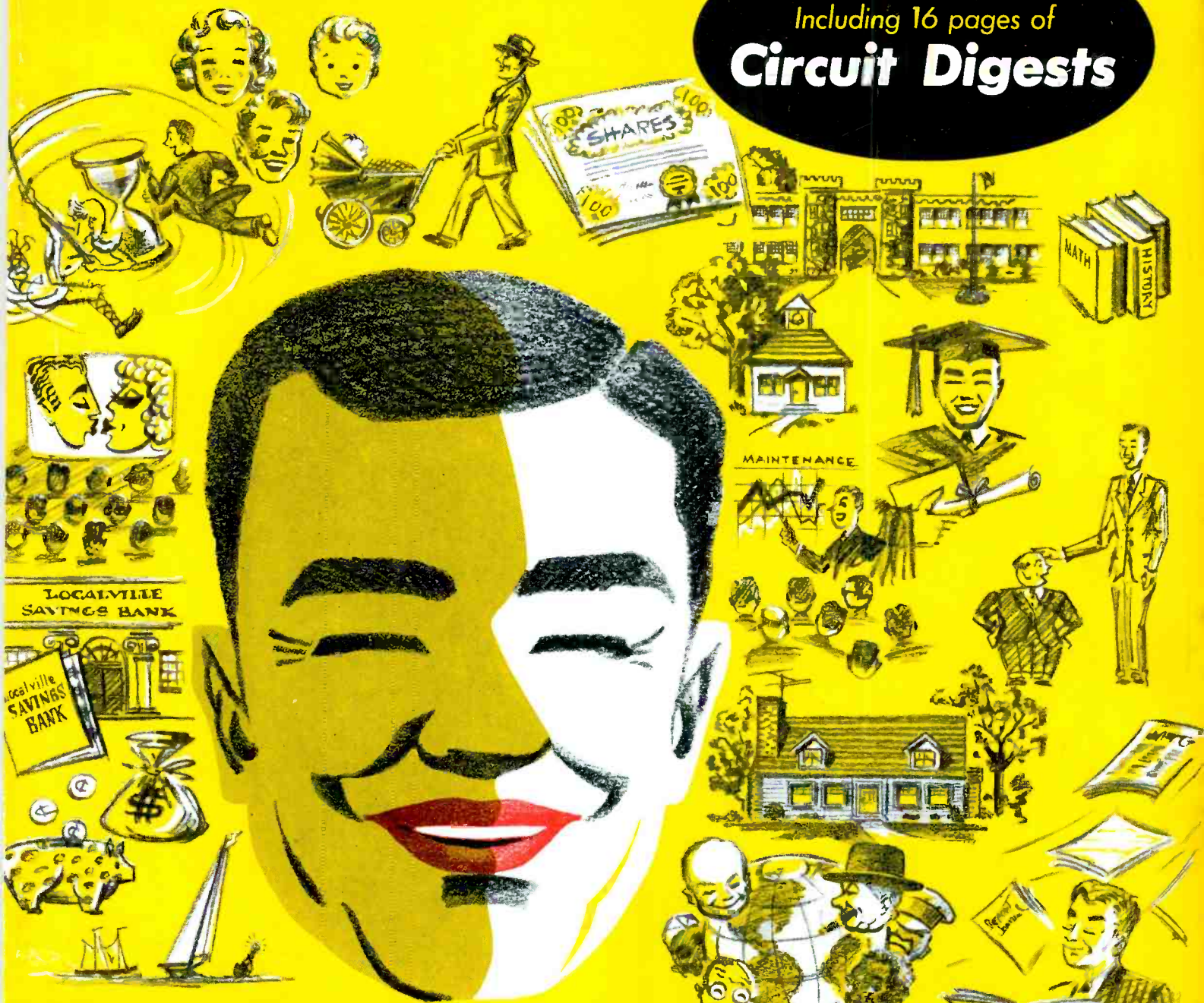


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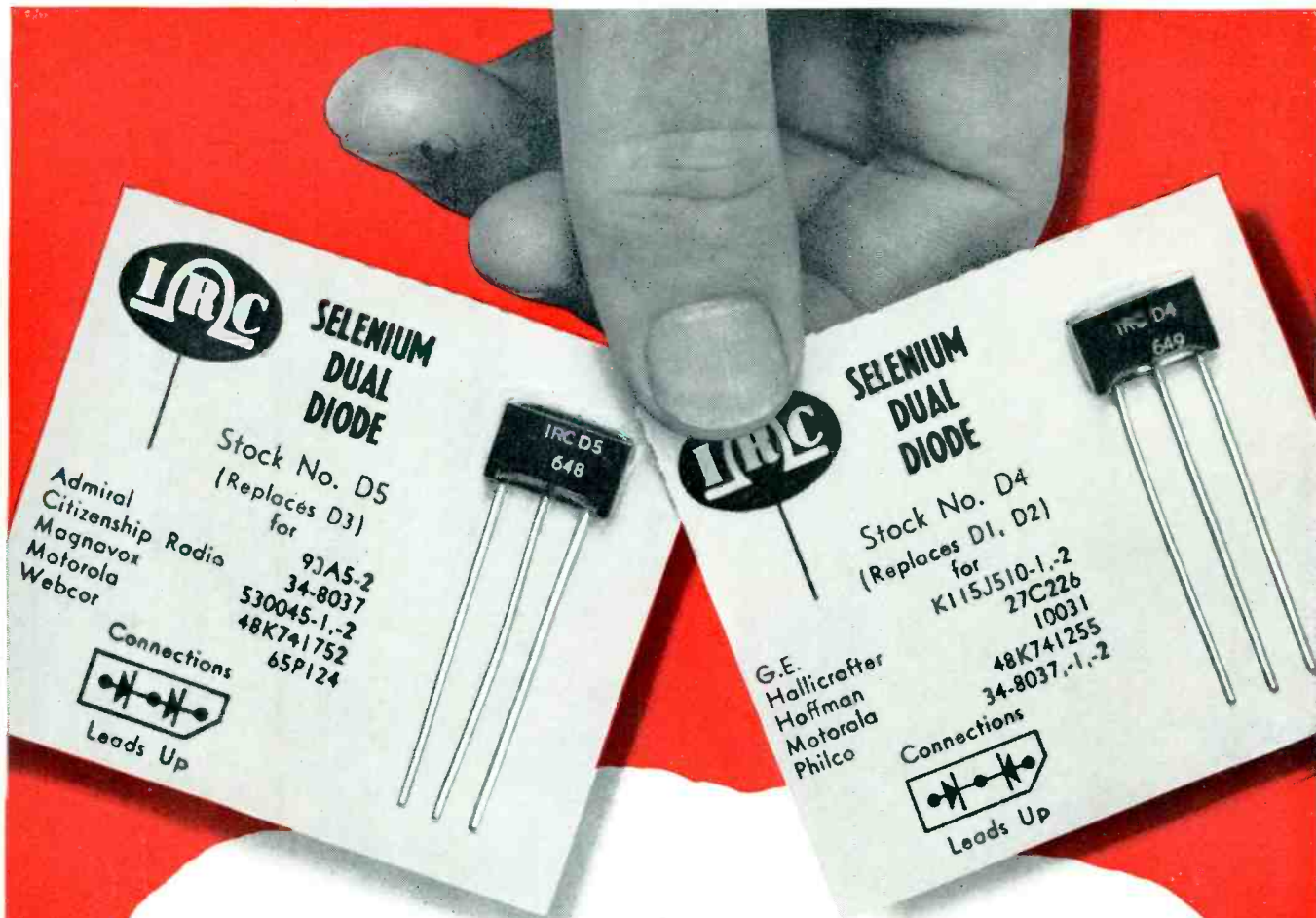


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November • 1957



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November, 1957

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CIRCUIT DIGESTS 81

ALIGNMENT

- Turn tuner channel on
- Connect sweep generator
- Connect a detector and
- Adjust mixing plate col
- Remove detector and
- Connect oscilloscope
- Adjust remaining tabs

PARTS LIST

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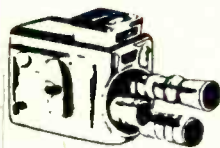
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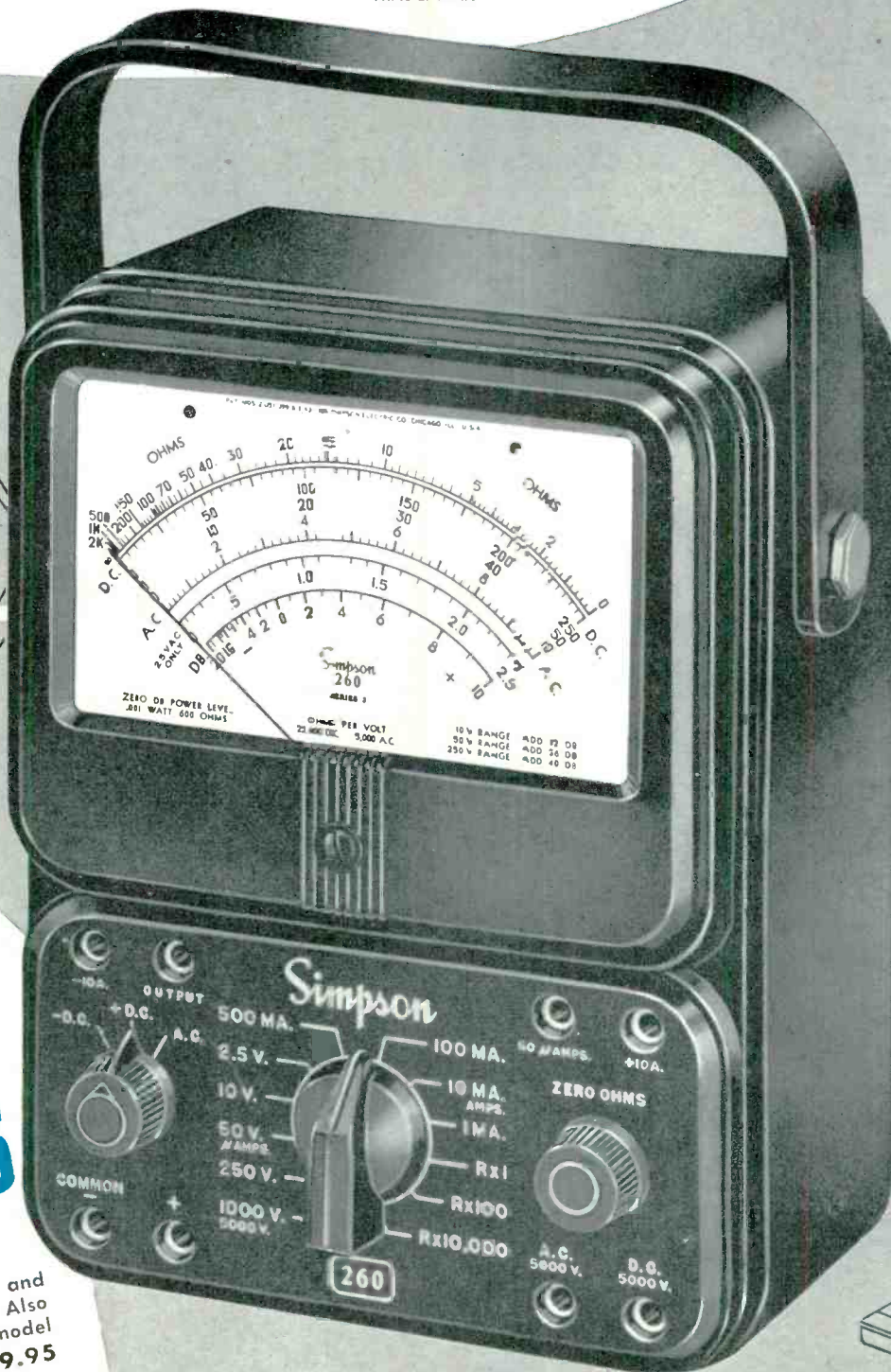
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NEW improved model Simpson 260!

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PRINTED
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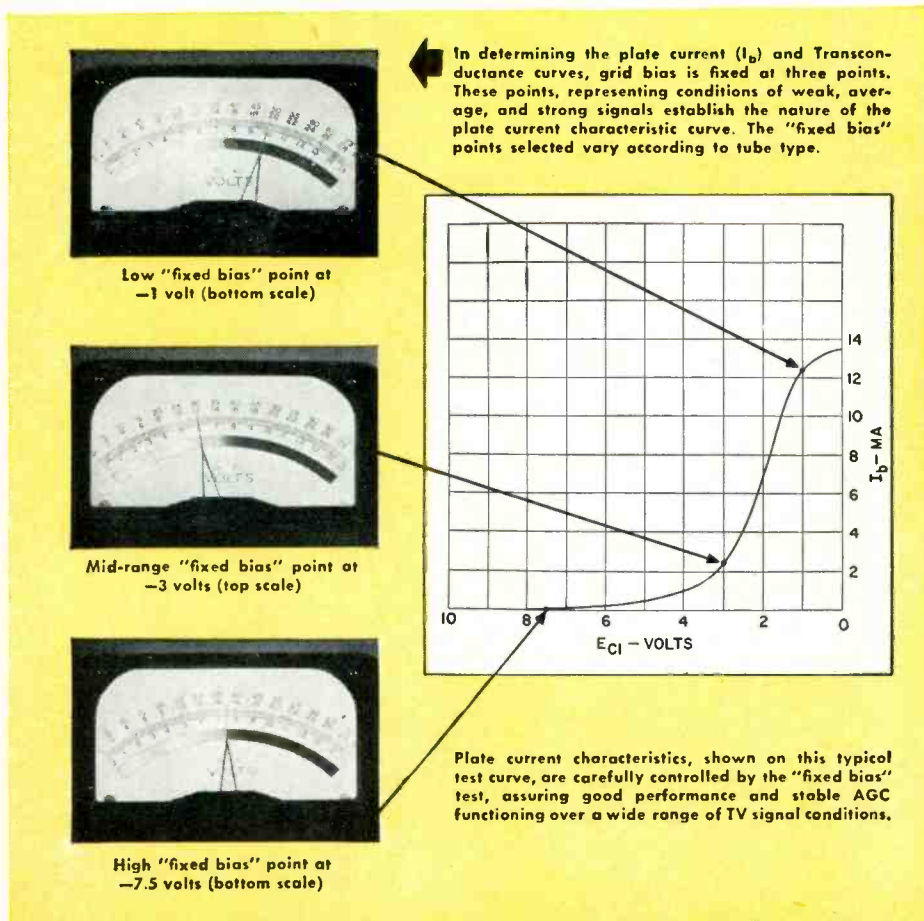
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Adjust-A-Vue Handle—
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makeshift props.

Sylvania IF Amplifier Tubes



“fixed-bias” tested



Dynamic TV set conditions are set up in these test bridges making the “fixed bias” test a true measure of how the tube will perform in TV sets encountered by you in the field.



for stable performance and service dependability

It HAS always been Sylvania's policy to search for new and better ways to test tubes under dynamic conditions for closer control over performance. The "fixed bias" test is typical of these techniques. It places a more stringent, realistic measure on the tube's ability to perform under varying circuit conditions.

By controlling the plate current characteristics and transconductance of IF amplifier tubes, the "fixed bias" test gives the serviceman an extra measure of dependability regardless of make, model, or age of the TV set serviced.

The range of stable operation is controlled, too, for smooth AGC action over wide variations in signal strength.

These are the same reasons that Sylvania IF types are the choice of leading TV set manufacturers, attested by the wide assortment of Sylvania original types listed among IF tubes now in popular use.

In addition to the "fixed bias" test many other electrical tests are performed on Sylvania IF amplifier types including stability during life. During life tests, close controls are placed on interelectrode leakage.

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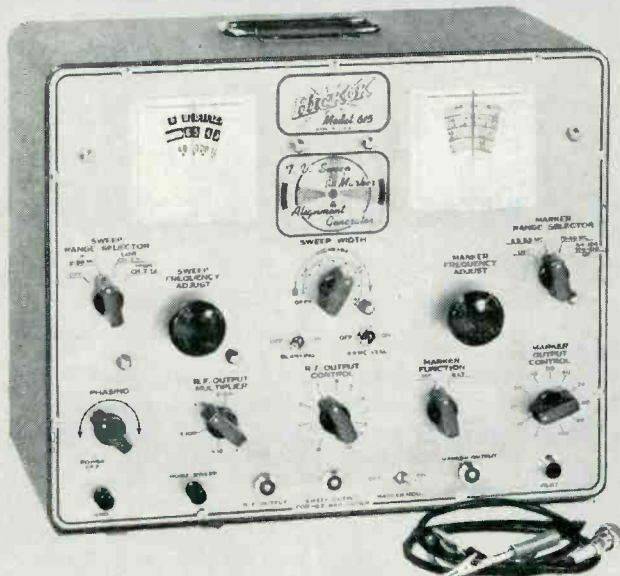
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LETTERS

To the Editor

Shock Hazards

Editor, ELECTRONIC TECHNICIAN:

An oversight must have occurred in your timely September editorial on shock hazards. Your suggestion of a polarized line plug would work only on those sets with the switch in the hot side of the ac line. It may have escaped your attention that many popular sets have the switch between the Chassis and ac line. Hallicrafters 14TS780 series, Truetone 2D2720D etc., Motorola YP14-P3 Series, Admiral TS171 series are a few picked at random.

On these sets, the chassis would be grounded only while the set is in operation. When turned off however, it would be at a full 110v ac, in series through the filament string. The low resistance of a cold heater string is of course insignificant as far as reducing the danger is concerned. A chassis-to-cabinet short would be extremely hazardous in spite of the polarized plug.

After installing a polarized plug, the technician should make sure that the ac switch is in the hot line and that the chassis remains connected to the grounded ac side even with the switch in the off position.

As some of these portables receive more abuse than a stationary set, and since they are more compact, considerable attention should be given during servicing to insure that none of the often flimsy insulation, like fishpaper, fiber washers etc., are damaged, and that there are no loose wire clippings or solder drops left in the chassis.

Louvers should be better screened by the manufacturers. Last April we serviced a 9" portable with the cabinet shorted to the ac line by no less than 16 toy coins and an assortment of bobby pins, obviously a child's doings.

PAUL BOLLER

Crist-Kissell Co.
Springfield, Ohio

• Our thanks to Reader Boller and other readers who pointed out the dangers of sets with the power switch on the chassis side of the line. However, using the isolation transformer and grounding the metal cabinet as we described will offer protection irrespective of where the switch is located.—Ed.

Up from the Ranks

Editor, ELECTRONIC TECHNICIAN:

In my opinion, ELECTRONIC TECHNICIAN has risen in the past year from a good magazine to the ranks of the finest. Your timely articles have helped me lick several dogs, and also served to whet my appetite for industrial electronics. I'm a happy subscriber.

ALLEN JOBIN

New York, N.Y.

(Continued on page 10)

Mr. Service Dealer...

PHILCO

 brings you extra picture tube business and extra dollars this Fall with a hard-selling, nation-wide advertising campaign. See your PHILCO DISTRIBUTOR. Cash in on this sales-making opportunity.

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ALUMINIZED PICTURE TUBES

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Doubly protected by written bond and warranty
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To back you up this Fall Selling Season Philco is running a tremendous advertising campaign in the magazine read by over 5,000,000 tele-viewing enthusiasts... TV Guide. In addition, in local newspapers the story of Philco superiority is being told to millions of additional prospects all over America.

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Please send me further information on Philco's Star Bright 20/20 Aluminized Picture Tubes.

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Report from Du Pont for Electronic Service Dealers

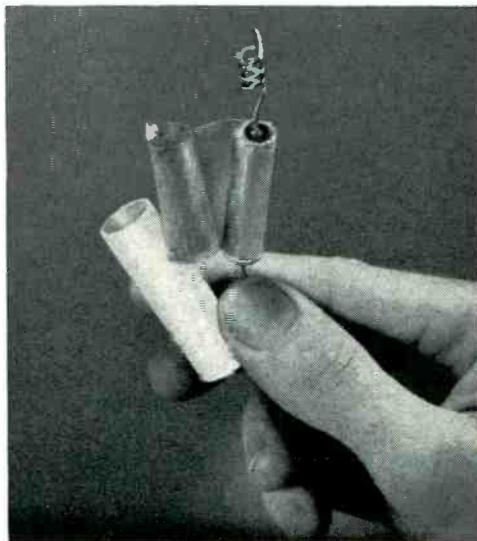
MYLAR

—THE MOST TALKED ABOUT NEW DIELECTRIC FOR CAPACITORS!

HIGH DIELECTRIC STRENGTH—this is an actual photograph of a sheet of "Mylar" polyester film exposed to high voltage.

Here are 5 important reasons you should use capacitors made with Du Pont "Mylar"

- 1. MYLAR* has high dielectric strength** . . . average of 4,000 volts per mil . . . average power factor of 0.003 at 60 cycles . . . dielectric constant above 3.0 at 72°F., 1,000 cycles.
- 2. MYLAR is tough and durable** . . . permits capacitor manufacturers to save space because the film is extra-strong even in the thinnest gauges.
- 3. MYLAR has long life** . . . will not deteriorate with age or voltage stresses within normal operating ranges of most electronic equipment.
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- 5. MYLAR has proved its value** . . . capacitors made with "Mylar" as the dielectric are being used in guided missiles and sensitive electronic computers.



Yes, where high reliability and long life are concerned, capacitors made with "Mylar" assure the finest in performance. Think of it! No more wasted call-backs for failure of newly installed capacitors . . . capacitors with "Mylar" assure longer shelf life, no storage problems.

So next time you order, ask your distributor for highly reliable, long-life capacitors made with Du Pont "Mylar". For detailed information on the basic properties of "Mylar", write Film Department, Room ET-10, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware.

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BETTER THINGS FOR BETTER LIVING
... THROUGH CHEMISTRY

DU PONT

MYLAR®

POLYESTER FILM

(Continued from page 8)

Pain in the Neck

Editor, ELECTRONIC TECHNICIAN:

Your issues are a pain in the neck. One can go blind trying to read those circuit diagrams on blue paper. I've told your representatives that twice before!

JAMES BUTTON

Albion, N.Y.

Sound Advice

Editor, ELECTRONIC TECHNICIAN:

I have a problem on sound distribution, and need expert advice. I am asking your counsel because of all the magazines we subscribe to, yours is the most read and down to earth. In this community of 6600 population, we have been approached to install a master sound center to supply recorded music, free of advertising, to various offices and stores. What pitfalls might I encounter after getting the OK from the city and others to run cables to the various outlets? Would FCC permission be required?

AVERY LEUTY

Leutys Radio-TV Service Co.
Salem, Ill.

• *FCC approval is not needed, but your state Public Service Commission may have pertinent regulations. For details, see "Muzak: A Money-Making Opportunity in Audio," in ET's Nov. 1956 issue.—Ed.*

Sync Source

Editor, ELECTRONIC TECHNICIAN:

I would like to comment on one of your Letters to the Editor in the August 1957 issue. You answered Mr. Bruce L. Meador of Waco, Texas, by stating that all sync signals originated at the local TV station, whether it is a local program or a network program.

I am certain that if you will check with a broadcast station engineer that they will ordinarily use the sync signals that accompany network broadcasts, rather than attempt to regenerate these sync signals locally.

It is possible to remove the sync signals from the network program and reinsert local signals if the quality of the network sync signal is doubtful, but this is seldom done.

The condition that Mr. Meador mentioned in his letter is not unusual and will predominate in some sets more so than others. The variations in horizontal sync stability of the type mentioned in Mr. Meador's letter is due primarily to the constant selected for the horizontal AFC filter component network and therefore some makes of sets would be more sensitive to misinformation in sync pulses than other makes will be.

W. E. WHITACRE
Service Manager

Allen B. DuMont Labs.
E. Paterson, N.J.

• *The use of direct network sync is usual, as Reader Whitacre says. However, a good number of stations use the network sync solely for driving their own generator, which produces the signals transmitted.—Ed.*

GOOD-ALL CAPACITORS



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600-UE Mylar* Dielectric • Molded in Epoxy**

NEW to the replacement market! Widely used by leading equipment manufacturers.

The 600-UE is created by the skillful combination of new "wonder materials," and Good-All's advanced design, exclusive production technique and tight quality control. It is ideal for replacement use in today's modern circuitry.

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Webcor recognizes the importance of providing a national network of service agencies to facilitate prompt handling of the parts and service requirements of Webcor fonografs, tape recorders, and diskchangers for service dealers.

For the last several years, Webcor has been establishing a nation-wide network of authorized service agencies. We are proud now to list these agencies on the following page for your convenience. These agencies have been appointed to furnish service dealers with technical know-how, service literature, and service parts.

So, please contact the Webcor franchised service agency nearest you whenever you need their assistance.

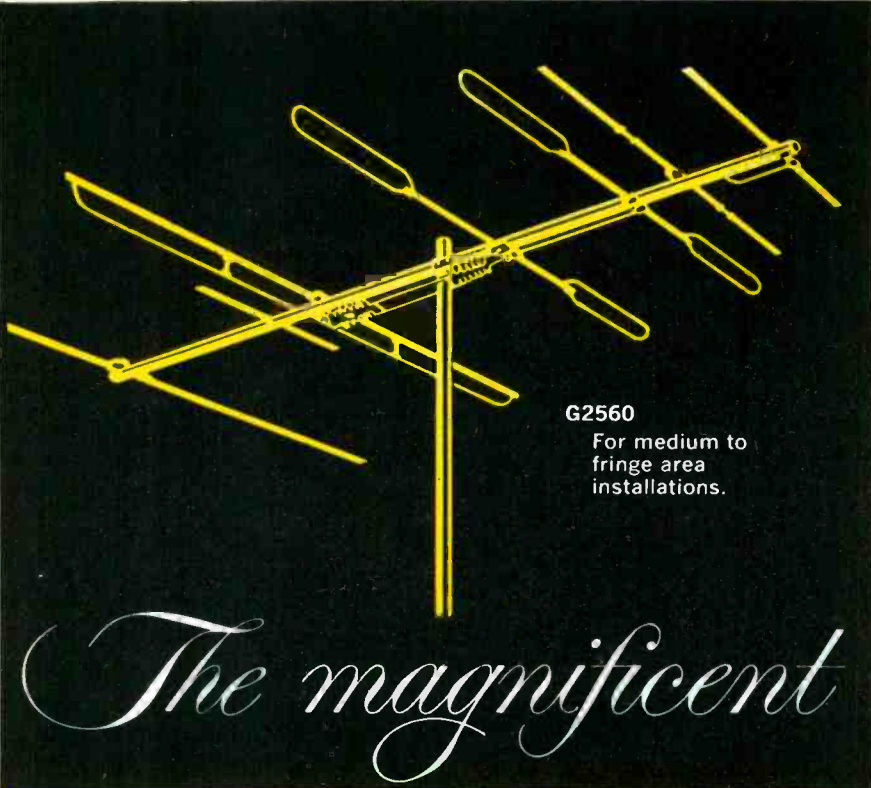
This new policy of locating a source of supply for Webcor parts in or near your home city is designed to speed up delivery, simplify your inventorying, and assure better service to your customers on a more profitable basis for you.

We are sure that as a result of this new program, you will be more than satisfied with the promptness and ease with which your needs can be fulfilled.

WEBCOR, INC.,
Service Department
912 West North Ave., Chicago 22, Ill.

WEBCOR AUTHORIZED SERVICE AGENCIES

ALABAMA BIRMINGHAM Allied TV Service Triple "A" Service, Inc. 9158 4th Avenue S MONTGOMERY Hanna Radio Goldthwaite St. ARIZONA PHOENIX Black & Ryan Distributors 630 West Washington Street ARKANSAS FORT SMITH Wide Radio & TV Supply, Inc. 1001 Towson Avenue Mose's Melody Shop 311 Main St. NORTH LITTLE ROCK Stanley Sound Service 915 West 23rd St. TEXARKANA Lavender Radio & TV Supply 520 E. 4th St.	FLORIDA (Cont.) ST. PETERSBURG Dealers Service & Supply Company 1035 Lafayette Street TALLAHASSEE Thurow Distributors, 213 E. Tennessee TAMPA Southern Photo & News, 608 Lafayette WEST PALM BEACH Pete's TV, 2015 South Dixie GEORGIA ALBANY Duncan and Morrison, 900 Oglethorpe ATLANTA Hopkins Equipment Co. 418 West Peachtree Street AUGUSTA Oxner's Radio & TV Service 1857 Central Avenue COLLEGE PARK The Radio Doctor, 114 No. Main St. COLUMBUS Dersy's Radio Service, 314-13th Street MACON Adams-Feigan Hardware Co. 42 Walnut Street SAVANNAH Kontor Radio & T.V. Service, 2114 Water HAWAII HONOLULU Honolulu Electrical Products, Co., Ltd. 930 Clayton Street IDAHO POCATELLO Tele-Tek, 353 E. Center Street ILLINOIS CHICAGO Lincoln Radio & T.V. Corp. 1201 W. Washington Blvd. WEBCOR Service Hqtrs. 912 W. North Avenue DANVILLE Belcher TV Service Co. 2809 North Vermillion St. GALESBURG Foster's Service, 47 South Cherry Street KANKAKEE Bob's Radio & T.V., 286 So. East Ave. MOLINE 23rd Avenue T.V., 3100-23rd Ave. PEORIA United Radio Service 101-103 Seventh Avenue QUINCY Waverite Radio Service Co. 334 North 12th Street ROCKFORD Mosley TV Service, 3011 Auburn SPRINGFIELD Beatty Bros. Electronics 115 W. Allen St. INDIANA EVANSVILLE George C. Mettle Company 17 S.E. First Street FORT WAYNE Moore's T.V. Service, 231 So. Harrison HAMMOND Electronic Television Service 2245 - 169th Street INDIANAPOLIS Jan Eden Recording & Sound Inc. 621 Ft. Wayne Avenue Radio Distributing Company 1013 North Capitol Avenue SOUTH BEND Radio Clinic, 729 So. Michigan IOWA CEDAR RAPIDS Ace Electronics, 1024 First St., S.W. DAVENPORT Supreme TV Service, 1618 W. 3rd St. DES MOINES TraViss Television and Radio 1606 Locust SIOUX CITY Bob's Radio & TV Sv., 703 W. 8th St. KANSAS DODGE CITY Interstate Electronic Supply Corp. 402 Military HAYES Interstate Electronic Supply Corp. 122 West Ninth HUTCHINSON Interstate Electronic Supply Corp. 325 West 4th KANSAS CITY Thomson Radio and Electronic Service 2810 West 53rd Street WICHITA Booker's Television, 5403 E. Kellogg KENTUCKY LEXINGTON Webb Radio Service, 712 No. Limestone LOUISVILLE Magnetic Tape Recorder Co. 637 1/2 South Preston Street LOUISIANA NEW ORLEANS Southern Radio Supply, 1900 Tulane SHREVEPORT Shipp Radio Service, 415 Lake Street MAINE PORTLAND H. D. Burrage & Company, 92 Exchange MARYLAND BALTIMORE Jos. M. Zamoiski, 110 S. Paca St. CUMBERLAND Humbertson's Strand TV Service 29 South Centre Street FREDERICK Hankey's Radio Service, 404 Elm HAGERSTOWN Stouffer Radio Service, 201 So. Potomac	MASSACHUSETTS BOSTON DeMambo Radio Supply Co. 1095 Commonwealth Avenue SPRINGFIELD Springfield Audio & Electronics, Inc. 664 Worthington Street WORCESTER DeMambo Radio Supply Co. 220 Summer Street MICHIGAN DETROIT Allied Music Sales Company 7600 Intervale FLINT Flint Radio & Television, 106 First Ave. GRAND RAPIDS Reid Television Service 444 Michigan N.E. KALAMAZOO Kuiper & Warfield Electronic Service Co. 2242 Portage Street LANSING Wolverine Service Company 4000 South Cedar Street MUSKEGON Reid Television Service, 1638 Terrace PONTIAC Blake Radio-Television, 3149 W. Huron MINNESOTA DULUTH Hawley-Collins Co., 2814 W. Third Ct. Low Bonn Company, 228 E. Superior MINNEAPOLIS Low Bonn Company, 1211 LaSalle Dealer's TV Service, 137 W. 7th St. MISSISSIPPI JACKSON May & Jackson, 125 South Lamar MISSOURI ST. LOUIS Fridley Brothers, Inc., 6510 Page Blvd. SPRINGFIELD Jack's Radio & TV Service, 618 Kimbrough NEBRASKA LINCOLN Harlan-Weist Sv. 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Sonnenberg TV Experts 178 East 33rd Street TRENTON Trenton Television Parts & Service Co., Inc., 1849 Brunswick Avenue NEW MEXICO ALBUQUERQUE Art's Shop, 112 - 14th Street NEW YORK ALBANY Lake Electronic Co., 1650 Central Ave. BINGHAMTON Ross' Radio Service, 34 Chenango BRONX Universal Sound & Phono Serv. 1916 Cross Bronx Expressway BROOKLYN Audio Visual Equipment Co. 2516 Avenue "U" BUFFALO Ernie Audio Serv Co., 151 Genesee St. Johnson Radio & Television 1530 Main Street at Ferry St. Radio Equipment Corporation 147 Genesee Street ELMIRA Chemung Service Company 403 E. Third St. FOREST HILLS Circuit Laboratories 110-68 Queens Blvd. MIDDLETOWN S & L Electronics, 17-21 Cottage St. NEW YORK Sigma Electric Co., 11 E. 16th Street NIAGARA FALLS Val's Radio & T.V. 2728 Woodlawn Ave. ROCHESTER Rochester Radio Supply Co. 600 E. Main St. SYRACUSE United Radio, 711 So. State Street UTICA Jewell's Radio Service, 1137 Linwood WEST HEMPSTEAD Audiotron, Inc., 493 Hempstead Ave.	NORTH CAROLINA (Cont.) CHARLOTTE Radio T.V. & Appliance Co. 1300 East 4th Street DURHAM United Radio Service, 121 Orange St. FAYETTEVILLE Jones Radio & T.V. Service, 116 Old St. GOLDSBORO Hughes Radio Laboratory 1009 North William Street RALEIGH Nelson's, Inc., 517 Hillsboro Road WILMINGTON R & E Radio T.V. Service 1415 S. 5th Avenue WINSTON-SALEM Andrew's Appliance Service 803 North Liberty Street NORTH DAKOTA BISMARCK Bristol Distributing Company Palmer TV & Radio, 423 Third Street FARGO Bristol Distributing Company 1345 Main Avenue GRAND FORKS Bristol Distributing Company MINOT Radio Clinic, 201 First Avenue, S.E. OHIO AKRON Midtown Radio & Television Service, Inc. 11 North Summit Street CANTON Television Maintenance Co. 3017 Cleveland Avenue, N.W. CINCINNATI T.V. Service, 25 E. Court St. CLEVELAND Associated TV & Radio Service 3101 Berea Road COLUMBUS Ace Radio & T.V. Service 214 East Gay Street Thompson & Hamilton, Inc. 211 North 4th Street DAYTON Guarantee Radio and TV 12 South Williams Street TOLEDO Allied Music Sales Company 2940 Monroe Street YOUNGSTOWN Appliance Wholesalers, 1197 Wick Ave. OKLAHOMA OKLAHOMA CITY W. S. Cox Radio and Sound 111 N.W. Ninth Street TULSA Audio Electronics, Inc., 216 E. 10th St. OREGON MEDFORD Medford, 19 Fir Street PORTLAND Bressie Electric, 909 S.W. 5th Avenue PENNSYLVANIA ALTIQUIPPA Lou's Fonograf Sv. Co. 345 Franklin St. ALLENTOWN Ray Electronics Co., 141 North 6th St. ALTOONA General Electronics, 508 Crescent Road CHESTER La Gamba Bros., 406 E. 9th St. EASTON Howard's TV Service, 809 Wilbur St. ERIE Warren Radio Company, 1313 Peach HARRISBURG K & D. Service Company 126 South Second Street LANCASTER K & D Service Company 332 North Queen Street LEBANON George D. Barbey Company 821 Quentin Road NEW CASTLE McGrath Radio & TV, 207 Mills Way PHILADELPHIA Audio Service Co., 131 North 10th St. Lee Service, Inc. N.E. Corner 40th & Walnut Street Merit TV Sv., 6640 Ogontz Ave. Radio Electric Service, 112 N. 7th Street Seattle TV & Radio, 4672 Griscom St. PITTSBURGH Dealer's Radio Service, 508 Chestnut E. & M. TV Service, 3625 Butler READING George D. Barbey Co., 157 Penn St. SCRANTON Greene Radio Service, 405 Gibson STRAFFORD Boyd Radio Service 710 Lancaster Pike WILKES-BARRE Rad-Art Radio Service, 13 Carey Ave. WILLOW GROVE Louis J. Smith Service Center 359 North York Rd. YORK Robert N. Tate, 802 So. Duke St. SOUTH CAROLINA CHARLESTON Holst Radio Service Co. 428 Meeting Street COLUMBIA Colonial Radio & TV Shop 3207 Colonial Drive FLORENCE Tommy Ayers Radio Service 116 South Coit Street GREENVILLE Carolina Camera Repair 500 Rutherford St. SOUTH DAKOTA WATERTOWN Jensin's Radio & TV Service 11 South Broadway	TENNESSEE CHATTANOOGA Northside Radio & Appliance Service 313 North Market Street KNOXVILLE Chenille Radio & Electric Co. 2211 Dutch Valley Rd. MEMPHIS Denton Radio & T.V. Service 3515 Southern Avenue NASHVILLE Eddie's Radio & TV Co. 265 Hermitage Ave. TEXAS ABILENE Howard Television Service, 1511 Pine AMARILLO R & R Electronics Company 707 South Adams AUSTIN Friendly Radio & Television 119 Congress BROWNSVILLE Blackburn's, 747 East Elizabeth Street CORPUS CHRISTI Harken Company, 3001 Leopard Street DALLAS Bradley Radio-TV Service 912-914 North Peak Street EL PASO The Telextronics Company 108 West Paisano Drive FORT WORTH The Cearley Company 517 Pennsylvania HOUSTON H & H Television, Inc., 3307 Chenavert Miller Audio Co., 4811 Gulf Freeway LUBBOCK Radio Lab, 1501 Avenue Q NAVASTA A-Z Television Service 1209 South La Salle Street PORT ARTHUR Carl's TV Co., 1816 Seventh St. SAN ANTONIO Spangler Radio & TV 322 Marquette Dr. VICTORIA Sam Niel TV Service, 204 So. Moody WACO Radio Center Television, 1813 Speight WICHITA FALLS Perry & Bob, 1104 Grace UTAH SALT LAKE CITY Electronic Service & Supply 115 E. Broadway VERMONT RUTLAND Vermont Television Service Co. 28 Allen Street VIRGINIA HARRISONBURG Chew Brothers, 242 East Water Street NORFOLK Bradshaw's T.V.-Radio Service 810 W. 25th Street RICHMOND Lakeside Radio Service 5101 Lakeside Avenue ROANOKE Wagner Electric Company 2902 Williamson Road, N.W. STAUNTON Southern Electric Corp. 818 Greenville Avenue WASHINGTON CLARKNTON Orin's Radio Service, 724 Sixth St. SEATTLE Seattle Radio Supply, Inc. 2117 Second Avenue SPOKANE Mu-Sonic Services 208 Symons Building TACOMA Ajax Electric Company 747 Faucett Avenue WASHINGTON, D. C. Emerson Radio of Washington 1522 - 14th Street, N.W. National Radio & T.V. Co. 6902 Fourth Street, N.W. WEST VIRGINIA BECKLEY Haddad's TV & Furniture Co., 112 Main CHARLESTON Pierce and Sodaro 325 West Washington Street HUNTINGTON Cunningham Television Co. 3437 Piedmont Road PARKERSBURG General Electronics Distributors 512 Seventh Street WHEELING General Electronics Dist., 735 Main WISCONSIN APPLETON Tri-City T.V. Service, Inc. 605 North Superior Street EAU CLAIRE Luar'ken's Inc., 315 North Barstow Ave. GREEN BAY Video Electronics, 1514 No. Irwin Ave. KENOSHA Clear Vue T.V. Specialists 6821 - 14th Avenue LACROSSE Nusmen TV & Appliance Service 1804 Jackson Street MADISON Chic Young TV Engineering Service 2503 University Avenue MILWAUKEE Mr. TV, 5407 West Center Street OSHKOSH Ra-Tel Service, Inc., 394 Ceaape Street SHEBOYGAN Van's Radio & T.V., Inc. 1511 South 12th Street WAUSAU Day's Hardware & TV Service 1910 - 6th Street
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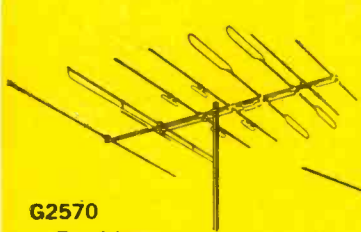


G2560
For medium to fringe area installations.

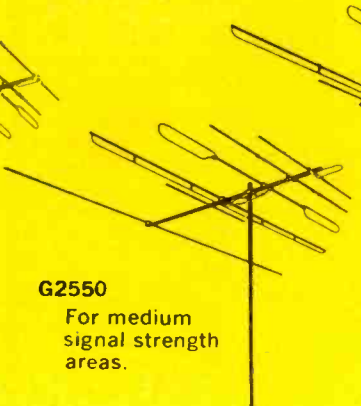
The magnificent

TAACD GOLDEN *Topliner* TM

without equal for performance, quality and value



G2570
For fringe to extreme fringe areas.



G2550
For medium signal strength areas.



G2540
For strong to medium signal strength areas.

Write for complete technical details...

TAACD *Topliners* ^{Trade-mark}

TECHNICAL APPLIANCE CORPORATION, SHERBURNE, N. Y.

In Canada: Hackbusch Electronics, Ltd., Toronto 4, Ont.

Editor's Memo



How big should a servicing business be? The answer is—big enough. Yes, big enough to be efficient for your particular set-up.

We can all gain some insight into the problem of size by observing how basic laws of nature operate to keep different creatures at their optimum sizes. Animals of freak size, or animals which do not adapt to their environment, can become as extinct as the dodo bird. Survival of the fittest applies to both business and nature.

Let's think in terms of expansion. An elephant is a large efficient animal; his basic structure enables him to be large. But suppose we wanted to create a man ten times as large as a typically tall man. Well, he would have to be ten times as tall, say 60 ft., but he would also have to be 10 times as wide and 10 times as deep.

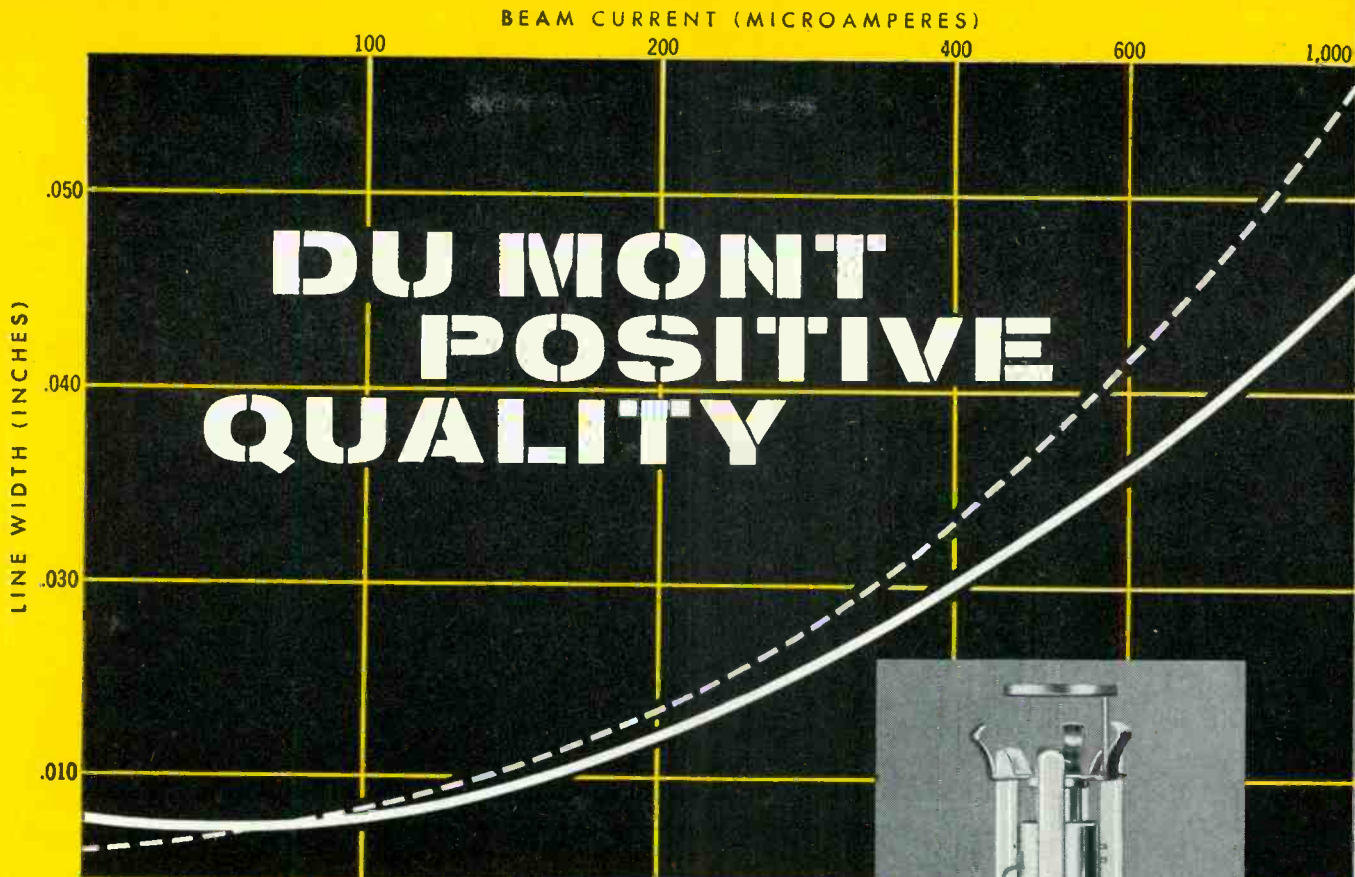
Now consider some of this giant's problems. His volume, and consequently his weight, has increased 1000 times (10 x 10 x 10), but the cross-section area of his bones has increased only 100 times (10 deep by 10 wide). So in effect each square inch of bone would carry 10 times as much weight as a normal man . . . which is just about the breaking strength of a leg bone. In other words, unless the giant's bones took on different proportionate dimensions or were made of different material, they couldn't support the giant.

A similar problem would arise with heat dissipation. Skin areas would increase by a factor of 100, but 1000 times as much heat would have to be given off. So each square inch of skin would have to give off 10 times as much heat as before. The opposite effect results with very small creatures; they lose a great deal of heat for their size.

As an analogy, carry this natural law of size to business. Should you try to become a giant of sorts? Well, it depends on your structure. Do you have enough money to finance additional facilities? Enough know-how to provide needed services? Good enough location to reach a substantial market?

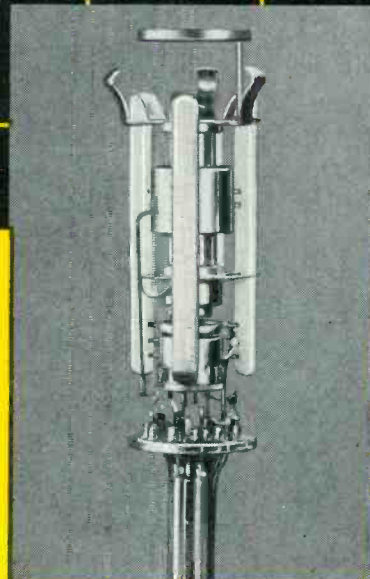
One thing is certain. With many new electronic devices in action—color TV, industrial electronics, transistor radio, mobile communications, high fidelity—it's most important that electronic technicians learn new skills and obtain required servicing equipment. You must, so to speak, adapt to your environment. After all, remember what happened to the dodo bird.

Al Forman



38%

SHARPER PICTURES



Du Mont "Stubby" electron guns showed the industry the way to short neck tubes, and are recognized as the industry's best. The gun is the heart of the picture tube — the determining factor in picture sharpness.

Another positive fact about Du Mont Positive Quality . . .
 You get not only sharper pictures with a Du Mont picture tube — "blossoming" in picture highlights is minimized — line width is retained, resulting in sharper, clearer pictures that make and keep customers happy. Always use Du Mont Positive Quality picture tubes and receiving tubes . . .

*Send for your free copy of the
 Du Mont Picture Tube Data Chart.



DU MONT[®]

TELEVISION TUBE DIVISION, ALLEN B. DU MONT LABORATORIES, INC., 750 BLOOMFIELD AVE., CLIFTON, N. J.

MATCHED TV FROM GENERAL

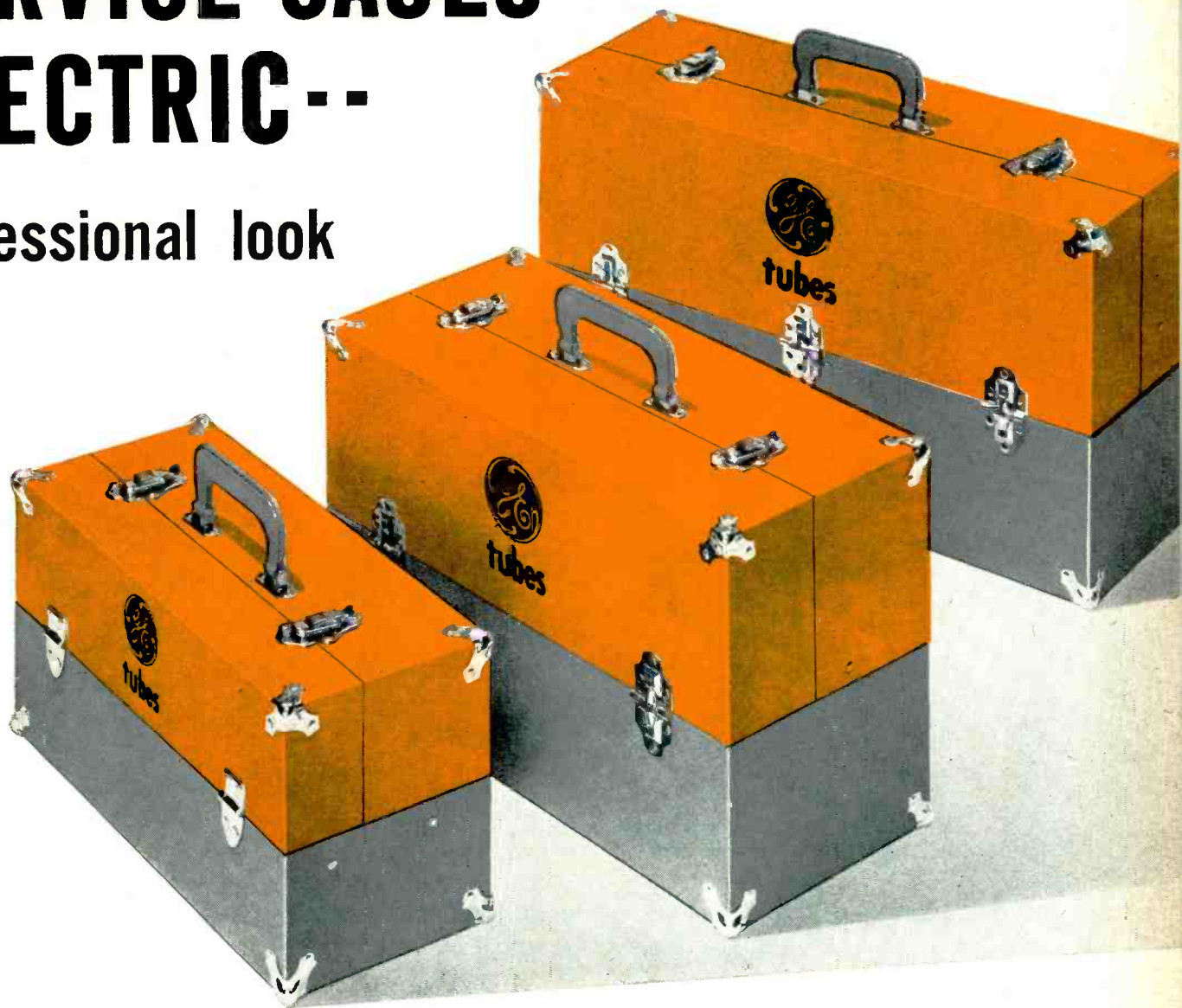
for that smart, efficient,

- Exclusive with General Electric tube dealers!
- Your prestige with customers will rise sharply.
- Same modern two-tone styling for all your equipment.
- Everything conveniently at hand for television repairs.
- Expertly organized to save your working time.
- Be first with the newest in home-service equipment!



SERVICE CASES ELECTRIC--

professional look



SERVICE TOOL CASE. 16" by 8" by 6 3/16". Weighs 5 1/2 lbs. without contents.

SPECIAL "160". Holds over 160 tubes. 17 7/8" by 8 3/8" by 11 7/16". 8 lbs. without contents.

SERVICE MASTER "240". Holds over 240 tubes. 22 1/8" by 9 9/16" by 12 3/4". 9 1/2 lbs. when empty.

These new matched service cases are a G-E "first". You can get them nowhere else. They are built just as strongly as their smart appearance indicates . . . with rugged construction, heavy-duty hardware, craftsmanship in every detail. And planned by service experts! You carry with you—compactly—everything you need for home service calls.

The cases are fully matched in design and in their attractive orange-and-gray colors. The

leatherette-type finish is scuff-resistant for plenty of hard wear. You will be proud to carry these handsome cases into the finest home. Their smart, up-to-the-minute appearance stands for the quality television service you offer.

Waiting for you . . . now . . . is your set of matched service cases. Your General Electric tube distributor will tell you how to obtain them. Phone him! *Distributor Sales, Electronic Components Division, General Electric Co., Owensboro, Ky.*

Progress Is Our Most Important Product

GENERAL  **ELECTRIC**

161-1A22

new profits available
in hi-fi servicing
and



is Hi-Fi Service Headquarters

Hi-Fi servicing is a booming new profit source for you, and WALSCO—always your completely dependable supplier for radio-tv service products—is ready with all the things you need to tap this growing field.

MOLDED-ON CABLES AND CONNECTORS



Look for this WALSCO display at your distributor. A complete assortment for your every need. Dozens of tenite shielded cables with phono pin plugs, jacks, phone plugs and alligator clips in a wide variety of combinations—in lengths up to 72".



#2400 (36")
\$1.05 List



#2418 (10")
\$3.25 List

PHONO-RECORDER BELTS AND DRIVES



Webcor Drive Wheel
#1463—\$2.50 List

A complete replacement source for Ampro, Collaro, Crescent, Garrard, Pentron, Revere, RCA, VM, Webcor and every other standard changer and recorder.



RCA Idler Wheel
#1432—\$1.00 List

HI-FI CHEMICALS



"No-Slip" for cords
and pulley belts
#260-01—60c List

A full line of special chemicals for Hi-Fi servicing—to make your job easier and faster.



RH Recording
Head Cleaner
#93-01—95c List

free!

The latest
WALSCO cata-
log . . . from
your distribu-
tor, or write for
it today.

WALSCO ELECTRONICS MFG. CO.

A division of Textron, Inc.
106 west green street
rockford, illinois

ALLIANCE MFG. CO. announces the promotion of **GEORGE GEMBERLING**, formerly General District Manager, to Sales Manager for the Consumer Products Division. Also **RAY BUHRMAN**, Advertising Manager, to Assistant Sales Manager for the Consumer Products Division. Mr. Buhrman will retain his duties as Advertising Manager.

JFD ELECTRONICS CORP. reports the Sell-A-Bration Sweepstakes sales incentive program for its dealers and distributors. Beginning in Sept. and ending March 31st, service-dealers will receive certificates covering brand name merchandise embracing over 1000 gifts, as well as pleasure trips. Distributor personnel, selling Colortennas, will also receive a corresponding number of certificates entitling them to merchandise and trip prizes. Winners will be announced May 19th at the Electronics Part Show, Chicago.

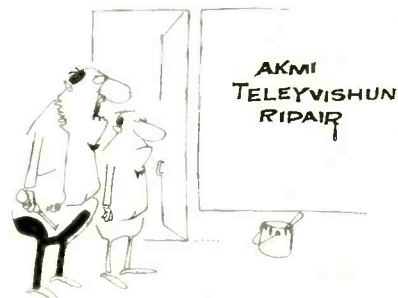
GRAMER-HALLDORSON TRANSFORMER CORP. announces the appointment of **LARRY STINEMAN** as Chief Engineer.

GENERAL ELECTRIC CO. reports the appointment of **RICHARD D. KENNEDY** to the newly-established post of advertising and sales promotion manager of the receiving tube department. Mr. Kennedy's staff will move from Schenectady to Owensboro, Ky. Also, **R. E. GIANNINI**, Van Nuys, Calif., has been appointed as western regional manager for distributor sales of electronic tubes and other components.

LANSDALE TUBE CO. announces the appointment of **R. S. MANDELKORN** as Manager of Operations.

MOTOROLA INC. in a realignment of marketing and engineering activities has appointed **W. W. BACHMAN**, formerly marketing field coordinator, as Manager of Contract Relations; **A. R. SIMPSON**, formerly acting manager and staff assistant to the engineering director, as Engineering Manager; **M. G. KORGER**, formerly manager of research and development, to Chief Engineer of the same activity. **R. F. WALDON**, formerly manager of product engineering to Chief Engineer of Production Design and Development.

(Continued on page 22)



"Go find that sign painter. I paid him in advance."



\$169.95 Net

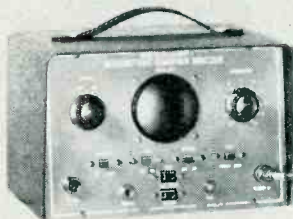
INDUCED WAVEFORM ANALYZER

MODEL 850

Top-O'-Chassis Troubleshooting . . . greatest servicing advance in years!

Perfect for Portable TV

Localizes defective stage in entire TV receiver in less than 5 minutes—without a direct circuit connection. Adapts any scope for spotting defects quickly by the modern, easy-to-use Induced Waveform Method. Unique, Phantom Defector Probe makes any tube a convenient test point. Just slip probe successively over each tube, then view and trace waveforms on scope from antenna thru RF, IF, audio, video & sync. Speeds servicing of TV, radios, amplifiers, instruments, industrial and laboratory equipment tool Compatible for color. Phone jack for audio monitoring.



\$89.95 Net

INTERMITTENT CONDITION ANALYZER

MODEL 828

Pinpoints Intermittents without waiting...cooking...or freezing.

Exclusive new principle makes any TV or radio super-sensitive to intermittents and noisy components . . . without waiting for breakdowns. Saves time and bench space. Cuts callbacks by detecting borderline components before they fail. Special Wintronix Probe and capacity pickup attachments let you hear intermittents thru built-in speaker.



\$79.95 Net

AGC CIRCUIT ANALYZER

MODEL 825

AGC Troubles Won't Fool You Any More!

Saves hours by detecting hard-to-find AGC faults that may look like sync trouble, etc. Furnishes standard, adjustable r-f signal to antenna; monitors AGC action; checks AGC buss for opens and shorts; measures action of gated pulse systems; supplies AGC bias to restore operation by substitution.

Wintronix ANALYZERS

Electronic "Wonder Drugs" for Troubleshooting Pains



Here are the instruments you need to diagnose ailments fast and profitably in today's complicated—often inaccessible—TV, radio & hi-fi sets.

These four Wintronix *Analyzers* swiftly turn wasted trouble-shooting time into profitable parts replacement time on more and more jobs. Obscure radio and TV faults get tracked down fast by Winston's specialized reference signals and measurements. Like X-rays, they quickly give a complete picture of circuit operation—at far lower cost, with fewer circuit connections, and with less set-up time than with separate conventional instruments.

Today, issue a prescription to yourself for a healthier servicing business—see and try these new Wintronix *Analyzers* at your local parts distributor or write for detailed literature.

SWEEP CIRCUIT ANALYZER

MODEL 820

Rapid, Dynamic Sweep Testing

\$69.95 Net



Completely troubleshoots entire sweep circuits and restores raster by substituting for defective stage. Tests all flybacks and yokes for continuity and shorts. Self-calibrating. Compatible for color.

Model 915/960 Adapter converts Model 820 to a Sync Circuit Analyzer for signal substitution of vertical and horizontal sync pulses.

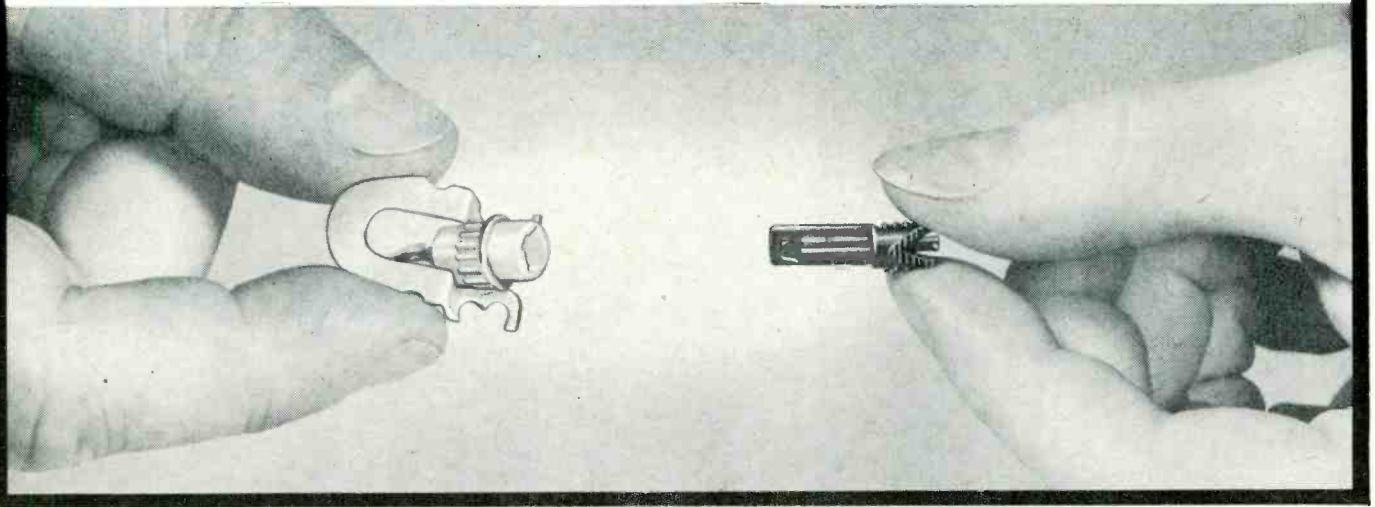
\$14.95 Net

WINSTON ELECTRONICS INC.

4312 Main Street, Philadelphia 27, Pa.

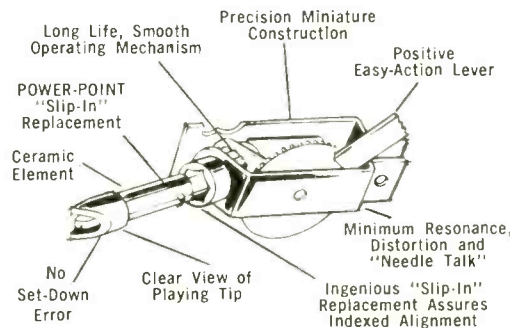
Electro-Voice® POWER-POINT

For Profit and Customer Service Without Problems!



POWER-POINT is the unique, easily installed, miniaturized unit containing BOTH a fresh ceramic cartridge and jeweled playing tips. You sell **POWER-POINTS** for LESS than the cost of a separate cartridge or two comparable phono needles alone! Most models \$3.95 list. Only $\frac{3}{4}$ " long and less than $\frac{1}{2}$ " in diameter, they're in color-coded nylon cases, blister-packed in plastic to keep them clean, factory-fresh, easy to handle.

YOU install the mount. Once that's done, the **CUSTOMER** can remove and replace units in a matter of seconds. You get the replacement business but none of the grief. You stock just three types of mounts and seven types of **POWER-POINT** units to service virtually all modern phonos. You save on inventory costs, conserve shelf space, take no risk of obsolescence.



Typical **POWER-POINT** and Turnover Mount
POWER-POINT
 Case—Nylon
 Element—Ceramic
 Tip Material—Superior Synthetic Sapphire or Natural Diamond
 Tracking Force—5 to 8 grams
 Net Weight—300 milligrams
 Terminals—Beryllium Copper, Self-cleaning Type
 Load—1 meg. 100 mmd
 Compliance— 1×10^{-6} cm/dyne
 Average Output Voltage at 1000 cps
 Test Record RCA 12-5.49V.85 Volt Col. 10004M 1.75 Volt
 PT1 Mount
 Material—Steel and Nylon
 Finish—Cadmium Plate
 Connector Size—.050"

THE MARKET IS BIG: OVER TWO MILLION NEW PHONOGRAPHS USE **POWER-POINTS** AS ORIGINAL EQUIPMENT! THE PROFITS ARE BIG—AND E-V HELPS YOU SELL WITH THESE MERCHANDISING AIDS.

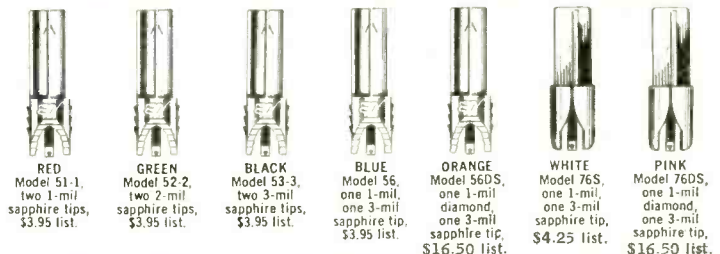


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Plastic-sealed blister-packed **Power-Points** are always in perfect condition. Package gives model identification, color-coding and instructions.

These are the color-coded **POWER-POINT** units, actual size



RED
 Model 51-1,
 two 1-mil
 sapphire tips,
 \$3.95 list.

GREEN
 Model 52-2,
 two 2-mil
 sapphire tips,
 \$3.95 list.

BLACK
 Model 53-3,
 two 3-mil
 sapphire tips,
 \$3.95 list.

BLUE
 Model 56,
 one 1-mil,
 one 3-mil
 sapphire tip,
 \$3.95 list.

ORANGE
 Model 56DS,
 one 1-mil
 diamond,
 one 3-mil
 sapphire tip,
 \$16.50 list.

WHITE
 Model 76S,
 one 1-mil,
 one 3-mil
 sapphire tip,
 \$4.25 list.

PINK
 Model 76DS,
 one 1-mil
 diamond,
 one 3-mil
 sapphire tip,
 \$16.50 list.

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 E-V DISTRIBUTOR
 TODAY!

Electro-Voice

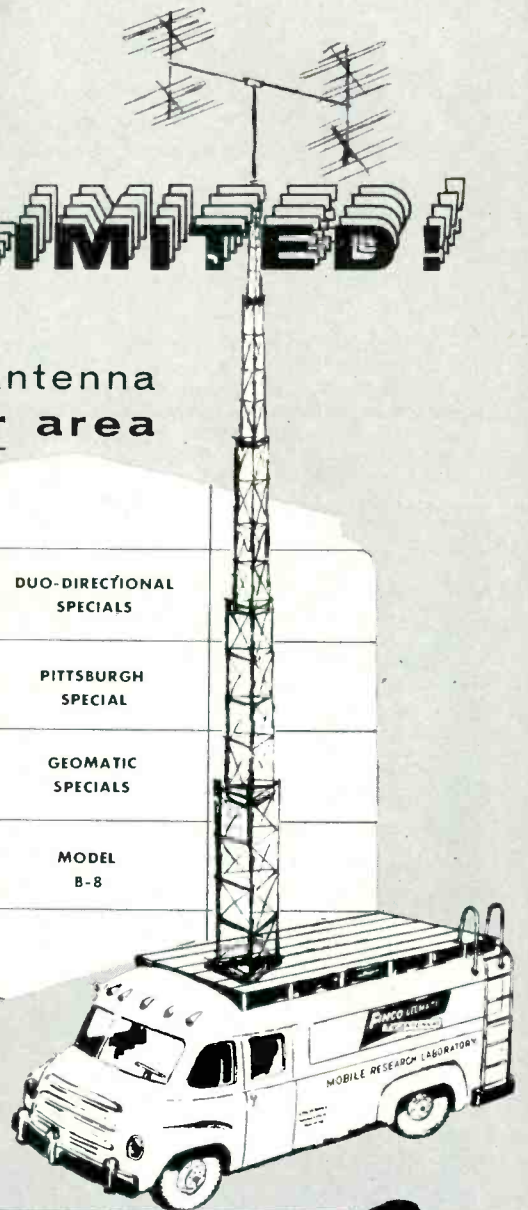
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MODELS UNLIMITED!

NOW ... you can sell a TV Antenna designed for your area

	BUFFALO SPECIAL	SYRACUSE-ROCHESTER SPECIAL	DUO-DIRECTIONAL SPECIALS
	SAN DIEGO B-6	CHICAGO SPECIALS	PITTSBURGH SPECIAL
LONGVIEW, TEXAS SPECIAL	VICKSBURG SPECIAL	FLORIDA, WEST COAST SPECIAL	GEOMATIC SPECIALS
	PATENTED FIDELITY PHASING	DETROIT-TOLEDO SPECIAL	MODEL B-8
UHF-VHF SPECIALS	MODEL B-66		
MODEL B-7	FRONT-TO-BACK SPECIALS		



• IN SOLVING UNUSUAL, LOCALIZED RECEPTION PROBLEMS, FINCO has proved that the only positive way to develop the most efficient and economical TV Antenna is by actual MOBILE RESEARCH LABORATORY TESTS combined with Expert Topology and Channel Power Plotting.

If a distributor qualifies, Finco's research department assumes the task of studying the specific, local reception problems. If the problems can possibly be solved the result is an exclusive Red-Hot, High-Profit Hi-Performance Antenna For Your Area —

Hundreds of FINCO research projects are now in process or already completed, giving dealers and servicemen a big jump on their competition. The total cost to your Jobber IS HIS COOPERATION : . . . urge Your Jobber to write, wire or call FINCO TODAY!

FINCO®

is often imitated . . .
the leader always is!



FINCO®

THE FINNEY COMPANY • 34 West Interstate Street • BEDFORD, OHIO • Telephone: BEdford 2-6161

Copyright 1957, The Finney Co.

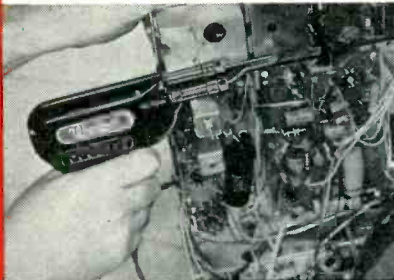
Form No. 20-109

4 IDEAS

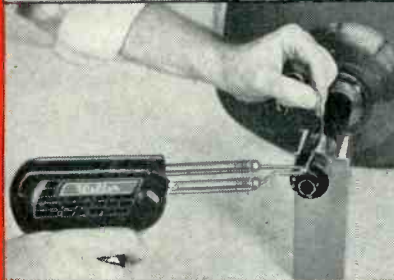
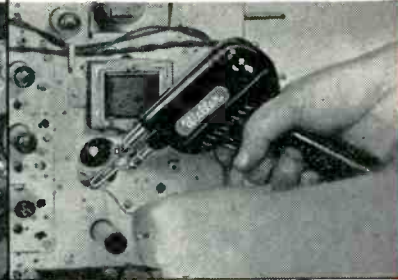
for getting even more use from your
Weller SOLDERING GUN

Your Weller Soldering Gun is the most useful tool in your shop. Service technicians find new, practical uses for it every day. Here are some time-saving applications:

1 CIRCUIT AND COMPONENT DEFECT ANALYSIS. Energized tip of Weller Gun is substituted for signal generator to find defective components in both audio amplifier section and picture circuit. Quickly uncovers thermal intermittance trouble.

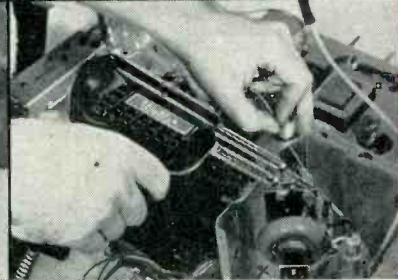


2 REACHES COMPONENTS THROUGH CHASSIS CUT-OUTS. Weller Guns, with their long, thin electrodes, reach recessed tube sockets and connections through small chassis cut-outs. Pre-focused twin spotlights light up this hard-to-get-at work.



3 NEW SOLDER FOR CATHODE TUBE BASE PIN. Defectively soldered (or loose) base pin is re-sweated to remove imperfections. New solder is then applied to establish uninterrupted contact. Weller Gun is ideal for this type of repair.

4 SOLDERING BROKEN TERMINAL LEADS. Weller Soldering Gun permits controlled application of heat. Solder is maintained at correct viscosity. This enables serviceman to produce rounded joints and prevent corona discharge in high-voltage compartment.



Weller SOLDERING KIT 8100K IDEAL FOR ALL SERVICE WORK



Complete kit for the price of the gun alone! Latest type Weller Gun—Model 8100, over 100 watts, with triggermatic heat control. 2 pre-focused spotlights. Reaches through small openings into dark places. Kit includes Wire Soldering Brush, wire-twisting Soldering Aid, Kester Solder. Top value at \$7.95 list.

SEE THE FULL LINE OF PROFESSIONAL MODEL WELLER GUNS AT YOUR ELECTRONIC PARTS DISTRIBUTOR

Weller ELECTRIC CORP. • EASTON, PA.
601 Stone's Crossing Road

(News continued from page 18)

STROMBERG-CARLSON reports the advancement of: D. W. ANDERSON to Ass't. to the Vice Pres.; P. R. SULTZBACH to Production Manager; W. F. HAFSTROM to Manager of Marketing.

ERIE RESISTOR CORP. announces that Dr. J. G. BUCK has been appointed as Director of Research and Development; and F. E. LEHMAN as Chief Mechanical Engineer.

CBS-HYTRON reports the appointment of R. A. JUUSOLA to Manager of Marketing Administration. Also B. P. HAYES to the newly created position of Syracuse District Manager.

ALLEN B. DU MONT LABORATORIES, INC. announces the appointment of W. G. FOCKLER as manager of Technical Products Engineering.

AMERICAN TELEVISION & RADIO CO. reports the addition of twelve new open-face models to their line of console television receivers. Priced at \$395.00.

NATIONAL HOME STUDY COUNCIL reports that Central Technical Institute, and Electronics Institute, Inc., both of Kansas City, Mo., have attained NHSC accreditation. There are now ten accredited schools offering study-by-mail courses in radio, television and electronics.

PHILCO CORP. announces plans for the expansion of electronic research and developmental facilities for the West Coast Area. Included is a new technological facility with increased research and development in military electronics. It is to be constructed in Palo Alto, Calif. to replace Western Development Laboratories in nearby Redwood City.

ALPHA WIRE CORP. announces the appointment of RAYMOND IVES as Mid-Western Regional Sales Manager with office at 21 Van Buren St., Chicago, Ill.

Reps & Distributors

MOTOROLA INC. announces the appointment of MILGRAY ELECTRONICS as distributor for semiconductors in New York greater metropolitan area.

ALLEN B. DU MONT LABORATORIES, INC. has appointed the ELECTRONIC SERVICE SUPPLY CO. LTD., Calgary, Alberta, as exclusive Canadian distributor for land mobile radio equipment.

DAN GREENE ORGANIZATION, INC., Cambridge, Mass. representative, has relocated its Connecticut office to 1115 Main St., Bridgeport.

FAIRCHILD RECORDING EQUIPMENT CO. reports the appointment of GRADY DUCKETT, as representative for high-fidelity products, in the southeastern states.

(Continued on page 28)

EXCLUSIVE FRANCHISES STILL AVAILABLE . . .

(this plan is already in highly successful operation)

HERE'S NEWS about "EXTRA INCOME" — A TV Sales Plan EXCLUSIVELY for YOU!



The Biltmore
in mahogany

EXPANDED ATR LINE INCLUDES 12 OPEN-FACED MODELS AND 15 FULL DOOR MODELS AUTHENTICALLY STYLED TO BLEND IN WITH ANY INTERIOR DECOR.



The Provincial
in cherry with fruitwood finish

EVERY DESIRABLE TV FEATURE ENGINEERED INTO AUTHENTICALLY DESIGNED FURNITURE CABINETS.

- Beautiful hand rubbed wood Finishes available in Walnut, Mahogany, Maple, Cherry and Blonde Korina
- The thick 3/4" Veneered Panels with tongue and groove construction give clear evidence of the finest in cabinet work.
- Sturdy Reinforced Construction that assures solid, positive support of the chassis.
- Special "Hidden Construction" conceals the Casters so that set has easy mobility while retaining the flawless beauty of the cabinet lines.
- All Door Models feature the "Tell-Tale" Pilot Light Reminder, showing whether the set is on or off, even with the doors closed.
- Slanted Safety Glass and Speaker Assembly
- High-Fidelity Amplifier and Audio System
- Spot-Light Tuning Channel Selector
- Optical Filter Safety Glass
- Extended-Range Speakers
- Aluminized Picture Tube

AT LAST... LONG DESERVED REWARDS TO THE TECHNICIAN THROUGH THE ATR TV CERTIFIED PLAN...

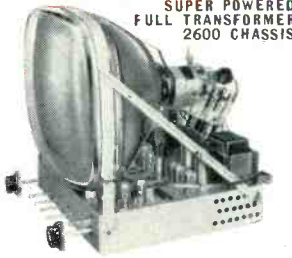
The entire ATR Plan—distribution of top quality sets by qualified TV Technicians—on a direct line from Manufacturer, to Independent, to the Customer . . . will prove to be a unique opportunity for you.



ATR TELEVISION
A NEW HORIZON IN TECHNICAL EXCELLENCE AND TV PERFORMANCE.

CHECK THIS LIST AND TAKE PRIDE IN WHAT YOU WILL BE OFFERING TO YOUR CUSTOMERS:

- 18,000 volts of quality picture power
- Giant 265 sq. in., 90° aluminized tube, 21" overall diagonal measurement
- Super-powered, full-transformer, 26 tube chassis
- Extended range, permanent magnet speakers of heavy duty-construction
- Automatic gain control
- 4-stage 41 MC IF amplifier
- Interference rejector
- Push-pull, hi-fidelity audio system
- Permanent-magnet focus, regardless of voltage fluctuations
- Higher gain video amplifier
- Wider band width for maximum picture clarity
- Precision interlace
- Tone control allows a wide range of personal tone preference, bass to treble
- Highest quality components including molded capacitors
- Dependable long life ATR circuitry
- Front tuning of all important control functions



SUPER POWERED FULL TRANSFORMER 2600 CHASSIS

It's as simple as this. The ATR TV Receiver is a Technician's Set. It is distributed only through TV-Radio Technicians . . . and is so superior to anything else on the market—that you would recommend it to your service customers, whenever the opportunity arose, with personal whole-hearted approval. And your commissions are extremely generous.

TV has become a regular, daily part of family life. Why should your customers, or anyone else, accept less than the most effective and the most enjoyable? Suggest that they enjoy dependable ATR's clear, crisp viewing and matchless sound reproduction. Let them own the finest in furniture craftsmanship and beauty, authentically styled to grace the decor of their home at prices they can afford.

The television season is close by. Many of your customers will be in the market for a new set—for replacement, as an original, or as the Number One set in a two-set house.

TV sets by American Television & Radio will give them the highest all-around quality they've ever had. And, of course, every ATR model is available for prompt delivery—in either the Full-Door or Open-Face.

Franchised areas are still available, so please send in your name right away—and you'll hear from us in time for the big season ahead.

ATR CO.

300 E. 4th St.
St. Paul 1, Minn.



Yes, I'm interested in "Extra Income." Please forward details about your ATR "Certified" Independent TV Plan.

NAME

COMPANY

ADDRESS

CITY ZONE

STATE

COMPLETE INFORMATION WILL BE RUSHED TO YOU BY



AMERICAN TELEVISION & RADIO CO.

300 EAST 4TH ST.
ST. PAUL 1, MINN.

YOUR INSTALLATION VOLUME CAN BE GREATER!

If you're *not* a Channel Master Dealer you are probably not getting your share of the *really profitable* antenna installation business. Hundreds of dealers have doubled and even tripled their antenna sales *in less than one year* when they

switched to Channel Master and featured the famous T-W antenna. In fact, far more T-W antennas are bought than any other fringe area antenna. There must be good reasons for this. Below are listed but a few of them.

*How much installation business are you losing every week? ...because you don't feature the **CHANNEL MASTER® T-W***

Put these extra selling advantages to work for you!

Superior PERFORMANCE! Outperforms any all-channel antenna ever made! Revolutionary "Traveling Wave" design delivers highest front-to-back ratios (better than 10:1) — top gain over the entire VHF range.

Stronger CONSTRUCTION! Super-strong in every detail of construction: Twin-Boom — the only antenna with 2 full length crossarms; 2 Super-Nests — the most powerful grip that ever held an antenna to the mast; Line-Lok — absorbs all transmission line tension; 7/16" dia. elements.

Bigger NATIONAL ADVERTISING! More than 75,000,000 advertising messages in America's leading national magazines. Now saturation coverage with big-space ads blanketing 173 prime outdoor antenna markets.

LIVE LEADS galore! Tens of thousands have already responded to Channel Master's Free "Antenna Check-Up Kit" offer — **repeated** in new national ads. Based on experience, 50% — and more — of these leads are converted into actual sales.

Local CO-OP ADVERTISING! The most liberal advertising allowance in the industry — so you can run your own local promotions. Channel Master dealers have the widest array of mats, radio and TV spots, and display materials.

Promoting ANTENNA REPLACEMENTS! Channel Master's national advertising hammers home the theme of antenna obsolescence — opening new markets for you!

Call your Channel Master distributor now!

© Reg. U.S. Pat. Office and Canada

7-element
model no. 350
5-element
model no. 351
3-element
model no. 352



model no. 354-1

including: • 2-element T-W
• Combination 4 ft. x 1 1/4" aluminum mast and Universal Tripod Mount • 3 Mounting Nails with Neoprene sealing washers • 50' 80 mil wire • 6 - 3 1/2" Standoffs • 1 Standoff Strap.

A COMPLETE ANTENNA

IN ATTRACTIVE 3-COLOR DISPLAY CARTON

NEW "INSTALL-IT-YOURSELF" ANTENNA KIT featuring new 2 ELEMENT T-W ANTENNA

Designed for top performance in suburban and metropolitan areas. Powerful "Traveling Wave" principle provides the 2-element T-W with better all around performance than a stacked conical.

Promotionally Priced at \$29⁹⁵ list



CHANNEL MASTER CORP.

ELLENVILLE, N. Y. copyright 1957 Channel Master Corp. WORLD'S LARGEST MANUFACTURER OF TV ANTENNAS AND ACCESSORIES



HOW TO PASS Your FCC Commercial LICENSE EXAMS*

Get Your FCC License in a Hurry!

We Guarantee*

to train you
until you receive

Your FCC License

* See Free Catalog for complete details

Cleveland Institute training results in success
with commercial FCC examinations
... easily ... and quickly

Here's Proof:

Name and Address	License	Time
Prentice Harrison, Lewes, Delaware	1st	27 weeks
John H. Johnson, Boise City, Okla.	1st	20 weeks
Herbert W. Clay, Phoenix, Ariz.	2nd	22 weeks
William F. Masterson, Key West, Fla.	2nd	24 weeks
Thomas J. Bingham, Finley, N. Dak.	2nd	9 weeks

(Names and addresses of trainees in your area sent on request)
Cleveland Institute training results in job offers like these:

Radio Operators & Technicians

American Airlines has openings for radio operators and radio mechanics. Operators start at \$334.53 per month. Radio mechanic's salary up to \$1.99 per hour. Periodic increases with opportunity for advancement. Many company benefits.

Electronic Technicians

Conair Electronics Department: Radio and Radar Mechanics, Electronics Technicians, and Junior Engineers are wanted for a special program on fire control development and installation. Beginning rate: \$365 and up.

And our trainees get good jobs

Salary Increased

"I recently secured a position as Test Engineer with Melpar, Inc. A substantial salary increase was involved. My Cleveland Institute training played a major role in qualifying me for this position."

Boyd Daugherty
105 Goswin Ct., Apt. C
Falls Church, Va.



Eastern Airlines

In a year and a half, he received his first class FCC License. He is continuing his training with Cleveland Institute. His goal is much higher than his present position with Eastern Airlines, so he is adding technical "know-how" to his practical experience.

Bob Thompson
2935 Ironwood Drive
Nashville 14, Tennessee

CLEVELAND INSTITUTE OF RADIO ELECTRONICS
Desk T-9, 4900 Euclid Bldg., Cleveland 3, Ohio



We can train you to pass your License Exams if you've had any practical experience—amateur, military, radio servicing, or other. Our proven plan can help put you on the road to success.

* Your FCC ticket will be recognized by employers as proof of your technical ability.

Mail Coupon Now

and get
**both
FREE**

Accredited by the National
Home Study Council

Cleveland Institute of Radio Electronics

Desk T-9, 4900 Euclid Bldg., Cleveland 3, Ohio



Please send Free Booklets prepared to help me get ahead in Electronics. I have had training or experience in Electronics as indicated below:

- | | |
|---|---|
| <input type="checkbox"/> Military | <input type="checkbox"/> Broadcasting |
| <input type="checkbox"/> Radio-TV Servicing | <input type="checkbox"/> Home Experimenting |
| <input type="checkbox"/> Manufacturing | <input type="checkbox"/> Telephone Company |
| <input type="checkbox"/> Amateur Radio | <input type="checkbox"/> Other _____ |

In what kind of work are you now engaged?

In what branch of Electronics are you interested?

Name _____ Age _____

Address _____

City _____ Zone _____ State _____

Special Tuition Rates to Members of Armed Forces T-9



AR-22



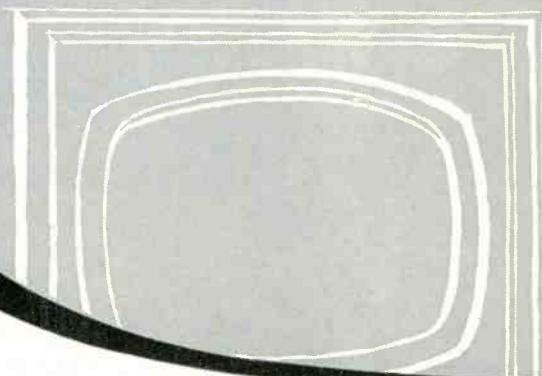
TR-2



TR-4

5-star feature...

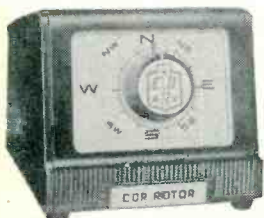
- ★ **1 the best color TV picture**
the growth of color TV means an even greater demand for CDR Rotors for pin-point accuracy of antenna direction.
- ★ **2 a better picture on more stations**
CDR Rotors add to the pleasure of TV viewing because they line up the antenna perfectly with the transmitted TV signal giving a BETTER picture . . . and making it possible to bring in MORE stations.



CDR ROTORS

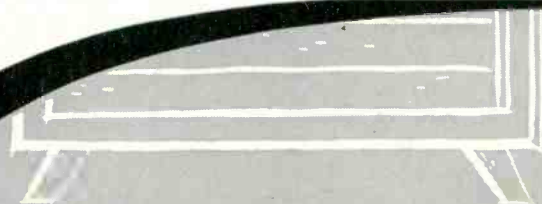


TR 11 and 12



AR 1 and 2

- ★ **3 tested and proven dependable**
thousands and thousands of CDR Rotors have proven their dependability over years of unflinching performance in installations everywhere in the nation. Quality and engineering you know you can count on.
- ★ **4 pre-sold to your customers**
the greatest coverage and concentration of full minute spot announcements on leading TV stations is working for YOU . . . pre-selling your customers.
- ★ **5 the complete line**
a model for every need . . . for every application. CDR Rotors make it possible for you to give your customer exactly what is needed . . . the right CDR Rotor for the right job.



CORNELL-DUBILIER
SOUTH PLAINFIELD, N. J.

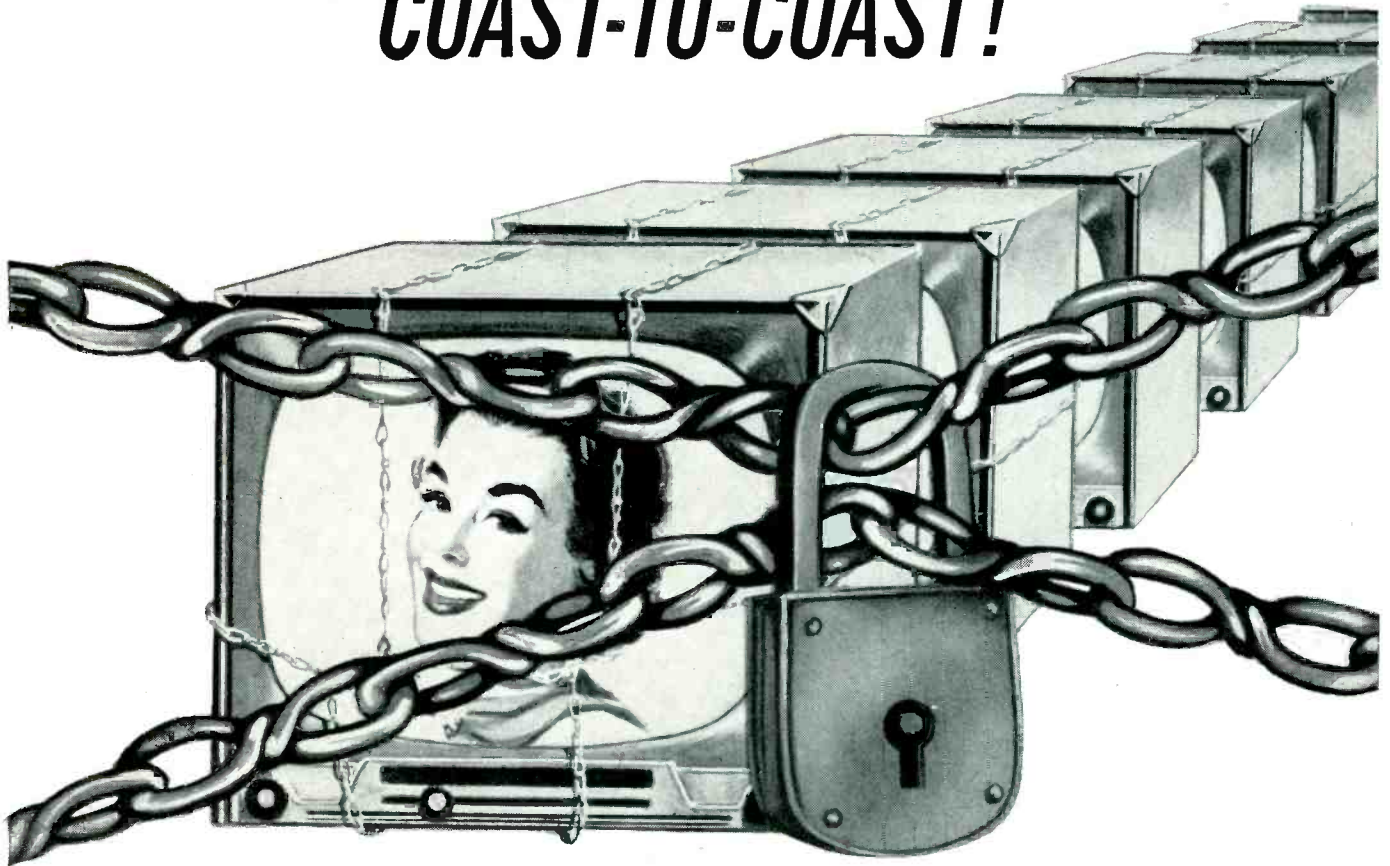


THE RADIART CORP.
CLEVELAND 13, OHIO

103 TV TUBE

"TORTURE TESTS"

COAST-TO-COAST!



"Locked TV" prove WESTINGHOUSE tubes work better, cut call-backs!

RIGHT NOW leading Electronic Parts Distributors across the nation are giving Westinghouse RELIATRON® Tubes the most grueling test in TV history!

RIGHT NOW 103 standard make TV sets—like those used by your customers—are performing continuously! Every set is locked tight. Every set is 100% equipped with Westinghouse RELIATRON Tubes taken right from regular Distributor stock to prove they outlast, outperform other tube brands—in any make TV!


RIGHT NOW these 103 sets are racking up fantastic performance records! For example, one "Locked TV" has run over 17,000 hours . . . more than 11 years' average viewing time!

SEE THE "LOCKED TV" TEST right now at *your* Westinghouse Tube Distributor. Find out how it can pay off in profits for *you!*

Electronic Tube Division • Elmira, New York

YOU CAN BE SURE...IF IT'S **Westinghouse**





**ONE
SOURCE**

FOR ALL YOUR TRANSFORMER NEEDS...

STANCOR

One line will satisfy the huge majority of your transformer needs . . . STANCOR. Why waste time shopping around? You can depend on your STANCOR distributor to have the transformer you want, always.

Do you have our latest catalog and replacement guides? Write for them today. (Free, of course.)

CHICAGO STANDARD TRANSFORMER CORPORATION

3513 ADDISON STREET • CHICAGO 18, ILLINOIS

Export Sales: Raburn Agencies, Inc., 431 Greenwich St., New York 13, N.Y.

IDEAL SOURCE OF SUPPLY

- for
- INDEPENDENT
- SERVICEMEN
- SERVICE DEALERS
- MANUFACTURERS

ZYTRON RADIO & TV RECEIVING TUBES

You can buy—and SELL—ZYTRON Tubes with confidence! They're Brand New, Individually Boxed, Dependable—and very Low Priced! Send for Price List #11.

ZYTRON TUBE CORPORATION
220 West 42nd St., New York 36, N. Y.



(Reps & Distr continued from page 22)

RADIO ELECTRIC SERVICE CO. OF PENNA. INC., Philadelphia, announces the appointment of Ted Haldis as manager of their high-fidelity sound studio.

LAND-C-AIR SALES CO., Tuckahoe, N. Y. engineering sales representatives, have added Jack A. DeVine to their staff of sales engineers.

NEWARK ELECTRIC CO., Chicago distributor, reports expansion of their Inglewood, Calif. branch. Construction on their new building to start shortly.

NATIONAL COMPANY, INC., announces the appointment of F. W. MOULTHROP CO., as sales representative for receivers and components in the northern portion of California and Nevada. **HERB BECKER CO.** will continue to represent the firm in southern California.

RADIO RECEPTOR CO. names **LE-ROY & MCGUIRE, INC.** as distributor sales representative for semiconductor products in New York state north of Rockland and Westchester counties.

Catalogs & Bulletins

PARTS & EQUIPMENT: 1958 general catalog of electronic parts and equipment, including high-fidelity components. 404 pages listing a great many items. Allied Radio Corp., 100 North Western Ave., Chicago 80, Ill. (ELECTRONIC TECHNICIAN No. B11-1)

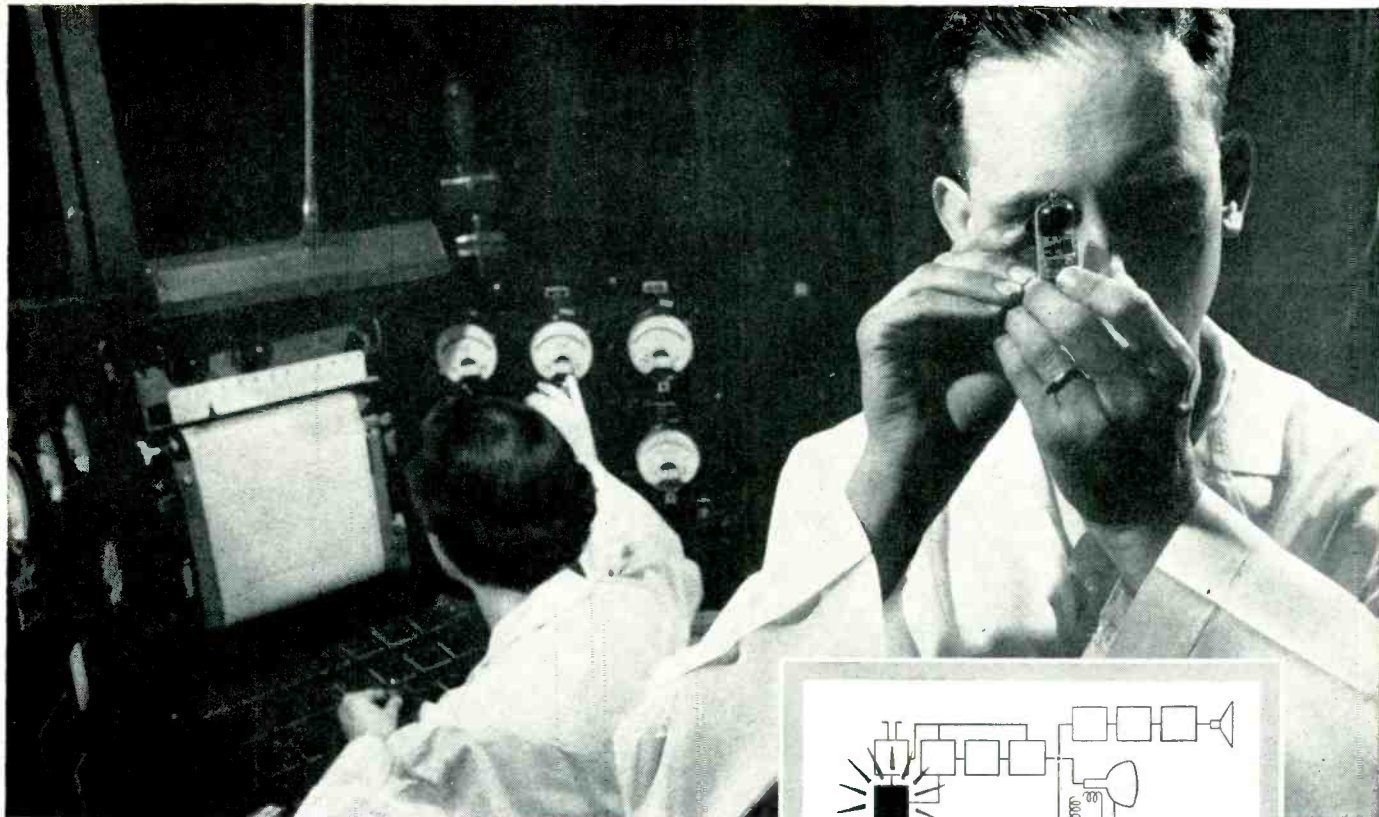
SWITCHES: 35-page catalog with complete specifications on rotary, slide, and lever switches. Centralab, a Division of Globe-Union Inc., 900 E. Keefe Ave., Milwaukee 1, Wis. (ELECTRONIC TECHNICIAN No. B11-2)

RESISTORS: 12-page technical data bulletin B-1C, covering type BT fixed composition resistors, and giving comprehensive data on construction, characteristics, solderability, terminations, heat dissipation, color coding, tolerances, power and voltage ratings, temperature rise, matched and balanced pairs, etc. Detailed charts and graphs. International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa. (ELECTRONIC TECHNICIAN No. B11-3)

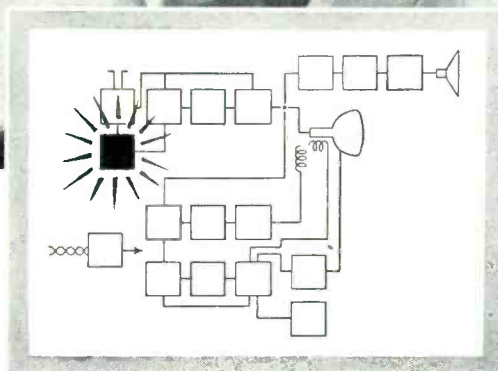
TRANSISTORS: 8-page specification chart and interchangeability guide covering germanium junction-alloy type transistors. Industro Transistor Corp., 649 Broadway, New York 12, N. Y. (ELECTRONIC TECHNICIAN No. B11-4)

KITS: A 16-page catalog covering Heath-kits for Fall, 1957, with descriptions, illustrations, and prices of the following equipment: audio, high-fidelity, test, ham, and other. Heath Company, Benton Harbor, Mich. (ELECTRONIC TECHNICIAN No. B11-5)

(Continued on page 62)



G-E DESIGN ENGINEER M. W. LeCler examines the structure of a 6U8 through a magnifier. Characteristics of the tube have been plotted by the two-axis recorder in background. Outstanding quality of G-E oscillator-mixer tubes—consequently, their popularity as replacements—comes from a balanced application of advanced design principles, precision manufacture, and careful testing.



Superior quality of G-E oscillator-mixer tubes proved by their high gain and uniform electrical characteristics!

Time is your most valuable commodity. Any replacement that conserves your working time and makes it more productive, puts extra dollars in your pocket.

The case for General Electric oscillator-mixer tubes rests on that benefit. These quality types—such as the 6U8, 6X8, 6CL8, 6CG8—have uniform tube-to-tube electrical properties. Install them as head-end replacements, and no adjustment of the coarse oscillator frequency control normally is needed.

Add the saving in call-back time that comes from first-class performance of customers' receivers! For high-gain General Electric oscillator-mixer tubes reduce noise. Their low microphonics mean minimum streaking and similar picture disturbances.

Complete redesign of the pentode section was neces-

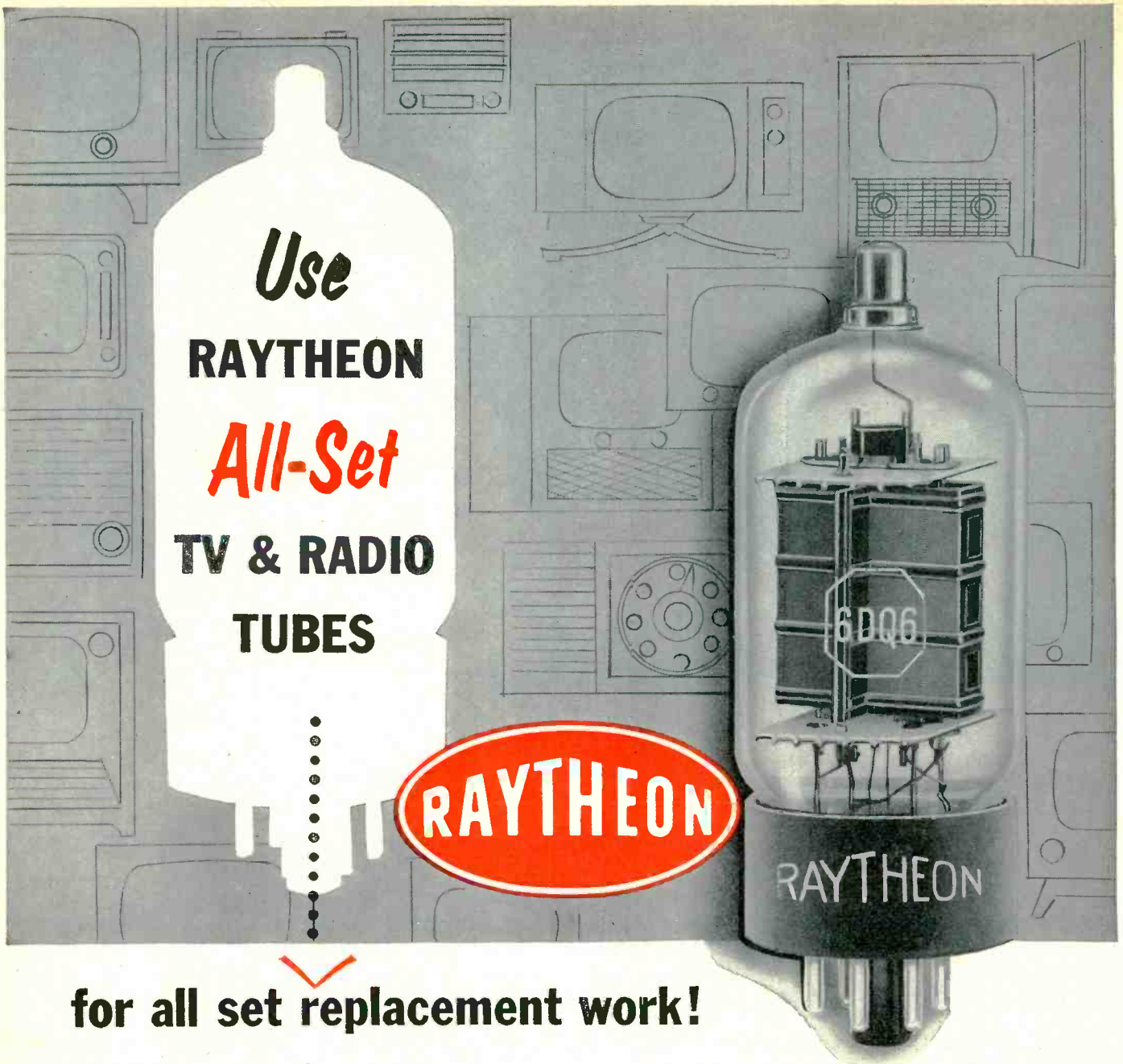
sary to obtain the high tube gain you require for top performance. Rigid tube structure and precision control of grid-rod and mica-aperture diameters keep down microphonics. Uniform electrical characteristics of G-E oscillator-mixer types are a product of (1) the industry's most advanced methods of manufacture to high-quality standards, (2) testing and retesting.

Install General Electric tubes for superior performance you can count on . . . every time, from every tube! Your G-E tube distributor makes fast deliveries. Phone him! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.*

Progress Is Our Most Important Product

GENERAL  ELECTRIC

161-1A11



for all set replacement work!

You'll save yourself trouble if you standardize on Raytheon "All-Set" Tubes for replacement work.

Here's why:

Raytheon "All-Set" Tubes are designed to give perfect service in many makes and models of receivers because Raytheon sells Tubes to almost

every set manufacturer. To satisfy the many and varying needs of so many manufacturers, these tubes must combine top quality performance and dependability. This successful combination makes Raytheon "All-Set" Tubes tops for replacement.

Always use Raytheon "All-Set" Tubes to satisfy your "all-set" customers.

TV-Radio service is your business . . . serving you is ours



RAYTHEON MANUFACTURING COMPANY

Receiving and Cathode Ray Tube Operations

Newton, Mass. • Chicago, Ill. • Atlanta, Ga. • Los Angeles, Calif

Raytheon makes all these { Receiving and Picture Tubes, Reliable Subminiature and Miniature Tubes, Semiconductor Diodes and Transistors, Nucleonic Tubes, Microwave Tubes.



ELECTRONIC TECHNICIAN

Including
Circuit Digests

Sputniks and Electronic Progress

The Russian earth satellite—the sputnik—and the American man-made moons in preparation will have a profound effect on the entire world. Above and beyond the political and legal considerations, such satellites will greatly affect scientific thinking.

There is little doubt that man will travel in outer space, probably within the lifetime of many of us. Without many necessary electronic developments, space travel would not be possible. Missile guidance and communication equipment are pioneering the way for new products for home and industry.

Look how radar, developed for our war effort, has boosted commercial products and provided many new opportunities for manufacturers and electronic technicians. Radar is now standard equipment at airports, in many airliners, and in traffic control. Research on radar display tube phosphors has contributed information of value in developing better TV screens. Improved circuits and materials are other pioneer advances which carry over to products technicians are being called upon to maintain.

It's interesting that one point about the sputnik which caught both the public fancy and the scientist's attention was the beeps transmitted to earth. The public focused on the tangible evidence of the satellite's existence; the scientist welcomed the beeps as a valuable tracking aid.

The satellite circles the globe about 500 miles up at a speed near 18,000 mph. As most of us know from newspaper accounts, the satellite is within the

earth's gravitational field, constantly in the process of "falling" back. Theoretically at least, it never returns because at its height and speed it continually "falls" around the earth's curvature. (If it did plunge back to earth, the heat of air friction when it entered the atmosphere would probably make it disintegrate.) In practice it could fall.

Any satellite could be equipped with instruments to measure temperature, radiation, pressure, etc. It is even conceivable for it to take pictures of the earth or to relay broadcasts. The means for getting measurements back to earth via radio is called telemetering. Essentially, telemetering is the technique of modulating a carrier by FM or pulses in relation to the measurement. This arrangement is also used in industry for remote indication.

The power source for satellite transmitting equipment is pointing the way for better consumer and industrial products. The American satellite is expected to contain solar batteries capable of converting the sun's radiant energy to electrical energy for many years. No doubt many consumer portable radios will eventually contain similar features . . . as one already does.

So bear in mind when you hear a sputnik beep on your short wave receiver or read a satellite story in your newspaper that the man-made moon is carrying electronic components that will shape your horizon of servicing opportunities in the years to come.

Private Communications

A quiet revolution may be in the making for the microwave communications field. In the past, common carriers such as telephone companies have been favored by the Federal Communications Commission to operate microwave communications systems. Eligibility of private licensees has been restricted.

Now the FCC is studying the utilization of frequencies above 890 mc. Members of the Electronic Industries Association (formerly RETMA) have gone on record in favor of a broader eligibility

base for private microwave licensees. They believe there is adequate spectrum space to provide a communications industry independent of common carriers.

If the FCC should agree with this viewpoint, it could generate business prospects for independent electronic technicians working with private companies. Needless to say, the benefits would be reaped by technicians who are furthering their study of commercial communications and developing the facilities to maintain such industrial electronics.

Tuning In the

TIME MAGAZINE, in its Oct. 14 issue, dished out a giant helping of misleading information on the service business, with heavy emphasis on the dishonesty and incompetence of TV repairmen. Buried in the middle of five pages of sad tales about unhappy housewives and gyp technicians is the reluctant admission that "the great majority of repairmen are honest enough. The difficulty is that no one can tell the good from the bad—so many are merely incompetent." Nowhere does *Time* mention the Roper survey for RCA which showed that 91% of set owners were satisfied with the repair service they were getting. Furthermore, their observation that set makers would be taking over their own servicing is in direct contradiction to official policy statements of the manufacturers. The editors of *Electronic Technician* have protested these uncalled for distortions. You may wish to let *Time* know how you feel about their untidy journalism. See letter, p. 45.

PRINTED WIRING BOARD resistance between conductors can change by a factor of 10,000 in a matter of minutes if surface humidity and temperature are sufficiently altered. In other words, 10,000 megs could become 1 meg, particularly in aircraft equipment encountering extreme environments.

ALUMINUM SOLDERING

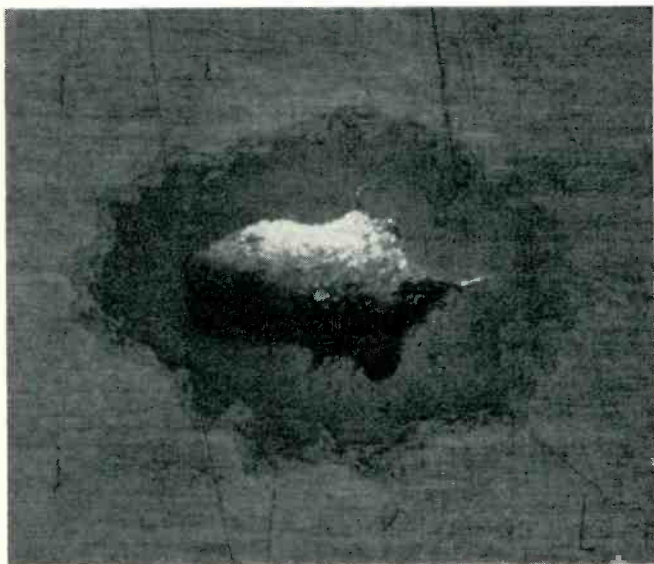


Photo of solder on sheet of commercial grade aluminum. Dark area around central spot contains solder which has crept under oxide layer and joined with surface. The zinc base alloy solder developed by Bell Labs needs no flux. It is stroked across heated aluminum. Lead and tin are not used in the solder. It's also useful for galvanized metals.



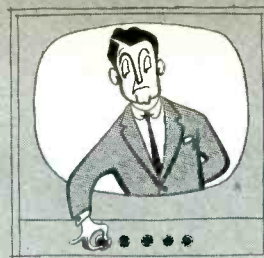
"I'll see you 6SN7 and raise you a 12CU6"

ELECTRONIC SEA HIGHWAYS The Bendix-Decca Navigator is a low-frequency radio position-finding device that can be operated either automatically or manually to provide a continuous "map" of a ship's course and heading. It is unaffected by weather conditions, jamming and other interference. Each chain is made up of a "master" station and three "slave" stations. Two chains located in Newfoundland, are known as "Moose East" and "Moose West." Another in Nova Scotia, is called "Caribou East." The chains, with still a fourth (Caribou West) in the Quebec area to be opened soon, will cover an area of one million square miles. There is also an automatic version of the system which operates a moving pen over a roller-mounted chart. The pen shows the ship's course and position as a continuous moving line on the chart.

DON'T BE SURPRISED if you see a 21-inch TV console cabinet that's only 10 inches deep. Sylvania is expected to have it on the market around the end of the year. The set uses a 110° picture tube and the usual 1-inch deep doghouse cup on the back, but the cabinet will be set back from the tube face.

KISS AND MAKE UP. It looks like the RCA-Zenith legal battle about who damaged whom is being settled. How much money will change hands in the settlement has not been announced by both sides, but it's expected to run into the megabucks.

Picture



THE 64,000 RUBLE QUESTION would be a smash hit in Russian TV. Moscow TV station tried a giveaway gimmick on its Evening of Merry Questions program. The announcer offered prizes to the first three viewers who arrived at the studio dressed for winter. Within minutes, 500 prize-seekers crowded the stage. The announcer was lost in the crush. Confusion reigned. The program was canceled "for technical reasons."

NATION'S AMATEUR RADIO operators will again be honored in General Electric's annual Edison Amateur Award for public service. The winner receives \$500. Nominations on behalf of hams who have performed outstanding public service in 1957 should be made no later than Jan. 3, 1958, with full descriptions, and mailed to: Edison Award Committee, General Electric Co., Owensboro, Ky.

PERSONAL PAGING SYSTEMS have taken hold in hospitals, industrial plants, hotels, office buildings, etc., during the past two years. They consist of small radio receivers which pick up voice or beep signals to notify the user that someone wishes to contact him. One type uses selective calls for one or more receivers; others hear all signals sent out by the main station. One system serves a city-wide area, another is used within a building only. Rental for the city-wide receiver service (units are not two-way), which has been available for about five years, runs close to \$13 per month.

CALENDAR OF COMING EVENTS

- Nov. 11-13: Radio Fall Meeting, King Edward Hotel, Toronto, Canada.
- Nov. 11-13: Third Instrument Conference and Exhibit, Biltmore Hotel, Atlanta, Ga.
- Dec. 8-11: Eastern Joint Computer Conference, Park Sheraton Hotel, Washington, D. C.
- Jan. 6-8: Fourth National Symposium on Reliability & Quality Control, Hotel Statler, Washington, D. C.
- Jan. 17-19: Long Island Guild Electronics Fair, Hempstead Armory, Hempstead, New York.
- Mar. 16-21: Nuclear Engineering & Science Congress, Palmer House, Chicago, Ill.
- Mar. 24-27: IRE National Convention, New York, N. Y.

LONG ARM OF THE LAW. After failing to find the source of TV interference plaguing London's Laven-der Hill section, British electronic experts put Scot-land Yard detectives on the case. The sleuths traced the TV noise to the basement of a home, reports Television Digest, where they discovered the offend-ing machine—a printing press turning out accurate facsimiles of 5-pound notes. Some \$560,000 worth of phony bills were found, the largest haul in British history. The four printers were arrested on counter-feiting charges—and suspicion of causing TV inter-ference.

SUBMINIATURE components are used in a new DuMont TV camera chain, making it ideal for air-borne and military installation where it is impractical to have human observers. The camera head measures 5"H x 4"W x 7-13/16"D.

RANDOM NOISE

AIRBORNE TV
HELPS PILOTS SEE GROUND AND PARTS OF AIRCRAFT NOT DIRECTLY VISIBLE FROM COCKPIT. GENERAL PRECISION MOUNTS 42-LB. CAMERAS IN PLASTIC HOUSINGS AROUND PLANE, 17" MONITORS AT CONTROLS

THIN-SCREEN AMPLIFIER
FOR X-RAY VIEWING MULTIPLIES IMAGE BRIGHTNESS 100 TIMES—THIS RCA DEVELOPMENT HOLDS IMAGE 30 SECONDS, OR CAN BE ERASED OR PHOTO-RECORDED BEFORE-SCREEN

PERMANENT MAGNETS THIN AS A HUMAN HAIR HAVE BEEN MADE BY NATIONAL BUREAU OF STANDARDS—ALLOY IS 60% COPPER, 20% NICKEL, 20% IRON—IT CAN BE COLD DRAWN AND HEAT TREATED, UNLIKE OTHER MAGNETS

CONSISTS OF TWO TRANSPARENT LAYERS, ONE A PHOTO-CONDUCTIVE POWDER—THE OTHER A PHOSPHOR

Personal Profile of the

How Do You Measure Up To Your Fellow Technicians?

ALBERT J. FORMAN, EDITOR
ELECTRONIC TECHNICIAN

• There are three kinds of lies, noted one observant wit: lies, damn lies and statistics.

In any statistical study of the personal situation and interests of electronic-TV technicians we'll agree that numerical compilations lie to this extent: Averages represent a typical, yet very narrow, middle area; the overwhelming majorities which form the averages are both statistically above and below the average. It's doubtful that any tech-

nician has the 2.44 average children reported here.

Beyond this one limitation, we think these statistical findings by Electronic Technician's Research Dept. will be of interest and value to both the large number of technicians who wish to see how they measure up against their colleagues on a personal basis, and to the people who do business with technicians. Over the years, as an industry guide, we have published many Research Dept. statistics reflecting the business profile of electronic technicians. Now, here's a look at the personal profile.

Cross Section

The findings reported here are based on a mail survey of a cross section of Electronic Technician subscribers. When reading the statistics, bear in mind that they represent the following proportions of reader categories who completed and returned the survey questionnaire: Shop Owners, 86.0%; Employed Technicians, 6.2%; Part-time Technicians, 4.3%; Other, 3.5%.

Age

The average electronic technician is exactly 38 years old.

Broken down into 10-year groups, 21.3% are in their 20's, 39.3% in their 30's, 24.6% in 40's, 13.2% in 50's, and 1.6% in 60's.

The oldest active man we ran across was 64.

Height

The height of the average technician is 5 ft. 9 $\frac{1}{10}$ in.

This is a fairly rangy group, 32.2% being 6 ft. or more. 62.0% are 5 ft. 6 in. through 5 ft. 11 in., and the remaining 5.8% are between 5 ft. 3 in. and 5 ft. 5 in. Tallest believable fellow is 6 ft. 5 in., though one does claim he is 6 ft. 11 in., all in shoes we assume.

Weight

The average electronic technician weighs 172.5 lbs.

Those under 200 lbs. account for 84.6% of the total, those over 200 for 15.4%. The lightweight title goes to a trim 100-pounder; the heavy-weight crown goes to a husky 240-pounder.

Marital Status

Bachelors are not too plentiful among those covered by this study. 91.1% are married; 8.9% unmarried.

Children

The average married technician has 2.44 children, divided almost

Mr. Typical Electronic Technician

(86% Shop Owners)

Age: 38
Height: 5'9-7/10"
Weight: 172.5 lbs.
Married
Number of Children: 2.44
Brothers & Sisters: 3
Electronic Experience: 14.24 years
1956 Income: Avg. \$7377;
Med. \$5600
1957 Income: Avg. \$7899;
Med. \$6000
Education: High School Graduate
Community Affairs: Slightly Active
Associations: Non-member
Owns Home
Home Value: Avg. \$13,582;
Med. \$10,000

Car: 1955 Ford
Savings: Avg. \$3060; Med. \$2000
Life Insurance: Avg. \$10,222;
Med. \$10,000
Politics: Half Republican, Half Democratic
Hobbies: Hunting & Fishing, Electronics
Technical Magazines Subscribed: 3.5
Technical Books Read Annually: 6
Non-Technical Books Read Annually: 12.6
Man Respected Most: Pres. Eisenhower
Favorite Actress: Marilyn Monroe
Favorite Actor: Gary Cooper

Electronic Technician

Here's Your Chance To Find Out!

exactly 50-50 among boys and girls.

Of those with children, 22.9% have one child, 39.7% have two, 19.8% have three, 7.3% have four, 8.3% have five, and 2.0% have six.

Brothers and Sisters

Technicians appear to come from larger families than they raise themselves. Each has exactly three brothers or sisters, 51.8% being brothers.

26.4% report they have only one brother or sister, 22.8% have two, 14.5% have three, 17.2% have four, 11.0% have five, 4.5% have six, and 3.6% have seven or more brothers or sisters. The fellow from the most prolific family shared bed and board with 13 brothers and sisters.

Electronic Experience

Technicians are not short on experience, as evidenced by the fact that the average has been in electronic work 14.24 years.

38.1% have less than 10 years of electronic experience, 33.9% have 10 or more years but less than 20, 16.5% have 20 to almost 30 years, 9.9% have from 30 up to 40 years, and 1.6% have 40 years or more experience.

Career Preference

We asked whether anyone would rather be in a different line of work. The overwhelming majority appear reasonably happy with TV and electronic maintenance; 78.1% said no, 15.6% said yes, and 6.3% reported that sometimes they wanted different work, or were undecided.

Interestingly enough, about three-quarters of those wishing to be out of servicing wanted to go into some other phase of electronics, such as engineering, broadcast, laboratory or industrial electronics. The remaining quarter (less than 4% of all technicians) of those discontented were interested in forestry, farming, army, power engineering,

construction, wild life conservation and manufacturing a product of their own, to name a few.

1956 Personal Income

The average respondent to this survey had a personal annual income in 1956 of \$7377. This high figure may be accounted for by the fact that 86.0% answering the questions sent to a random cross section of Electronic Technician readers were shop owners as well as technicians. (The median income was \$5600, as opposed to the average of \$7377. The median is that amount which 50% of technicians earn more than, and 50% earn less. In a way the median is a truer income figure than the average since it eliminates the disproportionately great influence that a few high earners have in raising averages.)

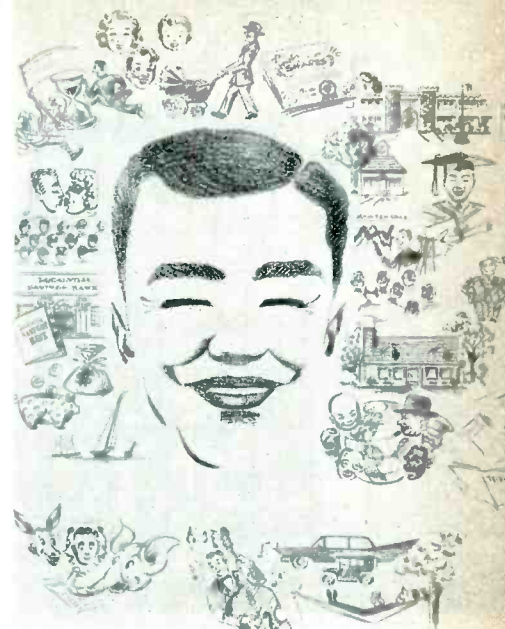
1957 Personal Income

Average personal income expected in 1957 is \$7899, which is \$522 over 1956. Median income expected for 1957 is \$6000, or \$400 more than 1956.

46.0% expect their incomes to be higher in 1957 than 1956, while 12.2% expect a decrease, and 40.8% see no change in the offing. Interestingly, those who expect an increase are looking forward to a substantial one of 26% on the average; likewise, technicians anticipating a decline expect it to be a solid 21%.

The income breakdown for both 1957 and 1956 is as follows:

Range	1956	1957
under \$3000	6.6%	3.0%
\$3000 to \$3999	8.5%	10.1%
\$4000 to \$4999	17.9%	13.1%
\$5000 to \$5999	20.8%	19.2%
\$6000 to \$6999	8.5%	16.2%
\$7000 to \$7999	16.9%	15.2%
\$8000 to \$8999	4.7%	5.1%
\$9000 to \$9999	3.8%	3.0%
\$10,000 to \$20,000	9.5%	11.1%
over \$20,000	2.8%	4.0%



Education

The electronic technician's schooling may be summed up in a non-statistical way as follows: He went to high school and/or trade school, usually graduated, and sometimes went to college for a while.

86.1% of all technicians went to high school; 85.5% of this total went for four years or more. Average attendance time was 4.2 years (8.7% went six years or more). Only 2.9% went less than 2 years.

58.0% went to trade school an average of 2.1 years. One fellow went to night school for 10 years.

27.2% of all technicians attended college an average of 2.4 years. 24.2% of those attending did so for 4 years or more.

Home Town

A majority of technicians do not seem to settle down in the towns they were raised in. 59.6% were not raised in the town they now work in; 40.4% were.

Community Affairs

Activity in community affairs is not the technician's strong point. 57.6% are only slightly active; 34.1% are moderately active; only 8.3% are very active.

Service Associations

Technicians certainly are not "joiners." 72.1% do not belong to service associations, unfortunately. 27.9% do belong.

Home Ownership

71.0% own their own homes; 29.0% do not. The average value is \$13,582, median value \$10,000. The

(Continued on page 54)

Servicing

TV's Often Overlooked

Adjacent Channel Sound And Video Traps, Peaking Coils,

CHARLES GARRETT

• There are several important circuits and components in a TV receiver that are often overlooked. Defects in these circuits can produce troublesome and sometimes evasive symptoms. At times it may appear as a poor picture, but not bad enough to work on. Often a weak video condition is attributed to the age or design of the set.

In other instances the antenna, location and even the TV station may be blamed. Depreciation in quality

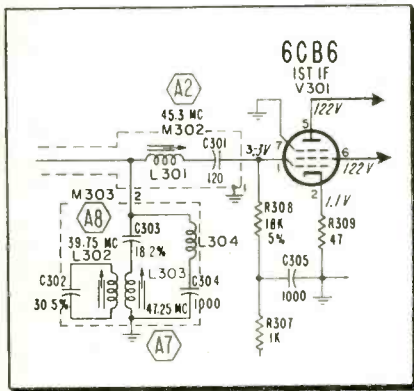


Fig. 1—Traps A7 and A8 are tuned to the sound IF of the next lower channel, and video IF of the next higher channel respectively.

is usually so gradual that the viewer is often not aware of his difficulties. The difference in just an ordinary repair and a picture that is snapped back to life may very well be, at least in part, the understanding and proper servicing of these circuits.

Adjacent Channel

The adjacent-channel sound trap in Fig. 1 is tuned to the i-f sound carrier of the next lower channel. For example, a set tuned to channel 9 is still capable of picking up a portion of the sound from channel 8 be-



Fig. 2—Adjacent channel interference caused by misadjusted traps.

cause of the broadness of the i-f response curve. Even though it is not likely that two adjacent channels would be operating in the same area, a weak signal from a distant station can still interfere. Fig. 2 shows the effects of this type of interference.

These absorption traps, however, are only effective if the fine tuning is properly adjusted so that the interfering signals fall into the proper place on the lower part of the i-f response curve and not on the upper part where the desired video information belongs. The spread between the video carrier and undesired sound is only 1.5 mc. Fig. 3 shows the effects of adjacent channel sound interference even with the

Fig. 3—Interference caused by improper setting of the fine-tuning control.

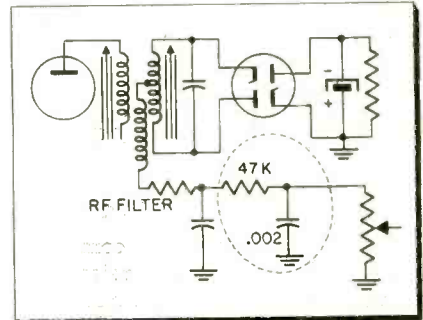


Fig. 4—De-emphasis network in sound sect.

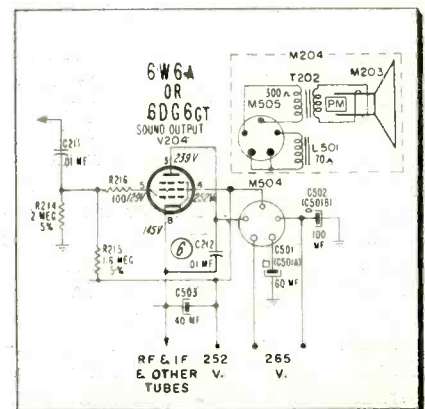
trap properly adjusted. Fine tuning, in this case, was not properly set.

For best adjacent-channel sound rejection, as well as for a picture with the most detail, the fine-tuning control should be set just back from the point where sound bars begin to form and the picture washes out. At this setting video, sound, and adjacent-channel signals should fall into their proper positions on the i-f curve.

The adjacent-channel video trap, also shown in Fig. 1, is an absorption type. This one is tuned to the i-f video carrier of the next higher channel.

Both of these traps are normally aligned with a scope, sweep generator, and marker generator. But

Fig. 5—Audio amplifier tube acts as a voltage divider and regulator.



But Important Circuits

Vacuum-Tube Voltage Divider and De-Emphasis Network

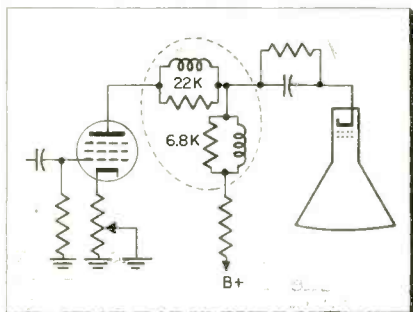


Fig. 6—Shunt and series peaking coils.

where adjacent-channel sound and video interference is particularly severe, better rejection may be obtained if these traps are retouched under actual interference conditions.

De-Emphasis Network

The de-emphasis circuit shown in Fig. 4 compensates for its counterpart, the pre-emphasis network, in the FM sound section of the transmitter. At the transmitter end the higher audio frequencies starting at about 1,000 cycles are deliberately given more amplification. By pre-emphasizing the higher frequencies in this manner, a better signal-to-noise ratio can be obtained. The de-emphasis circuit's shunting effect increases with increasing frequency and returns the higher frequency audio component to its original relative amplitude. In the absence of a de-emphasis network, the audio amplifier would sound as though the treble control were set too high. The network preceding the de-emphasis circuit is a low-pass filter designed to remove rf from the audio signal.

Because the voltage on these networks is feeble, their components give little trouble. If necessary, these circuits can be checked with an audio-signal tracer. The audio tone preceding the de-emphasis network should be of a higher pitch than that following it. And the tone preceding the low-pass r-f filter often will contain a slight hiss as compared to

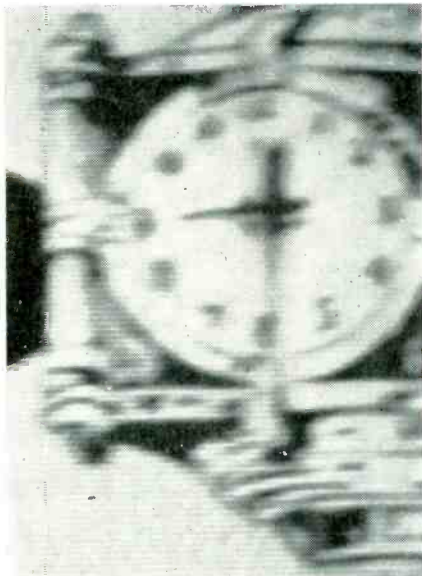


Fig. 7—Loss of high-frequency response caused by shorted peaking coils.

that immediately following this circuit.

VT Voltage Divider

There is more to Fig. 5 than meets the eye. It is not just an economical means of supplying the proper B+ voltage to the r-f and i-f circuits while providing audio output. It is also a means of regulating this voltage under varying signal strength and age conditions.

The i-f stages and especially the tuner are designed to operate at certain voltages. Appreciable variation from these set values can cause oscillator drift and age fluctuations. The vacuum-tube voltage divider maintains fairly constant voltages even in areas where both weak and strong stations are received. When a strong station is being received, the negative agc voltage on the r-f and i-f tubes' grid increases and causes the plate current to decrease. This in turn causes the plate voltage to increase. Since this voltage was taken from the cathode of the audio

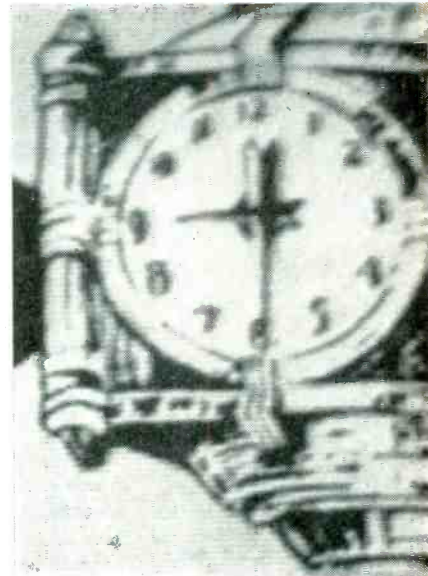
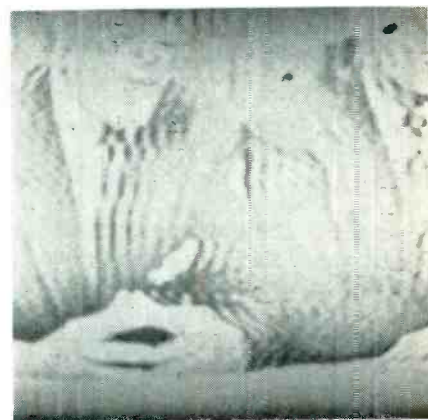


Fig. 8—Normal high frequency response.

output tube, the cathode will also become more positive. The grid of the audio tube is now more negative, with respect to its cathode. As a result, the tube's effective resistance is increased. When this occurs, a correspondingly greater portion of the voltage will develop across the tube. The voltage fed to the r-f and i-f tubes will return to approximately normal.

(Continued on page 60)

Fig. 9—Ringing due to overpeaking.



Tracing Distortion In

Simple Tests Can Isolate A Defective Stage When Looking For

NORMAN H. CROWHURST

• Most of us have heard the saying, "When she was good, she was very good, but when she was bad, she was horrid." This would provide quite a good description of the great majority of modern high-fidelity amplifiers; in correct operating condition they perform extremely well and give very low distortion, but if something goes wrong, the performance becomes much worse.

Like the naughty child, they can get the "parent" to scratch his head, to determine what to do next. To make the technician's troubles worse, the hi-fi amplifier owner is much more critical than the user of the average radio or TV set. Many a technician must have walked into a room with a TV set playing; which almost got up and begged to have an electrolytic capacitor replaced because of the hum in the picture and sound. Still the owner of the set was quite happy. He either was not aware of any defects, or decided to tolerate them until the picture or sound disappeared altogether.

With the hi-fi user it is quite a different story. The critical listener notices something wrong long before the amplifier starts to emit an audible hum, perhaps just because it gives some funny little sound on a pet piece of program material. The cause may be the same as in the TV set, an aging electrolytic. It will take considerably more tracing, be-

cause the malady has not reached such an advanced stage.

The kind of components that can go bad in a hi-fi amplifier are much the same as in any other piece of equipment, but the effects they have can differ because of the complex

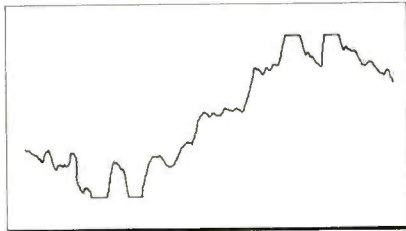


Fig. 1—Symmetrical clipping is usually due to improper conditions in the final stage.

feedback design in many units. Some forms of distortion require careful listening to detect, and equally careful tracing to find and eliminate.

Clipping

Start by looking at the output waveform with an oscilloscope, and listen to it. If the waveform shows signs of clipping, as shown in Fig. 1, at an amplitude much less than the rated-power output of the amplifier, it is obvious that the operating conditions are incorrect. Having ascertained that all tubes are good, check B+ and bias on the output tubes. Next to tubes the greatest upsets are most likely to occur in the final and B+ stages.

Other defects in the amplifier can also produce a similar kind of distortion. The scope can prove quite

useful in tracing the trouble to its source. The early stages in many high-fidelity amplifiers have only a little margin beyond the full value required to drive the output. If resistor values in these earlier stages change and reduce the amplification or signal handling capacity clipping could occur before the output amplifiers: The audible effect is quite similar. The pattern is usually asymmetrical; that is, the clipping occurs on one side only, as shown in Fig. 2.

One thing that often mystifies is the suddenness with which this clipping occurs and the drastic effects which it produces. The amplitude of the feedback signal varies with the

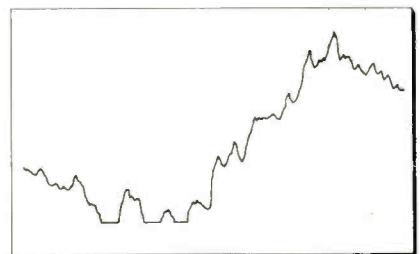


Fig. 2—One-sided clipping is usually caused by an upset prior to the final amplifiers.

amplitude and amplification of the applied signal. Normally the overall gain of an amplifier is reduced when feedback is increased. Conversely, less feedback results in more gain. Clipping which is in reality a limiting action prevents the feedback signal from any further increases, and therefore permits the earlier stages to amplify the already too large a signal even more. The signal

High Fidelity Amplifiers

Clipping, Peaking, Instability and Parasitic Oscillation

is too large, in this case, only because a defect in the amplifier has reduced the signal handling capabilities. It is the combination of these actions that causes clipping to occur suddenly and to an extreme degree.

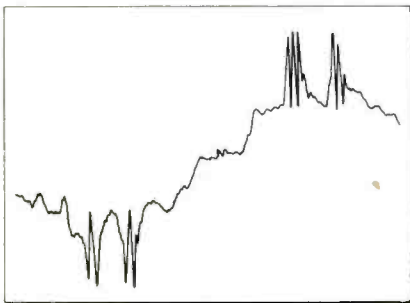


Fig. 3—Clipping prevents the amplitude of the feedback signal from keeping in step and causes peakiness in the earlier stages.

Peaking

This fact can be verified by looking at waveforms in different parts of the amplifier. When clipping occurs, the signal at points ahead of the clipping stage becomes extra peaky, tends to overdrive and adds to the clipping tendency, as shown in Fig. 3.

In some instances this clipping action, which works like a trigger, will be so severe, it will bias back one of the stages and block amplification for a short period, as shown in Fig. 4. Should this be the case, trace the signal with a scope to the point where this effect begins to show up. Probably, ahead of this point, an extra sharpness of the signal may be seen, similar to the

waveform shown in Fig. 3.

Blocking

Having found the place where blocking occurs, check the gain of the stages before and after the point of clipping. In a high-fidelity amplifier, plate and bias voltages are critical. Sometimes serious harmonic distortion occurs because the output tubes are forced to operate as a non-linear amplifier.

Bursts of parasitic oscillation, as shown in Fig. 5, may be due to a

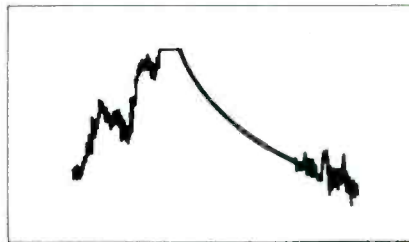


Fig. 4—Momentary blocking action sometimes triggered by sudden loss of feedback.

regenerative or other unstable condition. The most likely cause is a defective smoothing or decoupling capacitor in the B+ line. The capacitor may still have adequate capacitance, but the power factor and leakage values may have depreciated. A small capacitor, about 0.1 μf , connected in parallel, may remove the trouble.

Instability

Another cause of instability may

be due to improper lead dress, particularly in the early stages. Varying the dress while observing the scope may reveal trouble in this direction. It may be necessary to resort to shielding and bonding existing shielded cables. Upsets in the filament string are not always large enough to cause hum, but they can cause an unstable condition.

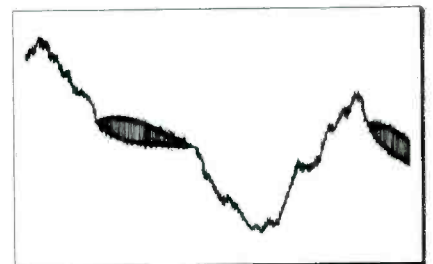


Fig. 5—Parasitic oscillation due to regenerative or other unstable conditions.

One would not normally suspect a phase-correction capacitor because it is small in value and robustly constructed. However, whenever bursts of r-f oscillation occur, it is a good idea to check these small μf capacitors. Sometimes the distortion and frequency response of an amplifier, under test conditions, might check out normal, but will act up on program material only. In the final analysis, it is the listening test that counts.

Hi-fi amplifiers have their quota of tough dogs, the same as any other piece of equipment. All the more reason for a well trained technician and a well equipped shop. •

How To Troubleshoot With

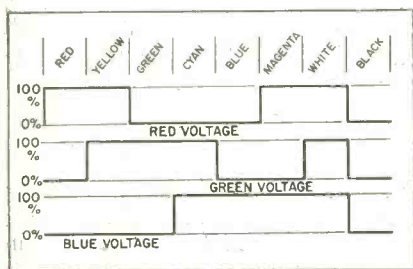
Simplified Procedure For Servicing Color TV Helps Find Troubles

ROBERT G. MIDDLETON

• When a 100% saturated NTSC color-bar pattern is displayed on the screen of a color CRT, the three electron guns will produce either 100% or zero output, depending upon the applied signal, as shown in Fig. 1. Some generators provide 75% saturated color bars, to correspond to a TV station's test pattern. In this case, the red, blue, and green guns will operate at 75% of maximum output.

In addition to variations in color saturation, the sequence and number of color bars will vary from generator-to-generator. Some generators provide only one color-bar signal at a time, as shown in Fig. 2, while others provide: a choice of a simultaneous display of primary and complementary colors, as shown in Fig. 3; or a choice of the individual color-difference test signals, (R-Y), (B-Y), I, and Q; and some instruments, (G-Y) 90° . There are generators which provide a simultaneous display in stair-step form, in which the highest chroma signal appears first and the lowest chroma signal last. All serve the same general purpose. However, there are some classes of service tests in which a given bar sequence may be more useful than another, particu-

Fig. 1—Relative output of each electron gun for a 100% saturated color-bar pattern.



larly when making burst-gating checks.

Burst-Gate Timing

When color sync is erratic, the trouble is sometimes due to mistiming of the burst-gate pulse. A typical circuit arrangement is shown in Fig. 4. The burst should gain entry into the burst-amplifier circuit, but the chrominance signals should not. If the chrominance signal is also admitted into the burst-amplifier circuits, the subcarrier oscillator will no longer sync on the burst alone, but will also try to follow the

chrominance signal. This situation is similar to random sync pulling, which occurs in black-and-white receivers, when the video signal gains entry into the horizontal-phase detector.

To prevent entry of the chrominance signal into the burst-amplifier circuit, the screen is gated. Thus the burst amplifier conducts only during the burst interval. If the gate pulse arrives too late, both chrominance and burst will gain entry. If the

Fig. 3—Complete color-bar signal showing electron-gun output for each color.

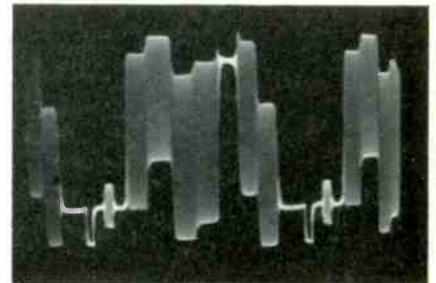
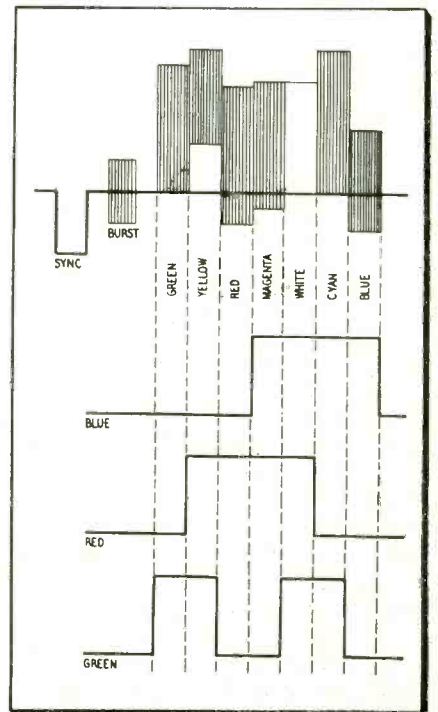
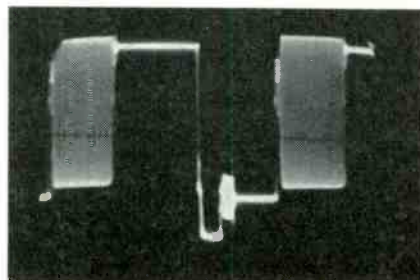
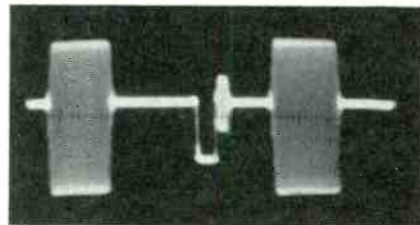
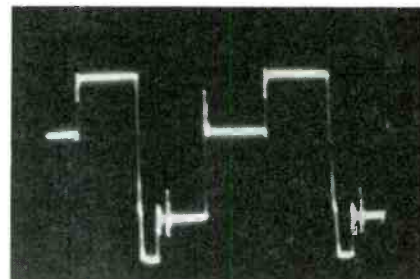


Fig. 2—Waveform from a color-bar generator delivering one signal at a time. The Y signal at the top combines with the chroma signal in the center to make a complete green color bar in the bottom photo.



A Color-Bar Generator

In The Burst-Gate Timing Circuits And Chrominance Channels.

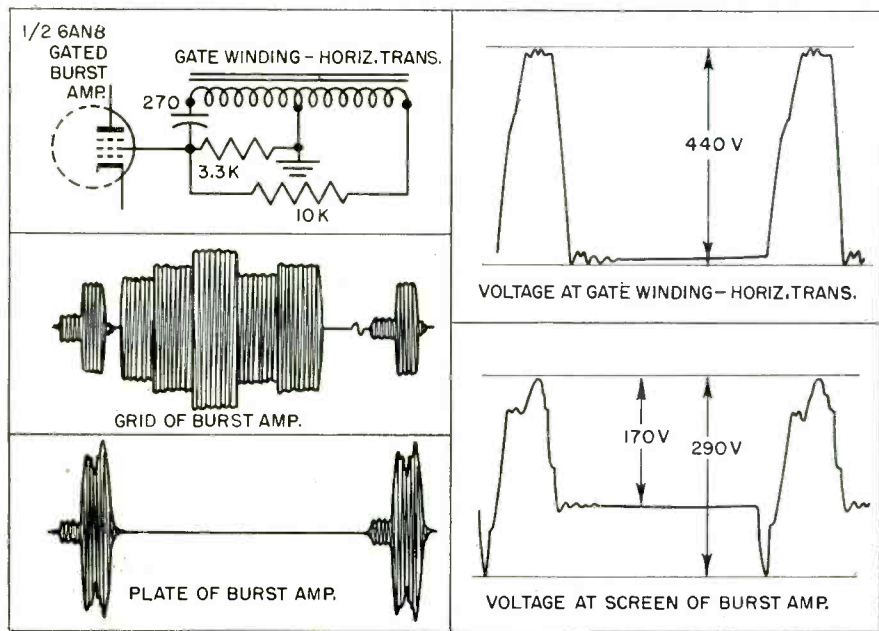


Fig. 4—RC network delays the keying pulse and causes it to coincide with the burst signal.

pulse arrives too early, the burst is distorted and phase shift occurs. The time constant of the two resistors and the capacitor, in Fig. 4, determines the pulse delay time. The pulse arrives at the screen grid when the capacitor is charged. The larger the capacitor, the greater the pulse-delay time. Why pulse delay? The original pulse is obtained from the flyback transformer, and corresponds essentially to the timing of the horizontal-sync pulse. The horizontal sync pulse, however, precedes the time of burst, as shown in Fig. 3. The delay network causes the burst and gate pulse to arrive at the burst-amplifier tube at the same time.

It should now be apparent that circuit faults such as incorrect values of resistors, a leaky capacitor, or a defective winding on the gate section of the flyback transformer will cause incorrect gate timing. When timing is off, color sync be-

comes unstable or is lost completely. When this happens look for; a partial or complete absence of the burst signal; or chroma signal in the burst amplifier.

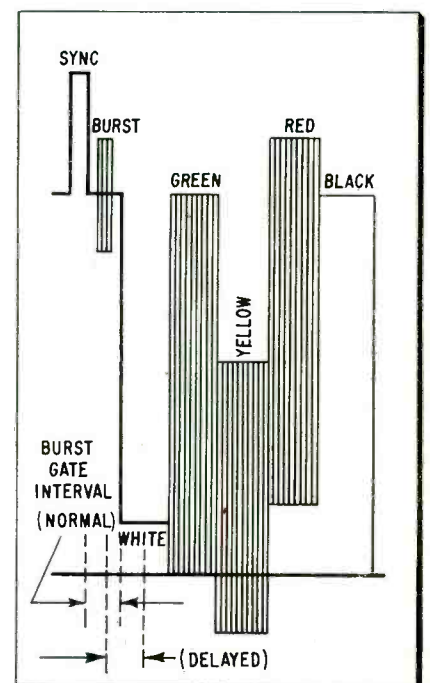
The easiest way to check the timing of the burst-gate pulse is to utilize a suitable color-bar signal. Adjust the color-phasing control to obtain the correct sequence of color bars and reduce the over-all chroma gain of the generator until the bars are approximately 50% saturated. If the burst-gate pulse is properly timed, the color bars will become paler, and no jump in hue will occur. If the burst-gate pulse is delayed and if green chroma gets into the burst-amplifier circuits: the burst-phase detector will respond to the average of the burst phase and the green phase; and if the green-chroma voltage is reduced, the burst-phase detector will receive less green and pull in the direction of burst. This causes a change in hue

of the color bars. The change may be gradual and proportional as the chroma level falls towards the gate threshold. The change will "jump" as the chroma level is reduced still further below the gate threshold. If the hue of the color bars does not remain stable, but drifts or jumps as the chroma-signal level is reduced, look for faulty components in the burst-amplifier gating circuit.

Not any color-bar generator will serve in the foregoing test. Fig. 5 shows a color-bar sequence in which the blanking pedestal is followed by a white bar, and then a green bar, etc. If the burst-gate pulse is abnormally delayed, the delay interval will fall into the white-signal region, and no indication of impaired color sync would be obtained by observing the color-bar pattern as the chroma gain is reduced at the generator. Since the white bar contains

(Continued on page 75)

Fig. 5—Excessive gate delay will not be detected if the white bar is next to the blanking pedestal.



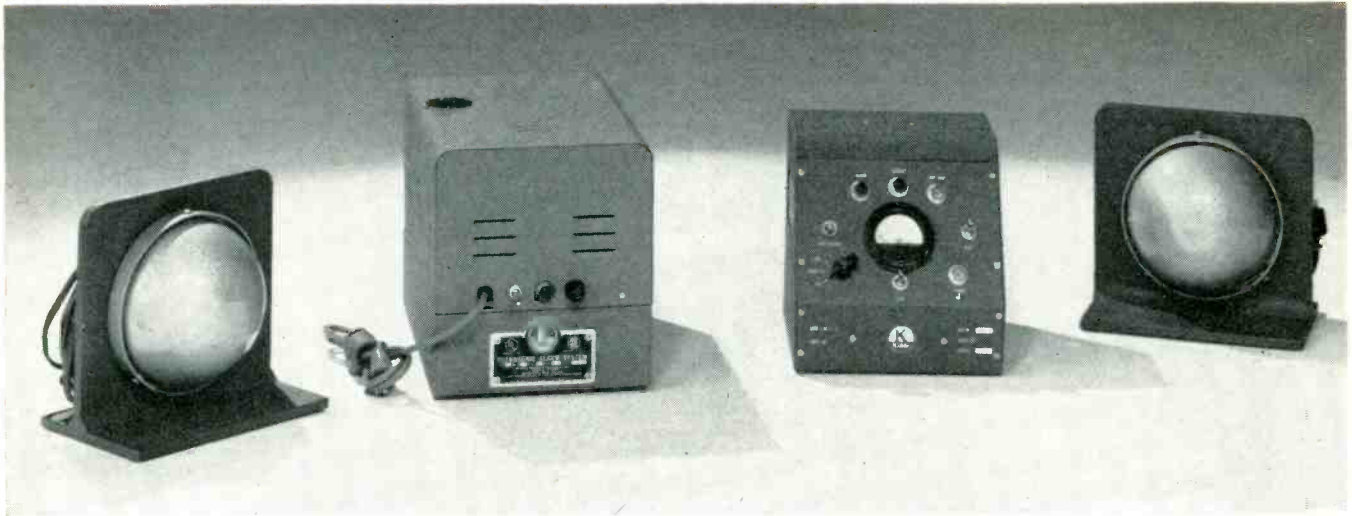


Fig. 1—Ultrasonic-alarm system operates at 19,200 cycles. It includes a transmitter, receiver, master control and a monitor panel.

Ultrasonic Burglar Alarm

Total Area Saturation Technique Provides Maximum Detection.

ALLAN LYTEL
ELECTRONICS LAB.
GENERAL ELECTRIC CO.

• Industrial electronic devices take advantage of just about every facet of our complex electronic age. The burglar alarm, just one of the countless number of children in the electronic family has become a most im-

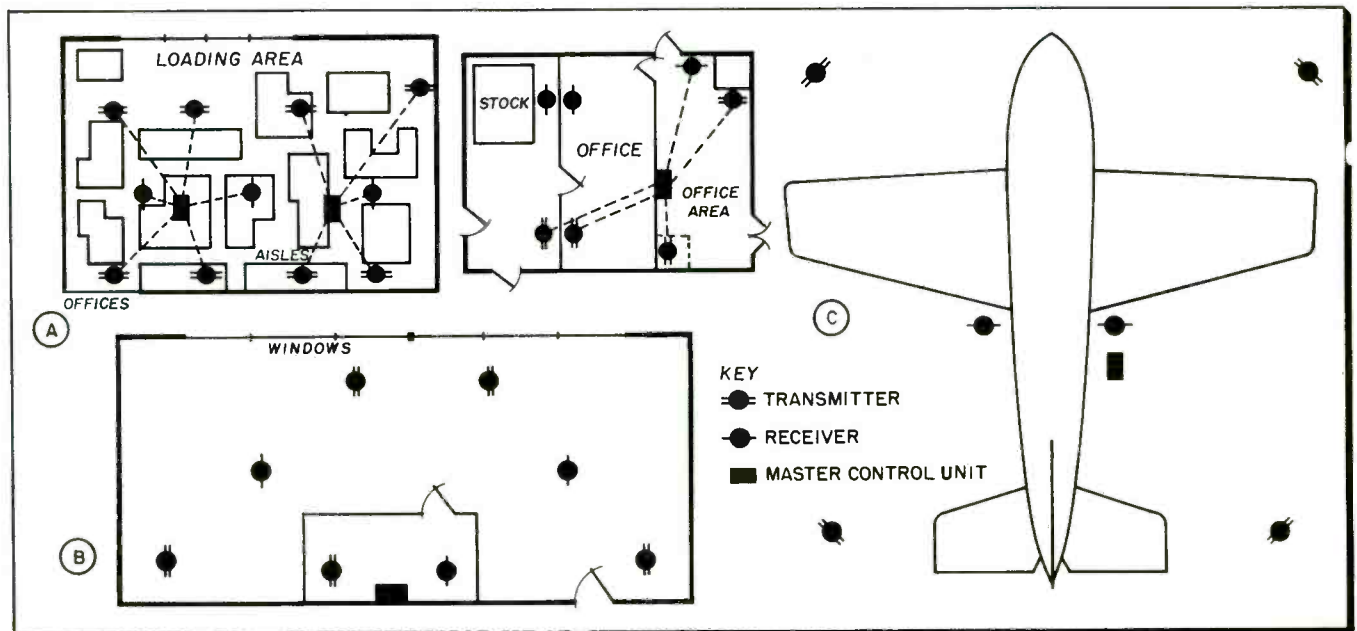
portant industrial device. We have progressed from the simple all-wire, point-to-point, system to the visible-light beam. From there we moved to the light beam that could not be seen, and then to the use of audio listening devices. We now consider the sound wave that cannot be heard. Until the advent of the ultrasonic applications, detection was mostly limited to perimeter or fence-

like protection. The February and October 1957 issues of *ELECTRONIC TECHNICIAN* describe some of the former systems. An entirely different and interesting concept follows.

Ultrasonic Alarm Systems

The Doppler effect and ultrasonic frequencies may be combined to

Fig. 2—Typical installations showing possible locations of equipment for protection of warehouse, drafting room and classified aircraft.



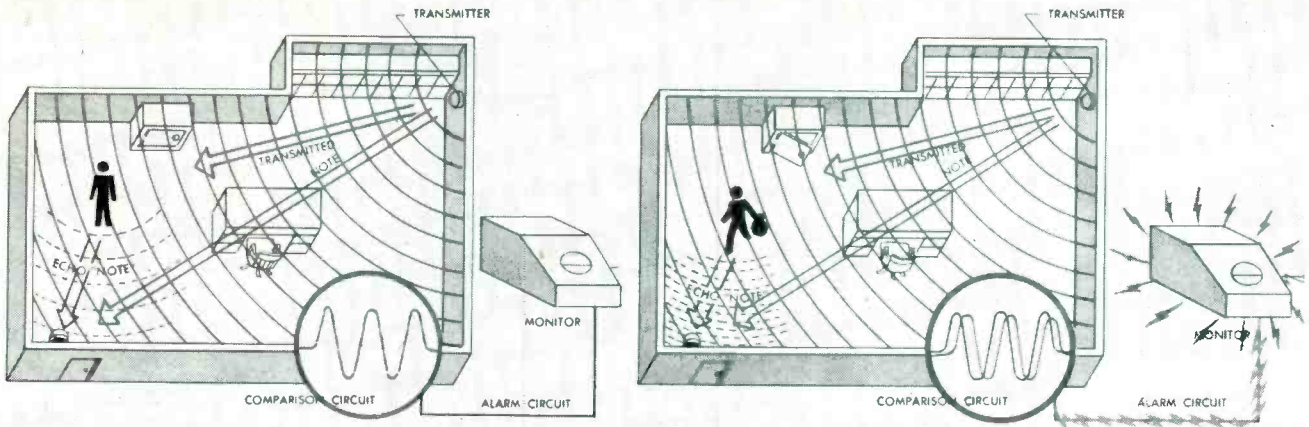


Fig. 3—Frequency of echo and transmitted note are the same in a still atmosphere. Any motion will cause frequency differences.

For Industry Protection

Any Unauthorized Movement, Even Fire Can Energize An Alarm.

make possible a total area protection system. The burglar alarm shown in Fig. 1 produces a "sound" wave of 19,200 cycles which is well above the audible range for most people. This generated signal fills the area to be protected and is picked up by an ultrasonic receiver. Any intrusion or movement in the room, even a fire, could change the frequency of the received signal and

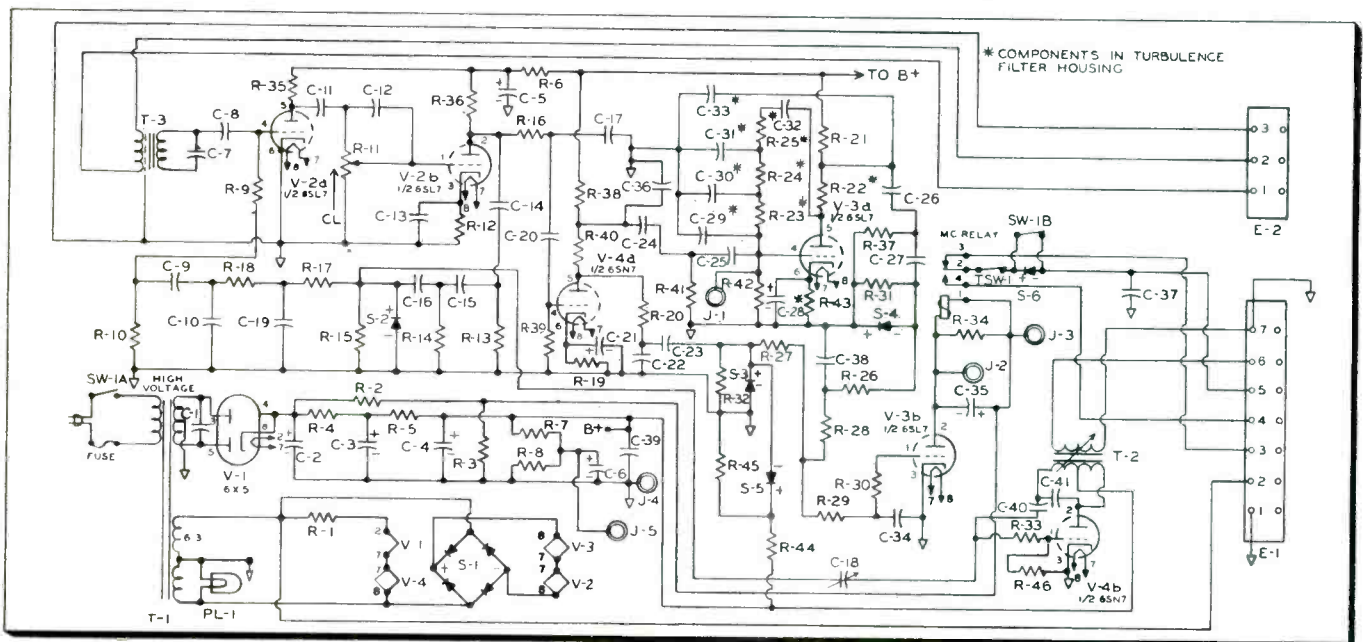
trigger the alarm.

The Doppler effect is usually explained by the train-whistle example. An observer beside a moving train hears the true note of the train whistle. In front of the train he hears a higher frequency because the wavelength appears shorter. In the other sense, an observer behind the train hears a lower frequency because the sound seems to have a

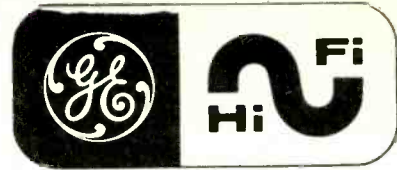
longer wavelength. As long as the distance between a sound source and the listener is changing, no matter which one is moving, there will be a change in the frequency of the sound heard. A person moving toward a 1,000-cycle note at 30 feet-per-second will hear a 1,026-cycle note. Any relative motion between the source and the receiver

(Continued on page 76)

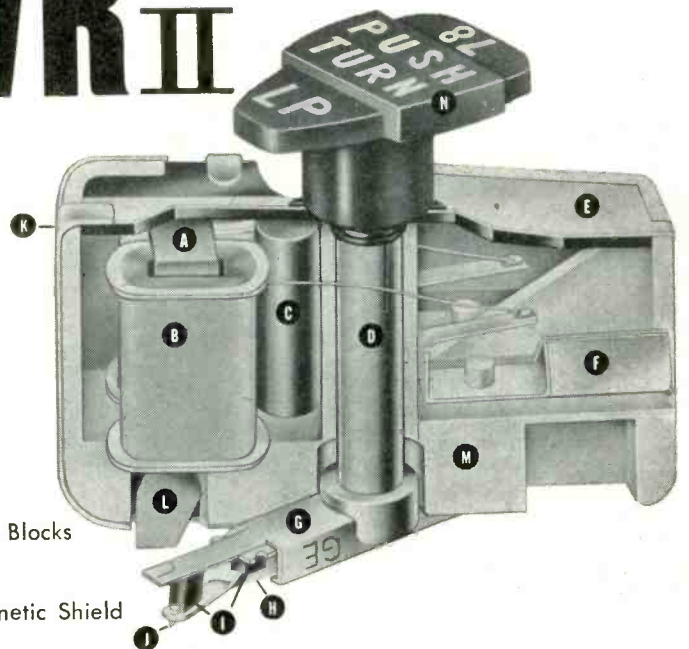
Fig. 4—Master control has oscillator, amplifier, detector, filters, and relay. Tamper proof design assures fool-proof operation.



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Here's how ELECTRONIC TECHNICIAN answers TIME magazine's slanderous attack on the nation's TV repairmen. . . .

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Including 16 pages of
Circuit Digests

Plaza-9-7889

Mr. Roy Alexander, Managing Editor
TIME
9 Rockefeller Plaza
New York 20, N. Y.

October 14, 1957

Dear Mr. Alexander:

The story of servicing in the Oct. 14 issue of TIME was truly a distorted piece of reporting, and a slander of the thousands of repairmen who work long hours for too little income and appreciation. Your half-hearted admission that "the great majority of repairmen are honest enough" is the most important point. Yet you chose to bury this prime fact in the middle of five pages of twisted tales of dishonest and incompetent repairmen and disgruntled homeowners.

A substantial part of your story appears devoted to smearing the TV service technician ("the chiseler's happiest hunting grounds are still in the booming TV industry"). If you would have checked your facts, you would have found that an Elmo Roper survey of TV set owners conducted last year showed that 91% were satisfied with their repair service, 89% reported their calls were answered promptly, and 83% had no price complaint and would call the same TV technician again.

Another proof of widespread customer satisfaction with TV repair is the fact that eight years or so ago three out of four set owners bought service contracts when they purchased their sets. Today, confident that good service is available at reasonable cost from independent technicians in their own communities, TV set buyers -- more than nine out of ten of them -- do not buy service contracts.

Still another fallacy you promote to undermine the TV technician is your erroneous contention that "big companies may control all their own repairs." In very recent months, policy statements by practically all leading manufacturers specifically stated that they have depended upon, and will continue to support, independent service technicians. At best, those few manufacturers who carry on their own TV repair activities account for only a minute portion of servicing on their own sets. . . and generally at a higher price than independent technicians receive.

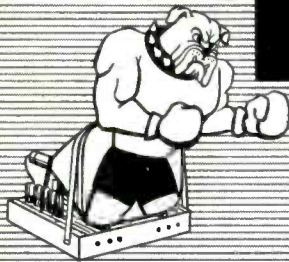
Your dreamy leave-em-laughing last paragraph which looks forward to the day when perfect machines will not need repair is as unreal as many other statements in your article, and reflects your writer's basic lack of understanding of electronic and mechanical devices.

You can well be ashamed of this untidy piece of journalism.

Yours truly,

Albert J. Forman

Albert J. Forman
Editor



"Tough Dog"

Corner



Difficult Service Jobs Described by Readers

Mysterious Vertical Sweep

I came across a real Tough Dog in an Emerson, Model 716F, Chassis 120168-D. I will probably never forget it. The symptoms were severe foldover with large spaces between scanning lines. I never saw a similar symptom.

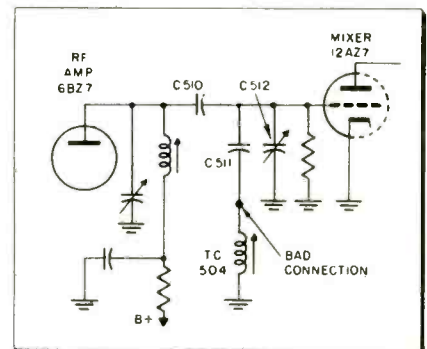
I checked the voltages on the vertical oscillator, and they seemed to be normal. I then checked the wave-shape at the plate of the vertical oscillator. It too looked normal. The waveform at the grid of the vertical-output tube was next, and it seemed a bit irregular. To eliminate the possibility of a leaky coupling capacitor, I disconnected the 0.1 μ f capacitor from the grid of the output tube to check it for leakage. It proved to be OK. But to my amazement even with the capacitor disconnected I was still getting vertical sweep, but with less amplitude. I then checked the grid circuit of the vertical-output tube to see if anything else was coupled to it. The only thing I saw

was the bias resistor to ground. I had already checked the output tube, in fact I had replaced it and was checking the set with a new tube. The only thing I could think of was that ac was getting into the grid circuit and causing the false sweep. The only other way ac could get in was through the cathode or plate. I checked the cathode circuit and found the cathode decoupling capacitor was in the same housing with other filters. Leakage from these B+ filters to capacitor C72 caused ac to be impressed on the cathode and that caused the complaint. Replacing the entire filter block cleared the trouble.—Sid Elliot, Miami, Fla.

In a somewhat similar situation, I repaired a set which had about 50% vertical sweep even with the vertical-output tube removed. An open B+ filter was responsible for a giant sized 120-cycle signal getting into the vertical output transformer. In spite of the B+ ripple, there was no indication of hum in the picture or sound.—Ed

Snowy Picture

The tuner on the Philco RF Chassis R181 was a real tough dog. This trouble was aggravated by the fact that the customer lived 50 miles from the TV stations in the Twin Cities area, and while sound and pix on all channels was acceptable in



Fringe area trouble due to bad connection.

town, it was an entirely different matter in the customer's home.

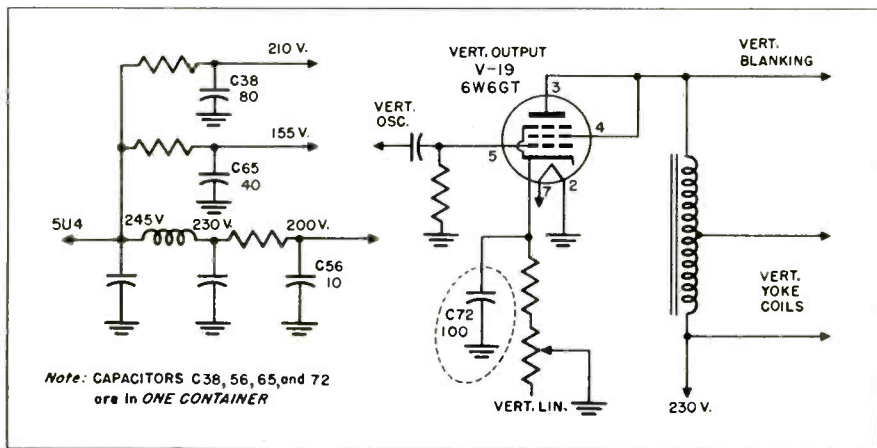
The low Channels 4 and 5 were barely fair while Channels 9 and 11 were extremely snowy and generally unusable. A quick check of the sensitivity of the i-f circuits, after checking all tubes, indicated trouble was probably in the tuner. A very rough check to determine if the trouble is in the mixer or ahead of it, is to pull out the r-f tube and insert a two-foot length of lead into the plate contact in the r-f amplifier socket. This will usually give a

(Continued on page 67)

WIN \$10.00!

ELECTRONIC TECHNICIAN will pay \$10.00 for acceptable Tough Dogs. Unacceptable items will be returned. Use drawing to illustrate wherever necessary. A rough sketch will do as long as it can be followed. Send to "Tough Dog" Editor, ELECTRONIC TECHNICIAN, 480 Lexington Ave., N. Y. 17, N. Y.

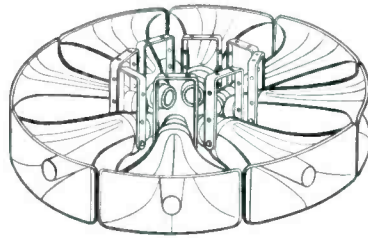
Emerson, Model 716F, Chassis 120168-D, Vertical Output & B+ filter circuits.



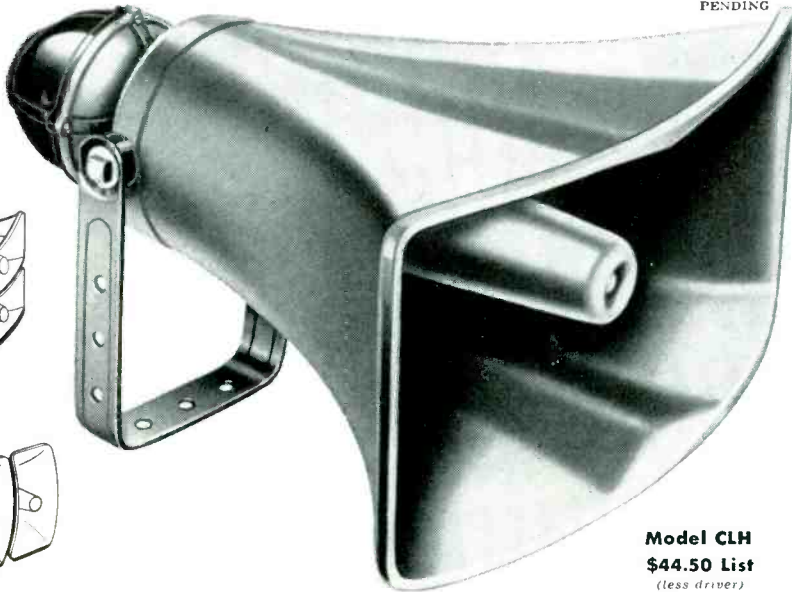
UNIVERSITY ANNOUNCES THE VERSATILE

MODEL

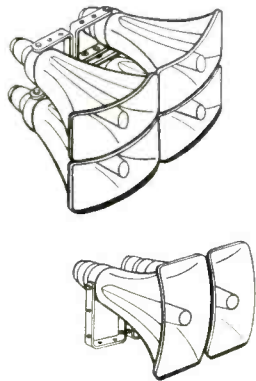
CLH WIDE-ANGLE PROJECTOR



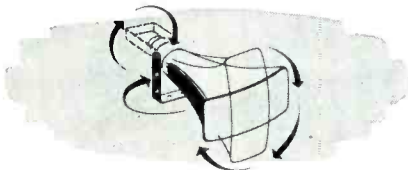
PATENTS
PENDING



Model CLH
\$44.50 List
(less driver)

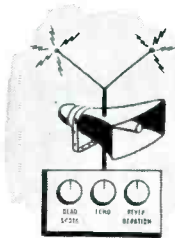


EXCLUSIVE OMNI-DIRECTIONAL MOUNTING



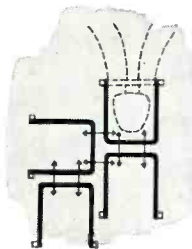
Horn bell rotates full 360° on its axis, while the 'U' mtg. bracket provides better than 180° vertical and 360° horizontal adjustment of projector positioning. Thus, sound can be distributed in any direction regardless of projector location.

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Model PA-50. Features extended high and low frequency range, highest continuous duty power capacity, greatest conversion efficiency, husky built-in multi-match transformer with terminals conveniently located at base of unit. The answer to the toughest sound problem. Nothing finer!

Response: 70 to 10,000 cps. Power Capacity: Full Range 50 watts; Adjusted Range* 100 watts; List Price: \$57.50.



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Response: 70 to 10,000 cps. Power Capacity: Full Range 50 watts; Adjusted Range* 100 watts; List Price: \$47.50.



Model SA-30. "Battleship" construction for maximum durability against abuse or in hazardous environments. Completely die-cast aluminum housing and built-in matching transformer for connection to high impedance lines or "constant voltage" systems.

Response: 80 to 10,000 cps; Power Capacity: Full Range 30 watts; Adjusted Range* 60 watts; List Price: \$47.50.



Model SA-HF. Will deliver that extra punch needed to cut through heavy noise. Use for speech or high quality music.

Response: 80 to 10,000 cps.; Power Capacity: Full Range 30 watts; Adjusted Range* 60 watts; List Price: \$36.00.



Model MA-25. Low in cost, high in quality, featuring high efficiency magnet, tropicalized 2" voice coil, "rim-centered" breakdown-proof bakelite diaphragm.

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*Program response adjusted to horn cut-off.

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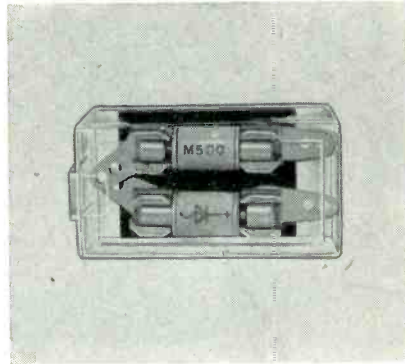
As described in ELECTRONIC TECHNICIAN send me more data on the Sarkes Tarzian M-500 Silicon Rectifier Conversion Kit. (11-5)

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← Sarkes Tarzian RECTIFIER

TV sets and other electronic devices may be quickly and easily rejuvenated by installing the M-500 Silicon Rectifier Conversion Kit. More B + voltage is supplied, thus making brighter, fuller pictures and improving performance of other electronic equipment. Features: small size; low cost; ease of installation; and one model covers the majority of replacements including half-wave and full-wave voltage doublers. Sarkes Tarzian, Inc., 415 North College Ave., Bloomington, Ind. (ELECTRONIC TECHNICIAN 11-5)

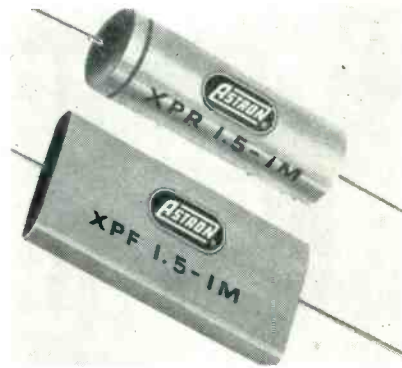
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← Astron CAPACITORS

Capacitors, type XPR and XPF, are designed for applications requiring minimum size, high insulation resistance and exceptional capacitance stability. A Mylar polyester outer wrap affords good protection against moisture, its ends being sealed with a plastic thermosetting resin. Voltage rating is 150 V at 85° C, 100 V at 125° C. The new series is available in flat and round construction. Astron Corp., 255 Grant Ave., East Newark, N. J. (ELECTRONIC TECHNICIAN 11-6)

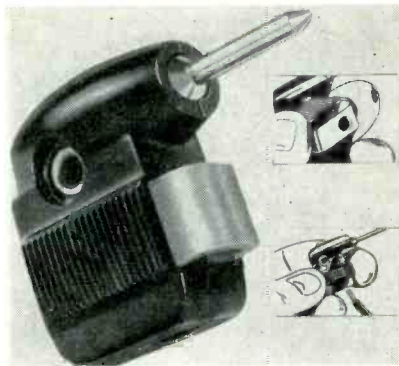
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← G-C TEST PRODS

The handy new contacts are called "Trigger Qwik" and are designed for easy and instant connections. The new solderless contact is the simplest method of preparing wires for test leads. To make a connection, pull the trigger on the gun shaped body and insert the stripped end of the wire. Release the trigger and a solid contact is made. They are available in red and black. List price \$1.20 for a kit of 2. General Cement Mfg. Co., 400 S. Wyman St., Rockford, Ill. (ELECTRONIC TECHNICIAN 11-7)

As described in ELECTRONIC TECHNICIAN send me more data on the Sightmaster Fuse Kit. (11-8)

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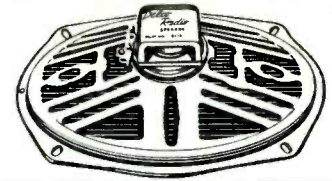


← Sightmaster KITS

All purpose, pocket sized, plastic fuse box for use by electronic technicians will be suitable for many different purposes after the fuses have been used. A series of clear plastic boxes will be made available which will carry separate identifications and serve several different functions. The dimensions are 4½" long, 3½" wide and ⅝" high. The kit contains 60 fuses covering the most popular sizes. Sightmaster Corp., New Rochelle, N. Y. (ELECTRONIC TECHNICIAN 11-8)

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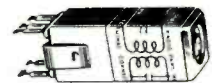
CAPACITORS



CONTROLS



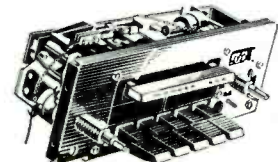
TUBES



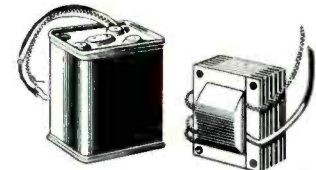
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City

State

As described in ELECTRONIC TECHNICIAN send me more data on the Webster Electric Co. Ceramic Cartridge-needle Combination V-8 line. (11-2)

Name

Address

Company

City

State

As described in ELECTRONIC TECHNICIAN send me more data on the V-M Tape-O-Matic Stereo-playback Portable Tape Recorder. (11-3)

Name

Address

Company

City

State

As described in ELECTRONIC TECHNICIAN send me more data on the Rek-O-Kut Portable Record Player Models L-34 and CVS-12 (11-4)

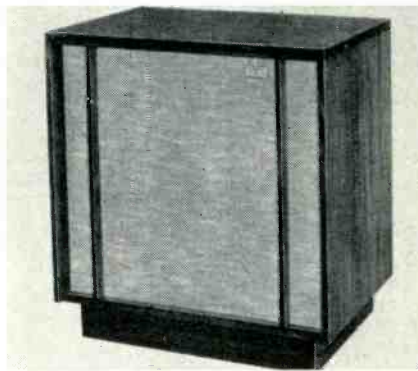
Name

Address

Company

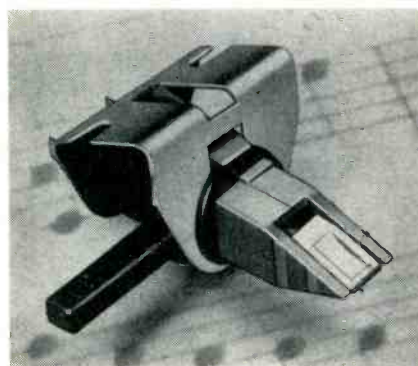
City

State



← Pilot SPEAKER SYSTEM

The Model S-121 is an acoustically matched 5-speaker, 4-channel system, consisting of a: 12" woofer in dynamically vented baffle; 8" low mid-range; 6" upper mid-range; and two 3" tweeters. It also features a separate treble balance control. Some of the specifications are: Input impedance 8 ohms; frequency response 35-20,000 cycles; maximum power 25 watts; fundamental resonance under 35 cycles. Pilot Radio Corp., 37-06 36 St., Long Island City 1, N. Y. (ELECTRONIC TECHNICIAN 11-1)



← Webster CARTRIDGE

Ceramic cartridge-needles combination units will replace a wide range of existing two needle turn-under and 2-mil single needle cartridges. Needles are high quality, synthetic sapphire tipped, one and three mil diameter. Also available are a combination 1 mil diamond and 3 mil sapphire. Specifications: Response 30 to 15,000 cps; tracking pressure 8 to 10 grams; output up to 1 volt; ceramic or nylon covered. Webster Electric Co., Racine, Wis. (ELECTRONIC TECHNICIAN 11-2)



← V-M TAPE RECORDER

The tape-o-matic stereo-play Model 711 has undergone a complete face lifting. It is a complete dual-track, dual-speed monaural tape recorder and also plays staggered-heads recorded stereo tapes. An inexpensive conversion kit adapts it to play stacked-heads stereo tapes as well. Features: 6" x 9" speaker, 3.5" tweeter, push-button control, "pause" button, monitor switch and precision index counter. V-M Corporation, 280 Park St., Benton Harbor, Mich. (ELECTRONIC TECHNICIAN 11-3)



← Rek-O-Kut RECORD PLAYER

A portable high-fidelity record player and the A-120 arm has now been combined. The units are equipped with dual-sapphire needles and either ceramic or magnetic cartridges. The L-34 plays at 33 and 45 rpm, while the CVS-12, shown in photo, permits continuous speed variations from 25 to 100 rpm without resetting or stopping a record. Operates on 110-120 volts, 60-cycle ac operation. Rek-O-Kut, Inc., 38-19 108th St., Corona 68, L. I. N. Y. (ELECTRONIC TECHNICIAN 11-4)

SHOP HINTS

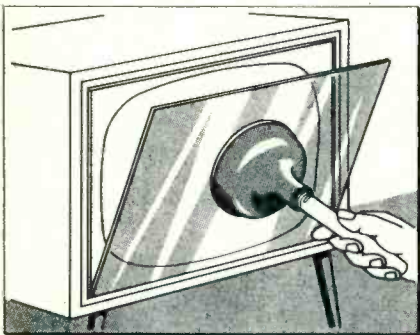


Tips for Home and Bench Service

Safety-Glass Removal

Many sets have provision for removing the safety glass from the front for cleaning. There is usually no way to grasp it, and prying with a screw driver may crack or chip the edge.

Removal of the glass is even more of a problem when it is stuck in place. If the glass does not come away easily, perform a thorough examination to make sure that all removable retainers have been removed. If the glass is still stuck in



Remove by tilting the top and then lifting.

place, then a plumber's helper may be used as a suction cup to provide a good hold.

Most glass is removed by tilting the top out and then lifting up. Exercise care and good judgment if the glass persists in staying put. A wrong move could prove to be costly and dangerous. In extreme cases, it may be better to pull the chassis and remove the CRT. In the field, large suction cups used on car-top carriers, are also suitable.

Glaziers have special types of suction cups equipped with a lever. This makes it unnecessary to apply inward pressure to force out the air and is an added safety factor.—*John Nahirny, Hamilton, Ontario, Canada.*

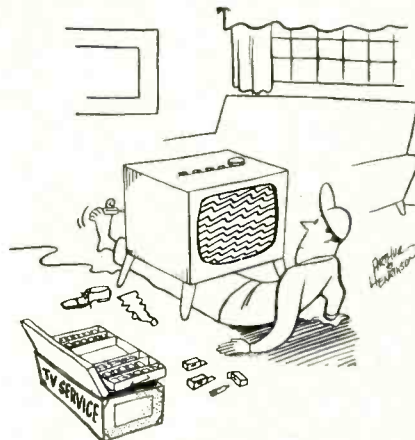
CRT Spots

Most spot eliminator circuits for receivers with magnetic-focus type picture tubes utilize a switch in the brightness control circuit to defocus or extinguish the beam when the receiver is turned off. Occasionally the technician gets a request to eliminate this spot or afterglow on the screen of a receiver which does not have the spot eliminator switch. Connect a 500 megohm resistor between the second-anode lead and the chassis. In most cases the trouble can be eliminated without taking the chassis out of the cabinet.

Some of the picture tubes used in the latest TV receivers are of the straight-gun type (do not use a beam bender) and have a high-capacity rating. These two characteristics increase the need for observance of correct service procedures at all times while checking or repairing the receivers. It is especially important that the sweep circuits should never be disabled while the picture tube is in the circuit, or damage to the phosphor screen may result. The screen damage may appear as a burn or a chip in the phosphor and will usually be located near

the center of the screen. The damage can occur in twenty or thirty seconds and therefore does not allow for the margin of error in service procedures which could be tolerated with the older picture tube types. The overall improved characteristics of these new picture tube types result in greatly improved performance, and it is therefore desirable to use them. Since the necessary service procedure includes standard practices normally recommended for the service of all receivers, no new problem is presented. However, turn the set off before pulling tubes in the oscillator or sweep circuits of the chassis. This includes other tubes which might disable the oscillator or sweep circuits (damper, sync, or control tubes).

Do not unplug the yoke from a chassis while the receiver is turned on. Disconnect the second anode lead (high voltage) and discharge the second anode of the picture tube to ground before turning on a receiver which has the yoke disconnected or removed from its normal position on the picture tube neck. Do not trust to luck in switching tubes. Picture tube damage could develop during the short time required for the tube to be replaced and heat up to its normal operating condition. — *Hoffman Electronics Corp., Los Angeles, Calif.*

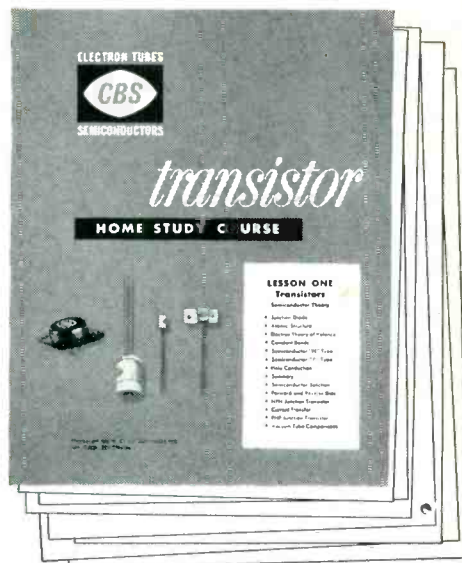


\$\$ FOR YOUR IDEAS!

Shop Hints wanted. ELECTRONIC TECHNICIAN will pay from \$3 to \$10 for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do as long as it can be followed. Photos are desirable. The amount paid will depend upon how original and practical the idea is. Unacceptable items will be returned. Send your entries to "Shop Hints" Editor, ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

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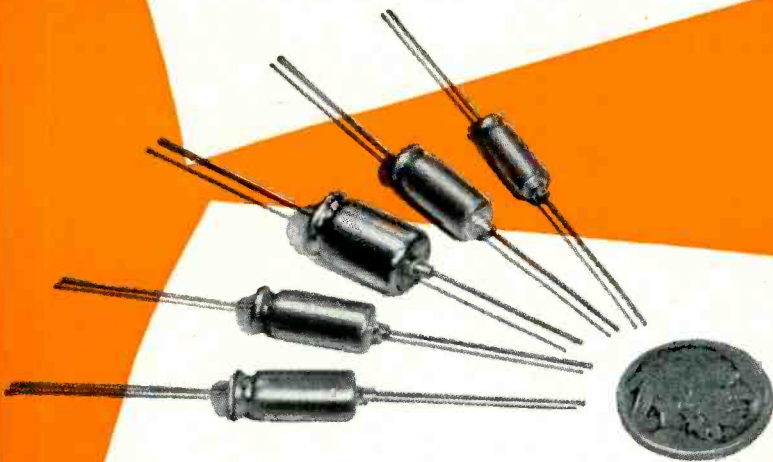


CBS-HYTRON, Danvers, Mass.
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New Miniature Electrolytics

Mallory quality
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Here's a brand new line of Mallory subminiature electrolytic capacitors. Known as the TT series, they offer a complete range of aluminum cased electrolytics featuring Mallory quality at moderate cost.

These tiny capacitors are especially well suited for replacement service in compact portable radios. The electrical characteristics make them ideal for transistor circuitry and for all battery operated equipment.

Mallory TT Capacitors are available in a complete range of capacities and voltages—from 1 to 110 mfd., and from 1 to 50 volts working. The tiniest of the line measures only $\frac{3}{16}$ " diameter by $\frac{1}{2}$ " long.

For rugged, subminiature replacement capacitors, depend on the new Mallory TT series—complete information is available through your local Mallory Distributor. See him today—for all your electronic component needs.



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Personal Profile

(Continued from page 35)

most expensive home turned out to be a \$56,000 combination house and farm.

Value	% Owning
Under \$5000	4.9%
\$5000 to \$9999	15.9%
\$10,000 to \$14,999	41.4%
\$15,000 to \$19,999	25.6%
\$20,000 to \$29,999	8.5%
\$30,000 and over	3.7%

Rent

Though 29.0% do not own their homes, only 21.5% pay rent (the difference is probably attributable to the men who live with parents or relatives). The average rent is \$60.20.

Of all who rent living space, 38.5% pay \$30 to \$49 monthly; 34.6% pay \$50 to \$69; 11.6% pay \$70 to \$89; and 15.3% pay \$90 to \$130.

Family Car

64.8% of electronic technicians who own cars (and that includes 98% of all technicians) bought them brand new; 35.2% bought them second hand. A 1955 moderately priced car is in the typical technician garage.

Though 16 different car makes were reported, the favorite few were:

Make	% Bought New	% Bought Used
Ford	21.0%	7.6%
Chevrolet	11.8%	7.6%
Oldsmobile	6.7%	8%
Plymouth	5.9%	5.9%
Pontiac	5.9%	1.7%
11 others	14.5%	11.6%
Total	64.8%	35.2%

Stock Ownership

83.8% of electronic technicians do not own any stock in any national corporation; 16.2% do own such stock. Of all who do own stock, 80.0% own \$2000 or less. \$10,000 worth was the highest reported.

Savings

The average nest egg of bank savings and government bonds totals \$3060; median is \$2000. These figures are based on 59.6% of all technicians reporting; the remaining 40.4% either have no savings or neglected to report it.

For those who reported savings, the breakdown is:

Savings

Under \$1000
 \$1000 to \$1999
 \$2000 to \$2999
 \$3000 to \$3999
 \$4000 to \$4999
 \$5000 to \$9999
 \$10,000 to \$19,999
 \$20,000 to \$30,000

% Technicians

27.8%
 31.9%
 12.5%
 9.8%
5.5%
 4.2%
 4.2%
 4.1%

Life Insurance

87.5% of our readers reported an average life insurance coverage of \$10,222; median is \$10,000. Break-down is:

Insurance

Under \$5000
 \$5000 to \$9999
 \$10,000 to \$14,999
 \$15,000 to \$19,999
 \$20,000 to \$29,999
 \$30,000 to \$47,000

% Technicians

17.9%
 30.4%
 28.6%
 10.7%
 8.9%
 3.5%

Politics

At the polls, technicians are fairly evenly divided. 48.3% are Republicans, 47.2% are Democrats. The remaining 4.5% are mostly independents with some Liberals.

Hobbies

When it comes to hobby recreation, the outdoors are strongly favored. 29.2% of all hobbies mentioned included fishing and/or hunting. 9.3% related to radio-TV-electronics. Travel and driving were next with 7.0%, music and records followed with 5.8%, and photography gathered 5.2% of the votes.

Hobbies receiving about 4% of mentions were boating, amateur radio and reading; close to 3.5% for bowling and gardening; under 2.5% for auto mechanics, cards, wood-working, flying and golf; under 2% for archery, model airplanes and swimming. All told, over three dozen different hobbies were noted.

Each technician, on the average, noted 1.4 hobbies. 11.4% reported no hobbies; 49.6% one hobby; 25.7% two hobbies; 11.6% three hobbies; and 1.7% reported four.

Magazines

We asked our readers how many technical magazines they subscribe to, not necessarily restricted to the electronic maintenance field. The average was 3.5 magazines (by selection of cross section, 100% subscribed to Electronic Technician).

7.7% subscribe only to one magazine; 24.8% to two; 23.9% to three; 21.3% to four; 22.3% to five or more. The record high was the avid reader who received 10 technical magazines.

(Continued on page 57)

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As described in ELECTRONIC TECHNICIAN send me more data on the AVO Hand-Calibrated Multimeter Model 8. (11-9)

Name

Address

Company

City State



← AVO MULTIMETERS

Each instrument is hand-calibrated against precise standards and is extremely stable, eliminating the need for frequent recalibration. Sensitivity is 20,000 ohms-per-volt. Twenty-nine ranges cover a-c and d-c voltages from 2½ to 2500 volts; d-c currents from 50 µa to 10 amperes; a-c currents from 0.1 to 10 amperes; resistance readings from 0.5 ohms to 20 megohms. Accessories are available to extend the ranges. British Industries Corp., Dept. K31, Port Washington, N. Y. (ELECTRONIC TECHNICIAN 11-9)

As described in ELECTRONIC TECHNICIAN send me more data on the Heathkit In-Circuit Capaci-tester Model CT-1 (11-10)

Name

Address

Company

City State



← Heath CAPACI-TESTER

With the new Model CT-1, most capacitors can be checked for "open" or "short" right in the circuit without disconnecting any leads. The capaci-tester can detect open capacitors from about 50 µf up, so long as the capacitor is not shunted by an excessively low resistance value. It can detect shorted capacitors up to 20 µf (not shunted by less than 10 ohms). 60 cycles and 14 megacycles are used as test frequencies. Price \$7.95. Heath Company, 305 Territorial Rd., Benton Harbor, Mich. (ELECTRONIC TECHNICIAN 11-10)

As described in ELECTRONIC TECHNICIAN send me more data on the Injectorall Tuner Cleaner with Injector Needle. (11-11)

Name

Address

Company

City State



← Injectorall CLEANER

Tuner cleaner and lubricant with injection needle is designed to save time and chemicals in cleaning tuners and controls. Aerosol dispenser assures easy application. The long injector needle enables the technician to reach hidden wafer contacts, and get inside welded tuners without taking them apart. A new wax-free lubricant added to the non-toxic cleaner keeps tuners lubricated. Injectorall Co., 2081 Shore Parkway, Brooklyn 14, N. Y. (ELECTRONIC TECHNICIAN 11-11)

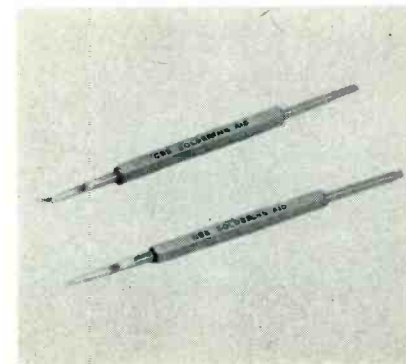
As described in ELECTRONIC TECHNICIAN send me more data on the CBS Printed Circuit Soldering Aids. (11-12)

Name

Address

Company

City State



← CBS SOLDERING AIDS

Two miniaturized soldering aids for printed circuits, one with straight tip, the other with angled tip, are especially designed for servicing the compact and delicate printed boards of modern miniaturized equipment. The fork end, like two tiny metal fingers, disconnects soldered joints. The spade end reams solder from lug holes. Tips withstand heat and shed solder. CBS-Hytron, A Division of Columbia Broadcasting System, Inc., Danvers, Mass. (ELECTRONIC TECHNICIAN 11-12)

(Continued from page 55)

Books

Mr. Technician is not only a substantial magazine reader, but a devoted book reader. He averages 6.0 technical books and 12.6 non-technical books each year.

22.6% of those reporting read more than the average of 6 technical books, the record high claimed by a man who read 50 annually. 19.8% did not read any or failed to report it.

22.4% read more than the average non-technical books, but 44.7% did not report any.

National Idols

We asked: Which world renowned person do you respect most highly. Ike won in a walk-away. 42.1% cited Pres. Eisenhower. Gen. Douglas MacArthur ran second with 6.6%, and the following had a bit over 5%: Winston Churchill, Herbert Hoover and Billy Graham. The 4% range included Franklin D. Roosevelt, Pope Pius and Bernard Baruch. Those with something over 2.5% of mentions were Harry Truman, Fulton Sheen and Nehru. A dozen others received occasional mention.




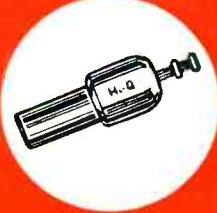
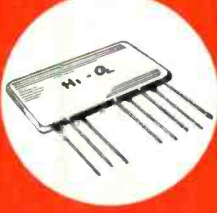

Favorite Performers

With technicians who know their actresses best, it's Marilyn Monroe 2-to-1. MM received 11.3% of the vote, while runners-up Doris Day and Jane Wyman pulled about 6.5%. Close behind were Ingrid Bergman, Kim Novak and Loretta Young, followed by Bette Davis, Rhonda Fleming, Audrey Hepburn, Helen Hayes, Jayne Mansfield, Donna Reed and Gail Storm. A few dozen others also ran. One sentimental old-timer cast his vote for Clara Bow.

He-men Gary Cooper and John Wayne led other actors with 12.1% and 9.5%, respectively. At about 5.5% we have Bing Crosby and James Stewart; at 4% there's Cary Grant, Clark Gable, Spencer Tracy and Clint (Cheyenne) Walker. Next came Randolph Scott, Hugh (Wyatt Earp) O'Brian, Ernie Ford and Rock Hudson. Several dozen others brought up the rear, including one for Rudolph Valentino.

Summary

There you have today's electronic technician, his family, his finances, his interests and his person . . . all in all a pretty solid citizen. He's experienced, financially fairly stable, happy in his work, and a typical American father and husband. •

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Right Or Wrong

In Labor Relations

A roundup of day-to-day employee problems and how they were handled by management. Each incident is taken from a true-life grievance which went to arbitration. Names of some principals involved have been changed.

MUST YOU PAY AN EMPLOYEE FOR A HOLIDAY IF HE WAS LAID OFF FOR LACK OF WORK THE DAY BEFORE?

What Happened:

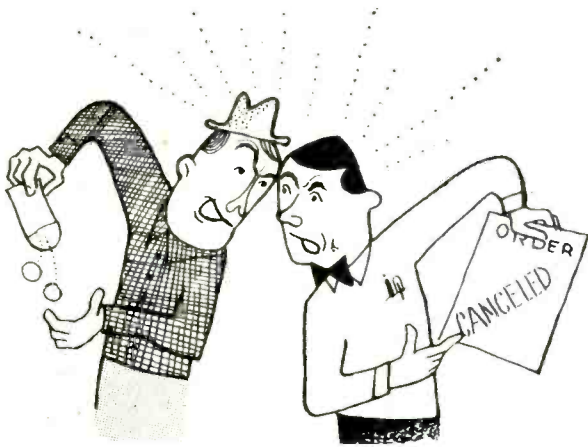
The company rule required that employees work the day before a holiday in order to get holiday pay. The men were looking forward to Thanksgiving Week because it was a short week with a full week's pay. Unfortunately, a big order was suddenly cancelled and the employer had to announce a lay-off beginning the day before Thanksgiving and lasting for a couple of weeks. When the pay checks for the period were distributed, the workers found that they weren't paid for the Thanksgiving Day holiday. When the employer pointed out the rule about working the day before a holiday in order to be eligible for holiday pay, the employees replied that they were ready, willing and able to work that day and that the lay-off was no fault of theirs. The company answered, "We were also ready to provide work until that unforeseen cancellation from a customer which was beyond our control. The rule has been in practice for a long time, and we are going to stick to it." This was not satisfactory to the workers, and they took the grievance to arbitration when they returned to work after the lay-off.

Were The Workers: RIGHT WRONG

What Arbitrator Ross O. Runnells ruled: "The rule that employees must work the day before and the day after a holiday is commonly employed in American industry. Its purpose is to dissuade employees from extending a holiday period and making it difficult or impossible for



the employer to schedule and carry on his business. In this case the employees were, to all intents and purposes, available and willing to work the required day. An unavoidable lay off caused their absence the day before Thanksgiving. Since their failure to work was in no way caused by any action of the employees concerned, it is obviously unfair to deprive them of holiday pay. All regular employees who were on the payroll and normally scheduled to work the day preceding the holiday should receive pay for Thanksgiving Day."



MUST YOU TAKE AN EMPLOYEE BACK THE VERY DAY HE SHOWS UP AFTER A LEAVE OF ABSENCE?

What Happened:

Burt Lewis, a regular employee, went to his department head and asked for six months off to go out West and straighten out the affairs of his father, who had just died. The leave was granted as the supervisor felt Lewis had a good reason, and he could be spared with some re-scheduling. Just before the expiration of the six-month period, Lewis showed up in the department one morning, ready to work. Just that day, the department head had left on vacation. The man in charge told Lewis he didn't have authority to rearrange the work schedules, and Lewis would have to wait for the head man to get back—about two weeks. Lewis wasn't happy about this, as he was anxious to get back on the payroll. But the man in charge wouldn't sign his reemployment slip. When the head of the department returned, Lewis went to see him, and was put to work at once. Shortly thereafter, Lewis filed a grievance, asking for pay for the two weeks he had waited. When the case went to arbitration, Lewis argued:

1. Six months was the maximum he had requested, and no mention was made of a minimum period.
2. He was not told in advance that prior notice of his return was needed.

The company replied:

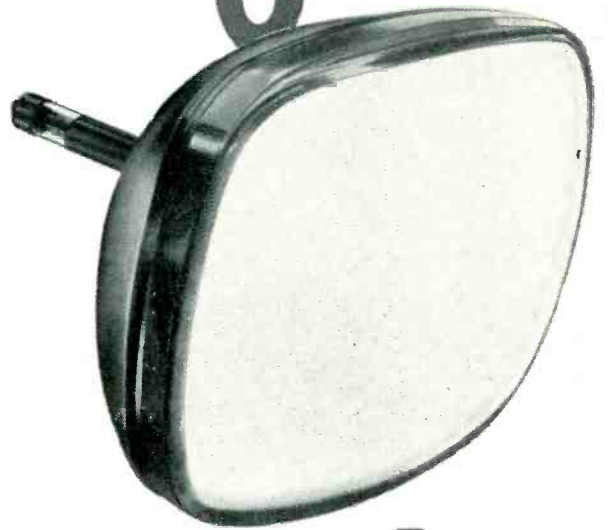
1. The leave and its terms was for the company to establish.
2. After such a long leave, the company needs notice of intention to return in order to integrate the employee into the work force.

Was The Worker: RIGHT WRONG

What Arbitrator Sidney A. Wolff ruled: "It seems to me that after being away on leave of absence for close to six months, it would be unfair to impose upon this company

(Continued on page 63)

FOR A brighter



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TV's Circuits

(Continued from page 37)

mately the same value it originally had. The reverse occurs when the age voltage decreases.

Tubes in these voltage regulating circuits seldom have an exact substitute replacement. For example, a 6V6 or 6K6 is not a substitute for a

6W6 in this type of audio circuit, even though all three may appear to perform alike. 6W6 tubes are specially designed to operate at low plate-to-cathode potentials; while the 6V6 and 6K6 are designed to operate at about twice that voltage. Other tube differences are likely to result in poor regulation.

If the audio output tube should fail, both the audio and video would be missing. Some TV receivers lost focus and video and still had sound, resulting in the oddly logical posi-

tion of replacing an audio tube to restore the picture, and clarity.

If either filter C3 or C4 opens, it would cause hum in the sound and possibly sound bars in the video. A shorted or leaky capacitor, C3, will place an excessively high voltage on the r-f and i-f tubes.

Voltage checking these circuits is best performed in two steps. First the audio tube plate and cathode voltages are measured from common ground. Then the screen, plate and grid voltages are measured from the cathode. The first step checks for proper B+ supply and divider voltages; the second for proper operating conditions of the audio tube.

It is advisable to take measurements from the tube's cathode because it permits the use of a smaller range when checking grid bias. If the ground were used to determine grid voltage, a reading would have to be taken from the grid and cathode, and then subtracted from each other.

Peaking Coils

The series and shunt peaking coils found in the video amplifier, as shown in Fig. 6, help develop a sharp picture. They make it possible for the video amplifier and associated circuits to maintain a high-frequency response.

Loss of high frequency response results in loss of fine detail as shown in Fig. 7. The peaking coils were shorted for the benefit of this photo. Note the added detail in Fig. 8, when the short was removed.

Overpeaking or over amplification of the high frequencies are also undesirable. This condition manifests itself as ringing, as shown in Fig. 9. This could happen if the peaking coil's shunt resistor were to open. The resistor is used to broaden the frequency response by lowering the Q of the coil.

An open resistor can not be easily checked because it is shunted by a low-resistance coil. The coil is usually wound around its body; making it a little difficult to disconnect it for an ohmmeter check. If overpeaking is the symptom, shunt with another resistor of equal value.

Open peaking coils, on the other hand, are easily checked. An ohmmeter check across the coil will show a reading of several thousand ohms, instead of the normal five-to-fifteen ohms.

Peaking coils having shorted turns will not respond to an ohmmeter check. Therefore, temporary replacement, not bridging, is the only reliable test. •

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Thousands of servicemen today make money and keep customer good-will by checking and correcting b&w picture tube troubles with the famous B&K CRT 400, right in the home without removing tube from set. Restores emission and brightness. Repairs inter-element shorts and open circuits. Checks leakage. Indicates picture quality customer can expect. Life Test checks gas content and predicts remaining useful life of picture tube. Makes new picture tube replacement sales easier!
Model 400 (without adapter) Net, \$5995

NEW MODEL C40 ADAPTER DOUBLES VALUE OF B&K CRT
Designed for use with all B&K Models 400 and 350 CRT's. Makes it easy to test and rejuvenate TV color picture tubes and 110° picture tubes. Isolates and detects difficult color troubles. Tests and rejuvenates each gun of the color picture tube separately the same way as a black & white tube.
Model C40 Adapter Net, \$995

See your B&K distributor, or write for Bulletin 400-C40-T.

Makers of CRT, DYNA-QUIK, DYNA-SCAN and CALIBRATOR

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Model EFB \$99.50 Net

New! Super-Filtered DC for transistor design work

Less than 15 millivolts AC ripple up to max. load

DC Power...for precision laboratory and design work

- Dual range — 0-32 volts up to 4 amperes
0-16 volts up to 8 amperes
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- Smooth voltage control with continuously variable carbon brush-type auto transformer
- Long-life selenium rectifiers—patented heat sink cooling

Model EB dual range DC Power Supply, same as above except 5% ripple.



Model D-612T \$44.95 Net

First to service all 3:

1. Transistor and hybrid auto radios
2. Transistor portable radios
3. Tube auto radios

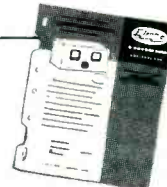
Improved D-612T ... better than ever — same low price

- Dual range — 0-8 volts, 0-16 volts, continuously variable
- Up to 22½ volts available for transistor portable radio loads
- 1/10% AC ripple for low current loads — ½% AC ripple up to 5 amperes
- 10 amperes continuous duty up to 12 volts
- 20 amperes intermittent service

ELECTRO PRODUCTS LABORATORIES

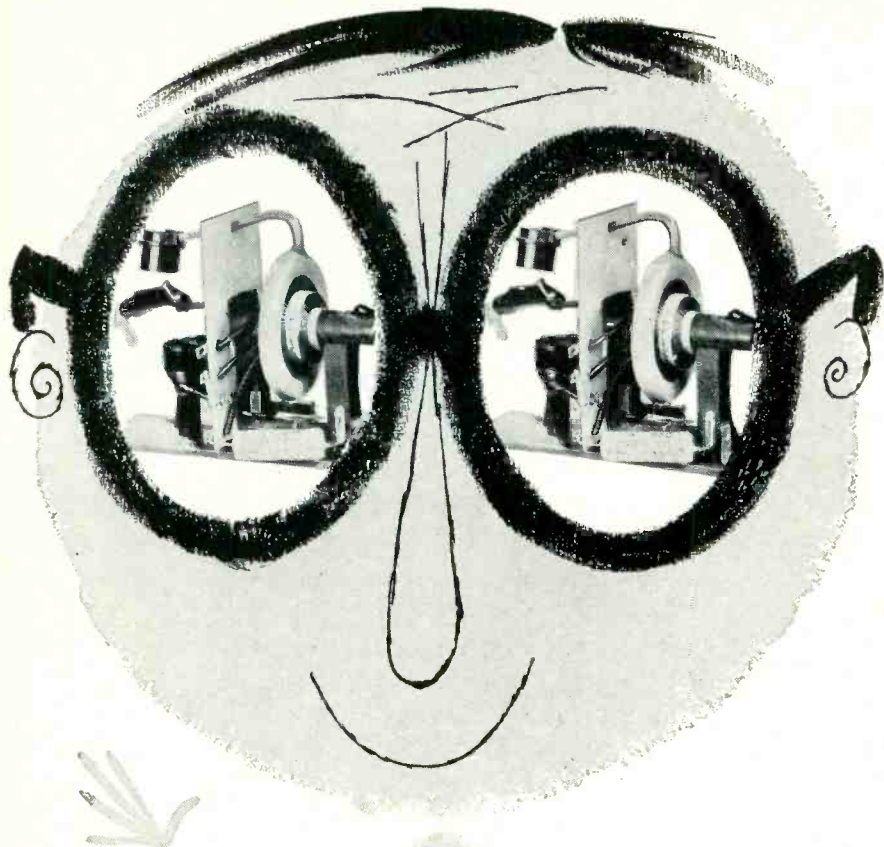
4501-T North Ravenswood,
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Canada: Atlas Radio Ltd., Toronto



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(Catalogs & Bulletins continued
from page 28)

FASTENING DEVICES: A 38-page catalog shows a plastic screw anchor kit. More than four hundred items are illustrated and described. Ask for "Hi" catalog #12-B. Holub Industries, Inc., Sycamore, Ill. (ELECTRONIC TECHNICIAN No. B11-6)

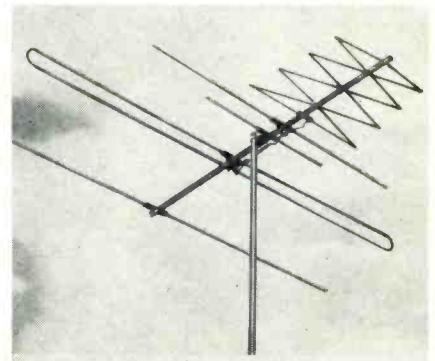
CORRESPONDENCE COURSES: A 24-page brochure and home study course outline gives current electronic industry employment requirements and opportunities. Individual instruction, coaching, pre-exam tests and other features, including a guarantee tied to passing of examination, in preparation for FCC license exams, are described. Cleveland Institute of Radio Electronics, 4900 Euclid Ave., Cleveland 3, Ohio (ELECTRONIC TECHNICIAN No. B11-9)

TRANSFORMERS: Exact replacement chart covering transformers, flybacks, yokes, and vertical outputs. Can be used as a wall chart or cut into sections. Each section provides name of original equipment manufacturer in alphabetical order. Covers a great many applications. Merit Coil & Transformer Corp., 4427 N. Clark St., Chicago 40, Ill. (ELECTRONIC TECHNICIAN No. B11-8)

TRANSFORMERS: 4-page folder describes the operation of constant voltage transformers for electron tube 6.3 volt filament supply. Includes electrical and mechanical data and prices for five stock transformers. Ask for Circular CVF-269. Sola Electric Co., 4633 W. 16th St., Chicago 50, Ill. (ELECTRONIC TECHNICIAN No. B11-7)

JFD ANTENNA

The new Gold Anodized Colortennas feature unbreakable low-loss insulators made of weather-resistant "Kra-lastic B". All elements over 30" long are reinforced with 16" aluminum



dowels in their center which prevents "sag" and "droop" and strengthens the element for continuous optimum performance. JFD Mfg. Co., 6101 Sixteenth Ave., Brooklyn 4, N. Y. (ELECTRONIC TECHNICIAN 11-16)

Labor Relations

(Continued from page 59)

an obligation to put Mr. Lewis back to work the very day he decided to return. Surely the company was entitled to arrange its schedules and operating plans so the reinstatement could be accomplished in a business-like manner. The company was justified in asking for reasonable notice. I find in the circumstances presented here the company was entitled to one week's notice for this purpose. Lewis could have provided notice by mail in advance of his return. The two weeks that the company took was not reasonably required as witnessed by the fact that he was reinstated in short order after the supervisor returned. Lewis should receive back pay for a one-week period."

Westbury RF AMPLIFIERS

Two new r-f amplifiers are specifically designed to provide an efficient and economical method for TV signal distribution for apartment houses, hotels, housing developments, etc. They feature high gain, low noise input, and linear response. Model ABB-3 for channels 2 to 6 or the all-band model ABB-4 for channels 2 to 13, operate from one antenna. Westbury Electronics, Inc., 300 Shames Drive, Westbury, N. Y. (ELECTRONIC TECHNICIAN 11-26)

Promotion Benefits TV Technicians

A new promotion designed to build consumer confidence in local radio TV service technicians and the profession of servicemen, was announced by J. C. Lane, advertising manager of the Westinghouse electronic tube division.

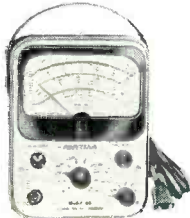
Key to the program is a pamphlet, "This is the Story of a TV Set," which is given free to all dealers as part of a "Build Consumer Confidence" kit. A dealer window display and streamers are also included in the kit.

"The objective of the program is to bring some of the little known facts of servicing to the consumer," Mr. Lane pointed out. "Consumers are not aware of the 'buy' they get in modern servicing because they fail to understand basic costs that go into servicing. Our program is designed to bring this story to the consumer.

The program will be announced on December 1 and will span the new year.

Whatever you want
in a V.T.V.M.—**PRECISION**
has it!

for High Performance at Low Cost—



the Model 68 Modestly Priced, Metal-Cased VTVM

- 5 Peak-to-Peak Voltage Ranges: 0-8-32-160-800-3200 volts
- 5 (+) Plus and 5 (-) Minus DC Voltage Ranges: 0-3-12-60-300-1200 volts, 13 1/3 Meg. input
- 5 Hi-Impedance RMS AC Ranges: 0-3-12-60-300-1200 volts
- 5 Resistance Ranges Up to 1000 Megohms
- 5 Zero-Center Reference Ranges
- Extra-Large, 5 1/4" Wide-Angle PACE Meter

Model 68: blue-grey ripple-finished steel cabinet, 5 7/8" x 7 3/4" x 3 1/2". Complete with tubes, ohmmeter battery and manual. Net Price: \$54.50

for Battery-Powered Portability—



the Model 78 Battery-Operated, Metal-Cased VTVM

- A MUST Where Power Line is Unavailable
- A MUST Where Power Line Connection is Undesirable
- 6 Zero-center DC Voltage Ranges: 0 = 1.5, = 6, = 30, = 150, = 600, = 1500 volts; 13 1/3 Meg. Input
- 5 Ohmmeter Ranges to 1000 Megohms
- 5 Hi-Impedance RMS AC Ranges: 0-3-12-60-300-1200 volts
- Extra-Large, 5 1/4" Wide-Angle PACE Meter

Model 78: blue-grey ripple-finished steel cabinet 5 7/8" x 7 3/4" x 3 1/2". Complete with tubes, batteries and instruction manual. Net Price: \$62.50

for Wide-Range Laboratory Quality—



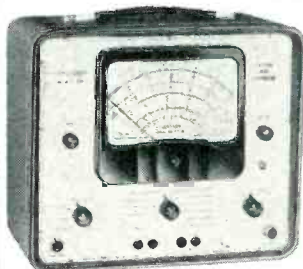
the Model 88 Compact, Lab-Type VTVM

- More Functions—More Ranges—More Sensitivity: 7 functions . . . 40 ranges . . . 26 2/3 megs input
- 6 Peak-to-Peak Voltage Ranges: to 3200 volts specially engineered for accuracy on pulsed and TV wave forms
- 6 Zero Center DC Voltage Ranges: to 1200 volts . . . also, 6 (-) minus and 6 (+) plus DC voltage ranges
- 5 Electronic Ohmmeter Ranges: to 1000 Megohms
- Extra-Large, 5 1/4" Wide-Angle PACE Meter

Model 88: Molded phenolic case, 5 3/8" x 7" x 3 1/8". Complete with AC line cord, ohmmeter battery, 3-way probe and manual. Net Price: \$74.50

for The Ultimate in Performance and Operating Ease—

the Model 98 Laboratory VTVM with 7" Meter



- PRECISION's Finest VTVM: More Ranges—More Functions—High Sensitivity
- 6 P-to-P Voltage Ranges to 3200 volts: specially engineered for maximum accuracy on pulsed wave forms
- 6 True-Zero-Center DC Voltage Ranges: 26 2/3 Megohms input to = 1200 volts
- 6 Electronic Ohmmeter Ranges to 1000 Megohms
- 6 Minus and 6 Plus DC Voltage Ranges: to 1200 volts 13 1/3 Megs input
- 6 Hi-Impedance RMS AC Ranges to 1200 volts
- 8 DC Current Ranges: from 0-300 microamps to 12 Amps
- 6 Decibel-Output-Meter Ranges: -20 to + 63 DB

Model 98-MCP: in blue-grey, ripple-finished cabinet and two-color brushed aluminum panel, 11 1/2" x 13" x 6 5/8". Complete with 3-way VTVM probe and manual. Net Price: \$119.50

PRECISION VTVM ACCESSORIES AVAILABLE

Model RF-10A.....High-Frequency Vacuum-Tube Probe (for Models 88 and 98).....	Net Price \$14.40
Model RF-12.....High-Frequency Crystal Probe (for Models 68 and 78).....	Net Price \$10.95
Model TV-4.....Super-High-Voltage Safety Test Probe (for Models 68 and 78).....	Net Price \$14.75
Model TV-8.....Super-High-Voltage Safety Test Probe (for Models 88 and 98).....	Net Price \$14.75
Model LC-1.....Leather Carrying Case (custom-designed for Model 88).....	Net Price \$9.50
Part No. ST-1.....Retractable Snap-On-Tilt Stand for Model 88.....	Net Price \$1.00



PRECISION Apparatus Company, Inc.

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New Product Review

Sorensen POWER SUPPLY

The Model 300B wide-range power supply utilizes printed circuits for lightness, compactness, and reduced cost. It features parallel or series operation, external sensing, excellent regulation and stability, and low ripple. It provides a regulated 0-300 v d-c and unregulated 6.3 or 12.6 v a-c output. Single or dual units are available in a cabinet or for rack mounting. Sorensen & Co. Inc., Richards Ave., South Norwalk, Conn. (ELECTRONIC TECHNICIAN 11-17)

ASCO BATTERY CHARGER

Industrial Type Battery Chargers can be equipped with a number of modified features as follows: a high-low toggle switch for manual selection of charging rate; and a charging disconnect relay and reset timer. When the battery is low, the relay-timer-battery charger combination automatically charges the battery at a high rate for a fixed period. After this fixed period, the charger is automatically reset to a trickle charge. 6, 12, 24, 32 volt d-c output voltages are provided with a continuously variable charging rate of 0.05 to 2.0 amperes. Automatic Switch Co., Florham Park, N. J. (ELECTRONIC TECHNICIAN 11-22)

Dynox BATTERY

The first model of the new battery is 1¼" long, ¾" in diameter, and has a potential of 95 volts. It can supply a steady current of 1×10^{-9} amperes for 176,000 hours at 70° F, with only a 10% voltage drop, or a flash current of 20 µa. It can be stored for 20 years without losing its power. Batteries that can furnish 625 volts per cubic inch and can be drained continuously for 5 years at 5×10^{-9} amperes are also available. Universal Winding Co., P. O. Box 1605, Providence, R. I. (ELECTRONIC TECHNICIAN 11-23)

Guardian POWER SOLENOID

A powerful No. 18 A-C Solenoid with an encapsulated Permaseal coil is available for intermittent or continuous-duty operation. With a ¼" plunger stroke, the solenoid can lift up to 11 pounds. The stroke is adjustable from 1/32" to 1". Guardian Electric Mfg. Co., 1621 W. Walnut St., Chicago 12, Ill. (ELECTRONIC TECHNICIAN 11-25)

Tung-Sol TWIN POWER TRIODE

Type 6528 twin power triode is a high current, medium-mu, twin triode developed specifically for series regulator service in d-c power supply units. The 6528 was designed for use when unusual output characteristics, high reliability or long life are requirements. Tung-Sol Electric Inc., 95 Eighth Ave., Newark 4, N. J. (ELECTRONIC TECHNICIAN 11-20)

Magnavox CAPACITORS

Miniature aluminum electrolytic capacitors, having only a few microamperes of electrical leakage, range from 1 to 125 µf and 4 to 150-volts dc. Permissible operating temperature range is -20° C to +85° C. Centered axial leads permit automatic insertion in printed-circuit boards. The case is electrically insulated and is effectively sealed with epoxy resin. The Magnavox Co., Fort Wayne, Ind. (ELECTRONIC TECHNICIAN 11-15)

Erie PAC

"PAC" stands for Pre-Assembled Components and consists of interconnected capacitors and resistors, automatically assembled into a unitized module for quick, easy installation. The new "PAC" units were tested by subjection to a 1,000 hour humidity test in which they revealed an average change of less than 0.07% and a maximum change of 0.19%. Erie Resistor Corp., 644 W. 12th St., Erie, Pa. (ELECTRONIC TECHNICIAN 11-21)

Raytheon SILICON RECTIFIERS

The 1N253, 1N254, 1N255, and 1N256 are all welded, hermetically sealed, high temperature, medium current, diffused silicon rectifiers designed to operate over ambient temperatures in the range of -65°C. to +150°C. This series of diodes is particularly suited to rectifier applications where high inverse voltages, high forward conductance, very low leakage current, and extremely high rectification efficiency are required. Raytheon Mfg. Co., 55 Chapel St., Newton 58, Mass. (ELECTRONIC TECHNICIAN 11-19)

Helix MAST GRIPPERS

New lightweight clamps used for antenna installations are used in pairs. These grippers instantly convert any 1¼" tubing into a slidable trombone mast. With them, one man can easily raise, lower, or turn an antenna. Shaped like a reinforced figure 8, the Mast Gripper is made of cast aluminum alloy 3½" x 2½" x ½", and equipped with rust resistant set screws. Helix Rotor Co., Marlin, Texas. (ELECTRONIC TECHNICIAN 11-18)

RMS ANTENNA

The Dynamo is the latest addition to the outdoor antenna family. It is designed for fringe areas. The addition, where needed, of the optional B7 booster section insures clearer viewing. Tests in the field for signal gain and mechanical function including, ease of assembly, installation, weight tests for snow and icing problems, and wind resistance were made. Radio Merchandise Sales Inc., 2016 Bronxdale Ave., New York 62, N. Y. (ELECTRONIC TECHNICIAN 11-24)

Electro RELAY

A new, compact relay sub-assembly, designed as a safety device for machine-tool builders, operates as an over- or under-speed control. The relay requires no external source of power other than that generated by a power type magnetic pickup. The pickup consists of a magnet with a coil of wire surrounding it, and acts as a miniature generator when placed near the teeth of a gear. Critical speed for the relay is set by adjusting spacing between the magnetic pickup and actuating metal. The over/under speed control relay is a single-pole double-throw switch with contacts rated at 5 amps non-inductive load. Electro Products Laboratories, Inc., 4500 N. Ravenswood Ave., Chicago 40, Ill. (ELECTRONIC TECHNICIAN 11-14)

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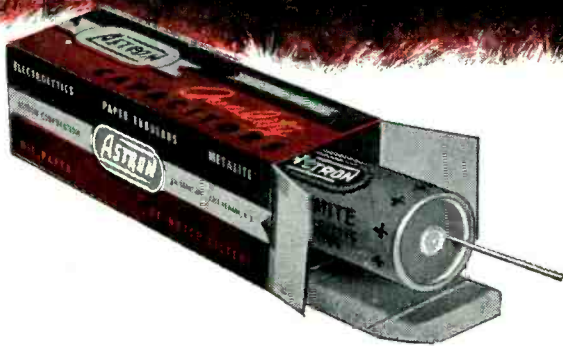
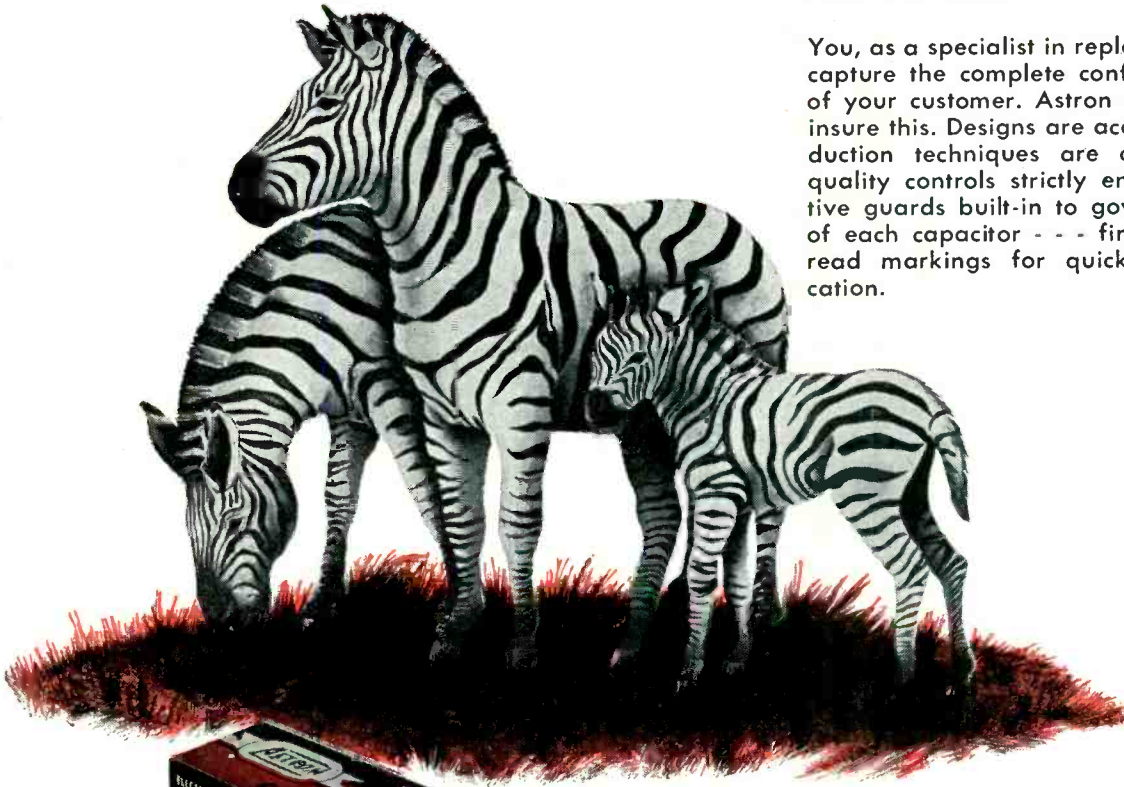
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It's no trick to save time replacing dual controls



with **Centralab** **Fastatch® FR-22A** **Control Kit**

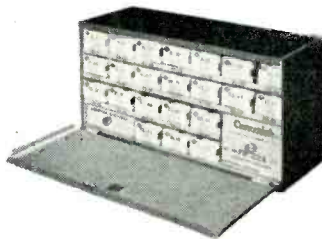
Why waste time with special trips to jobbers every time you need a dual-concentric, when — at a fraction of the cost — you can stock a complete line within arm's reach?

The handy Fastatch® FR-22A kit puts 570 dual-control variations at your fingertips — gives you the replacement you need for 85% of your TV, radio, and auto-set service calls . . . and all this for only \$28.51!

Make it a point to pick up a Fastatch® FR22A dual-control kit at your Centralab distributor the next time you need supplies.



Each Fastatch® FR-22A kit contains 22 control units, 4 Fastatch® switches, and 2 auto-adaptor bushings that you can combine to get 570 of the most popular dual controls. Each control is factory-assembled, tested, and guaranteed by Centralab.



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B-3258

Association News

RTASCV Elects

Radio Television Association of Santa Clara Valley in California elected the following officers: Richard J. Kelso, Pres.; W. I. Smith, V.P.; and Harold L. Kelley Jr., Sec. Treas.; and Jim Davis & C. S. Dawson, Board of Directors. Among the organizational matters discussed at the last meeting were, uniforms, insignia, identification cards and standard service forms. Harold L. Kelley Jr. won \$10.00 just for being present at the meeting.

TSA Group Insurance

The Television Service Association in Michigan report that in addition to many cases pending final completion and payment, the following benefits were paid for the months of March, April and May.

21 Maternity Cases	\$ 5,023.10
11 Emergency Accident Cases	710.05
21 Miscellaneous Hospital Cases	6,244.88
6 Weekly Accident & Sickness Benefit Cases	1,412.86
		<hr/>
		\$13,390.89

TESA-SW Mo. Elects

TESA-SW Missouri elected: Carol King, Pres.; Sam Youngue, V. P.; George Scott, Sect.; Bill Moudy, Treas.; and Val Banes, NATESA Director with Red Gulliford, as alternate.

TSDA Flat-Rate

The Television Service Dealers Association in San Mateo County, California, is studying a pricing system brought back from the NATESA National Convention by W. D. Haines. TESA of Cincinnati and TESA of Ohio, after two years of research, arrived at this suggested flat-rate billing procedure and presented it to the National Convention. It was reported that Cincinnati has adopted this pricing schedule and is using it as a guide to inform the consumer of the costs that may be incurred for TV repairs.

These suggested Fees cover Diagnosis of trouble, location, installation or repair of component or circuit including mechanical defects. Parts are additional. They are based upon a survey of operational expenses of leading service companies, time studies and cost analysis of time required to accomplish the listed service operations on a wide variety of television receivers with operations performed by competent technicians. All parts and operations performed are guaranteed for 90 days.

(Continued on page 69)

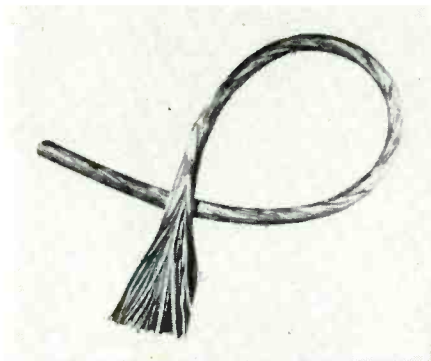
(Tough Dogs Cont. from page 46)

mildly snowy but usable picture, and normal sound. In this particular case, sound was very weak and picture was practically non-existent. Reinserting the r-f tube brought the picture up to a point where programs could be seen; therefore, I assumed that the r-f tube and circuit was functioning, especially since all voltages tested near normal.

The first real clue came when the brass slug in the high band mixer coil TC504 was touched by the end of a metal screwdriver. Picture and sound came in on all channels and remained as long as the blade was touching the adjustment screw. The second clue, trimmer C512, which tunes the inductance selected by the wafer switch through C511, was very broad in its action. C511 was checked and found ok. Evidently something was wrong between TC504 and C512. Finally the source of several hours headache was located. A small rivet goes through the wafer switch to which one end of TC504 is soldered. This is on one side of the wafer. On the other side one end of C511 is soldered to a lug held in place by this same rivet. A resistance check between the two sides showed several ohms resistance. A hot soldering iron completed the repair, and all channels came in strong. All due to a cold solder joint!—M. G. Goldberg, St. Paul, Minn.

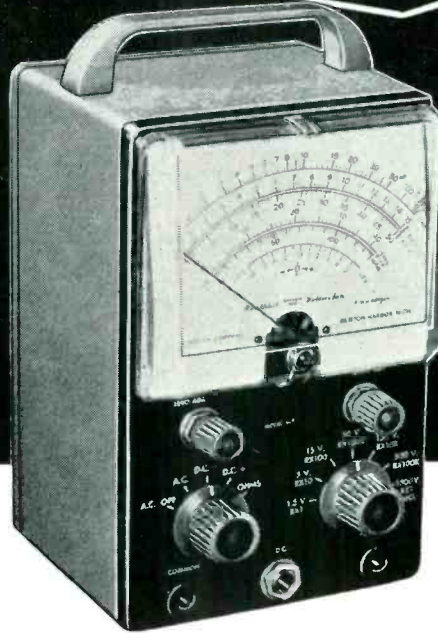
Alphlex ZIPPER TUBING

A new harnessing and cabling technique reduces to just the slide of a zipper the time and labor needed to group, mark, protect, harness and custom-cable. Constructed of poly-vinyl-chloride plastic, it is strong, durable



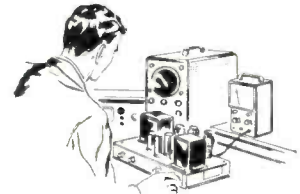
and low-cost. It is supplied flat and open, the user zips it to close. Available in sizes from 10' to 1000' long, and from 1/2" to 4" I.D. Alphlex Tubing Div. of Alpha Wire Corp., 200 Varick St., New York 14, N. Y. (ELECTRONIC TECHNICIAN 11-51)

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Contains detailed descriptions of Heathkit models available, including VTVM's, scopes, generators, testers, bridges, power supplies, etc.

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New Books

SELECTION AND APPLICATION OF METALLIC RECTIFIERS. By Stuart P. Jackson. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N.Y. 326 pages. Hard cover. \$8.00.

Planned to serve as a guide for engineers and technicians in the selection and application of metallic rectifiers, the book furnishes information on rectifier characteristics, and use in a wide variety of electronic and electrical equipment. Fundamental rectifier and related

filter circuits, and transformer requirements are shown plus design procedures for such uses as pulse circuits, industrial power supplies, battery charging, and amplifiers. The general discussion includes information on ratings, rating methods, and how to use typical data provided by manufacturers. Design data in the form of curves and equations, and illustrations are also included.

TRANSISTOR A. F. AMPLIFIERS. By D. D. Jones and R. A. Hilbourne. Published by Philosophical Library Inc. 15 E. 40 St., New York 16, N.Y. 152 pages. Hard cover. \$6.00.

Design details of five circuits of proven performance, with outputs rang-

ing from 1 to 20 watts illustrate the practical applications of the theoretical considerations discussed. Power supplies, and possible applications of transistor audio amplifiers including high-fidelity reproduction and public-address systems are described.

1958 RADIO-ELECTRONIC MASTER. Published by United Catalog Publishers, Inc., 60 Madison Ave., Hempsted, N.Y. 1584 pages, hard cover. Available from parts distributors, names furnished on request by publisher.

This 22nd edition of the "Master" is reported to be the largest catalog ever published for the electronic industry. It covers 150,000 items made by 350 manufacturers, including more than 11,500 illustrations. A fabulous variety of equipment, parts and products associated with TV, radio, electronics and audio are represented. If you buy through jobber outlets, this catalog and guide—a veritable industry institution—is a most worthwhile reference.

ESSENTIALS OF TELEVISION. By Morris Slurzberg, William Osterheld and Elmo Voegtlin. Published by McGraw-Hill Book Co., 330 W. 42 St., New York 36, N.Y. 687 pages, hard cover. \$8.50.

Here is a most comprehensive book on TV reception, with detailed analysis of circuit performance of each stage in the receiver. It is written in textbook style, with questions at the end of each of the 15 chapters, and answers to these problems in an appendix. Much practical data is included, though repair techniques *per se* are not described. The text is well-integrated with the many illustrations.

MARINE ELECTRICAL PRACTICE. By G. O. Watson. Published by Philosophical Library Inc. 15 E. 40th St., New York 15, N.Y. 325 pages. Hard cover. \$12.00.

A practical approach to marine electrical practices. The book fills the gap after fundamentals have been mastered. Although the descriptions are based on British practice, the underlying principles apply equally to apparatus of other countries. 182 illustrations help describe the ac, dc, battery, controlling, and switching systems. Engineers studying for the Ministry of Transport examinations will find this book quite helpful.

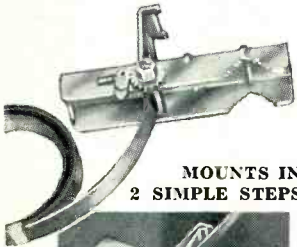
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EXAMPLE "A"

1—6BQ6 tube	\$ 3.90
2—6CB6 tube @ 2.10	4.20
1—6BQ7 tube	3.50
Repair and align tuner (items 20 & 36)	14.50
1—1000 ohm ½ watt resistor	.17
Repair filament wiring in printed circuit (items 8 & 29)	14.70
	40.97
Sales Tax	.36
Service Fee	6.00
	<hr/> \$47.33

EXAMPLE "B"

1—21EP4B picture tube	\$47.50
1—25W4 tube	2.30
1—120 µf. silver mica capacitor	.50
Align Horizontal phasing circuit with oscilloscope (item 34)	7.75
Install picture tube (item 13)	10.00
Repairs to Horizontal Synchronizing Circuit and installation of Component (120 µf) (item 19)	14.65
	82.70
Sales Tax	1.51
Service Fee	6.00
	<hr/> \$90.21

EXAMPLE "C"

1—5U4 tube	\$ 1.90
1—2.2 meg ohm 4 watt resistor	1.30
1—2 µf, 600 Volt capacitor	.65
Repairs to High Voltage power supply and installation of component (2.2 meg) (item 14)	12.15
Analyses and installation of coupling in Horizontal Damper Circuit (.2 µf) (item 6)	11.60
Align discriminator transformer	4.25
	31.85
Sales Tax	.12
Service Fee	6.00
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These suggested fees include only the operation performed on a set in the service department or in the home. On outside calls there will be an additional Service Fee. April 1, 1957
Prices Subject to Change without notice.

Readers may wish to compare the above schedule with the RCA Service Flat-Rate Plan which appeared on page 50 of the January 1957 issue of ELECTRONIC TECHNICIAN.—Ed.



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Audio NEWS LETTER

HIGH FIDELITY STATISTICS: The Institute of High Fidelity Manufacturers reports that hi-fi component sales have climbed from \$12 million in 1950 to \$165 million in 1956. Institute executive director Ed Cornfield

believes the 1957 figure will rise 25%, passing the \$200 million mark. Total sales of everything labeled high fidelity zoomed to \$500 million in 1956, and should exceed \$700 million next year. Record sales, mostly hi-fi discs, accounted for \$300 million last year. Phonos are currently selling at a \$300 million annual rate, and should go over \$400 million in 1958. Magnetic tape recorders are being produced

at the rate of 475,000, and are expected to be well over a half-million units in 1958.

VIDEO INSTRUMENT CO., Los Angeles, has introduced an all-transistor hi-fi amplifier, the Vico Model 77, priced at \$98.50. This 20-watt amplifier is reported as having hum and noise 100 db below rated output. Operation is either from 117 volts ac or 12-volt battery. Response is 20 to 30,000 cps within 0.5 db.

AUDIO DEVICES has leased an additional factory building adjacent to its Glenbrook, Conn. plant to raise operating space to 60,000 sq. ft. The company also announced national Educational Awards to 66 schools and colleges for their ideas on applying modern sound recording to education. Highest award in each of two groups was \$2750 worth of tape and equipment.

1958 ELECTRONIC PARTS DISTRIBUTORS SHOW, May 19-21 at Chicago's Conrad Hilton Hotel will be a 3-day show instead of the previous 4. Space drawing will be held in New York Dec. 4. A new rule change permits parent and subsidiary companies to exhibit separately if they meet certain conditions. In 1958, exhibitors will receive 2 gold guest badges each instead of 1 as in 1957.

H. H. SCOTT announces a new AM/FM stereophonic tuner, Model 330-C, with both AM and FM sections completely separate. An amplifier and speaker can be connected to each for simultaneous play. A provision for future multiplex is included. Cross-modulation rejection is 80 db; AM sensitivity 1 microvolt.

FAIRCHILD RECORDING has appointed Martin I. Stoller as manager of its Marketing Dept. He was formerly with Young & Rubicam. The company also reports that its XP-3 experimental cartridge priced at \$50, uses a 0.7 mil stylus.



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utah RADIO PRODUCTS CORPORATION
HUNTINGTON • INDIANA

Export Dept. Fidevox International, Chicago, Illinois

INTEGRAND CORP. has announced a new integrated system of loudspeakers and transistorized amplifiers for hi-fi reproduction. Consists of 3 speakers, each driven by its own transistor amplifier, and is equipped with a special feedback winding. It is available in either stereo or monaural models. President of the Westbury, New York firm is Joseph Daniels. Sales are being handled by Brand Products, Inc. of the same city, headed by Mort Wimpie, formerly with Rockbar.

REEVES SOUNDCRAFT has published an attractive multi-color brochure describing its complete line of full coated magnetic films and Magna-Stripe. Free copies may be obtained from the company at 10 E. 52nd St., New York City 22. Ask for bulletin RS57-8.

BRUSH ELECTRONICS has developed a new piezoelectric microphone, and when the first man-made moon is fired into space these tiny piezoelectric microphones will "hear" collisions with microscopic meteorites. These collisions will be converted into electrical signals which will be transmitted to earth.

BELL & HOWELL named Richard B. Phillips as Atlantic states sales manager for tape recorders.

GROMMES announces the release of the following "Little Genie" hi-fi kits: Model 207AK preamp; LJ-6K 10-watt amplifier; 250K 50-watter.

UNITRONICS CORP. and HUFFORD CORP. have merged into the SIEGLER CORP. The merger calls for one share of Siegler common stock to be exchanged for every two shares of Unitronics, and 108,000 shares of Siegler Common to be issued and exchanged for all the outstanding Hufford stock. As a result, Siegler's outstanding common stock will be increased to approximately 1,170,000 shares.

NORTRONICS COMPANY, Minneapolis, announces the TLD-S in-line stereo tape recording head. A new inter-channel shield provides 48 db of crosstalk rejection. It can easily be compensated for flat 30-10,000 cps response. Audiophile net is \$19.50; available to manufacturers in quantity.

JOHN F. RIDER will publish "Stereophonic Sound," by Norman H. Crowhurst. Book

will be available during October at \$2.25. It is written primarily for hi-fi enthusiasts.

MAGNAVOX reports net income and sales for fiscal year ended June 30th as \$3,759,226. and \$87,467,-864. respectively. This reflects an increase of 21% in earnings and 24% in sales over last year, which company officials attribute mainly to hi-fi sales.

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COLOR VIDEO TAPE: HOW IT OPERATES

• Magnetic tape recording of color television programs involves the conversion of electrical signals into a pattern of magnetic fields, produced by millions of particles of iron oxide powder embedded in a plastic film on a strip of plastic tape.

Held in this form, the picture and sound information can be stored indefinitely or played back repeatedly for viewing or listening. Playback involves a reversal of the process with the same equipment used for recording. In playback, the information is "read" from the tape to reproduce the electrical signals, which are then converted into the color television picture and its accompanying sound. Using electronic techniques, the information stored magnetically on the tape can be "erased" at any time so that the same tape may be used again and again for recording new information.

The technique of television tape recording is far more complex than that of sound tape recording. This is because television information involves frequencies up to four million or more cycles per second, while sound information extends only up to about 15,000 cycles per second. In standard color television broadcasting, pictures made up of 525 lines are presented at a rate of 30 complete pictures per second. A practical color television tape recording system must store and reproduce all of this information at the same rate. Hence, television tape recording for either color or black-and-white techniques involves far higher speeds and vastly greater precision than are required in sound tape recording.

Furthermore, the requirements for extreme precision are even greater in the case of color television which, unlike black-and-white, involves the transmission of extra color signals that must be closely synchronized.

In the television tape recording system, the electrical signals corresponding to picture information are translated into magnetic patterns through "heads" which are in physical contact with the tape. The color system demonstrated by RCA employs tape two inches in width, which moves across the head mechanism at a speed of fifteen inches per second—the speed employed in standard sound tape recording systems.

The head mechanism consists of four separate tiny recording or reproducing elements. These are placed at an equal distance from one another on the perimeter of a narrow disc or wheel placed at a right angle to the tape. As the disc rotates, the four heads pass, one after the other, across the two-inch width of the tape, as the tape itself moves past.

The result is a pattern of magnetic information stored on the tape in a series of tracks extending from one edge of the tape to the other, rather like the arrangement of rungs in a ladder. With this arrangement, the television signals are fed to the tape through the head that is in contact with the tape at any given instant. As the head approaches the bottom edge, the signals are also fed onto the tape through the next head as it begins its sweep from top to bottom of the tape so that there is a slight overlapping to insure recording of all of the pictures. In playback, the process is simply reversed so that the head picks up the color program information stored on the tape.

All of this occurs at extremely high speeds. The disc carrying the recording heads rotates at a speed of 14,400 revolutions per minute, so that each head crosses the tape 240 times each second. During each of these crossings a single head records information corresponding to slightly more than sixteen lines of a color television picture.

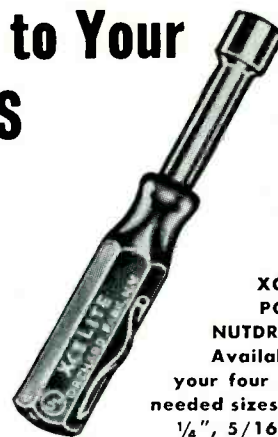
In developing the RCA color television tape recording and playback system, engineers devised extremely precise electronic and mechanical control techniques. In effect, the newly developed electronic technique uses the standard color synchronizing information, or "burst" on every color signal to re-synchronize the color components at the beginning of each scanning line in the picture.

An hour-long color television program can be stored on, and played back from a 12½-inch reel of tape. •



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Gene Wilson

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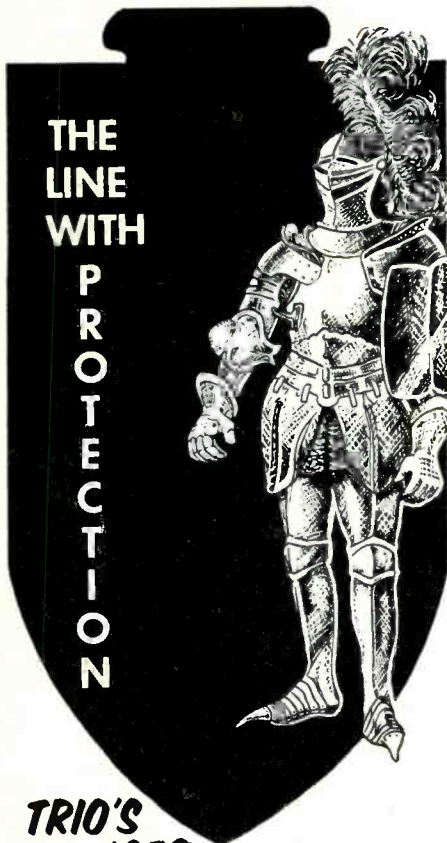
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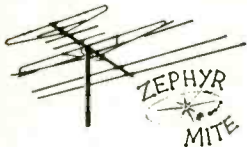
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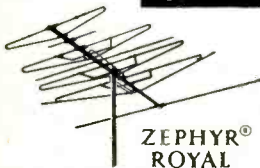


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• With hundreds of thousands of fuse-resistors and line-voltage ballasts in radio and TV sets, some misunderstanding as to their purpose still exists, according to Fran J. Chamberlain who heads Clarostat's Distributor Division. Occasionally a fuse-resistor fails as a replacement. Returned units are thoroughly checked and the engineers invariably find that they have functioned as originally intended, that is, burned out when overloaded. The difficulty, then, lies in the individual application.

The fuse-resistor or Fuzohm serves a dual purpose in its application. First: The manufacturers of certain types of rectifiers specify that a dropping resistor of from 5 to 15 ohms should be used in series with their rectifiers to absorb peak surges that may be present in the line-voltage. Second: Underwriters recommend that these circuits be fused to eliminate the possibility of fire in the set when surges occur at a level higher than the resistor's ability to reduce to a safe value.

Causes for failure or blowing of

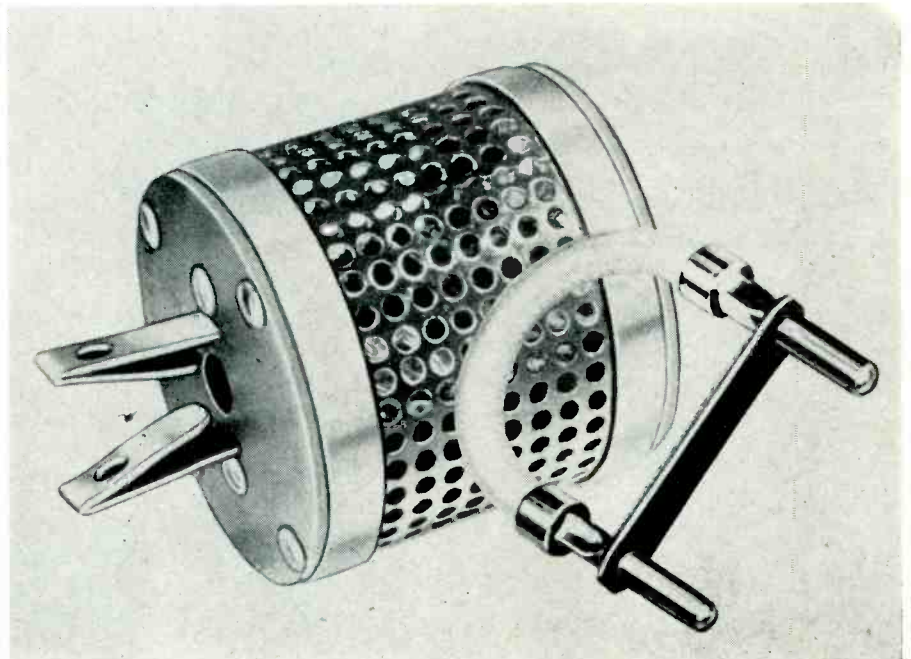
the fuse-resistor may be attributed to two commonly known factors: The line-voltage source having fluctuations reaching a high peak value and remaining there long enough to cause the fuse-resistor to burn out; and increased loads due to aged components. If the current reaches or exceeds the rating of the fuse-resistor for over the time limit rating, it will burn out.

A simple remedy for the first condition is the use of an external dropping resistor or regulator. For the second condition, fuse-resistors will function as a temporary remedy; but eventually, parts causing added load will have to be replaced.

The fuse-resistor is an expendable item designed to burn out in case of trouble and to protect expensive components. Using a higher rated fuse-resistor would be defeating its purpose, and expose the entire set to excessive voltages.

If excessive line-voltage-surge conditions exist, they should be compensated for. The solution is simple. A line-voltage regulator or ballast should be installed in conjunction with the replacement. •

Fuse-resistors and ballasts protect equipment from failure due to excessive voltage peaks.



Color Bar Generator

(Continued from page 41)

no chroma voltage, the burst-phase detector will see only the burst phase and will not affect the color sync response at this time. Therefore, it is necessary that chroma follow the blanking pulse immediately,

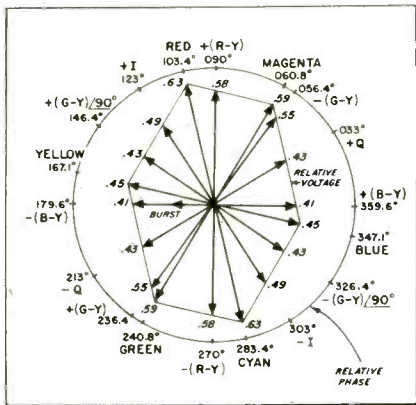


Fig. 6—Relative voltages and phases reproduced in operation of a good color receiver.

as shown in Fig. 3. The color-bar signal would be more useful in this type of test if the red bar followed the blanking interval. The reason for this is that green bar, as seen in Fig. 3 has a peak voltage equal to the blanking level, but not equal to the peak voltage of the burst. On the other hand, the peak voltage of the red bar is equal to the burst level. This is the worst possible condition of program reception, and is the most critical test of gate delay. Under actual receiving conditions when the gating pulse is delayed bright red objects present at the left-hand edge of the screen, will cause a strip of distorted color and a long trailing smear. Yellow objects on the left-hand edge of the screen will not cause color sync pulling.

Chrominance Values

In order to service chrominance channels, it is essential to understand readjustment of chrominance values. The receiver's picture tube operates on the same voltages as the CRT in the color camera. Since the original camera voltages would produce overmodulation of the picture carrier, they are reduced, or read-

adjusted. Therefore, the gain of the different chrominance channels, in the receiver, is made correspondingly larger in order to restore the chrominance signals to their original unadjusted values. This is done by making the gain of the (B-Y) channel 1.78 times as great as the gain of the (R-Y) channel, and the gain of the (G-Y) channel is made 0.68 times the gain of the (R-Y) channel. Potentiometers adjust the (B-Y) and (G-Y) level in some receivers. The possibility of incorrect quadrature-transformer adjustment should not be overlooked when troubleshooting. Incorrect colors are caused by mis-adjustment of the quadrature transformer, or by incorrect setting of the color-phase control. Trouble in the chroma channels could cause improper voltage at any of the CRT electron guns; for example, the red gun might have other than zero output for the green, cyan, and blue signal. Fig. 1 shows the relative voltage applied to the different guns for each of the colors in a normal receiver.

TABLE 1

Chroma Voltage and Phase Angle, and Y Voltage.

Signal	Y Voltage	Color Voltage	Subcarrier Phase
Red	0.30	0.635	103.42°
Yellow	0.89	0.447	167.13°
Green	0.59	0.593	240.83°
Cyan	0.70	0.635	283.42°
Blue	0.11	0.447	347.13°
Magenta	0.41	0.593	60.83°
(B-Y)	0.1571	0.4135	359.63°
Q	0.2711	0.4265	33°
(R-Y)	0.3371	0.5848	90.03°
I	0.5393	0.4865	123°
(G-Y)/90°	0.7317	0.4313	146.38°
Burst		0.2	180°
-(B-Y)	0.8429	0.4135	179.63°
-Q	0.7289	0.4265	213°
-(R-Y)	0.6629	0.5848	270.03°
-I	0.4607	0.4865	303°
-(G-Y)/90°	0.2683	0.4313	326.38°

For ready reference, a tabulation of the Y, subcarrier voltages, and phases is presented in Table 1. The Y voltages are the readjusted values that appear at the output of the picture detector. Phase and subcarrier voltages shown are those that appear in a vectorgram at the outputs of the chrominance detectors. As shown in Fig. 6. The vectorscope technique for adjustment of the phase and quadrature transformer was described in the August 1957 issue of ELECTRONIC TECHNICIAN. •

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Burglar Alarms

(Continued from page 43)

will result in a changing frequency. Even if both are motionless, a moving object such as an intruder will reflect a changing frequency signal to the receiver which can trigger an alarm. Fig. 3 shows how a moving intruder changes the echo note and causes the alarm to sound. A typical set of installations is shown in Fig. 2. Note the use of multiple transmitters and receivers. Security regulations for a drafting room having an area of about 4,000 square feet, required all drawings be placed in storage cabinets when not in use. This resulted in a great loss of time; each evening the drawings were stored and each morning they were returned. The area had to be protected at all times, which was being done by guards around the clock.

An ultrasonic alarm system was used to protect the entire cubic content of the area. It can detect anyone who might have concealed himself, within the area, before closing time, as well as anyone attempting to enter. The drawings are now permitted to remain on the drawing boards at night. Lightweight fabric covers are used to make it impossible to photograph them through a window. Alarms are

registered on a monitor unit which is located in a central guard station.

Another situation required protection of a multi-engined classified aircraft. Because of the secret classification of materials and equipment installed in the airplane, it was necessary to protect it in such a manner that the approach of anyone would be detected. Either an armed guard or an electronic system would have been required. However, as the airplane might be standing in any one of a number of locations, a permanently installed system could not be used. Transmitters and receivers were mounted on small wooden stands. All elements could be positioned around the plane and the system put into operation in a few minutes. Any approach to or movement within the protected area could be detected and indicated on a distant monitor unit.

Master Control

The complete schematic of the master control is shown in Fig. 4. The power supply uses a Sola constant-voltage power transformer which permits operation on line voltages from 100 to 130 volts at 60 cycles. The power transformer has three secondaries. Because the circuit is sensitive to 60-cycle hum, the filaments of V-2 and V-3 are supplied with dc from a full-wave bridge rectifier S-1.

Fig. 5—Parts list for the master control unit in the ultrasonic burglar alarm.

C-1	1 μ f.	660V AC	R-3	20 K	10 W.	V-1	6x5	
C-2	20 μ f.	450V	R-4	2.2 K	2 W.	V-2	6SL7	
C-3	40 μ f.	450V	R-5	2.2 K	2 W.	V-3	6SL7	
C-4	20 μ f.	450V	R-6	120 K		V-4	6SN7	
C-5	40 μ f.	250V	R-7	470 K		S-1	25V FWBR 60 ma.	
C-6	10 μ f.	250V	R-8	270 K		S-2	1RC-9GA2-4D	
C-7	200 to 400 μ f.	500V	R-9	220 K		S-3	1RC-9GA2-4D	
C-8	200 μ f.	500V	R-10	10 Meg.		S-4	1RC-9GA2-4D	
C-9	.02 μ f.	400V	R-11	10 Meg. Pot.		S-5	1RC-9GA2-4D	
C-10	.01 μ f.	400V	R-12	4.7 K		S-6	R. R. 2M1	
C-11	.047 μ f.	400V	R-13	470 K		T-1	SOLA-7104	
C-12	500 μ f.	500V	R-14	470 K		T-2	Osc. Coil-W.K. & Co., Inc.	
C-13	.1 μ f.	400V	R-15	470 K		T-3	Input Xformer-W.K. & Co., Inc.	
C-14	100 μ f.	500V	R-16	470 K		SW-1 (A and B)	DPDT Switch, Smith 523	
C-15	100 μ f.	500V	R-17	220 K		Fuse	1.6 amp SLO-BLO	
C-16	100 μ f.	500V	R-18	220 K		Pilot Lamp	12V AC	
C-17	.01 μ f.	400V	R-19	4.7 K		MC-Relay	Sigma Type 5R W.K. & Co., Inc.	
C-18	1-8 μ f.	Var.	R-20	220 K		S-W 2	SPST (NC) Switch, GE Switchette	
C-19	.01 μ f.	400V	R-21	270 K		Turbulence Filter W.K. & Co., (complete)	J-1	110BCS1 Yellow
C-20	.1 μ f.	400V	R-22	120 K		J-2	110BCS1 Blue	
C-21	20 μ f.	25V	R-23	1.2 Meg.		J-3	110BCS1 Red	
C-22	.1 μ f.	400V	R-24	1.2 Meg.		J-4	110BCS1 Green	
C-23	.5 μ f.	400V	R-25	1.2 Meg.		J-5	110BCS1 White	
C-24	.01 μ f.	400V	R-26	1.2 Meg.		E-1 Strip	Ground	
C-25	.01 μ f.	400V	R-27	4.7 Meg.		2	6V AC	
C-26	.03 μ f.	600V	R-28	1.2 Meg.		3	Relay N.C.	
C-27	2x.5 μ f.	400V	R-29	470 K		4	Rel N.D.	
C-28	10 μ f.	50V	R-30	2.2 Meg.		5	Rel Arm.	
C-29	.008 μ f.	400V	R-31	1.2 Meg.		6	Osc Hor	
C-30	.01 μ f.	400V	R-32	1.2 Meg.		7	Osc Cold	
C-31	.01 μ f.	400V	R-33	22 K		1	E-2 Strip	
C-32	.1 μ f.	400V	R-34	22 K		1	Input	
C-33	.01 μ f.	400V	R-35	270 K		2	Input	
C-34	2x.5 μ f.	400V	R-36	180 K		3	Shield	
C-35	10 μ f.	250V	R-37	470 K				
C-36	.02 μ f.	400V	R-38	100 K				
C-37	.1 μ f.	400V	R-39	2.2 Meg.				
C-38	.25 μ f.	400V	R-40	22 K				
C-39	.5 μ f.	400V	R-41	1.2 Meg.				
C-40	.001 μ f.	1600V	R-42	1.2 Meg.				
C-41	.0015 μ f.	1000V	R-43	4.7 Meg.				
			R-44	180 K				
			R-45	22 K				
			R-46	47 K				

Rectifier

The high-voltage winding feeds a 6X5 full-wave rectifier in the conventional manner. The cathode is connected to a capacitor filter, C-2, and the voltage-divider network R-2 and R-3. This furnishes plate voltage for the relay tube, V-3. The output of the rectifier also feeds a two-stage R-C filter, R-4, C-3, R-5, and C-4, which supplies plate voltage to the amplifiers and the oscillator.

The first two amplifier stages, V2a and V2b, have a decoupling network R-6 and C-5 in their plate supply. A separate voltage dividing network and filter, R-7, R-8, and C-6 is connected to the oscillator plate supply. The voltage from C-6 is also used to supply proper magnetic bias for the operation of the magnetostriction transducers (microphones and speakers).

Tube section V-4b is the oscillator, and operates at a frequency of approximately 1,912 kc. The oscillator-output voltage is stepped down to 6 volts by transformer T-2, and is fed to terminals 6 and 7 on the E-1 strip. From there it is connected by cable to the windings of the transmitting transducers.

19-KC Signal

The 19-kc sound wave, radiated by the transducers, is picked up by the receiving transducer and converted to a 19-kc electrical signal which is fed to the control at terminals 1 and 2 of E-2.

The signal is fed into a step-up transformer, T-3, the secondary of which is tuned to the oscillator frequency. Its output is coupled by C-8 to the grid of V-2a. The grid resistor R-9, is connected to the biasing resistor R-10. The 19-kc signal is again amplified by V-2b. Capacitors C-14, C-15 and C-16, and resistors R-13, R-14 and R-15 form a high-pass filter which couples the signal to the detector, S-2. The network of R-16 and C-17 is a low-pass filter. The 19-kc signal does not appear at the grid of V-4a. The selenium diode is connected across R-15. At this point, the 19-kc signal from V-2 is beat against the original signal coupled back from the oscillator through capacitor C-18.

A moving object in the protected area causes a portion of the received signal to be of a different frequency from the transmitted signal. Any variations in frequency, phase or amplitude will modulate the received 19-kc signal. The low-

frequency modulation component appears across resistor R-15. The frequency of the variations in the received signal caused by an intruder, will range from about 15 to 100 cycles-per-second. Air turbulence will cause variations at lower frequencies, which can be filtered and compensated for, so as not to prematurely trigger the alarm.

Turbulence Filter

The low-frequency signal resulting from mixing and detecting goes through the low-pass filter R-17, C-19, R-18, and C-10. It is then coupled to the grid of V-2a by capacitor C-9 and resistor R-9. This simultaneous amplifying of low and high frequencies by the same tube is known as "reflexing." V-2 is operated as a two-stage reflex amplifier. The amplified low-frequency signal then goes to the high end of the sensitivity control R-11. At these low frequencies, C-12 appears as an open circuit and the setting of this control determines the amplitude of the low-frequency signal applied to the grid of the next stage. From the plate of this stage the low-frequency signal is fed through a low-pass filter R-16 and C-17 and coupled by C-20 to the third stage, V-4a. Since capacitor C-14 is part of the high-pass filter, none of the amplified low-frequency signal can be coupled anywhere else but to the third stage.

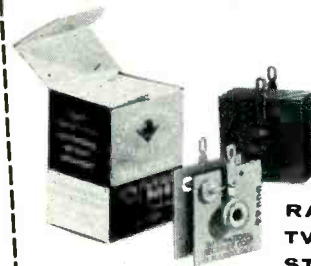
The output from the third amplifier is divided into two portions. A low-frequency portion, about 5 cycles-per-second, is fed through the low-pass filter R-20 and C-22, through C-23 to the diode S-3 where it is rectified to give a signal that is positive with respect to ground. The higher frequency component of the signal is coupled to the grid of a V-3a through C-24 and C-25. The plate of a V-3a is coupled through R-21, C-26, and C-27 to the diode S-4 where it is rectified in a direction that is negative with respect to ground. In order to improve the selectivity of V-3a, a negative feedback filter, consisting of C-28, R-22, R-23, C-29, R-24, C-30, R-25, C-31, C-32, and C-33, may be used. The filter is mounted in a plug-in case which fits into the V-3 socket, V-3 is turn plugs into the filter. Thus its use is optional but it is advised wherever a condition of severe turbulence is encountered, such as caused by space heaters.

These rectified negative and positive signals are added in the proper

(Continued on page 78)

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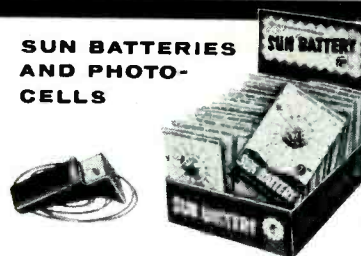
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(Continued from page 77)

ratio, to overcome turbulence, by the resistance network R-26, R-27 and R-28. The resultant voltage is taken from the junction of R-27 and R-28, and fed to the grid of the relay tube V-3b. Resistor R-29, and capacitor C-34 serve as a filter circuit. Resistor R-30 limits the grid current if the voltage across capacitor C-34 becomes positive. In order to prevent the positive compensating signal from becoming excessively large, when the negative signal has reached a high enough value to saturate V-3a, a limiting circuit is inserted across the rectifier S-3. This circuit is a diode, S-5, used as a positive limiter. The voltage divider network composed of R-44 and R-45, provides a positive bias on rectifier S-5. Rectifier S-5 will not conduct until the positive signal developed across S-3 exceeds the biasing voltage. When the voltage is exceeded, S-5 conducts and limits the positive potential that can be developed across S-3. In this manner, the positive signal can compensate but cannot over-compensate.

Alarm Signal

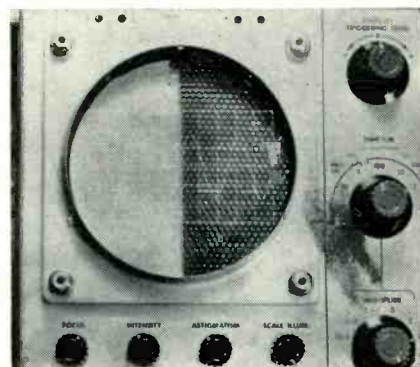
The negative resultant of the alarm signal is fed to the grid of V-3b and used to control the alarm-relay coil which is in the plate circuit. Capacitor C-35 and resistor R-34 are across the coil, and acts as a filter to prevent chatter, and voltage limiter, respectively. Operation of the unit with the relay removed is to be avoided.

When not in the alarm condition, the relay coil is continuously energized. Jacks J-2 and J-3 are used to insert a high-resistance voltmeter to monitor the voltage across the relay coil. A voltage reading compared with the minimum energizing relay voltage will indicate how safely above the dropout point, the relay is operating. Normally closed or normally open contacts are part of the relay and are available at the E-1 strip. An added safety factor is built into this unit by wiring the filaments of some of the tubes in series. If for example the oscillator tube V4 had an open filament, the rectifier tube V1 would be disabled and the alarm would sound. •

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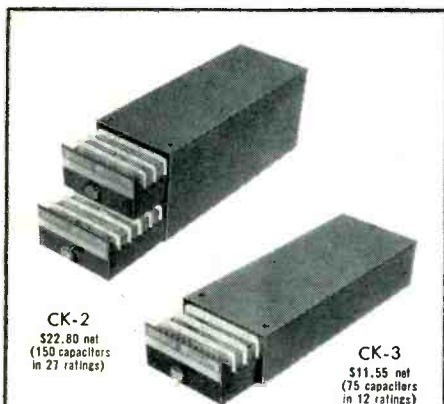
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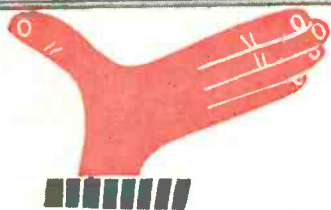
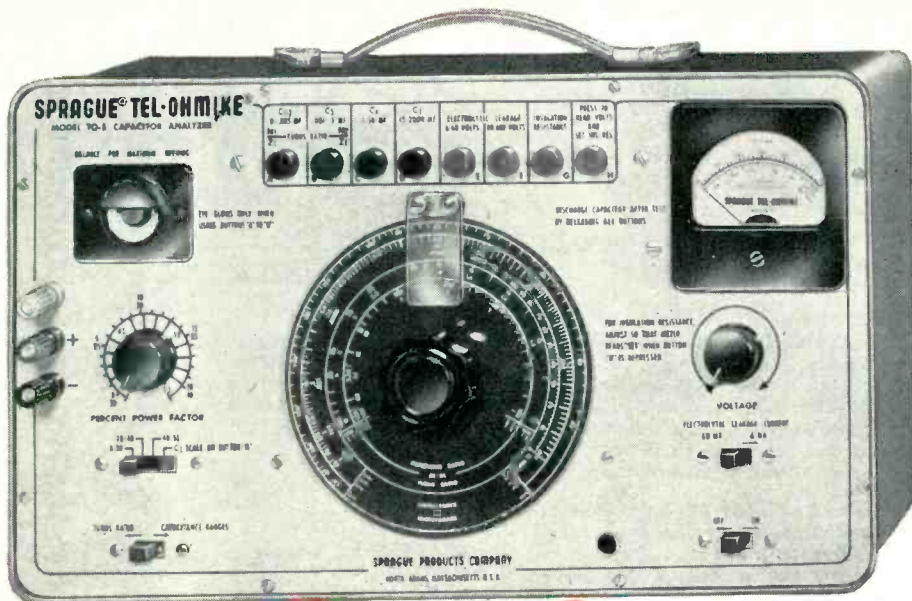
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1U5	.85	6BD5	1.45	12AH7	1.25
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3CB6	1.00	6BQ6GTA	1.65	12B4A	.95
3CF6	1.10	6BQ7A	1.45	12B8A	.80
3CS6	1.00	6BX7GT	1.70	12BA7	1.30
3DT6	.95	6BY5G	1.40	12BQ6	.85
3LF3	1.35	6BY6	.90	12B6	.85
3Q4	1.00	6BZ6	.90	12BF6	.80
3Q5GT	1.20	6BZ7	1.55	12B7A	1.15
3S4	.95	6C4	.65	12BK5	1.25
3V4	.95	6C5	.90	12BN6	1.10
4BC8	1.75	6CB5	2.90	12BQ6GTB	1.65
4BQ7A	1.65	6CB6	.90	12BR7	1.05
4BS8	1.60	6CD6G	2.15	12BV7	1.25
5AM8	1.20	6CF6	.95	12B7A	1.15
5AN8	1.20	6CG7	.95	12BZ7	1.15
5AR5	.90	6CH8	1.20	12C5	.85
5AS8	1.25	6CH8	1.25	12CA5	.80
5AT8	1.20	6CL6	1.40	12C6	1.65
5AU4	1.25	6CM6	1.00	12D06	1.65
5AV8	1.45	6CM7	1.05	12L6GT	.95
5AW4	1.20	6CN7	1.05	12SA7GT	1.10
5AZ4	.80	6CS6	.90	12SG7	1.05
5BK7	1.55	6CS7	1.10	12SH7	1.15
5BR8	1.40	6CU5	.85	12S17	1.05
5BQ7	1.70	6CUG	1.65	12SK7GT	.95
5C68	1.35	6CD6	1.00	12S16	1.20
5J6	1.05	6DE6	.95	12SN7GTA	1.05
5R4GY	1.60	6DT6	.85	12SQ7GT	.90
5T8	1.45	6D06	1.65	12V6GT	.85
5U4G	.85	6E5	1.00	12W6GT	1.10
6A7	1.20	6F6M	1.25	12X4	.65
6ABM	1.35	6F6G	1.05	14B6	1.00
6AB4	.80	6J5	.90	19AU4	1.20
5U4GB	.85	6J6	.80	19B6G	2.50
5UB	1.25	6J7	1.25	19I6	1.10
5V4	1.10	6K6GT	.85	19T8	1.25
5V6GT	.90	6K7	1.05	19T8	1.25
5X8	1.30	6K8	1.35	19X8	1.25
5Y6GT	.70	6L6G	1.45	25AV5GT	1.40
5Y4G	.90	6L6GA	1.55	25AX4GT	1.15
5AB4	.80	6L6M	2.10	25BK5	1.25
6AR5	1.30	6L7	1.20	25BQ6GTB	1.70
6AC5GT	1.35	6N7	1.30	25C06GA	2.20
6AC7	1.35	6P7	1.05	25CUG	1.65
6AF4	1.70	6S4	.80	25L6GT	.85
6AG5	.90	6S8GT	1.15	25W4GT	1.00
6AG7	1.65	6SA7GT	1.00	25Z6GT	1.00
6AH4GT	1.05	6SC7	1.10	35A5	1.05
6AH6V	1.45	6SF5	.95	35B5	.90
6AJ5	1.85	6SG7	1.10	35C5	.85
6AK4	1.60	6SH7	1.00	35L6GT	.90
6AK5	.85	6SJ7M	1.05	35W4	.60
6AK6	.95	6SK7GT	.95	35Y4	.85
6AL5	.75	6SL7GT	1.15	35Z5	.70
6AL7GT	1.90	6SN7GTAB	1.05	50A3	1.05
6AM4	1.90	6SO7GT	.85	50B5	.95
6AM8	1.20	6SR7	1.00	50C5	.85
5AN4	1.85	6T4	1.40	50L6GT	.90
6AN5	3.70	6T8	1.25	50Y7GT	.95
6AN8	1.30	5U8	1.25	70L7GT	2.60
6AQ5	.85	6V3A	1.70	80	.70
6AQ6	.65	6V6GT	.85	81	2.00
6AS5	.90	6V6M	1.60	83	1.25
6AS6	2.35	6W4GT	.90	117N7GT	2.30
6AS7G	3.15	6W6GT	1.05	117P7GT	2.10
6AS8	1.30	6X4	.65	117Z3	.90
6AT6	.75	6X5GT	.70	117Z4GT	1.20
6AT8	1.20	6X8	1.25	117Z6GT	1.25
6AU4GT	1.40	6Y6G	1.05	5642	1.15
6AN5GT	1.55	7AU7	1.00	5654	1.40
6AU6	.80			AND OTHERS	

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Measures up to 2000 μf in five overlapping ranges . . . including an accurate 1 to 100 μf range, exclusive with Sprague.	Power factor of electrolytic capacitors is measured by the highly accurate bridge method. Reads up to 55% in three ranges for convenience in measurement.	Leakage current of electrolytics is measured directly on the meter, with exact rated voltage up to 600 v. applied from continuously adjustable power supply. Two ranges — 0-6-60 ma.	Insulation resistance of paper, ceramic, and mica capacitors is read directly on meter . . . up to 20,000 megohms.	In addition to its function as a complete capacitor analyzer, the TO-5 also measures the turns ratio of power and audio transformers.

The NEW TO-5 TEL-OHMIKE Capacitor Analyzer is one of the fastest and surest ways of measuring . . . capacitance, power factor, leakage current, insulation resistance, and turns ratio. This compact, easy-to-use instrument has the highest accuracy of any instrument of its type available to the service trade.

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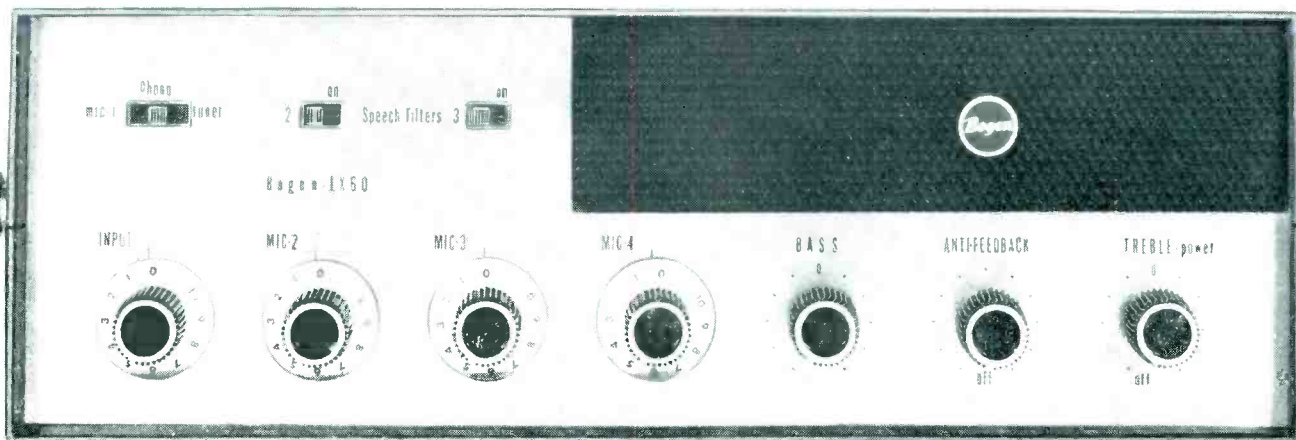
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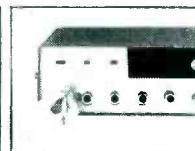
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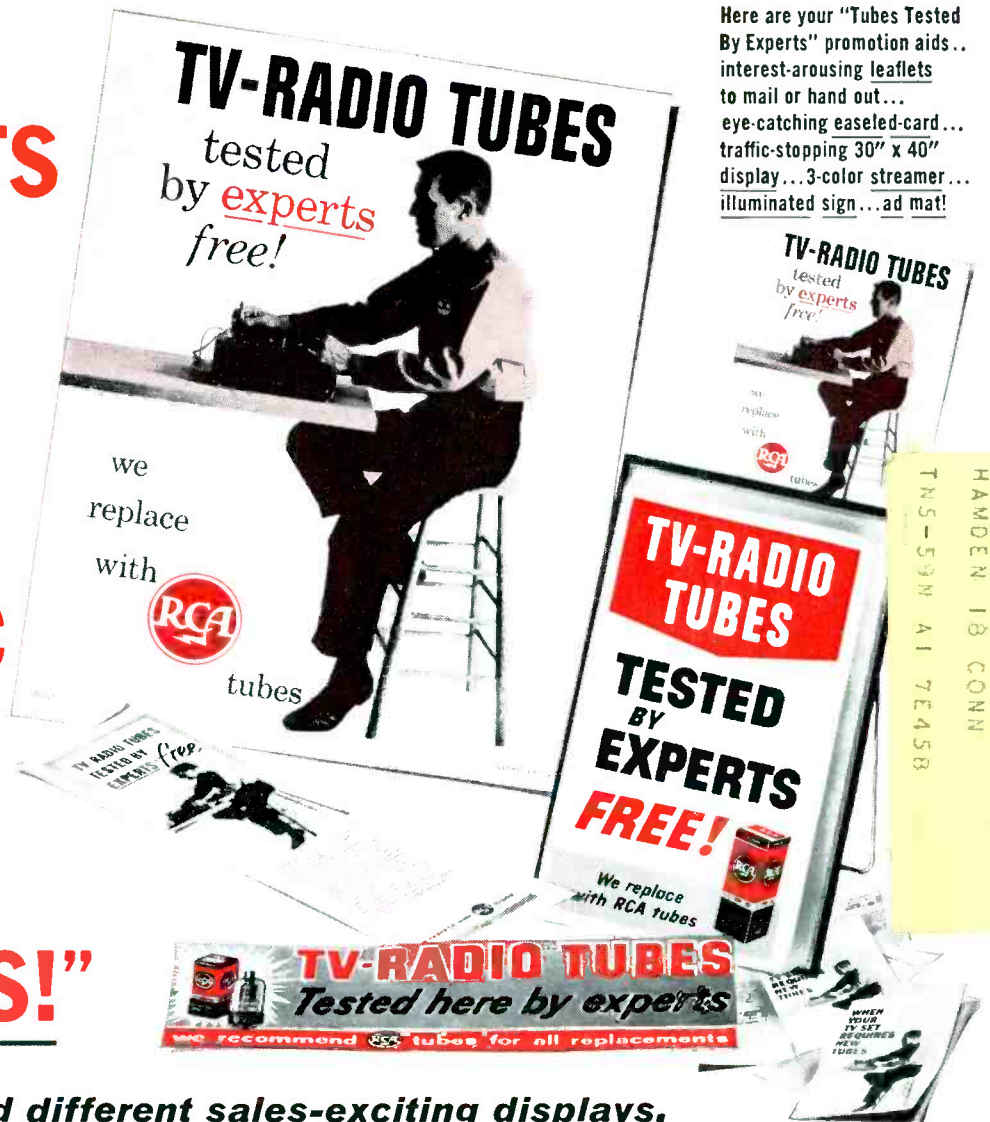
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