also go bad. These troubles can be remedied without requiring any skill in electronics.

To determine if it is the amplifier, earphone or its cord that is defective, simply remove the earphone plug from the amplifier output jack. Connect a d-c voltmeter in place of the earphone plug, turn the hearing aid on and talk into the microphone. There should be voltage and its reading should increase as you talk closely into the microphone. Or, connect a d-c milliammeter through a 200 to 450 ohm resistor to the output terminals. When talking into the microphone, the current reading should increase because of the action of the class B amplifier. If the amplifier is equipped with an output transformer, use an a-c voltmeter or VTVM. It should read zero when no sound is picked up. Output voltage should exist and vary when

Fig. 5—Pictorial view of a Conny T-2 Hearing Aid, showing major components.



talking into the microphone. If these tests are passed, but you can hear nothing when the earphone is plugged in, you can assume that the amplifier is functional and that the earphone, its cord or its plug is defective.

Diagnosing amplifier troubles

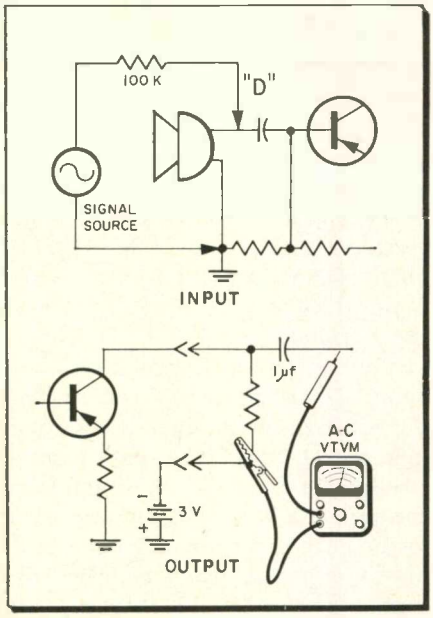


Fig. 6—Practical test set-up for checking the overall gain and frequency response of a transistorized hearing aid.

requires skill, but not a great deal. In the first place, it is a simple electronic audio amplifier. But, because of its compactness, good eyesight and careful workmanship are required. What can go wrong with a hearing aid amplifier? Resistors can change in value, capacitors can open, short or become leaky, and transistors can go bad.

The first step is to make a visual inspection, looking for goo running out of capacitors, dirt, corrosion and broken connections. Don't expect to find scorched resistors since the voltages are so low that current flow through resistors is extremely small.

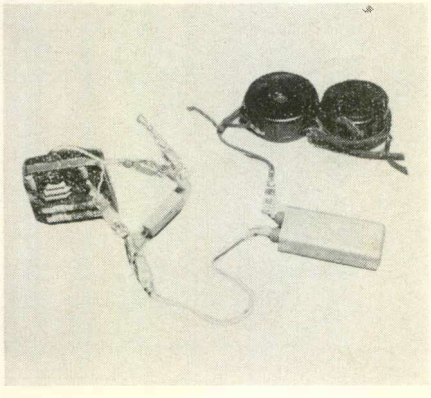
Once it has been determined that the transistors and battery are good, signal tracing is the next step. With a hearing aid earphone or an ordinary radio headset connected to the output jack, you're ready to proceed. You need an audio signal source. If you're using an audio signal generator, be sure to ground the signal generator case. Also, connect the signal generator's grounded output lead to the ground bus or case (if it is grounded to the circuit) of the hearing aid. Apply a 1000-cycle signal through a 100,000-ohm resistor, using one of the resistor leads as a probe, successively to the input of each amplifier stage, starting with the last stage. Typical signal injection points are identified as A, B, C and D in Fig. 4.

You should hear a tone when you apply the signal to point A. When you apply the signal to points B, C & D, the tone should get progressively louder. Be sure the hearing aid volume control is turned up and keep reducing the output of the signal generator as you progress toward the head end of the amplifier. If you do get tone when you apply a signal at point B, but you get none when feeding signal to point C, you have trouble in the second stage. When you apply signal to point A, you might hear the tone through the microphone, functioning as a loudspeaker.

You can measure overall gain and frequency response by applying a signal to point D and measuring a-c output voltage across a dummy load as shown schematically in Fig. 6. Monitoring an output section with headphones is shown in Fig. 7.

Hearing aids, like other electronic devices, last longer and work better if given periodic preventive maintenance. Cleanliness is most important. Amplifiers worn close to the human body are subjected to heat and moisture. Leaky batteries can contaminate parts. Earphones are apt to become clogged with wax. A simple way to clean amplifiers and earphones is to dunk them into a cleaning solution, using an ultrasonic cleaning system. In a matter

Fig. 7—Monitoring a hearing aid's output with headphones. The phones are shunted across a resistor through a 1μf capacitor.



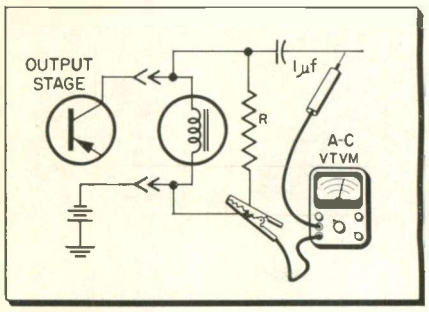


Fig. 8—Test set-up for finding the impedance of a headset, using an a-c meter to indicate voltage drop at R.

of seconds, they will be amazingly clean. Remove batteries first, and make sure the cleaning solution will not dissolve any of the parts. Manufacturers of ultrasonic cleaning systems generally provide information on which cleaning fluid to use for various applications.

Parts Problems

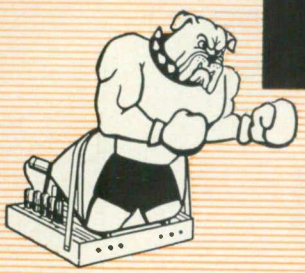
It may be difficult to get parts or information from some hearing aid manufacturers who want to restrict all servicing to themselves or their dealers. If you run into unmarked or unknown transistor types, you can quickly determine which lead is base, collector and emitter if you have an in-circuit transistor tester. Merely try the test leads in various combinations. When you find the right combination, the tester gives an indication, if the transistor is operative. You can also determine if it is PNP or NPN and its beta.

To determine the impedance of an earphone, measure the a-c voltage across it as shown in Fig. 8, trying various values of R. When the voltage is twice as great with R disconnected than it is with R connected, the impedance of the earphone is approximately equal to the value of R.

The resistors and capacitors used in hearing aids are usually standard types available at radio parts jobbers. Volume controls and transformers may be special. Microphones and earphones are usually available from firms specializing in these miniaturized devices. Cords, plugs and other accessories are available from such firms as those listed in the Chart I.

To get into the hearing aid am-

(Continued on page 50)



"Tough Dog" Corner

Difficult Service Jobs Described by Readers

Sync Capacitor Weakens Video

An Admiral 21F1 chassis nearly stumped me. The set was brought in with no high voltage due to a shorted 500 $\mu\mu$f 20 kv hi voltage capacitor. After replacing same I was faced with a weak pix; the sound appeared normal. The contrast control was operative and when fully clockwise the picture showed re-

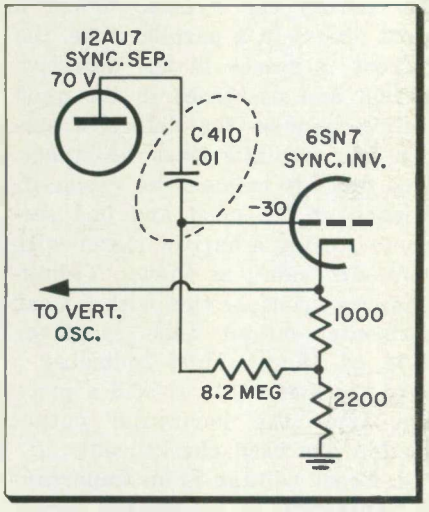


Fig. 1—Intermittent loss of horizontal sync and weak video in an Admiral 21F1 TV set was caused by a leaky sync capacitor.

trace lines. Sync would lock for about ten minutes and then intermittently fall out. It locked in vertically, though.

I used an analyst to check r-f and i-f circuits and could get the pattern to come through fine, with good contrast. However, the horizontal sync still lost hold every now and then. Since my analyst has a variable r-f and i-f signal control, it seems all I was doing was *forcing* a signal through the set. Still suspecting i-f trouble I measured all voltages: plate, screen, cathode, and grid bias. All measured normal. The video amplifier voltages were checked and rechecked. Resorting to an agc box, I still found no improvement in the contrast.

The thought occurred to me that perhaps I should tackle the sync problem. I began with the 12AU7 (sync separator tube section) shown in Fig. 1. Plate voltage was just a mite low, but continuing on the grid of the 6SN7 sync inverter I read a positive voltage instead of the −30 I was expecting.

I changed the coupling capacitor (already had replaced tubes), and I turned the set on to check the horizontal sync. Much to my surprise, not only did it lock in and hold, but the pix came on with normal contrast too.—*Elmer Woods, Los Angeles, Calif.*

Filament Globar Kills Oscillator

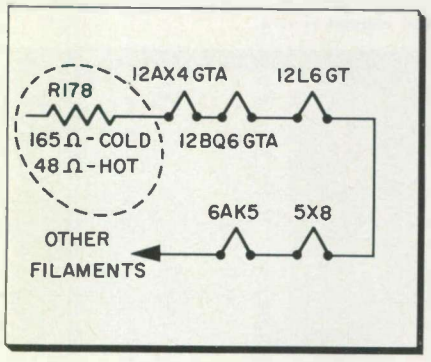
My customer's complaint on his Sylvania Model 21T-103M was: no sound (though audio noise was apparent), picture on low frequency channels (4 and 5) and no picture on the high frequency band (Channel 9) at any time. After approximately twenty minutes operation, channels 4 and 5 would disappear.

At the shop I double checked by substituting the r-f and oscillator mixer tubes (5X8 and 6AK5) and still didn't receive a picture. Troubleshooting by checking and substituting tuner parts proved a failure. I did notice that it took the set quite a while to warm up when first turned on.

I decided to change the globar resistor (shown in Fig. 2) in the series filament string and to my astonishment the set returned to normal operation. The trouble was low filament voltage on the 5X8 and 6AK5 tubes. Since I had full raster and audio noise, I did not suspect low filament voltage.—*M. F. McWilliams, Drummond, Okla.*

• *High frequency oscillator circuits are particularly sensitive to voltage inadequacies. Therefore, it's not surprising to find a slightly lower filament voltage affecting tuner oscillator operation before the horizontal oscillator or other circuit sections. A low-voltage rectifier with deficient output could conceivably also kill the tuner oscillator without influencing width.—Ed.*

Fig. 2—A defective globar resistor used in Sylvania's 21T-103M chassis killed the tuner's oscillator tube.



TOUGH DOGS WANTED

$10 for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do. Photos are desirable. Unacceptable items will be returned if accompanied by a stamped envelope. Send your choice entries to "Tough Dogs" Editor, ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

Misconceptions In TV Servicing

Five Commonly Accepted TV Repair "Facts" Are Disproved

WAYNE LEMONS

• Everyday, it seems, we read or hear some fallacy concerning some facet of TV service. These fallacies are picked up by technicians and are told and retold until they permeate the thinking of the service industry—but as someone has said, "if fifty million people say a fallacy is true, it's still a fallacy."

Certain errors have crept into our thinking over the years—with no one more guilty than myself, for at one time or another I would have sworn that all these misconceptions were true!

Let's take a look at some of the more common fallacies and then present evidence to prove that, truly, each *is* a misconception.

1. A bright vertical line can only occur on sets with a r-f high voltage power supply.

You've probably read this statement somewhere, but the technician who has had vertical line troubles (no horizontal deflection) with a flyback supply knows better. See Fig. 1. The cause may be: open yoke or an open yoke coupling capacitor. Many sets will still develop high voltage without the yoke connected; most autoformer types will! Direct drive sets often produce *excessive* high voltage with the yoke or linearity coil shorted! It follows then that if high voltage is present but there is no sweep energy in the yoke, a vertical line could be present on the picture tube.

2. Vertical output grid will be negative if receiving vertical drive.

This statement is accepted universally by technicians. The facts are: there is no negative drive unless the height (shown in Fig. 2) or linearity is misadjusted. Many vertical output stages are class A amplifiers and they *normally* draw no grid current, since they function on the linear portion of the curve. Thus, no vertical output stage will overheat because of the lack of drive! Unlike horizontal circuits, which rely on stored damper current to produce part of the sweep, vertical output stages must produce a linear sweep through the entire sweep cycle—just like audio amplifiers.

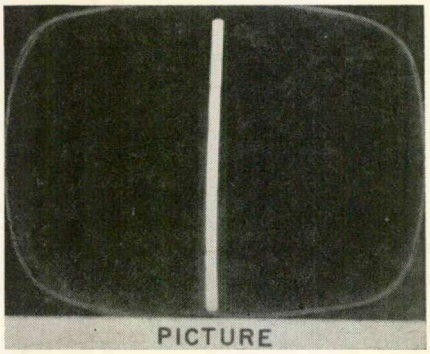
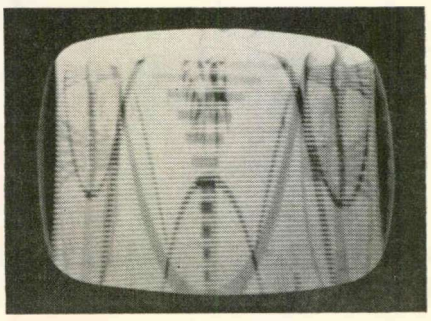


Fig. 1—*Misconception:* Bright vertical line can only occur with a r-f high voltage power supply. *Fact:* This can also happen in a flyback circuit.

Fig. 2—*Misconception:* Vertical output grid has a negative voltage if receiving vertical drive. *Fact:* When height or linearity controls are misadjusted, the grid will indicate a negative voltage. However, at normal control settings, grid voltage is zero.



3. A shorted or partially shorted yoke will cause horizontal "keystoning" (trapezoidal raster).

This is true of series-connected yokes (Fig. 3A), except when used in direct drive sets. Many modern sets, though, use parallel yokes. That is, the horizontal yoke windings are connected in parallel (Fig. 3B) across the flyback. When a short occurs in a parallel yoke, the current increases in the defective section and decreases in the good section because the defective section now exhibits least resistance. This tends to balance the sweep efficiency of the good and bad sections, causing a narrow raster with *paralleled* sides, as shown. Technicians may confuse this with a weak horizontal output tube symptom. Rule of thumb then indicates a yoke check if width is still a problem after the horizontal output section has been checked out.

4. Boost voltage is an important measurement in horizontal circuit troubleshooting.

This fallacy is widespread among many TV technicians. You can nearly always start an argument with other technicians by simply saying that it *is* a misconception. To win the argument—simply ask the disputant to list what troubles he can determine by measuring boost. He'll fumble a bit, for all a boost measurement can do, except in extremely rare instances, is to indicate there is some (undetermined) amount of sweep energy or there is none. However, he already knows this or wouldn't be checking this circuit!

(Continued on page 60)

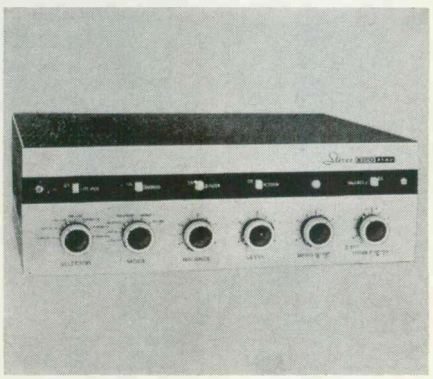
Shure PHONO CARTRIDGES

Models M7-N21D and M3-N21D stereo phono cartridges have been added to the M7D and M3D series. Equipped with N21D tubular stylus. Tracking force, 2 grams. Claimed for these new units is greater compliance and cleaner high-end frequency response. Also available is the M232 (12") and M236 (16") independent tone arms with either of the new cartridges installed and with the arm balanced and set at the proper tracking force. M7-N21D, $36.75; M3-N21D, $47.25; M232 arm with M7-N21D, $66.70; M236 arm with M7-N21D, $68.70; M232 arm with M3-N21D, $77.20; and M236 arm with M3-N21D, $79.20. M7D and M3D cartridges will continue to sell at $24 and $45, respectively. Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill.

For more data, circle 2-35-2 on coupon, p. 46

EICO STEREO AMPLIFIERS

Two stereo integrated amplifiers, built to handle any stereo program source, are: model ST70, contains 2 35-watt power amplifiers, frequency response, ±½ db 10-50,000 cps, harmonic distortion, less than 1% from 25 to 20,000 cps; model ST40, frequency response ±½ db 12-25,000 cps, harmonic distortion, less than 1% 40-20,000 cps. ST70: kit, $94.95, wired, $144.95. ST40: kit, $79.95, wired, $124.95. Prices include metal cover Eico Electronic Instrument Co., 33-00 Northern Blvd., Long Island City 1, N. Y.



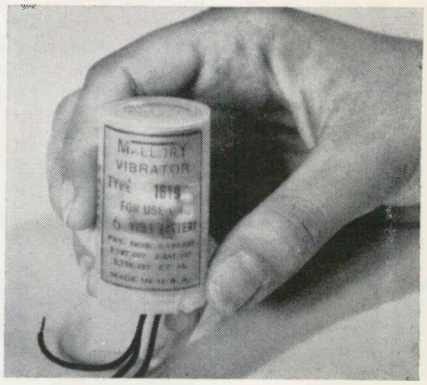
For more data, circle 2-35-3 on coupon, p. 46

RCA TRANSISTOR

Announced is a new "drift-field" power type transistor which makes it possible, economically to transistorize high-fidelity and public address systems, auto radios, jukeboxes and intercoms. It is a p-n-p germanium type for use in both Class A and B audio amplifiers; has an alloyed emitter, diffused collector and graded base; and delivers high audio power for monaural and stereo sound equipment when operated either from a car battery or standard house current. RCA Semiconductor and Materials Div., Somerville, N. J.

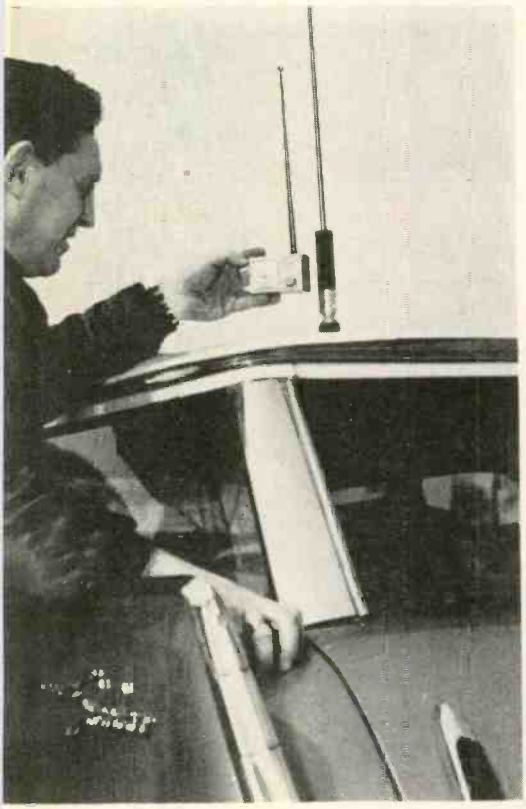
Mallory VIBRATOR

Type 1619 vibrator, developed for a photoflash application, employs a molded polyethylene case and is 20% to 30% lighter than a similar unit packaged in metal. The cylindrical case resists deformation at temperatures up to 150°F. Three leads extend through an epoxy-sealed hole in one end of the case. It is non-synchronous, has a frequency of 115 ± 7 cps and a maximum load of 3 amperes. Can be supplied in 3, 6, 12, 24 or 32v ratings. Mallory Electromagnetic Div., P. R. Mallory & Co., Inc., Du Quoin, Ill.



For more data, circle 2-35-4 on coupon, p. 46

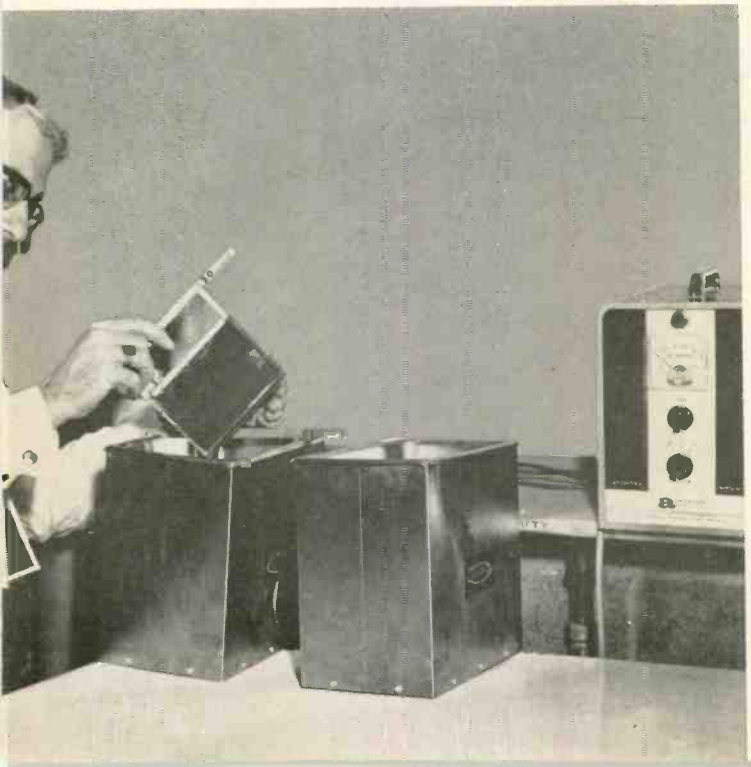
When out on assignments, photographer uses mobile telephone to keep in constant touch with clients and his office. Control head of transmitter can be seen to left of the auto's air conditioner.



Technician Cooper holds field strength meter near base-loaded antenna to check out transmitter in Jacques' "wagon."

Local electronic technician, Bob Cooper, who keeps Saphier's equipment in top condition, peaks up one of the police radio monitors in photographer's station wagon.

Ultrasonic high speed film developing is one of the research projects undertaken during Saphier's spare time.



Saphier pushes button in dark room and electronic "computer" controls exposure when making photographic enlargements.

Electronics In Photography

Photographer Employs Electronic Flash, 2-Way Radio, Ultrasonics For Increased Efficiency

Photographer Jacques Saphier using a portable Citizens band transmitter-receiver while covering an out-door event. He uses photoelectric and "strobe" flash equipment on cameras.

LEE CRAIG

• Electronics helps Jacques Saphier to live up to his slogan "Have Camera—Will Travel—Anywhere—Right Now!" This 20th century professional photographer uses electronic devices in his darkroom, while taking pictures, and when on the road.

In order to receive assignments from United Press International and his many clients, he makes it easy for them to reach him. To contact Jacques Saphier, a client merely dials his telephone number. If his secretary is in, she answers the call. If not, a telephone answering service takes the call. Whichever got the call dials "operator" and asks for the mobile service operator who in turn dials Jacques' mobile telephone number.

If he is in his station wagon, the message is relayed to him via the mobile radiotelephone. But, if he is out of his car shooting pictures, the lighted "call" lamp on the telephone control head alerts him to check in with his office immediately.

Not satisfied with this arrangement, he is going a step further. A modified Link transmitter has been installed in his station wagon. When in operation, it will transmit a tone modulated radio signal which will actuate the selective decoder in his Pagemaster pocket radio receiver. The Pagemaster will issue a beep, which will alert him to run out to his car to answer the telephone.

The 30-watt transmitter operates on 27.255 mc. It transmits for one second when it is actuated by the closure of the contacts of a relay connected to his mobile telephone. This relay is energized when the mobile telephone bell rings. Its contacts control a relay in the transmitter which puts it on the air. A time delay circuit automatically turns off the transmitter after one second.

The Pagemaster receiver, which Jacques plans to carry in his pocket at all times, is tuned to 27.255 mc and responds only to a specific tone.

This telephone bell extension will permit Jacques to know at all times when his mobile telephone is called. It has been tested manually, but is not yet in automatic operation. While already licensed as a class C Citizens Radio station, Jacques has appealed to the FCC to grant him a waiver of the rules to permit remote control of a Citizens radio station.

Besides the mobile telephone and the bell-extender transmitter, Jacques' station wagon is equipped with a class D Citizens Radio and an AM auto radio, plus HF and VHF fixed-tuned receivers. The HF receiver monitors a 25-50 mc band police radio channel; the VHF receiver monitors a 152-174 mc band police radio channel. Since he is the official photographer for the two police departments whose radio signals he monitors, Jacques has permission to do so.

While taking pictures he uses electronic flash equipment including photocell controlled slave units.

In his darkroom, Jacques employs an electronic computer which automatically controls the exposure time of his enlarger. A photocell looks at the projected image and feeds a signal to the computer which tells the computer how much light is available. As a result—perfect pictures every time.

Jacques also uses an ultrasonic cleaning system for cleaning darkroom tools, film holders and camera parts. The ultrasonic agitation frees them from developer, hypo and dirt.

Recently, Jacques has been experimenting with ultrasonic high speed film developing. The developer is placed in one of the ultrasonic cleaning tanks, hypo in another. By agitating the developer

(Continued on page 56)

Get Ready For Stereo Multiplexing

A Prime Contender For FCC-Approved Stereo Broadcasting Is Analyzed

ALAN ANDREWS

• Ever since the advent of stereo sound production, *broadcasting* in stereo has been more desirable to many stereo equipment owners. Early attempts along this line utilized two stations, either AM and FM, or else FM and TV. This system had obvious disadvantages. It required two stations, a costly procedure, and at the receiving end two receivers are needed.

More plausible systems were devised whereby stations could broadcast both stereo signals on the same carrier. One of the stereo signals modulated the carrier directly, the other signal was used to modulate a subcarrier which then modulated the main carrier. The general term multiplex is used to describe any communications system where more than one signal is transmitted on the same carrier. Accordingly, stereo broadcasting is often called a stereo multiplex system.

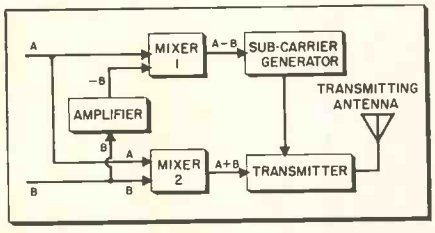
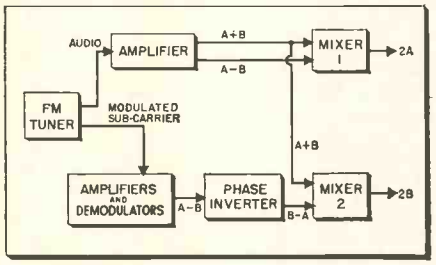


Fig. 1—Block diagram of the mixing circuits employed at a stereo multiplexing broadcasting station, showing the A + B and A — B type Crosby FM-FM transmission system.

Fig. 2—Shown here is a block diagram of an FM receiver multiplex converter.



The subcarrier method produces adequate stereo when the proper equipment is available at the receiving end. But there is one primary disadvantage. To receive a broadcast in proper perspective the listener is obliged to be equipped for stereo. The listener, having only a conventional FM tuner, hears only part of the music; usually either the left or the right side of the orchestra. Therefore these systems are not compatible, which is a definite disadvantage.

A compatible stereo multiplex system produces stereo when the proper equipment is available, but also produces a complete output from monophonic equipment. This is comparable to our system of compatible color TV whereby the owner of a black and white receiver can see an acceptable picture even though the broadcast may be in color.

The National Stereophonic Radio Committee has evaluated numerous stereo multiplex system proposals in their efforts to recommend a standard to the F.C.C. One of the tests employed by the Committee included test-tape field tests using various taped musical selections. Some of these selections and test results are indicated in Chart I.

Among the stereo multiplex systems under FCC consideration is the Crosby system, using FM-FM transmission. (Several manufacturers have already produced stereo receiving equipment based on this system.) This is a compatible system, combining two signals so the combined form produces an acceptable output from a conventional FM receiver. Two separate signals are also available for use in stereo.

Transmission & Reception

A block diagram of the mixing circuits used at the transmitting station is shown in Fig. 1. Two stereo signals, A and B, are amplified and applied to mixer 2. The output is the combined A + B signal. This signal modulates the transmitter in the usual manner, and is the signal received by conventional FM receivers. B signal is amplified to produce an output labeled — B. Phase is inverted due to the normal reversal of phase between grid and plate of an amplifier. The —B signal is then applied, along with signal A, to mixer 1 which produces the difference signal, labeled A — B. This signal modulates a 50 kc generator which is producing the subcarrier. The modulated subcarrier modulates the main carrier in the transmitter.

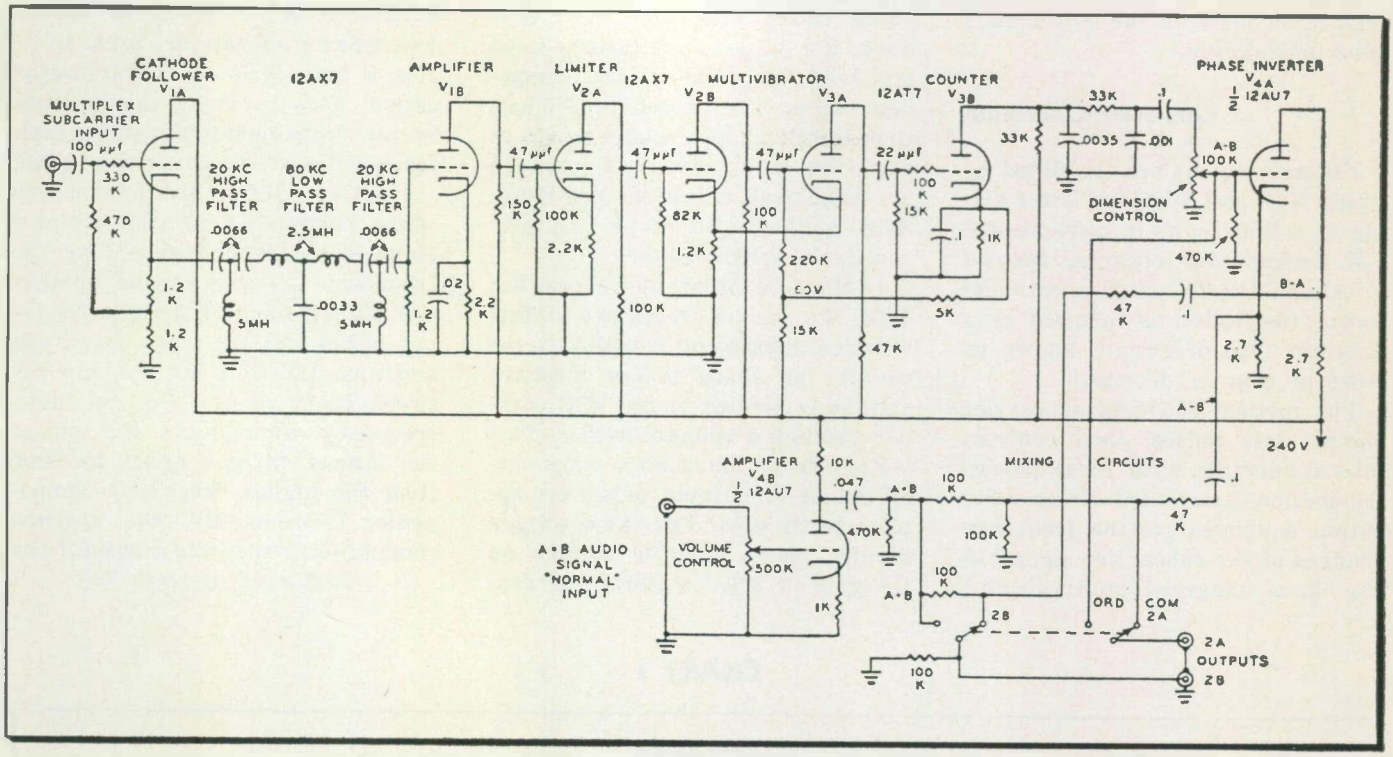


Fig. 3—Schematic of a commercially-available multiplex unit, Madison Fielding Model MX-100.

In FM broadcasting a frequency deviation of ±75 kc is considered 100% modulation. This 75 kc is divided equally between the main and subcarriers, with a 37.5 kc maximum deviation for each. The smaller deviation (37.5 kc compared to 75 kc) results in slightly reduced amplitude for monophonic reception, but the reduction is not enough to impair reception. Both signals are preemphasized before modulation, just as in regular FM broadcasting. A special converter recovers the original stereo signals at the receiving end. A simplified block diagram of a converter is shown in Fig. 2. All blocks, except the FM tuner, are parts of the converter.

The FM tuner is a conventional one with two outputs. One output is the regular A + B audio output, the other is the 50-kc subcarrier modulated by the A − B. This signal is taken from a point ahead of the deemphasis network in the FM detector stage. The subcarrier signal is then amplified and demodulated leaving the A − B signal. A − B is applied to a phase inverter and also to mixer 1.

Mixer 1 also receives the amplifier A + B signal, and its output is (A + B) + (A − B), which is equal to 2A. At the output of the phase inverter, the A − B signal appears as B − A, and combining this with the A + B signal, mixer 2 produces (A + B) + (B − A), which is equal to 2B. The original A and B signals are thus recovered, and can be applied to separate audio channels for amplification and reproduction. Two times A and two times B are produced, providing high signal-to-noise ratio, even though transmitter deviation is limited.

Fig. 4—Tuners without multiplex provisions can be modified to include a multiplex tap, as shown. The ratio detector in (A) only requires an added capacitor. In a discriminator circuit (B), it may be necessary to modify the balance capacitor, C1, in addition to adding a subcarrier capacitor.

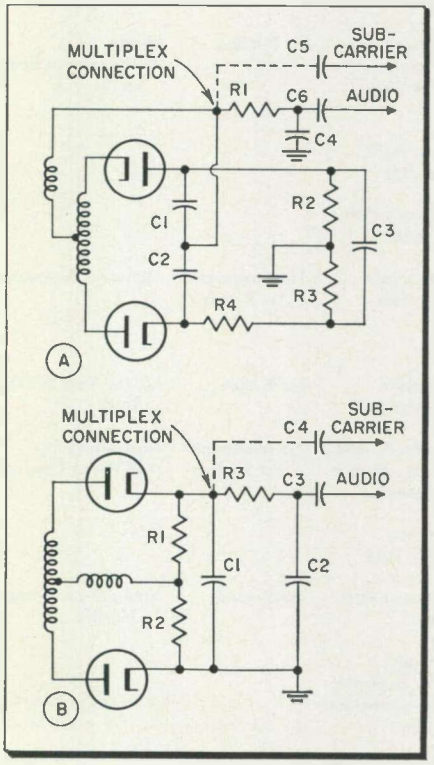


Fig. 3 illustrates a complete schematic of a commercially available converter. The subcarrier signal is applied to the cathode follower stage shown at the left in the diagram. The A + B audio signal is applied to the input of the V4B amplifier stage (across the volume control shown in Fig. 3).

Cathode follower stage V1A is used for isolation purposes and matches impedances between the converter input and filter circuits. High-pass sections of the filter pass only those frequencies above 20 kc, eliminating audio variations. A low-pass network attenuates signals and noise above 80 kc, passing the modulated subcarrier. The maximum range of frequencies of the subcarrier signal is from 25 to 75 kc. This is at 100% modulation, where the deviation caused by modulating with the A − B signal is ±25 kc. The full 37.5 kc is not used, thereby providing frequency

separation between the two signals after modulation.

Converter Operation

Filtered signals are simplified by stages V1B and V2A, the latter acting as a limiter, as in conventional FM demodulator circuits. Instead of using a discriminator or ratio detector, the limiter is followed by a different type of circuit, known as pulse or counter detection.

The method converts subcarrier signals into pulses, then controls tube conduction with these pulses. Conduction variations form an audio output equivalent to the frequency changes of the subcarrier signal. In Fig. 3, a triggered multivibrator, using tubes V2B and V3A, produces the pulses. A cathode-coupled multivibrator is used, and component values are chosen to produce consistently shaped square waves at any frequency between 25 and 75 kc. Amplitude variations are eliminated by the limiter stage V2A, preceding the multivibrator.

In the grid circuit of the counter, V3B, the square waves are differentiated, subsequently applied to the counter as sharp pulses. Positive voltage is applied to the V3B cathode through a voltage divider. This voltage keeps the counter stage cutoff except when input pulses are applied to its grid. The same voltage divider places positive voltage on the grid of V3A, maintaining conduction. It holds V2B at cut-off, except when a subcarrier signal initiates a new cycle of multivibrator action. This prevents the multivibrator from operating at its own frequency and distorting the signal.

Positive differentiated pulses cause conduction of the counter stage at a rate determined by the frequency changes of the subcarrier signal. Each of the counter input pulses has the same amplitude and time duration, but the time between them varies. For the low-frequency components the pulses are spaced farther apart in time than for higher frequency components. Consequently, the average conduction of the tube is less for the

(Continued on page 58)

CHART I

Test Tape

Some NSRC Selections For Stereo Broadcast Field Tests

Selection	Suggested Condition To Be Tested	Prominent Resultant Spatial Changes For Center Listener	Excerpt	Album Title	Composer, Orchestra, Conductor, Artists, Etc.	Label	Max Sound Level "C" Scale (slow)
Pathetique	No separation of low freqs.	Tympani on left shifts to center	3rd movement last 2 mins.	Pathetique Symphony No. 6 in B Minor	Tchaikovski Boston Symphony Pierre Monteux	RCA-Victor GCS-5	86 db
A Foggy Day	No separation of low freqs.	String bass on right shifts to center	1st 2 mins.	Donny Brook with Donegan (Disc)	Dorothy Donegan 3 Piece Jazz Combination	Capitol ST1226	87 db (82 used)
	Also						
	No separation of high freqs.	Brushes on left shift to center					
Arab Dance	No separation of low freqs.	Broad image of bass and percussion shifts to center	1st 2 mins.	Stereo Adventures in Exotic Lands	Tchaikovski Paris Theater Orchestra, Henri Gaste	Bel Canto ST 11	85 db
	No separation of high freqs.	Tambourines, right shift to center					
	Reduced sep. all freqs.	Side instruments shift toward center					
Classical Symphony	No separation of high freqs.	Violin section, left shifts to center	1st movement 1st 2 mins.	Classical Symphony	Prokofiev, Netherlands Phil. Orchestra, Walter Goehr	Concert Hall	85 db
You're An Old Smoothie	Reduced sep. all freqs.	Side voices shift toward center	1st 2 mins.	It's The Talk Of The Town	Ray Conniff Singers	Columbia GCB-47	83 db
2nd Piano Concerto	Reduced sep. all freqs.	Piano, slight left, and Orchestra, left shift toward center	1st movement 1st 2 mins.	Rachmaninoff, 2nd Piano Concerto	Rachmaninoff, Rubenstein, Chicago Symphony	RCA-Victor ECS-19	88 db (86 used)
	Delay in one channel	Piano shifts to undelayed side					
Surrey with The Fringe on Top	Reduced sep. all freqs.	Side instruments shift to center	1st 2 mins.	Straight Down the Middle	Sauter-Finegan Orchestra	RCA-Victor CPS 113	87 db (82 used)
	Add channels for mono	Cymbal sounds unsteady. Example of Stereo-Mono not compatible					

SHOP HINTS

Tips for Home and Bench Service

Pseudo Color-Bar From Video Analyst

If you get a picture like the one shown in Fig. 1 when you turn a B&K Video Analyst on, don't think you've got a color-bar pattern. It isn't! If you'll look inside the Analyst, you'll probably find you have a vertical deflection problem.

Mine turned out to be the vertical output transformer: this is a standard 8:1 auto-transformer in case you want to replace it yourself without waiting for the part from the factory. Be sure to recheck your vertical linearity with a test pattern before putting the instrument back in the case; this test is described fully in the instrument's instruction book.—*Jack Darr, Mena, Arkansas.*

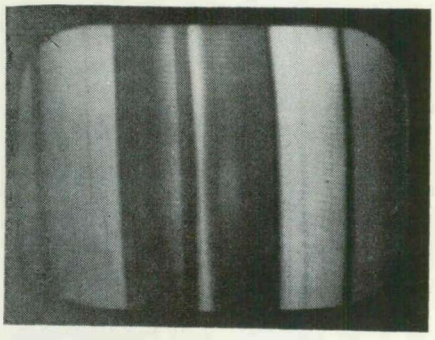


Fig. 1—What appears to be a color-bar pattern may indicate vertical deflection trouble in B&K Video Analysts.

Volume Control Signal Pickup

Not long ago, I had a run of sound trouble on RCA 21CS7815, 21CT-7835, 21CD7895 Series color TV sets. The interfering signal could be heard with the volume control in the normal listening position or, in some cases, with the volume control turned completely counter-clockwise.

I found that the signal pick-up was due to the long leads from the volume control. In all cases (five instances) this interference was remedied by connecting a 470$\mu\mu$f capacitor between the grid and cathode of the first audio amplifier tube, shown in Fig. 2.

Keep the leads as short as possible, and do not attempt to use any ground point other than the cathode terminal of the tube socket, as this is *not* chassis ground.—*R. R. Fitzmaurice, Dunedin, Florida.*

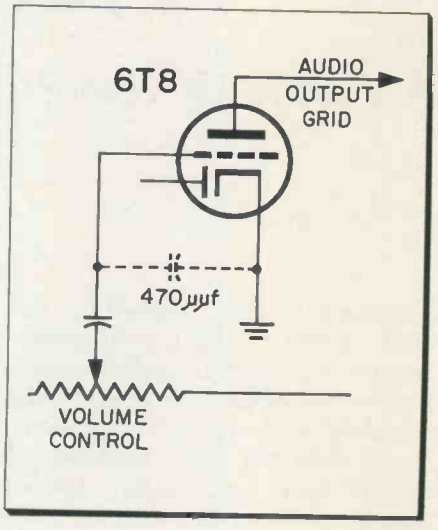


Fig. 2—Reader eliminates audio interference in RCA 21CS7815 color sets by installing a 470 $\mu\mu$f capacitor between grid and cathode of the first audio amplifier.

Solder Tool Tip Removal

By shooting a little graphite into the recess of a soldering iron before installing a new tip, the tip will remove readily when replacement time comes.—*Harry J. Miller, Sarasota, Florida.*

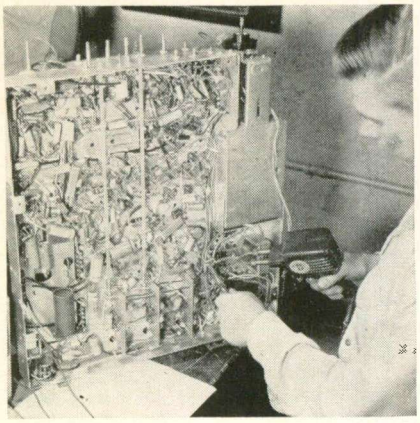
Recorder Extension Feet

Tape recorder, changer and amplifier performance can be improved by providing extension feet to afford better ventilation and absorb vibration. Such extensions can be devised in seconds by using sections of garden hose, as shown in Fig. 3. Make these sections at least one-inch long and fit them over the existing plastic feet of the unit. In most cases it will be necessary to cut out one end of the hose section so that it will fit over the plastic foot.

After the correct height is assured, the inside of the hose can be smeared with a bit of white glue to make a permanent installation. Elevating the base of a recorder in this way assures improved air circulation and often reduces the mechanism noise.—*Glen F. Stillwell, Manhattan Beach, Calif.*

Fig. 3—Installing leg extensions made of garden hose can improve chassis ventilation and reduce motor noise.

Hand-Wired Chassis Soldering Problems



A Variety Of Non-Printed Circuit Solder Jobs Still Face Technicians

GEORGE KRAVITZ

• Although many radio-TV, and other electronic equipment manufacturers employ printed circuitry, hand-wired equipment is still very much in evidence. In fact, hand-wired units are being produced in rather large quantities. Consequently, proper application of modern soldering techniques to hand-wired equipment is still necessary and highly important.

Skilled electronic technicians already know that the ability to solder, unsolder, and re-solder properly is a prerequisite to becoming a successful technician. Manufacturers' production and quality control engineers, as well as assembly line inspectors, are all thoroughly aware of this fact.

Only an infinitesimal amount of "heavy handed" soldering passes present day original equipment manufacturers' test and inspection sections. The discriminate and observant technician, however, sees many examples of poor soldering in hand-wired circuitry that was accomplished by prior repair jobs. For example, cold solder joints, excessive flux, balls and splatters of solder clinging or floating around various sections of an equipment chassis. Heavy handed soldering leaves a shoddy, sloppy trail of overheated and damaged resistors, diodes, burned capacitor ends, broken terminals, and shorted terminal strip tie points. And, what technician has never seen at least one broken tube socket terminal which has been "tack soldered" back into place—hanging by a thread of solder?

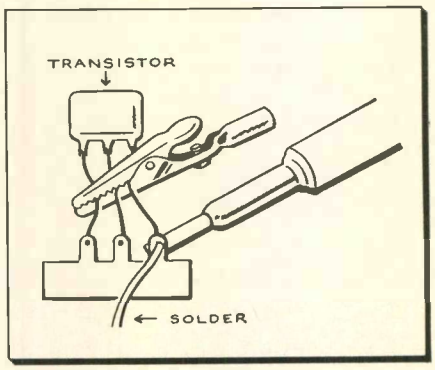


Fig. 1—When soldering-in a transistor, diode or small wattage resistor, an alligator clip is placed on the lead being soldered. Clip is a heat sink to dissipate excess heat which may damage component.

Soldering Fundamentals

Before digging into some of the fine points of removing and replacing hand-wired components, it may be helpful to review a few of the simple elementary rules which are automatically observed by all skilled technicians. Attention should also be directed briefly to some of the soldering pitfalls to be avoided.

A good soldering job that won't return to haunt us at the most inopportune moments must have the following minimum requirements:

1. A clean, thoroughly deoxidized surface.
2. Joint electrically and mechanically secure before soldering.
3. A 50/50 tin-lead or higher tin content, pure rosin cored solder.
4. Iron tip (gun or regular type), to be perfectly clean and brightly tinned.

Clean surfaces are obtained by scraping with a knife, file, sand paper, etc., and pre-tinning surfaces with rosin cored solder. A thoroughly secure joint, tie, or wrap, is one that will conduct electrically and cannot be disturbed by normal pulling or vibration—before it is soldered. The best way to keep a soldering iron tip clean while working is to wipe it frequently with a thoroughly wet cotton cloth or commercially available cleaning pad.

All other requirements being fulfilled, perhaps the outstanding technique involved in obtaining a good solder job is proper application of heat and solder. The joint to be soldered should be heated at one side with a flat surface of the iron tip, and the solder applied to the joint at the top or opposite side, as shown in Figs. # 1 & 2. When the joint is hot enough to cause the solder to flow freely, the iron should be removed. This temperature is about 125° to 150°F above the melting point of the particular solder being used. If more solder is required on the joint (this is seldom necessary

except in special cases), the process should be repeated. If a joint is properly heated, and solder applied directly to the joint, solder will flow into every crevice (through capillary action) and the highly desirable true alloyed joint will result.

In addition to the sad practice of carrying solder to a joint on an iron's tip (usually resulting in a cold solder joint), is the error of overheating. When a joint is overheated, solder runs off like water from a duck's back, or a greased surface. This is primarily true because the rosin flux is partly carbonized and cannot act to completely deoxidize the joint's surfaces.

No technician would think of using a two pound sledge hammer to drive an insulated twin-lead tack, or a tack hammer to drive a PK nail in cement. It is startling, however, to observe the number of technicians who do just this with soldering irons. The proper iron should be selected for a particular job. For example, a thin terminal strip lug carrying two #24 tinned leads can be heated and soldered with a 100 watt iron, properly manipulated. On the other hand, 200 to 250 watts are necessary to heat a chassis ground point for a heater transformer's center tap or comparable type grounded lead.

Another improper practice is holding a component or component lead while soldering. The slightest vibration or movement of a component lead before the solder cools, regardless of its apparent mechanical security to a tie point, can result in a bad solder joint. When cooled, this joint will appear dull, granulated or chalky. Do not hold the component or lead, even with long nose pliers. If a heat sink is required, snap an aligator clip or other type sink next to the joint to be soldered, as shown in Fig. 1. All component leads should be made self-supporting before attempting to solder.

One particularly helpful technique revealed by the experts, is a silver solder tinned soldering iron tip, regular or gun type. This silver solder tipped iron gives excellent heat transfer, lasts longer and develops scale infrequently. A solder pot and torch to heat the pot is necessary for doing this tinning job. The recently cleaned iron tip, at its normal temperature, is dipped momentarily into the molten silver solder one or more times.

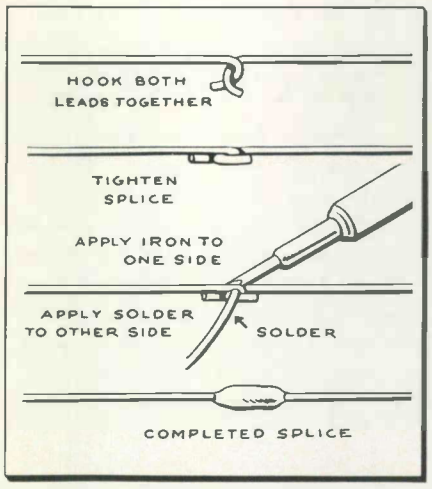


Fig. 2—The hook-splice is frequently helpful when replacing components which have been cut from a crowded terminal tie point.

Component Replacement

Component replacements in hand-wired chassis sometimes present a problem when three or more component leads are tied to one terminal point. We have all seen examples of "stacked up" components—with the defective part at the very bottom of the stack. There are several approaches to this situation. (A) Remove one lead on all components so they can be moved about, (B) pry and worm-out the defective part, (C) cut out the defective component leaving enough lead to allow splicing-in the new component. The latter method is frequently the most satisfactory.

A practical and widely used splice for component replacement under these conditions, is illustrated step-by-step in Fig. 2. Ends of the old component leads should be scraped and pre-timed before the hooks are made. The two hooks should then be squeezed together tightly with long nose pliers and then soldered. Soldier should not be piled up on the joint (except when soldering certain high voltage leads and terminal points), and the wire outlines of the two hooks should show plainly through the solder. Generally speaking, all finished joints should show approximately two-thirds of the wire thickness standing out from the solder—with one third being covered by solder.

If it is necessary to remove a wire or component lead from a lug, a slotted "soldering aid" type tool is helpful. Heat the lug properly and unwind the lead carefully with minimum pressure on the lug, using the soldering tool. Slotted soldering tiplets can also be used to perform the same task. Attempting to unsolder and remove wires from small thin lugs, for example, miniature tube socket contacts and similar tie points, is not recommended. If absolutely necessary to do so, great care should be exercised or the technician may find it necessary to completely replace a socket or other component.

When soldering leads to closely spaced multiple lug terminal strips, the technician should take precautions to prevent solder flowing to an adjacent lug. If soldering is properly done, however, this problem seldom arises. In the event too much solder is on a joint, for whatever cause, excess solder can be easily removed with an offset soldering tiplet, as shown in Fig. 3.

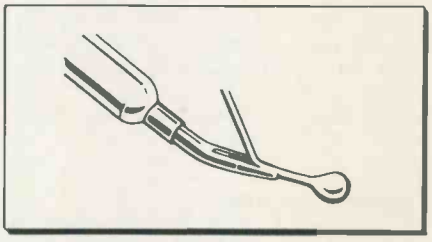


Fig. 3—An offset slotted iron tiplet can be used to draw off excess solder from a terminal point. Solder flows into tiplet notch.

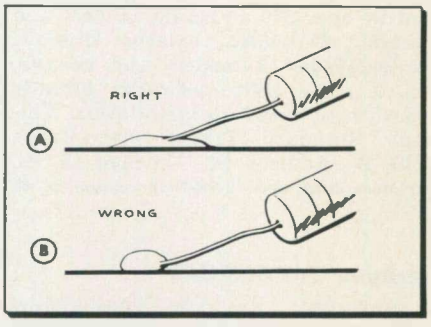


Fig. 4 (A)—A properly made chassis joint has a cohesive contour. (B) "Blob" type will not be electro-mechanically secure.

Ground Connections

Mechanical ground connections made with bolt, washer and nut, or self tapping screws, are frequently

unsatisfactory because of inadequate lead-to-chassis contact. Soldering direct to a chassis is not an easy job. If a punch-out chassis terminal point or a hole is not available for hooking the lead into, the task must be carefully performed if future trouble is to be avoided. Perhaps the largest percentage of hand-wired repair and original equipment solder faults arise in chassis-ground connections—with or without punch-out terminals. In any event, proper cleaning and heating are prime considerations. To solder directly against a white metal or plated chassis, proceed as follows:

First clean the area carefully with a sharp instrument, file or sandpaper. A thoroughly bright roughened area is desirable. Use a high-wattage gun (about 250 watt) or heavy duty iron and tin the scraped area, applying solder directly to the area and not to the iron. Remove the heating tool and freshly tin about one inch of the lead end. Curl one turn of the component lead in a circle about ¼ inch in diameter. Spring and shape the circle and component lead so that the circular area fits flat and tightly against the tinned area. Apply the iron flat against the tinned area, touching and tangent to the component lead circle. Feed solder to the inner area of the circle until the joint appears as shown in Fig. 4.

If the lead is sufficiently long or there is no danger of overheating a component, the iron may be placed flat over half or more of the circle and solder fed to the inner circle as before. A heat sink can be attached to the component lead if desired. When the proper amount of solder appears at the joint the iron is removed and the joint allowed to cool without vibration or other disturbance. If the joint appears in the vertical plane, place the iron below, feed solder from the top. Capillary and alloying action will insure a good joint and excess solder that may be drained away by the iron will not interfere.

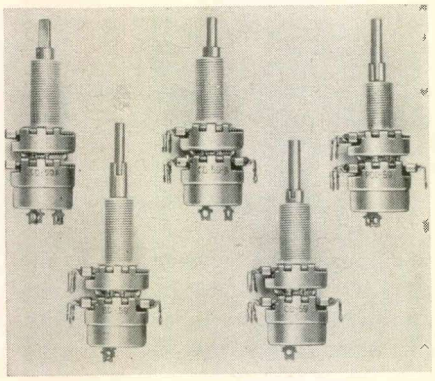
If there is any doubt about a solder joint, test it with a hooked tool by pulling the lead back and forth near the solder joint. A chassis joint can also be tested with a sharp pointed instrument (ice pick) or screw driver. Try to wedge the point between joint and chassis. A properly alloyed joint cannot be dislodged.

One additional caution regarding overheating. Not only can crystal diodes be damaged but ½ watt or even larger carbon resistors can change value considerably if overheated. A 5% tolerance gold-stripe resistor can be made completely useless for its particular application by overheating its lead.

When a technician observes all the basic rules of good soldering and has a full line of proper irons, tips and specialized tools, the so-called problems of soldering quietly disappear. •

Illustration credit: Ungar Electric Tools, Inc., Los Angeles, Calif.

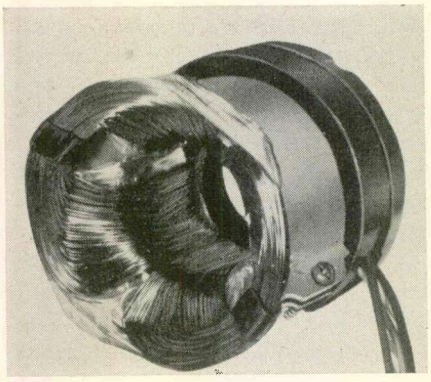
Centralab CONTROLS



Five new exact replacement auto radio controls, for use in 1959 Delco auto radios are: Part No. BD-59, replacement for original part No. 7273993 used in 1959 Buicks; CD-59-A and CD-59-B, replacements for original part No. 7273302-1221260 and 7273367-1221268 used in 1959 Chevrolets; OD-59, replacement for original part No. 7272855, used in 1959 Oldsmobiles; and POD-59, replacement for original part No. 7273623, used in 1959 Pontiacs. Centralab Div., Globe-Union Inc., 900 E. Keefe Ave., Milwaukee 1, Wis.

For more data, circle 2-44-1 on coupon, p. 46

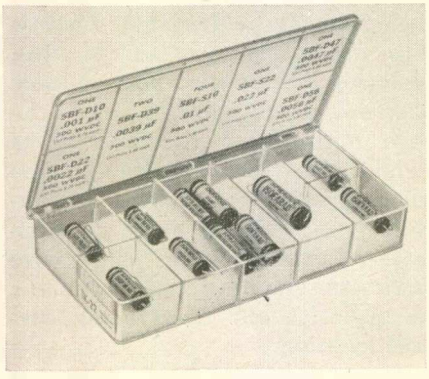
STANCOR YOKES



3 new exact replacement deflection yokes are: DY-41A, for RCA Part Nos. 76616, 77625, 77697, 79510, 79868, used in almost 250 models and chassis; DY-42A, for RCA 103830 and Sylvania 100-0031, 100-0032, 100-0033, used in 10 RCA models and chassis and in over 200 Sylvania models and chassis; DY-46A, replaces Olympic CL-26215 in 14 models and chassis. All 3 units have networks already wired in to speed up installation. Chicago Standard Transformer Corp., 3501 W. Addison St., Chicago 18, Ill.

For more data, circle 2-44-2 on coupon, p. 46

Sprague CAPACITORS



Announced are two specially-selected assortments of Isofarad capacitors. TK-22, shown, contains 11 capacitors in the 7 most-frequently-used ratings. TK-8 includes 17 capacitors in the 7 most popular ratings. Packaged in crystal-clear, hinged-lid, compartmented plastic cases; each compartment identified by catalog number and rating. Designed for color TV synchroguide circuits, horizontal and vertical oscillators, etc. Sampler assortment TK-22, $5.88. TK-8, $9.18. Sprague Electric Co., North Adams, Mass.

For more data, circle 2-44-3 on coupon, p. 46

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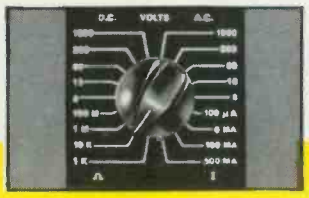
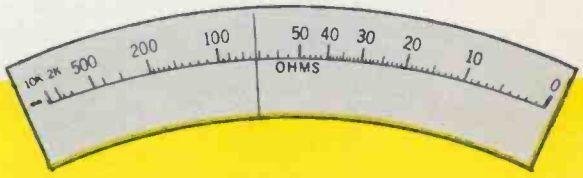


SEE IT!

READ IT!

DIRECTLY—ACCURATELY
WITHOUT MULTIPLYING



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AC Volts — 0 - 3, 15, 60, 300, 1000, 6000 (5,000 Ω/v)
AF (Output) — 0 - 3, 15, 60, 300 volts
DC Current — 0 - 100 μa, 5 ma, 100 ma, 500 ma, 10 amps
Resistance — 0 - 1000 ohms (3 Ω center)
0 - 10,000 ohms (50 Ω center)
0 - 1 megohm (4 k Ω center)
0 - 100 megohms (150 k Ω center)

Supplemental Ranges: 18 separate external overlay meter scales for:
DC Volts— 0 - 250 mv **Capacitance**—100 mmfd to 4 mfd
Audio Power Output—up to 56 watts **DB** (decibels)
Peak-to-Peak AC (sine) Volts— 0 - 170, 850

Polarity Reversing Switch and **Automatic Ohms-Adjust Control**
Frequency Response AC: 5 - 500,000 cps
Burn-Out Proof Meter: Protected against overload and burn-out
Complete with 1½-volt and 9-volt batteries and test leads

Ask Your B&K Distributor for Demonstration or Write for Catalog AP17-T

B&K MANUFACTURING CO.
1801 W. BELLE PLAINE AVE • CHICAGO 13, ILL.
Canada: Atlas Radio Corp., 50 Wingold, Toronto 19, Ont.
Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.

For more data, circle 2-45-1 on coupon, p. 46

FREE LITERATURE

To receive the literature below without charge, simply circle the numbers on the coupon.

Cut out and mail to ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

1 **Sound Equipment:** Components and complete systems for users of public address and allied equipment are covered in a 16-page catalog, No. 307C. Illustrations, descriptions, specifications, and prices included. Bogen-Presto.

For more data, circle 2-46-1 on coupon

2 **Home Study Courses:** Among several up-to-date electronic courses recently announced are Semiconductors, Hi-Fi & Sound Systems, Radiotelephone License, and Industrial Electronics. International Correspondence Schools.

For more data, circle 2-46-2 on coupon

3 **Electronic Components:** Transformers, coils, chokes, yokes, inductors, etc., are covered in 32-page catalog 6001. Cross-referenced parts number index included. Merit Coil & Transformer Corp.

For more data, circle 2-46-3 on coupon

4 **Components:** A 151-page catalog contains complete listings of the firm's universal-type components with specifications. Includes cross reference charts and prices of major parts used in firm's TV receivers, radios, and record changers as far back as 1949. Motorola Inc.

For more data, circle 2-46-4 on coupon

5 **Tube-Checker Kits:** Literature covers model T-61C and T61F self-service tube-checker kits. Designed for fast, easy, operation; and reported to provide high accuracy and dependability. Paco Electronics.

For more data, circle 2-46-5 on coupon

6 **CB Transceiver:** Literature covers model CB1200, combined crystal controlled transmitter and continuous tuning superheterodyne receiver, for use in 11 meter class "D" citizens band. Shell Electronics Mfg. Corp.

For more data, circle 2-46-6 on coupon

7 **Antenna Mounting Accessories:** Colorful, well-illustrated, 20-page catalog No. 60 and accompanying 16-page price list cover a complete line of antenna mounting accessories. South River Metal Products Co.

For more data, circle 2-46-7 on coupon

8 **Antennas & Accessories:** Catalog FR-61-B provides 16 well-illustrated pages of information on antennas, mounts, suppressors, mikes, etc. Telco Electronics Mfg. Co.

For more data, circle 2-46-8 on coupon

9 **Background Music:** Special program for TV-electronic service dealers details how to get into lucrative background music business with only small investment. Deal directly with manufacturer. Attractive brochure, data and application form describe tape system and contract terms. Musi-Pak, Inc.

For more data, circle 2-46-9 on coupon

10 **Scope Carrier:** Covered in catalog is a scope carrier designed to mobilize your work. Folds to fit into trunk or car. Top: level, and 22° angle. Capacity: 350 lbs. Chrome finish. 4" wheels. Many Models. Technibilt Corp.

For more data, circle 2-50-2 on coupon

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Note: Code 2-3-1 means February issue, Page 3, 1st item on page.

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2-5-1	2-20-4	2-44-2	2-50-1	2-55-1	2-61-2
2-6-1	2-20-5	2-44-3	2-50-2	2-56-1	2-61-3
2-7-1	2-20-6	2-45-1	2-51-1	2-56-2	2-61-4
2-8-1	2-20-7	2-46-1	2-51-2	2-56-3	2-61-5
2-10-1	2-20-8	2-46-2	2-52-1	2-57-1	2-61-6
2-11-1	2-21-1	2-46-3	2-52-2	2-57-3	2-62-1
2-12-1	2-23-1	2-46-4	2-52-3	2-57-4	2-62-2
2-13-1	2-24-1	2-46-5	2-52-4	2-58-1	2-62-3
2-16-1	2-25-1	2-46-6	2-52-4	2-58-2	2-63-1
2-16-2	2-26-1	2-46-7	2-52-5	2-59-1	2-63-2
2-18-1	2-35-1	2-46-8	2-53-1	2-59-2	2-64-1
2-19-1	2-35-2	2-46-9	2-54-1	2-60-1	2-C3-1
2-20-1	2-35-3	2-47-1	2-54-2	2-60-2	
2-20-2	2-35-4	2-48-1	2-54-3	2-60-3	

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NEW

for the first time, a

B & K QUALITY TUBE TESTER

at this amazing low cost!

TESTS All TV and Radio Tubes —both old and new

TESTS the Nuvistors

TESTS the new 10-pin tubes

TESTS the new 12-pin Compactrons

TESTS voltage regulators, thyratrons, auto radio hybrid tubes, European hi-fi tubes, and most industrial types.

Checks for all shorts, grid emission, leakage, and gas

Checks each section of multi-section tubes separately

Checks tube capability under simulated load conditions

Rejects bad tubes —not good tubes

Model 600 DYNA-QUIK

only $69.95 NET

8½" x 11" x 4½"

Handsome, sturdy leatherette-covered carrying case

For the man who wants the performance and reliability of a B&K professional-quality tester at minimum cost . . . there's nothing like the new "600". No other tube tester in this price range is so complete and up-to-date. Tests the newest tube types, as well as the old. It's fast . . . it's accurate . . . it's easy to use. Quickly reveals tube condition. Saves customers. Sells more tube replacements. Stops call-backs. Steps up servicing profit . . . day after day. Pays for itself over and over again.

Exclusive adjustable grid emission test. Sensitivity to over 100 megohms. Phosphor bronze socket contacts. Complete tube listing in handy reference index. Extremely compact.

NEW TUBE INFORMATION SERVICE

available every 3 months for all B&K Dyna-Quik Tube Testers

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For more data, circle 2-47-1 on coupon, p. 46

ASSOCIATION NEWS

Illinois

TESA, Chicago, reports the following officers were unanimously elected: Pres., Nick Donato; 1st V. P., Marshall Ruehrdanz; 2nd V. P., Al Enzulis; 3rd V. P., John Cahill; Secy., Angelo Chrysogelos; Treas., Joseph Issak; Sgt. at Arms, Bill Hamada; Ch'man of B'd., Frank Moch.

Indiana

TVB, Elkhart, elected the following officers: Pres., Willis Roberts; V. P., Dale Dinkledine; Sec'y., Arden Gaerte; Treas., Hubert McAllister.

License Fund Faltering

IESA, Indianapolis, urges members to contribute towards their Licensing Fund, introduced at an October meeting, advising that all have not fulfilled their "one service call per quarter" pledge. Contributions to TESA-Kansas City to check the "license war" is also urged.

Missouri

TESA, Columbia, advises the following officers have been elected: Pres., Benton Linder; N. E., V. P., Ken Cleaton; S. E. V. P., Fred Reichman; N.W.V.P., William Ragen; S. W. V. P., Albert Hawn; Sec'y., Marion Crane; Treas., Carl Adcock.

New York

TSA, Albany, elected the following officers for 1961: Pres., Warren Baker; V. P., Robert Cooper; Sec'y., Roger Wells; Treas., Henry Szypulski.

License Bill Outlined

ESFETA, Albany, reports a special meeting of the License Committee was held with legal counsel to review their proposed license bill. Here is a brief outline of the proposed bill:

(1) Any TV technician now engaged in TV repair is eligible under a grandfather clause.

(2) Anyone over 16 years of age may apply for an apprentice license.

(3) License fee will be $25 for techs and $10 for apprentices.

(4) Seven men will comprise the license board: four licensed technicians, one TV manufacturer's service manager, one electronics teacher (appointed by the State Board of Education), and one individual (with no interest in the TV service industry) to represent consumers.

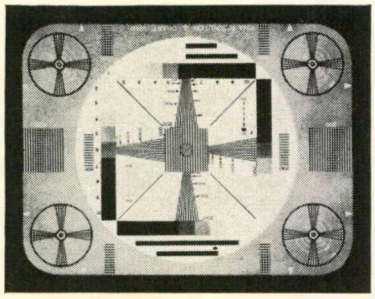
North Carolina

NCFEA, Mt. Airy, has elected the following officers: Pres., Glenn Thacker; V.P., Sparky Vogler; Sec'y., Mack Wood; Treas., Vic Goad.

Pennsylvania

"Pay TV" Stand

FRTSA, Harrisburg, has elected the following officers: Pres., Wayne Prather; Rec. Sec'y., Clarence Eck; Cor. Sec'y., Leon J. Helk; Treas., L. B. Smith. The Federation's stand regarding "Pay Television or Subscription TV" had been misquoted in the press as opposing the new media. FRTSA advises they do not oppose Subscription TV, but *would* oppose any monopolistic service practices by any and all interests that would tend to make the new system a "captive" one.



TV TIPS FROM TRIAD

NO. 11 IN A SERIES

"—and then this character with the calibrated eyeballs looked at the next chassis coming down the line, saw it was an inch and a half narrow, reached into the 39 mickey mouse tray for a 4 KV disc, hung it on the damper plate and cathode and sure enough the scan spread out and covered the CRT and the picture became brighter," said Joe, as he reported on his trip to the local TV chassis factory.

"Were all the sets an inch and a half narrow?" asked Ray the outside man.

"No, the one before was almost OK, and a later job was too wide," answered Joe, "and all the scan adjuster did was to clip the collar on the yoke cable and spread the leads a little and the pattern narrowed down to normal."

"Why didn't he adjust the width control, or drive or something?" asked Ray.

"No drive, no width, no lin, no capacity links, no nothing, on that 'Special,'" said Joe with a laugh.

"As long as the line voltage holds optimum, and all tubes and parts are normal, or better, the set may work OK," commented Bill, the Senior PTM, "but the point the serviceman has to watch is to maintain the capacitive balance when he services the set. Changing the flyback, even with an original replacement, will almost always call for change of the 'width calibrating' capacitor because flyback distributed capacitance varies slightly, lead dress may be disturbed, and the only way the width-high voltage relationship can be controlled is by adjustment of the shunt capacity. Don't forget that this capacitor may not be as obvious as in the case Joe mentions; it may be in the AGC circuit, across taps on the flyback, it may be the capacitive divider for the yoke center tap return, may be developed in the yoke cable, or be hidden out in the yoke itself. If the center tap of the yoke is returned to a center tap on the flyback, a capacitor across the 'hot' yoke winding will be as much a width calibrator as an anti-ring network."

* * *

MORAL: Width and high voltage must be correct when you finish a sweep service problem. If you care to investigate further read page 5, col. 3, and page 7, col. 2 of PTM #2. If you don't have your copy ask your Triad Distributor or write direct to **Renewal Division, Triad Transformer Corporation,** 4055 Redwood Avenue, Venice, Calif.

For more data, circle 2-48-1 on coupon, p. 46

DOUBLES YOUR EFFECTIVE MANPOWER

Fix "Tough Dogs" Fast!

Save Half Your Time!

Step Up Your Profit!

B&K NEW MODEL 1076

TELEVISION ANALYST

for Black & White and Color

Check all circuits-Pinpoint any TV trouble...in minutes

By Easy Point-to-Point Signal Injection, You See the Trouble on the TV Screen and Correct it—Twice as Fast and Easy!

There's no longer any need to "lose your shirt" (and customers)—and worry about the lost hours you never recover—on "tough dogs" or even intermittents. *The remarkable B&K Analyst* enables you to inject your own TV signal at any point and watch the resulting test pattern on the picture tube itself. *Makes it quick and easy to isolate, pinpoint, and correct TV trouble in any stage* throughout the video, audio, r.f., i.f., sync, and sweep sections of black & white and color television sets—*including intermittents.* Makes external scope or wave-form interpretation unnecessary. Most useful instrument in TV servicing! Its basic technique has been proved by thousands of successful servicemen the world over.

The Analyst enables any serviceman to cut servicing time in half, service more TV sets in less time, really satisfy more customers, *and make more money.*

Model 1076. Net, **$299.95**

Available on Budget Terms. As low as $30.00 down.

See Your B&K Distributor or Write for Bulletin AP17-T

Combines all the features of both the Model 1075 and Model A107

- COMPLETE R.F. and I.F.
- VIDEO TEST PATTERN
- COMPOSITE SYNC
- FM MODULATED AUDIO
- COLOR PATTERNS
- HORIZONTAL and VERTICAL PLATE and GRID DRIVE
- B+ BOOST INDICATOR
- HI-VOLT INDICATOR
- YOKE and HI-VOLTAGE TRANSFORMER TEST

Also Now Provides:

- SWITCH-TYPE TUNER
- NEGATIVE BIAS SUPPLY
- AGC KEYING PULSE
- PICTURE TUBE MODULATION

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Canada: Atlas Radio Corp., 50 Wingold, Toronto 19, Ont.

Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.

For more data, circle 2-49-1 on coupon, p. 46

Hearing Aids

(Continued from page 32)

plifier repair business, you must establish sources of supply for cords, plugs and other special parts. Some hearing aid manufacturers will furnish service manuals. Some will not. See Chart II for a list of major hearing aid manufacturers). If you're going to do farmed-out work for hearing aid dealers, they should be able to help you get parts and servicing information.

CHART I

Parts & Accessories Suppliers

A. J. Schneider, Reading, Mass.

ADCO Distributors, 631 15th St., Denver 2, Colo.

All-Makes Hearing Aid Exchange, Mellie Esperson Bldg., Houston 2, Tex.

Danavox, c/o Rye Sound Co., 145 Elm St., Mamaroneck, N. Y.

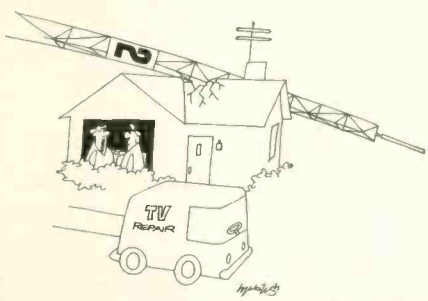
Hal-Hen Co., 3614 11th St., Long Island City 6, N. Y.

Hearing Mart, 84 Ellis St., San Francisco, Calif.

Mears Radio Hearing Device Corp., 145 Elm St., Mamaroneck, N. Y.

Shelby Instrument Co., 1701 Magnolia Ave., Long Beach, Calif.

The standard price, $12.50, is fair compensation for a repair job, including parts. Seldom will you find more than one defective part or transistor. Cords, plugs, earphones and batteries are extra, since they are expected to require frequent replacement. •



"The picture's fine but I can't get channel 2."

CHART II

Hearing Aid Manufacturers & Distributors

Acousticon International, 95-25 149th St., Jamaica, N. Y.

Audio Company of America, 401 W. Jackson St., Phoenix, Ariz.

Audiovox, 123 Worcester St., Boston 18, Mass.

Beltone Hearing Aid Co., 2900 W. 36th St., Chicago, Ill.

Dahlberg Co., (Motorola), Golden Valley, Minneapolis 27, Minn.

Danavox, c/o Rye Sound Co., 145 Elm St., Mamaroneck, N. Y.

Gem Earphone Co., 89 E. Jericho Trnpke, Mineola, N. Y.

Hal-Hen Co., 36-14 11th St., Long Island City 6, N. Y.

Kendall Laboratories, Inc., 440 E. Las Olas Blvd., Ft. Lauderdale, Fla.

Lafayette Radio, 165-08 Liberty Ave., Jamaica 33, N. Y.

Maico Electronics, Inc., 21 No. Third St., Minneapolis, Minn.

Muller-Ernesti, Hamburg-Wandsbek, Germany

Nichols & Clark, Inc., Hathorne, Mass.

Otarion Listener Corp., Ossining, N. Y.

Paravox, Inc., 2056 E. Fourth St., Cleveland 15, Ohio

Qualitone Co., Linden Hills Station, Minneapolis, Minn.

Radioear Corp., Valley Brook Rd., Canonsburg, Penna.

Sears, Roebuck & Co., Chicago, Ill.

Sonotone Corp., Elmsford, N. Y.

Superior Hearing Aid Co., 411 W. 7th St., Los Angeles 14, Calif.

Telex, Telex Park, St. Paul, Minn.

Tonemaster Mfg. Co., 128 S. Monroe, Peoria, Ill.

Trans-Audio Corp., 45 Bromfield St., Boston 8, Mass.

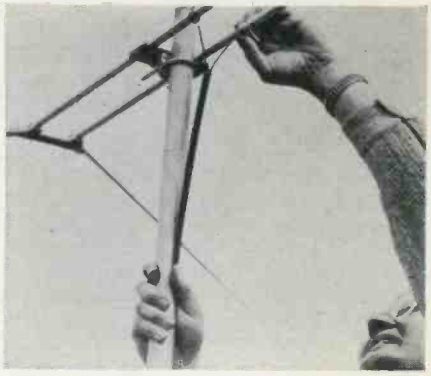
Vicon Instrument Co., Vicon Bldg., Colorado Springs, Colo.

Zenith Radio Corp., 5801 W. Dickens Ave., Chicago 39, Ill.

CBS TOOL

"Kwik-Klip," for quick and easy TV antenna lead replacement, provides simple, one-hand, clip-on operation. Its use eliminates the bother of removing rusted or corroded nuts and bolts to replace the antenna lead-in; and avoids unnecessary danger when working on roof tops. Its use is also reported to improve reception and restore the original signal strength in many older installations. CBS Electronics, Danvers, Mass.

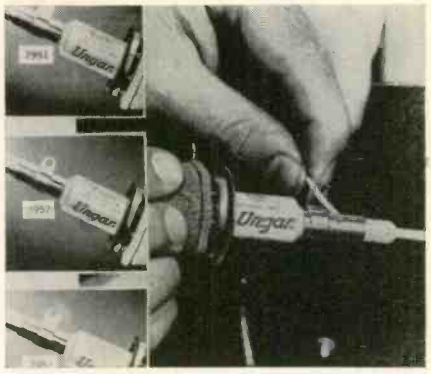
For more data, circle 2-51-2 on coupon, p. 46



Ungar WIRE STRIPPER

New thermo wire stripping clips strip wire insulation while soldering without changing tools. It can be used with any of the Ungar #4000 series soldering tips or heating units by slipping it on the barrel. Severs all rubber and plastic insulation from 8 to 24 gauge wire and will not cut, nick or score the strands. Available in types #7951, #7952, and #7953 the wire stripper affords the user a choice of v-shaped, notched or circular cutting edges. $.75 per unit. Ungar Electric Tools, 4101 Redwood Ave., Los Angeles 66, Calif.

For more data, circle 2-52-3 on coupon, p. 46



Sylvania TUBES

Announced are the following receiving tubes: 12FX8, 9-pin miniature triode and heptode used in superheterodyne receivers as a triode r-f amplifier and frequency converter; 1N2A, filamentary half-wave diode for use in high voltage rectifier applications including TV; 60FX5, 7-pin miniature power pentode for the audio output stages of radio, phonograph, and TV; 2FQ5, semi-remote cutoff triode for use as a VHF r-f amplifier; and 13EM7, double triode with dissimilar sections, section 1 is used as a vertical deflection oscillator, section 2 as a vertical deflection amplifier in TV receivers. Sylvania Electric Products, Inc., 730 Third Ave., New York 17, N. Y.

For more data, circle 2-52-4 on coupon, p. 46

Sencore SUBSTITUTION UNIT

The Big 20, model PR111 has 20 power resistors for fast, on-the-spot substitution of all power resistors. Covers all the values encountered in radio, TV, and Hi-Fi circuitry. Each power resistor can be substituted in circuits that dissipate up to 20 watts

and for all values between 2.5 and 15,000 ohms. It will also substitute for fuse resistors. Each resistor in the unit is reported to withstand up to four times the fuse resistors operating current without burning out. $12.75. Sencore-Service Instruments Co., Addison, Ill.

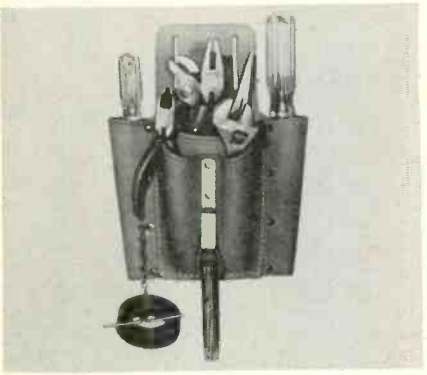
For more data, circle 2-52-5 on coupon, p. 46

RCA TEST INSTRUMENT

WR-64A color-bar/dot/crosshatch generator combines the functions of two test units in one compact, easy-to-use instrument. It provides color-bar signals for checking, adjusting, and troubleshooting color-TV circuits, and dot- and crosshatch-pattern signals for adjusting convergence in color receivers. It may also be used for adjusting linearity and overscan in both color and black-and-white receivers. Has only three control knobs and only one output cable which connects to the antenna-input terminals of the receiver. RCA Electron Tube Div., Harrison, N. J.

Xcelite TOOL HOLSTER

Announced is a new saddle leather hip holster featuring an electrical tape holder, knife clip, and 5 tool pockets. It is designed to carry a variety of wrenches, screwdrivers, pliers, and other tools used by the electronic technician. Has a comfortable, hip-contoured back, hot-waxed stitching, brass riveting, and pliable belt slots. Xcelite, Inc., Thorne Ave. & Bank St., Orchard Park, N. Y.



For more data, circle 2-54-2 on coupon, p. 46

Utah AUTO RADIO SPEAKER

Model SP410E replacement auto radio speaker may be used in the following 1961 automobiles: Buick, Cadillac, Chevrolet (except Corvair), Studebaker (except Lark), Pontiac, and Oldsmobile. 4" x 10". Features a 2.15 oz. Alnico V magnet. Delivers 8 watt power handling. Utah Radio & Electronic Corp., Huntington, Ind.

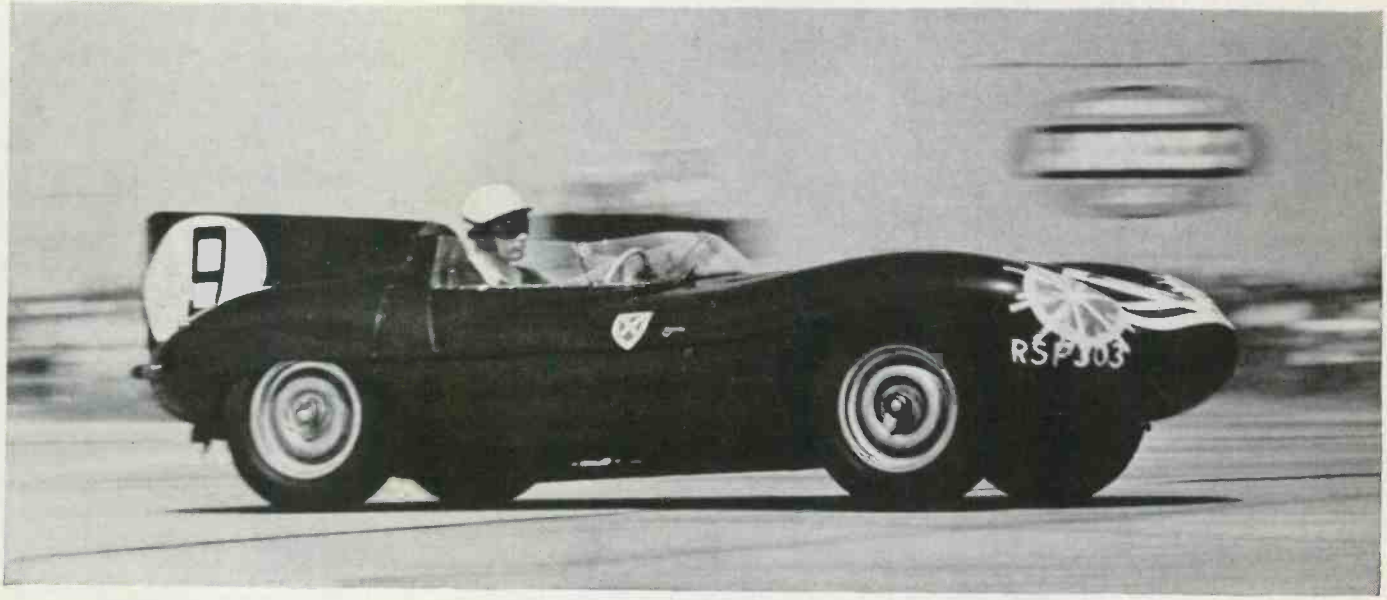
For more data, circle 2-54-3 on coupon, p. 46

PACO POWER SUPPLY KIT

Model B-12 features fully-variable and regulated d-c plate voltages from 0-400v, at 150 ma maximum. Also provides bias voltages from 0-150v at 2 ma and three 3-ampere a-c filament outputs: 2 at 6.3v, plus an exclusive 12v filament output. It has high stability, with an output variation of less than ⅛ of 1% (or .3v, whichever is greater), from zero load to full load. Less than 0.4% or 0.5v output variation for ±10v line voltage variation from 117v a-c input. Kit, $69.95. Wired $99.95. Paco Electronics Co., 70-31 84th St., Glendale 27, L. I., N. Y.

For more data, circle 2-54-4 on coupon, p. 46

there are drivers



and there are drivers!

Which is by way of saying: If you want your full share of the public address business in your territory, *don't use a boy for a man's job!* University's complete line of man-sized loudspeaker drivers is designed to meet every application requirement of both voice and music. Features like these tell you why University drivers are the standard of the industry: ▶ One-piece linen base phenolic diaphragms for exceptionally uniform over-all frequency response ▶ Rim-centered palate assembly for shock- and vibration-proof mechanism ▶ Individually precision-wound tropicalized voice coils ▶ Conservatively rated continuous-duty power handling capacity at maximum conversion efficiencies mean lower dollar-per-watt costs for the user ▶ Completely weatherproof construction and acrylic finishes for lifetime protection ▶ Models with built-in transformers provide highest degree of versatility of application and flexibility of operation ▶ Important conveniences of field-replaceable diaphragm assemblies, phase-coded terminals, standard threads for interchanging trumpets. ▶ *With drivers like these you're off to a good start.* Now team them up with trumpets from University's all-inclusive line — wide-angle, directional, radial — *and you're ahead all the way.* For complete details on University public address speakers and accessories, write Desk Z-2, University Loudspeakers, Inc., White Plains, N.Y.

CHOOSE FROM THESE SIX DELUXE ID MODELS—FROM 20 TO 60 WATTS

ID-20, 20 watts **ID-30,** 30 watts **ID-40,** 40 watts **ID-40T,** 40 watts **ID-60,** 60 watts **ID-60T,** 60 watts

OR FROM THE WORLD FAMOUS STANDARD LINE OF UNIVERSITY DRIVERS

UNIVERSITY™

WORLD'S LARGEST MANUFACTURER OF PUBLIC ADDRESS SPEAKERS

A Division of Ling-Temco Electronics, Inc.

For more data, circle 2-55-1 on coupon, p. 46

Shell STEREO AMP/PREAMP

The Manhasset model 2020P consists of 2 identical 20-watt amplifiers equipped with fully equalized preamplifiers. Power output, 20-watts/channel; peak, 80 watts. IM distortion, 60 cps—6 kc (4 to 1) less than 2% at rated output. Harmonic distortion, 30

cps to 10 kc less than 1%. Frequency response, ±1 db 30—20,000 cps at rated output; ±1 db 30—50 kc at 2 watts. Other features include binaural output jack and exclusive dynamic input balance controls. $129.95. Shell Electronics Mfg. Corp., 112 State St., Westbury, N. Y.

For more data, circle 2-56-3 on coupon, p. 46

Photography

(Continued from page 37)

ultrasonically, better "wetting" action is obtained, and developing time is reduced. But, Jacques warns that he is still experimenting and no firm conclusions have been made as to the practicability of ultrasonic developing.

Jacques leans heavily on Bob Cooper, of Bob's TV of Paramus, N. J. for keeping his electronic gear in good shape. Bob is also kept busy installing new electronic gadgets whenever Jacques finds a new one that will help him in his work.

Jacques became exposed to electronic apparatus when he was an executive of Peerless Camera Stores in New York. After being injured in an automobile accident, which kept him from working for a year, he decided to go into business for himself. To make his business profitable, he relies heavily on electronics to gain top efficiency. •

Scott AMPLIFIER KIT

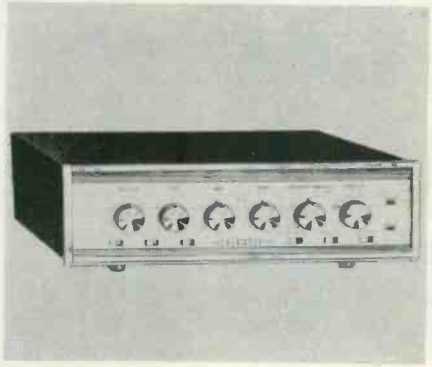
LK-72, dual channel, 35 watts/channel, amplifier is packed in a "Kit-Pak" container that opens to a worktable. Wires, pre-cut and pre-stripped. Mechanical parts, pre-riveted to the chassis. Other parts, mounted on "Part-Charts." Instruction book, full-

color, easy-to-follow. IHFM power band, extends down to 20 cps. Total harmonic distortion, 1 kc, is less than 0.4% at full power. Amplifier hum level, better than 70 db below full power output. $149.95, east of the Rockies; slightly higher West coast. H. H. Scott, Inc., 111 Powdermill Rd., Maynard, Mass.

For more data, circle 2-57-3 on coupon, p. 46

Sherwood AMPLIFIER/PREAMP

Model S-5000 II, 80 watt music power stereo amplifier/preamplifier provides either stereophonic or monophonic hi-fi system operation with only one set of basic controls. Features: 10 two-channel controls; stereo normal/reverse switch; phase inversion switch; dual amplifier mono-



phonic operation with either set of input sources; presence-rise switch, phono channel hum and noise 60 db below rated output and phono sensitivity of 1.8 mv. Also included, at no extra cost, is a third channel output, $199.50. Sherwood Electronic Labs., 4300 N. California Ave., Chicago 18, Ill.

For more data, circle 2-57-4 on coupon, p. 46

Stereo Multiplexing

(Continued from page 40)

low frequencies. The conductions are averaged out by the pi-network integrator circuit connected between the plate of V3B and the grid of V4A. This removes the subcarrier frequencies, leaving only the audio voltage variations to be applied to the phase inverter stage. Here the A — B signal is amplified, the actual signal input to the stage being determined by the setting of the dimension (sometimes called "difference" or "stereo") control.

V4A, the inverter stage, is a split-load amplifier with equal plate and cathode resistances giving both polarities of output, with equal amplitudes. The A — B signal is applied to the grid, producing A — B at the cathode and B — A at the plate. The two signals are applied to the mixing circuits along with the A + B signal from amplifier stage V4B. The A + B signal is demodulated in the FM tuner and applied to the converter as audio, so needs no further demodulation.

A double-pole switch is included here because, at the present time, the type of stereo multiplex has not been selected by the FCC which may be compatible or non-compatible. In a non-compatible system one stereo signal is transmitted directly on the main carrier; the other on a subcarrier which modulates the main carrier, with no combining of signals. With the switch of the converter being described in the ORD (ordinary) position the demodulated main carrier is connected from V4B to one of the outputs. The demodulated subcarrier can be obtained from the grid circuit of V4A and applied to the other output jack. For use on the Crosby multiplex system, the switch is set to the COM (compatible) position.

There are two controls on the converter, as shown in Fig. 3: the volume control and the dimension control. The dimension control sets the amplitude of A — B signal which is applied as input to the V4A stage.

In doing this it also sets the amplitudes of the A – B and B – A signals applied to the mixing circuits.

The volume control sets the amplitude of A + B signal which is applied to V4B and to the mixing networks.

In order to achieve proper balance these two controls should be set properly in relation to the rest of the system. First, turn the dimension control all the way down, then raise the volume to the desired level. Both speakers will then be producing sound but it will be a monaural output. The volume controls of the audio amplifiers should then be adjusted so that the sound seems to be coming from a point midway between the two speakers. After this the dimension control should be advanced to provide proper stereo effect.

Installation

Some FM tuners manufactured during the last few years are equipped with multiplex outputs, brought out to terminals at the rear of the chassis. In the overall tuner circuit this connection normally connects to an audio signal point, just ahead of the deemphasis network. When this connection is available it can be connected to the multiplex input of a converter. Normal audio output should be connected to the other input terminals of a converter.

If a multiplex output connection is not already provided on the tuner it can be installed. The correct connections for both ratio detector and discriminator circuits are shown in Fig. 4. In each case, connection is made at the input of the deemphasis network to keep its response from unduly attenuating the modulated subcarrier. For the ratio detector no circuit changes are required, as shown in Fig. 4A. Simply make a connection at the point shown, connecting a small capacitor (about 0.002 μf) in series with the lead.

In all probability no circuit changes will be required with a discriminator circuit. However, as shown in Fig. 4B, the capacitor marked C_1 shunts the output and could attenuate a portion of the subcarrier signal, especially if the capacitor is large. Sometimes it may be necessary to either remove this capacitor completely, or replace it with a smaller value. For each of these circuit arrangements, the leads carrying the subcarrier signal can be connected to a phono jack or screw-type terminal permanently installed at the back of the tuner.

As stereo multiplex gains in popularity more manufacturers will enter the field. This will offer radio and TV technicians additional sales, installation and servicing opportunities. •

For more data, circle 2-59-1 on coupon, p. 46

For more data, circle 2-59-2 on coupon, p. 46

Misconceptions

(Continued from page 34)

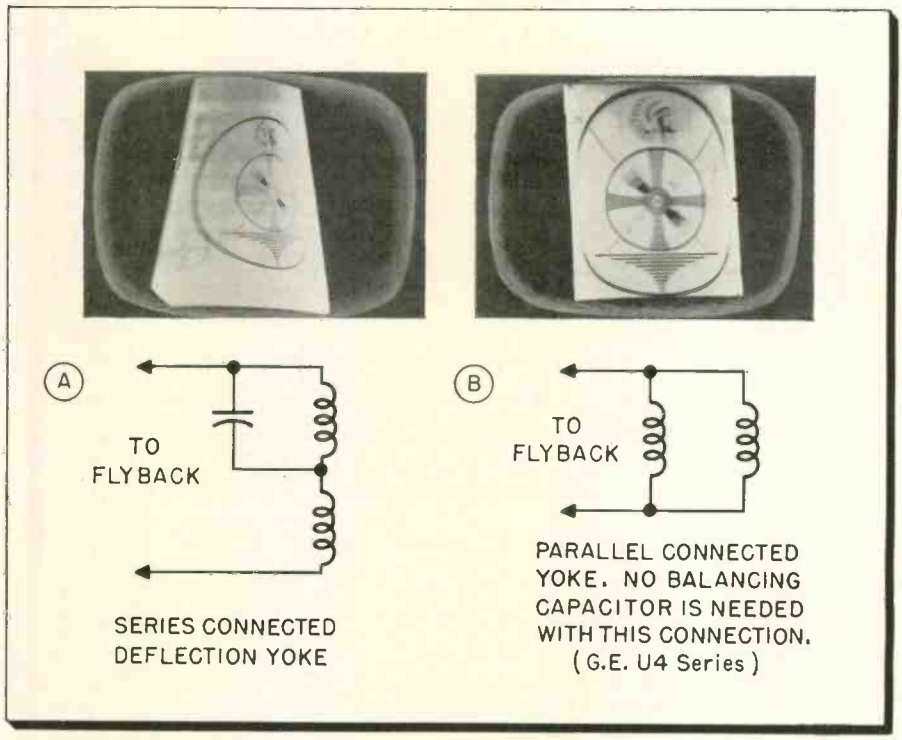
Almost any trouble in the sweep circuit will affect the boost voltage, but just how will it affect it? No one really knows. Therefore, boost measurement will not help you *localize* a single defective part! We once read a story, though, that said low boost indicated trouble in the yoke . . . I've often wondered how! Now, of course, boost voltage can be used to indicate sweep energy, or the return of sweep energy after you make the repair; but then, so will an arc drawn by a screwdriver!

5. A "milky" picture when the brightness is turned up is always caused by defective CRT.

Though it's true that the picture tube is the most common offender in this respect, just ask an embarrassed technician that installed a new tube and still had the same trouble. He'll testify that the picture tube is not the only cause of a milky picture.

In many RCA models, as well as others using the high level con-

Fig. 3—*Misconception:* A shorted yoke will cause a trapezoid pattern. *Fact:* This is true in some series-wired yoke circuits (A). In parallel wired circuits (B), a short results in reduced parallel sides.



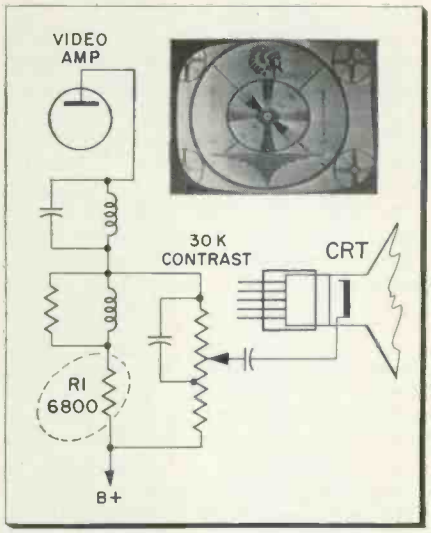


Fig. 4—*Misconception:* A "milky" picture when the brightness control is turned up is always caused by a defective CRT. *Fact:* Many TV chassis using the illustrated circuit have been known to cause a milky CRT if the plate load resistor opens.

trast control circuit, shown in Fig. 4, an open video plate load resistor R1 will produce a symptom resembling a defective picture tube. Note that with resistor R1 open, plate voltage is still supplied to the video amplifier tube through the much higher resistance of the contrast control. This keeps the video amplifier working, but the frequency response is very poor.

Though presenting only five common misconceptions that might throw you for a loop, there are no doubt many more. But these will serve to emphasize why service technicians should analyze circuits before jumping to an incorrect conclusion. •

Illustration Credit: John F. Rider Publisher, Inc., New York, N. Y.

Amperex DIODE

Announced is subminiature type 1N3182 voltage variable capacitor silicon diode, for automatic frequency control applications in TV and FM tuners. Specifically designed and manufactured exclusively for automatic frequency control applications. Features a high Q (typical 60) and maintains a precise oscillator frequency. All-glass construction. Maximum series resistance, 3 ohms. Average capacitance, 30 $\mu\mu$f. Inverse voltage, 4v. Amperex Electronic Corp., Semiconductor & Special Purpose Tube Div., 230 Duffy Ave., Hicksville, L. I., N. Y.

For more data, circle 2-61-4 on coupon, p. 46

Atlas ROTOR WIRE

A new heavy duty rotor wire, Atlas 4-C, is the latest addition to a group of rugged fringe area type wires. The new cable is reported to be heavily insulated and to contain 18 gauge copper in each conductor. Additional stranding, added for flexibility, brings the total in all four conductors to 164 strands. Jersey Specialty Co., Burgess Place, Mountain View, N. J.

For more data, circle 2-61-5 on coupon, p. 46

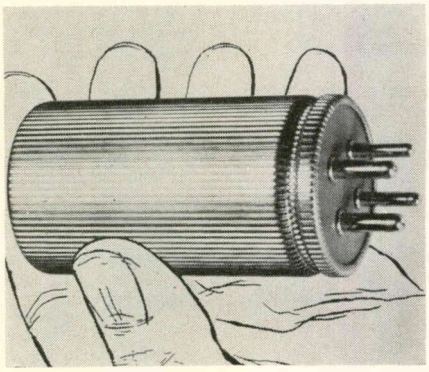
Raytheon TUBES

Announced are five new entertainment tubes. Audio receiving tubes: 7-pin 7543, replacement for 6AU6 and providing a low-hum, non-microphonic operation; and the 9-pin 14GT8, a duplex diode, a high-mu triode, designed for use as an FM detector and AF voltage amplifier. Video tubes: 9-pin 6GN8, a miniature triode pentode with the triode section designed for use as a voltage amplifier or synchronizing separator and the pentode section designed for video amplifier service; 8-pin 10EG7 octal-based, double-triode with dissimilar sections, one designed as an oscillator and the other as an amplifier in the TV receiver's vertical deflection circuit; and 7-pin 2ER5 miniature, remote-cutoff, frame-grid tetrode for VHF TV tuners. Raytheon Co., Westwood, Mass.

For more data, circle 2-61-6 on coupon, p. 46

James VIBRATOR

Announced are 3 models in a line of vibrators, designed specifically for citizens band radio equipment. Features include double lead wires having twice normal current capacity and oversize contacts giving 71% more contact area. Model CB-40, 6v, 4



prong, receive current 5 amps. max., transmit current 10 amps. max. $4.95. CB-41, 12v, 4 prong, receive current 3 amps. max., transmit current 6 amps. max. $5.15. CB-42, 12v, 3 prong, receive current 3 amps. max., transmit current 6 amps. max. $5.15. James Electronics, Inc., 4050 N. Rockwell St., Chicago 18, Ill.

For more data, circle 2-62-3 on coupon, p. 46

New Books

REPAIRING TRANSISTOR RADIOS. *By Sol Libes. Published by John F. Rider Publisher, Inc. 168 pages, soft cover. $3.50.*

Transistor theory, how it operates in radio circuits and servicing procedures are thoroughly discussed in this fine book. Each stage of a radio is covered, with a service chart that indicates "Trouble," "Possible Cause," and "What To Look For" following each discussion. AM, FM, and Auto radios receive excellent coverage. A chapter each is devoted to "Trouble-shooting Techniques," and "Tools & Test Equipment." Also, an appendix offers a transistor interchangeability chart. Admirably written and illustrated, the guide should further a technician's knowledge of transistor radio repair techniques.

TELEVISION TUBE LOCATION GUIDE, Vol. 10. *Published by Howard W. Sams & Co., Inc. 98 pages, soft cover. $1.25.*

This handy guide for caddy or bench is the tenth volume in a series of TV chassis tube layout diagrams. 74 tube location charts with keyed tube pins are accompanied by a listing of failure symptoms and the tubes that could cause these failures. Series-string filament circuits, fuseohm resistor values, and control locations for individual TV receivers are also helpful aids for the service technician. Previous volumes, 8, 9, and 10 are indexed.

TELEVISION ANALYZING SIMPLIFIED. *By Milton S. Kiver. Published by B&K Manufacturing Co., Chicago, Ill. 134 pages, soft cover. $1.00.*

This second edition (revised) of a manual published in 1958 employs the publisher's commercially-available analyst to troubleshoot TV receivers. In substance, the text is an applications manual for their instrument. However, the practical TV circuit analysis and signal injection techniques presented here can serve well as a general guide for the use of all signal injection instruments. The author's shirt-sleeve method of troubleshooting each section of a receiver should certainly help owners of an analyst reduce their service time. Additionally, non-owners of analyst-type equipment can, for only one dollar, expose themselves to the use of this type equipment.

SOUND MERCHANDISING TECHNIQUES. *By Walton N. Hershfield. Published by Sound Publishing Co., 299 Madison Ave., New York City. 66 pages, soft cover. $3.00.*

Originally published as a series of articles in a periodical, this collection of sound equipment material has been expanded to include sales and advertising methods. Public address, intercom, and interphone equipment is presented, with a view towards merchandising, which includes a non-technical discussion of equipment. Detailed applications are also presented, such as installations in: schools, airports, churches, offices and other prime selling areas. Recommended reading as a good selling guide in an expanding field.

SERVICING TRANSISTOR TV RECEIVERS. *By Milton S. Kiver and Charles R. Gray. Published by Howard W. Sams & Co. 272 pages, soft cover. $4.50.*

Following on the heels of recently introduced transistorized television receivers, this book offers a detailed description of transistors, basic circuits, and how they are applied in modern transistorized TV sets. A chapter is devoted to transistor circuit operation of each section of a TV chassis: tuners, video amps, detectors, etc. A final chapter discusses service techniques, though practical repair methods are limited. Numerous circuit diagrams accompany the text. Recommended to readers wishing a better understanding of a transistor's role in TV.

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February 1961

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2-27						Los Angeles
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5-22		Memphis	Buffalo			San Francisco
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6-12		Charlotte		Chicago		Portland
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6-26	Union	Atlanta		Minneapolis	Dallas	Salt Lake City

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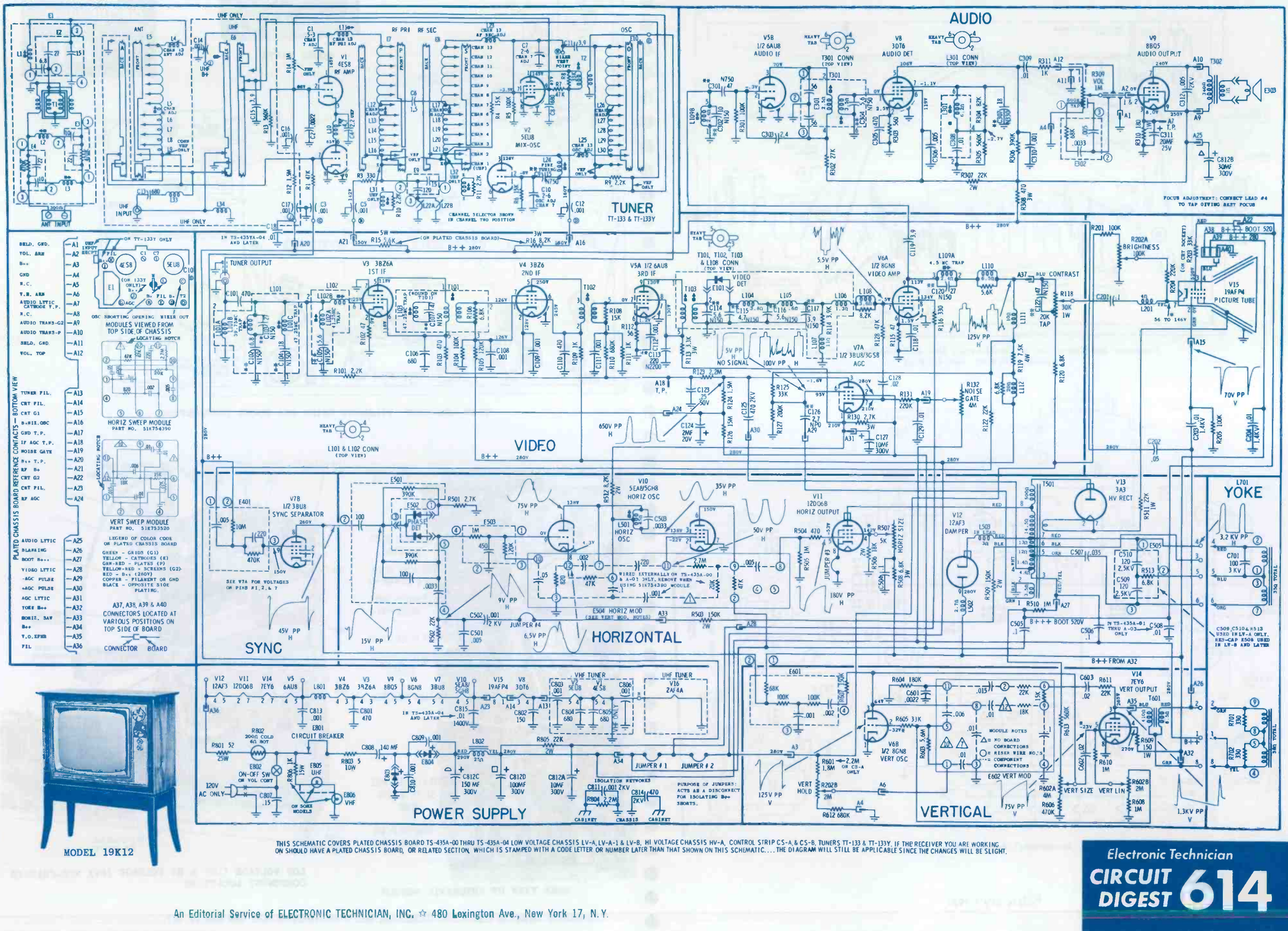
ELECTRONIC TECHNICIAN CIRCUIT DIGEST 614

MOTOROLA
TV Chassis
TS-STS & WTS-435



THIS SCHEMATIC COVERS PLATED CHASSIS BOARD TS-435A-00 THRU TS-435A-04 LOW VOLTAGE CHASSIS LV-A, LV-A-1 & LV-B, HI VOLTAGE CHASSIS HV-A, CONTROL STRIP CS-A, & CS-B, TUNERS TT-133 & TT-133Y. IF THE RECEIVER YOU ARE WORKING ON SHOULD HAVE A PLATED CHASSIS BOARD, OR RELATED SECTION, WHICH IS STAMPED WITH A CODE LETTER OR NUMBER LATER THAN THAT SHOWN ON THIS SCHEMATIC.... THE DIAGRAM WILL STILL BE APPLICABLE SINCE THE CHANGES WILL BE SLIGHT.

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ELECTRONIC TECHNICIAN 615 CIRCUIT DIGEST

RCA
Reverberation Amplifier Chassis RS-194A

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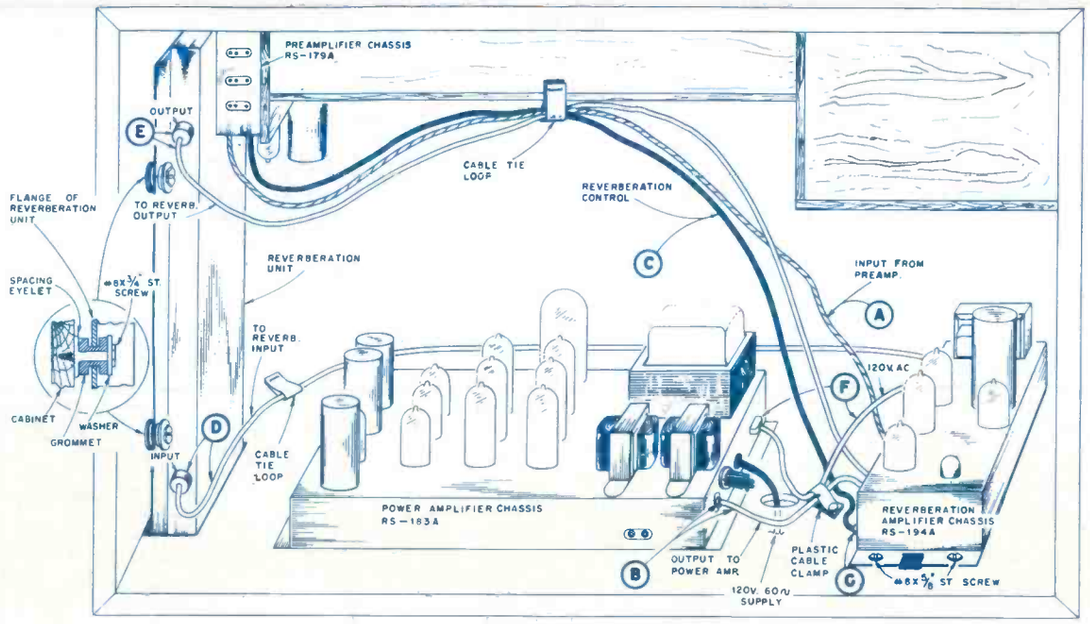
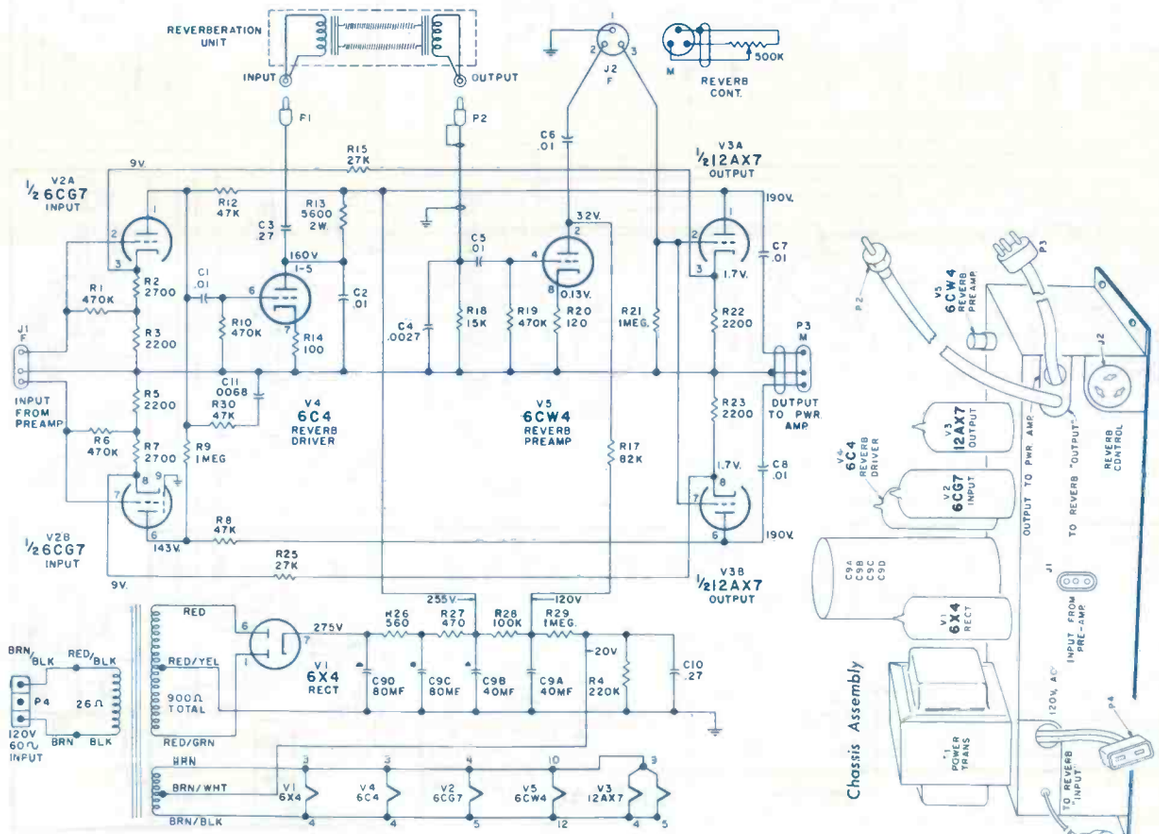


Placement and Connection of Reverberation Unit and Amplifier in Models RVCR-45, RVCR-46, and RVCR-84



Reverberation Amplifier Chassis RS-194A

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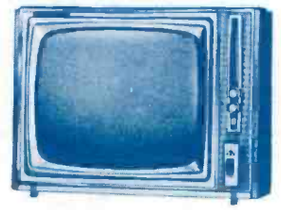
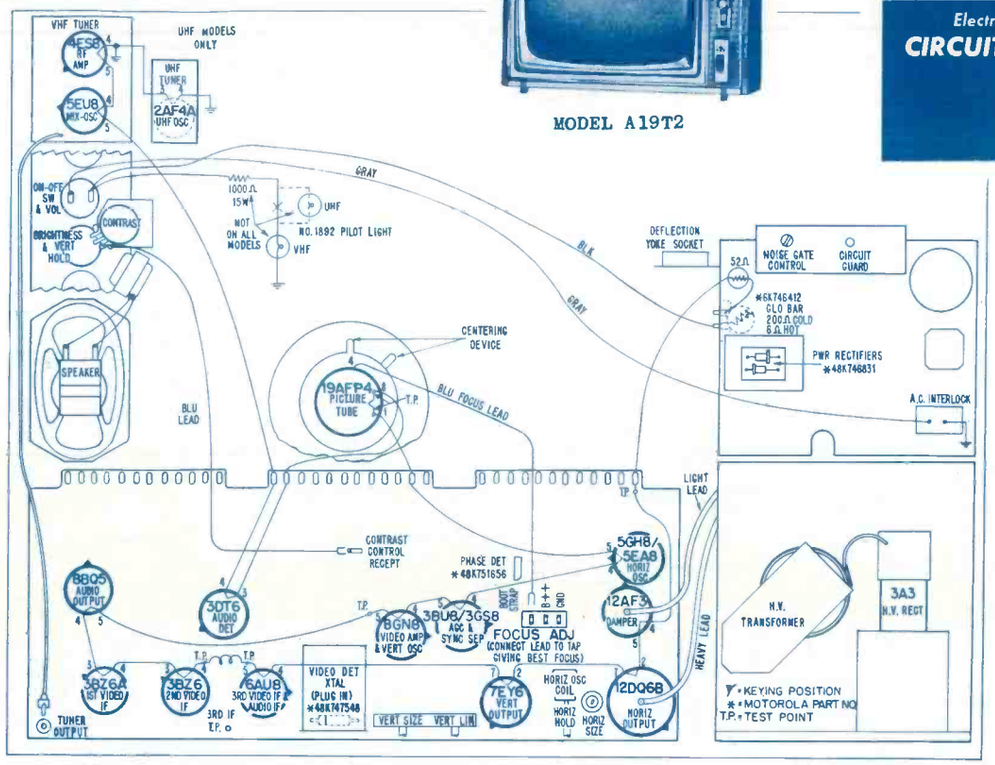
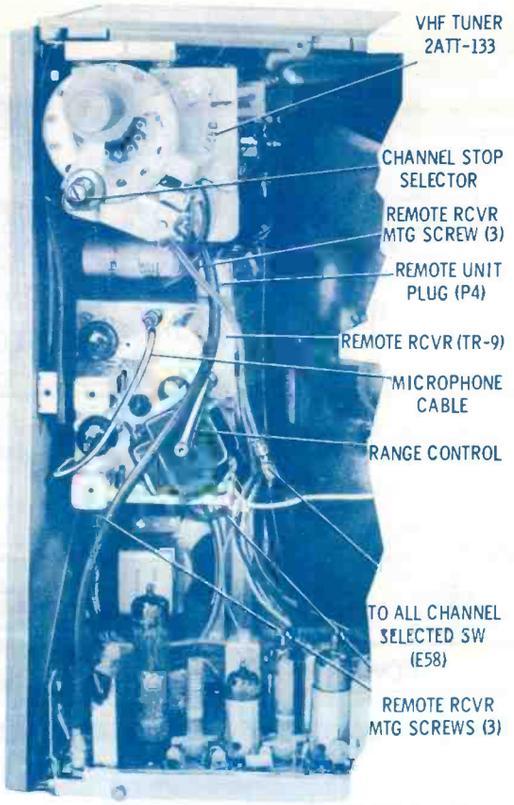


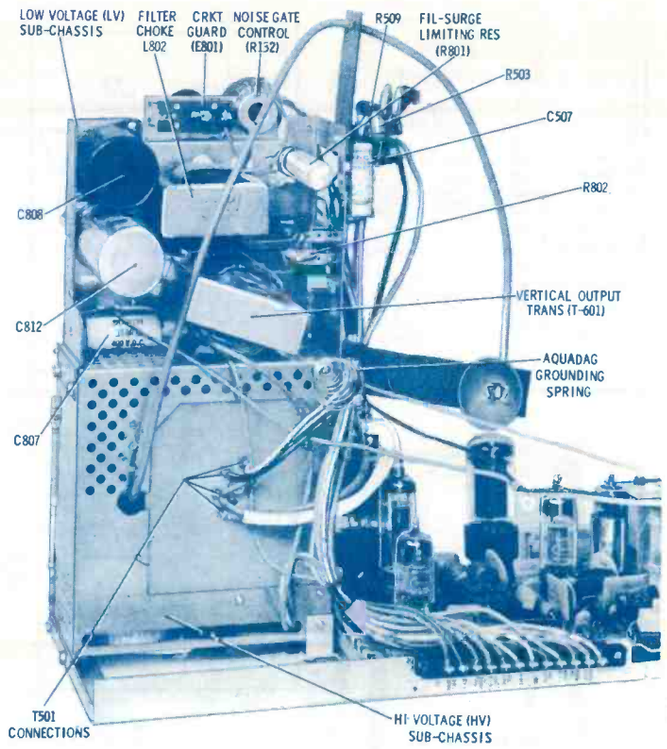
MODEL A19T2



TUBE LOCATION, FILAMENT GUIDE AND FOCUS INFORMATION



REAR VIEW OF AUTOMATIC MODELS



LOW VOLTAGE (LV) & HI VOLTAGE (HV) SUB-CHASSIS COMPONENT LOCATIONS

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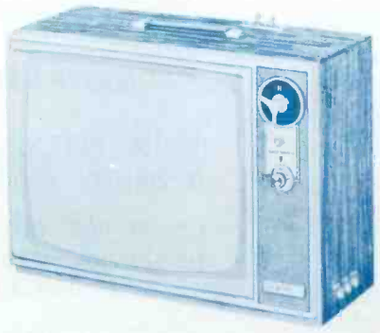
ZENITH
TV Chassis
16F23, 16F23Q



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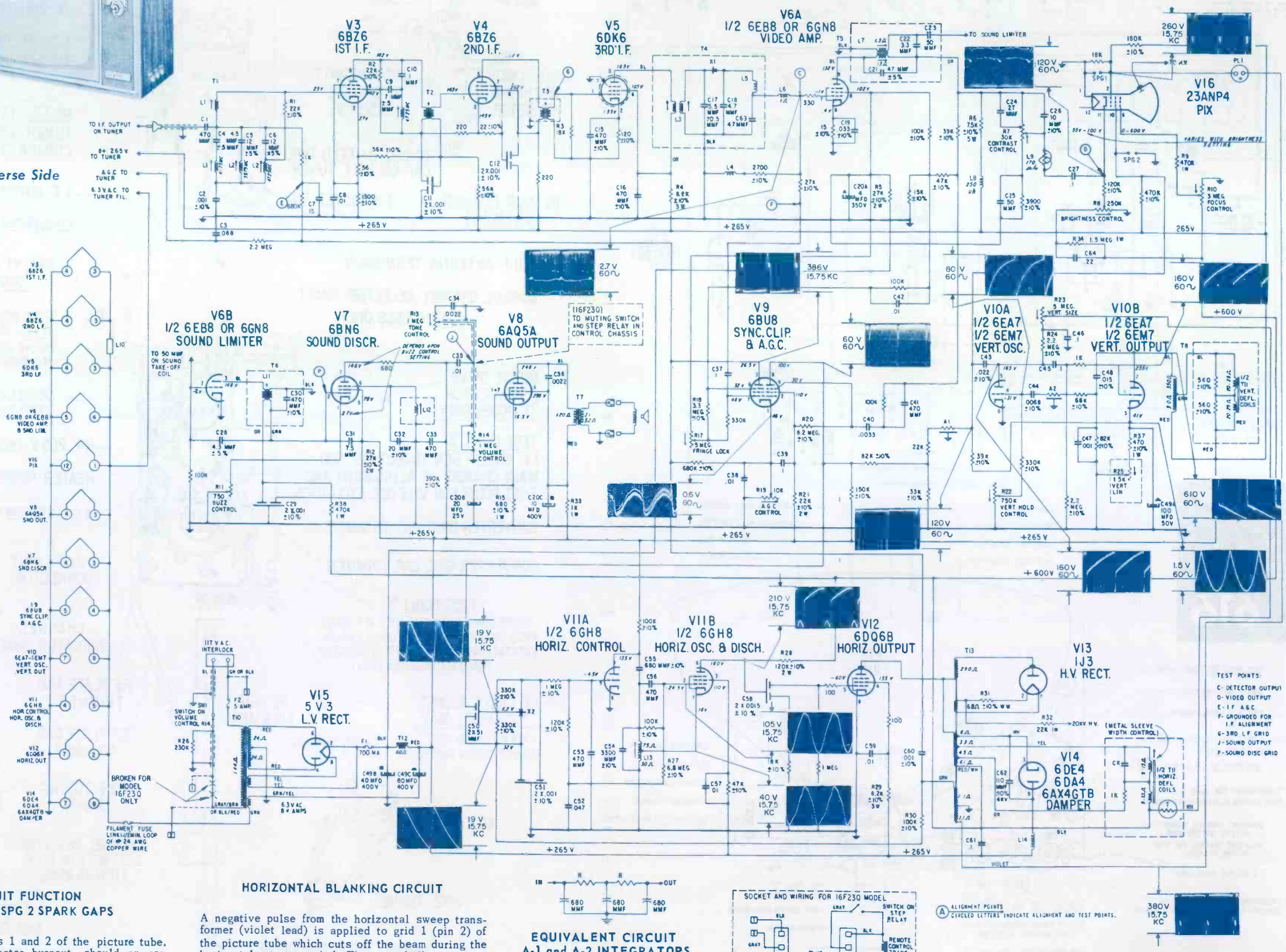


CIRCUIT FUNCTION
SPG 1 AND SPG 2 SPARK GAPS

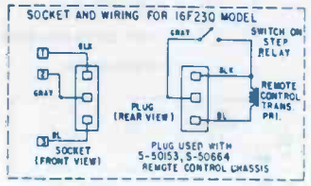
SPG 1 slips over pins 1 and 2 of the picture tube. The gap prevents heater burnout, should an arc occur in the gun. If the picture tube is replaced, install the gap as on the original tube. SPG 2 similarly protects integrator A1.

HORIZONTAL BLANKING CIRCUIT

A negative pulse from the horizontal sweep transformer (violet lead) is applied to grid 1 (pin 2) of the picture tube which cuts off the beam during the horizontal retrace period. The neon bulb acts as a switch which allows the pulse to pass through, but blocks off any transients that may reach the grid during the trace period.

EQUIVALENT CIRCUIT
A-1 and A-2 INTEGRATORS

87-4 R is 47K
87-5 R is 33K
87-7 R is 68K
87-8 R is 82K



Ⓐ ALIGNMENT POINTS
CIRCLED LETTERS INDICATE ALIGNMENT AND TEST POINTS.

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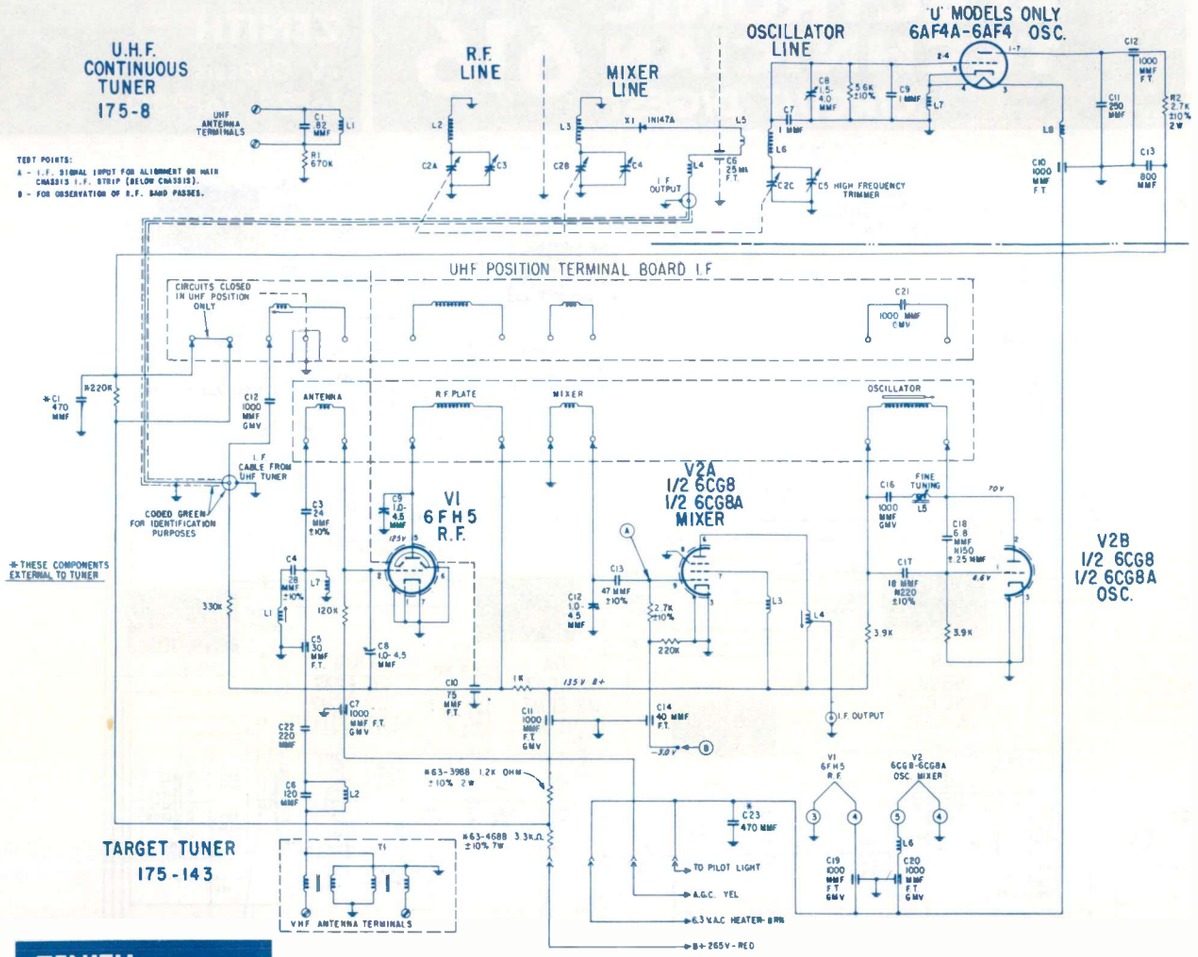

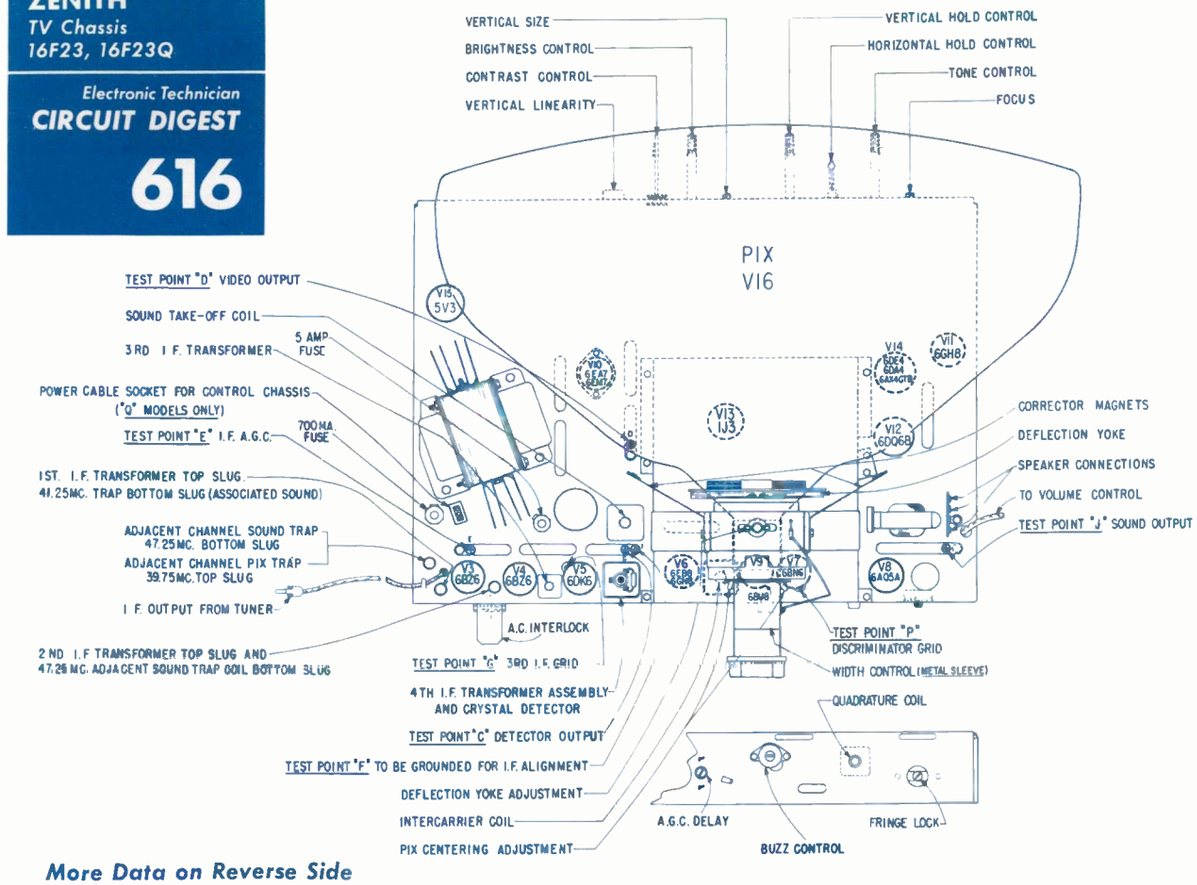

ZENITH
TV Chassis
16F23, 16F23Q

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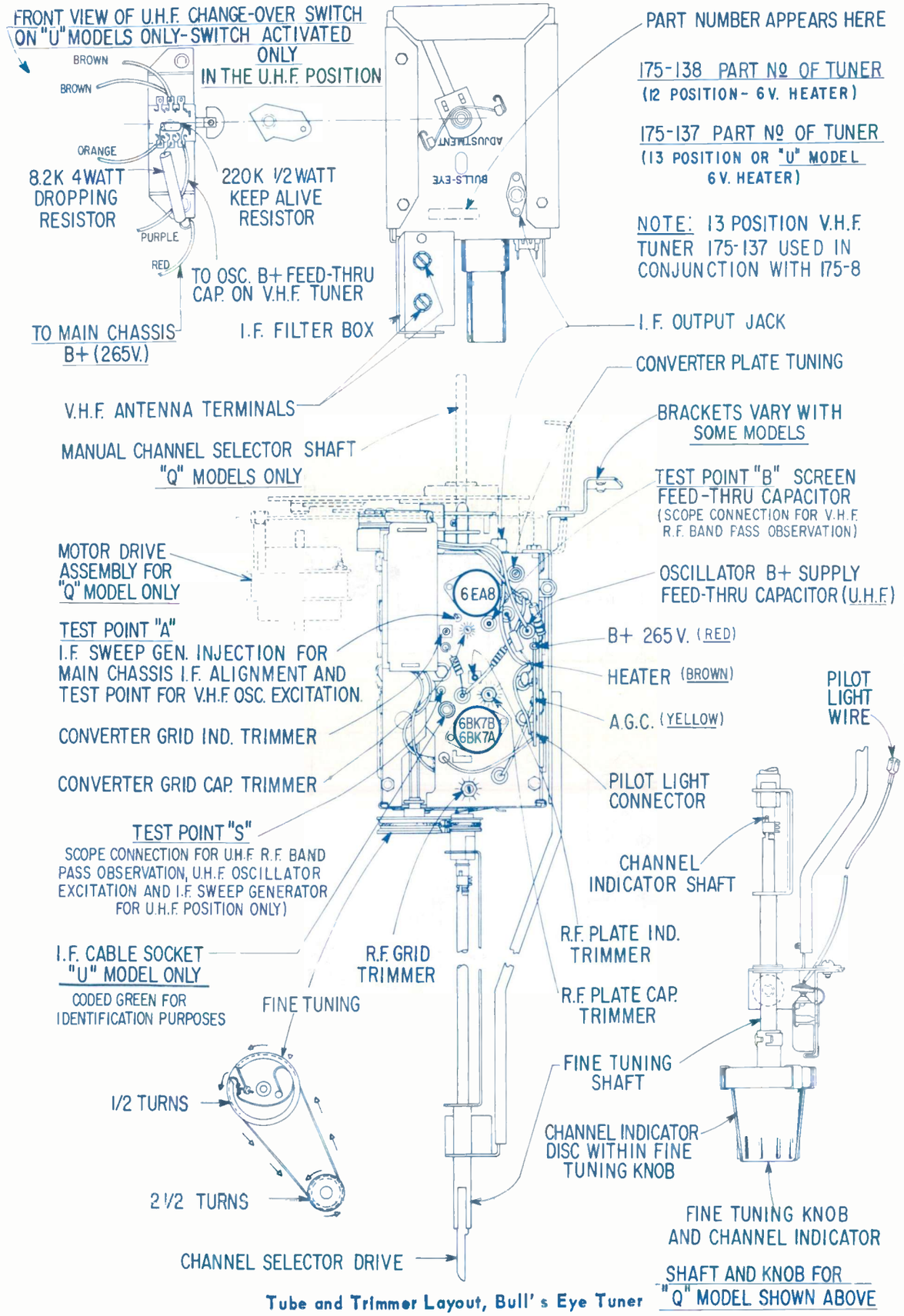

Tube and Trimmer Layout, Bull's Eye Tuner

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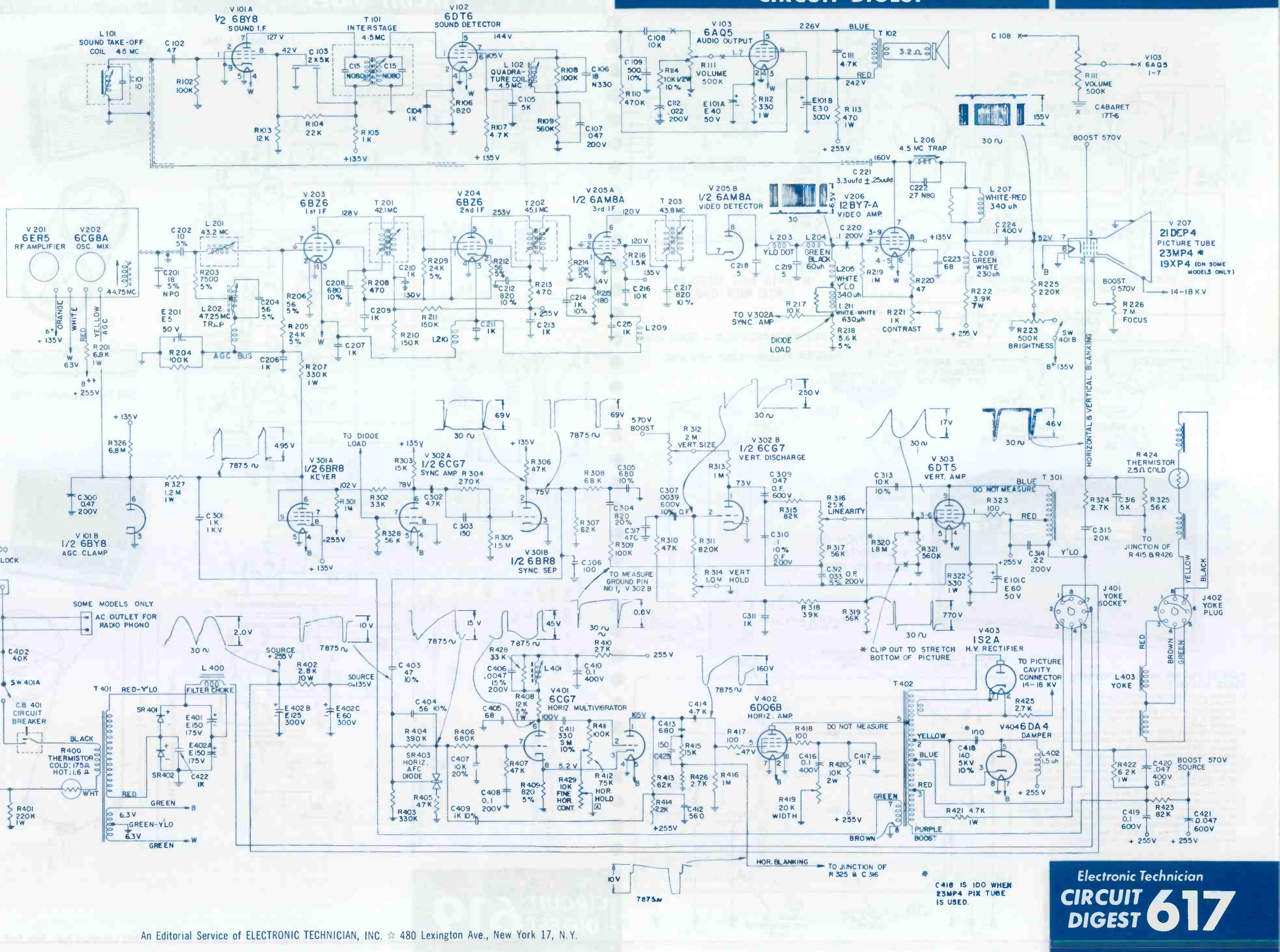
ELECTROHOME
TV Model "Selkirk"



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Electronic Technician CIRCUIT DIGEST 617

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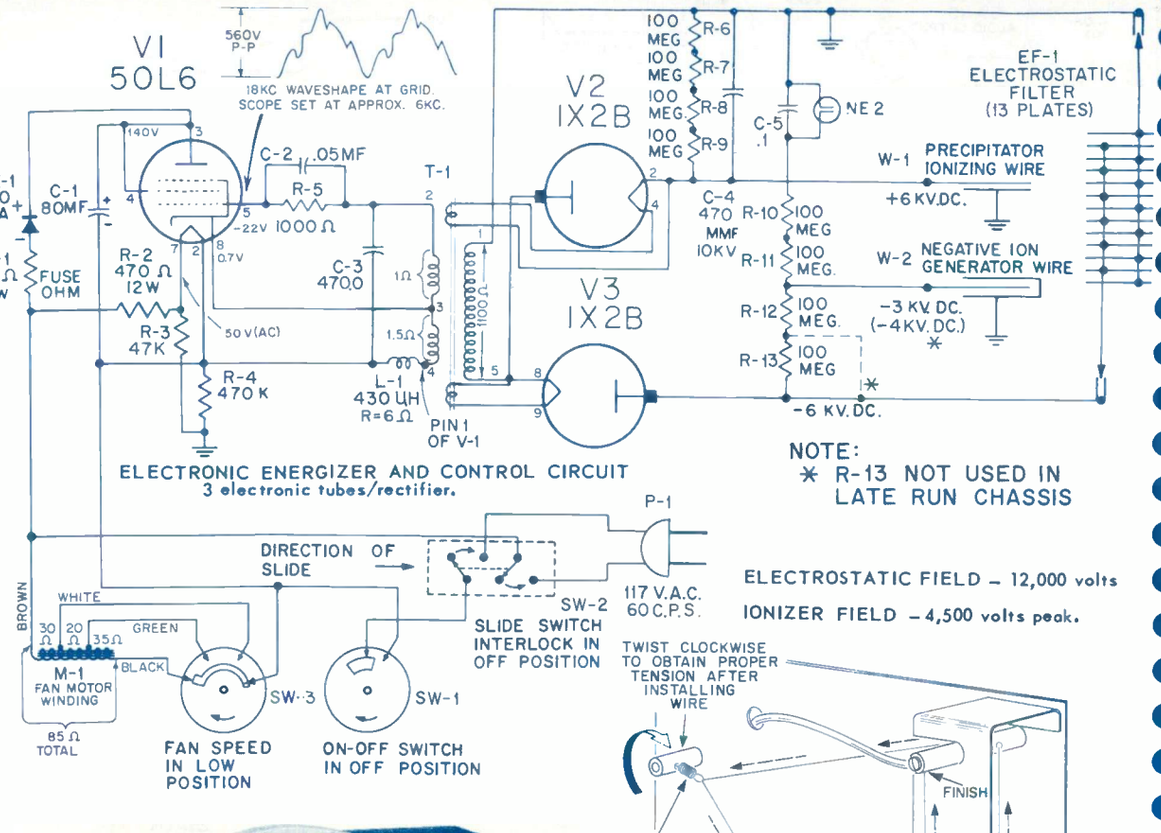
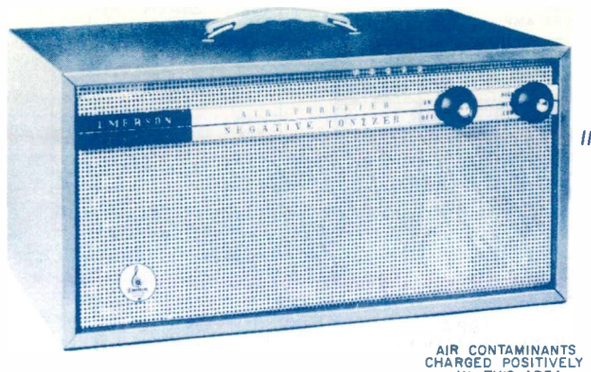
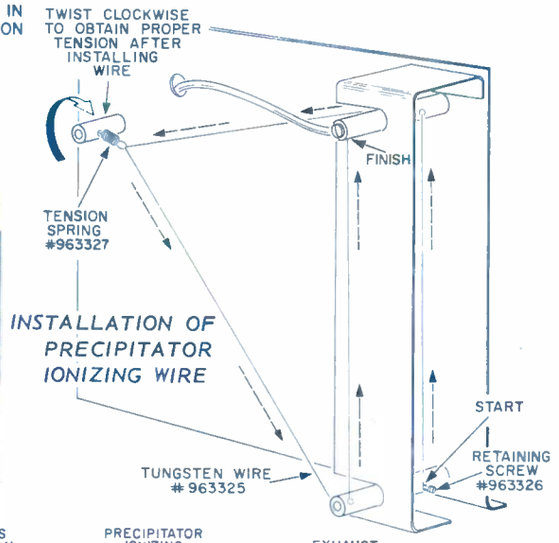
EMERSON
Air Purifier Ionizer
Model EP-40

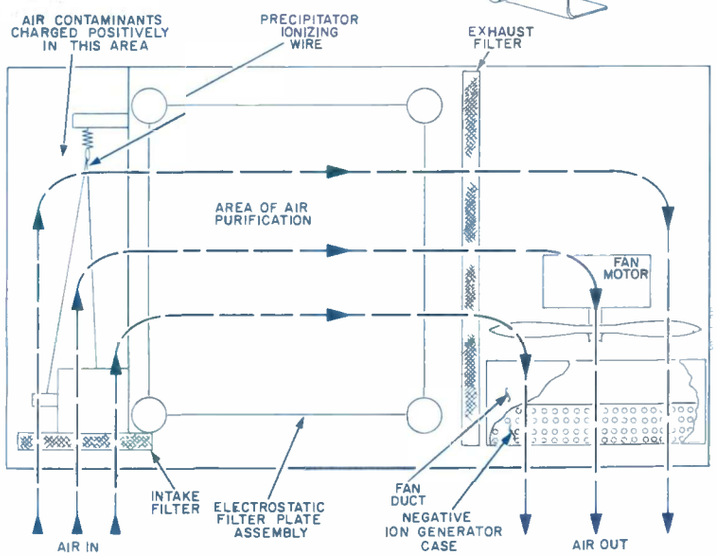






CARE OF FILTERS AND ELECTROSTATIC PLATE ASSEMBLY

1. Remove power cord from electrical outlet.
2. Remove knobs by pulling gently forward.
3. Remove front grille by grasping bar across grille and pushing downward. This releases the top edge of grille so that it tilts outward freely.
4. Inspect the black filter on the left side first. A vacuum cleaner may be used for cleaning this filter. After a fourth cleaning, however, the filter should be replaced.
5. Each of the 13 plates in the larger electrostatic unit at the center of the ionator should be inspected for surface accumulation of dirt. When this accumulation becomes visible, it should be removed either with a vacuum cleaner or a thin wire brush or both. The plates may be removed easily by following the instructions on the back side of the front grille.
6. The large black fibre glass filter, located between the electrostatic unit, described in 4 above, and the circulation fan should be inspected from time to time. In normal use, however, this filter will not require more than an occasional cleaning. Its only function is to trap flakes which may fall from the electrostatic filter plates, due to excessive accumulation.



Electronic Technician
CIRCUIT DIGEST 618

ELECTRONIC TECHNICIAN CIRCUIT DIGEST 619

GENERAL ELECTRIC
Transistor Radio
Models CT110, CP775

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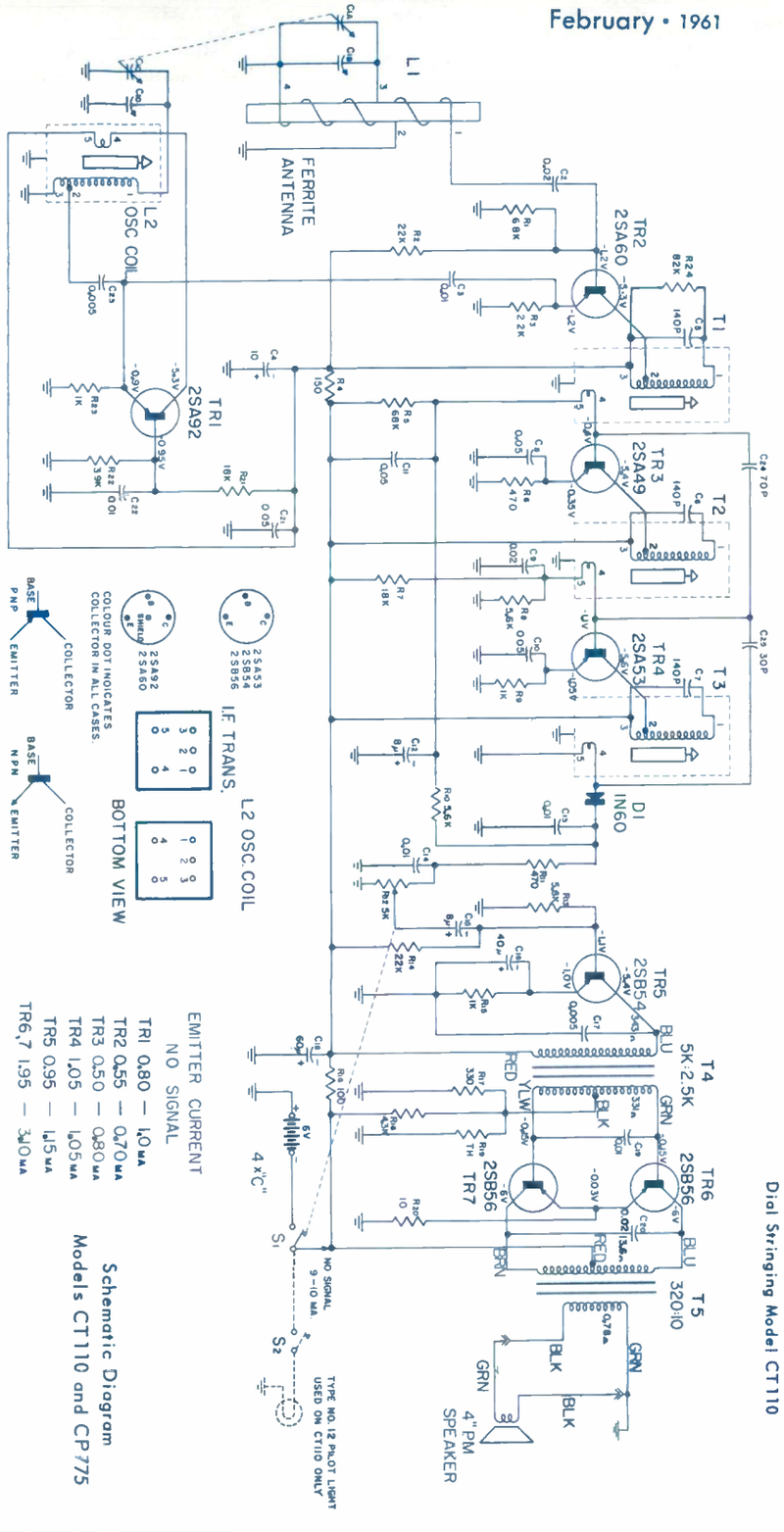
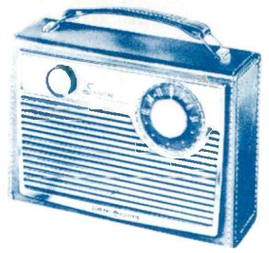
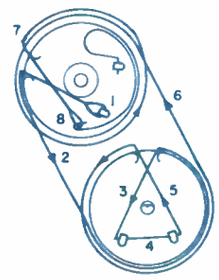
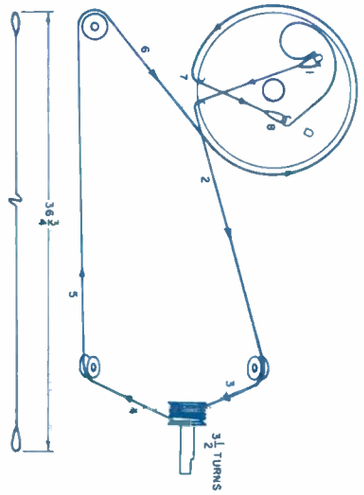


Schematic Diagram
Models CT110 and CP775





Dial Stringing Model CP775



Dial Stringing Model CT110

Electronic Technician
CIRCUIT DIGEST 619

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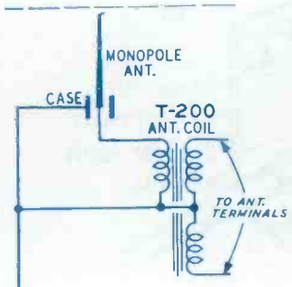
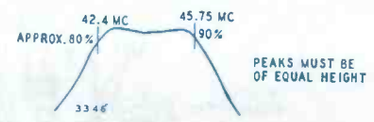
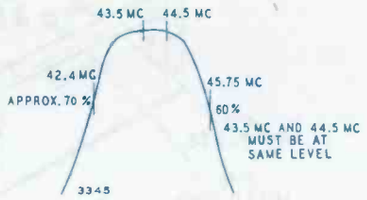
ELECTRONIC TECHNICIAN CIRCUIT DIGEST 620

MONTGOMERY WARD
TV Models
WG-4225A, WG4325A

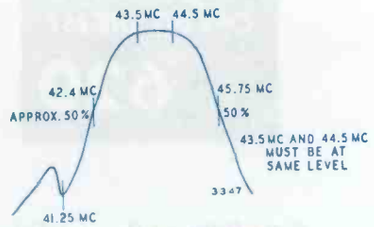




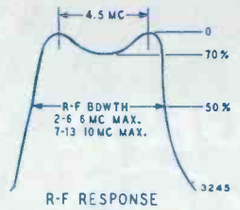
·2nd Pix I-F Response



·Pix I-F Response From 1st Pix I-F Grid

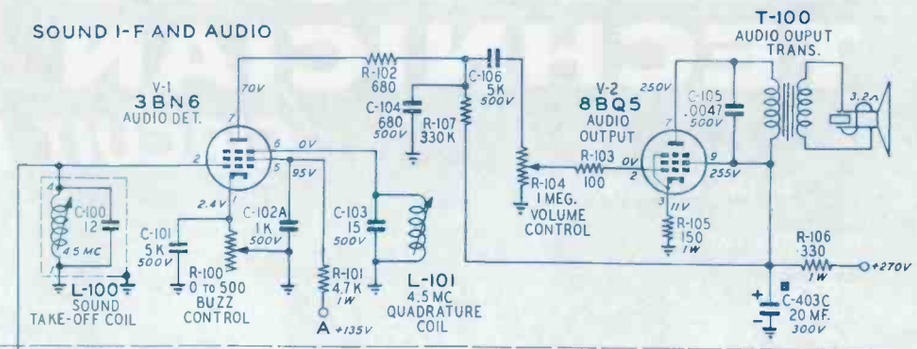


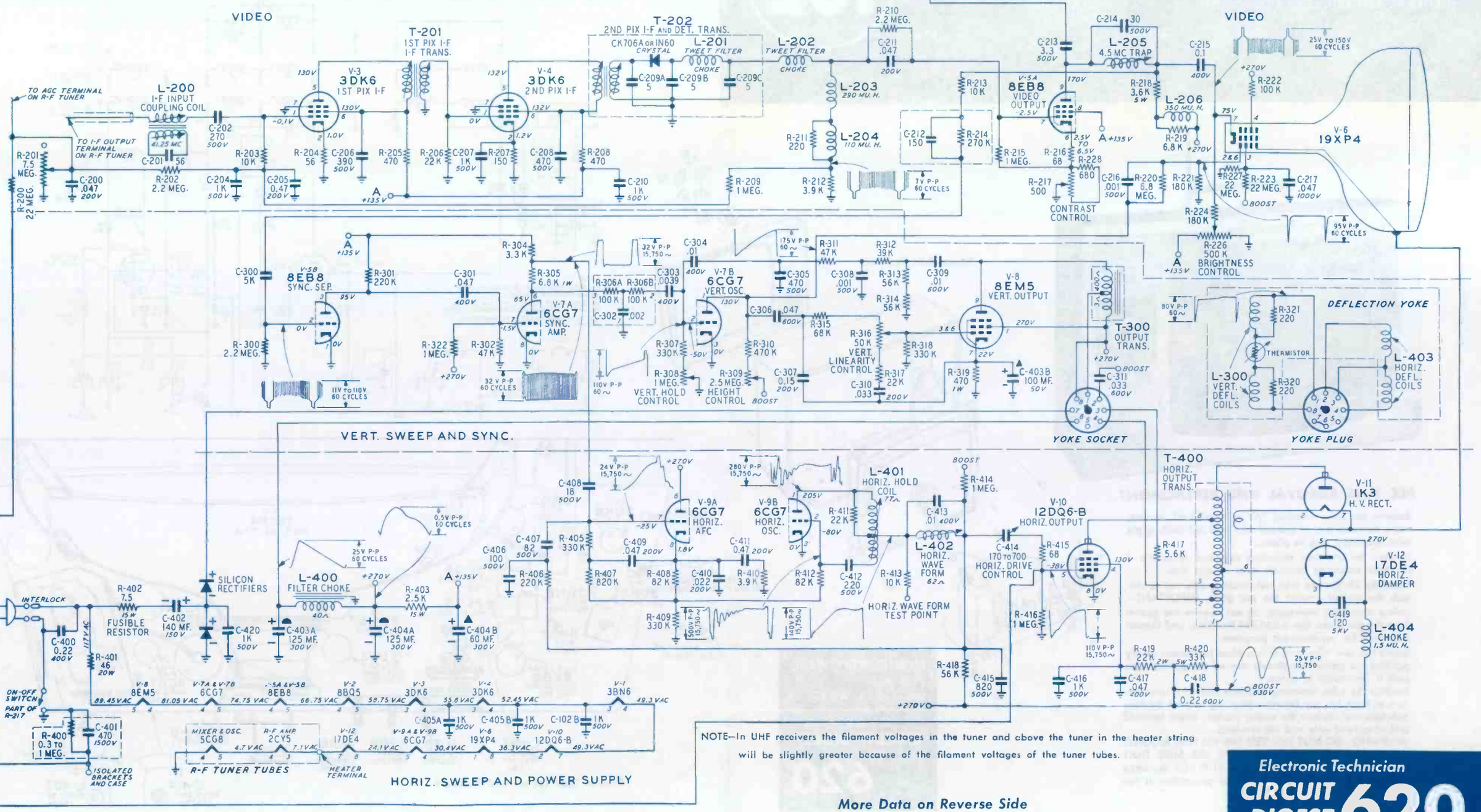
·Overall Pix I-F Response



R-F RESPONSE

·Pix & Audio Markers





NOTE—In UHF receivers the filament voltages in the tuner and above the tuner in the heater string will be slightly greater because of the filament voltages of the tuner tubes.

More Data on Reverse Side

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Electronic Technician CIRCUIT DIGEST 620

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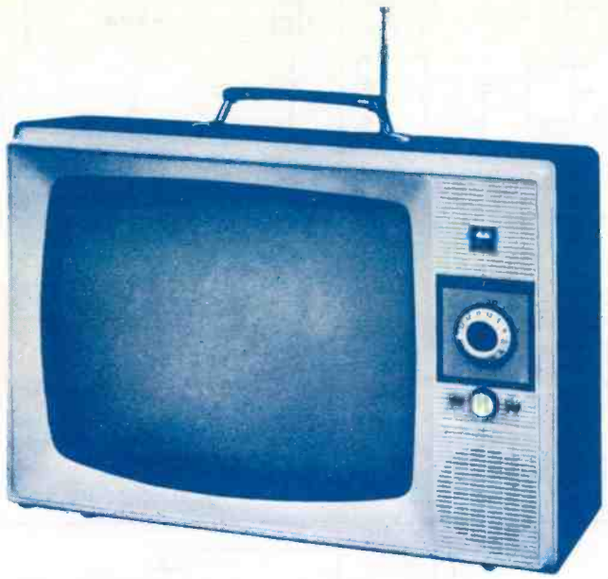
CIRCUIT DIGESTS

In This Issue (No. 102)

Circuit Digest Schematic No.

GROUP 102



PIX TUBE REMOVAL AND REPLACEMENT

Remove the screw (marked "A" in illustration), washer, screw terminal end of ground wire and nut holding pix tube mounting ring in place.

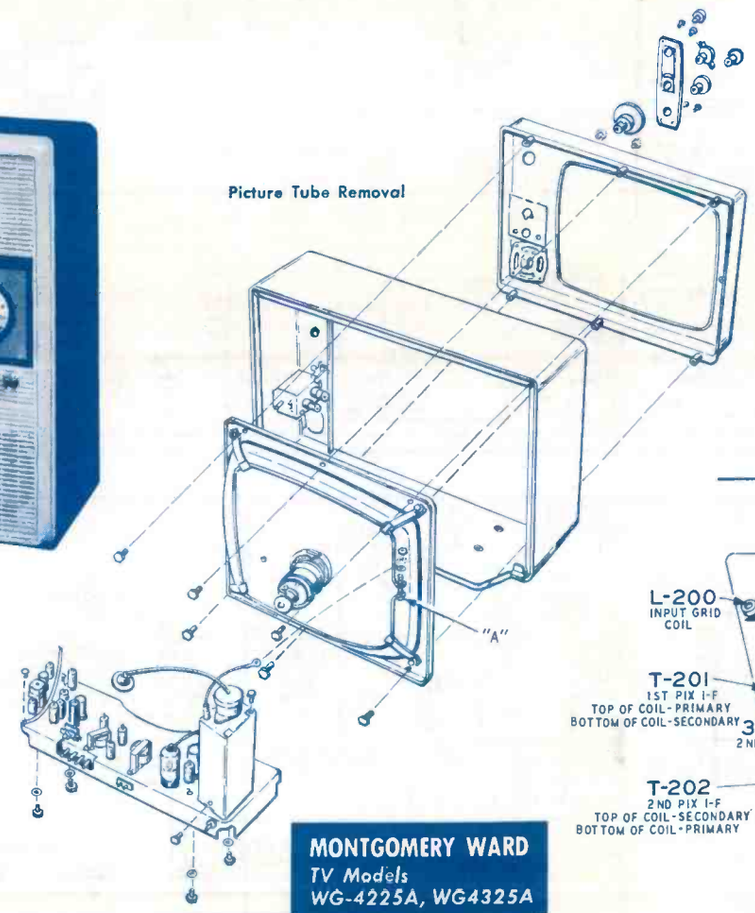
Remove the pix tube mounting ring and move the 4 pix tube mounting brackets over to one side.

Carefully lift the pix tube out, making sure not to disturb the gasket around the pix glass. IMPORTANT—Unless absolutely necessary, do not remove the gasket fram the pix glass. Use a 26A704 Pix Glass and Gasket Assembly for replacement purposes.

Install the new tube, and with a blunt instrument gently position the gasket completely around the picture tube until it fits snugly in place.

Position the tube mounting brackets over the four corners of the tube, slip the mounting ring around the four brackets and replace the screw, washer, screw terminal end of ground wire and nut removed.

WARNING—DO NOT TIGHTEN THE PIX TUBE MOUNTING RING SCREW IN UNTIL YOU ARE SURE THAT THE 4 PLASTIC INSULATORS ARE IN PLACE (between the bracket and the frame). If this precaution is not observed, severe shock may result.



Picture Tube Removal

MONTGOMERY WARD
TV Models
WG-4225A, WG4325A

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TV Models
WG-4225A, WG4325A

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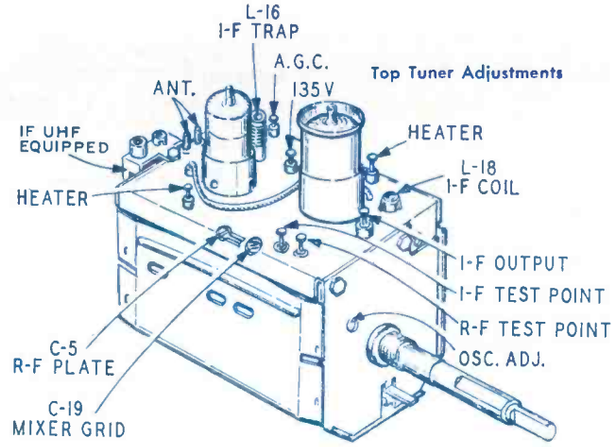
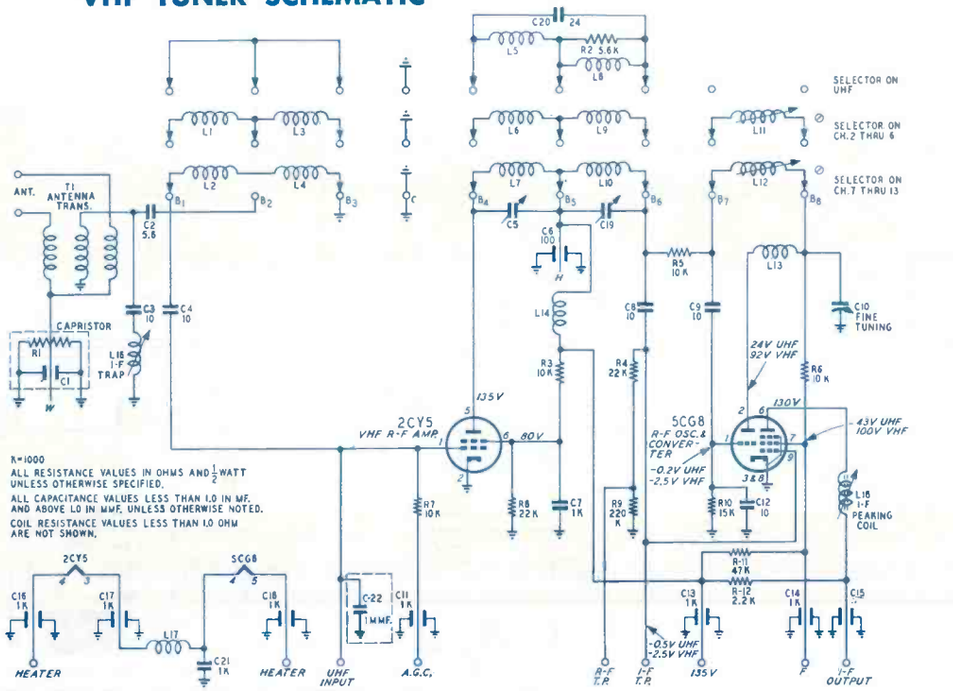
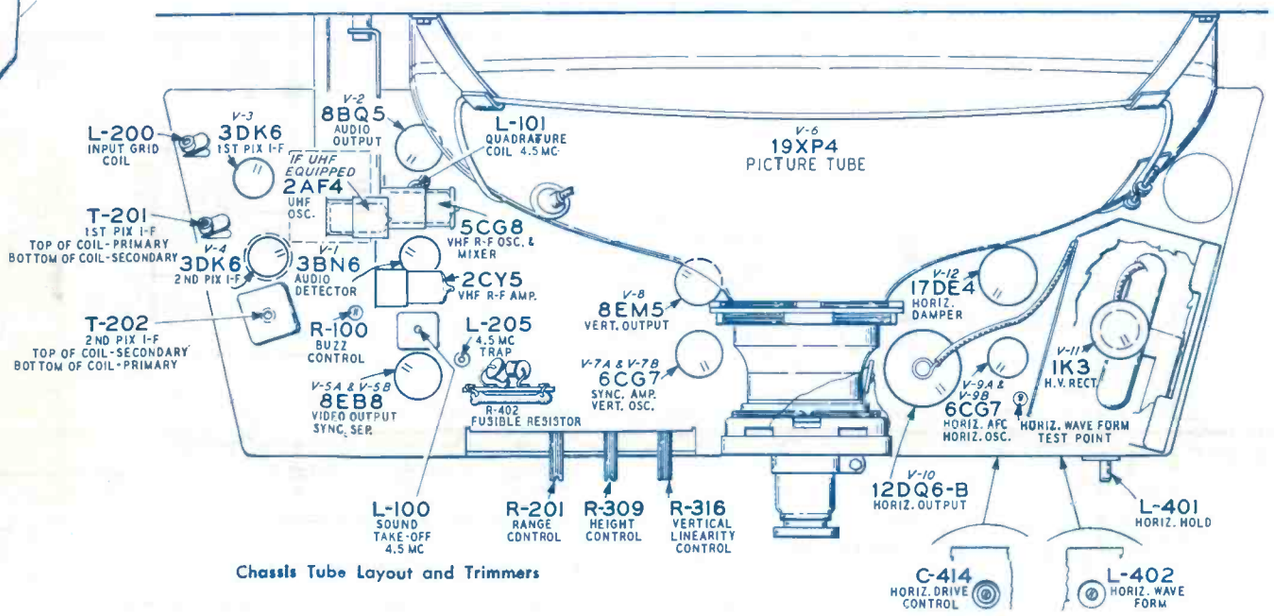
CIRCUIT DIGEST
620

More Data on Reverse Side



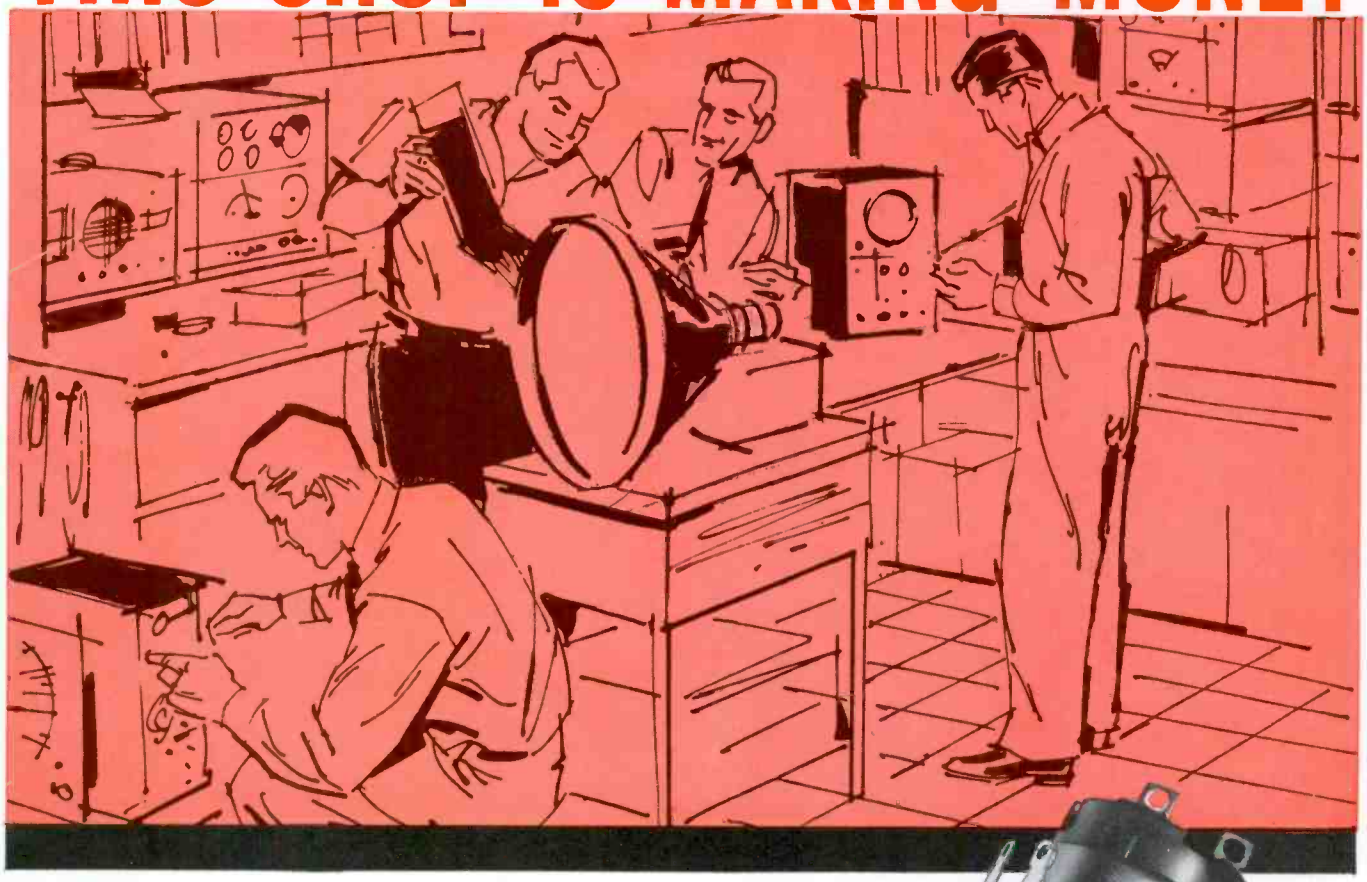
VHF TUNER SCHEMATIC





Chassis Tube Layout and Trimmers

THIS SHOP IS MAKING MONEY



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Radio and television repair shops in all parts of the country are increasing their profits with Clarostat RTV controls—the controls that are *right* for the job, *right* from the carton.

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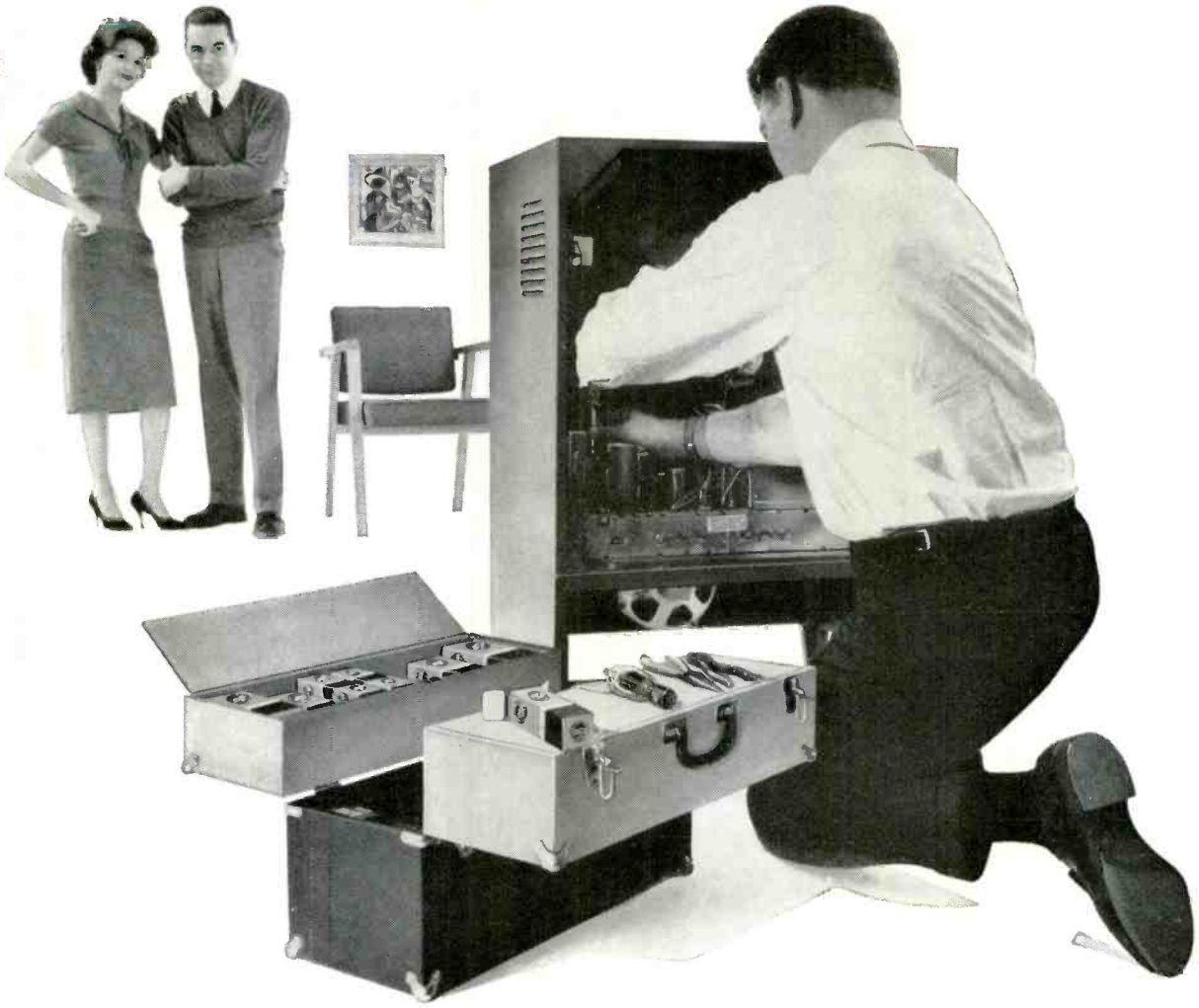
For more data, circle 2-C3-1 on coupon, p. 46

How do your customers rate you?



Your reputation is based largely on what happens *after* you leave the scene of each service call. For this reason the name on the tubes you install makes a world of difference. RCA tubes are designed and manufactured to assure customer confidence in you as well as in RCA.

RCA tube quality is your best insurance against call-backs due to premature tube failure.

RCA tube performance puts your workmanship in the best light and protects it through rigid quality control.

RCA's trademark symbolizes a name and reputation customers have respected for decades.

Your customers know that those red-white-and-black RCA tube cartons in your tube caddy represent the most trusted name in electronics. Remember, customer confidence is the cornerstone of your business.

To protect your service reputation before, during and after every service call, make sure your next tube order specifies... RCA TUBES.

SIGN OF A SERVICE JOB WELL DONE

RCA ELECTRON TUBE DIVISION, HARRISON, N. J.

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