

ELECTRONIC TECHNICIAN

Including
SERVICE
Magazine

\$500,000,000
Industrial
Electronic
Market

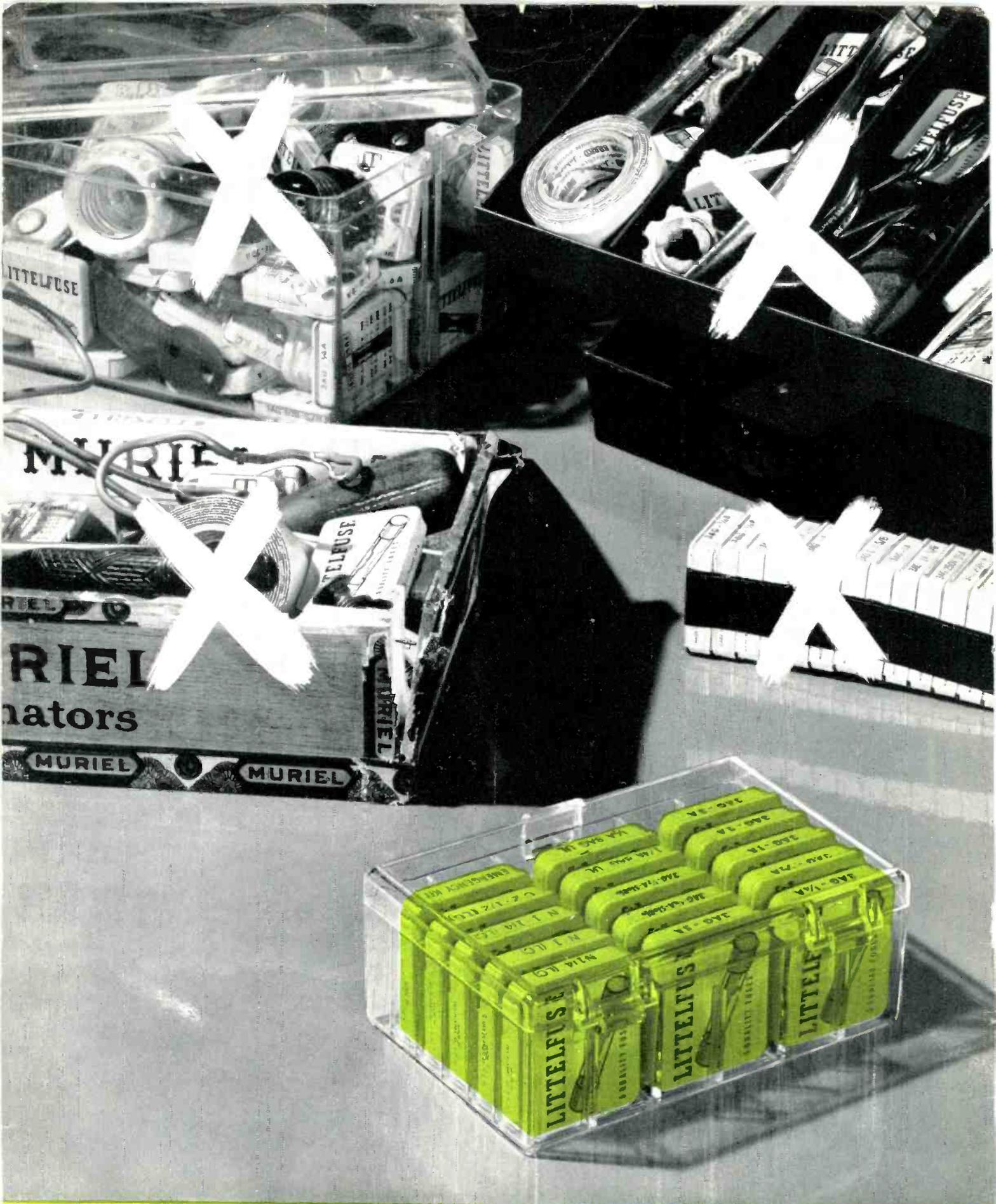
\$2,900,000,000
TV-Radio-Hi-Fi
Servicing

50¢

January • 1960

WALTER F. PUDLIK
RT 1 BOX 278
ENGLEWOOD COLO

TN7-6IN AS 6CS114C



Barton browser advertising

THERE'S ONLY ONE RIGHT WAY

A fuse caddy for your tube caddy: 18 individual compartments for fingertip selection. The fuse caddy is complete with the 15 boxes of fuses required to service 93% of all TV sets. Three spare compartments are provided for additional fuses of your own selection.

LITTELFUSE Des Plaines, Ill.

The Most Dramatic Guarantee In Picture Tube History:

The Quality Stays



Raytheon TV Tubes Work Fine . . .

Or Raytheon Pays!

Only Raytheon dares to make this offer:

No if's, and's or but's. If any Raytheon picture tube fails within one year of installation, the Bonded Service Dealer who installed it *will be reimbursed for the cost of his time in making the call-back.*

Of course, he also gets a new picture tube free, as provided by the warranty.

Raytheon distributors are authorized to issue a full \$5 credit memo. All you do is fill out the form. The tube must work without a fuss, or you charge the call-back cost to us.

Raytheon makes this offer only

because of the outstanding quality of its picture tubes, manufactured to meet strictest original equipment manufacturers' requirements. No other picture tube ever undergoes more torture tests, more inspections, more rigid, rugged double-checks before it comes to your shop.

That's why Raytheon, and only Raytheon, dares to make this offer. When you buy a Raytheon picture tube, you *know* it will perform, or we cover the call-back. Raytheon tubes are made to *last . . . and the price is right, too.*



A One-Year Call-Back Guarantee

This offer is made to Raytheon Bonded Dealers only, because of Raytheon's willingness to stand back of the integrity of its Bonded Dealers. See your Raytheon distributor and learn how *you* can become Bonded, too.

Or Our Money's On The Line!



Precision cutting...a simple job

with the new

Centralab

SK-2

SHAFT-KUT

TOOL



Now you can cut controls and control the cut . . . precisely and exactly.

CENTRALAB'S Shaft-Kut Tool is a precision instrument, *guaranteed* to make a really simple job of cutting shafts to the exact size you need.

With this tool you can cut any single or dual control . . . or switch shaft, and get cuts that are accurate to $\frac{1}{64}$ th of an inch! The tool and calibrated jig are made of case hardened tool steel, designed to last a lifetime.

You can't make a wrong cut with the CENTRALAB Shaft-Kut Tool! And the price is less than half what you'd expect to pay for a precision device of this kind . . . a low \$4.95 dealer net. Ask your distributor to show you how easy it is to use this new tool.

Centralab

B-5931

ELECTRONICS DIVISION OF GLOBE-UNION INC.
902A E. KEEFE AVE. • MILWAUKEE 1, WIS.
IN CANADA: 669 Bayview Ave., Toronto 17, Ont.

**CONTROLS • ROTARY SWITCHES • CERAMIC CAPACITORS
PACKAGED ELECTRONIC CIRCUITS • ENGINEERED CERAMICS**

Editor's Memo



Laymen love to educate specialists. One doctor I know tells me that many of his patients carefully explain to him what happens in the body when Anacin and Bufferin are swallowed. You see, when the stomach trap door opens, the anvil chorus on the brain stops.

TV techs get their share of such education. Bet you didn't know that outdoor antennas and rabbit ears can be eliminated by a so-called "miracle socket antenna" that turns house wiring into a giant antenna, hundreds of feet long. It works like a paraboloidal radar antenna-reflector, your customer might patiently explain to you, if he remembers the big words in the ad.

The sad fact is that such an explanation is even more incorrect than the one about little analgesic "B's" marching hup-two-three-four along intestinal plumbing.

Socket antennas—consisting of a piece of wire; a series capacitor and a plug for the 100-volt line outlet—are, unfortunately, not very effective. I'm not referring to similar types which are tunable and do not plug in. These units which lay against the a-c line were not tested.

We checked some of the capacitor coupled socket gadgets at the request of the Better Business Bureau. In a strong signal area, we found that it worked so-so when plugged into the ac line. When removed from the wall outlet it still worked about as well!

Here are some salient points from the BBB report:

Most house wiring is electrically shielded against effective signal pickup.

The random nature of house wiring directivity would reduce its efficiency.

Signal pickup, if any, in such devices is largely limited to the five foot line cord. Within the primary area of transmitters there may be sufficient signal pickup on an equal length of a-c line.

There is no correlation with respect to extensive length (that house wiring theoretically could offer as an antenna, for example) and the degree of signal strength to be yielded therefrom. On outdoor antennas, signal strength is a function of careful antenna design.

References to radar in such advertising have no basis in fact.

Some hazard may be involved in such devices, for the full voltage of the house wiring circuit could be impressed on person or set if condensers in the device are defective or become shorted.

Al Forman

Channel Master
AUTOMATIC
TENN-A-LINER
model 9524
\$49⁹⁵ list



Hits TV stations right on the nose! The Channel Master Automatic Tenn-A-Liner is the only rotator that aims the antenna within **one degree** of the precise transmitter location.

Superior parallel circuit delivers a full 29 volts to the rotator, producing higher torque that easily turns even the heaviest antennas. Fewer moving parts—all fully protected from weather extremes—contribute to long, trouble-free service.

For these and other reasons, you can recommend and install the Automatic Tenn-A-Liner with full confidence of customer satisfaction.

from the top of the roof...to the back of the set...

CHANNEL MASTER

works wonders in sight and sound



Premium tube features at no extra cost. Channel Master Electron Tubes are designed for use in television, AM/FM radio, and high fidelity systems. They offer the same outstanding performance, quality, and value you've come to expect from all products bearing the Channel Master name.

Rigid manufacturing controls assure consistent performance characteristics, exact tolerances, long life, low noise, and maximum gain. Channel Master Electron Tubes are engineered to provide the best possible results.

For happier customers, fewer callbacks, higher profits... put Channel Master tubes in the sets you service.

Copyright 1959 Channel Master Corp.

CHANNEL MASTER CORP. ELLENVILLE, N. Y.

TV ANTENNAS • ACCESSORIES • TRANSISTOR RADIOS
STEREOPHONIC HIGH FIDELITY COMPONENTS

FIRST TIME . . . a versatile

DUAL

HEAT

SOLDERING GUN

FOR ONLY
\$7⁹⁵
LIST
Model 8200K



...and best of all,
it's a new

Weller[®]

Here from Weller, long time leader in the soldering field, is the newest and finest soldering gun value on the market.

WELLER DUAL HEAT FEATURE saves time, gives greater convenience and greatly increases tip life. A touch of your finger on the Triggermatic control switches heat to high (125 watts) or low (90 watts) as your job requires. It adapts instantly to varying needs, and you use high heat only when necessary.

HIGH EFFICIENCY WELLERTIP utilizes copper for superior heat transfer and soldering efficiency, plus iron plating for durability. Flat cross-section design gives added strength and rigidity.

NEWEST DESIGN with sturdy plastic housing that resists hard knocks. Compact "feel" and comfortable balance aid precision soldering. Like all other Weller guns, this new model features instant heat, and a spotlight illuminates your work.



KIT INCLUDED

In addition to the Dual Heat Soldering Gun you get:

- Nylon Flux Brush
- Soldering Aid for opening old joints, twisting wires
- All-purpose Solder

On sale now at your
Electronic Parts Distributor

WELLER ELECTRIC CORP. • 601 Stone's Crossing Rd., Easton, Pa.

LETTERS

To the Editor

New & Rebuilt CRT's

Editor, ELECTRONIC TECHNICIAN:

You should be commended for your courageous November editorial. My feelings could not have been expressed in a better way. Unfortunately, there is still a fly in the ointment. When we sell a "new" CRT, we mean just that, and want to be able to back it up 100%. You might be amazed by the number of customers who ask for a new picture tube. I must agree with Kimble, that many rebuilt CRT's are sold as "all new," the dealer knowing good and well that the difference in performance can't be detected. I would be happy to see an editorial on CRT labelling, so that we technicians have some protection too. After all, we want to be sincere with our customers, and not misrepresent a "rebuilt" for a new CRT.

PAUL BOLLER

Springfield, Ohio

• See "N.Y. Bill Regulates Tube Sales" in this issue.—Ed.

A Micron Is A Micron

Editor, ELECTRONIC TECHNICIAN:

It has been called to my attention that tape recorder manufacturers have been describing tape head gap widths in terms of "microns," while meaning *micro-inches*, as in "90 microns width (0.00090 in.)." I would like to point out that a micron is a unit in the metric system, equal to a millionth of a meter. 90 microns equal 0.0035 inches, 120 microns equal .0047 inches—sizeable gaps! A micron is 39.37 times as large as a micro-inch. I can't emphasize too strongly that the use of the word micron in any other meaning than a millionth of a meter is incontrovertibly incorrect, and should not be tolerated.

PHILIP N. BRIDGES

Rockville, Maryland

Obsolescent Testers

Editor, ELECTRONIC TECHNICIAN:

I still have not obtained the up-to-date tube chart that Precise Development Corp. was supposed to send me. All I got back from them was a check reimbursing me for the \$1.10 I sent them long ago for this promised chart. The check is signed by "Debtor in Possession." The Precise Model 116 tube tester is still being sold through parts houses. Unknowing service technicians should be informed. In the past you have been very good at exposing tube rackets, and I hold your magazine in very high regard.

JOHN I. LABOSKY

Johnnie's Radio & TV
Newton Falls, Ohio

(Continued on page 8)

PHILCO THE FIRST NAME IN ELECTRONICS

QUALITY

... THE LAST WORD IN

Because the Philco name is symbolic of quality, long-life Philco tubes are the **FIRST CHOICE** of quality-wise technicians. It will pay you to use them for all replacements—TV, radio and hi-fi. Their proven reliability protects your profits. In addition, the prestige of the Philco name builds customer good will. For top performance in receiving tubes as well as CR picture tubes and all other replacement parts, look to Philco—the first name in electronics...the last word in quality!



SEE YOUR PHILCO DISTRIBUTOR. Get the facts about the Philco Sweetheart Offer for Valentine's Day



PHILCO ACCESSORY DIVISION WORLD-WIDE DISTRIBUTION

Service Parts • Power-Packed Batteries • Universal Components • Long-Life Tubes • Heavy Duty Rotors • Star Bright 20/20 Picture Tubes • Long Distance Antennas • Appliance Parts • Laundry Parts • Universal Parts and Accessories.

(Continued from page 6)

Printed Circuits

Editor, ELECTRONIC TECHNICIAN:

I have just read your November Editor's Memo, and am surprised at the editorial stand you have taken in regard to printed circuits. In my opinion, Consumers Union should be praised for letting the public know the truth about PC. No matter what the manufacturers do to make servicing these nightmares easier, it still would not replace a hand wired chassis. What have the manufacturers done to make changing a filter pack, i-f coil, tube socket and many other components easy? Have you ever tried changing some of these parts without breaking the printed board?

M. J. UNTERWEISER

Empire Electronics
Massapequa, N.Y.

Rejection Reaction

Editor, ELECTRONIC TECHNICIAN:

A couple of your hired hands have managed to get me into a major disappointed electronic snit. Last month I received an invitation from your circulation department to enter the ranks of your happy subscribers. It was well presented and offered what I thought was a good deal. So I filled out the proper lines and wrote a check. The arrival of your regular subscription rejection form and the check accounts for the disappointment. Reading it and thinking it over accounts for the snit. Of all the mealy-mouthed crud!!! If you have a magazine that sells and you can make money in its distribution, and can't supply the demand, get a bigger press or hire more help and work 'em nights, but get the stuff out. Then the real reason comes out. The prospectus never said a word about any restrictions in the subscription list. I am now spending \$27.00 of my own money and most of my spare time at trying to learn the business and I think that ought to qualify me for something more than a double-talking rejection. My good wife tells me not to make a Federal Case out of this. Besides I have a patient and forgiving nature and I wouldn't want this first little misunderstanding to cause what might be a long and satisfactory association to die aborning.

MELVIN J. MILLER

Seattle, Washington

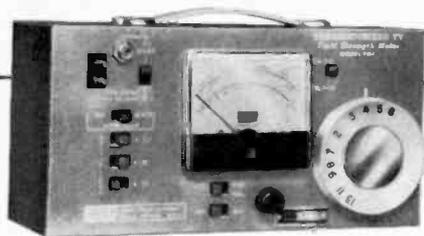
• We regret Mr. Miller's unhappy state of mind, but the fact is that our subscription offer specifically stated it was open only to active TV-electronic technicians—the people who earn their bread in our industry. Last year we returned \$18,000 to people who wanted to subscribe, but did not qualify. There are other publications available to serve students and hobbyists. In any case, by his own admission, Mr. Miller has a "patient and forgiving nature," so we hope he will give us the opportunity to serve him if and when he enters the trade.—Ed.

(Continued on page 14)



Now!

Checking Signal Strength *Anywhere* ... IS AN EASY ONE-MAN JOB!



JERROLD

MODEL TMT

Direct Reading

TRANSISTORIZED FIELD STRENGTH METER

only \$135. net weatherprotecting leather carrying case, \$12.95 net

Now you can measure *exactly* how much signal is in the area, coming off the antenna, coming off the down lead and is at the set! Just 4½ pounds of rugged instrument, the radically new Jerrold TMT responds only to the TV sync signal to which it is tuned and is therefore immune to noise . . . carries its own power supply (4 simple "c" batteries). Tailor-made for the professional television serviceman and systems technician, the TMT:

- provides accurate (± 3 db) signal strength readings
- reads directly, not relatively in microvolts (100 to 2,000,000) in 8 switchable ranges
- for probing and orienting antenna signals and measuring distribution systems
- checks horizontal synchronizing frequencies in TV receivers

JERROLD

ELECTRONICS CORPORATION, Distributor Sales Division

PD 191 The Jerrold Building, Philadelphia 32, Pa.

Jerrold Electronics (Canada) Limited, Toronto

Export Representative: CBS International, New York 22, N.Y.



CLOSE-UP of pitted area. The filament is so badly camaged that it soon will break, or bend to meet the plate, shorting out the tube.

FILAMENT INTACT. General Electric 5U4-GB filament, after life test inside its unribbed plate at 35% above rated tube voltage, shows no destructive effects from "hot spots".

FILAMENT BADLY PITTED. Ordinary 5U4-GB filament after the same life test inside its ribbed plate, shows minor or heavy damage that has occurred opposite each rib.

Smooth Plates of G-E 5U4-GB Protect Filaments!

Service-Designed Tube is free from "hot spots" that damage filaments of less dependable 5U4-GB's with ribbed plates!

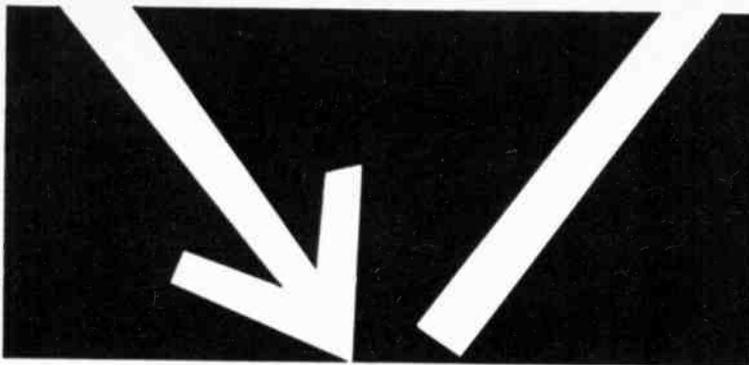
Install the rectifier tube with the smooth, unribbed plates—General Electric's Service-Designed 5U4-GB! No raised metal lips to collect contaminants. These build up into ridges which serve as sources of back emission, causing "hot spots" that melt and eventually destroy the filaments of ordinary tubes (see photographs above, right).

Dependable from the moment you install them, Service-Designed 5U4-GB's mean fewer callbacks and less chance of a rectifier-tube short-circuit, with risk of transformer burnout—a costly possibility in many modern TV sets. See your G-E tube distributor! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Ky.*

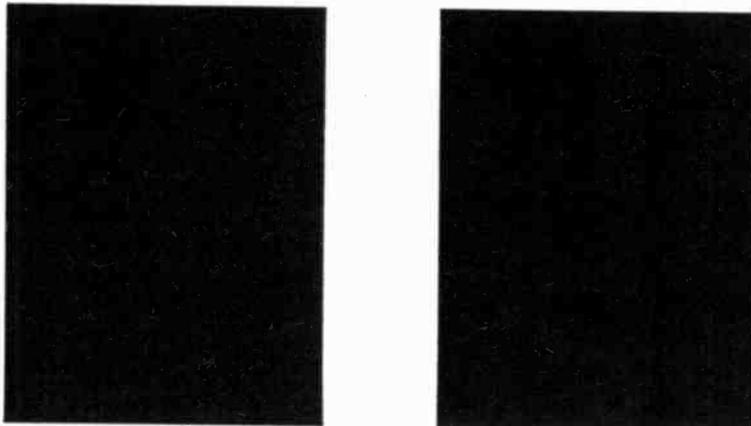
Install the picture-perfect pair: Service-Designed Tubes and Black-Daylite Picture Tubes!

GENERAL  ELECTRIC

2-111-209



HOW MUCH DO YOU KNOW ABOUT TRANSISTORS?



Attend the

**Delco Electronics—One Week
—Advanced Training School** No tuition charge
No laboratory fees
Textbooks supplied

Bring yourself up to date on transistors and other modern electronic equipment with personalized instruction at the Delco Electronic training school to be held soon at a General Motors Training Center near you. Classes are conducted by graduate engineers with special training in your field.

The Delco Radio diploma, awarded only to those who successfully complete the courses, will mean a great deal to you—and to your customers.

The Delco Electronics—One Week—Advanced Training Schools will be conducted in the General Motors Training Centers indicated below. One of them is near you. Register now through your local Delco Electronic Parts Distributor or write directly to Delco Radio Division, General Motors Corporation, Kokomo, Indiana, Attention: Service Manager.

COURSES OF STUDY OFFERED AT NO COST TO YOU:

- ① Transistor Fundamentals—complete coverage of transistor theory without the use of mathematics.
- ② Transistor Circuit Trouble-shooting—lecture and lab work analyzing defects in transistor circuits.
- ③ Hybrid-type Automobile Radios—low voltage tube and output transistor circuits. Lecture and lab.
- ④ Trouble-shooting procedures for dead or weak low voltage auto radios—factory developed techniques that are foolproof.
- ⑤ Lecture and lab practice on "Signal Seeker" and "Wonder Bar" auto radio tuners and trigger circuits.
- ⑥ Guide-Matic Headlamp Control (Autronic Eye)—lecture and lab.
- ⑦ Twilight Sentinel Automatic Headlight Switch—lecture and lab.
- ⑧ Garage Door Operators—lecture and lab work including the new Delco Radio all-transistor control units.
- ⑨ Auto Portable Radios—lectures on circuitry of both 1959 and 1960 auto portable radios.

DELCO
DEPENDABILITY
RADIO
RELIABILITY

DATE	REGION 1	REGION 2	REGION 3	REGION 4	REGION 5	REGION 6
1-11	Philadelphia	New Orleans	Chicago			
1-18				St. Louis	Dallas	Salt Lake City
1-25		Atlanta	Detroit			
2-1	Union					
2-8				Omaha	Memphis	
2-15	Pittsburgh	Jacksonville				Los Angeles
2-22	Pittsburgh		Cincinnati			
2-29				Kansas City Kansas City		
3-7	Tarrytown	Charlotte			Dallas	Portland
3-14			Cleveland			
3-21				Omaha	El Paso	
3-28	Boston Boston	Atlanta				Los Angeles
4-4			Chicago	Minneapolis Minneapolis		
4-11					Houston Houston	San Francisco
4-18	Union	Washington Washington	Milwaukee			
4-25						
5-2			Cincinnati	Omaha		Portland
5-9	Buffalo				Okla. City	
5-16		Atlanta	Detroit	St. Louis		
5-23						Los Angeles
6-6	Tarrytown		Chicago		Dallas	
6-13		New Orleans				San Francisco
6-20	Philadelphia			Denver		
6-27			Cleveland		Memphis	Salt Lake City

Hey...
I've
got
new
coil heaters!

(GOODBYE TO YOUR
FRONT-END TROUBLES)



"All 6BQ7A's used to have folded heaters . . . and gave you plenty of trouble. Now, all of us CBS 6BQ7A tubes have new coil heaters for our new improved cathodes . . . and *you* don't have heater burnouts, shorts or slumping gain."

Yes, the new CBS 6BQ7A offers you *total reliability* . . . proved in performance by leading TV and radio set manufacturers. You, too, can profit from the *total reliability* of CBS tubes. Prove it to yourself. Replace with CBS.

TOTAL RELIABILITY...proved in performance



Old-style 6BQ7A folded heaters had seven folds . . . each fold a potential source of burnouts and shorts. The new CBS 6BQ7A heaters, because of the telescopic effect of coiling the heater, have only one gradually curved fold. The result is that CBS 6BQ7A's just don't develop those irritating, costly shorts and opens.



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

CBS ELECTRONICS

Danvers, Massachusetts

A Division of Columbia Broadcasting System, Inc.

NOW take another look at

NEW MODEL 644

SOUND SPOT MICROPHONE • LIST \$110.00

If you are in the commercial sound business, you have had your share of . . . "they couldn't be done" . . . jobs at one time or another in your business life. These jobs could not be solved because general purpose microphones just couldn't do the job. That, fortunately, is past history. E-V's new Model 644 ushers in a new era in the concept of microphone pick-up. So *take another look* and see how many of those "tough" jobs the 644 reclassifies to "simple and easy". Your local E-V distributor has all the details on the Model 644. Why not call him today or write Dept. 10T for our new Commercial Sound Catalog No. 132.

Electro-Voice®

The New E-V Model 644 is in stock now at

ALABAMA

Birmingham — Forbes Distributing, 2600 3rd Ave.

ALASKA

Anchorage — Yukon Radio Supply, 645 '11' St.

ARIZONA

Phoenix — Culver Electronic, 231 N. First Ave.
Phoenix — High Fidelity Sound Systems, 1809 E. McDowell

CALIFORNIA

Burbank — Valley Electronic, 1302 W. Magnolia
Fresno — Dunlap Radio, 2617 Tulare St.
Hollywood — Hollywood Radio, 5606 Hollywood
Los Angeles — Kieruff Sound, 820 W. Olympic
Los Angeles — Radio Product Sales, 1501 S. Hill St.
Oakland — Elmar Electronics, 140 Eleventh
Pasadena — Audio Associates, 689 S. Fair Oaks Ave.
Pasadena — Dow Radio, 1755-59 E. Colorado
Pomona — Anderson-Maggs Electronic, 1095 E. 3rd
Sacramento — Dunlap Radio & TV, 1800 22nd
San Diego — Wrights House of Hi Fi, 5140 El Cajon
San Francisco — Columbia Music & Electronics, 1080-86 Market St.
San Francisco — San Francisco Radio, 1284 Market
San Francisco — Eber Electronics, 2355 Market St.
San Jose — Alco Paramount, 79 South Third
San Rafael — Catania Sound, 1541 Fourth St.
Santa Barbara — Channel Radio Supply, 18 E. Ortega
Stockton — Dunlap Radio, 27 North Brant St.

COLORADO

Denver — Fisteles Electronic Supply, 1001 Bannock
Pueblo — L. B. Walker Radio, 100 N. Victoria

CONNECTICUT

Hartford — Dressler Electronics, 401 Trumbull St.
Hartford — Hatry of Hartford, Inc., 100 High St.
Meriden — Business Music, Inc., 99 Colony
Middletown — G. U. Reed, 143 Williams St.
Waterbury — The Bond Radio Supply, 439 W. Main

DELAWARE

Wilmington — W. S. Wilson Co., 405 Delaware

DISTRICT OF COLUMBIA

Washington — Commissioned Electronics, 1776 Columbia Rd., N.W.
Washington — Electronic Whlstr., 2345 Sherman, NW
Washington — Shrader Sound, 2803 'M' St., NW
Washington — Silberne Radio & Electronic Co., 3400 Georgia Ave., N.W.
Washington — U.S. Recording, 1121 Vermont Ave.
Washington — Wilson-Gill, 1 Thomas Circle, N.W.

FLORIDA

Jacksonville — Fidelity Sound, 1427 London Ave.
Miami — Electronic Equipment, 2701 N.W. 42nd
Miami — Electronic Supply, 61 N.E. 9th St.
Miami — Flagler Radio, 1068 West Flagler St.
Tampa — Thurow Distributors, 121 South Water
Winter Park — Laird Electronics, 803 Fairbanks Ave.

GEORGIA

Atlanta — Calhoun Co., Inc., 121 Forrest Ave., N.E.
Atlanta — Radio Television, 526 Plaster Ave., N.E.

Atlanta — Southeastern Radio Parts Co., 400 W. Peachtree St.

HAWAII

Honolulu — Precision Radio, 1160 South Kings St.

IDAHO

Boise — Robbies Radio & TV, 3801 Hill Rd.

ILLINOIS

Benton — Lompley Radio Co., 452 East Church St.
Broadview — Hi Fi Unlimited, 1303-05 Roosevelt Rd.
Chicago — Allied Radio, 100 North Western
Chicago — deHann HI-FI, Evergreen Shopping Plaza
Chicago — Newark Electric, 223 W. Madison St.
Chicago — Private-Tele-Communications, Inc., 1010 West Diversey Parkway
Chicago — Woodlawn Appliance, 1215 East 63rd
Jacksonville — Besco, 419 South Mauvaisterre St.
Peoria — Klaus Radio, 403 East Lake

INDIANA

Anderson — Seybert's, 1331 Main St.
Bloomington — Stansifer Radio — 1805 S. Walnut
Evansville — Ohio Valley Sound, 20 E. Sycamore
Fort Wayne — Warran Radio, 1716 S. Harrison
Fort Wayne — Workrite Intercommunication Systems, 5341 Gardenview
Indianapolis — Graham Electronics, 122 S. Senate
Indianapolis — Radio Distributing, 1013 N. Capital
Indianapolis — Warren Radio, 732 N. Capital Ave.
Kokomo — Georges Electronic, 320 W. Superlar
Peru — Clingman Sound, 814 West Main
Richmond — Fox Electronics, 711 South Ninth
Rolling Prairie — Rolling Sound, Rural Route 1
South Bend — Colfax Company, 747 S. Michigan
South Bend — Industrial Sound Engineers, 531 1/2 Eddy St., South
South Bend — Radio Distributing, 1212 S. High St.
Terre Haute — C. T. Evinger Co., 1216 Wabash
Wabash — Mark's Camera & Hi-Fi Shop, 14 Canal

IOWA

Council Bluffs — World Radio, 3415 W. Broadway
Des Moines — Radio Trade Supply, 1224 Grand Ave.
Iowa City — Woodburn Sound, 218 East College St.

KANSAS

Kansas City — D. Beatty Stereo Hi-Fi, 1616 W. 43rd
Wichita — Radio Supply Co., 115 Laura St.
Wichita — Stark-Suburban Sound, 807-09 South Woodlawn

KENTUCKY

Lexington — J. M. Hisle, 405 South Upper St.
Lexington — Radio Equipment Co., 480 Skoin St.
Louisville — Universal Radio Service, 533 S. 7th St.
Paducah — Rowton TV & Sound Corp., 4815 Clarks River Rd.

LOUISIANA

New Orleans — Electronic Parts, 3622 Toulouse

MAINE

Bongor — Moine Electronic Supply, 494 Broadway
Portland — Maine Electronic Supply, 148 Anderson

MARYLAND

Baltimore — Henry O. Berman, 12 E. Lombard St.

Baltimore — Industrial Electronics, 127 Light St.
Baltimore — Kann Ellert Electronics, 9 S. Howard
Baltimore — R. Selway Collins, 627 N. Bend Rd.

MASSACHUSETTS

Boston — Cramer Electronic, Inc., 811 Boylston St.
Boston — DeMambo Radio, 1095 Commonwealth
Boston — The Louis M. Hermon Co., 885 Boylston St.
Boston — Radio Shack Corp., 730 Commonwealth
Boston — Tape & Music Inc., 1026 Commonwealth
Boston — Trimount Coin Machine, 40 Watham St.
Cambridge — Hi Fi Lab Electronic, 1077 Mass.
Springfield — Regent Sales, 999 Worthington St.
Worcester — Fred G. Walters Co., 1308 Grafton St.

MICHIGAN

Ann Arbor — Wedemeyer Electronic, 213-17 N. 4th
Battle Creek — Electronic Supply, 94 Hamblin Ave.
Detroit — Audio Equipment, 15747 Wyoming
Detroit — KLA Laboratories, 7375 Woodward Ave.
Detroit — Pecar Electronics, 11201 Morang Ave.
Detroit — Rissi Electronic Supply, 14405 Wyoming
Flint — Folsom's Commercial Sound Engineering, 1608 Albert St.
Grand Rapids — Radio Electronic Supply Co., 505 Jefferson, S.E.
Grand Rapids — Radio Parts, 542 Division, S.
Lansing — Offenbauer Company, 5019 W. Saginaw
Lansing — Tape Recording Industries, 3335 East Michigan Ave.
Muskegon — West Michigan Sound, 1932 Peck
Saginaw — Audio Communications, 1511 Janes

MINNESOTA

Minneapolis — Low Bonn, 67 South Twelfth St.

MISSISSIPPI

Jackson — Swan Distributing, 342 North Gallatin
Tupelo — Pale Electronics, Highway 45 South

MISSOURI

Cape Girardeau — Seudekum Electronics, 2215 Broadway
Kansas City — Audio Communications, 1515 Baltimore Ave.

Kansas City — Burstein Applebee, 1012-14 McGee
Kansas City — McGee Radio Co., 1901 McGee St.
Kirkwood — Kirkwood Camera, 122 W. Jefferson
St. Louis — Ebinger Electronics, 2501 S. Jefferson
St. Louis — Gasco, Inc., Box 113, Lambert Field
St. Louis — Hollander & Co., Inc., 3900 W. Pine
St. Louis — Interstate Supply, 4445 Gustine
St. Louis — Phone Craft Co., 427 North Euclid
St. Louis — Van Sickle Radio Co., 1113 Pine St.

NEBRASKA

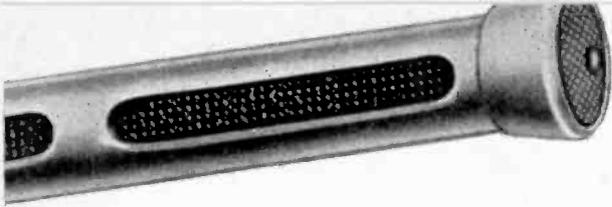
Omaha — J-B Distributing Co., 1616 Cass St.

NEW JERSEY

Camden — Radio Electric Service, 513 Cooper
Jersey City — Nidisco-Jersey City, Inc., 713 Newark
Mountainside — Federated Purchaser, 1021 Rte. 22

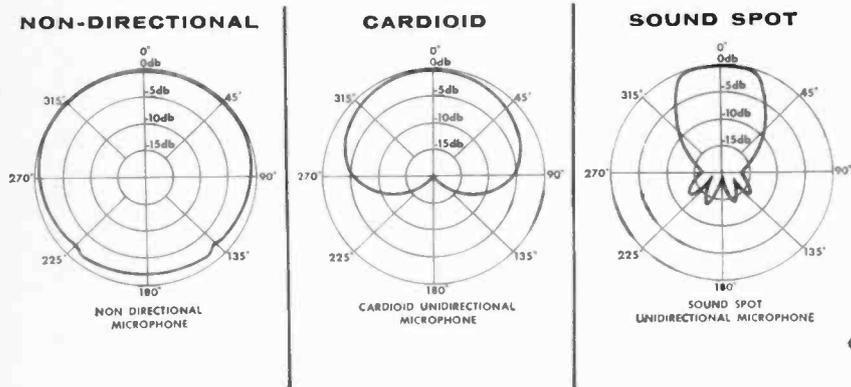
NEW YORK

Albany — Audio-Video Corp., 324 Central Ave.
Albany — Fort Orange Radio, 904 Broadway
Auburn — Dare Radio, 22 East Genesee St.



those "impossible" sound jobs!

compare polar patterns yourself



- Four times greater working distance than the best cardioids, depending on acoustics
- Greatly reduces feedback
- Retains "on-mike" presence despite extended working distance
- Excellent outdoors . . . less wind noise
- Priced low to fit most budgets
- Lasts a lifetime

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Commercial Products Division • Loudspeakers-Microphones

BUCHANAN, MICHIGAN



your Electro-Voice Microphone Headquarters

Binghamton — Stack Electronics, 25 State St.
 Buffalo — Radio Equipment, 147 Genesee St.
 East Meadow — South Service Engineers, 1778 Hempstead Turnpike
 Elmira — Chemung Electronics, 403 East Third St.
 Farmingdale, Long Island — Gem Electronics Distributors, 34 Hempstead Turnpike
 Jamaica — Lafayette Radio, 165-08 Liberty Ave.
 Mineola, Long Island — Arrow Electronics Inc., 525 Jericha Turnpike
 New York — Airex Radio, 64 Cortlandt St.
 New York — Goody Audio, 235 West 49th St.
 New York — Harvey Radio, 103 West 43rd St.
 New York — Heins & Bolet, 68 Cortlandt
 New York — Hudson Radio, 37 West 65th St.
 New York — Leonard Radio, Inc., 69 Cortlandt
 New York — Magic-Vue Television, 323 E. 13th St.
 New York — Milo Trading, 215 Fulton
 New York — Recording Tape Co., 123 East 88th St.
 New York — Sonocraft, 115 West 45th St.
 New York — Terminal Radio, 85 Cortlandt
 Rochester — Rochester Radio, 600 East Main St.
 Syracuse — Brown Sound Equipment, 521 E. Washington
 Valley Stream — Sam Goody Green Acres, Inc., 44 North Parking
 White Plains — Westchester Electronic Supply, 602-610 Mamaroneck Ave.

NORTH CAROLINA

Asheville — Freck Radio & Supply Co., 38 Biltmore
 Charlotte — Dixie Radio, 4131 Bryant St.
 Gastonia — Stroup Hi Fi Center, 112 Green Drive
 Winston Salem — Dalton Hege Radio, 938 Burke

NORTH DAKOTA

Fargo — Walter Electronic, 402 North P. Ave.

OHIO

Akron — Olson Radio, 69 West State St.
 Akron — The Sun Radio Co., 110 East Market St.
 Canton — Burroughs Radio, 2705 Fulton Rd., N.W.
 Columbus — Associated Sound, 671 Dennison Ave.
 Columbus — Electronic Supply, 134 E. Long St.
 Dayton — Custom Electronics, 1918 S. Brown
 Dayton — Srecco, Inc., 314 Leo St.
 Lima — Hutch & San, Roberts at Lenore
 Marion — Servex Electronics, 220 N. Prospect
 Massillon — M. H. Martin Co., 1118 Lincoln Way, E.
 Steubenville — The D & R Radio Supply 221 S. 3rd
 Toledo — Warren Radio Co., 1002 Adams St.
 Zanesville — Thompson Radio, 110 South 6th St.

OKLAHOMA

Oklahoma City — Johnson Wholesale Electronics, 927 Northwest First St.
 Oklahoma City — Trice Wholesale, 800 N. Hudson

OREGON

Portland — United Radio, 22 Northwest 9th
 Salem — Universal Sound Corp., 1461 Capitol, N.E.

PENNSYLVANIA

Allentown — A. A. Peters, Inc., 231 North 7th St.
 Allentown — Radio Electronic Service, 1313 Linden
 Bethlehem — Buss Radio, 431 West Broad St.
 Erie — Warren Radio, Inc., 1313-17 Peach St.
 Harrisburg — D & H Distributing, 2535 N. 7th St.
 Johnstown — Cambria Equipment, 17 Johns St.
 McKeesport — McKeesport Electronics, 1661 5th Ave.
 Philadelphia — Airtone, 1710 Sansom St.
 Philadelphia — Almo Radio, 913 Arch St.
 Philadelphia — General Sound, 3500 N. 9th St.
 Philadelphia — Magnetic Recorder & Reproducer, 1533-35 Cherry
 Philadelphia — Rodia Electric Service Co., N.W. 7th and Arch Sts.
 Pittsburgh — Cecil T. Hall Labs, 770 Washington
 Pittsburgh — Radio Parts Co., 6401 Penn Ave.
 Pittsburgh — Olson Radio Warehouse, 5918 Penn
 Pottsville — Moyer Electronic, 330 N. Norwegian
 Reading — George D. Barbey, Second and Penn Sts.
 State College — Alvo Electronic, 103 S. Pugh
 Wilkes-Barre — Shelborne Electronics, 169 N. Penn

RHODE ISLAND

Providence — W. H. Edwards, 92 Broadway
 Providence — Gertz, Inc., 257 Adelaide Ave.

SOUTH CAROLINA

Charleston — Radio Labs, 475-477 East Bay St.
 Columbia — Dixie Radio Supply 1628 Laurel St.

TENNESSEE

Knoxville — McClung Appliance, 310 Georgia, NE
 Knoxville — Roden Electrical, 708 Central, N.W.
 Knoxville — Smith Electronic, 301 E. Magnolia
 Memphis — Bluff City Distributing, 234 East St.
 Memphis — Glenn Allen Co., 1150 Union Ave.
 Memphis — Lavender Distributors, 180 S. Cooper
 Memphis — W & W Distributing, 644 Madison Ave.
 Nashville — D & N Dist., 113 19th Ave., S.
 Nashville — Electra Distributors, 1914 W. End Ave.

TEXAS

Arlington — Audia Acoustics, 130 Fairview
 Corpus Christi — Electronic Equipment and Engineering, 805 South Staples
 Dallas — All State Distributing, 2411 Ross Ave.
 Dallas — Southwest Radio, 1820 W. Harwood
 Fort Worth — C. Herring Sound, 1705 7th St., W.
 Fort Worth — Rae Gantt Sound, 12th & Throckmorton
 Houston — Sound Equipment, 2506 Crawford
 Lubbock — R & R Distributing, 1607 Avenue G
 Lubbock — Sound Photo Sales, 2107 Broadway
 Waco — Best Electronics, 324 North 18th St.

UTAH

Ogden — Carter Supply, 3214 Washington Blvd.
 Ogden — Ballard Supply, 3109 Washington Blvd.
 Salt Lake — Custom Sound by Poll, 1651 S. 11th

Salt Lake — Ballard Supply Co., 44 E. 6th St., S.
VIRGINIA

Arlington — Rucker Electronic, 1213 Wilson
 Danville — Womack Radio, 513 Wilson
 Newport News — General Supply Co., 4215 Huntington Ave.
 Norfolk — Cain Electronics, 14th and Monticello
 Norfolk — Electronic Engineering, 4201 Hampton
 Norfolk — Priest Electronics, 6431 Tidewater Dr.
 Norfolk — Radio Paris Dist'ng., 128 W. Olney
 Norfolk — Radio Supply Co., 711 Granley St.
 Richmond — Cottrell Electronics, 408 East Main St.
 Roanoke — L. C. Hartman, 3236 Cove Rd., N.W.
 Staunton — Southern Electronic, 818 Greenville

WASHINGTON

Everett — Pringle Radio, 2514 Colby
 Seattle — Electricraft, Inc., 1408 6th Ave.
 Seattle — Western Electronic Supply, 717 Dexter Ave.
 Seattle — Pacific Electronic Sales, 1209 First Ave.
 Tacoma — C & G Radio Supply, 2502 Jefferson Ave.
 Tacoma — Wible Radio Supply, 2360 S. Fawcett Ave.

WEST VIRGINIA

Charleston — Chemcity Electronic Dist., 1637 4th
 Charleston — Mountain Electronics, 708 Bigley Ave.
 Parkersburg — Hausfeld Radio Supply, 536 7th St.

WISCONSIN

Manitowoc — Harris Radio Corp., 115 N. Tenth St.

BRITISH COLUMBIA

Vancouver — D. Eldon McLennan, 1624 W. 3rd Ave.

NEW BRUNSWICK

Monroton — Lewis-Price TV Radio, 330 St. George

ONTARIO — CANADA

Kitchener — MacDonald Electric, 307 Queen St., S.
 London — C. M. Peterson Co., 575 Dundas St.
 London — Provincial Electronic Supply, 641 York
 Ottawa — Tower Productions, 278 Sparks St.
 Scarborough — R. C. Kahner, 73 Crackford Blvd.
 Sudbury — Sonic Northern, 300 Elm St., East
 Toronto — Electro-Sonic Supply, 540 Yonge St.
 Toronto — Electro-Voice Sound Systems, 126 Dundas
 Toronto — General Sound & Theatre, 861 Bay
 Windsor — Adams Electronics, 2471 Ouellette Ave.
 Windsor — C. M. Peterson & Co., 800 Howard Ave.

QUEBEC — CANADA

Montreal — Electric Labs, Reg'd, 7556 St. Hubert
 Montreal — Payette Radio, 730 St. James West
 Montreal — Radio Service, 2022 McGill College
 Quebec City — Crabel, Ltd., 790 Blvd. Charest E.
 Quebec City — George Latour, Inc., 1540 Third

MANITOBA — CANADA

Winnipeg — Dollard Recording Ltd., 138 Portage

EXPORT

New York — Telesco International, 36 W. 40th St.

(Continued from page 8)

New! from

Simpson

MODEL 311 VTVM



Compare these features before you buy!

- 22 MEGOHM Input Impedance
- Peak-to-Peak Readings of Complex AC Voltages
- Accessory RF Probe with High Frequency Response and Accuracy
- New "TIMESAVER" Probe Tip
- Unbreakable Metal Case
- AC Balance Adjustment



This new Simpson VTVM has all the capabilities you need to run highly accurate tests on practically any job. Note its timesaving features, too—slimline probe; special two-way probe tip; and Adjust-A-Vue Handle. You might expect Model 311 to cost a good deal more than it does, but the price complete with probe, lead, ground cable, clips, and Operator's Manual is a sensible

\$64⁹⁵

DC VOLTS: 0-1.5, 5, 15, 50, 150, 500, 1500
(±3% accuracy)

AC VOLTS: 0-1.5, 5, 15, 50, 150, 500, 1500
(±5% accuracy)

AC PEAK-TO-PEAK: 0-4, 14, 40, 140, 400, 1400, 4000 volts
(±5% accuracy)

OHMS: X1; X10; X100; X1000; X10,000; X100,000; X1 megohm (meter can be set for center zero for FM alignment)

AC FREQUENCY RANGE: 30 to 100,000 cycles per second

INPUT IMPEDANCE: 22 Megohms

SIZE: 7½" x 5⅝" x 4½" deep

WEIGHT: 4½ lbs.

RF PROBE: 50 cycles to 100 megacycles, ±5%; 0-150 volts maximum, RMS. Input capacitance, 10 mmf **\$10.95**

HIGH VOLTAGE PROBE: Gives measurements from 0-30,000 volts, DC **\$10.95**

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Tube Sales

Editor, ELECTRONIC TECHNICIAN:

In the Los Angeles area, most "wholesalers" sell to anyone at 50% off list. The only catch is that they are selling out-dated tubes as old as 1955. Now who is to guarantee these tubes for one year? If the tube doesn't fix the set, some people take it back and trade it in as if the clerk gave them the wrong tube. This also applies to picture tubes. Personally, I won't accept a picture tube in an open box, and I wish it were possible to seal all tubes.

R. VAN CAMP

Los Angeles, California

Circuit Correction

Editor, ELECTRONIC TECHNICIAN:

In the October issue which contains Circuit Digest No. 86, circuit No. 530, a Truetone chassis No. 2DC3030A, shows an error. The video detector is wired with incorrect polarity. The plate of the diode looks into the last i-f transformer. The diode would only conduct on positive signals as its impedance would be low then, transferring the signal to the video amplifier's grid. The developed AGC will also be incorrect, as well as the cathode feed CRT.

JIM SOUTHWARD

Poughkeepsie, N.Y.

• Reader Southward is correct regarding the wrong polarity of the diode. If the diode were connected as is, the input video signal would be demodulated into a video signal of positive polarity. This positive polarity, applied to the video amp's grid, would then reproduce a negative signal in the plate circuit. Since the proper black and white relationship calls for a positive signal to the CRT cathode, this is not correct. If the CRT was grid-fed, rather than cathode-fed, then the existing diode polarity would be correct.—Ed.

Competition Never Hurt

Editor, ELECTRONIC TECHNICIAN:

As a long-time subscriber to your informative magazine, I feel another pat on the back won't make you round shouldered. Your magazine deserves compliments. I have been in this profession for a long, long time, and have devoted full time to maintaining TV, radio and electronic equipment in a modern equipped shop. For the past two years and four months, I have been employed as a laboratory technician in a local electronic plant, and take care of my electronic business evenings and weekends. Too many full time electronic technicians are too interested in what part timers are doing and not enough in their own venture. A good technician has no worry; only the unqualified use this as an excuse. Competition never hurt anyone. If you have something on the ball, you progress. Your magazine is a good example.

EUGENE W. BRACH

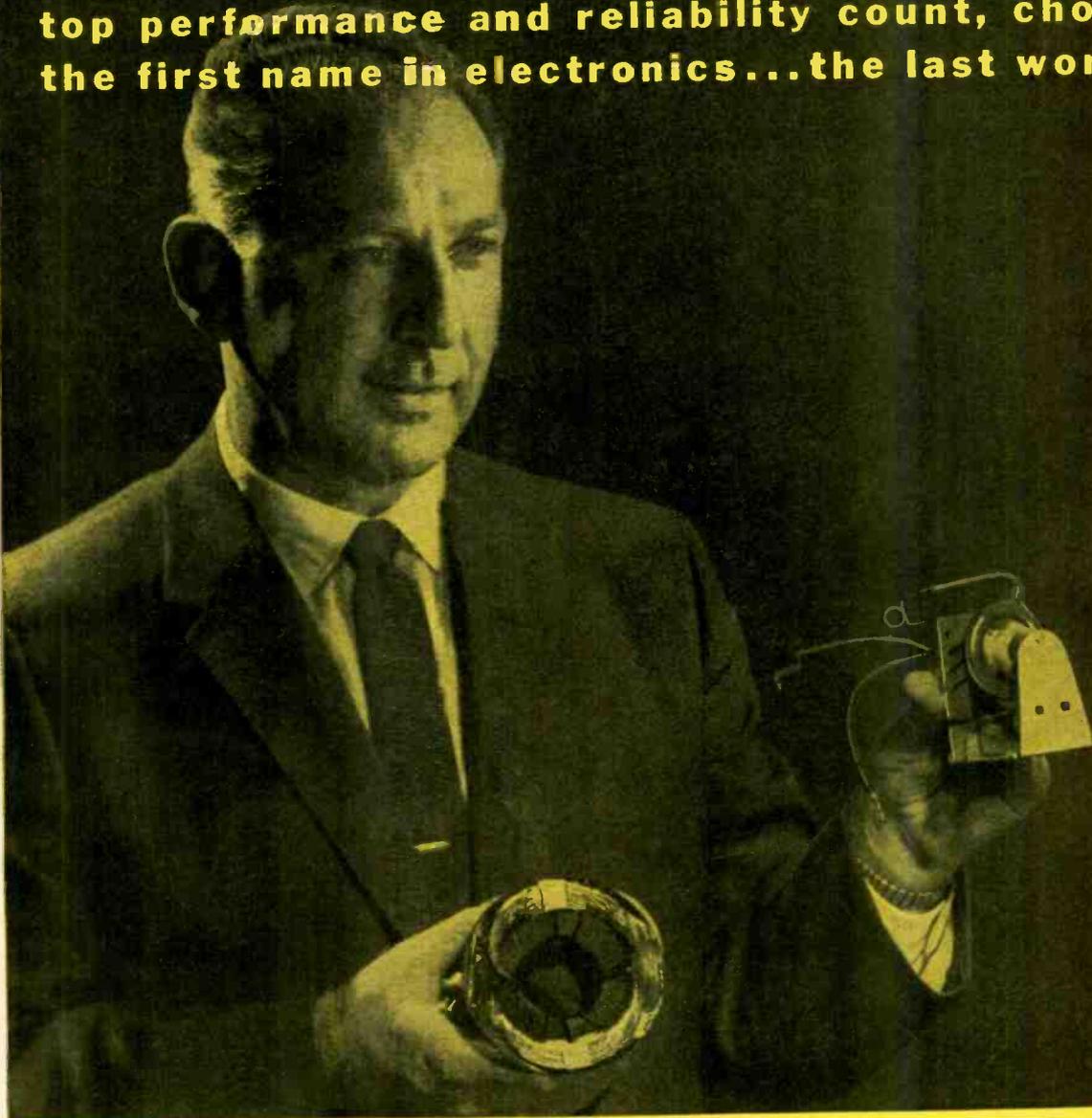
Brach's TV
Amsterdam, New York

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QUALITY

...THE LAST WORD IN

Your Philco Distributor has a **COMPLETE LINE OF SWEEP COMPONENTS** and other TV replacement parts to repair all makes of television receivers. These components are precision-engineered to the highest standards in the industry. Where top performance and reliability count, choose Philco—the first name in electronics...the last word in quality!



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

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If you service television and radio receivers and would like to receive valuable promotional mailings from Philco, attach this coupon to your Company letterhead and forward to above address.

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TV•Radio•Hi-Fi shop owner *ELMER MAUTER* says:

"MALLORY quality replacements keep customers happy"

"Courtesy in handling customer service has been one factor responsible for our growth . . . that's why I chose the name Courtesy for my business. We have always used only quality replacement products . . . that's why I use Mallory components. I know that I can depend on Mallory quality. The Mallory label on replacement parts reassures my customers; it's a name they know they can rely on for top performance."

When electrolytics need replacement, Elmer Mauter, like thousands of other service technicians, knows that Mallory FP's will stand up at the high temperatures common in the small cabinets now being built for TV and hi-fi. Even when they're mounted next to a hot rectifier or

output tube, where ordinary replacement filters would wilt, the FP gives extra service. It's the original 85°C capacitor. Its combination of new shock-resistant construction with leakproof seal and etched cathodes, available without premium price only in the Mallory FP, assures long life and hum-free performance.



Whatever your component needs, Mallory supplies the widest line of quality products at sensible prices. See your Mallory distributor for a full selection of the parts you need.

Put an end to call-backs with these quality Mallory products . . .



GEMS

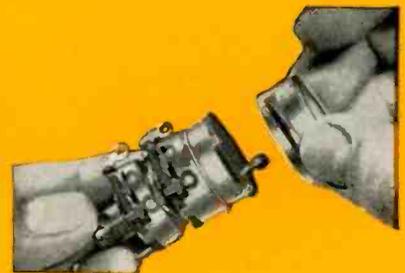
5 rugged, moistureproof, Mallory "Gem" tubular capacitors in a handy dispenser that keeps your stock fresh and clean—easy to find—prevents kinks in lead wires. Unequaled for service in buffer, by-pass or coupling applications.



RMC DISCAPS®

Made by the world's largest producer of ceramic disc capacitors . . . long the original equipment standard, they are available for replacement in a handy 3" x 5" file card package . . . easy to stock, simple to use.

® Trademark of Radio Materials Company,
A Division of P. R. Mallory & Co. Inc.



STA-LOC® CONTROLS

No more waiting for out-of-stock controls. Your distributor can custom build, in just 30 seconds, any of over 38,000 combinations. You can replace the line switch by itself, without unsoldering control connections.



Elmer Mauter owns and manages Courtesy Television in Elmhurst, Illinois, a suburb of Chicago. He received his initial electronics training in the Coast Guard, later attended Sprayberry Electronics School and the School of Radio Technique.

In 1952, Elmer opened his present shop, for sales and service of television, radio, hi-fi, record chargers and auto radios. He employs two service technicians and keeps two station wagons busy with 15 to 20 calls a day.

Distributor Division

P. R. MALLORY & CO. Inc.
MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA



GOLD LABEL® VIBRATORS

Sell the best in auto radio servicing; use Mallory Gold Label Vibrators every time. Exclusive buttonless contact design gives longest life, sure starts. The quietest vibrator ever made.



TC TUBULAR ELECTROLYTICS

Economically priced filter capacitors with a reputation for top performance. Proved in service and backed by years of Mallory experience. Also special TCX type available for -55°C .



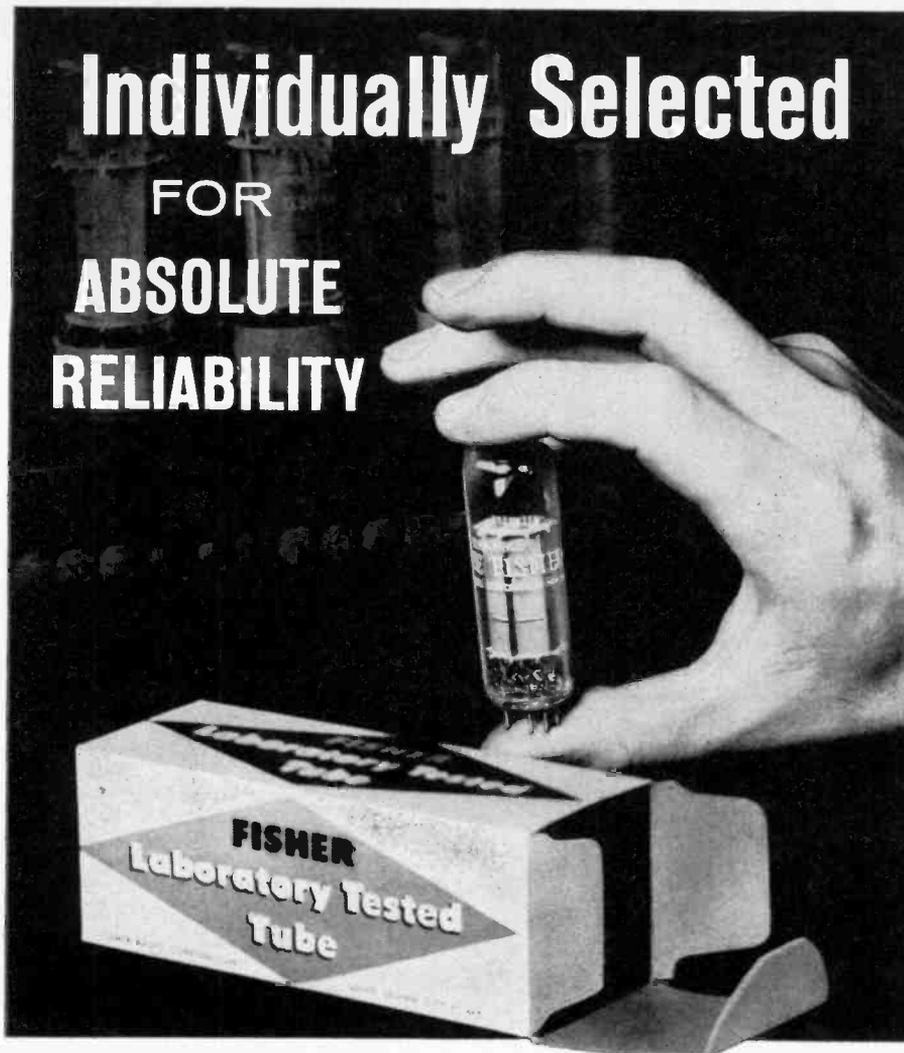
MERCURY BATTERIES

Unequaled for long, fade-free life in transistor radios. Chosen as the "power package" in U. S. satellites. Virtually limitless shelf-life. Made by the world's largest manufacturer of mercury batteries.

Individually Selected

FOR

ABSOLUTE RELIABILITY



THE FISHER

Laboratory Matched Tubes

At FISHER RADIO, the age of mass production is still on the 'outside looking in.' FISHER Laboratory Tested and Matched Tubes are still individually selected, and *guaranteed* to fulfill the maximum requirements of your high fidelity components.

For absolutely minimum hum, noise and distortion — choose FISHER Tubes. For high fidelity performance free of disturbing microphonics and intermittents — choose FISHER Tubes. For perfectly matched power output tubes designed specifically for stereo reproduction — choose FISHER Tubes. You will find no 'variables'— nothing less than the best in every box.

Audio-Fans, Servicemen, Dealers

WRITE TODAY FOR COMPLETE INFORMATION



FISHER RADIO CORPORATION, 21-24 44th Drive, L. I. C. 1, N. Y.

I want to know more about FISHER Laboratory Matched TUBES!

NAME _____

STORE NAME _____
(If a serviceman or dealer)

ADDRESS _____ CITY _____ STATE _____

News of the Industry

I. H. MFG. reports the appointment of BEN BRAUN as Dir. of Sales.

RAULAND-BORG has named FRED D. WILSON Asst. to the Pres.

TELEX, INC. has been joined by WINFIELD SHIRAS as Vice Pres. and General Mgr.

RAYTHEON CO. Semiconductor Div. announced price reductions on 23 different types of transistors, lowering prices 5 to 35%.

CORNELL-DUBILIER has appointed RAYMOND T. LEARY as General Sales Mgr. HERBERT C. CRAIG has been appointed to the new position of Marketing Mgr. of Oil-Paper Capacitors.

WELLER ELECTRIC has made the following additions to its sales force: PAUL W. RHODES, JR., Regional Sales Mgr. for the Midwest region with headquarters in Chicago; and WILLIAM BRECKINRIDGE will service accounts in Me., N. H., Vt., Mass., Conn. and N. Y. State.

AMPEX CORP will conduct its domestic business through the following five integrated companies: AMPEX DATA PRODUCTS CO., JOHN JIPP, Mgr.; AMPEX PROFESSIONAL PRODUCTS CO., NEAL K. MC-NAUGHTEN, Mgr.; AMPEX MILITARY PRODUCTS CO., ROBERT L. PAPPAS, Mgr.; AMPEX AUDIO, INC., HERBERT L. BROWN, Mgr.; ORR INDUSTRIES, JOHN M. LESLIE, Mgr.

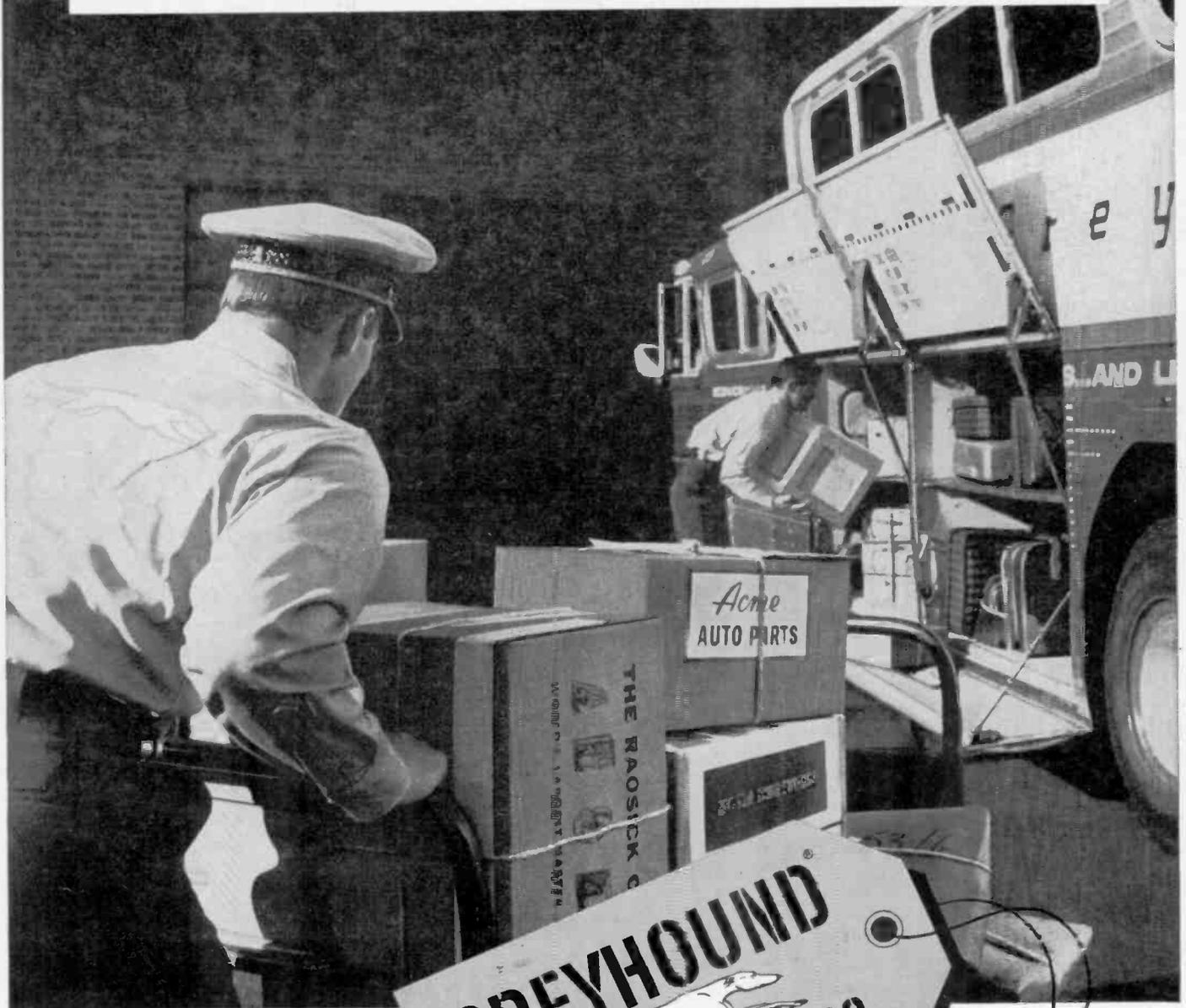
WORKMAN TV, INC. announced the winners of their "Chance of a Lifetime" contest: Grand Prize winner of the 1959 Volkswagen truck equipped with Jackson test equipment, I. G. TRACY of Tulsa, Okla.; Second Prize winner of new Volkswagen, S & S RADIO SUPPLY, Tulsa, Okla.; and Third Prize winner of \$250 U. S. Savings Bond, VICTOR J. GOSS, counterman at S & S Radio Supply, whose name appears on Mr. Tracy's entry.

RCA Semiconductor & Materials Div. has established four separate product departments with the following new appointments: Entertainment Semiconductor Products Dept., NORVAL H. GREEN, Mgr.; Computer Products & Materials Dept., KENNETH M. MC-LAUGHLIN, Mgr.; Micromodule Dept., BARNES V. DALE, Mgr.; Industrial Semiconductor Products Dept., manager to be announced later. The Division's Marketing Dept. will handle the combined marketing and sales functions for all product lines with THOMAS R. HAYS as Mgr.

(Continued on page 21)

HOW TO "GENERATE" BETTER BUSINESS

A military installation needed a special generator in a hurry. The local supplier phoned the manufacturer...specified Greyhound Package Express...and was able to make delivery days earlier than expected. Result: increased business from a valuable customer.



IT'S THERE IN HOURS

... AND COSTS YOU LESS!

When getting it there in a hurry means business, you can count on Greyhound Package Express! Your packages go anywhere Greyhound goes, by dependable Greyhound buses on their regular runs. That means you get service seven days

a week... 24 hours a day... weekends and holidays! And you can send C.O.D., Collect, Prepaid—or open a charge account. For information, call any Greyhound bus station, or write Dept. 17A, 140 South Dearborn St., Chicago 3, Ill.



**Reduce callbacks
to a trickle**

If you've been showered with callbacks, get under an umbrella of Tung-Sol Blue Chip quality. You know a single callback will drown out the profit on the next three service calls. That's why it's a good idea to use Tung-Sol tubes for all radio, tv and hi-fi replacements. They're made to set manufacturers highest original equipment standards so that you can keep your service profits dry and high. Tung-Sol Electric Inc., Newark 4, N. J.

Tell your jobber you'd rather have

ts TUNG-SOL®

Blue Chip Quality

TUBES • TRANSISTORS • DIODES

(Continued from page 18)

UNGAR ELECTRIC TOOLS has won their unfair trade case against Sidco.

SHELL ELECTRONICS announced a first day sellout of 170,000 shares of stock in its first public stock issue.

ORYX CO. has relocated to larger facilities at the following address: 13804 Ventura Blvd., Sherman Oaks, Calif.

MOTOROLA Semiconductor Products Div. has opened a new district sales office at 13131 Lyndon Ave., Detroit, Mich.

THOMAS ELECTRONICS has promoted EDWARD LISOVICZ to the new post of Div. Mgr., Industrial and Military Cathode-Ray Tubes.

PEERLESS ELECTRICAL PRODUCTS Div. of ALTEC LANSING CORP. reports the appointment of JOHN W. HORTON as Mgr.

GENERAL ELECTRIC Electronic Components Div. has named THOMAS S. KNIGHT, JR. as Sales Mgr. for receiving tubes, television picture tubes and high-fidelity components.

PRECISION APPARATUS CO. Pres., S. M. WEINGAST, and the presidents of 15 other major electronics firms participated in opening day ceremonies at the Dept. of Commerce building in Washington, D. C. of an exhibition sponsored by the U. S. Patent Office on how the patent system has benefited industry and the public.

PHILCO's LANSDALE DIV. Chicago office has been moved to 6957 W. North Ave., Oak Park, Ill. A new sales office headed by sales engineer HAROLD J. BRONKALA has been opened at 1821 University Ave., St. Paul, Minn. The Consumer Products Div. announced the appointment of FRANK SATTERWHITE to Appliance Product Mgr., parts-accessories.

RADIO RECEPTOR CO., subsidiary of GENERAL INSTRUMENT CORP., has announced three key appointments and promotions: RALPH MENDEL, Gen. Mgr. of the new Advanced Development Lab. at Westbury, N. Y.; ARNOLD M. WOLF, Vice Pres. of Engineering Products Div., Brooklyn, N. Y.; SEYMOUR D. GURIAN, Vice Pres. in charge of Military Marketing.

TUNG-SOL ELECTRIC has elected EDWARD J. DANNEBERG to the newly created position of Vice Pres. for personnel. Formation of the Canadian Div of TUNG-SOL SALES CORP. was announced, with E. LESLIE PETER as Sales Mgr. of the new division which will distribute automotive products throughout Canada. Headquarters are at 1117 S. Catherine St., West, Montreal 2.

(Continued on page 22)

What's the latest score on cartridges?

<input checked="" type="checkbox"/>	1ST	ceramic cartridge was invented by Sonotone ...
<input checked="" type="checkbox"/>	13	years ago. Today, over ...
<input checked="" type="checkbox"/>	65	different manufacturers have specified Sonotone for ...
<input checked="" type="checkbox"/>	662	models of high-quality phonographs. Altogether over ...
<input checked="" type="checkbox"/>	9,000,000	Sonotone Ceramic Cartridges have been used for original and replacement purposes. ("Nuff said!")

Sonotone ^C_{ORP.}

Electronic Applications Division, Dept. C9-10

ELMSFORD, NEW YORK

In Canada, contact Atlas Radio Corp., Ltd., Toronto

Leading makers of fine ceramic cartridges, speakers, microphones, electronic tubes.

NEW FROM **SECO** DYNAMIC TRANSISTOR CHECKER



MODEL
100

DYNAMICALLY CHECKS WIDE RANGE OF TRANSISTOR TYPES EITHER "IN OR OUT" OF CIRCUIT!

This new low-cost checker uses an entirely new approach but a proven DYNAMIC principle for checking transistors.

Safely tests PNP and NPN transistors either "in or out" of the circuit. Covers wide range of types: small signal including "drift" types, medium power; and power types. Provides positive check for "opens," shorts, and gain—condition indicated by means of a visual indicator plus jacks for meter or scope. Also provides GO-NO-GO test at practical currents—and permits matching of similar transistor types. No set-up required—no further leakage tests necessary. Model 100 is compact, lightweight, complete, and ready-to-use . . . helps you cash-in on the big profits in the fast growing transistorized equipment servicing field!

MODEL 100—Wired and factory tested \$19.95 NET

NEW FROM **SECO** LOW COST, COMPLETE TUBE TESTER

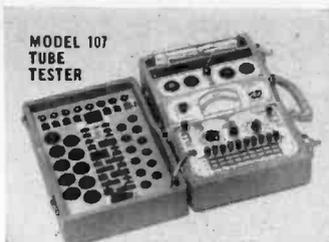


MODEL 78

GRID CIRCUIT and TUBE MERIT TESTER

Complete test coverage of all modern TV tube types as well as all heater type radio tubes including hybrid types, using only 5 sockets. Incorporates patented Seco GRID CIRCUIT TEST plus a reliable CATHODE EMISSION test using new low impedance low test voltage circuit—also checks filament continuity and provides open element test. One easy-to-read meter indicates results for both Grid Circuit and Tube Merit Tests. Two-stage dc amplifier isolates meter from tube under test to protect meter—and makes it possible to achieve a wide range of load currents and test conditions. Complete with portable carrying case, pin straighteners, and flip-chart for quick set-up data.

MODEL 78—Wired and factory tested \$69.50 NET

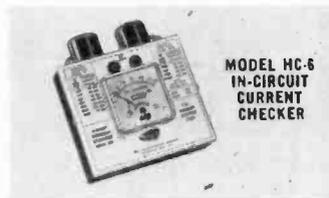


MODEL 107
TUBE
TESTER

outstanding reliability, accuracy

Provides 3 important tests: amplifier types tested for gain by Dynamic Mutual Conductance method—power types tested for cathode current by Cathode Emission method—all types tested for shorts and grid error by Grid Circuit Test developed and patented by Seco. Dynamic Mutual Conductance Test pre-wired to eliminate elaborate set-up. Cathode Emission Test done by free point pin-selector method—will not be obsolete. Completely self-contained in portable carrying case.

MODEL 107—Wired and factory tested \$139.50 NET

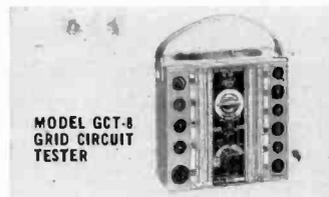


MODEL HC-6
IN-CIRCUIT
CURRENT
CHECKER

positive, on-the-spot check of horizontal output current!

This new, low-cost current checker provides simple means for making a positive on-the-spot check of TV horizontal circuits. Can be placed into the circuit in seconds—no unsoldering of circuit wiring—immediately indicates whether horizontal tube cathode current is within manufacturer's recommended limits. Valuable as a fast, accurate indicating device when adjusting horizontal drive and linearity. Eliminates one of the most common causes of callbacks. Compact, inexpensive, easy to use.

MODEL HC-6—Wired and factory tested \$12.95 NET



MODEL GCT-8
GRID CIRCUIT
TESTER

fast check of critical "control grid" conditions

Model GCT-8 checks "control grid" condition of vacuum tubes faster, more accurately than any other tester! As many as eleven simultaneous checks—automatically! Quickly spots grid errors and leakage—stops guessing, substitution checking, and costly rechecks. Electron-Eye tube indicates faults at a glance. Truly portable. The perfect companion to any tester that employs only conventional gas and shorts test. Carry it on all calls.

MODEL GCT-8 Complete Kit . . . \$19.95 NET

MODEL GCT-8 Wired and tested . . . \$29.95 NET

(Continued from page 21)

INSTITUTE OF RADIO ENGINEERS has elected RONALD L. MC FARLAN Pres. for 1960.

MALLORY BATTERY CO. Div. of P. R. MALLORY appointed WILLIAM H. KNOTH Gen. Sales Mgr.

ROYAL INDUSTRIES appointed J. R. JOHNSON as Executive Vice Pres.

HICKOK ELECTRICAL INSTRUMENT Bd. of Directors has elected PAUL WILLOUR Vice Pres.—Treas. and ROBERT L. PURCELL, Asst. Secy.—Treas.

ALLIANCE MFG. has established an Export Div. to handle TV antenna rotator sales overseas.

Reps & Distributors

KARET-MARGOLIN, INC. rep firm, has moved to 1803 Belle Plaine, Chicago 13, Ill.

SILICON TRANSISTOR CORP. has added the R. W. FARRIS CO. to its list of reps, to cover southern Ill., Iowa, Kan., Mo., and Neb.

RADIO RECEPTOR CO., distr. div. GENERAL INSTRUMENTS CORP., announces the following rep appointments: HYDE ELECTRONICS CO., rocky mountain territory; JERRY KIRSHBAUM CO., metropolitan N.Y. and N.J.; JACK McDONOUGH ASSOCIATES, New York state; and SOUTHWEST ELECTRONIC INDUSTRIES, INC. Texas, Okla., Ark. and La.

ELECTRONIC REPS. ASSOC. First National Convention, Feb. 11-13, Drake Hotel, Chicago, Ill., opens with a welcome luncheon keynoted by ROBERT C. SPRAGUE. Meetings of the four ERA trade divisions follow at which national divisional officers will be elected and a work program established for the year. Feb. 12th: the first of eight business management sessions in the morning. These sessions cover sales planning, executive development in rep firms, and selection and compensation of salesmen; on the educational list are business and tax planning, advertising and public relations for reps and a session on business and technical letter writing. The 25th Annual Meeting of ERA will take place in the afternoon followed by the President's reception and the Annual Banquet. The convention closes with a farewell luncheon on Saturday, Feb. 13th.

(Continued on page 85)

SEND FOR COMPLETE SECO STORY ON . . .

- Three Tube Testers
- VTVM
- Dynamic Transistor Checker
- In-Circuit Current Checker
- 100% Accurate Flyback Checker
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BLACK BEAUTY[®] CAPACITORS BEAT HEAT AND HUMIDITY

New DIFILM Black Beauty Capacitors lead the way in tubulars! The operating temperature range of these new capacitors goes up to 105 C (221 F) *without voltage derating*. **Capacitance tolerance is held to $\pm 10\%$.***

- The new dual dielectric used in DIFILM Capacitors combines the proven long life of paper capacitors with the effective moisture resistance of polyester plastic film capacitors . . . to give you performance that can't be beat.

- Here's the kind of performance you can expect from DIFILM: very high insulation resistance, low power factor, moderate capacitance change with temperature,

excellent retrace under temperature cycling, and superior long-term stability . . . *all at regular prices!*

- This high performance is fully protected by HCX[®], an exclusive Sprague hydrocarbon material which impregnates the windings, filling all voids and pinholes before it polymerizes. The result is a solid rock-hard capacitor section. These capacitors are further protected by an outer molding of humidity-resistant, non-flammable phenolic.

For complete technical information on DIFILM Black Beauty Capacitors, write for Bulletin M-759 to Sprague Products Company, 65 Marshall St., North Adams, Mass.

*From .001 μ F up

The major capacitor improvements come from

SPRAGUE[®]

world's largest capacitor manufacturer

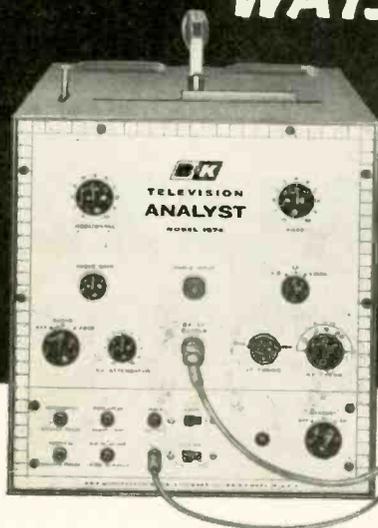
SPRAGUE RESEARCH IS CONSTANTLY PRODUCING NEW AND BETTER CAPACITORS FOR YOU

SAVE 1/2 THE TIME

Make Twice The Profit!

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Trouble-Shooting

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SIGNAL INJECTION
POINT-TO-POINT
DIRECT VIEWING
WAY



MODEL 1075

B&K TELEVISION ANALYST

Solve Rough Sweep Output Problems



NEW Model A107 DYNA-SWEEP CIRCUIT ANALYZER

Saves many hours of service work. Provides vertical and horizontal sync and driving pulses that enable you more easily and quickly to check out every stage in the sync and sweep sections of a television receiver.

Tracks down troubles in the horizontal and vertical output circuit including defective output transformer and yoke; checks for shorted turns, leakage, opens, short circuits, and continuity. Includes unique high-voltage indication. Eliminates trial and error replacements.

Model A107 Dyna-Sweep. Companion unit for use only with B&K Model 1075 Television Analyst for driving source.

Net, \$49.95

Model 1070 Dyna-Sweep. Same as Model A107 but has its own horizontal and vertical driving pulse, and is used independently of the Model 1075.

Net, \$69.95

New Technique Makes TV Servicing Easier, Faster, More Profitable

Thousands of service technicians already save thousands of hours every day with the amazing B&K TELEVISION ANALYST. Enables you to inject your own TV signal at any point and watch the resulting test pattern on the picture tube itself. Makes it quick and easy to isolate, pin-point, and correct TV trouble in any stage throughout the video, audio, r.f., i.f., sync, and sweep sections of black & white and color television sets—including *intermittents*. Makes external scope or wave-form interpretation unnecessary. Enables any serviceman to cut servicing time in half, service more TV sets in less time, really satisfy more customers, and make more money. Color generator provides both rainbow pattern and color bars.

MODEL 1075 TELEVISION ANALYST. Complete with standard test pattern, white dot, white line, and color-bar slide transparencies, and one clear acetate. Net, **\$259.95**

See your B&K Distributor or Write for Bulletin ST24-T



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ELECTRONIC TECHNICIAN

Including
SERVICE
Magazine

Let's Practice What We Preach

Many years ago it was a standing joke how automotive parts manufacturers delivered their products to auto plants in horse-drawn wagons.

Undeniably there is something humorous, and a little pathetic, about an industry that fails to benefit from its own products. To a great extent, the electronic industry is a case in point. Only recently have electronic organizations started to utilize the very innovations which they have pioneered for other fields. But we still have a long way to go.

A visitor to electronic manufacturing plants usually cannot help but be impressed—or more correctly unimpressed—by the lack of automation and electronic control in the production operations. Often hundreds of girls are to be seen sitting at the production line doing manually what machines can do more efficiently.

Many obvious improvements are frequently overlooked. Doors that could be actuated by photoelectric devices continue to be bruised, and to bruise in return, workers pushing handtrucks. Sound systems are often inadequate or non-existent. Pocket paging receivers are only rarely found. Closed circuit TV is a rarity. The list could go on and on.

Electronic distributors earn their bread selling parts and equipment, but most of them are too close to the forest to see the trees. Only recently have a small number started to make use of computers for payroll, inventory and other functions.

Most service dealers miss the obvious too. The ones who are on their toes have found that two-way radio contact with service vehicles in the field has substantially increased efficiency.

Of course, the individual characteristics of each business enterprise determine how much electronics can be used. One thing is sure though—a business need not be large to utilize electronics. Even computer services on an hourly basis are available to small companies.

Each member of the electronic industry is a kind of emissary of the electronic concept. It behooves all of us to examine our operations to see how electronics can be put to work. Naturally, more important than propagating the electronic concept, is the fact that we can frequently make our own activities more efficient.

Though an increasing number of companies in our industry are "going electronic," the accomplishment thus far is still modest.

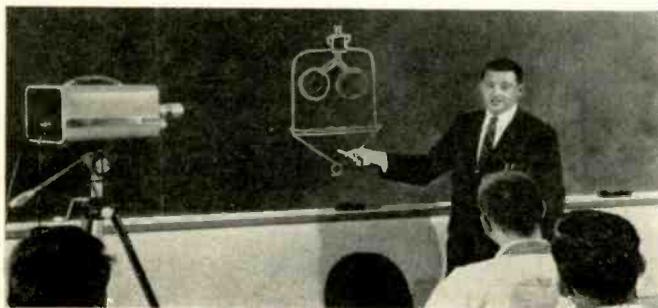
Let's not be like the shoemaker's son who goes barefoot. Electronics is expected to be the nation's biggest industry by 1970, with anticipated sales of \$30 billion annually. Let's see how we can make electronics work for us, as we have for many others.

Tuning In the

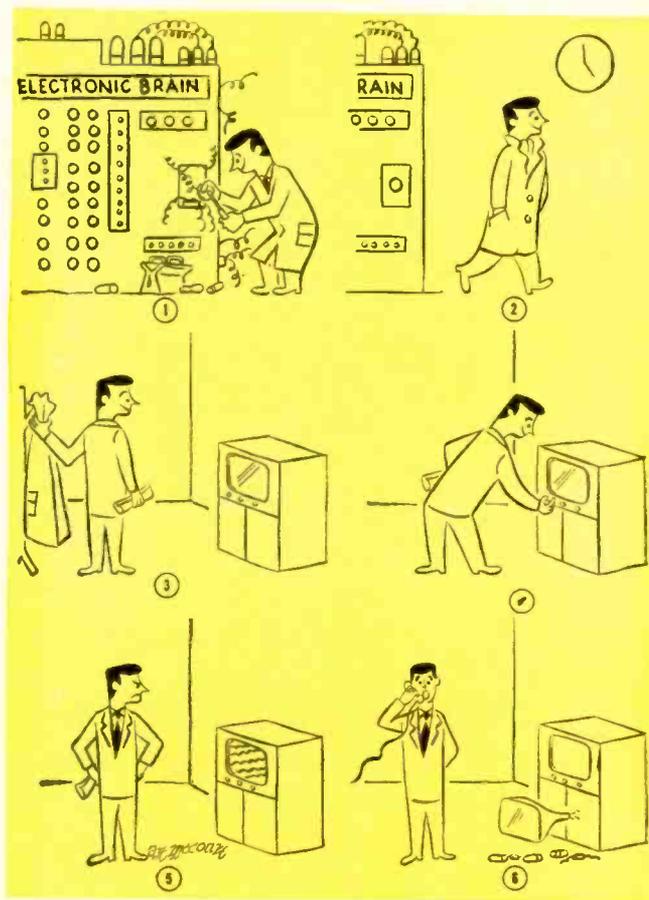
ELECTRONIC PIONEER Dr. Vladimir K. Zworykin foresees many wonderful electronic developments. For biological and medical research, he sees the so-called radio pills for transmitting pressure variations from within the gastro-intestinal tract of a patient to an external radio receiver, and the use of "pacemaker pulses" to stimulate the muscles of the heart. While in the hospital, automatic data transmission techniques can be applied to taking patients' temperature and pulse rate as well as to the diagnosis of illness by matching observed symptoms with those applicable to a range of diseases. In transport, it is envisaged that a series of wire loops would be embedded in the highway, so that the movement of a vehicle over the loops produces electric signals. The signals can be used to actuate warning lights at the side of the road if there is traffic dangerously near in the same lane. By an extension of the techniques, the whole of the steering and speed-control of a vehicle could be taken over by an "automatic pilot." Finally, Dr. Zworykin envisages the use of the existing telephone system in conjunction with data handling equipment to record the opinions of all voters on issues of national importance.

ART MASTERPIECES propelled TV repairman Alfonso Follo into national headlines. Follo came here from Italy three years ago. He and his sister report locating 10 old world masterpieces in his home. His sister is said to have brought the paintings to America 15 years ago. Their family has owned them for generations, but never realized their value. Art experts say that the paintings are the greatest art find of the century, and are probably worth millions of dollars.

DIRECT-WIRE TV FOR SCHOOLS



An unattended, vidicon-type camera mounted on a conventional tripod is shown in use as an instructor puts himself "under the camera" with the new direct-wire television system introduced by Sylvania's Argus Cameras Div. The new camera, listing at \$595, is expected to put closed-circuit TV within the financial limits of many schools. Resolution is 250-300 lines. In the Argus system, the 16-pound camera is wired directly to conventional television receivers.



"Hello. Star TV Repair?"

ANTENNA ROTATORS are preferred to improve home TV reception in fringe areas, according to a poll of television station managers conducted by Alliance Mfg. Co. More than 80% of 600 surveyed station managers said the rotator gives a clearer picture.

INFORMATIVE PUBLICATIONS put out by the Government may be of interest to readers. For 40¢ per copy, you can get the 144-page 1960 edition of Tax Guide For Small Business. It discusses accounting methods, inventories, business and entertainment expenses, operating losses, taxes, depreciation, and many other important points. A second publication is the 28-page pamphlet, Patents and Inventions—An Information Aid for Inventors. Available for 15¢ per copy, it discusses the type of records an inventor should keep, how to go about filing a patent application, and other data an inventor should know about to protect himself. These publications may be obtained by sending payment to the Supt. of Documents, U.S. Government Printing Office, Washington 25, D.C.

Picture



WORLD'S LARGEST conclave of electronic specialists will be held March 21-24th. It's the Institute of Radio Engineers International Convention held in New York's Waldorf-Astoria Hotel and New York Coliseum. More than 60,000 technical people from 40 countries are expected to attend. Approximately 850 exhibitors will display some \$15 Million worth of the latest electronic equipment. A comprehensive program of 275 technical papers will be presented. We heartily recommend that electronic technicians interested in commercial and military devices attend this convention.

SQUARE-CORNERED picture tube which does not employ an attached safety plate has been developed by General Electric Co. The tube employs 114 degree deflection but still utilizes 110 degree sweep components, made possible through a channeled interior in the yoke area. The 23" wide angle tube weighs only about 3½ pounds more than the standard 21-inch, yet has an increase of about 20 sq. inches in picture area.

Big Contest Coming!

Next Month In ELECTRONIC TECHNICIAN

Subscribers can win valuable prizes for themselves and winning authors by voting for their favorite "Shop Hint" and "Tough Dog" of 1959.

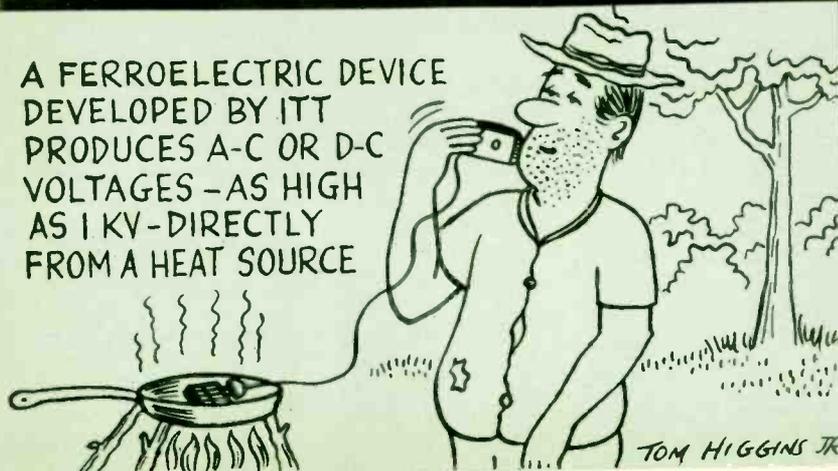
CALENDAR OF COMING EVENTS

- Jan. 25-28: Plant Maintenance & Engineering Show, Convention Hall, Philadelphia, Pa.
- Feb. 1-4: Instrument Society of America Instrument-Automation Conference and Exhibit, Sam Houston Coliseum, Houston, Texas
- Feb. 3-5: Professional Group on Military Electronics, 1960 Winter Convention, Biltmore Hotel, Los Angeles, Calif.
- Feb. 10-12: 1960 International Solid State Circuits Conference, Irvine Auditorium and University Museum, University of Penna. and Sheraton Hotel, Philadelphia, Pa.
- Feb. 11-13: Electronic Representatives Association, First Annual Convention, Drake Hotel, Chicago, Ill.
- Mar. 21-24: IRE National Convention, Coliseum and Waldorf Astoria Hotel, New York, N.Y.
- Apr. 4-7: 1960 Nuclear Congress & Atomic Exposition, New York Coliseum, New York, N.Y.
- Apr. 18-19: Conference on Automatic Techniques, Sheraton Cleveland Hotel, Cleveland, Ohio.
- Apr. 20-22: S.W. IRE Regional Conference & Electronics Show, Shamrock-Hilton Hotel, Houston, Tex.
- Apr. 29- May 1: Producers of Associated Components For Electronics, Annual Meeting, Nevele Hotel & Country Club, Ellenville, N.Y.

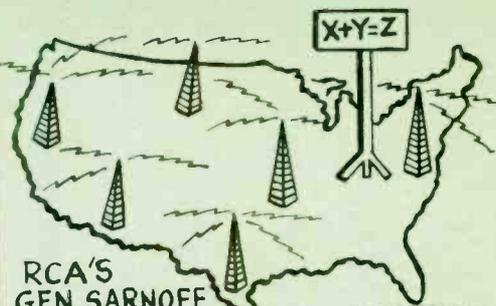
VIDEO TAPE RECORDER being produced in Tokyo by the Tokyo Shibaura Electric Co. (Toshiba) employed a new concept which simplifies operation. Unlike the four-head type used in the U.S., the Toshiba unit uses only one revolving head, and is capable of recording the whole television field on a single diagonal track to eliminate the problem of horizontal stripes and the need to match heads.

RANDOM NOISE

A FERROELECTRIC DEVICE DEVELOPED BY ITT PRODUCES A-C OR D-C VOLTAGES - AS HIGH AS 1 KV - DIRECTLY FROM A HEAT SOURCE



TOM HIGGINS JR



RCA'S GEN. SARNOFF PREDICTS NATION-WIDE EDUCATIONAL TV WITH 100,000 + STUDENTS AND JUST ONE GIFTED TEACHER

DID YOU KNOW THAT WHEN TV HORIZONTAL & VERTICAL DEFLECTION COILS OVERLAP, THE HORIZONTAL ONES ARE MOUNTED UNDER THE VERTICAL COILS?



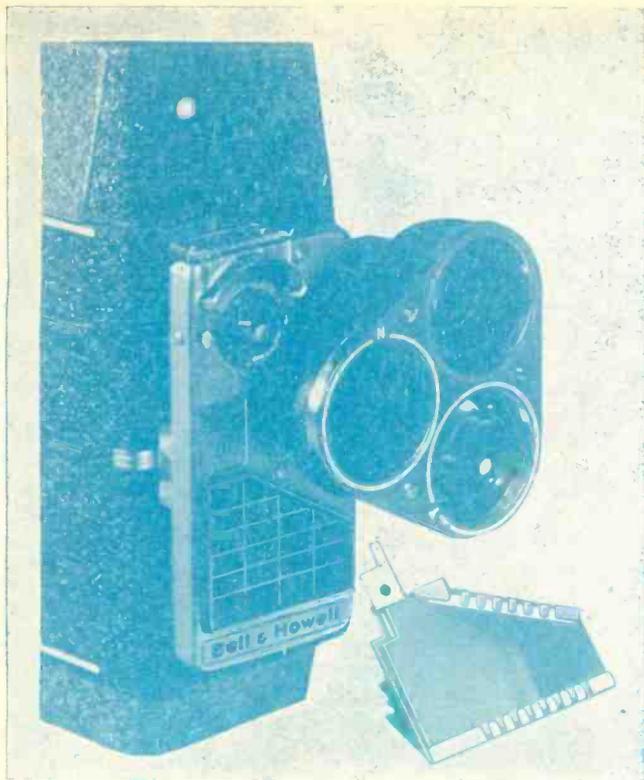


Fig. 1—A photocell in this movie camera reacts to light changes, and automatically adjusts the lens according to the prevailing light level.

Using Solar Energy

Semiconductors Harness Sunshine For Electric Power

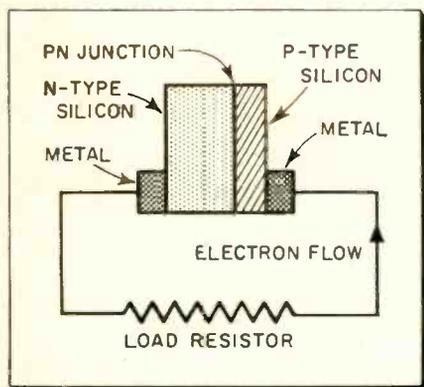
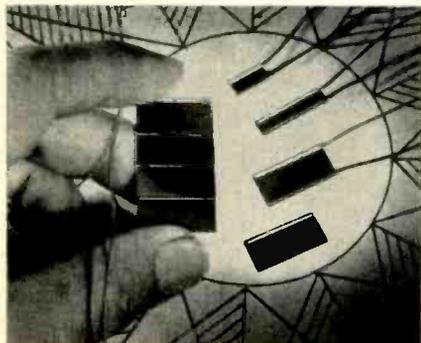


Fig. 2—Structure of a P-N type silicon cell which converts sunlight to electricity.

Fig. 3—A commercial silicon cell develops 30 mw power for each square inch of its area.



HERB ALLEN

• The ancient worshippers of the Sun God, Ra, really chose a hot diety. The idolized source, the sun, has been acknowledged the bearer of many fine fruits, ranging from vitamin D and aesthetic tans all the way to conversion of its rays into electric current. The latter discovery is, of course, our prime interest.

Only a scientific curiosity for many years, solar energy is now a practical reality. It is presently a source of power for rural telephone lines, eyeglass hearing aids, solar-powered radios, etc. Even the immense space satellite program included solar batteries as an integral part of the scientific undertaking.

There are several types of devices which are photoelectric. The photoconductive cell changes resistance because of light and the photoemissive cell emits electrons under the influence of light. But, both require a voltage source. A true "primary" solar cell is a photovoltaic device which produces a voltage when light hits the cell, hence it does not require a voltage source to produce energy.

Selenium Cell

With a response faster than the

human eye, a selenium photocell reacts to changing light levels and sets the lens opening on an automatic 8 mm motion picture camera manufactured by Bell & Howell Co. See Fig. 1.

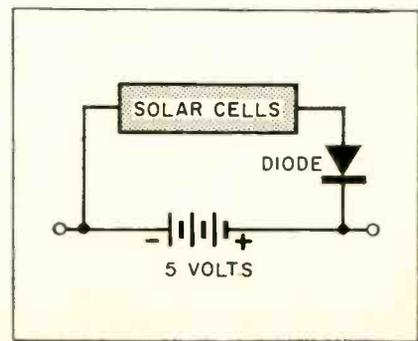
The photocell, manufactured by International Rectifier Corp., supplies an electric current which sets the lens before the camera starting-button is touched. Focusing is not necessary. The automatic adjustment enables the photographer to pan directly from sunlight to shadowed areas with continuous proper exposure settings.

Chart I shows some typical sun battery operating characteristics.

Silicon Cell

A silicon photocell which generates

Fig. 4—Solar cells charge batteries to operate radio when no sunlight is available.



energy, as in Fig. 2, uses a PN junction to produce electrical energy from light. Pure silicon is a poor electrical conductor. Adding small amounts of arsenic or phosphorus to the silicon crystal permits electron conduction since these materials have one more electron in their atomic structure than does silicon. N-type silicon then, has conduction by electrons.

If boron or gallium is added to the pure crystal P-type silicon, electron conduction also results since these materials have one less electron than silicon. It therefore steals one electron, conducting by holes or positive charges, which are the absence of electrons.

When both N and P types are present in a single crystal, the N-P junction is the boundary between the two types. In the presence of light, electron-hole pairs are formed as light energy falls upon the silicon. The electric field at the junction forces the electrons into the N side and holes into the P side.

This potential difference (voltage) is the power output from the cell. In bright sunlight the voltage is about 0.6 volts and cells can be placed in series for higher voltages. There is no chemical change, as in a battery, hence the solar cell does not degenerate.

A typical solar cell is shown in Fig. 3. Under load conditions a single cell produces about 0.3 volts. Current depends upon the light intensity, the cell area, and the load resistance. An average cell has a maximum power output of about 30 milliwatts per square inch of area with a 4 to 5 ohm load.

Designed and manufactured to extremely rigorous military specifications, these rectangular cells are now available for both commercial and military applications, and are capable of providing an output of approximately 9 watts per sq. ft. of active cell area in bright sunlight. The high efficiency (10% or higher) and rugged construction of these units is due in part to new alloying techniques which permanently bond the contact to the silicon wafer, making the contact an integral part of the cell itself, while still allowing soldering of individual cells.

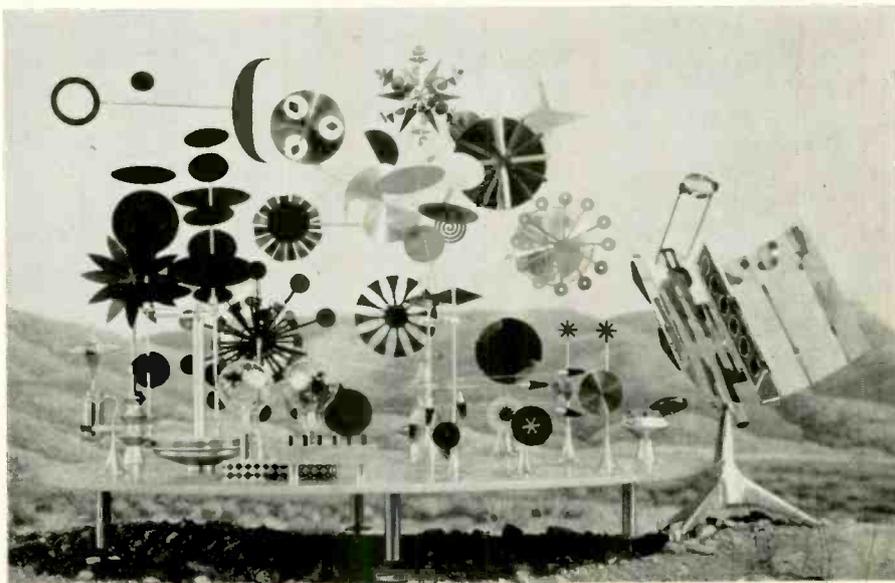
Solar-Powered Radio

A silicon cell by Hoffman Electronics Corp. provides 4.2 ma at 0.39

CHART I								
SELENIUM SUN BATTERIES								
Maximum Operating Temperature:					Continuous duty at 85°C Intermittent duty 100°C			
Maximum Illumination Intensity:					15,000 foot candles			
SUN BATTERY CELL... ELECTRICAL CHARACTERISTICS AT 25°C								
Standard Cell Types	Overall Dimensions inch x inch	Active Area Square Inch	Typical Output Power for Optimum Match to Load					
			2000 foot candles		5000 foot candles		10,000 foot candles	
			volts	milliamps	volts	milliamps	volts	milliamps
1B2	0.72 x 0.44	0.26	0.24	1.0	0.25	2.0	0.26	3.5
B2M	1B2 cell on angle bracket with pigtail leads							
1B5	1.44 x 0.64	0.76	0.24	3.0	0.25	6.0	0.26	10.0
1B10	1.69 x 0.88	1.26	0.24	5.0	0.25	10.0	0.26	17.0
1B15	1.69 x 1.69	2.25	0.24	9.0	0.25	18.0	0.26	30.0
1B20	2.0 x 2.0	3.27	0.24	12.0	0.25	23.0	0.26	37.0
1B30	3.25 x 3.25	9.41	0.24	32.0	0.25	60.0	0.26	100
SUN BATTERY... STANDARD TYPE								
Sun Battery Model*	Overall Dimensions inch x inch	Typical Output Power for Optimum Match to Load						
		2000 foot candles		5000 foot candles		10,000 foot candles		
		volts	milliamps	volts	milliamps	volts	milliamps	
SB-16B10	4.8 x 8.1	4.0	5.0	4.0	10.0	4.0	18.0	
SB-8B15	4.8 x 8.1	2.0	9.0	2.0	18.0	2.0	30.0	

Courtesy of International Rectifier Corp.

Fig. 5—The "toys" in this demonstration become animated when the sun shines on a bank of solar cells, which sends current to electric motors.



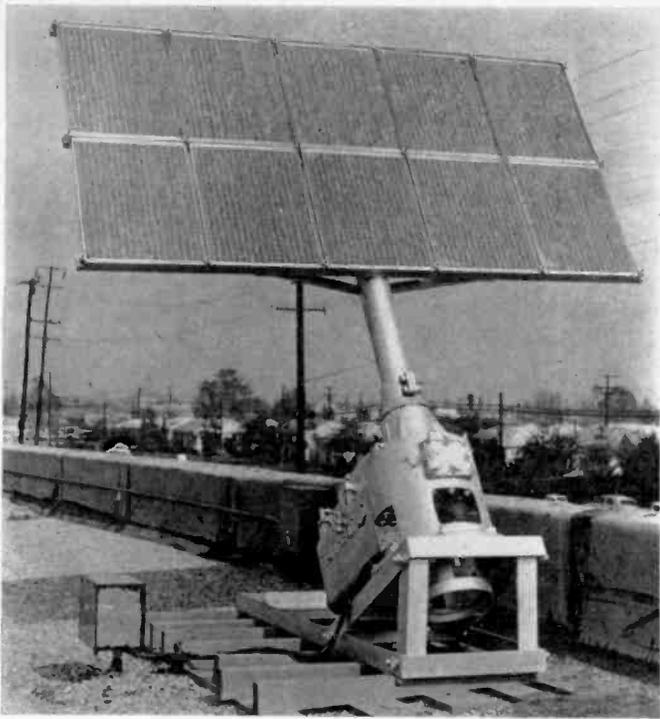


Fig. 6—"Big Bertha," the world's largest solar energy machine, contains 7,800 solar cells. Used for display and research, it follows the sun automatically and is now helping attack the problem of converting salt water into fresh water.

volts at a low light level of 100 foot candles and 42 ma at 10,000 foot candles. They are used in a solar-powered transistor radio which requires less than 20 ma for normal use. The solar cells are mounted in the handle and obtain light through a plastic window. Sixteen cells are used in series, hence their combined output is about 5 volts. Because they are sensitive to a broad range in the spectrum, either sunlight or artificial light may be used. They operate over a wide range of temperatures from -65°C to 175°C .

Light energy is converted into electrical power to operate the radio. But, because light is not always available the cells are in parallel, as in Figure 4, with four rechargeable battery cells. These are a series of 1.25 volt cells which produce 5 volts to run the radio under conditions of little or no light. Since the solar cells are across the battery, they charge the cells of the battery. The battery has a capacity of 450 ma-hours or 90 ma for 5 hours, but the radio needs only about 20 ma (or less) so that the solar cells trickle-charge the battery and the battery alone can run the radio for a full day's listening.

Another recent and successful application of sun batteries is found in a solar radio being marketed on a national scale. This unique radio, no larger than a pack of cigarettes ($\frac{3}{4}$ " x 2" x 3"), utilizes an International Rectifier B2 battery as its power

source; operates entirely without other type batteries or electrical connections.

The circuitry this radio employs takes advantage of some recently developed electronic components. A high-impedance hearing aid type earphone is used for receiving signals over a full AM broadcast band. Specially selected transistors and diodes and a Hi-Q omni-directional ferri-loopstick have been incorporated in this unit for optimum performance.

Fig. 8—With this foldable 4 foot parabolic reflector, the sun's rays can be focused on a grill for outside cooking. The cooking time is said to be about 15 or 20 minutes for a steak or hamburger.

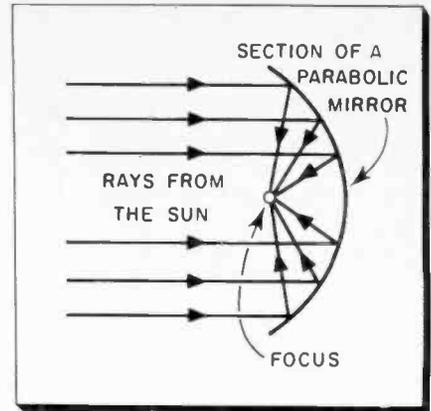
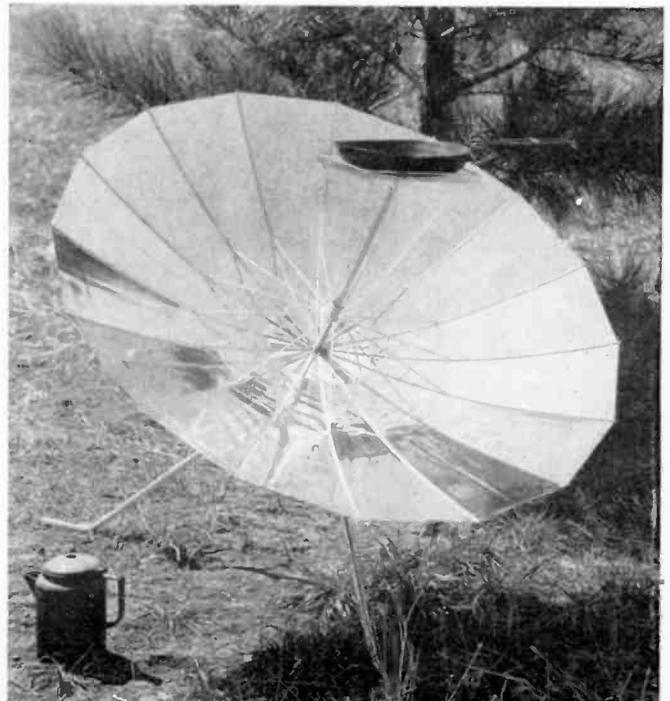


Fig. 7—With parabolic mirrors, rays of the sun concentrate to create a solar furnace.

Local reception is said to be excellent. It has been stated that when conditions are above average, stations over 1,000 miles away can be heard.

The aerial which is required for reception features a mini-gator clip, which provides easy means of antenna attachment to the fingerstop of a telephone, metal lamps or wire fence.

Solar Energy

For the purpose of demonstrating the possibilities of solar energy, Aluminum Company of America commissioned the device shown in Fig. 5; an aluminum solar toy. The "toy" utilizes silicon solar cells by International Rectifier Corp. and is part of ALCOA's "Forecast Collec-
(Continued on page 76)



"Tough Dog"

Corner



"Soft" Ground Makes A Hard Dog

I recently had a call on a Philco Chassis TV440. The complaint was hum in the sound and a badly distorted picture.

Arriving at the customer's home I turned the set on and confirmed the complaint. After making tube substitutions with no improvement, the owner was informed that the set would have to go to the shop in order to make an accurate diagnosis. At this time I surmised that only one fault was the cause of both symptoms. I did notice that the raster was free of distortion when the channel selector was turned off a station. I also noted that pressure applied to the printed board sound and video output circuits would cause the audio hum to vary.

With the set in the shop I began routine checks for a-c in the sound system. All filters appeared in order. Applying pressure to the board varied the hum from maximum to minimum. At the same time I saw a definite change in the picture pulling. Having substituted all tubes with new ones for trial purposes, this left only the components as suspects. Voltage and resistance checks revealed nothing out of the ordinary.

Checking ground connections between the printed board and chassis was my next step. With a $\frac{1}{4}$ inch spintite I began to alternately tighten and loosen the mounting screws holding the printed board to chassis ground, illustrated in Fig. 1. The sound varied in quality, and the hum varied from maximum to minimum; at the same time the picture warping would vary. I decided that the mounting screws had worked loose enough to cause the trouble. I therefore made a solid ground contact all around the board to chassis and the sound was perfect. I stepped back to marvel at the job!

But wait! The picture was still distorted by an "S" like pull shifting

slowly from bottom to top. I thought of a heater-cathode leakage in the sweep circuit. The horizontal output and damper tubes were new, but I substituted two more. This was in vain. Using manufacturer's notes, I compared resistance and voltage measurements and they appeared to be within tolerance. I set the scope and checked all waveforms in the horizontal sync, phase, oscillator and output circuit. Surprisingly, I did not

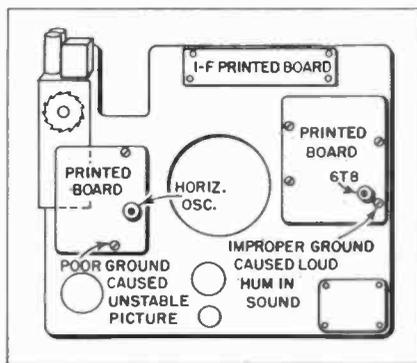


Fig. 1—Tightening self-tapping screws holding printed board units to chassis-ground, eliminated unstable picture and audio hum.

detect anything out of the ordinary. Completely baffled, I thought could it be possible the same situation existed here as with the sound problem? Quickly applying pressure to the horizontal printed board, the picture did vary accordingly. I grabbed the spintite again and tightened the mounting screw at the bottom of the printed board and the picture straightened up beautifully. After making a good ground connection as I had in the sound problem, and touched up the horizontal stabilizer coil, my problems with the set were over. I delivered this TV to a satisfied customer with great relief.—Calvin B. Bailey, Erwin, Tenn.

Win A Prize!

Pick the best Tough Dog of 1959

Next month Electronic Technician's Board of Editors will present their nominations for the best Tough Dog published in 1959.

You—the reader—will have the opportunity to vote for your favorite. Both you and the winning Tough Dog author can win valuable prizes. Watch for details next month.

TV Prefers Test Pattern

"Just another service call," I thought as the customer explained by phone that the pix was tearing with frequent vertical roll.

When I switched on the Admiral 20Y4E4, the picture came in rolling vertically and slipping horizontally. At one point I was able to lock it horizontally for a moment and observe the picture bending in the middle. Replacing the 6CS6, noise gate, sync separator and the 6BH8 agc tubes, did not cure the trouble. Video amplifier and sync inverter tubes were substituted — without any change. Having tried all other tubes in the picture link, I took the set to my shop.

In our town there is no transmitter on the air before 1 p.m. Therefore, the following morning I set up the "analyst" and injected a straight video signal to the cathode of the CRT. The picture looked clear and clean. Moving the injector probe to the grid of the 6AW8 video amplifier tube, the picture appeared slightly

(Continued on page 86)

Electronic Statistics

1959 TV-Hi-Fi-Electronic Industry Totals

• First half 1959 shipments of electron tubes, semiconductors, and other principal electronic components increased more than 15 percent over the preceding 6 months, and were in excess of 30 percent above the comparable period in 1958, the Electronics Division, Business and Defense Services Administration, U.S. Department of Commerce, reported (Tables I & II).

This sharp rise, the greatest since the Korean War period, confirms employment trends and other general indicators of steadily growing electronics output.

The following tables, which give details by component category, were derived from the semiannual Joint Survey of Production Capabilities for Electronic Parts conducted by the Electronics Production Resources Agency, Department of Defense, and the Electronics Division, BDSA. The data presented, however, represent estimated total industry shipments rather than aggregates of the survey data. The data were prepared to aid industry in market programming. •

Industrial Electronic Factory Sales

(In Millions of Dollars)	
Type of Equipment	1959
Computers & Processing	\$ 322.0
Testing & Measuring	238.0
Navigational Aids	105.0
Landmobile	167.0
Microwave	
Broadcasting	
Industrial Controls	179.0
Nuclear-Electronic Apparatus	47.0
Medical & Therapeutic	156.0
Commercial Sound	147.0
Communication	49.0
Miscellaneous	110.0
TOTAL	\$1,520.0

TABLE 1

Estimated Shipments of Selected Electronic Components, Except Tubes and Semiconductors, During the First Half of 1959¹

Category	Quantity in millions of units			Value in millions of dollars		
	Total	Military	Non military	Total	Military	Non military
Capacitors	587.8	67.6	520.2	111.1	33.8	77.3
Paper	137.3	15.7	121.6	33.8	9.9	23.9
Film	16.1	1.7	14.4	5.1	1.8	3.3
Metallized paper	6.2	2.5	3.7	3.2	1.4	1.8
Electrolytic, aluminum	44.4	4.8	39.6	24.1	2.8	21.3
Electrolytic, tantalum	7.4	3.5	3.9	14.9	10.2	4.7
Mica, fixed	60.8	14.5	46.3	6.9	2.0	4.9
Ceramic, fixed, except high voltage	281.7	19.5	262.2	11.1	1.6	9.5
Other ³	33.9	5.4	28.5	12.0	4.1	7.9
Connectors	41.4	26.6	14.8	69.8	49.1	20.7
Coaxial (RF)	10.8	6.5	4.3	7.9	4.2	3.7
Cylindrical	14.2	9.8	4.4	32.2	25.5	6.7
Multiple contact (rack and panel)	8.3	4.7	3.6	14.1	8.3	5.8
Fusion sealed	.9	.7	.2	2.0	1.5	.5
Printed circuit ⁵	2.6	1.9	.7	2.9	1.9	1.0
Other	4.6	3.0	1.6	10.7	7.7	3.0
Quartz crystals	1.8	.7	1.1	5.1	2.0	3.1
Sealed	1.7	.7	1.0	4.8	1.9	2.9
Unsealed	.1	.4	.4	.3	.1	.2
Relays (for electronic applications)	11.7	4.5	7.2	85.2	45.1	40.1
Electromagnetic, except coaxial and stepping switches						
Through 100 mw. actuating power	1.0	.4	.6	8.9	4.2	4.7
Over 100 mw. actuating power	6.9	2.7	4.2	44.2	26.9	17.3
Telephone types	2.0	.7	1.3	13.7	5.0	8.7
Other ⁶	1.8	.7	1.1	18.4	9.0	9.4
Resistors	972.9	151.8	821.1	112.0	53.9	58.1
Fixed composition	776.9	111.3	665.6	22.2	4.0	18.2
Variable composition	59.7	5.4	54.3	19.5	6.6	12.9
Deposited carbon	40.3	17.6	22.7	9.9	5.2	4.7
Fixed wire-wound, non-precision	38.1	3.1	35.0	6.5	1.1	5.4
Fixed wire-wound, precision	8.2	6.2	2.0	8.2	6.0	2.2
Variable wire-wound, non-precision	13.7	1.9	11.8	7.0	2.3	4.7
Variable wire-wound, precision	1.6	1.4	.2	24.1	21.2	2.9
Other ²	34.4	4.9	29.5	14.6	7.5	7.1
Transformers and reactors	11.2	3.2	8.0	68.0	38.2	29.8
Transformers and reactors, except toroidal						
Under 2 oz.	1.1	.6	.5	5.5	3.5	2.0
2 oz. to 30 lbs.	9.0	1.7	7.3	45.8	23.2	22.6
Over 30 lbs.	.2	.1	.1	7.9	4.3	3.6
Transformers and reactors, toroidal	.9	.8	.1	8.8	7.2	1.6

¹ Estimated total industry shipments including intra-plant and inter-plant transfers.

² Includes boro-carbon and metal film; variable, non wire-wound, precision potentiometers; toroidal precision potentiometers; attenuators; voltmeter multipliers; varistors, and thermistors.

³ Includes variable mica capacitors; high voltage, multiple or packaged units, and variable ceramic capacitors; glass and vitreous enamel capacitors; and variable air capacitors.

⁴ Less than 0.1 but included in the totals.

⁵ For printed circuit board and cable applications.

⁶ Includes coaxial, stepping switches, thermal, meter movement, motor driven, and other relays.

TELEVISION

New sets	5,900,000
\$ volume at retail	\$1,200,000,000
Sets scrapped	3,000,000

TELEVISION SETS IN USE

U.S. homes with b & w sets	44,800,000
Secondary sets in above homes	5,600,000
Sets in business places, institutions	2,700,000
Color sets (included above)	470,000
Total TV sets in U.S.	53,100,000

RADIO

New sets (including 1.4 million FM) ...	14,400,000
\$ volume at retail	\$ 490,000,000

RADIO SETS IN USE

U.S. homes* with sets	53,000,000
Secondary sets in above homes	56,400,000
Sets in business places, institutions	13,900,000
Automobile sets	43,900,000
Total radio sets in U.S. (including 15,700,000 FM)	167,200,000

*Includes all dwellings such as apartment hotels, etc.

ANNUAL RETAIL BILL FOR SERVICING

194,000,000 replacement receiving tubes	\$ 343,000,000
6,800,000 replacement picture tubes	\$ 250,000,000
Antennas, components, parts, instruments	\$ 910,000,000
Labor	\$1,390,000,000
Total servicing bill	\$2,890,000,000

INDUSTRIAL ELECTRONICS

Industrial electronics, factory sales	\$1,520,000,000
Industrial electronic & communications maintenance	\$ 510,000,000

TV-ELECTRONIC TECHNICIANS

Major service outlets	63,800
Parts jobber business accounted for	67%

TUBES MANUFACTURED

Picture Tubes

Number made (including rebuilds)	12,700,000
% used for replacement	53.5%

Receiving Tubes

Number made	420,000,000
% used for replacement	46.2%

TRANSISTORS

Number made	86,000,000
% used for replacement	6%

TELEVISION STATISTICS 1946-1959

Year	Sets Manufactured	Total Sets in Use	TV Stations on Air
1946	10,000	8,000	5
1947	250,000	230,000	20
1948	1,000,000	1,000,000	44
1949	3,000,000	3,800,000	100
1950	7,500,000	10,500,000	107
1951	5,600,000	15,750,000	108
1952	6,300,000	21,800,000	123
1953	7,300,000	28,000,000	350
1954	7,300,000	33,000,000	440
1955	7,800,000	39,000,000	485
1956	7,300,000	43,900,000	512
1957	6,800,000	47,240,000	521
1958	5,100,000	50,300,000	546
1959	5,900,000	53,100,000	560

AUDIO

Home Hi-Fi Service (75% of outlets) ..	\$ 125,000,000
PA Installation & Repair (37.1% of outlets)	\$ 60,000,000
Phonographs sold	4,800,000
Phonographs \$ volume at retail	\$ 495,000,000
Phonographs in U.S.	38,500,000
Tape recorders sold	550,000
Tape recorder \$ volume at retail	\$ 104,000,000
Hi-Fi audio \$ volume	\$ 280,000,000

ELECTRONIC TECHNICIAN statistics are an industry reference, used each year by such authoritative sources as the World Almanac.

TABLE II

Estimated Shipments of Electron Tubes and Semiconductors During the First Half of 1959¹

Category	Quantity in thousands of units			Value in millions of dollars		
	Total	Military	Non military	Total	Military	Non military
Receiving tubes	214,903	17,036	197,867	188.1	35.4	152.7
Sub-miniature	3,453	2,773	680	12.6	10.8	1.8
Miniature	151,043	11,273	139,770	119.2	18.0	101.2
Standard glass (G and GT)	54,358	2,180	52,178	49.9	5.1	44.8
Other (metal, ceramic, acorn, pencil, lock-in)	6,049	810	5,239	6.4	1.5	4.9
Television picture tubes	4,500	—	4,500	87.9	—	87.9
Power and special purpose tubes	5,751	1,702	4,049	124.7	87.5	37.2
High vacuum tubes	2,007	938	1,069	30.5	16.9	13.6
Gas and vapor tubes	790	317	473	7.4	3.2	4.2
Klystrons	123	109	14	19.2	17.0	2.2
Magnetrons	41	38	3	23.6	23.0	.6
Forward and backward wave tubes	5	4	1	13.6	13.1	.5
Duplexer tubes	101	94	7	3.7	3.6	.1
Light sensing and emitting tubes	736	114	622	12.4	5.2	7.2
Storage tubes	3	2	1	3.4	2.6	.8
Other ²	1,945	86	1,859	10.9	2.9	8.0
Semiconductor devices	93,880	22,723	71,157	177.2	74.4	102.8
Germanium diodes and rectifiers	29,352	6,703	22,649	17.3	4.8	12.5
Silicon diodes and rectifiers ³	28,055	10,413	17,642	59.6	28.3	31.3
Transistors	36,473	5,607	30,866	100.3	41.3	59.0

¹ Estimated total industry shipments including intra-plant and inter-plant transfers.

² Includes UHF planar (lighthouse) tubes; radiation detection tubes; spark gaps; beam deflection tubes; decade counters; electronic switches; orbital beam tubes; and vacuum capacitors, switches and gauges; excludes X-ray tubes.

³ Includes power rectifiers, light sensitive devices, and mixer crystals; excludes selenium and copper oxide rectifier stacks.

How To Troubleshoot

Low Voltage Source Can Be Tricky. Here Are Practical Procedures For

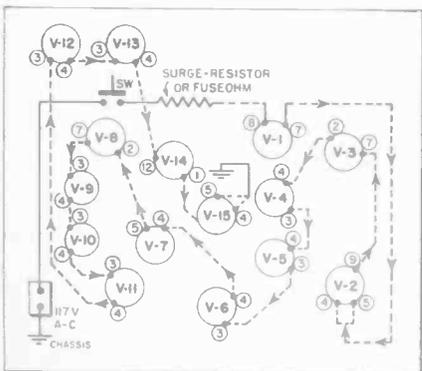
JERRY WELLS

Many easily overlooked component failures can cause the TV low voltage supply to operate improperly—or not at all. It could be simply a phono/TV switch. Or an elusive intermittent heater. Or questionable leakage. Or leaky electrolytic. Or weak rectifiers. Alertness can prevent the creation of an artificial tough dog. Transformer and series string types offer problems peculiar to the particular design.

• The techniques used to isolate faulty components in low voltage supplies are essentially similar to those employed in other TV sections. Typical methods call for an organized step by step process of elimination.

In a number of case histories reviewed, however, there were some obvious contradictions. This can be explained by the fact that some technicians, knowing the inherent simplicity of low voltage power supplies, develop "cock-sureness" at times,

Fig. 1—Removing and testing the middle tube in a series string, e.g. V-7, followed by a continuity check of each half of the heater string, will eliminate 50% of the testing.



causing a temporary departure from otherwise regular procedures. In almost all instances, after wasting considerable time making repairs, the sets were stamped with "tough dog" labels. Some technicians refer to such cases as "artificial dogs."

Preliminary Steps

How many experienced technicians have not at some time been "stung" by a defective on/off switch, open interlock or defective line cord? And that phono/TV switch, previously flicked to the phono position by a grandchild on grandpa's TV one Sunday evening, resulting in a one hour house call on Monday? It can happen to the best.

Variable factors and unknowns prevent accurate statements regarding the time required to isolate and pin-point a defective component in a power supply. One thing is certain: a careful review of a particular manufacturer's schematic is generally considered a preliminary step in the proper direction. A large number of experienced technicians maintain that visual inspection is next in importance.

Before working on a set, some questions require definite answers. Is it a classical power transformer supply? A modified transformer type? Autotransformer? Transformless series heater string? Are voltage divider-bleeder networks involved? Is a B supply being taken from the sound output cathode? There are other important questions a manufacturer's data can answer.

Isolating Open Heaters

With the advent of 450 and 600 ma type tubes, series-string circuits have become more widely used. Fewer open heaters result. Most manufacturers describe rapid procedures for

locating a burned out tube in transformerless series string sets. But we do not recall seeing a necessary warning: *Do not depend upon tube heater continuity checks alone.* Where "leakage" begins and a "short" ends is likewise unexplained.

Procedures followed by some technicians require preliminary removal of the center tube in a string. This tube is tested on a tube checker to determine if leakage or shorts exist; if the heater is good or open, continuity checks are then made with a VOM. For example, referring to Fig. 1, if the entire string is "unlit," V-7 is removed from the string. After this tube is properly tested, continuity checks are made from the tube socket contact 4 to the a-c interlock. A similar test is then made from contact 5 to the interlock or chassis ground. This immediately isolates an open heater or line fault to one half of the string.

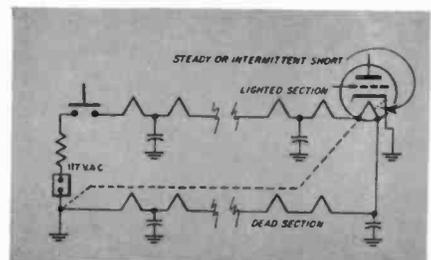
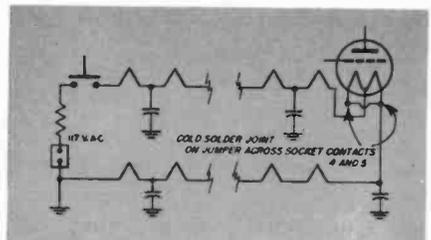


Fig. 2—A steady or intermittent cathode-to-heater short in a series string tube, can cause a tube in the remaining "hot" filament section to burn out or repeatedly fail.

Fig. 3—If a cold solder joint opens in a series string parallel-filament connection, the excess current going through only one of the two filaments can blow the heater.



TV Power Supplies

Making Effective Repairs In The Wide Variety Of Circuits In Use

In the next step, another tube is removed from the center of the open half-string. Procedure is repeated, step by step, until the open heater, global, fuseohm, interlock, or fuse is located. This procedure, once again, reminds us of the basic process of elimination employed throughout a TV; from section, to stage, from component to component. There are few effective alternatives.

Special Problems

Despite the development of controlled heater type tubes, opens, shorts and leakages still occur. Checking the continuity of a tube heater is not conclusive. The heater can be separated with continuity being made via the cathode. Or it can be intermittently open. Other unusual situations develop in series string tubes. A particular symptom is determined by the nature of the short or leakage, where the tube is being used and the circuit in which the tube is employed.

For example, in certain series strings a heavy cathode heater short can "kill" part of the string, as illustrated in Fig. 2. The lit string may glow brightly for a short while until one of the tube heaters burn out. On the other hand, it may remain lit indefinitely without a tube opening up if sufficient tubes are in the lit section.

If a global changes to high resistance a situation can arise causing all tubes to appear normal, but with one or more sections of the set operating abnormally—because of insufficient heater voltage.

A number of unusual situations have been reported. Here is one culled from a large number. With a tube cathode grounded, an intermittent cathode heater short can develop, killing part of the string and causing another tube in the hot string

to blow. When the set cools the short in the culprit tube disappears. The technician locates the open heater tube, replaces it and goes his way. At some unknown time later the culprit again shorts and the process is repeated, with considerable embarrassment to the technician. After the third trip, both the customer and technician have progressed somewhat beyond embarrassment. These and somewhat similar problems have driven many good technicians to the brink of "flip-happiness."

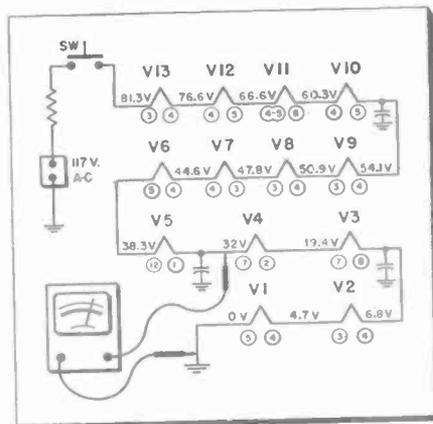


Fig. 4—Voltage measurements at each tube filament should conform closely with the manufacturer's specifications. Series string faults are indicated by incorrect readings.

Another example, with equally disruptive characteristics, is illustrated in Fig. 3. Here a parallel or center tapped heater develops an intermittent open in a jumper across the socket contacts 4 and 5. When the open takes place the tube will usually blow out. When two or three tubes have been replaced over a period of time, the technician usually brings the set to the work bench and locates the faulty contact. It is cured with a soldering iron.

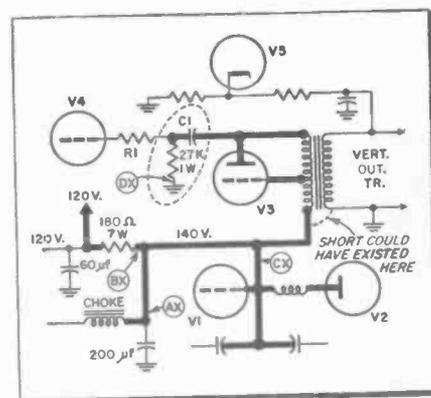


Fig. 5—A popular method of troubleshooting an overloaded power supply or B+ short is to disconnect key points until the overload is indicated. Commencing at point Ax, the lines were disconnected in the circuit shown until the overload was discovered at point Dx.

Taming Wild Ones

Careful testing on a good tube checker, after reaching normal operating temperature, giving each tube a "vibration" test, will generally reveal the defective tube. If an intermittent condition exists, appearing only after a set has been operating for some time, one approach requires the aid of a manufacturer's hot string schematic, illustrated in Fig. 4. If a-c voltage measurements do not correspond with those specified for a particular set, the cause can be resistance change, a shorting tube or leaking filament bypass. A wide variety of symptoms can be caused by heater cathode shorts and leakage.

A cold string test is likewise useful under certain conditions. The total resistance of an average cold string is rather low, approximately 100 ohms or less, including resistors. If a higher than normal cold string exists, begin looking for a shorted tube or changed-value resistor. A shorted filament bypass capacitor could cause a lower than normal reading depending upon its position in the string. In

(Continued on page 72)

Precautions For Installing Marine Radios



AL LYNCH

• Reports from the National Association of Engine and Boat Manufacturers indicate that a wide cross-section of our population has discovered an old sport and pleasure. Specifically, the Outboard Boating Club of America reports approximately 7 million pleasure boats in operation.

Although communication plays an important role on water as well as land, only a tiny fraction of this group have 2-way radios. According to the FCC, there are only some 65,000 vessels using 2-way radio and very few of these are pleasure boats.

Under these circumstances, sales and subsequent service present the technician with an almost virgin field.

Equipment

Numerous radio-telephone units are commercially available. The in-

creased popularity of small boats has spurred manufacturers to produce lightweight, low-power, low-cost radio-telephone equipment.

Transistorized equipment offers the small-boat owner a compact unit. Most include a broadcast receiver for weather reports, news, entertainment and Civil Defense information.

Power

In order to operate the radio-telephone equipment, a source of power is necessary. Although some units are portable with self-contained batteries, it is usually desirable to also use available boat power. This can be done by taking power directly from the boat's battery terminals.

The largest convenient conductors should be used to avoid excessive power losses. A minimum gauge No. 10 is recommended. A stranded wire power cable size and length chart is listed in Chart I.

*Get The Most
Out Of Equipment
By Proper Grounds
& Connections*

CHART I

Length	Gauge
0-10 ft.	No. 10 wire
10-15 ft.	No. 8 wire
15-20 ft.	No. 6 wire

The small boat power supply voltage is invariably 12 volts. When connecting to the radio-telephone equipment, be certain to observe correct polarity. Transistors can be permanently damaged if the polarity is incorrect.

Wire insulation should be moisture and fungus-proofed. Leads should be cut to the required length and dressed to the location of the set. Flapping wires are dangerous.

Grounding

A good ground is an emphatic must for good reception. This does not mean that an operator cannot transmit or receive with an inadequate ground.

(Continued on page 83)

SHOP HINTS



Tips for Home and Bench Service

Auto Radio Short Checks

If a "fuse blows" complaint arises on a 1960 Delco manual transistor auto radio, the following checks are suggested:

1. Insert proper fuse and connect radio to power supply.

2. Turn radio on and immediately note current drain. If over 4 amps, quickly turn radio off.

3. Check for a shorted transistor bias control. If the transistor bias control is shorted, the 10 ohm resistor, shown in Fig. 1, will overheat if the radio is left on more than a few seconds without a 4 amp fuse.

Other defects can also cause a blown fuse: Shorted "A" line spark plate capacitor, shorted electrolytic,

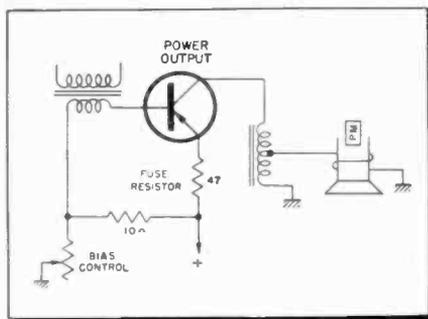


Fig. 1—A possible cause of "blowing fuses" in 1960 Delco auto radios is a shorted bias control. This is usually accompanied by over-heating of the 10 ohm resistor.

or a shorted power transistor.

If any discoloration exists in the area of the 10 ohm resistor on the circuit board, the resistor is probably overheating. If the resistor is discolored, indicating signs of excessive current, the bias control should be changed. Also check for an open transistor fuse resistor.

The bias control normally measures 3 to 10 ohms when in the circuit, depending on meter polarity used. A shorted control would probably measure "0" ohms, although it could be intermittently shorting. When removed from the circuit a good control measures a much higher resistance, usually 135 to 300 ohms. *Delco Radio Div., General Motors Corp., Kokomo, Ind.*

Win A Prize!

Pick the best Shop Hint of 1959

Next month Electronic Technician's Board of Editors will present their nominations for the best Shop Hint in 1959.

You—the reader—will have the opportunity to vote for your favorite. Both you and the winning Shop Hint author can win valuable prizes. Watch for details next month.

Yoke Clamp

When working with a test CRT on the bench it is very aggravating to have the yoke continually slip down the neck. I have tried various clamps to hold the yoke against the test CRT flare, but found them all inadequate or too time consuming to put in place. After some experimenting I finally found an ideal yoke clamp as follows: Remove the magnet from a

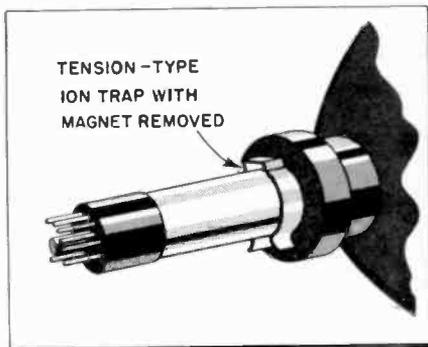


Fig. 2—A deflection yoke can be positioned against the flare of a test CRT without slipping, by using an ion trap as a clamp.

tension-type ion trap. This tension clamp can then be clipped on the test CRT neck behind the yoke—and then pushed up against the yoke, as shown in Fig. 2. The clamp does the job well and can be installed in only a few seconds.—*Albert J. Krukowski, West Springfield, Mass.*

Handy Retriever

When small screws, washers, nuts, clips or similar objects drop into an inaccessible place, such as a TV or radio chassis or cabinet, they can be quickly recovered with a small mag-

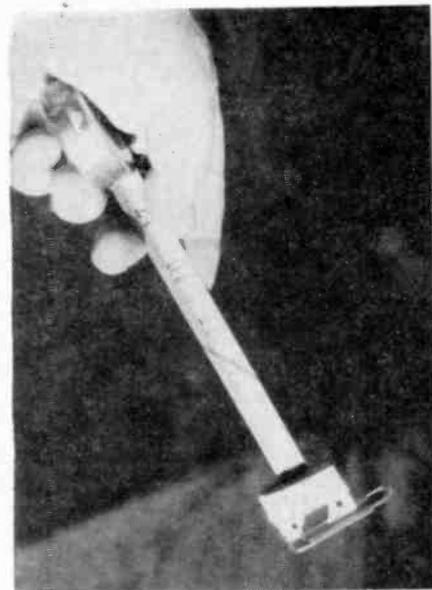


Fig. 3—A small magnet attached to the end of a steel tape can retrieve lost objects from various inaccessible places and is instantly adjustable to the required length.

net attached to the end of a steel tape, as shown in Fig. 3. The magnet is fastened to the end of the tape by means of a rubber band or masking tape. If the article to be recovered is non-magnetic fasten a bit of masking tape, sticky side out, to the end of the tape and this will pick up any small objects. Also, it is extremely useful for removing lost washers from the shell of a speaker or from the speaker housing.—*Glenn F. Stillwell, Manhattan Beach, Calif.*

Checking Magnetized Tape Heads

Modern tape recorder heads with small gaps, are particularly susceptible to magnetization. This can be caused by magnetized tools in close proximity to the head. It can also be a result of injecting d-c current into the head windings; for example,
(Continued on page 77)



Eliminating Set Loaners Ups Service Income

TV Rental Charge Gears Operation For Profits

C. THOMAS

• "Eliminating loaners," said one of the partners of a successful TV and Hi-Fi service company, "solved one of our major problems."

Instead of free-loaners, SOS TV, located in El Paso, Texas, rents TV sets to service customers. Rental charges, when concerned with repair work, costs the customer a \$5.00 maximum—or \$1.00 per day if the customer's defective set is kept less than a full week.

Since SOS averages between 200 and 250 service calls a week, with about 55 to 60 sets brought in for bench work, it is obvious how many loaners this would involve. And the investment for loaned TV sets would be a total financial loss.

In view of the \$5.00 maximum rental charge—it is imperative that an excellent stock of replacement parts is maintained. Getting the customer's set back to him within five days means

that constant revenue from rentals is achieved. Therefore, an inadequate parts inventory with abnormal waiting time for parts orders, will cost the service company money.

Sales

While explaining the rental charge rate to customers, service technicians talk the advantage of buying a second set. The company claims that outside service techs sell 1 out of every 10 "bench job" customers a new TV receiver, or an average of six sets per week. Surprisingly, a partner says, 90% of these sales are for consoles.

As only 1 bench customer out of 8 rents, it is safe to assume that most customers take a "loaner" only because it is available without extra cost. The SOS TV owners feel that doing away with loaners have upped their sales.

Service

SOS has 4 service trucks—all 2-way radio equipped and with a thousand dollars worth of service equipment and parts in each one. Each service technician works loosely within a bounded area, thereby knowing the streets and customers.

Service calls are \$4.50. The sales of tubes and parts average each call at \$10.00. Minimum charge on black and white sets brought to the shop is \$12.50 labor plus parts.

Only color TV's sold by SOS (over 1,500) are serviced by the company. Home service calls are \$7.50; bench job labor minimum is \$16.50.

All service works carry a 7-day labor guarantee, 90-day parts and full-year CRT guarantee.

Organization

The shop employs six benchmen; three are trained color techs. Three years ago, SOS TV discontinued hav-



"A stitch in time . . ." Outside men check their truck's parts stock before leaving the shop.



As soon as a shop job is brought in, it's immediately cleaned with compressed air.



No stalling here . . . Once the TV set is clean, it's placed on the bench for prompt service.



2-way radios are also checked every morning. Four service trucks are similarly equipped.

A Day In The Shop



Pricing, parts stock and perpetual inventory control can "make or break" a service shop.

Dispatcher receives incoming service calls & routes them to outside men by mobile radio.



ing outside men double as benchmen. Subsequently, benchmen were not allowed to make outside calls. This policy is said to have saved both money and grief.

All the outside service technicians are reported qualified as benchmen. However, the outside men are chosen for their personality and salesmanship, as well as for their technical knowledge. A large percentage of new TV sales are directly attributed to outside service technician contact with customers. The service company does not bother with wholesale service accounts.

Modern business methods, including a strong "paper work" set-up for parts inventory and a service/sales case history file, 2-way mobile radios, technical library and decentralization of responsibilities have contributed to a profitable service operation for SOS TV. •

With the aid of a dolly and wide panel-truck doors, the repaired TV set is put into the truck for delivery.



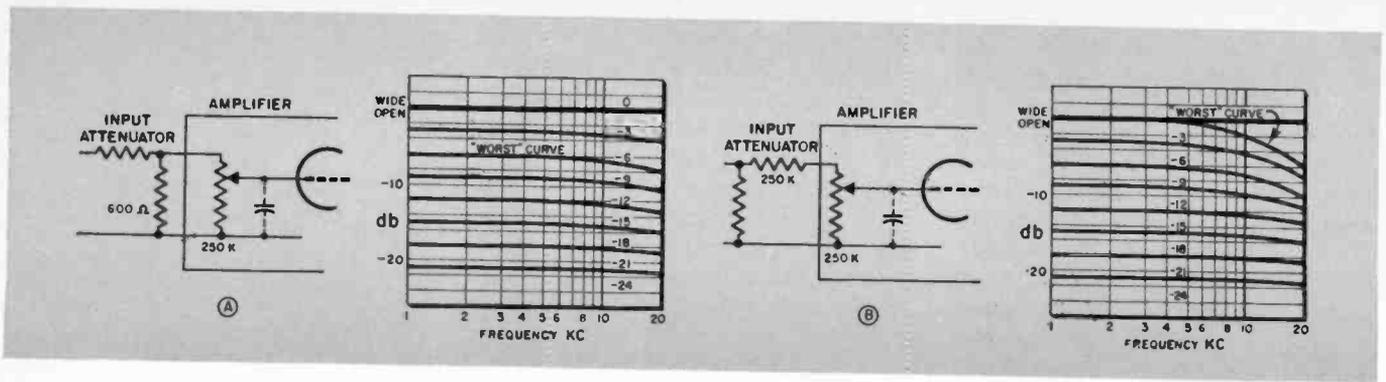


Fig. 1—Amplifier frequency response can vary according to the audio oscillator input circuit and the setting of the gain control. (A) Indicates a low impedance input going into a high impedance control. The graph illustrates a high frequency loss when the slider is at the control's mid-resistance point. (B) Shows the result of matching the input and amplifier impedances. The greatest high frequency loss is indicated at control's maximum gain.

How to Assure Dependable Audio Measurements

Different Frequency Response Readings Are Often Due To Dissimilar Control Settings & Impedance or Load Matching

NORMAN H. CROWHURST

IN BRIEF

Following the manufacturer's audio frequency response measurement instructions "to the letter" can still result in diverse readings. Unsatisfactory conclusions are often made due to misunderstanding the influence of:

- Gain Controls
 - Tone Controls
 - Input Impedances
 - Output Loads

• Frequency response measurements sounds rather like a "snap-job." However simple it may sound, though, some puzzling measurement variations are often made that makes one wonder if everything is being done correctly.

Apart from invalidations due to

hum, oscillation or some other spurious output, a test set-up can affect the measured response. This does not necessarily mean that the response you measure is a wrong one. But, it may come out differently than a measurement made by another method.

This, of course, can raise a doubt in the mind of the tester regarding the veracity of his readings. Understanding some of the differences that can occur in this way is a great help in making intelligent use of frequency response measurements.

Gain Settings

The first possibility in this direction is a comparatively simple one, but one that has caused a number of furrowed brows. The response of an amplifier often varies according to the precise setting of the gain control. The effect of gain control setting on frequency response will be dependent upon the impedances of the stage with which it is associated.

Many basic amplifiers have a gain

control right at the input, before the grid of the first stage; the object being to make certain that an excessive input from the preamplifier will not overload the first stage of the basic amplifier. Under these circumstances setting of the gain control may well modify the frequency response in different ways.

Measurement Differences

Suppose that the audio oscillator comes out at relatively low impedance, say 600 ohms, and you use a 600 ohm attenuator to go with it. From this 600 ohm impedance you go directly into a high Z volume control, possibly 250K or higher. Under this circumstance the response of the amplifier will be unaffected by the resistance of the volume control when the gain is set either at maximum or near the bottom of the resistance. But at about 6 db below maximum, where the slider has an equal resistance to top and bottom of the potentiometer, the grid input capacitance of the first stage will produce

a maximum high frequency loss. This is one way the response can vary with gain control setting, as shown in Fig. 1A.

Suppose, however, the input resistance is arranged to "match" the input resistance of the amplifier, external equal to internal, which is the "standard" method of measurement in some circles. The fact that the internal resistance is 250K, for example, means the oscillator or attenuator is terminated with a 250K resistance feeding into the input of the amplifier (Fig. 1B). With this method, using the same basic amplifier, the high frequency response will show an even greater droop at maximum gain setting than it did in the middle with the previous method. As the slider goes progressively nearer the bottom the response improves.

Thus, the variation in response with position of the gain control can be quite different according to the input source resistance used. So, in specifying the frequency response of an amplifier it is not sufficient to specify merely the setting of the gain control as being wide open, 6 db below maximum, or some figure such as this. It is also necessary to specify the source impedance used in making the measurement.

Showing that there is a measurement difference in this way does not say which method is correct. This will really depend on the circuit with which the basic amplifier is to be used. Many preamplifiers come out from a cathode follower which has a source resistance in the region of 600 ohms.

If the amplifier test is to determine what will perform with such a pre-amplifier, the oscillator input resistance should also be 600 ohms, which will simulate working conditions.

Some gain controls are compensated to offset high frequency loss part way down, as shown in Fig. 2. Under these conditions, careful checks are necessary to find what effect gain control setting has on frequency response. This should not be confused with loudness compensation, which is yet another thing.

Instrument Matching

A bewildering cause for differences in frequency response measurement is one that is much less evident. If the amplifier oscillates or produces hum, one may immediately suspect differences in input and output ground, or some stray coupling due to the measurement method. But sometimes the measurement method does not specifically induce hum or oscillation. Possibly the transformers in the test equipment are adequately shielded to prevent hum induction and the tendency to instability produced by the test conditions is not sufficient to make the amplifier actually oscillate. But they do make it show a rising characteristic at the frequency where, with a little more encouragement, it would oscillate.

In one test setup encountered recently, the oscillator output was in the region of 1000 ohms impedance. For some reason, this impedance, in conjunction with the basic amplifier

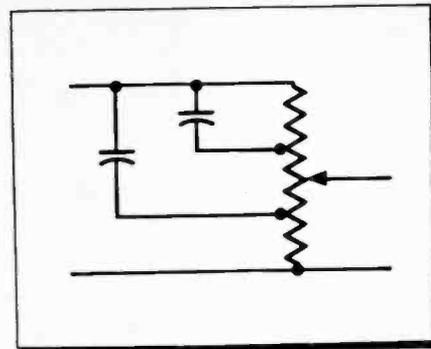


Fig. 2—When the amplifier contains a compensated gain control, frequency response checks should be made at various settings of the control.

being tested and the output measurement equipment, almost produced high frequency instability. Instead of oscillating, it showed a rising characteristic that went up several db in the region of 10 to 20 kc. According to the specifications, the amplifier shouldn't do this. Putting a 500 ohm load across the output of the oscillator stopped the effect and produced a level response.

This change could not be due to a simple R-C effect because the difference between 500 and 1000 ohms would never make that much difference between a considerable rising high frequency response and a level one. Anyway, using a higher input resistance would cause the high frequency response to droop, if anything. But, manifestly, using too high an input impedance, coupled with the particular test setup we were using, produced a feedback back-coupling

(Continued on page 63)

Fig. 3—A quick check to set bass treble controls at "flat" position is to adjust them for equal amplifier gain at 100, 1K and 10K cps. The rule is not infallible, as indicated by curves "A" and "B" having equal gain at these points, though responses differ.

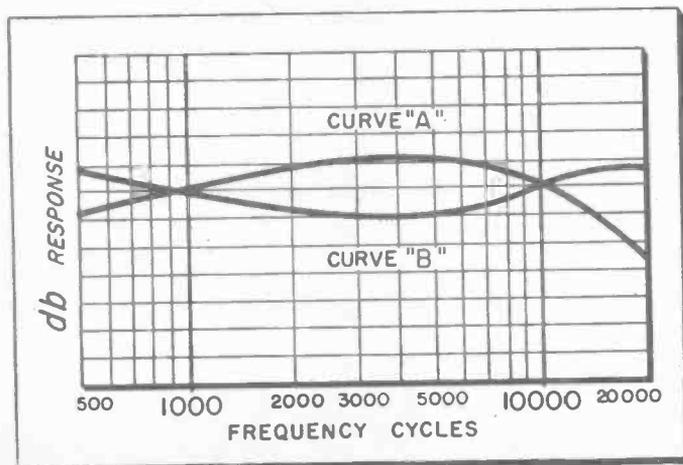
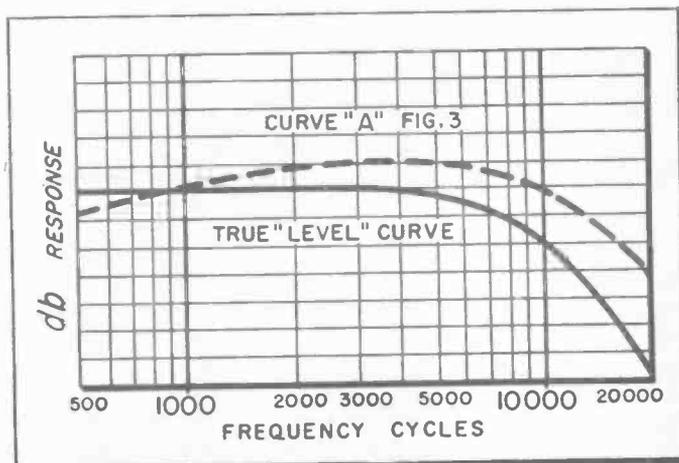


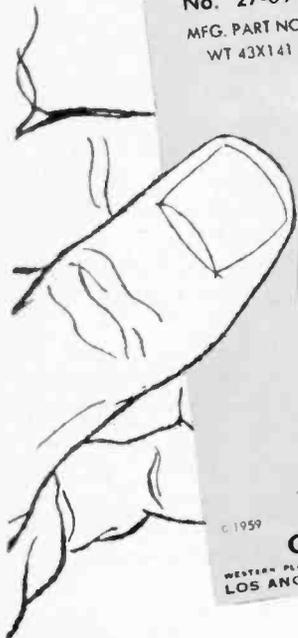
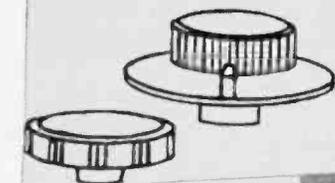
Fig. 4—The best flat frequency response capabilities of a given amplifier is obtained when tone and volume controls are balanced to level. A true "level" curve can be adjusted by setting controls to obtain a flat response from Curve "A's" 1K cps point to where a loss begins.



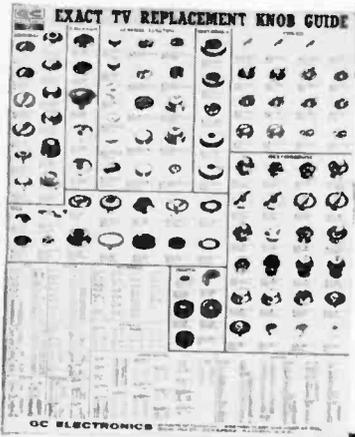
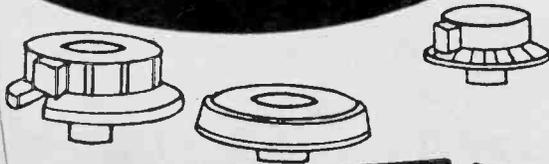
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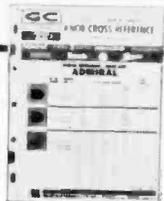


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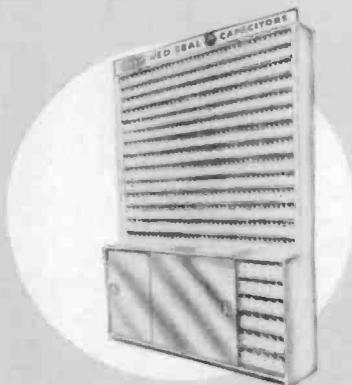
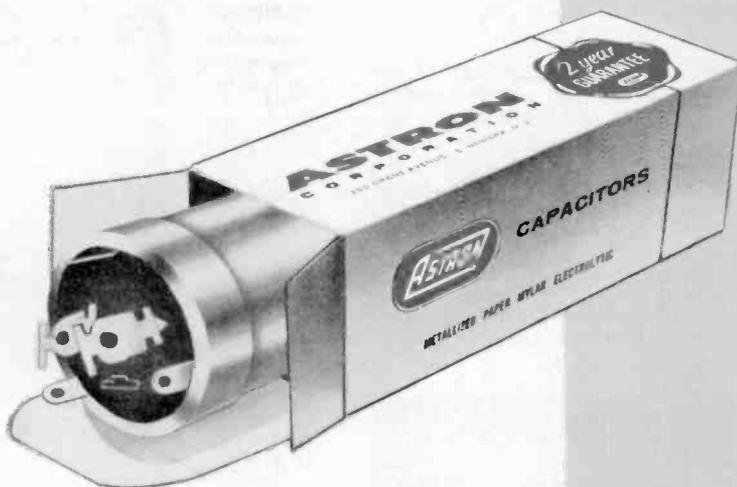
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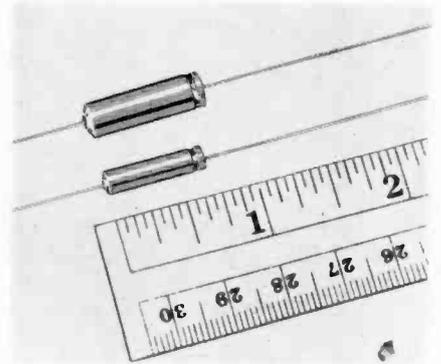
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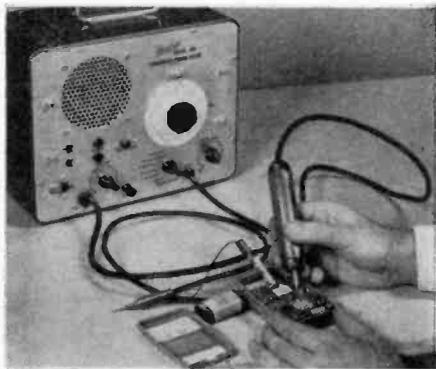
and consumer products. They feature low-leakage, welded terminal connections and no pressure contacts. Operating temperature range is -20°C to $+85^{\circ}\text{C}$; 3v to 150v d-c working. Cornell-Dubilier Electric Corp., 333 S. Hamilton Blvd., South Plainfield, N. J. (ELECTRONIC TECHNICIAN 1-3)

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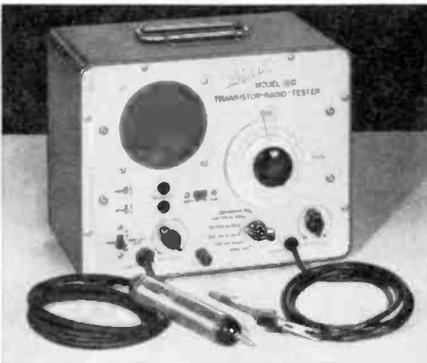
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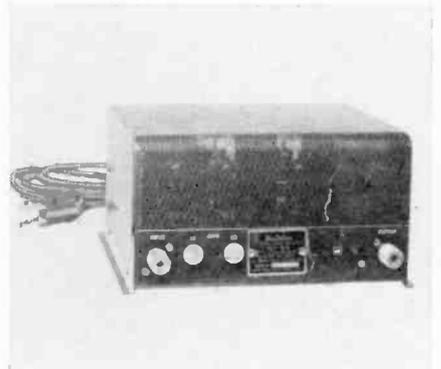
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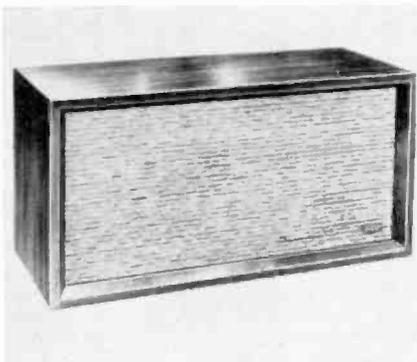
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Eico SPEAKER SYSTEMS

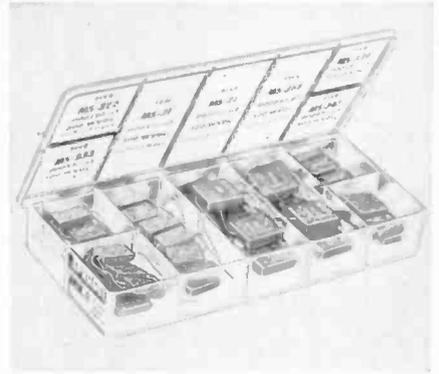
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ohms. Model HS-5, bookshelf type, two-way, has one 8" woofer and 3 1/2" tweeter. 25 watts. Response, ± 5 db, 52 to 14,000 cps. Impedance, 16 ohms. \$72.50, \$83.50, \$47.50, respectively, unfinished birch. Finishes higher. Electronic Instrument Co., 33-00 Northern Blvd., Long Island City 1, N. Y. (ELECTRONIC TECHNICIAN 1-41)

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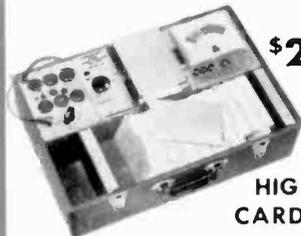


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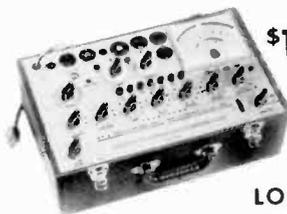
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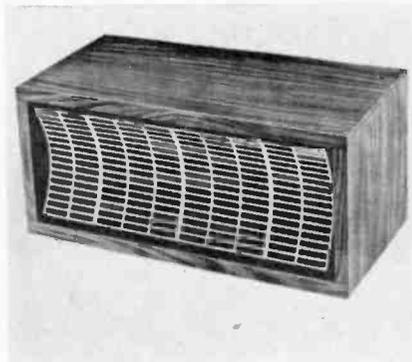
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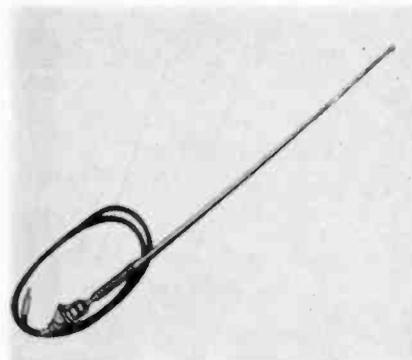
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a satellite system, but a solid, well-balanced unit. Walnut cabinet, 9½" x 10" x 18". \$59.95. Audax, Inc., 38-19 108th St., Corona 68, N. Y. (ELECTRONIC TECHNICIAN 1-40)

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You read it right! Now you can get C-D's miniaturized 100% Mylar* film-wrapped capacitors at prices you'd normally expect to pay for paper-dielectric types! And these C-D Mylars—with their epoxy-anchored leads—are the universal types you use daily, especially for hard-to-get-at repairs. Not a dust-collector in the assortment!

HERE'S THE DEAL:

Quantity	Type No.	Capacitance (mfd.) ±10% Tolerance	Voltage (DCW)
10	WMF6S1	.01	600
10	WMF6S22	.022	600
10	WMF6S47	.047	600
10	WMF6P1	.1	600

All 40 pieces for only ~~\$140~~ **\$870**
 (dealer net)

HERE'S THE PACKAGE:

Typical of the quality C-D builds into every capacitor in their complete line, the assortment's sturdy, space-saving, clear plastic container fits easily into your tool kit. And, when the box is empty, it's perfect for holding small tools and parts you want at a moment's notice.



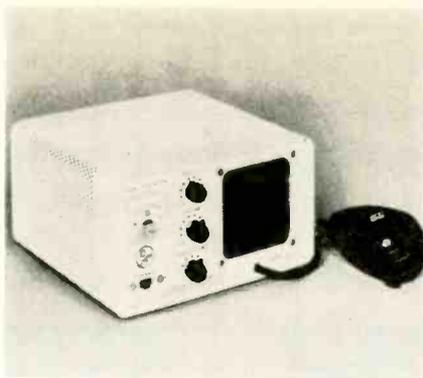
HERE'S HOW TO GET IN ON IT: First in a Series of C-D 50th Anniversary Deals, this limited-time offer is designed to save you money... help you do your job better, easier... keep your customers happy! Get the whole story—and the deal—from your C-D Distributor. Call him **today!** Get in on Cornell-Dubilier's 50th Anniversary Sales Celebration. (Also ask about C-D's complete capacitor line for industrial electronic maintenance.)

*Du Pont Reg. T.M.

CDE **CORNELL-DUBILIER ELECTRIC CORPORATION**
 Affiliated with Federal Pacific Electric Company

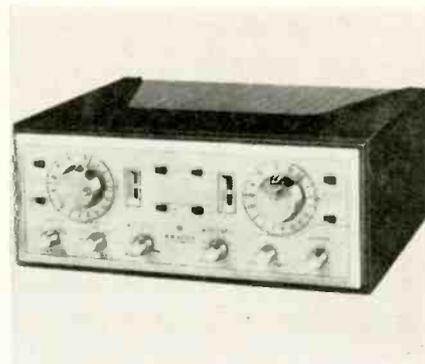
Kaar **RADIOTELEPHONE** →

The new "D" Phone is a 5-watt mobile unit that operates on any two of the 23 available channels in the 26.96-27.33 mc frequency band. It is available for either 12 volt d-c or 117 volt a-c. Range is 5 to 10 miles. Features include: crystals on both transmitter and receiver; signal level meter; power output peaking controls; and superhet circuit with automatic noise limiting. Price, complete with push-to-talk microphone and one set of crystals, \$179.00. Kaar Engineering Corp., 2995 Middlefield Rd., Palo Alto, Calif. (ELECTRONIC TECHNICIAN 1-6)



H. H. Scott **TUNER/AMPLIFIER**

Model 399, a new stereo tuner/amplifier combination, combines two preamplifiers, two 20-watt power amplifiers, an AM tuner, and an FM tuner on one chassis. Features include: separate tone controls on each channel;



phase reverse switch on the front panel; third channel output; highly sensitive AM and FM front ends; 40-watt stereo amplifier; non-magnetic chassis; and d-c heaters on all preamplifier tubes. \$399.95. H. H. Scott, Inc., 111 Powdermill Rd., Maynard, Mass. (ELECTRONIC TECHNICIAN 1-43)

1500
servicemen
told us*



1500 servicemen recently gave us their good *business* reasons for choosing Perma-Power Vu-Brites. You and your colleagues told us that your customers invariably had confidence in the neat-looking product and the attractive package . . . and were pleasantly surprised by the low price (\$9.95 the dozen, net). Result: no sales resistance—a happy satisfied customer who is sure to call back next time—virtually guaranteeing you a highly profitable picture tube sale.

Of course, you have a lot of other good reasons for choosing Perma-Power Vu-Brites. One outstanding reason is that you've never found a defective one. That's because Perma-Power Vu-Brites are engineered for quality, and 100% tested. They instantly restore brilliance and clarity to fading TV pictures. You can use them on either electro-static or electro-magnetic picture tubes, Model C-401 in Series sets, Model C-402 in Parallel sets.

Perma-Power also makes a full line of special purpose brighteners, tube restorers, and accessories, all described in our latest catalog, available free from your distributor, or by writing direct to us. Don't say "brightener," say "Perma-Power" . . . the standard of all-comparison.

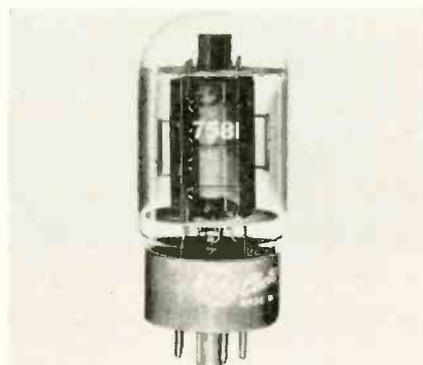
on their entry blanks in Perma-Power's Las Vegas contest.

Perma-Power COMPANY

3104 N. ELSTON AVENUE • CHICAGO 18, ILL.

GE AUDIO TUBE

A new 30-watt beam power pentode, the 7581, primarily for high quality audio power output also provides good radio frequency performance because of its low-loss mica-filled base. This



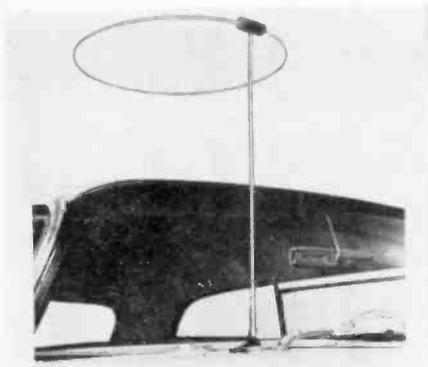
tube is interchangeable with the 5881, 6L6, and KT-66. General Electric Co., Receiving Tube Dept., Owensboro, Ky. (ELECTRONIC TECHNICIAN 1-10)

Wuerth TUBE SAVER

TV Life Saver, which plugs directly into a wall outlet, is a highly simplified, compact, version of the firm's TV Tube Saver. The plug for the TV set is plugged into the TV Life Saver, rather than the bare wall outlet. Protection against in-rush currents is provided for any tube-operated electrical equipment drawing 100 to 275 watts. A second version is for equipment drawing 250 to 400 watts. Wuerth Tube Saver Corp., 9125 Livernois Ave., Detroit, Mich. (ELECTRONIC TECHNICIAN 1-50)

Clear Beam AUTO ANTENNA

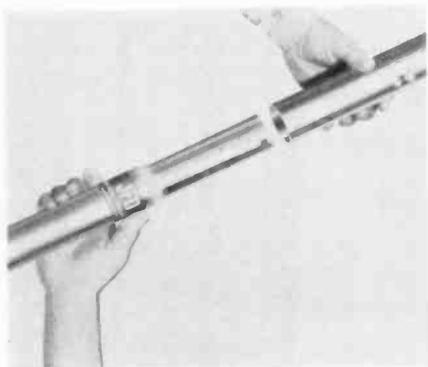
A simple-to-install special FM "Halo" antenna for automobiles and mobile reception of all kinds features a tubular support column with an inside diameter just large enough to fit snugly over a standard automobile AM radio antenna. The horizontal loop is con-



structed of aluminum with a division insulator. Antenna support column and fastening collar are heavily nickel plated brass. There are no holes to drill. Clear Beam Antenna Corp., 21341 Roscoe Blvd., Canoga Park, Calif. (ELECTRONIC TECHNICIAN 1-12)

JFD ALUMINUM MASTS

Announced is a new series of low-cost, light weight, corrosion-proof aluminum masts. Available in 5 ft., 7½



ft., and 10 ft. 1¼" od. .042 (19 gauge) sections in natural silver or gold anodized aluminum. JFD Electronics Corp., 6101 16th Ave., Brooklyn 4, N. Y. (ELECTRONIC TECHNICIAN 1-19)

Delco SILICON RECTIFIERS

Representing the firm's entry into the silicon rectifier field are two series of four models each. They are rated at 22 amperes and 40 amperes for continuous duty up to 150°C; and offer a low maximum reverse current of 5.0 ma at maximum rated temperature and peak inverse voltage. Models of the 22 ampere series are: IN1191A through IN1193A—in 50V steps from 50V piv to 200V for the 1193A model. The 40 ampere series, starting with IN1183A through IN1186A also run from 50V through 200V. Delco Radio Div., General Motors Corp., Kokomo, Ind. (ELECTRONIC TECHNICIAN 1-9)

Sencore CHECKER BOX

A new series of display boxes are printed with an all-over blue tweed design and blue, yellow and white sales story which opens up to display both the merchandise and message. This heavy duty, corrugated container affords greater protection in shipping. The



first unit to be shipped in the new box is the LC-3 leakage checker, redesigned to check 172 tube types and furnished with a new replaceable roll chart. The recently introduced SS-105 sweep circuit trouble shooter is also being shipped in the new box. Sencore, Addison, Ill. (ELECTRONIC TECHNICIAN 1-23)

Olson CAPACITOR SUBSTITUTION BOX

Model SW-142 has an eight-position selector switch for the selection of any one of eight popular capacitor values,

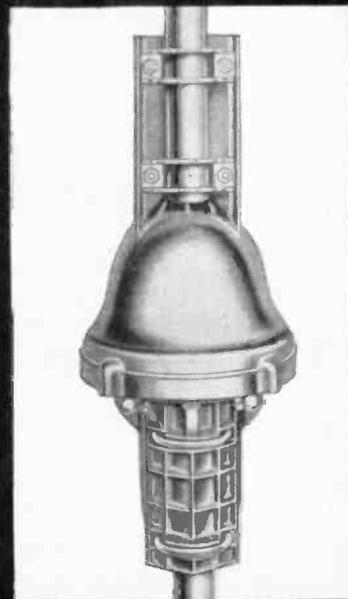


ranging from 0.001 to 0.25 µf. All values are rated at 6,000 volts. \$3.00. Olson Radio Corp., 260 S. Forge St., Akron, Ohio. (ELECTRONIC TECHNICIAN 1-22)

Amperex TUBES

Two new, internally shielded, frame grid pentodes have been developed for i-f amplification of TV sets. 6EH7, for remote cutoff; and 6EJ7 for sharp cutoff. The gain-bandwidth measures 55% higher than currently used conventional i-f tubes. As a semixer converter, the 6EH7 is used with a IN87 diode. Other features are high trans-conductance, low capacity and low feedback capacity. Amperex Electronic Corp., Special Purpose Tube & Semiconductor Div., 230 Duffy Ave., Hicksville, L. I., N. Y. (ELECTRONIC TECHNICIAN 1-8)

Cornell-Dubilier Rotors



turn profits
your way

Whether you are after original installation business or replacement sales, you'll find the rotor best-suited for any job in the complete CDR line. Consider, the heavy-duty TR-4 recommended for areas where ice-storms, heavy snowfalls and strong winds impair the efficiency of antennas turned by ordinary rotors. Your CD Rotor distributor is ready to show you why the TR-4 and other CD Rotors are the easiest to install...most satisfactory in the long run. Write for catalog TVR to Cornell-Dubilier Electric Corp., S. Plainfield, N. J.

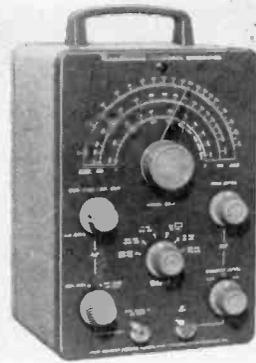
CDE **CORNELL DUBILIER**

Affiliated with Federal Pacific Electric Company

Heath GENERATOR KIT



With 2% accuracy, preassembled and aligned coil and bandswitch assembly, 3-scale dial. Heathkit RF-1 provides an accurate source for r-f signals. Features include: extended frequency coverage in six bands from 100 kc to 110 mc on fundamentals, and up to 220 mc on calibrated harmonics of the fundamental frequencies; built-in 400-cycle audio generator with 10 volt output; smooth sine wave output on all bands with 2% accuracy; and r-f output of at least 100,000 μ v. Heath Company, Benton Harbor, Mich. (ELECTRONIC TECHNICIAN 1-17)



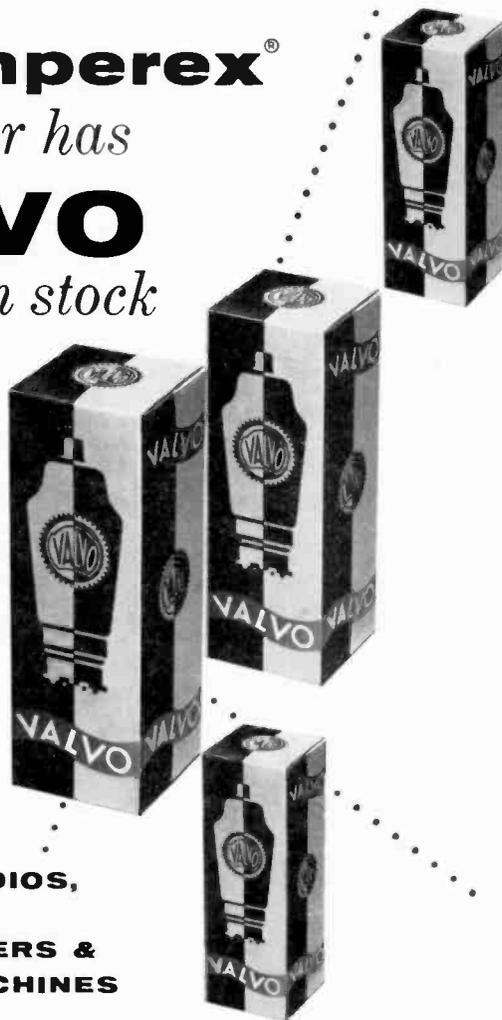
Gonset 2-WAY RADIO

Equipped with four crystal-controlled channels, for both transmitter and receiver, the new G-12 is a complete 2-way radio station. It operates within the 26.965 to 27.234 mc Citizens Band. Operators can instantly switch to other channels, and different frequencies can be assigned to the stations. The super-



het receiver with r-f stage has automatic noise limiter and adjustable squelch for muted standby. Transmitter rating: 5 watts power input. Price, complete with press-to-talk microphone and crystals for one channel, \$149.95. Gonset Div., Young Spring & Wire Corp., 801 S. Main St., Burbank, Calif. (ELECTRONIC TECHNICIAN 1-5)

Your **Amperex**[®]
Distributor has
VALVO
TUBES *in stock*



for
servicing

**IMPORTED RADIOS,
HI-FI SETS,
TAPE RECORDERS &
DICTATING MACHINES**

To help you achieve optimum results in the repair and servicing of imported electronic equipment utilizing European-made VALVO receiving tubes, your franchised Amperex distributor now stocks the entire line of VALVO types.



ask Amperex

for the name and address of
your nearest VALVO distributor

Amperex ELECTRONIC CORP. 230 Duffy Avenue, Hicksville, L.I., N.Y.

Utica 2-WAY RADIO

Announced is model PT27 "Town and Country" 11 meter citizens band transceiver. Features include: operation on 117 volts a-c, 12 volts d-c, 6 volts d-c; double conversion superhet receiver with sensitivity of less than 1 μ v; low signal-to-noise ratio; 100% modulation at maximum power output; r-f tank



circuit minimum measurements of 3.25 watts over a 50 ohm non-inductive load; press-to-talk operation; and automatic squelch. Price, complete with 1/8th wave whip, microphones, crystals, and printed forms and brochures, \$159.50. Utica Communications Corp., 19 S. LaSalle St., Chicago 3, Ill. (ELECTRONIC TECHNICIAN 1-7)

For More Information On
NEW PRODUCTS

Circle Code Numbers, p. 46

VACUUM TUBE VOLTMETER

WITH NEW 6" FULL-VIEW METER



Compare it to any peak-to-peak V. T. V. M. made by any other manufacturer at any price!

- Uses new improved SICO printed circuitry.
- Employs a 12AU7 as D.C. amplifier and two 9006's as peak-to-peak voltage rectifiers to assure maximum stability.
- Meter is isolated from the measuring circuit by a balanced push-pull amplifier.
- Uses selected 1% zero temperature coefficient resistors as multipliers.

AS A DC VOLTMETER: The Model 77 is indispensable in Hi-Fi Amplifier servicing and a must for Black and White and color TV Receiver servicing where circuit loading cannot be tolerated.

AS AN ELECTRONIC OHMMETER: Because of its wide range of measurement leaky capacitors show up plainly. Because of its sensitivity and low loading, intermittents are easily found, isolated and repaired.

SPECIFICATIONS

• DC VOLTS — 0 to 3/15/75/150/300/750/1,500 volts at 11 megohms input resistance. • AC VOLTS (RMS) — 0 to 3/15/75/150/300/750/1,500 volts. • AC VOLTS (Peak to Peak) — 0 to 8/40/200/400/800/2,000 volts. • ELECTRONIC OHMMETER — 0 to 1,000 ohms/10,000 ohms/100,000 ohms/1 megohm/10 megohms/100 megohms/1,000 megohms. • DECIBELS — -10 db to + 18 db, + 10 db to + 38 db, + 30 db to + 58 db. All based on 0 db = .006 watts (6 mw) into a 500 ohm line (1.73v). • ZERO CENTER METER — For discriminator alignment with full scale range of 0 to 1.5/7.5/37.5/75/150/375/750 volts at 11 megohms input resistance.

AS AN AC VOLTMETER: Measures RMS value if sine wave, and peak-to-peak value if complex wave. Pedestal voltages that determine the "black" level in TV receivers are easily read.

Comes complete with operating instructions, probe, leads, and steamed-in carrying case. Operates on 110-120 volt 60 cycle. Only... **\$42.50**

TUBE TESTER



★ Tests all tubes, including 4, 5, 6, 7, Octal, Lock-in, Hearing Aid, Thyatron, Miniatures, Sub-miniatures, Novals, Sub-minars, Proximity fuse types, etc.

★ Uses the new self-cleaning Lever Action Switches for individual element testing. Because all elements are numbered according to pin-number in the RMA base numbering system, the user can instantly identify which element is under test. Tubes having tapped filaments and tubes with filaments terminating in more than one pin are truly tested with the Model TW-11 as any of the pins may be placed in the neutral position when necessary.

★ The Model TW-11 does not use any combination type sockets. Instead individual sockets are used for each type of tube. Thus it is impossible to damage a tube by inserting it in the wrong socket.

★ Free-moving built-in roll chart provides complete data for all tubes. All tube listings printed in large easy-to-read type.

NOISE TEST: Phono-jack on front panel for plugging in either phones or external amplifier will detect microphonic tubes or noise due to faulty elements and loose internal connections.

EXTRAORDINARY FEATURE

SEPARATE SCALE FOR LOW-CURRENT TUBES: Previously, on emission-type tube testers, it has been standard practice to use one scale for all tubes. As a result, the calibration for low-current types has been restricted to a small portion of the scale. The extra scale used here greatly simplifies testing of low-current types.

The Model TW-11 operates on 105-130 Volt 60 Cycles A.C. Comes housed in a handsome portable saddle stitched Texon case. Only... **\$47.50**

C.R.T. TESTER

Tests and Rejuvenates ALL PICTURE TUBES



ALL BLACK AND WHITE TUBES

From 50 degree to 110 degree types — from 8" to 30" types.

ALL COLOR TUBES

Test ALL picture tubes—in the carton—out of the carton—in the set!

• Model 83 is not simply a reshaped black and white C.R.T. Tester with a color adapter added. Model 83 employs a new improved circuit designed specifically to test the older type black and white tubes, the newer type black and white tubes and all color picture tubes.

- Model 83 provides separate filament operating voltages for the older 6.3 types and the newer 8.4 types.
- Model 83 employs a 4" air-damped meter with quality and calibrated scales.
- Model 83 properly tests the red, green and blue sections of color tubes individually—for each section of a color tube contains its own filament, plate, grid and cathode.
- Model 83 will detect tubes which are apparently good but require rejuvenation. Such tubes will provide a picture seemingly good but lacking in proper definition, contrast and focus. To test for such malfunction, you simply press the rej. switch of Model 83. If the tube is weakening, the meter reading will indicate the condition.
- Rejuvenation of picture tubes is not simply a matter of applying a high voltage to the filament. Such voltages improperly applied can strip the cathode of the oxide coating essential for proper emission. The Model 83 applies a selective low voltage uniformly to assure increased life with no danger of cathode damage.

Model 83 comes housed in handsome portable Saddle Stitched Texon case—complete with sockets for all black and white tubes and all color tubes. Only... **\$38.50**

RCA RADIATION COUNTER

MADE TO SELL FOR \$150 — OFFERED FOR ONLY **\$47.50** NET

(Much less than cost of Manufacture.)

INDICATES RADIOACTIVITY IN 3 WAYS!

- 1—BY NEON
- 2—BY PHONE
- 3—BY METER



Endless experiments and discoveries in the new exciting field of nuclear energy are made possible when you acquire this finely built and engineered device. In the past, a rugged counter which was suitable for the prospecting of radio-active ores such as uranium, thorium and radium, was unsuitable for laboratory work due to the inability of combining accuracy with ruggedness. Conversely a laboratory counter, while being extremely sensitive, could not withstand use in the field where it would be subjected to abuse and abnormal hard knocks. In the laboratory where determination of intensity (counts) of a reading are necessary, the WF-10AWB provides sensitivity for surpassing many laboratory counters.

SPECIFICATIONS

Employs the extra sensitive 1B85 Bismuth Type Geiger Counter Tube. Sensitivity is .05 Roentgens per hour (1 MR/HR=2,000 counts per minute). • Three counting ranges: 0-100/1,000/10,000 counts per minute. • Handy reset button. • Ideal for survey work because the complete unit weighs only 5 1/2 lbs. • Sight and sound indications by neon flashes and headphones. Then when an indication is obtained you switch to meter reading for exact measurements. • Decontamination easy with damp cloth applied to the weather-

proofed aluminum case. • A radioactive specimen is included for instrument checking and experiments. • Included at no extra charge—U. S. Atomic Energy Commission booklet titled "Prospecting with a Counter." • R.C.A. Model WF-10AWB comes complete with self-contained batteries which provide over 200 hours of intermittent operation.

Comes with complete set of batteries, carrying strap, headphones and A.E.C. booklet Only **\$47.50**

SHIPPED ON APPROVAL

NO MONEY WITH ORDER — NO C. O. D.

Try any of the above instruments for 10 days **before** you buy. If completely satisfied **then** send down payment and pay balance as indicated on coupon. **No Interest or Finance Charges Added!** If not completely satisfied return unit to us, no explanation necessary.

MOSS ELECTRONIC, INC.
Dept. D-714 3849 Tenth Ave., New York 34, N. Y.

Please send me the units checked on approval. If completely satisfied I will pay on the terms specified with no interest or finance charges added. Otherwise, I will return after a 10 day trial positively cancelling all further obligations.

Name
Address
City Zone State

All prices net, F.O.B. N. Y. C.

Model 77... Total Price \$42.50 \$12.50 within 10 days. Balance \$6.00 monthly for 5 months.

Model TW-11... Total Price \$47.50 \$11.50 within 10 days. Balance \$6.00 monthly for 6 months.

Model 83 Total Price \$38.50 \$8.50 within 10 days. Balance \$6.00 monthly for 5 months.

RCA Radiation Counter... Total Price \$47.50 \$11.50 within 10 days. Balance \$6.00 monthly for 6 months.



Audio NEWS LETTER

ELECTRO-VOICE announces a complete line of some 250 needles, reported to permit the replacement of 97% of needles now in use.

UNIVERSITY names Haskell Blair, ex-Blair-Steinberg, as president.

FAIRCHILD RECORDING announces the SA-12 stereo transcription arm @ \$34.95. Features include a spirit level built into the base, springless counterbalance, self-cleaning cartridge slide contacts. Length is 12-1/4".

ALLIED RADIO introduces the KN-125 FM/AM tuner @ \$139.95. It features adjustable dynamic sideband regulation and a 50-ohm input for shielded antenna lead-in.

AMPEX introduces the Model 970 Stereo Monitoring Recorder @ \$750. It uses the same tape transport as the 960, plays 4-track and 2-track stereo tapes, and covers 30-20,000 cps, dynamic ranges 55 db at 7-1/2 ips.

HEATH's recently announced 14/14 watt stereo amplifier Model SA-1 has been dropped, and will be replaced by the new 25/25 watt Model AA-50.

CLEVITE publishes a 23" x 28" Walco wall chart listing over 600 types of needles, plus cartridge cross-reference information.

RYE SOUND announces the R201 universal earphone for all transistor radios. Known as the METROpolitan, it lists for \$6.50.

NESHAMINY appoints Harold Barton, ex-Sam Goody, as sales VP.

AUDIO EMPIRE names reps: Ray Hutmacher, Chicago; Robert Smith, Brookline, Mass.; Ron Merritt, Seattle.

DUOTONE names Ken Burton sales manager.

UTAH RADIO appoints Lowell Sales Cubana, S.A., of St. Louis to handle Western Hemisphere export sales. Cliff Battles is named customer relations rep.

REK-0-KUT names Jerry Meltzer as sales promotion manager.

ROBINS INDUSTRIES releases a modular Add-a-Unit self-service display for changer and turntable covers.

JENSEN INDUSTRIES introduces the Lifetime Diamond needle retailing for \$25. It is guaranteed against any wear for the lifetime of the owner.

FIDELITONE has come out with the Comparator, a shadowgraph machine which shows needle wear by projecting a magnified image. Valued at \$50, it will be given free to dealers who merchandise needles effectively.

Now Completely SELF-CONTAINED

For Testing & Rejuvenating

BLACK AND WHITE and COLOR including 110° TUBES

NEW CRT 440



CATHODE REJUVENATOR TESTER

B&K

TESTS AND REJUVENATES

all black & white and color picture tubes at correct filament voltage from 1 to 12 V.

TESTS AND REJUVENATES

110° tubes with 2.34, 2.68, 6.3 and 8.4 volt filaments.

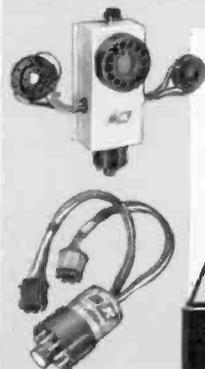
TESTS AND REJUVENATES

color picture tubes. Checks each color gun separately same as black & white tubes.

Used by Thousands of Professional Servicemen
MAKES NEW PICTURE TUBE SALES EASIER

Gives you more value than ever—all-in-one. Quickly checks and corrects most TV picture tube troubles in a few minutes right in the home without removing tube from set. Gives new useful life to weak or inoperative tubes. Checks leakage. Restores emission and brightness. Repairs inter-element shorts and open circuits. Life test checks gas content and predicts remaining useful life of picture tube. Completely self-contained in leatherette-covered carrying case. Net, \$69⁹⁵

ACCESSORIES for USE ONLY with FORMER B&K Models 400 and 350 CRT



Model C40 Adapter. For use only with all previous B&K Model 400 and 350 CRT's. Tests and rejuvenates TV color picture tubes and 6.3 volt 110° picture tubes. Net, \$9.95

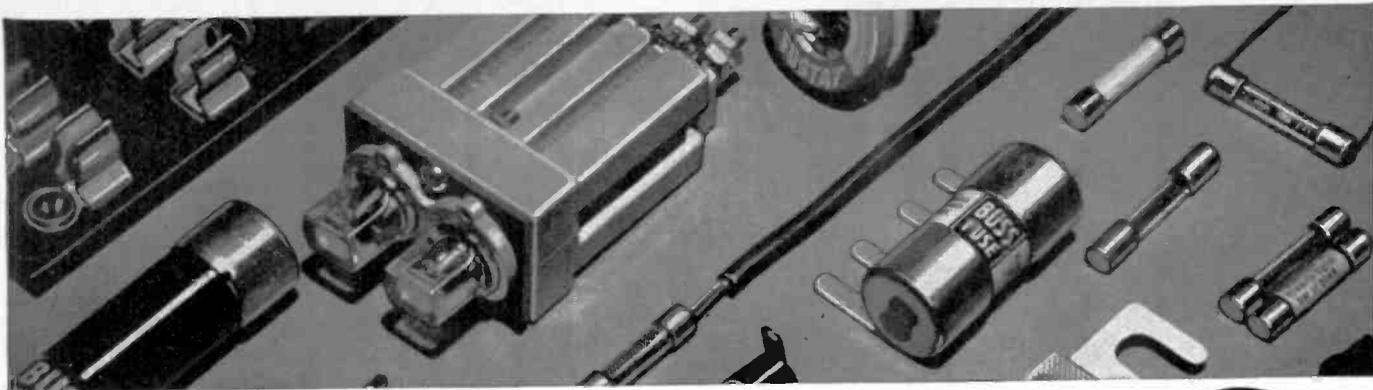
Model CR48 Adapter. For use only with all previous B&K Model 400 and 350 CRT's. Tests and rejuvenates 110° picture tubes with 2.34, 2.68, and 8.4 volt filaments. Net, \$4.95

See your B&K Distributor
or Send now for Bulletin ST24-T

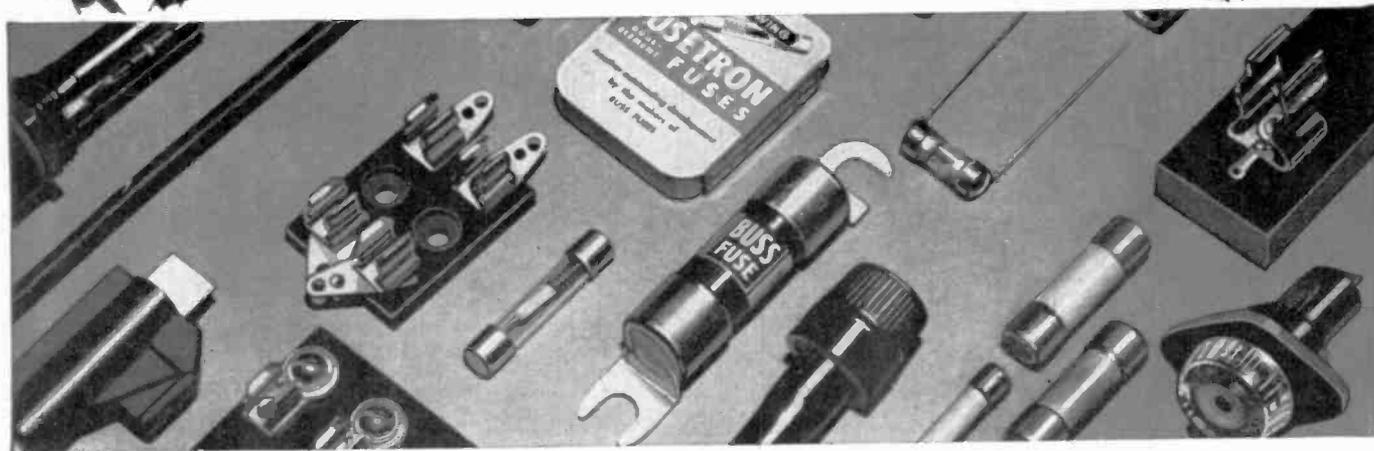


B & K MANUFACTURING CO.

1801 W. BELLE PLAINE AVE • CHICAGO 13, ILL.
Canada: Atlas Radio Corp., 50 Wingold, Toronto 10, Ont.
Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.



Use BUSS Fuses!



Because dependable BUSS and FUSETRON Fuses help eliminate "profit-eating" service complaints.

Service complaints literally eat up your profits thru customer dissatisfaction and time spent on adjustments.

But — standardize on BUSS and you're on your way to winning satisfied customers, knocking out complaint losses.

BUSS and FUSETRON Fuses give you maximum protection against damage due to electrical faults and maximum protection

against wasteful shutdowns caused by fuses blowing needlessly.

To assure this, every BUSS and FUSETRON Fuse is tested in a sensitive electronic device that automatically rejects any fuse not correctly calibrated, properly constructed and right in all physical dimensions.

For more than four decades, millions upon millions of BUSS fuses have been in service — telling

proof that you and your customers can also depend on BUSS.

For the complete line of BUSS and FUSETRON fuses there is a companion line of fuse clips, blocks and holders.

It's no wonder the way to a profitable business in fuses is the BUSS way.

BUSSMANN MFG. DIVISION,
McGraw-Edison Co.
University at Jefferson, St. Louis 7, Mo.

160

BUSS fuses are made to protect - not to blow, needlessly.

BUSS makes a complete line of fuses for home, farm, commercial, electronic, electrical, automotive and industrial use.



WINEGARD Antenna Dealers to Make 1960



PAUL HARVEY
Sells Winegard Gold
Color'Ceptor Antennas
on National ABC Radio Network

"I'll be telling your customers why the Winegard Gold Color'Ceptor TV antenna is America's best antenna buy. I suggest you stock up on Color'Ceptors now to take advantage of Winegard's advertising and make more profit in 1960."

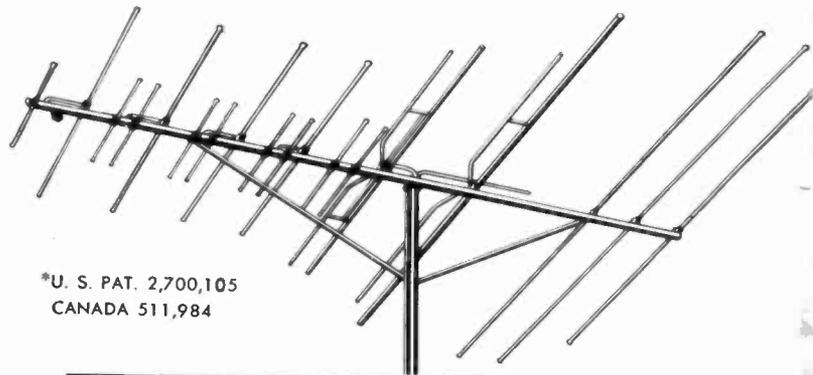
Tune in Paul Harvey News, ABC Network, Monday through Friday 5:55 E.S.T., starting January 18. (Check local listings for time and station.)

Profit with the Antenna Dealers have learned to trust

Winegard dealers make more money for three important reasons—

1. They have the best performing, easiest to install, best constructed and neatest looking antenna on the market in the Winegard Gold Color'Ceptor.
2. They have the only written Performance Guarantee in the industry that guarantees 100% customer satisfaction or full list price of antenna refunded by Winegard—and the dealer still keeps his profit.
3. They get the antenna industry's biggest advertising backing.

Three Color'Ceptor models meet all needs: CL-4, \$29.95; SCL-4, \$38.95; CL-4X (with power pack) \$44.90



*U. S. PAT. 2,700,105
CANADA 511,984

Winegard Gold Anodizing

Winegard's special 7 cycle bright gold anodizing inside and out (not a cheap flash finish) hardens the antenna surface, seals out corrosion and weathering, exceeds U.S. Gov't specifications in salt spray tests.

Winegard performance is protected by U.S. patents, confirmed by leading consumer researchers, by millions of happy users, by prospering dealers everywhere. First with the advancements the public wants and sales-minded dealers can sell! Feature the leader and be one!

Get Biggest Ad Backing Biggest Profit Year Ever!

NOT here today and gone tomorrow... but ALL YEAR LONG!

Big Winegard Gold Color'Ceptor ads in the biggest consumer magazines... Paul Harvey on Network Radio... The Antenna Industry's biggest and most helpful advertising keeps hammering away, stronger and better than ever!



Giant 6-ft. 3-color metal road sign... with your name on it.

DEALER SALES HELPS

to connect Winegard's ad powerhouse to your cash register. To use in your store, outside your store, and out where the sales begin. Get these sales helps (delivery prepaid) with FREE "PROMOTION BUCKS". One "Buck" goes with each Color'Ceptor you order. Use your "Bucks" to get the sales helps that will do you the most good.



Balloons—With Winegard selling message—



Illuminated window and counter sign.



Gold anodized telescopic antenna display mast.



Truck decals, pressure-sensitive. No water.



Metal outdoor store sign with hanger.

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ANTENNA  SYSTEMS

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- RUSH full color brochure showing Winegard's new antenna dealer sales aids... and tell me how I can get them free!
- Send literature on Winegard's complete line of FM and TV antennas.

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which needle for which phono- graph?

here's your answer, just
off the press!

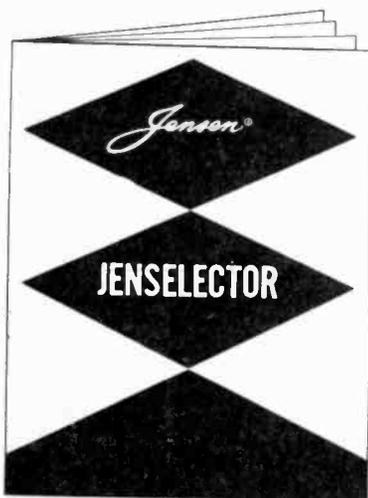
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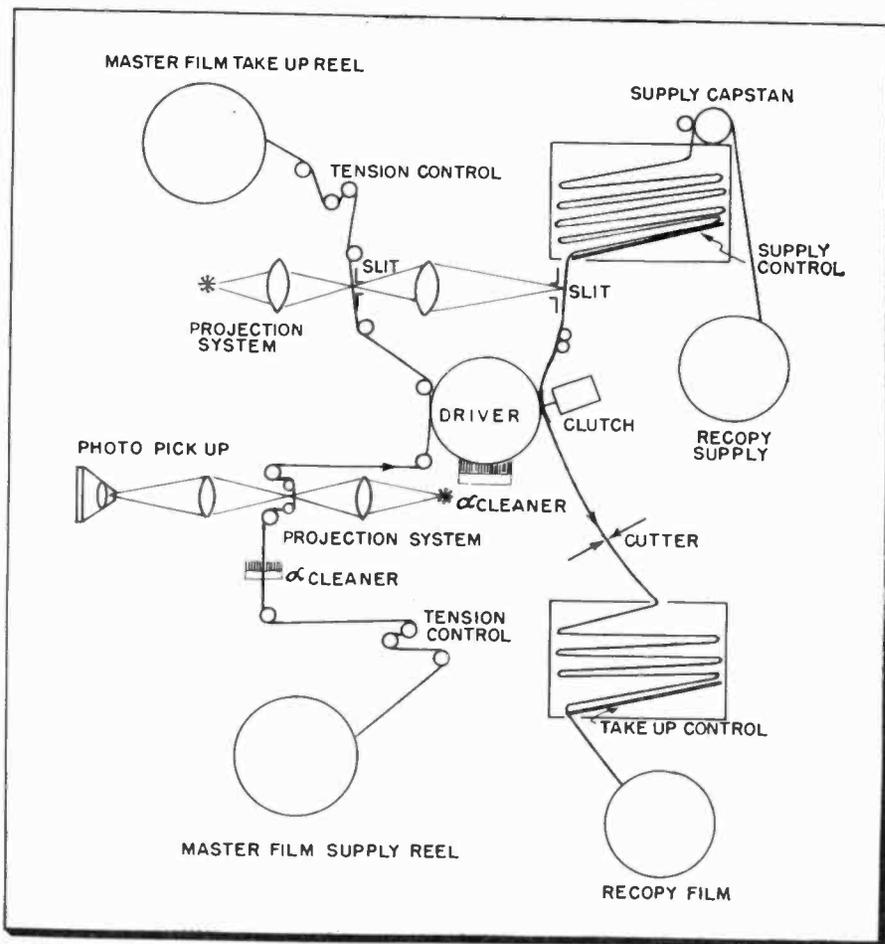
Automatic Document Retriever

• An improved model of a rapid selector automatic document retrieval device has been developed by the National Bureau of Standards. The machine is to be used for the Patent

Office and the Navy Bureau of Ships.

By means of a binary dot code identifying the printed material, previously recorded on 35-mm microfilm, the machine examines about 2,400

Fig. 1—System shows steps taken by retriever in selecting 2,400 pages per minute.



BIG MONEY—CONVERT TAPE RECORDERS TO 4 TRACK STEREO!



ROBINS M/M 5Q8 (1/4 track)

ROBINS M/M exact replacement and conversion tape heads now available from your local parts jobber. 75% of all 2 track machines come equipped with M/M "B" series heads. ROBINS M/M 5Q8 (1/4 track) is an exact replacement for these.

Conversion can frequently be made by simply replacing a "B" head with a "Q" head. Send coupon for latest FREE conversion data sheets and catalog.
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Please send FREE data sheets and catalog to:

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City Zone State



pages per minute; retrieving information from massive files of correspondence, drawings or patents. When the desired document is located it is immediately photographed by the machine on a strip of recopy film.

As an outgrowth of an idea originally proposed by Dr. Vannevar Bush more than 20 years ago, the machine was developed into its present form by Yale university and the Bureau of Standards.

The code frame, identifying a single item, is about 1/4 inch long and as wide as the film. It contains 6 rows of 46 bits each; 40 bits relate to document information and 6 to machine control. The mechanism reading these rows of bits has sufficient tolerance to allow for normal dimensional changes in the film and slight skew in the rows.

In operation the code is scanned by a bank of photocells. A block diagram of the operation is shown in Fig. 1. A highspeed clutch mechanism is activated the instant a desired item is located. This clutch presses the recopy film to a drive drum, accelerating it to the same speed as the master film. After the desired item is transferred to the recopy film from the master, by means of slit photography, the clutch is disengaged and the recopy film stops. •

Information credit: National Bureau of Standards.

TUNING SHAFT

Part TS4, an exact replacement tuning shaft for Standard Coil Tuners in TV receivers, rotates a full 360 degrees and has no stop. The dielectric wafer is sufficiently thin to pass through the conducting metal plates of the tuner. Constructed of aluminum in extra long lengths. Eastern Jewel Corp., 137-21 70th Ave., Flushing, N. Y. (ELECTRONIC TECHNICIAN 1-35)



Take the guesswork out of the TEST, REPAIR and REACTIVATION of ALL BLACK AND WHITE and COLOR PICTURE TUBES with the

CENTURY

Model CRT-2

CRT TESTER-REACTIVATOR

TESTS, REPAIRS and REACTIVATES

• ALL BLACK AND WHITE

PICTURE TUBES (including 110° tubes) from 8" to 30", whether 12 pin base, 8 pin base, 14 pin base . . . and the very latest 7 pin base.

• ALL COLOR PICTURE TUBES

. . . Each of the red, green and blue color guns is handled separately.

Model CRT-2
\$57.50 Net
TERMS: \$13.50 within 10 days. Balance \$11 monthly for 4 months.

THE CRT-2 DOES ALL THIS RIGHT IN THE CARTON, OUT OF THE CARTON OR IN THE SET

TEST

- ✓ for quality of every black and white and color picture tube
- ✓ for all inter-element shorts and leakage up to one megohm
- ✓ for life expectancy

REPAIR

- ✓ Will clear inter-element shorts and leakage
- ✓ Will weld open elements

REACTIVATE

- ✓ The unique controlled 'SHOT' (high voltage pulse) method of reactivation provided by the CRT-2 will restore picture tubes to new life in instances where it was not possible before. Furthermore the high voltage is applied without danger of stripping the cathode as you always have perfect control of the high voltage pulse.
- ✓ The 'BOOST' method of reactivation also provided by the CRT-2 is used effectively on tubes with a superficially good picture but with poor emission and short life expectancy. It will improve definition, contrast and focus greatly and add longer life to the tube.

ADDITIONAL FEATURES

- Employs the time proven dynamic cathode emission test principle • Large 4 1/2" meter with heavily damped movement for smooth action, accuracy and long life • Provides separate shorts test for each element in the picture tube
- Filament continuity is shown on a separate glow indicator • An easy to read instruction manual contains all the latest information on old and new type picture tubes • Housed in handsome hand-rubbed oak carrying case with special compartment for MULTI-HEAD and line cord • GUARANTEED FOR ONE FULL YEAR.

Unlike ordinary CRT testers that keep entering the field with a limited range of operation, the CRT-2 employs a new brilliantly engineered circuit designed to test, repair and reactivate every black and white or color picture tube made. The CRT-2 eliminates the guesswork and risk that until now, has always been present when a picture tube is reactivated. It accomplishes this by providing perfect control of either the "Boost" or "Shot" method of reactivation.

CHECK THESE EXCLUSIVE FEATURES

1. THE MULTI-HEAD (Patent Pending) . . . A SINGLE PLUG IN CABLE AND UNIQUE TEST HEAD — A tremendous advance over the maze of cables and adapters generally found with other testers. Enables you to test, repair and reactivate every type of picture tube with greater convenience than ever before.
2. WATCH IT REACTIVATE THE PICTURE TUBE — You actually see and control the reactivation directly on the meter as it takes place, allowing you for the first time to properly control the reactivation voltage. This eliminates the danger of stripping the cathode of the oxide coating. It enables you to see the speed of reactivation and whether the build-up is lasting. You will see if the cathode contamination is too great and if the picture tube is too far gone to be reactivated.
3. CONTROLLED "SHOT" WITH HIGHER VOLTAGE FOR BETTER REACTIVATION — Stronger than any found in other testers . . . high enough to really do the job — yet controlled to avoid damage to the picture tube.
4. UNIQUE HIGH VOLTAGE PULSE CIRCUIT — Will burn out inter-element shorts and weld open circuits with complete safety to the picture tube.
5. VISUAL LIFE TEST — Enables both you and your customer to see the life-expectancy of any picture tube right on the meter. The fact that your customer can see the results of your tests as you make them virtually eliminates resistance to picture tube replacement when necessary.
6. TESTS, REPAIRS AND REACTIVATES SPECIAL LOW SCREEN VOLTAGE TUBES — Many new type picture tubes use special low voltage of approximately 50 volts. The CRT-2 will handle these types with the same thoroughness as the regular types with complete safety.
7. SEPARATE FILAMENT VOLTAGES — Including the very latest 2.35 volt and 8.4 volt types as well as the older 6.3 volt types.
8. TESTS, REPAIRS AND REACTIVATES 'SF' PICTURE TUBES — found in the newest Sylvania and Philco TV sets. These picture tubes have different base pin connections than standard picture tubes and there is always an element of risk that the tube may be burned out when tested with ordinary picture tube testers. The CRT-2 is designed to accommodate this new base pin arrangement and will test the tube with no danger of damage.

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SEND NO MONEY - NO C.O.D.

- Try for 10 days before you buy
- If satisfied pay in small monthly payments
- No financing charges added
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CENTURY ELECTRONICS CO., INC.

111 Roosevelt Avenue
Dept. 501, Mineola, N.Y.

Yes, I want to take advantage of your 10 day FREE try-before-you-buy offer. Ship on approval the Model CRT-2 CRT TESTER-REACTIVATOR. After I have tried the Instrument for 10 full days I will either send you the down payment of \$13.50 and pay the balance in 4 monthly payments of \$11 until the total price of \$57.50 plus shipping charges are paid — or I will return the instrument and owe nothing.

Name

Address

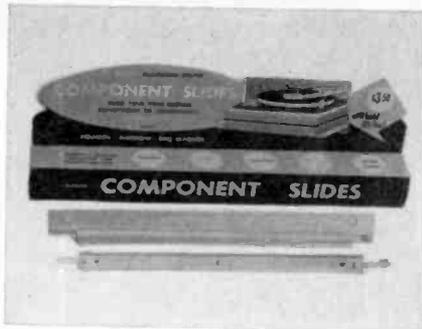
City

State

ABSOLUTELY NO RISK ON YOUR PART

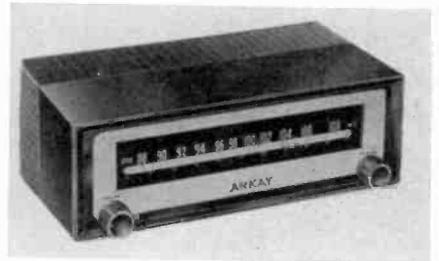
Robins DISPLAY →

Announced is a new counter display package for the firm's aluminum component slides, CS-1311. It is printed in orange and black glossy inks with white space accenting the large illustration and pertinent copy. The component slides are contained inside the base of the display from which there is an extension to form the counter sign. Robins Industries Corp., 36-27 Prince St., Flushing 54, N. Y. (ELECTRONIC TECHNICIAN 1-34)



Arkay FM TUNER

FM-7 tuner has 20 to 20,000 cps response $\pm 1/2$ db. Distortion is less than 1%. Hum level -70 db. Drift-free AFC; 3 double-tuned if stages; band width 260 kc at -6 db. Sensitivity is 1.9 μ v for 20 db quieting. Image rejection 40



db. Multiplex and cathode follower outputs. 7 tubes plus selenium rectifier. Wired, \$64.95. Kit, \$39.95. Arkay International, Inc., 88-06 Van Wyck Expressway, Jamaica 18, N. Y. (ELECTRONIC TECHNICIAN 1-33)

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Like a fine watch, each CBS-Ronette cartridge is given individual attention by skilled hands and eyes. Built-in quality has made CBS-Ronette first choice of original equipment manufacturers the world over. Now CBS Electronics makes CBS-Ronette stereo and monaural cartridges available to you. And remember over 6,000,000 are in use in this country today . . . a ready-made and profitable replacement market for you. Insist on dependable quality. Always ask your distributor for CBS-Ronette, the world's most popular cartridge.



Ask for Catalog PF-285

CBS ELECTRONICS

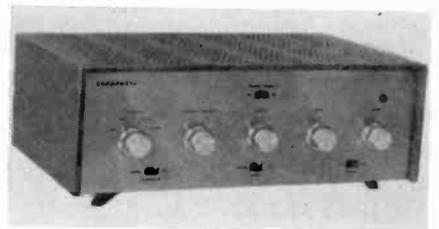
Danvers, Massachusetts, U. S. A.

A Division of Columbia Broadcasting System, Inc.

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

Lafayette STEREO AMPLIFIER

LA-235 dual channel 35-watt stereo amplifier has 20 to 20,000 cps response ± 1 db at normal listening level. Hum and noise with the volume control at maximum for high level inputs are 65 db below rated output. Channel separation is greater than 40 db. Inputs: 2



aux; 2 tape (high level); 2 tuner; 2 mag phono and 2 crystal phono. Outputs: 2 tape out and dual 8 and 16 ohm speaker. 14"x4 $3/4$ "x9". Tube complement consists of 4-EL84, 2-7199, 2-12AX7 and 1 G734. \$69.95. Lafayette Radio, 165-08 Liberty Ave., Jamaica 33, N. Y. (ELECTRONIC TECHNICIAN 1-32)



SALERNO
"C-46, BR-A-A-A-WK, C-46!"

Audio Measurements

(Continued from page 41)

at the high frequency that almost produced instability. Using a lower impedance on the input eliminated this instability and enabled us to measure the true frequency response of the amplifier.

In a case like this, it is well to try more than one value of resistance across the output of the oscillator, say 100 ohms as well as 500 ohms, which will of course reduce the voltage output from the oscillator due to the loading. It will also show whether a condition has been reached where the instability that tends to arise from the higher impedance is completely suppressed. You may be in a spot where a small degree of unstable boost just offsets a normal top loss and gives a fictitiously "flat" reading. Trying different values will make sure you have reached "bottom." The amplifier gain control may also appear to show exaggerated response variation under these conditions, whether the control is located at the front end or elsewhere.

When the same amplifier is used under completely different circumstances, where the preamplifier has no connection with anything measuring the output and the only thing connected to the preamplifier is a pickup or some other input source, this kind of trouble would not normally arise.

Tone Control Settings

Another problem in taking frequency response measurements occurs in preamplifiers and the complete packaged amplifiers that include preamplifier and basic amplifier functions. How does one set the tone control to measure a "flat" response? Of course, one can set the tone controls to the position marked "level," if such a position is indicated. But this may not always be quite accurate due to tolerance variation in individual controls. Some manufacturers make provision for adjusting the position of the knob so that it will coincide with the panel position marked "level." Even so the question comes, what is the significance of frequency response when tone controls are inserted?

The best way, if a specific level position is not indicated or one has no means of knowing when the controls are set for level, is to adjust the bass and treble controls until the amplifier gain measures the same at three spot frequencies. The usual ones chosen are 100, 1000 and 10,000 cycles. Adjust the bass control so that the 100 cycle and 1000 cycle gains are the same and the treble control so the 1000 cycle and 10,000 cycle gains are the same. This can then usually be considered as the nominally level

position. However, due to the peculiarities of tone controls in general this may not necessarily be the true level position. The only definite way to find out is to take a complete frequency response in this position.

In some instances there may be quite a rise before 10 kc which dips down through the zero at 10 kc, because this is how you set it, and then shows a rapid drop above 10 kc as shown in curve A of Fig. 3. This

(Continued on following page)

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Check Transistors, Diodes, Rectifiers . . .

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Accurately checks all transistors in hearing aids, radios and power transistors in auto radios. Tests for opens, shorts, leakage, current gain. Measures forward-reverse current ratio on all crystal diodes. Measures forward and reverse currents on selenium rectifiers. With set-up chart for accurate checking of each transistor. Size, 5x4½x2½". With batteries. DEALER NET..... 17⁹⁵



Replace Batteries During Repair . . .

SENCORE PS103 BATTERY ELIMINATOR

All-new "Transi-Pak," twin to TRC4 Checker above. Provides variable DC voltage to 24 volts; 1.5-volt biasing tap (a "must" for servicing Philco and Sylvania radios). Metered current output, to 100 ma. Handles 200-ma peaks. Two 200-mfd electrolytics provide proper filtering and low output impedance. No hum or feedback problems. Ideal for alignment using station signal; adjust IF slugs for max. current, also ideal for charging nickel-cadmium batteries. Size, 5x4½x2½". DEALER NET..... 17⁹⁵



Find Defective Stage in a Minute . . .

SENCORE HG104 HARMONIC GENERATOR

New signal generator designed primarily for fast signal-tracing of transistor radio circuits. No need to unsolder all transistors. Provides RF, IF and audio signals *simultaneously*, drastically cutting service time. Traces from speaker to antenna. Clear 1000 cycle note signal is heard in speaker from all good stages. Signal weakens or stops at defective stage. Equally as effective for testing TV, hi-fi and other audio circuits also. Size, 3½x4½x1¾". With batteries. DEALER NET..... 9⁹⁵



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SENCORE

ADDISON 2, ILLINOIS

(Continued from preceding page)

rather suggests that the treble control has been set to some amount of boost to offset a natural high frequency loss in the amplifier. Under these circumstances the point at which the response starts to turn over should be selected as a high frequency setting point and the gain should be re-adjusted so that it is equal to 1000 cycles and at this turn-over frequency. See Fig. 4.

A similar remark applies to the low frequency end. It is not the function of tone controls to make good a deficiency in amplifier frequency response.

Occasionally the reverse situation may occur. There may be a rising characteristic in the amplifier due to a feedback loop somewhere approaching instability, in which case setting the tone control on the spot frequency method will produce a dip before the rise. See curve B of Fig. 3.

This too produces a rather artificial characteristic that does not truly represent the nearest the amplifier can be set to a flat response. Again, a similar method should be adopted to obtain the nearest to flat over the mid-range region. Then deviation beyond this point can be regarded as a deviation in the basic amplifier characteristic rather than something due to compensation interaction with the tone controls.

Cathode Follower

In the case of a preamplifier that comes out with a cathode follower the frequency response is usually fairly independent of loading. But a word of caution should be mentioned. Its distortion isn't.

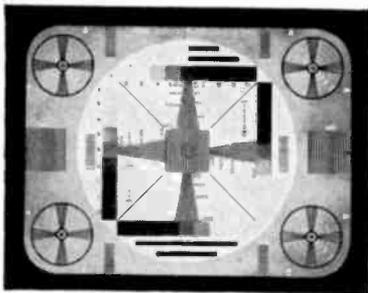
Many people think that a preamplifier with a cathode follower output can be connected to a nice low input resistance, such as 1000 ohms or even 600 ohms. This will definitely cause distortion in the preamplifier. Cathode followers do not work as well into matching loads as into high impedance. The input to an amplifier fed from a cathode follower should be high impedance; 100,000 ohms or so. The reason for using a cathode follower is to avoid high impedance pickup of hum or static and also to avoid high frequency loss due to shielded connecting leads. This a cathode follower does very well. Don't abuse it by connecting it to a low impedance amplifier input.

Output Impedance

Another thing that can dramatically affect taking frequency response of amplifiers is its output impedance. Normally an amplifier's frequency response is taken working into a dummy load—a resistor carefully matched to the nominal value intended for the amplifier. This enables its power output to be accurately determined by measuring the voltage and working out the power from $W = E^2/R$. But an amplifier that measures a flat response, relatively speaking, using a resistive load, is likely to do all kinds of things when feeding a loudspeaker.

Stability

Some people test an amplifier's stability margin by connecting all kinds of capacitance loads to the output,



TV TIPS FROM TRIAD

NO. 5 IN A SERIES

"Haven't you fixed that kluge, yet?" the senior PTM said to Joe.

"No, Bill, it shrinks a little horizontally after it's on for an hour, and I can see 'Callback' written all over it."

"What are you going to do next?" queried Bill, as he poured himself a cup of coffee.

"I've already done it," said Joe with a grin. "I knew you'd show up if I waited."

"All right, what do you know about the chassis for sure?" said Bill.

"Well," Joe recited, "New Charley Dog Six, flyback, and damper tube, high voltage ok, boost a little low after an hour, screen ok—"

"How do you know the screen is ok?"

"The service folder says so. It says the screen voltage should be 165 and this one measures about 178, which is within ten percent."

"Let's use the Check Chart* on it," said Bill.

"Here we go. Set off. Screen resistance?"

"8.2K," replied Joe.

"Set on? Voltage across screen resistor?"

"192."

"Chart shows current is 23 ma. Measure screen to ground."

"Still 178," Joe said.

"Wattage dissipated in screen 4.3. Max safe level 3 watts. *Expected tube life probably less than one hundred hours!*"

"What's next?"

"Let's try it with a 10 watt 18 K. Voltage across resistor?"

"210."

"Current 12 ma. Voltage to chassis?"

"160," Joe said, surprise in his voice.

"Screen wattage 1.9, width better, and boost normal," said Bill, as he finished his cup of coffee. "Now, you could have done that yourself, couldn't you?"

*Triad Callback Stopper, that is.

* * *

MORAL: The Triad Callback Stopper Check Chart may be just as useful to you as it was to Bill and Joe. Get yours from your distributor, or write to us and we'll send you one. Triad Transformer Corporation, 4055 Redwood Avenue, Venice, California.

up to say 0.1 μ f. This may check that the amplifier does not become unstable using a capacitive load, but it does not check what connecting such a load may do to the high frequency response. If the frequency response is measured with these different loads quite a variation may be found to occur.

Even so, this is hardly an adequate test of the way an amplifier can deviate under all circumstances. The only practical load that may produce capacitive loading on the amplifier is an electrostatic tweeter. In spite of certain recommendations by a consumer reporting organization, some people still prefer dynamic tweeters which give an excellent performance, the reports notwithstanding. However, they also provide inductive loading for the amplifier at the high frequency end.

Amplifier Loading

This is not quite so easy to check on measurement, because inductances of a value comparable with voice coil values are not as easy to find as small capacitors are, which could explain a consumer reporting policy. Having judged amplifiers on whether they are stable with capacitive loads, they are virtually committed to use electrostatic tweeters. The fairer way is to find a method of checking amplifiers with inductive loads.

One way is to check the response into a variety of tweeters that may be handy and which may be known to have specific inductance values. The best thing to check, as far as amplifier performance is concerned, is the relative deviation in frequency response that occurs by loading the amplifier with reactances on both sides of resistive. One amplifier may misbehave when the load becomes capacitive and be perfectly "O.K." with an inductive load, while another one may misbehave when the load becomes inductive and be perfectly "O.K." when it is capacitive.

This explains why some people complain of radically bad frequency responses under different practical operating conditions. This can be related to whether a dynamic or electrostatic tweeter is used and sometimes even to precisely which unit is used. A comparative test of different amplifiers with different tweeters, bearing in mind the way the loads deviate from purely resistive, will usually determine whether and to

what extent the characteristics of individual amplifiers may be at fault.

A good amplifier is one that appears to have uniformly flat frequency response regardless of the loading impedance. There is, of course, no reason at all why a rough check on frequency response should not be made when the amplifier is feeding different types of loudspeaker loads instead of the pure resistance. One will not expect to come out with the fantastically good frequency responses

quoted for resistance loads, but the practical deviation encountered will indicate which of two amplifiers is the better, especially when tests are made with deviation in both directions, inductive as well as capacitive.

A comparatively new feature in amplifier design is facility for adapting to different types of load, inductive or capacitive, by changing feedback phase compensation. This is one way of providing consistently better performance in practical operation •

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36 most-often-needed resistors and capacitors, for fast, easy, direct substitution in all circuits. • Eliminates searching for replacement components for test purposes. • Avoids unnecessary unsoldering and soldering—no more solder mess. • Pays for itself the first month in time saved. • Flick of a switch instantly selects any one of . . .

24 RESISTORS from 10 ohms to 5.6 megohms

10 CAPACITORS from 100 mmfd to .5 mfd

2 ELECTROLYTICS, 10 mfd and 40 mfd

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SENCORE ES102 ELECTRO-SUB

Usable from 2 to 450 volts, D.C.

Contains 10 electrolytics from 4 to 350 mfd. Select the correct value with the flick of a switch. Features automatic discharge, surge protector circuit. Prevents accidental "healing" of capacitor being bridged. Completely safe—no arc or spark when connecting or disconnecting. DEALER NET..... 1595

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Instantly tells you whether or not it is safe to replace fuse resistors, fuses, or circuit breakers. Separate red and green scale for each commercially available fuse resistor used in radio and TV. Eliminates guesswork and wasted time. Also handy for wattage checks up to 1100 watts. DEALER NET..... 895

Substitute for Bias Batteries During Repair

SENCORE BE3 "ALIGN-O-PAK"

Completely isolated DC supply, with less than 0.1% ripple. Eliminates messy batteries in TV service work. Handy for alignment, AGC trouble-shooting, or checking gated sync circuits. Just dial the voltage you need, 0-18 volts, positive or negative. Covers all voltages recommended by TV set manufacturers. Size, 3 1/2 x 4 1/2 x 1 3/4". For 110-120 volts, 60 cycle AC. 785 DEALER NET.....

UNIVERSAL TV JUMPER CORD

Fits any set from back to chassis. Box has male and female plugs for additional power source, soldering, etc. DEALER NET 195



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ADDISON 2, ILLINOIS

N. Y. Bill Regulates Tube Sales

Proposed Legislation Requires Full Disclosure Of Tube Condition.

• The current session of the New York State Legislature is considering a bill which requires accurate labeling and disclosure of the condition of receiving and picture tubes. Used, out-of-warranty and surplus tubes are defined, and misdemeanor penalties are specified for non-compliance.

This bill is expected to pass and become law. Not only is it of interest to residents of New York, but people throughout the U.S. may feel its impact since New York State is frequently a precedent-setter for legislation elsewhere.

Timing of the bill's introduction appears excellent. Rigged programs and payola have stimulated the public to demand an end to misleading

sales practices. The tube industry has had a plentiful share of sharp operators, deceptive promotions and unethical tricks of the trade. As will be seen from the rough draft published here—a few small changes may possibly be added—phony comparative pricing, meaningless guarantees and outright deception about a tube's condition are forbidden. The purpose of the law is to protect the public without handicapping responsible elements in the industry.

Much careful thought has gone into the drafting of this bill by the Office of the Attorney General of New York. Special Assistant Attorney General Joe Rothman, who guided the drafting of the bill, has held many lengthy meetings with an ad-

visory committee representing all interested parties. Service associations were represented, as were manufacturers, distributors, the Federal Trade Commission, the Better Business Bureau and others.

The following is the rough draft. Note in particular paragraph 2.3, which requires technicians to affirmatively disclose the installation of a tube other than new. A safe way to do this is to write the information on your invoice . . . and keep a carbon copy.

General Business Law

Article 29-B

Radio and Television Tubes

1. Definitions. When used in this article

UPPER STRATA STRATEGY!

Friend of ours who always attends the sessions in the lecture halls, starts on the Fourth Floor with Production Items . . . and works his way down to Components on the First Floor. Says his feet tell him it's easier to come down than to go up! And he never misses a trick this way. Sounds like good engineering logic. Why don't you join him this year . . . and see if it doesn't work for you!

Will Copp

Show Manager

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the place to look for

NEW IDEAS IN RADIO-ELECTRONICS

1960!

Here, in New York City's Coliseum, is where you'll find the very latest information about the giant, radio-electronics industry's plans for the future.

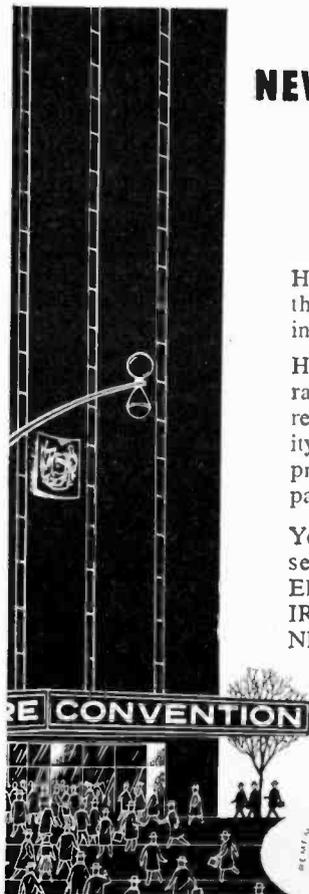
Here, you'll rub shoulders with over 60,000 of your fellow radio-electronics engineers. Here, you'll see 950 exhibits, representative of 80% of your industry's productive capacity, covering equipment, component parts, instruments and production. Here, you'll hear your choice of more than 200 papers to be given during the CONVENTION.

Yes, here—and only here—is your once-a-year chance to see and profit by all the NEW IDEAS IN RADIO-ELECTRONICS, 1960 gathered in one place. Attend the IRE NATIONAL CONVENTION AND RADIO ENGINEERING SHOW. Come to the Coliseum!

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Coliseum, New York City

MARCH 21, 22, 23, 24

The Institute of Radio Engineers
1 East 79th St., New York 21, N. Y.



"Tube" means an electron receiving tube or cathode ray tube (commonly known as a "picture-tube") designed primarily for use in a home type television or radio receiver, phonograph, tape recorder, or any combination thereof, or other home type electronic device or appliance.

"Used" or "second-hand," when referring to a tube, means that it, as a whole, has been subjected to consumer, demonstrator or floor sample use.

"Used component" means any part or material salvaged from a used or second-hand tube.

"Tube utilizing used components" means a tube which as a whole has not been used but which in the manufacture thereof has utilized one or more used components. Such a tube shall not be construed as used or second-hand.

"Hot-Shot" means temporarily reactivating or rejuvenating a weak, worn out or defective tube by means of applying high voltage electric current to the elements thereof without dismantling such tube and replacing weak, worn out or defective parts or materials and re-assembling the same; also a tube which has been so reactivated or rejuvenated.

"Out-of-brand name warranty," when referring to a tube, means that it is a new tube which at the time of its sale or offer of sale is free from any warranties to the retail purchaser thereof, purchasing for home consumption, by the owner of the brand name, if any, appearing thereon. A tube shall not be construed to be out-of-brand name solely by reason of the execution of the brand name owner's warranty obligations by any wholesale or retail vendor of such tube within the time limit specified on such tube and/or its container by the owner of the brand name appearing thereon.

"Surplus" when referring to a tube means that it is a tube originally acquired by an electronic equipment or appliance manufacturer for initial use in such equipment or appliance rather than for resale for replacement purposes, as such, or originally acquired by a governmental procurement agency for any purpose, which is thereafter offered for sale in the replacement market by any person other than the owner of the brand name appearing thereon under his own brand name and his own warranty. A tube shall not be construed to be "surplus" solely by reason of the execution of the brand name owner's warranty obligations by any wholesale or retail vendor of such tube within the time limit specified on such tube and/or its container by the owner of the brand name appearing thereon.

"Person" means an individual, partnership, firm, association or corporation.

2. Prohibitions. Misdemeanor penalty for violation

1. Except as hereinafter provided, no person shall distribute or sell, offer to distribute or sell, expose for distribution or sale, possess with intent to distribute or sell or otherwise dispose of for a consideration any "hot-shot", "surplus", "out-of brand name warranty", "second-hand" or "used" tube or "tube utilizing used components" without affirmatively disclosing the same by the use of such words or words of similar meaning clearly and conspicuously displayed by stamp, mark, tag, notice or label attached to such tube and to any carton or container thereof in such manner that

it cannot readily be removed or of such a nature as to remain in place until removed by the purchaser at retail.

2. No person other than a purchaser at retail for his own use and consumption shall remove, deface, cover, obliterate, mutilate, alter or cause to be removed, defaced, covered, obliterated, mutilated or altered any notice, tag or label from any tube, carton or container therefor, required under this article.

3. No person performing services or repairs for any consideration whatsoever on a home type radio or television receiver, phonograph, tape recorder or any combination thereof, or other home type electronic device or appliance shall knowingly install therein any "hot-shot", "surplus", "out-of-brand name warranty", "second-hand" or "used" tube or "tube utilizing used compo-

nents", without affirmatively disclosing the same to the customer irrespective of the fact that such tube or the carton therefor contains a notice, tag or label disclosing the same.

4. (a) No "used", "second-hand" or "hot-shot" tube may be represented, directly or indirectly, as "new" by the use of such word or words of similar import under any circumstances whatsoever.

(b) No tube utilizing used components may be represented, directly or indirectly, as a new tube, by the use of such words or words of similar import under any circumstances whatsoever. Nothing in this article contained shall be construed to prevent the representation of the true or actual quality of such a tube provided, however, that such representation shall not have the capacity

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Whips those "tough dog" tube troubles . . .

Ask any serviceman who owns one . . . or try one for just one day of servicing in your shop. You'll see for yourself how much time the LC3 can save you. Checks for leakage between all elements, whether caused by gas, grid emission or foreign particles. Also checks leakage on all capacitors with voltage applied—including electrolytics. Provides instant filament checks in "Fil-Check" position—no need for a second filament checker. One spare pre-heating socket and new roll chart prevent obsolescence. New charts provided—no charge. Leakage sensitivity, 100 megohms, control grid to all other elements; 50,000 ohms, heater to cathode. Size, 7x6x3 1/2". Wt., 3 lbs. For 110-120 volts, 60 cycle AC. DEALER NET **28⁹⁵**



NOW . . . checks 172 tube types—more than any other checker of this type.

NEW . . . replaceable Roll Chart prevents obsolescence.

Check Filaments of All Receiving Tubes and Picture Tubes



FC4 FILAMENT CHECKER

For fast, easy checking of all tube filaments, without pulling chassis. Neon light goes out if tube filament is good. Also acts as continuity and voltage tester. Neon lamp glows when 115 v. AC is applied by cheater cord, providing a check on power to TV set. Size, 3 1/4 x 4 x 1". With leads. DEALER NET. **2⁹⁵**

Check 3- and 4-Prong Vibrators . . . Faster, Easier



VB2 "VIBRA-DAPTOR"

Plugs into any tube checker; ideal for use with LC3 above. To check 6-v. vibrators, set for 6AX4 or 6SN7; for 12-v. vibrators, set for 12AX4 or 12SN7. Two No. 51 lamps indicate whether vibrator needs replacing. Instructions on front panel. Steel case. Size, 1 1/2 x 1 1/2 x 3". DEALER NET. **2⁷⁵**

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SENCORE

ADDISON 2, ILLINOIS

to mislead any person into the belief that such tube is a new tube.

5. No "hot-shot", "surplus", "out-of-brand name warranty", "second-hand" or "used" tube may be represented, directly or indirectly, as a first quality tube by the use of such words or words of similar import under any circumstances whatsoever. Nothing in this article shall be construed to prevent the representation of the true or actual quality of such a tube provided such representation shall not have the capacity to mislead any person into the belief that such tube is a first quality tube.

6. No person shall administer or cause to be administered a "hot-shot" to any weak, worn-out or defective tube with the intention of concealing its true condition from any other person.

7. No person shall sell, offer to sell, expose for sale, possess with intent to sell or otherwise dispose of, for any consideration whatsoever, any weak, worn-out or defective tube, knowing that such tube has been temporarily rejuvenated or reactivated by the administration of a "hot-shot" in order to conceal its true condition from any other person.

8. No person shall have in his possession any electrical device or tool or other instrument adapted to or commonly used for administering a "hot-shot" to any weak, worn-out or defective tube under circumstances evincing an intent to use or employ or allow the same to be used or employed, for the purpose of concealing the true condition of such tube from any other person, or knowing that the same are intended to be so used.

9. No tube shall be represented as "guaranteed" by the use of such word

or words of similar import in any advertising or other material designed to induce the purchase of such tube or upon any tag, label or other notice attached to or printed on any carton or container therefor, unless the nature, extent and duration of the guarantee, the identity of the guarantor, and the manner in which the guarantor will perform thereunder are clearly and conspicuously disclosed and furnished to the purchaser at retail for home consumption in writing at the time of purchase; nor shall any such tube be repre-

Technician Licensing Bill on the Way!

As we go to press, a report has been received that the New York State Office of the Attorney General is working on a draft of a bill which will require all TV technicians to be licensed.

It will be recalled that last year a voluntary technician certification bill did not pass the legislature. This year, a mandatory licensing bill is expected to have a better chance.

It's still too early to present details of the bill, but the following features are expected to be incorporated.

1. The bill will apply to TV receiver servicing only. Radio, audio, antennas and installation would not be covered.
2. The bill will not outlaw part-timers.
3. Licensed apprentices will be able to work on TV sets only under the direct supervision of a fully licensed technician.
4. A Board of Examiners will set up licensing rules, determine required tests and revoke licenses for improper conduct.

sented in any such material as "fully guaranteed" or "unconditionally guaranteed" by the use of such words or words of similar import unless such guarantee is free from any conditions or limitations whatsoever, except as to the duration thereof provided such duration immediately precedes or follows such words in letters of equal size and conspicuousness.

10. No person shall represent that a tube is being sold at a reduced price or at a savings when the alleged reduction or savings is from a fictitious price or is otherwise untrue, misleading or deceptive. Without limiting the generality of the foregoing, an alleged reduction or savings is from a fictitious price or otherwise untrue, misleading or deceptive

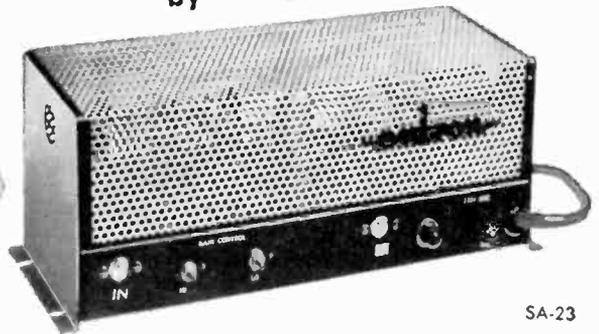
(a) when the alleged reduction or savings of a "hot-shot", "surplus", "out-of-brand name warranty", "second-hand" or "used" tube is from the manufacturer's established list price for his first quality tubes or

(b) when the alleged reduction or savings of a "tube utilizing used components" is from the manufacturer's established list price for tubes utilizing only new components in the manufacture thereof or (c) when the list price of a manufacturer, other than the owner of the brand name appearing on the tube being sold, is employed in connection with such sale as indicative of such reduction or savings.

11. No representations may be made, directly or indirectly, concerning a tube which, by reference to a patent license pursuant to which such tube was manufactured, have the capacity to mislead

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High Power Output • 10,000 Hour Tubes • Long Life Silicon Rectifier • Separate Tilt and Gain Controls for Each Band

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Fixed Tuned Single Channel Design
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any person into the belief that such tube is manufactured or sponsored by said patent licensor, when such is not the fact.

12. A violation of any provision of this section shall constitute a misdemeanor which shall be prosecuted by the attorney general in the name of the people of the state of New York.

13. In any prosecution for a misdemeanor for violating any provision of this section no proof shall be required that any person has, in fact, been misled or deceived or otherwise damaged thereby; and, except in a case provided for in paragraphs "3", "6", "7" and "8" of this section, no proof shall be required that the defendant knowingly violated such provision; but proof, that the defendant did not knowingly violate such provision shall constitute a good defense in any case.

3. Injunctions; Power of Attorney-General

(a) Before any violation of this article is prosecuted or sought to be enjoined the attorney-general shall give the person against whom such proceeding is contemplated such notice and opportunity to show either orally or in writing why proceedings should not be instituted against him as the attorney-general deems appropriate in the circumstances.

(b) Whenever any person has violated any provision of this article the attorney-general may apply, in the name of the people of the state of New York, to the supreme court of the state of New York, on notice of not less than five days, for an order enjoining the continuance of such violation; and if it shall appear to the satisfaction of the court or justice that the defendant is, in fact, violating any provision of this article, no proof shall be required that any person has, in fact, been misled or deceived or otherwise damaged thereby nor that the defendant knowingly violated such provision. In connection with any such proposed application, the attorney-general is authorized to take proof in the manner provided in section four hundred six of the civil practice act.

4. Construction

Nothing in this article shall apply to any television or sound radio broadcasting station or to any publisher or printer of a newspaper, magazine or other form of printed advertising who broadcasts, publishes or prints such advertisement.

5. This act does not repeal any other provision of the law.

6. Separability.

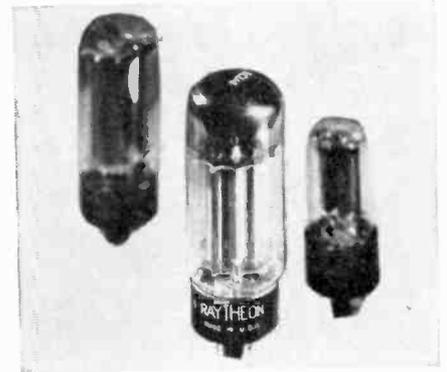
If any section of this article or any part thereof shall be adjudged by any court of competent jurisdiction to be invalid, such judgment shall not affect, impair or invalidate the remainder or any other section or part thereof. •

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Raytheon RECTIFIER

A single, full-wave rectifier that can be substituted for two rectifiers in TV and hi-fi design, the 5CU4, is a 425 ma cathode-type tube delivering 300 volts d-c. It is designed to replace the 5U4GB and the 5Y3GT with savings in tube, socket and assembly costs. With a tube voltage drop of only 24 volts, the new 5CU4 improves regulation while operating from a transformer secondary with only 25 volts per plate. Raytheon Co., Receiving Tube Div., 465 Centre St., Quincy, Mass. (ELECTRONIC TECHNICIAN 1-11)



The missing link in TV service . . .

SENCORE SS105 SWEEP CIRCUIT TROUBLE SHOOTER

IT'S A . . . **UNIVERSAL HORIZONTAL OSCILLATOR.** For direct substitution. No wires to disconnect in most cases. Traces trouble right down to the defective component. Variable output from 0-200 volts, peak-to-peak.

HORIZONTAL OUTPUT CATHODE CURRENT CHECKER. A proven method that quickly checks the condition of the horizontal output tube and associated components. Adaptor socket prevents breaking wires. Easily replaceable Roll Chart gives all necessary pin, current and voltage data.

UNIVERSAL DEFLECTION YOKE. A new, simple way to determine yoke failure accurately—without removing yoke from picture tube. Merely disconnect one yoke lead and substitute. If high voltage (also bright vertical line) is restored, TV yoke is defective.

DYNAMIC FLYBACK TRANSFORMER CHECKER. Merely flip switch to "Flyback Check" and meter will indicate condition of flyback transformer, in degrees of horizontal deflection. Extremely sensitive and accurate; even shows up one shorted turn on flyback.

VOLTMETER. For testing bootstrap, screen and other voltages. Direct-reading voltmeter, 0-1000 volts.

UNIVERSAL VERTICAL OSCILLATOR. Checks oscillator, output transformer and yoke. Merely touch lead to component and check picture on screen.

Size, 7x6x3½". Wt. 4 lbs.
For 110-120 volts, 60 cycle AC.

DEALER NET 39⁵⁰

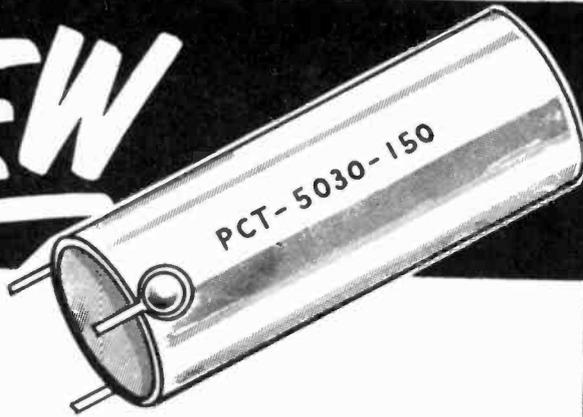


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 For 65°C operation . . . recommended for table and clock radios . . . individually packaged . . . guaranteed for one year.

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Association News

California

RTA/SRTT, Pomona, participated jointly in a highly successful publicity campaign at the recent Los Angeles County Fair. The effort was directed at up-grading public confidence and aiding the general public in avoiding the few remaining unethical persons in the business. Booklets were distributed at the booth listing reputable service technicians in Association areas.

APA, Los Angeles, has taken the "captive service" appliance fight up north. Meetings were held in Stockton, Sacramento, Oakland and San Francisco. Appliance attendants attending these meetings were reported to have pledged enthusiastic support.

Florida

TESA, Miami, announced its draft of a licensing ordinance is ready to be presented to the Dade County Board of Commissioners. A "grandfather" clause is included to automatically license those presently in business and properly recorded with all tax divisions and local municipal governments.

Indiana

IESA, Indianapolis, announces new officers: Pres., Dean R. Mock; V-P., Lamar Zimmerman; Sec'y., Wayne L. Clem; Treas., Harry Carmien.

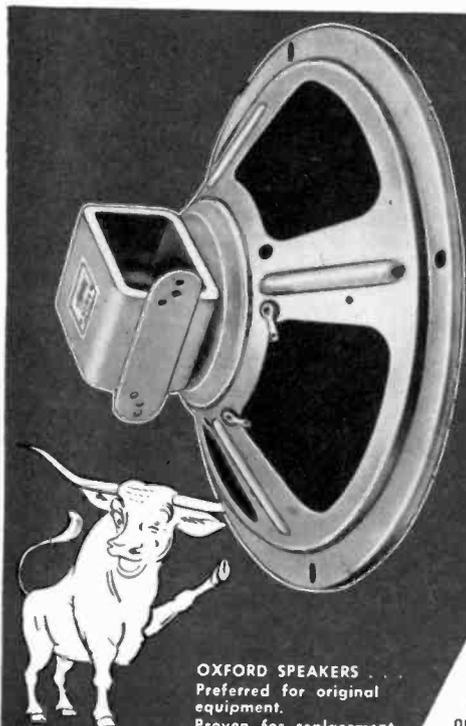
New York

ESFETA, Albany, elected the following officers: Pres., Irving Toner; V-P., Robert Henderson; Sec'y., O. Capitella, Corr.-Sec., Mel Cohen.

CETA, New York City, announced election of the following officers: Pres., Robert Cornell; V-P., Fred Jones; Treas., John McMannon; Corres.-Sec'y., Alfred Schabuttli; Rec.-Sec'y., John B. Van Essen and Sgt-at-Arms, Jack Hendricks.

North Carolina

NCFEA, Charlotte, in cooperation with the N.C. State Vocational Education Department, is attempting to raise the technical standards of all TV radio technicians by offering refresher and advanced electronic courses. The State Department of Education pays for instructors and furnishes classroom facilities. Ten to Fifteen full-time service technicians are required to begin a class, with



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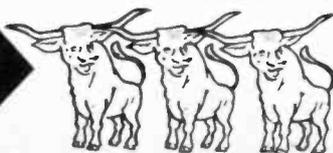
ONCE MORE UNTO THE BREACH, DEAR FRIENDS! When you are looking for replacement speakers on a par with original equipment, the prime source is Oxford. Oxford is the foremost name in original equipment speakers specified by manufacturers. We can supply you with exact replacement speakers which will be of the same high quality as that originally supplied. Oxford has a complete line for any and every application.

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text books paid for by the students. Examinations are given, with certificates and cards being issued by the State Vocational Education Department. One class of certificate is issued to qualified Television Servicemen and another to qualified Television Technicians. The latter designation is given only to those successfully finishing an advanced course, including color TV servicing.

NCFEA, Greensboro, reports new officers are: Pres., Bob Best; V. P., George Kiser; Sec'y., L. C. Tate; and Treas., Bill Burgess.

Oregon

Roseburg. Lee Schmeltzer was elected temporary chairman of a new association of TV dealers and service technicians which was tentatively formed at an organizational meeting here recently.

Pennsylvania

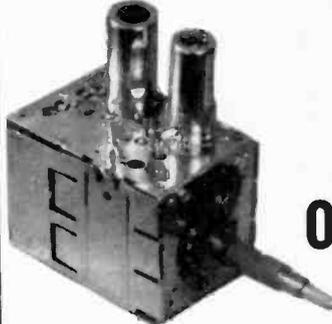
FRTSA, Pittsburgh, has drafted plans for establishment of antenna safety standards following an incident in Lackawanna County where a defective TV antenna fell across a primary service power line, disabling it for several hours. Standards for proper and safe installations, including inspections by Middle Department Association of Fire Underwriters, are being drafted for presentation to utility companies.

ESDA, Harrisburg, in a panel discussion with top state officials, charged distributors with unfair competition by selling to part-time retailers and alleged collecting 4 percent sales tax at wholesale rates. The problem of manufacturers' refusal to reimburse retailers for sales tax charged on factory warranty service job, was likewise raised. This tax cannot be collected from the consumer and the retailer should be reimbursed by the manufacturer, a state official indicated. Ronald Katzman, Asst. Attorney General, urged ESDA members to report the names of part-time dealers not holding tax certificates.

ESDA, mid-state, elected: Pres., Charles E. Ross III; V. P. Don Bellow; Sec'y., Arthur Mottern; and Treas., Oscar Stroup, at the group's annual meeting.

Texas

TEA, Ft. Worth, announced the election of: Pres., Dean O. Cochran; V. P., Wade W. Whittle; and Exec.-Sec'y., Will A. Shaw.



TV TUNERS OVERHAULED

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UHF

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**MAKES
AND
MODELS**

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FAST SERVICE PRESENT DELIVERY IS
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VHF OR UHF TUNER OVERHAULED **\$9.95** NET

UHF/VHF COMBINATION OVERHAULED **\$19.90** NET

Prices include labor and minor parts only, defective tubes and damaged major parts are extra at net prices.

Forward defective tuner complete with tubes, shield cover and any damaged parts. Quote make and model and describe complaint. We will ship C.O.D. —F.O.B. Chicago or Toronto.

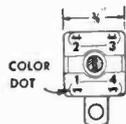
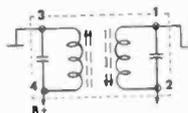
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MODEL 12-C11



new MILLER 455 kc IF transformer

— an exact replacement for
G. E. RTL-143 and RTL-163
— at your MILLER distributor

Here's the IF transformer used in a broad line of G.E. clock and table radios—available from any Miller distributor. It comes to you complete with schematic and base layout, to speed installation. List price: \$2.30

This unit is one of many miniature IF transformers designed for replacement in "personal" radio receivers. The line includes:

MODEL	ITEM
12-H1	262 KC Input I.F. Trans.
12-H2	262 KC Output I.F. Trans.
12-C1	455 KC Input I.F. Trans.
12-C2	455 KC Output I.F. Trans.
6203	4.5 Input or Interstage
6205	4.5 Ratio Detector

Write for the Miller general catalog, and the TV replacement guide, or get them at your distributor.

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CANADIAN REPRESENTATIVE:
Atlas Radio Corp., Ltd., Toronto 10, Ont.



J. W. MILLER COMPANY

5917 S. Main St., Los Angeles 3, Calif.

TV Power Supplies

(Continued from page 35)

a partially lit string, first check the last tube in the lighted string, and if this is not the culprit, try the first one in the dead string. Under certain conditions this will save time. A shorted filament bypass can also cause a partially lit string.

A word of caution: Do not use parallel type tubes in a series string. Replace with proper 450 or 600 ma

tubes. Otherwise a real tough hot dog may be cooking.

Not all exasperating problems are confined to series string circuits. Transformer and parallel heater type supplies also have their share.

Overload Checking

Some progressive technicians utilize various types of wattage load checks, current drain checks, and multi-check type equipment, to isolate overloading sections of B+ supplies. These operations are generally

confined to larger "assembly line" type repair operations, not always practical for the average technician. Manufacturer's data on current drain specifications are not provided for TV circuitry, either over-all or for voltage divider branches, and the time required to compute normal current drain is often impractical.

The old system of VOM resistance checks from high B+ to B-, or from high B+ and high B-, and across various bleeder-divider points, will generally lead to the isolation of a defective component by the process of elimination. Any branch showing unusually low resistance naturally

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FLUXVALVE "V-GUARD" "T-GUARD" UNIFOISE PAC (TM)

Here is more for the best of everything in quality record reproduction—the more that makes the difference!... more channel separation!... more response... more record life! In short—more to enjoy because there's more quality for more listening pleasure. Without question, Pickering's Collectors' Series 380 is the finest—with more features and more flexibility than any other stereo pickup in the world.

For example, the 380 is fully encapsulated in radiation-proof precious mu-metal for absolutely hum-free performance in any record player regardless of type—make—model. The only true way to judge a high fidelity component is to compare it with another... measure its performance with the most vital instrument of all... the ear. For—those who can hear the difference choose PICKERING*.

COLLECTORS' SERIES 380.

OUTPUT: 15 mv per channel. CHANNEL SEPARATION: 30-35 db. FREQUENCY RESPONSE: + 2 db 20-20,000 cycles. SIGNAL TO NOISE RATIO: -65 db below reference. TRACKING FORCE: "A" type stylus—2.5 grams; "C" type stylus—3.7 grams.

Model 380E Collectors' Ensemble includes the Stanton Stereo FLUXVALVE with 3 "V-GUARD" stylus for stereo, microgroove and 78 rpm records. \$60.00

Model 380A includes Stanton Stereo FLUXVALVE with D3807A "V-GUARD" stylus for transcription arms. \$34.50

Model 380C includes Stanton Stereo FLUXVALVE with D3807C "V-GUARD" stylus for auto-changer arms. \$29.85

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Only the Stanton Stereo FLUXVALVE features the safe, comfortable, easily replaceable stylus assembly.

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TV TUNERS REBUILT

ALL MAKES & MODELS
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EXCHANGED OR REPAIRED	\$8.95
COMBINATION UHF/VHF UNITS	\$19.90

Price includes labor and minor parts only, defective tubes and damaged major parts are extra at net prices.

Forward tuner complete with tubes, shield cover and any damaged parts. Quote make and model.

Include \$9.95 plus 95c handling and return transportation or include 25% deposit and we will ship C.O.D.

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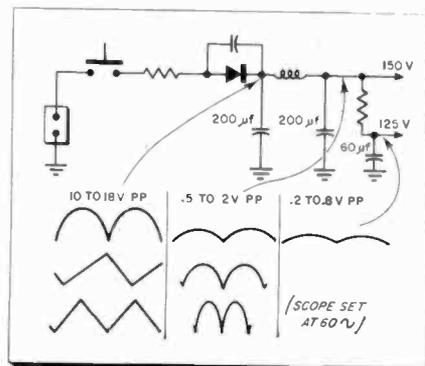


Fig. 6—Average 120 cycle ripple amplitudes in a power supply can be measured with a scope at points indicated. Ripple voltage can upset video, sync and cause audio hum.

indicates trouble. Here again, when tracing a particular B+ line, it is necessary to consult a schematic for voltage divider and circuit load resistances. Isolating shorted electrolytic filter in the power supply or along a given B+ line, including a defective by-pass, coupling or blocking capacitor in the load circuit, is generally treated in the same manner. There are some exceptions in the case of leaking or open electrolytics. A scope is often more practical.

Directing attention to basic techniques may appear elementary to most technicians. But to some it may prove to be a welcome reminder. A case has been selected involving the simple circuit shown in Fig. 5.

Bus Tracing

The symptom was "no high voltage, no picture and poor sound." The fusible resistor was open and a replacement promptly blew out. This indicated power supply or B+ overload and the set was brought to the

shop. At the bench a schematic was consulted. With a VOM it was quickly determined, after disconnecting the bus at point Ax, that an overload existed on the 140v line. The technician next disconnected the 120v bus at point Bx. A similar VOM check indicated low resistance remained on the 140v bus. The third step involved a disconnect at Cx, eliminating the horizontal output and damper tube circuits. The load still remained on the bus.

At this point the technician again inspected the diagram and paused for a few moments. Carefully inspecting the circuitry and components in the area around V-3 and V-4, the technician then noticed R-2, a 27k resistor from ground was discolored. He then disconnected R-2 from ground. A VOM check now showed high resistance on the bus. Blocking condenser C-1 was leaking heavily and R-2 was discolored. Both capacitor and resistor were replaced. The problem had been solved and total time, including setting up the chassis, was 40 minutes.

This case was brought to the attention of a modest number of technicians over a period of months. They were not informed of the original troubleshooting procedure. The answers were interesting. 15% suggested different methods, not included here. 20% described methods essentially similar to the original. 65% described average procedures beginning with schematic inspection and followed by visual inspection. Some said visual inspection would have been used before any other checks. Some would have begun visual inspection after operation Bx and some after Cx. All maintained the leaking condenser would have been located via the overheating, discolored resistor by sight and feel (and possibly smell) and the entire operation would have required not more than 25 minutes (their total average). A number said 15 minutes was sufficient time. This appeared to confirm again that most highly skilled and experienced technicians place visual inspection next to schematic perusal as an essential time saving preliminary before disconnecting wires or making voltage or resistance checks of any kind.

"Artificial Dogs"

Certain types of leakages and shorts in the audio output tube, or defective electrolytics in its cathode

circuit, can create some trying situations if the technician is not wide-awake. A traditional symptom of "raster but no sound and no picture," directs attention to other areas, rather than to sound output tube. However, many circuits provide 135 to 150 volts B+ for sound and video i-f's, from the output tube cathode. Overlooking this fact, together with voltage readings somewhat at variance with manufacturer's specifications, have led many excellent tech-

nicians along various tangents, from one false clue to another. If a condition exists in a circuit preventing a tube from drawing little or no current, the voltage on its plate or screen will naturally jump appreciably above normal. If the tube is drawing excessive current the voltage will drop considerably below normal. Forgetting this fact is a major factor in creating "artificial dogs."

A number of other troublesome situations have arisen because of



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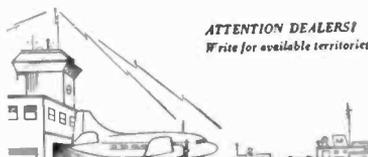
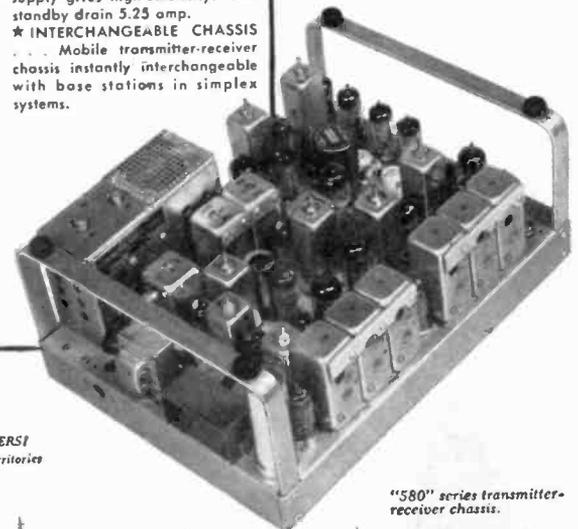



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faulty procedures. A typical one is presented here. Symptoms were: "hum in the sound, accompanied by unstable sync and sometimes with poor age action." On an average a number of hours were wasted checking in wrong areas, before a scope was employed in final troubleshooting stages. All cases involved leaking electrolytic B+ filters. This situation can happen in a reverse manner; that is, with sync pulses leaking back into the B+ upsetting certain normal functions.

B+ Ripple

Permissible ripple designed into B+ supplies will vary but very little. Average PP ripple voltage waveforms are shown in Fig. 6. An accurately calibrated scope is required for ripple measurements. References should normally be made to an individual manufacturer's data. If the data is not available, memorizing these averages may save time in certain future problems. A-c PP voltage should lie between 10 and 18 volts at

the rectifier output, input filter junction. It should be not more than 2v PP at the choke output-filter junction. Some supplies will give less than 1v PP ripple at this point. These figures vary with different power supplies and at various bleeder-divider B+ outputs if additional filter is provided. Vertical section B+ supplies generally show 1 volt PP and preferably less. Some sets observed operated perfectly with slightly higher amounts of ripple and others were critical at somewhat lower amounts than those specified.

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Selenium Rectifiers

Checking either a new or old selenium for reverse and forward resistance with a VOM is to be considered a preliminary investigation to determine if the unit is obviously defective. If doubt exists after checking, the readings are meaningless and the unit or units must be checked under normal operating conditions or with a professional checker. If an in circuit selenium is suspected, parallel another one with clip-leads while noting the out-put voltage with a VOM. If a 20 or 25 volt increase is obtained (average transformerless TV supply)—replace the unit or units. In a two selenium supply most technicians replace both units when one becomes defective. Initial inspection should include looking for bent plates, discolored plates, metal particles between plates, loose plates, melting and running of outer plate coating and black spots—normally indicating where arcing has taken place.

Some manufacturers specify "aging" of their units for best results and maximum life. This can be done in various ways but the most practical way for the average shop is to run the seleniums at normal load, off and on, at intervals of 4 or 5 minutes for at least one hour.

It goes without mention that defective seleniums should not be replaced until chokes, electrolytics and B+ lines are checked for appreciable overload.

Germanium And Silicon Rectifiers

A number of TV manufacturers have been employing germanium and silicon rectifiers for some time. Compared to other solid state devices, germanium and silicon junctions are presently superior in many ways, in-

cluding much smaller size with fuse-like snap in replacement facilities. Both have a lower forward resistance than seleniums, with the result that higher voltages are obtained. In some cases the increase runs as high as 10% d-c over conventional seleniums. However, selenium types are constantly being improved and smaller improved units are being made.

Silicon type rectifiers showed a rather high percentage of failures during their initial first few years of use. Recent indications are that improvements have been made and an increasing number of TV manufacturers are using them. Depreciation in both junction types appears negligible after 5 years of normal operation.

Electrolytic Capacitors

The most important characteristic of electrolytic capacitors from the technician's point of view, is that quality allowing dielectric reformation. Voltage ratings are determined by the thickness of the oxide dielectric on the positive plate. For example, if an electrolytic is allowed to operate in a power supply or B+ line over an extended period at substantially lower than normal voltage, the dielectric film will become thinner. If normal voltage is then suddenly applied to the capacitor it is subject to break-down. Many TV sets have "popped" after replacing rectifier tubes and seleniums because the sets had been allowed to operate over long periods of time with low emission rectifier tubes and run-down seleniums. Many technicians frankly raise this question with customers whenever minimum repairs are made. A change of electrolytics is generally recommended and often warranted under such circumstances.

Power Transformers

Power transformers probably give less trouble than any other unit employed in TV's. However, they do open, break down, smoke and burn up—when no fuse is employed in the a-c line and a stubborn rectifier refuses to give up. As with all other components, shorting circuit elements must be located and removed before replacing a transformer. When a transformer requires replacement, some technicians install a fuse barrel at a convenient spot on the chassis,

providing protection in event of a repetition.

New replacement transformers should be carefully inspected at the point where leads enter the case. Make sure the insulation is good here. It is generally advisable to obtain an exact replacement. Universal type replacements take additional time for which the technician is not paid.

A number of manufacturers are using a type of autotransformer or magnetic shunt regulator. They are especially welcome in areas providing unstable house voltages and in color TV chassis. They maintain steady d-c voltages even if the a-c line voltage varies.

A special oil-filled capacitor is employed across the secondary in these transformers generally rated between 1 and 2 μ f, at 1000 volts, 60 cycles. When they become defective an exact replacement is required.

Protection

It is assumed that all TV shops have provided isolation transformers for use when working on transformerless power supplies. This is an essential safety measure for the technician as well as his expensive equipment. The customer, however, would rarely have an isolation transformer in his home. Even in sets where the manufacturer has insulated the chassis from all external metal parts, certain precautions are highly important for his protection.

Loose screws and other small metal parts left in cabinets where space is at a premium, especially in small portables, can make the cabinet unsafe to touch. Before delivering such sets, after repair, the following tests are recommended:

Using a VOM or VTVM set to measure a-c, clip the meter common probe to a grounded conduit (make sure it is grounded) or a cold water pipe. Place the hot meter probe on all exposed metal parts around the cabinet. If the a-c reading is higher than 65 or 70 volts, (representing static charge), check for a short between chassis and cabinet. Reverse the line plug and re-check. The cabinet will normally be safe if no higher than 70 volts is obtained with the plug in both positions.

These simple precautions may save a life, and, after all, it may be your own or that of your best customer. ●

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Solar Energy

(Continued from page 30)

tion" to demonstrate new uses for aluminum.

Sunlight, falling on an array of aluminum panels, is focused on twin rows of solar cells. The current generated by the cells is passed to electric motors spotted throughout the display. This causes the colorful discs,

moons, shafts and pin wheels of the machine to spin and whirl in a colorful rainbow of motion.

The silicon cells furnish instantaneous action to the toy, needing only a touch of sunbeam to set the aluminum abstracts gliding into motion.

"Big Bertha"

Fig. 6 depicts "Big Bertha," the world's largest solar energy converter, permanently installed on the roof of

the manufacturer's (Hoffman Electronics Corp.) Semiconductor Center. 7,800 solar cells, similar to those used in U. S. earth satellites, are mounted on a single 4 x 8 foot panel. The device's swivel base automatically tracks the sun for maximum efficiency. Surplus energy is stored in batteries for use at night or on sunless days.

The exciting challenge of converting salt water into fresh water is being aided by Big Bertha. Although the cost is still prohibitive, the possibility of reducing it through use of free sunlight exists. A salt water converter powered by Big Bertha is already in operation, for experimental and display purposes.

Solar Furnace

Energy from the sun can be used directly as a source of heat by using a solar furnace made, in principle, from a parabolic mirror. As illustrated in Fig. 7, the rays from the sun fall upon the mirror surface where they are all reflected to meet at the focus. Spherical mirrors are not usually used since they do not bring the energy to as sharp a focus.

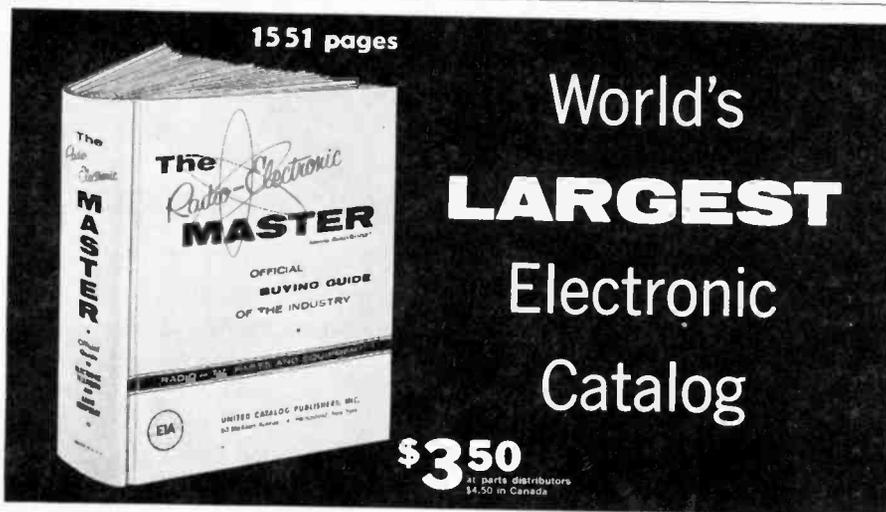
A do-it-yourself furnace for picnics is shown in Fig. 8. This is a portable and foldable 4-foot parabolic reflector which focuses the sun's rays on a 10 inch grill for cooking outdoors. In about 15 or 20 minutes the steak or hamburgers or hotdogs are ready to eat.

Future

Solar energy is a vast potential source for electrical power. At high noon, and in full sunlight, about 1,000 watts fall upon each square yard of the earth's surface. If this could be economically used, it could supplement other energy sources.

Electricity for the home is being studied by the Association for Applied Solar Energy. According to their figures, about 580 kilowatt hours fall daily on a roof of 1,075 square feet in the Temperate Zone. With an efficiency of only 10% in the energy conversion process, this could produce 58 kw/hours in a day. The average home uses only 11.5 kw/hrs. Therefore, it is theoretically possible to convert sunshine on your roof into electricity for the house.

Two major problems exist, though. The present cost is much higher than commercial electricity as we know



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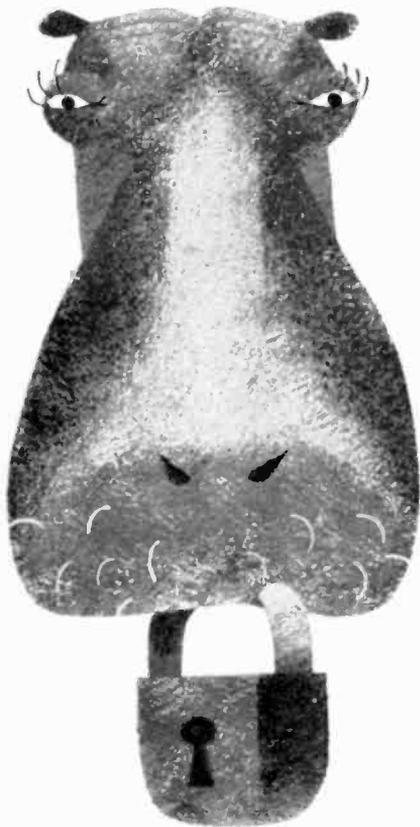
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it and a storage system is needed for rainy days. This storage system must have enough electricity in reserve to carry over the longest span of sunless days.

The progress in the solar energy field has been great. The prospects are still greater; solar energy is becoming more important every day. However, continue to pay your electricity bill until the future does reach your home. •

Magnetized Tape Heads

(Continued from page 37)

when an ohmmeter is used to check winding continuity.

Symptoms of magnetization are generally indicated by a high noise level, hissing and popping sounds when a completely blank tape is played. To check, observe the following procedure:

1. Connect the vertical circuit of an oscilloscope to the speaker jack, as illustrated in Fig. 4. (An audio voltmeter may also be used.)

2. With the amplifier warmed up and no tape on the transport, press the PLAY-RECORD button and adjust the loudness control and scope

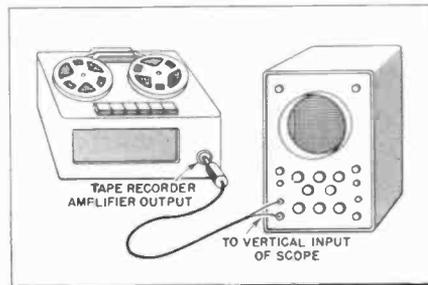


Fig. 4—A tape recorder head can be checked for magnetization by first observing its output without any tape and, without changing the setting of controls, with blank tape. If any appreciable increase in amplitude is seen on the scope, then the head should be demagnetized.

gain for some convenient indication. Resulting indication will arise from normal amplifier noise. (Tube hiss.)

3. Place a completely blank tape on the transport and again press the PLAY-RECORD button. Do not change the control settings.

Head magnetization will be indicated on the scope by an increase in signal amplitude—the amount of the increase being dependent on the degree of magnetization. A head that is not magnetized will show about the same average level when a blank tape is played, as was shown with no tape.—RCA Victor Company, Ltd. Montreal, Canada.

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John T. Thompson, manager of Raytheon's Distributor Products Div., said the new Unimarket system will eliminate three field warehouses, reduce duplicated inventories by some \$2,000,000, and eliminate extra billing costs on back orders.

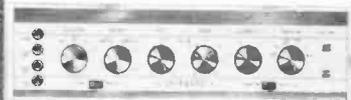
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*MASTER RECEIVING-PICTURE TUBE SUBSTITUTION GUIDE BOOK. By H. A. Middleton. Published by John F. Rider Publisher, Inc. 352 pages, soft cover. \$7.45.

This volume is a revised version of its predecessor, first published November 1950, with three subsequent supplements. In addition, there has been added complete data on CRT substitutions for tubes developed since 1957, including others expected to be in general use in 1960. The never-ending flow of new tube types has resulted in the book now covering 5,100 American receiving tube substitutions; 825 American CRT substitutions, and 325 American-European receiving tube equivalents. The volume is divided into 10 sections, including regular, emergency, ruggedized and foreign tube type substitutions. A full chapter covers circuit discussions, thoroughly discussing tube type descriptions as applied to specific circuitry, while analyzing substitution problems. Saving unnecessary tube stock duplication, the book is a worthy addition to any radio-TV shop.

AAI EVALUATED TEST REPORTS. Published by American Audio Institute, 394 E. 18th St., Paterson, N. J. 63 pages, soft cover. \$2.50.

Test reports of 18 stereo amplifiers are described in detail by the AAI, an independent testing organization. A complete description of the testing procedures used precedes the evaluation report. The individual reports are very thorough, to the extent of evaluating features, such as ease of operation, number of inputs, etc. Each test factor is given a standard "weight" according to its importance. The results are rated on the basis of a 0-100 point scale. The method of evaluation is most interesting and is accompanied by graphic illustrations depicting frequency response curves, power output curves, etc.

*MAGNETISM AND ELECTROMAGNETISM. Edited by Alexander Shure. Published by John F. Rider Publisher, Inc. 78 pages, soft cover. \$1.80.

Another Electronic Technology Series Book, No. 20, devotes itself to basic magnetism and electromagnetism. The technical approach, admittedly a fundamental one, is comprehensive enough to render service as a foundation for further studies. Most trade schools slough off this topic, especially typical calculations, leaving students without a sure knowledge of it. The simple mathematical treatment offered by this book should correct the situation.

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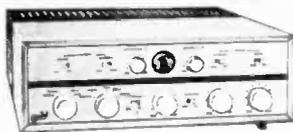
You "play ball" with MAJOR LEAGUERS" when you buy ZALYTRON Tubes! Tubes are our middle name! We have been supplying tubes for many years to service dealers and Tube Tester Route Operators—and the ZALYTRON Brand Name has achieved a reputation for quality and performance second to none!

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OUR PRICE **\$895**
ONLY PREPAID

MODEL 2020P—A complete Hi-Fi Stereophonic Control Center consisting of two identical 20-watt amplifiers with fully equalized pre-amps for tape heads and magnetic pickups. Combined power rating 40 watts (80 watts peak). Self-contained highly stable power supply. Dual variety inputs and outputs for full stereo or monaural reproduction. Stereo Electric Eye permits exact visual balance between channels. Size 15"x10 1/2"x4 3/8" deep. Net Weight 22 lbs.

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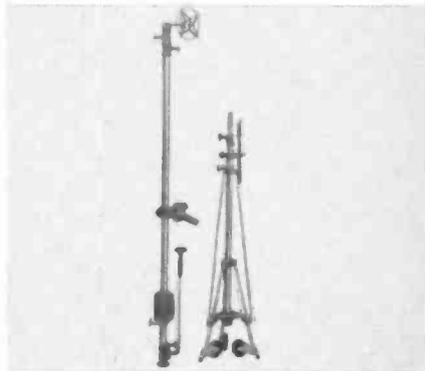
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Atlas MIKE BOOM

"Porto Boom" model BS-37, a new collapsible microphone boom, extends to 18 feet and retracts to 7 feet. Features include: large brake shoe type clutch assembly to securely lock the telescopic upright in position; piston type air check mechanism to prevent collapse of the upright; adjustable



pneumatic orifice valve in the base to permit rapid height adjustment and prevent sudden downward motion; two position dual control gunning device that rotates the microphone through a 360° arc. Upright is 5 1/2 ft retracted; 9 ft extended. \$375.00. Atlas Sound Corp., 1449 39 St., Brooklyn 18, N. Y. (ELECTRONIC TECHNICIAN 1-31)

Philco HI-FI & STEREO UNITS

Over 140 different size and shape permanent magnet speakers, for every application, are included in a complete new hi-fi and universal line. New stereo conversion kit, part #325-8045, converts Philco record changers M20, M22, M24, M26, M28 and M39 to stereo. Can also be used with phonos which utilize the Webcor micro-mix changer, such as Webcor, Motorola and Magnavox. New economy private listener, Part 326-0005, has 16 ohms impedance, a 39-inch cord, metal ear piece and right angle plug. Can be used with Admiral, Arvin, Cavalier, DeWald, Emerson, Motorola, RCA, Regency, Roland, Raytheon, Trav-ler, Zenith and Japanese imported sets. Philco Corp., "C" & Westmoreland., Philadelphia 34, Pa. (ELECTRONIC TECHNICIAN 1-30)



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A satisfactory repair job means a satisfied customer. To keep your customer happy and to prevent costly call-backs you must depend on a reliable replacement. Aerovox AFH Twist-Prong Electrolytics can always be depended on to give long-life and excellent service because they're made better . . . high-purity aluminum foil construction throughout, 85°C operation, improved hermetic sealing and rugged prongs and mounting terminals. Available in the widest selection of exact-duplicate replacements including printed-wiring and selenium rectifier types. Your local Aerovox Distributor stocks the replacement you need when you need it. Call on him today for all your capacitor requirements.

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Your Aerovox Distributor offers you special "Stack-A-Lytic" kits (AK-400 and AK-401) with a selection of 8 or 16 popular TV replacements with a FREE handy metal storage rack with stacking features.



**AEROVOX CORPORATION
DISTRIBUTOR DIVISION
NEW BEDFORD, MASS.**

1/4 Track Tape

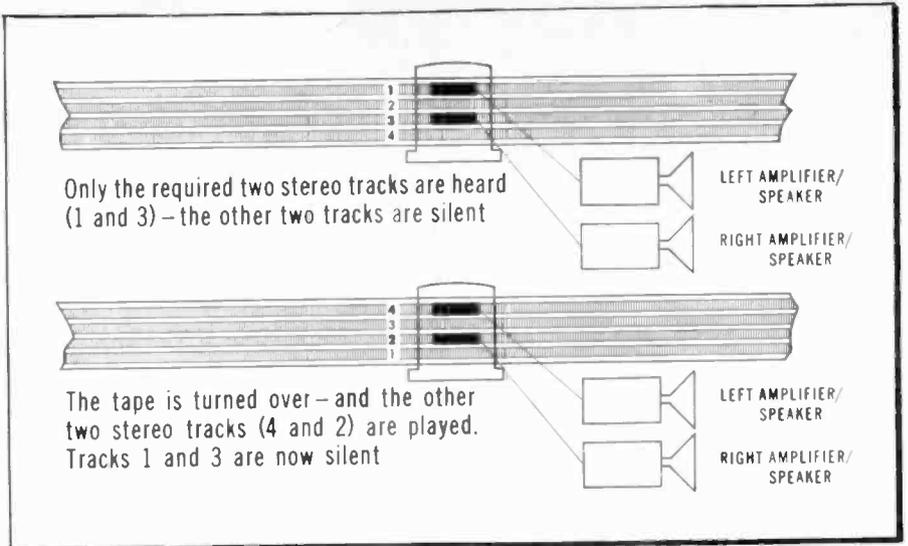
The Magnetic Recording Industry Association recently went on record as backing quarter-track tape and it now seems certain that quarter-track will attain wide acceptance in the industry.

At least 19 companies thus far are producing quarter-track pre-recorded tape, and approximately three-quarter million 1/4 track tape machines have been manufactured to date.

In view of this tangible evidence, consumers will surely inquire about the new development. Will you have the right answers? The MRIA asked dealers around the country to come up with a list of their ten favorite questions about quarter-track tape. Here are the ten most popular ones, as compiled by the MRIA:

1. What is four-track tape?

Whether called four-track or quarter-track, it is simply two narrow tracks play in one direction and two tracks play in the opposite direction—for a total of four tracks. During the first run, only two tracks are



heard for stereo reproduction. The other two are silent. When the tape is turned over, the two previously silent tracks are reproduced and the first two tracks are now silent. See Fig. 1.

2. Will four-track reels save me money?

Yes. Since the process doubles the length of playing time of a tape, the cost of tape itself is cut in half.

3. Do I have to rewind the tape?

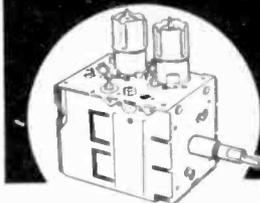
No. Since the tape is reversed to play the second set of tracks and therefore travels in the opposite direction, rewind is not necessary if the user desires to play the entire tape selection.

4. Is the quality of four-track tape as good as two-track?

Today's four-track tape is as good as the older two-track tape. New ultra-narrow gap tape heads and im-

(Continued on following page)

TARZIAN Offers 48-Hour, Direct Factory Service on Tuner Repairs



only
\$8.50

Price Effective Jan. 1, 1960

That's right. Net, \$8.50 per unit and \$15 for UV combinations, including ALL replacement parts. 90-day warranty against defective workmanship and parts failure. Tuners repaired on approved, open accounts. Replacements offered at these prices* on tuners not repairable:

VHF 12 position tuner	\$22.00
VHF 13 or 16 position	23.00
VHF/UHF combination	25.00
UHF only	15.50

*Subject to change



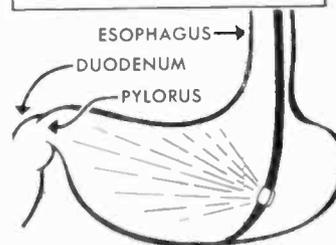
Tarzian-made tuners are easily identified by this stamping on the unit. When inquiring about service or replacements for other than Tarzian-made tuners, always give tube complement . . . shaft length . . . filament voltage . . . series or shunt heater . . . IF frequency, chassis identification and allow a little more time for service. Use this address for fast, 48-hour service:

SARKES TARZIAN, Inc.

Att.: Service Mgr., Tuner Division
East Hillside Drive
Bloomington, Indiana

This Lamp...

Lights Up Your Interior!



Lamp located at end of gastroscope, has a flexible rubber finger that guides end of instrument across floor of stomach while the lamp illuminates wall of stomach for viewing through gastroscope. Even color pictures can be taken through the instrument!

When the gastroscope was invented—the instrument that enables a physician to take an actual, close-up peek at our expensively-acquired ulcers—a special miniature lamp was needed to illuminate the interior of the stomach and expose the results of our follies!

Chicago Miniature was asked to design that lamp, and, since then, has made many more for this purpose.

Noted for its ability to design and produce precision lamps to exacting specifications for special and unusual functions, Chicago Miniature also produces the broadest line of standard lamps in the industry to the same high standards of quality.

When you need miniature lamps for replacement purposes, you can always be sure of dependable quality when you ask your parts jobber for Chicago Miniature Lamps.

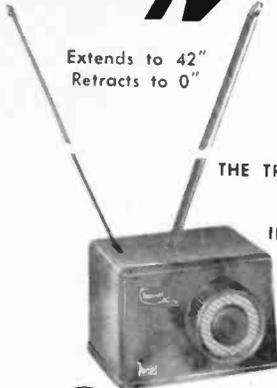


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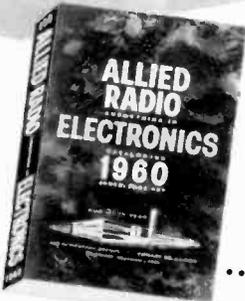
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(Continued from preceding page)

proved duplicating methods have increased reproduction quality. These same improvements correspondingly benefit two-track tape, too. Therefore, two-track tape still maintains optimum quality for those who prefer it.

5. *Can I play new four-track reels on my present tape deck?*

Four-track reels may be played on your present tape machine if it is one of the three-quarter million machines produced thus far with four-track tape heads. Otherwise, it cannot be played unless the older two-track heads are replaced with new four-track ones. Many conversion kits are currently available for this purpose.

6. *Are all major companies manufacturing four-track machines and conversion kits?*

The large majority of major companies are producing four-track machines and conversion kits.

7. *Can I continue to play reels from my extensive two-track library with machines equipped with the new four-track heads?*

In most cases two-track reel-to-reel tapes can be played with a four-track machine. However, in some instances, a mechanical lever is necessary to move the tape heads in order to obtain equal output from each track.

8. *Will I have a wide selection of four-track pre-recorded stereo tapes?*

Yes, almost 200 tapes this fall, with 400 by year's end.

9. *How many recording companies presently produce four-track pre-recorded tapes?*

Nineteen—Audio Fidelity, Bel Canto, Concertapes, Dot, Elektra, Everest, Hi-Fi Tapes, Kapp, M-G-M, Mercury, Omegatape, Roulette, Stereophonic Music Society, Vanguard, Verve, Vox, Warner Brothers, Westminster and World Pacific. Also, distribution and marketing has been greatly improved through establishment of a central marketing company.

10. *Do I need an entirely new tape deck in order to play the new four-track cartridge?*

Yes, although at least one reel-to-reel deck manufacturer has developed a cartridge adapter for their machines.

GE SPEAKERS

Four new models are: 1201B, shown, 12" wide-range basic speaker. Power, 25 watts. Response, 48 to 13,000 cps. Also, model G-504, 2 3/4" tweeter, styled for surface mounting if desired. 30 watts. Response 1,200 to 16,000 cps; model G-502 dual-cone 12" with auxiliary "whizzer" cone. 25 watts. Response,



30 to 16,000 cps; and model G-503 dual-coaxial 12" speaker with L-C crossover network and extra-long aluminum base voice coil. 30 watts. Response 30 to 16,000 cps. Models 1201B and G-504, \$19.95. G-502, \$34.95. G-503, \$59.95. Slightly higher in the West. General Electric Co., 1285 Boston Ave., Bridgeport, Conn. (ELECTRONIC TECHNICIAN 1-42)

Shortcuts For SERVICE... PROFIT From R-Columbia

New FONO MAGIC

A compound of special rubber and carbide . . . eliminates turntable slipping-dragging. Makes automatic changers cycle properly.

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- Praised by the experts
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Color & Monochrome • DC to 5 MC Lab & TV
5" Oscilloscope #460
Wired \$129.50 Kit \$79.95
Features DC amplifiers; flat from DC to 4.5 mc, usable to 10 mc.



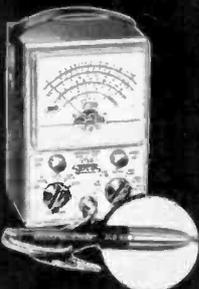
TV-FM Sweep Generator & Marker #368
Wired \$119.95 Kit \$69.95
Entirely electronic sweep circuit with accurately biased inductor for excellent linearity. Extremely flat RF output.

Dynamic Conductance Tube & Transistor Tester #666
Wired \$109.95 Kit \$69.95

Tests all receiving tubes (picture tubes with adapter), n-p-n and p-n-p transistors.



Add 5% in the West



Peak-to-Peak VTVM #232 & Uni-Probe (pat. pend.)
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Uni-Probe — exclusive with EICO — only 1 probe performs all functions: half-turn of probe tip selects DC or AC-Ohms.

In stock at over 1500 distributors in the U.S. and Canada

IMPORTANT NOTE: All EICO kits built according to our instructions, and all EICO factory-assembled equipment, conform to the high standards and specifications published in EICO literature and advertisements. All EICO factory-assembled equipment is completely and meticulously hand-wired throughout — no printed circuitry; each factory-assembled unit is 100% final-tested throughout for each feature and function — no "spot" or "partial" checking. In EICO's final-test techniques, nothing is left to chance.

EICO, 33-00 Northern Blvd., L.I.C. 1, N. Y.

Marine Radio

(Continued from page 36)

quate ground, but why lose 20 and 30% of the equipment's available sensitivity.

To obtain an adequate ground on metal hull vessels, copper braid strap or heavy stranded cable should be connected from the hull to the engine frame.

On wood or fiberglass hulls, a ground plate of No. 20 copper sheet, at least 12 square feet in area, is recommended. This should be fastened to the hull at approximate midship. A large bolt should be installed through the hull near the engine and connected to the engine frame with copper braid strap or heavy cable. For twin screw vessels, connect engine frames together.

Noise Suppression

Annoying ignition noises may be picked up by equipment on inboard engine boats unless spark plug suppressors are used in all plug leads and distributor coil leads. Also, a capacitor should be installed on the generator from armature lead to ground and/or field lead. Likewise at the ignition coil from battery lead to ground.

Another source of electrical noise may be the propeller shaft and associated metallic surfaces. All metal surfaces on the vessel should be bonded together, if practical. Shield around the engine sometimes minimize electrical disturbances, also.

Other Considerations

The antenna must be installed in a location clear of obstructions and located so that its tuned lead length will be maintained. Its overall height is often doubled when deck-mounted. The base is installed as deck or side mount on material able to withstand normal whipping of the antenna. Bolts are frequently used for mounting in one-half inch plank-ing.

Equipment proper should be located in a protected area on the boat, convenient to the operator. It should also be as close as possible to the boat's battery to avoid unusually long connecting cables. •

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- Easy console installation



FM Tuner HFT90 Wired \$65.95* Kit \$39.95*
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"Outstanding quality... extremely versatile."
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3-Way High Fidelity Speaker System
Semi-Kits MFS-3 & MFS-5

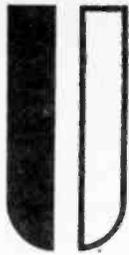
- Complete with factory-constructed enclosure
- Easy to assemble — no gluing or woodworking
- MFS-3 unfinished birch, \$72.50; walnut, mahogany or teak, \$87.50
- MFS-5 unfinished birch, \$47.50; walnut, mahogany or teak, \$59.50.
- Other speaker system semi-kits from \$39.95.

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■ Prior to assignment, field engineers will receive two to six months training at full pay in our St. Paul, Minnesota, laboratories. Benefits include company paid life insurance, hospitalization, medical and surgical benefits, relocation expenses, and living allowances at field sites.

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Catalogs & Bulletins

DIODES: GD-40 is a 10-page, 2-color, brochure giving specifications, characteristics and reverse curves of germanium gold bonded diodes. Also describes the mechanical, electrical, and hermetic seal tests to which the diodes are subjected. General Transistor Corp., 91-27 138th Place, Jamaica 35, N. Y. (ELECTRONIC TECHNICIAN B1-1)

RELAYS: Engineering specifications for relays "off-the-shelf" is a 4-page circular covering the firm's many types of standard stock relays. Relay numbers with such information as resistance, contact arrangements, operating characteristics, operating time, contact rating, and coil impregnation are listed. Kurman Electric Co., 191 Newel St., Brooklyn, N. Y. (ELECTRONIC TECHNICIAN B1-2)

TRANSISTORS: A colorful 4-page transistor data chart lists, by type, such data as: class of service, typical application, maximum ratings, characteristics, and switching time. Radio Corp. of America, Semiconductor & Materials Div., Somerville, N. J. (ELECTRONIC TECHNICIAN B1-3)

VOLTMETER: Features of model R-2 voltmeter are covered in a bulletin which specifies the unit's applications such as measuring the regulation of power supplies, the resolution of potentiometers and the linearity of amplifiers. Specifications and a schematic diagram are included. Southwestern Industrial Electronics Co., 10201 Westheimer, Houston 19, Texas. (ELECTRONIC TECHNICIAN B1-4)

RECTIFIERS: Illustrated bulletin #40 "Tube Replacement Silicon Rectifiers" provides a listing of types, replacements, electrical characteristics, pin connections and dimensions. Graphs of typical regulation curves are included. Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind. (ELECTRONIC TECHNICIAN B1-5)

TUBE TESTERS: A new dealer price list includes the firm's entire line of tube testers and merchandising aids. All products are illustrated to make it easy to connect the model numbers with the proper units. Vis-U-All Products Co., 640 Eastern Ave., S. E., Grand Rapids 6, Mich. (ELECTRONIC TECHNICIAN B1-6)

HOME LAUNDRY ACCESSORIES: The firm's new 1960, 76 page, Laundry Parts & Accessory Catalog includes charts and photographic illustrations for easy identification. All Philco-Bendix home laundry products are covered. Philco Corp., Accessory Division, "C" & Westmoreland Sts., Philadelphia 34, Pa. (ELECTRONIC TECHNICIAN B1-7)

NEW *
TV/FM with "Anti-Stub" Switch

ANTENNA OUTLETS

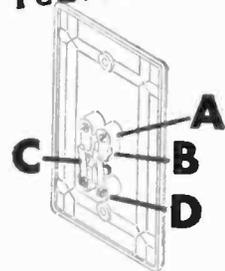


New Type FD-1PK MOSLEY TV & FM Outlet permits multiple antenna outlets to be wired in tandem without losses due to stub effect of unused line.

*When polarized plug is inserted, the silver-plated spring leaf switch opens the circuit beyond the outlet in use. Action is positive... fail-safe!

Type FD-1PK, complete with polarized plug and mounting brackets. List Price \$2.20

Exclusive Features!



- A. Strong one-piece molded construction!
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Available at your favorite parts distributor.

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Electronics, Inc.

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(Continued from page 22)

AEROVOX announces the grand award winner in the "Name This Cabinet" contest is **SOUTHWEST WHOLESALE RADIO INC.**, Phoenix, Arizona.

CLEAR BEAM announces the appointment of the following two rep firms: **BAATZ SALES CO.**, Ind. and Ky.; **LAWRENCE ZAFFINA CO.** Mich.

VIS-U-ALL PRODUCTS CO. announces the following rep appointment: **THOMAS SELBY SALES CO.**, Western Penna., and W.Va.

JULES J. BRESSLER CO., rep firm, serving metropolitan New York and northern N.J. accounts, has added **PAUL EPSTEIN** to the sales staff.

FRANK J. CAMPISANO & JAMES W. MURRAY, Cincinnati reps, have opened a new office in the Bel Rue Crest Center Bldg., Race Rd. and Harrison Ave.

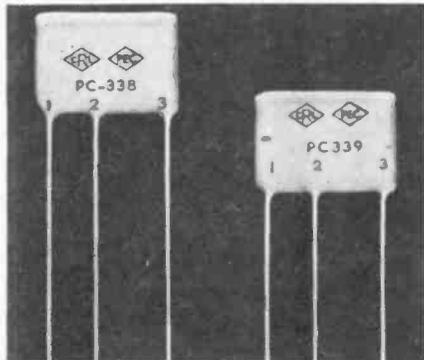
COMMUNITY ENGINEERING announces the appointment of the following two rep firms: **WILLIAM R. LEHMANN CO.**, Fla., Ala. and Ga.; **PHILIP NESBITT CO.**, Md., Dela., Va., Wash. D.C., lower N.J. and eastern Penna.

HOFFMAN ELECTRONICS reports the appointment of two distributors for the consumer products division: **STANDARD ELECTRIC SUPPLY**, eastern Wis. and northern Mich.; **PARAMOUNT RADIO SHOPS, INC.**, Neb. and Iowa.

BUCKEYE CHAPT. of **ERA** announced three new members: **J. R. DANMILLER** of **J. R. DANMILLER ASSOC.**, Cleveland, O., full membership; **BERNARD C. NEWMAN** of **F. A. DAUGHERTY CO.**, Cleveland, O. and **TODD HART** of **H. H. SEAY CO.**, Columbus, O., associate members.

Centralab CIRCUITS

Two sync time K networks have been added to the firm's line of PEC replacement packaged circuits. Identified as **PC-338** and **PC-339**, the units are

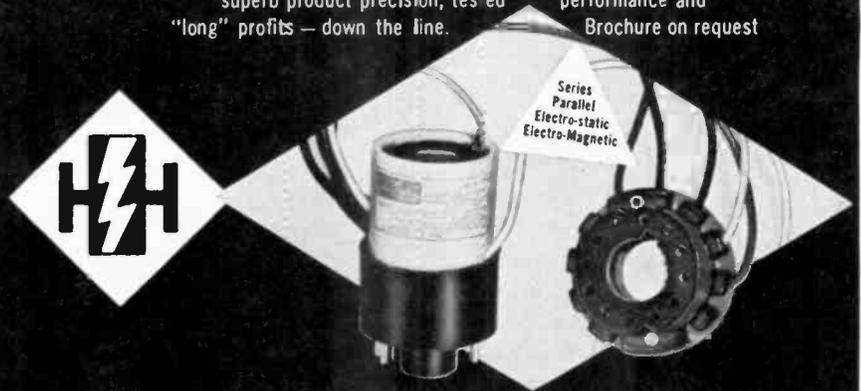


replacements for original equipment circuitry in over 500,000 RCA and Philco TV receivers. Centralab Div., Globe-Union, Inc., 900 E. Keefe Ave., Milwaukee 1, Wis. (ELECTRONIC TECHNICIAN 1-2)

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BOOSTER FOR EVERY USE!

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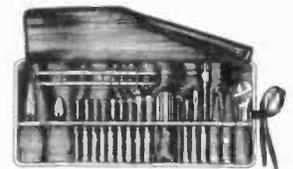
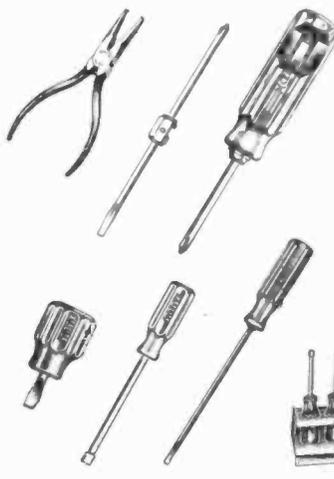
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No. 42H

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- Holds wires etc. while soldering.
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Victor J. Goss I. G. Tracy

WINNING SLOGAN:
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Outstanding
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Keep
Man-hours
At
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Submitted by
Mr. I. G. Tracy, Tracy Television Service, Tulsa, Oklahoma • First Prize, New Volkswagen equipped with Jackson Test Equipment.

S&S Radio Supply, Tulsa, Oklahoma (distributor for Tracy Television Service) Second Prize, New Volkswagen.

Victor J. Goss, Counterman at S&S Radio Supply whose name appeared on Mr. Tracy's entry: Third Prize, \$250 U. S. Savings Bond.

WORKMAN TV PRODUCTS, INC.
Sarasota, Florida

Test Pattern

(Continued from page 31)

distorted. I assumed the trouble to be in the video output circuit. With a VOM I checked all voltages here and they were within reasonable tolerance. Feeding an i-f signal into the 6AM8 (3rd i-f and video detector) while working back toward the tuner, appeared to produce an increasingly better picture. Turning the analyst to r-f and feeding a signal into the antenna terminals produced a good picture except that low frequency response appeared to be poor. Because of this I supposed the alignment was off and proceeded to

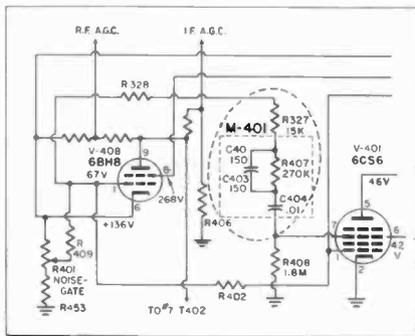


Fig. 2—A defective packaged sync-coupling unit caused pix tearing and rolling, but let analyzer's test pattern reproduce perfectly.

check it. It needed minor touch-up. Applying the analyst to the set again I now obtained an excellent pattern. I let the set run for a while—watching for tearing or rolling, but none appeared. It remained this way until the local station came on the air with the first commercial. Then all the tearing and rolling started again! Composite waveforms on the scope through the i-f section indicated no apparent faults up to the video detector plate. At the video amplifier grid, however, the signal appeared slightly distorted. About this time the commercial was over and the station test pattern came on. With the test pattern on, the signal at the video amplifier grid cleared up and the pattern did not pull, tear or roll!

With the VOM I again checked voltages on the sync board, including the gated agc, with the station pattern on. All voltages checked normal within 10% of manufacturer's specifications. When the next commercial came on I went back over the voltages and noted that grid #3 (pin 7) of the 6CS6, which previously read -10.2 v, now measured -5 v and other voltages on this tube had

changed some. At this point I was puzzled.

Varying the noise gate control had no effect on the picture! I checked it with a VOM and likewise R-453 in series with it to ground. Scope probing pin 1 and 7 of the 6CS6 showed considerable distortion of both vertical and horizontal sync signals.

I next began checking components in this area. All parts were checked except PEC's M401 and M402. Not having either, I proceeded to make up an M401 sync coupling couplate, illustrated in Fig. 2, from two condensers and one resistor from regular stock. After replacing the PEC with the improvised one, the set worked normal over a wide range of varying signal inputs.—Peter Fehr, Picture Butte, Alta., Canada.

Kupfrian POWER SUPPLIES

Two new low-cost converters, added to the firm's line of transistorized power supplies, are models CA-1263-12 and CA-12105-10. Input voltage for both units is 12.6VDC. Output characteristics are, respectively: voltage, 600/300VDC, 1,000/500VDC; current,



200/400ma, 100/200 ma; power, 120 watts, 100 watts. Efficiency often exceeds 80%. They have a steady d-c output with a ripple of 0.4% maximum. The units operate effectively from -55° C to +60° C. \$60.00. Kupfrian Mfg. Corp., 395 State St., Binghamton, N. Y. (ELECTRONIC TECHNICIAN 1-20)

Imperial TUBE TESTER

A new TV picture tube tester, which permits in-the-home testing, reads picture beam current, not just total cathode emission. It measures 2"x5"x2", weighs only one pound and will run a test in thirty seconds. The meter indicates 0-400 microamperes (in red), 400-600 microamperes (in yellow) with G₂ at 300 V and G₁ at 0 volts. All shorts and leaks over a megohm in resistance are detected. All standard types of tubes may be accommodated through use of adaptors for 110° tubes. Operating from its own power supply, it cannot harm the tube being tested. Imperial Electronics Sales, Inc., 250 Montgomery St., Shreveport, La. (ELECTRONIC TECHNICIAN 1-18)

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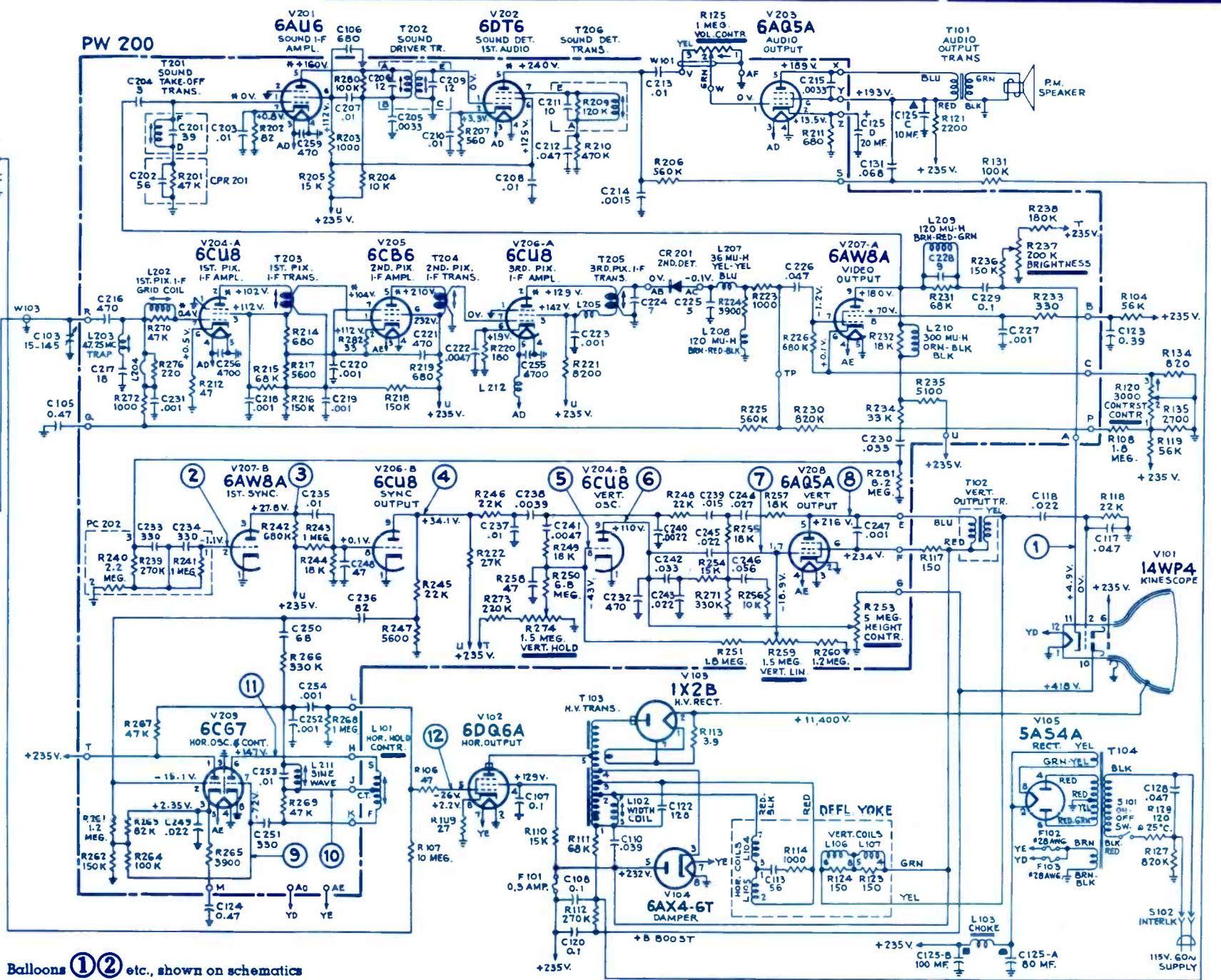
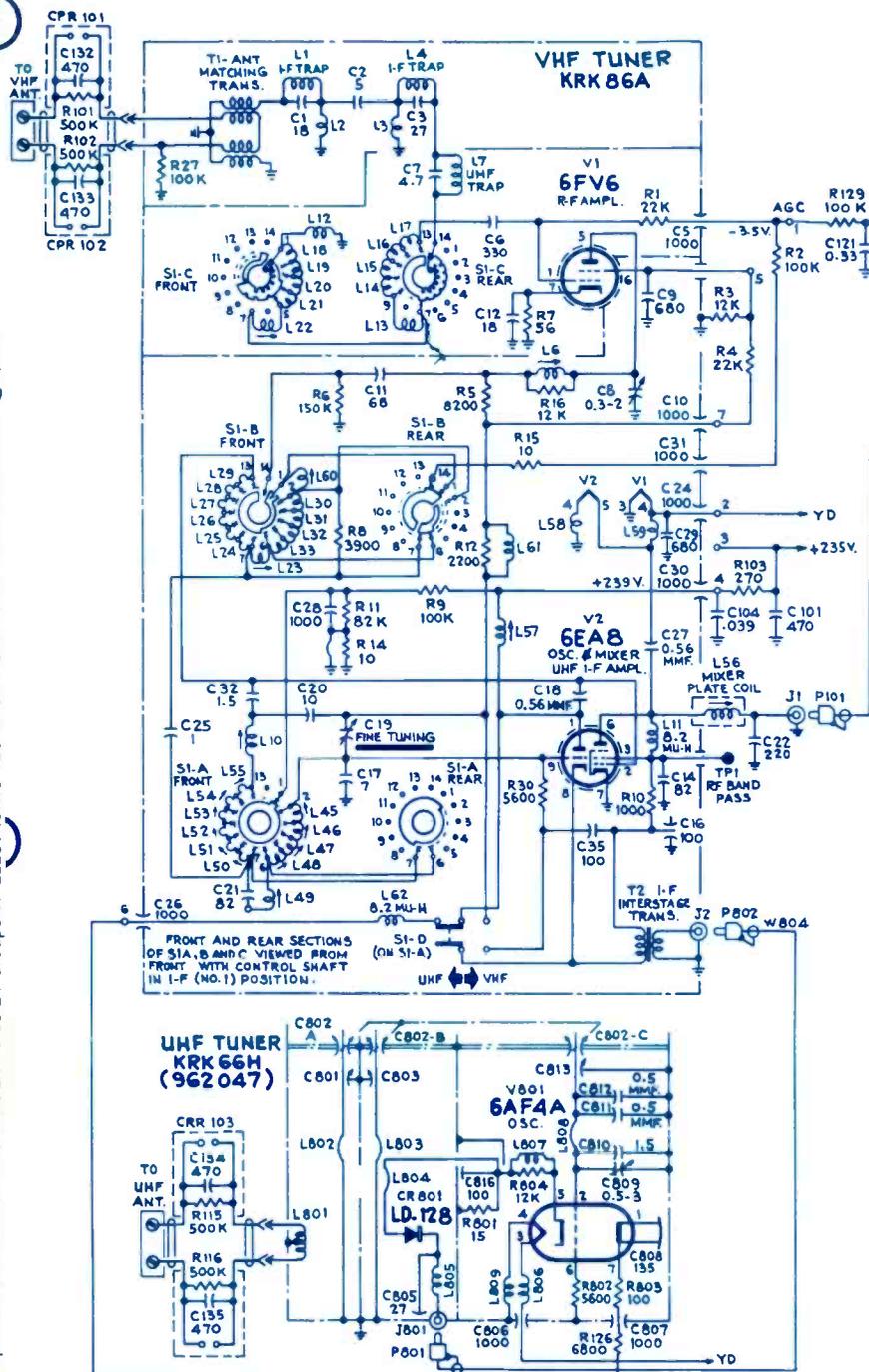
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TV Chassis
KCS120E, KCS120F
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All voltages measured with "Volt-Ohmyst" and with no signal input. Voltages should hold within $\pm 20\%$ with 117 v. a-c supply.

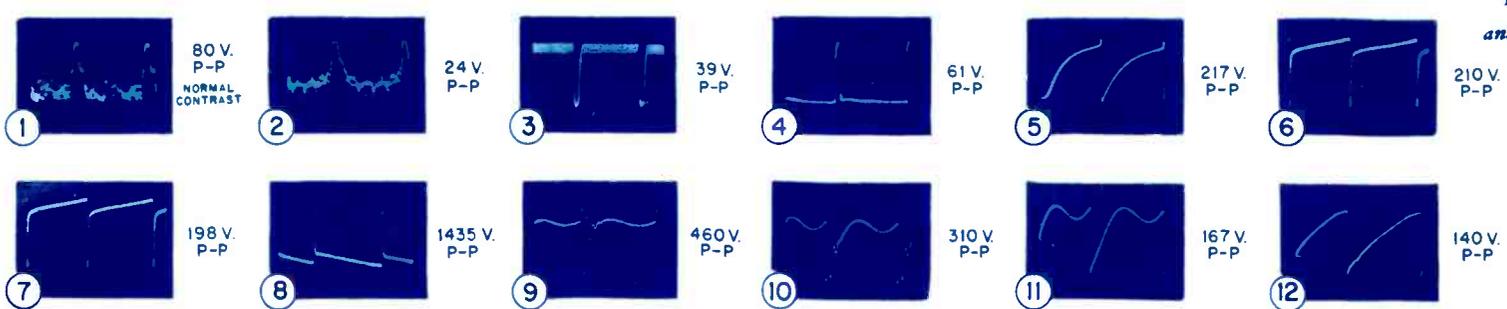
*Measured with 1 megohm, 1/2 watt resistor in series with meter probe.

January • 1960

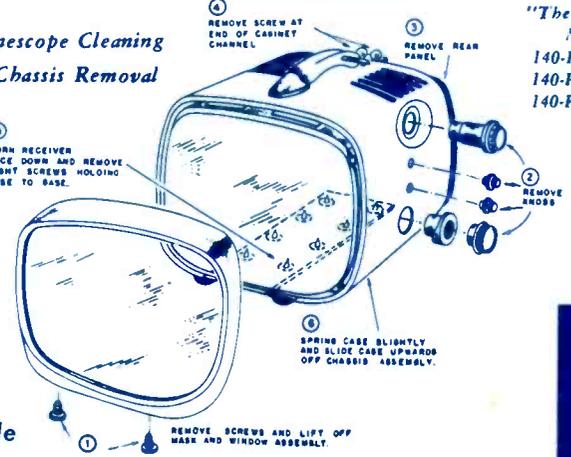
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Balloons ① ② etc., shown on schematics indicate points of observation of the waveforms shown



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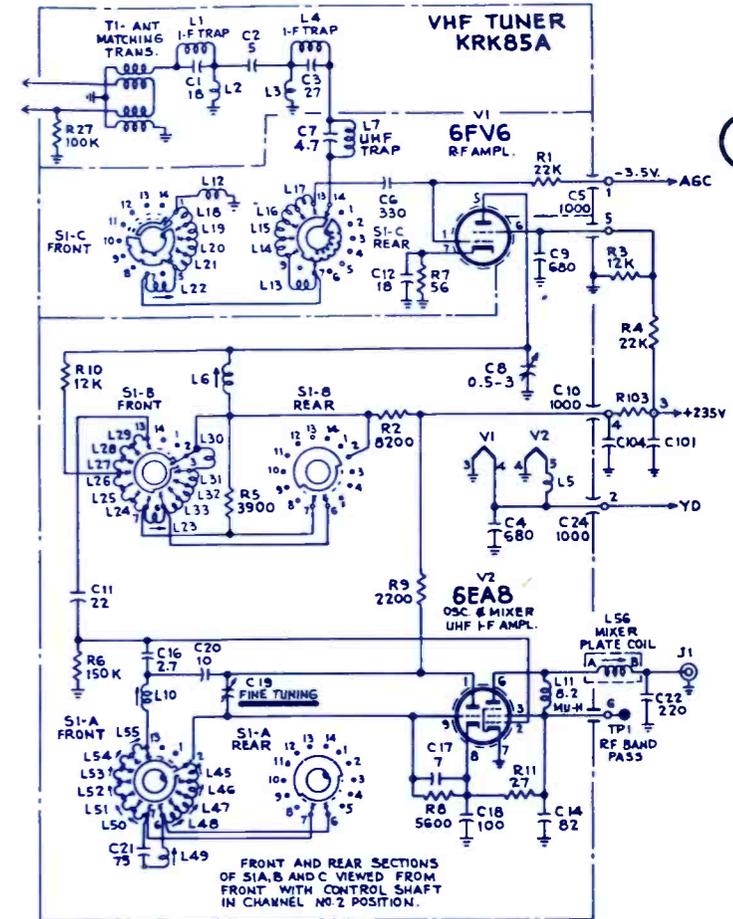
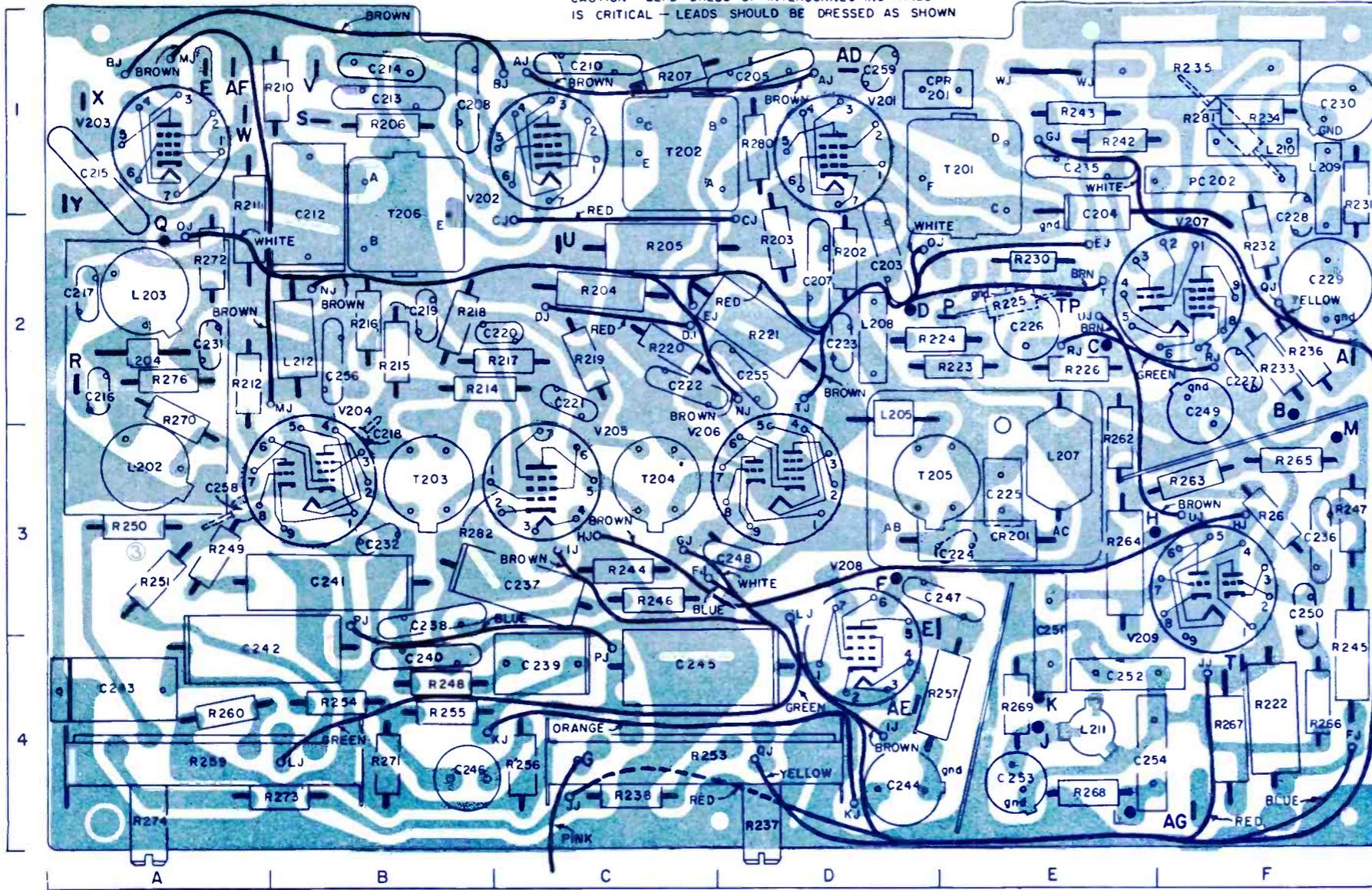


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CAUTION - LEAD DRESS OF INTERCONNECTING WIRES IS CRITICAL - LEADS SHOULD BE DRESSED AS SHOWN



KRK85A VHF TUNER SCHEMATIC FOR KCS120E CHASSIS

KCS120E & KCS120F SECURITY SEALED CIRCUIT

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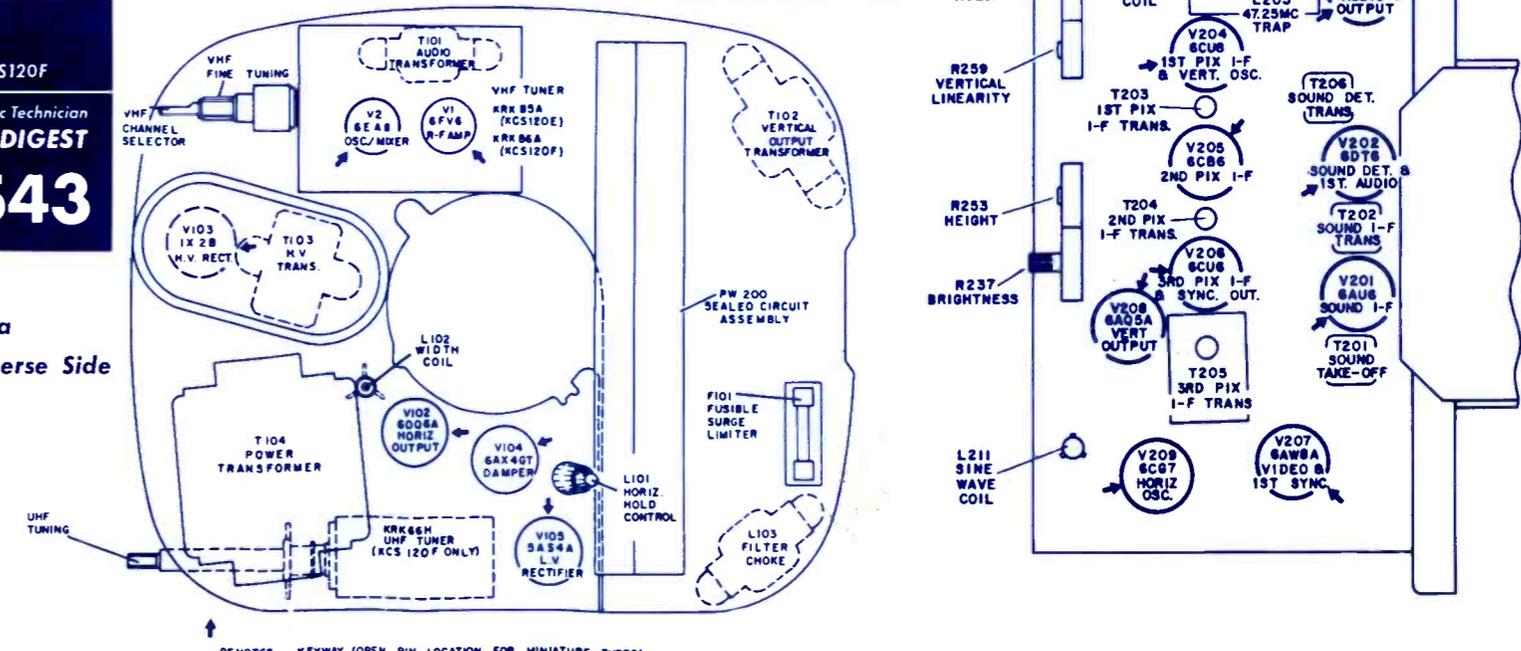
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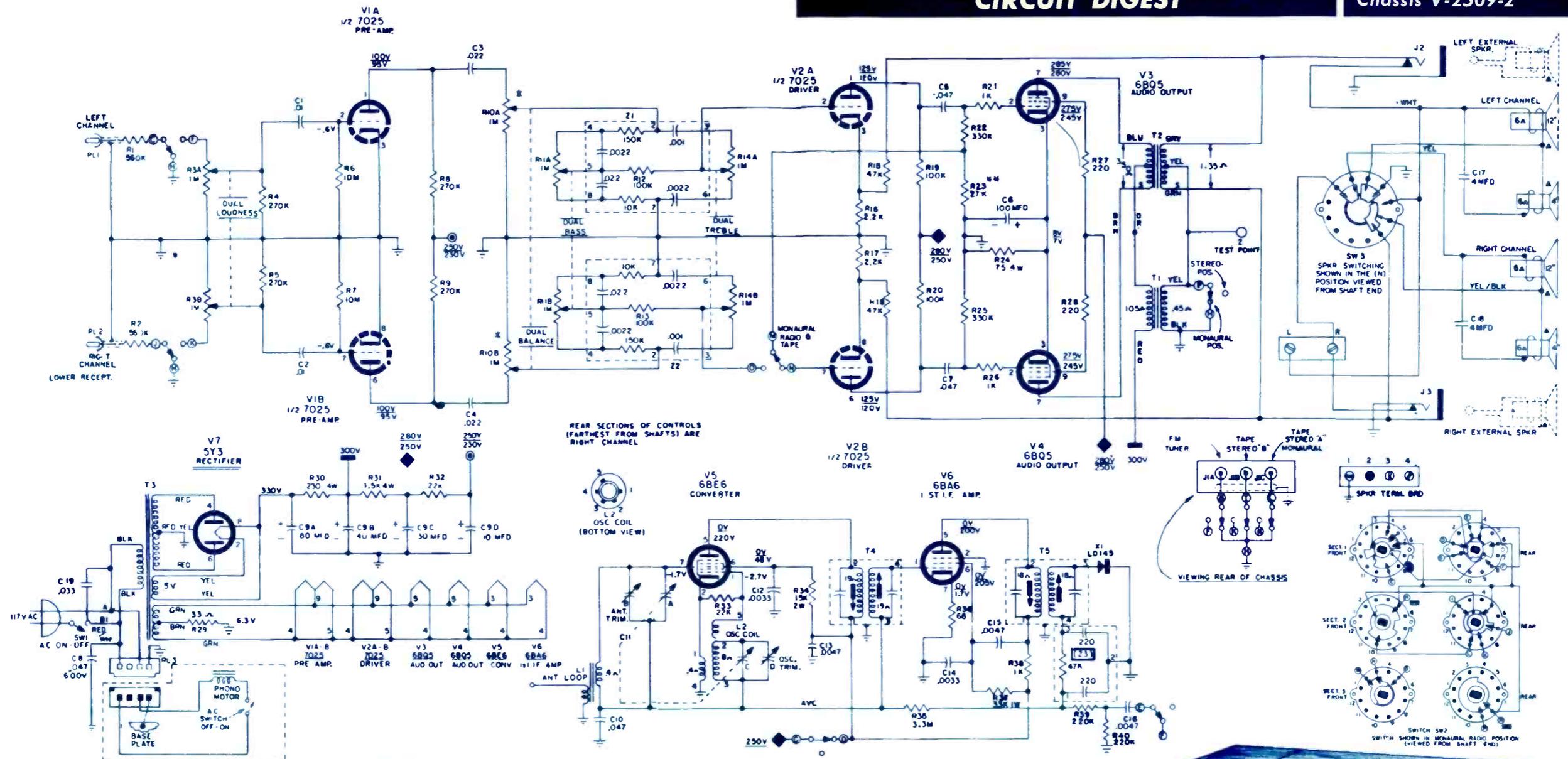
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CHASSIS REAR VIEW

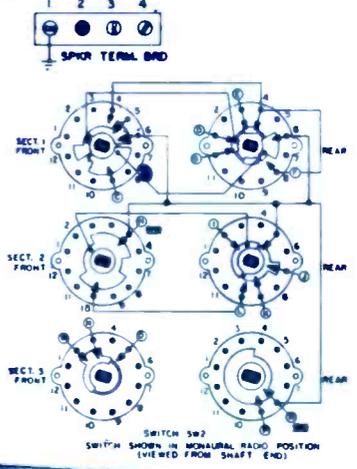




REAR SECTIONS OF CONTROLS (IF FARTHEST FROM SHAFTS) ARE RIGHT CHANNEL

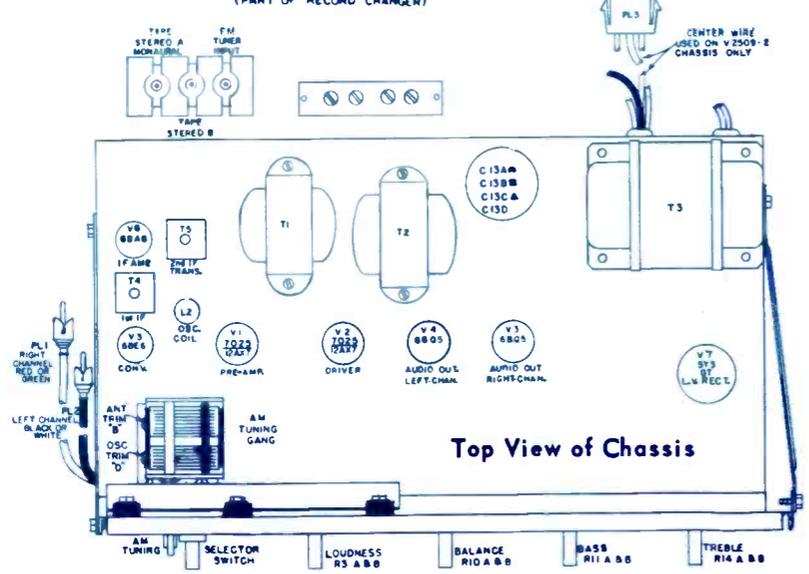


VIEWING REAR OF CHASSIS

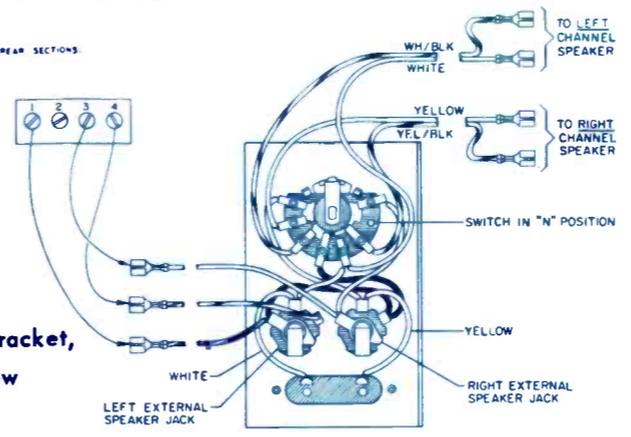


- NOTES
1. ALL CAPACITANCE VALUES IN MFD & ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.
 2. ALL VOLTAGES ARE MEASURED FROM POINTS INDICATED TO CHASSIS GROUND USING A VTVM. LINE VOLTAGE SET AT 117V. A.C., NO SIGNAL INPUT, LOUDNESS AT MINIMUM, TUNING CAPACITOR SET AT MAXIMUM.
 3. VOLTAGES SHOWN UNDERLINED ARE WITH SWITCH SW2 IN ALL POSITIONS EXCEPT RADIO.
 4. ALL REFERENCES TO LEFT AND RIGHT ARE AS VIEWED FACING FRONT OF SET.
 5. BY LOU LY PROD. 22K.

* R10 IS A SPECIAL CONTROL WITH OPPOSITE TAPERS ON FRONT AND REAR SECTIONS. WESTINGHOUSE REPLACEMENT PART #3277 BE USED.



Speaker Switching Bracket, Rear View



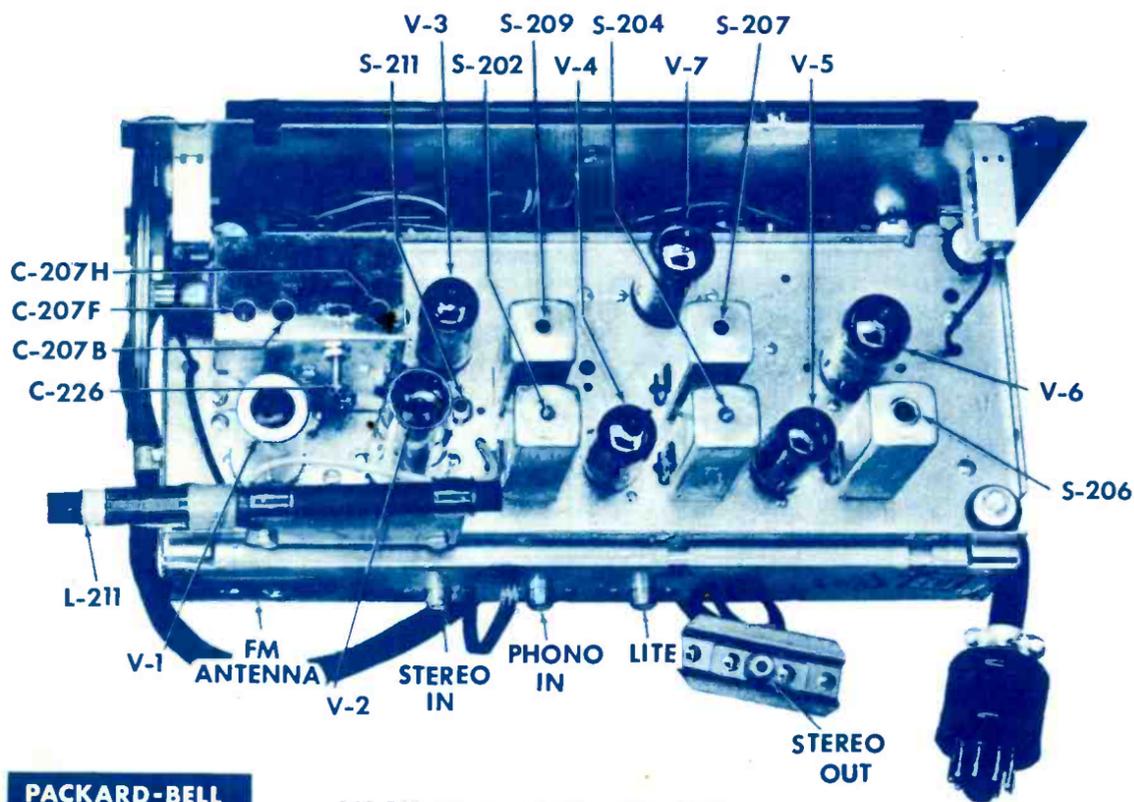
ELECTRONIC TECHNICIAN

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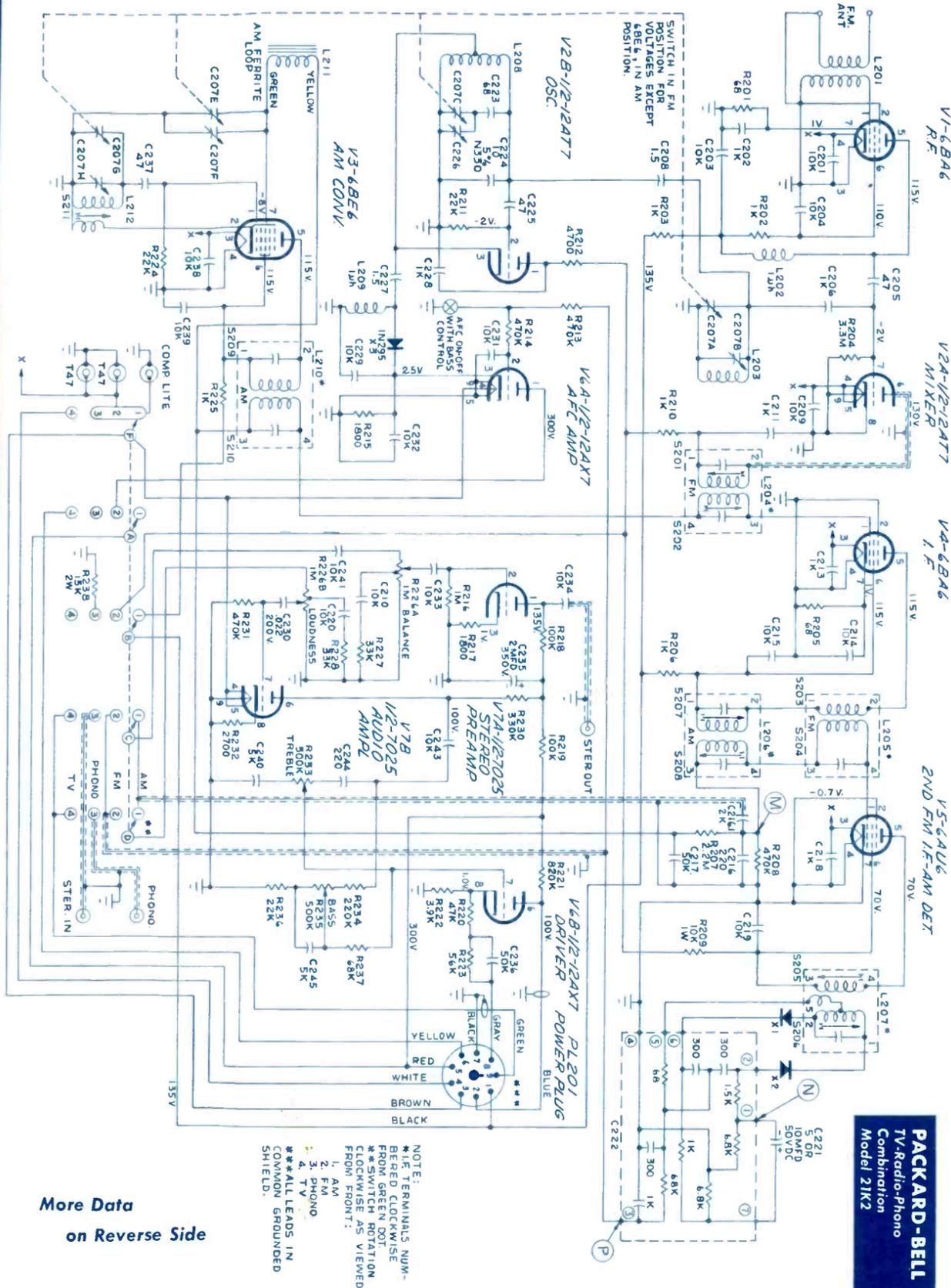


AM-FM Tuner 7TU3, Top View

PACKARD-BELL
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Model 21K2

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CIRCUIT DIGEST

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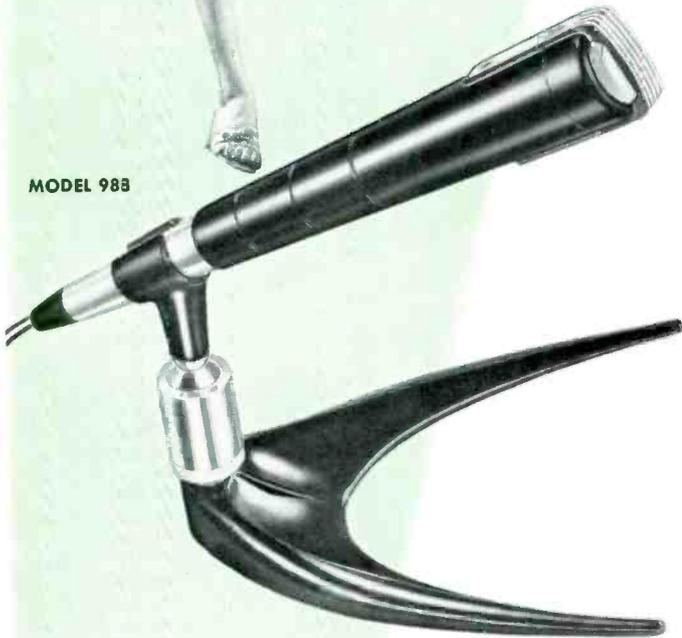
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FUTURA TRIPLETS...

three models... superbly styled... covering a wide range of applications

MODEL 988



ASTATIC'S FUTURA

SERIES DYNAMIC MICROPHONES

Most versatile performers in the microphone field are the Astatic Futura Series Dynamic Microphones—Models Metro 788, Tempo 888, and Vogue 988. Beautifully styled, encompassing the newest and most advanced principles in microphone engineering, each model is designed to outperform any other microphone in its price class.

Futura mikes are instantly convertible from hand to stand to lavalier use. offer many special features such as rugged, stable, fatigue-free Mylar diaphragm and, on the 888 and 988, the Cannon XLR-3 connector for instant detachment from cable ("Take the microphone to the cable.")

MODEL 888



MODEL 788



Model No.	Type	Response	Output	Impedance	Finish and Trim	Price
788	Omni-Directional	60-13,000 cps	-55 DB	Hi or 150	Black and Gold	\$ 79.50
888	Omni-Directional	50-15,000 cps	-56 DB	50, 200, Hi	Black and Chrome	110.00
988	Omni-Directional	40-20,000 cps	-58 DB	50, 150, 250	Black and Gold	150.00

NOTE — Exclusive Astatic impedance selector permits instant choice of impedance without special tools.

All three microphones come complete with lavalier and belt clip, 360° swivel adaptor for 3/8" #27 thread.

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FROM WHAT YOU HEAR

ASTATIC MICROPHONES ARE A SENSATION ON ANY INSTALLATION

REDUCE DAMPER TUBE CALLBACKS



Here are some important facts about damper circuits

In the *transformer-coupled* circuit, Figure 1, the damper cathode is connected to the "low" (Boost) side of the sweep-output circuit. The voltage difference between cathode and ground is usually less than about 600 volts.

In the *direct-drive* circuit, Figure 2, and in the *auto-transformer* circuits, Figures 3 and 4, the damper cathode is connected to a "high" point in the sweep-output circuit. The peak voltage difference between cathode and ground may be several thousand volts.

Because the damper cathode is "above ground" by several hundred to several thousand volts, care must be taken to prevent voltage breakdown between heater and cathode in the

damper tube. Two basic methods are used:

In one method, shown in Figures 1, 2, and 3, heater is connected to cathode. This connection eliminates voltage difference between heater and cathode, but it also makes the damper tube heater circuit "hot" with respect to ground. For this reason it is necessary to use a separate secondary winding on the power transformer just for the damper heater. This winding, and its connecting leads, must be insulated to withstand the peak voltage difference between cathode and ground.

In the circuits of Figures 1, 2, and 3, if the damper heater winding becomes grounded, or arcs to ground, high current will flow from B+ to ground through the damper tube, and the fuse will blow. Correction of this trouble usually requires costly and time-consuming replacement of the power transformer.

The second method, shown in Figure 4, takes advantage of the fact that modern damper tubes, such as the RCA-6AX4-GTA, 6AU4-GTA, and 6DE4, are designed to withstand high-amplitude positive pulse voltages between heater and cathode. These RCA

tubes make it possible to ground the damper heater circuit, and for this reason, the damper heater may be connected to the regular 6.3-volt-ac grounded-heater circuit, thus eliminating the need for an additional high-voltage-insulated secondary on the power transformer.

From a servicing viewpoint, the second method has definite advantages:

In the circuit of Figure 4, if the insulation between heater and cathode should break down, high current will flow from B+ to ground through the damper tube, and the fuse will blow, but the trouble can be corrected easily, quickly, and inexpensively by installing a new RCA damper tube. This is a lot easier and cheaper than installing a new power transformer!

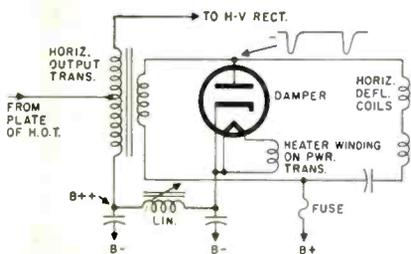


Figure 1. Transformer-coupled horizontal-output circuit. Note that the damper tube heater is connected to the cathode.

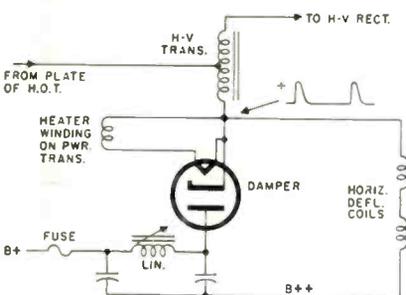


Figure 2. Direct-drive circuit. In some variations of this circuit, a capacitor is connected between heater and cathode in place of the direct connection. The capacitor serves to reduce the pulse-voltage difference between heater and cathode.

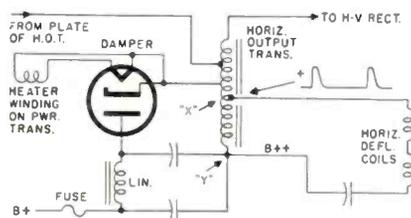


Figure 3. Auto-transformer circuit in which the damper tube heater is connected to the cathode. In some variations of this circuit, the heater is connected to a lower-voltage tap, "X" or "Y", in order to make the heater negative with respect to the cathode, and to reduce the shunting effect of the heater-circuit capacitance.

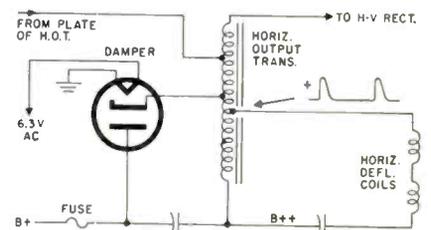


Figure 4. Modern auto-transformer circuit in which the damper tube heater is grounded. Tubes such as the RCA-6AX4-GTA, 6AU4-GTA, and 6DE4, which are designed to withstand high peak pulse voltage between heater and cathode, are required in this circuit.

Momentary arcing, or flashover, in a horizontal output tube or damper tube may be "self-correcting", that is, the flashover may not occur again. But the momentary flashover results in a heavy surge of current which will blow the conventional type of fuse. You can eliminate such unnecessary fuse failure by using RCA "chemical" fuses in the horizontal-output circuit. Three varieties, RCA Stock Nos. 104295, 105041, 105042, are available at your RCA distributor.

RCA damper tubes are designed to give long, dependable service—eliminate costly callbacks—prevent loss of your time and profits. Take for example the RCA-6DE4 and RCA-17DE4. These tubes can supply a peak plate current of 1100 milliamperes and withstand a heater-to-cathode potential of 5000 volts—with a 900-volt dc component! Assure your customers of this kind of performance by asking your distributor for RCA damper tubes.



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