

ELECTRONIC TECHNICIAN

Including 16 pages of
Circuit Digests

BUILDING AUDIO
LITERATURE
FILE
See page 40

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March • 1957

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Including
Circuit Digests

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MARCH, 1957

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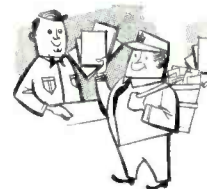


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FRONT COVER

It's easy to build your audio literature reference file. Service aids and technical bulletins covering home hi-fi, industrial paging and other audio opportunities may be obtained by filling in the request coupons starting on page 40. Your postman will deliver the manufacturers' literature requested.



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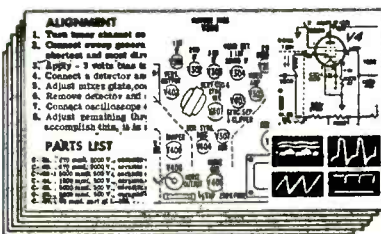
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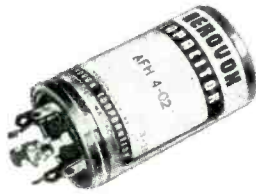
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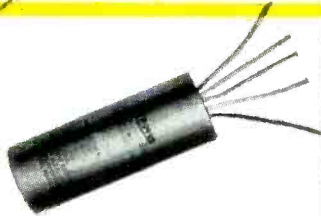
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LETTERS

To the Editor

Flat Rate Falls Flat?

Editor, **ELECTRONIC TECHNICIAN**:

Is the "RCA Service Flat Rate Plan" in your Jan. 1957 issue, page 50, editorial or advertising? Is this an indication of factory service rates? It is hard to believe that RCA Service Co. would furnish such precise information as to their proposals in the service business. Service departments surely could not present invoices for many of the operations noted in your feature without previously advising the set owner. It has been normal practice to perform many of the minor adjustments you listed, such as vertical height, linearity, etc., as routine. It may be correct to present an invoice covering each operation performed on a set repaired in the shop as a protection and limitation of set guarantee responsibility. Nevertheless, how could the serviceman prepare a bill based on each individual operation listed? It should be noted that no charge is listed for ringing the doorbell. Could you tell me the type of weapon needed to collect such in-the-home billing as you describe?

O. J. COOMBES

All Suburban TV Service
Park Ridge, Ill.

• *The article referred to is editorial material . . . and a bit of a scoop at that. As was stated in the article, this flat rate plan is strictly experimental, not an industry proposal. Our purpose in publishing it is to keep our readers fully informed. It should be noted that in other fields, such as auto repair, the flat rate manual for every make, model and part is widely used. Only time will tell whether such a plan is suitable for electronic repair.—Ed.*

Audio Franchise Response

Editor, **ELECTRONIC TECHNICIAN**:

To date we have received 71 inquiries expressing interest in Muzak franchises as a result of your article in the Nov. 1956 issue. As you know, we have 131 franchised distributors. Despite this wide coverage, 5 of the first 60 inquiries are in areas where Muzak franchises have not yet been established. We expect to complete franchise arrangements with 3 of these prospects in the next 60 days. We still have a limited number of reprints of your article, "Muzak: A Money Making Opportunity in Audio," which we will be happy to send to any of your readers who missed the Nov. issue. Many thanks for your very fine factual treatment of this story.

EDWARD HOCHHAUSER, JR.
Vice President

Muzak Corp.
229 Fourth Ave.
New York 3, N. Y.

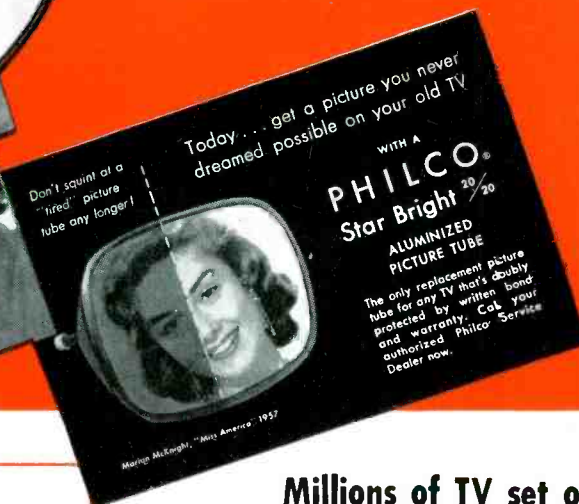
(Continued on page 4)

Mr. Service Dealer

Nationwide campaign breaks to bring you tremendous sales and profits on

PHILCO Star-Bright 20/20

ALUMINIZED PICTURE TUBES



Clearest, Most lifelike picture for any TV. And only Philco gives you this double edged selling tool

Philco Star-Bright 20/20 is the only picture tube that's BONDED to have all new picture making parts... plus full year replacement warranty. This offers double protection to your customers.

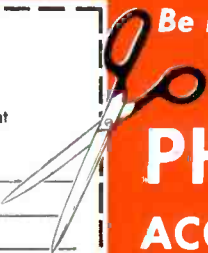
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PHILCO CORPORATION

ACCESSORY DIVISION PHILA. 34, PA.

ET-357

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(Continued from page 2)

Business Forms Source

Editor, ELECTRONIC TECHNICIAN:

Your article, "Build Customer Good Will," Jan. 1957 issue, showed TV service shop reports. Could you give us the address where we may order these forms?

FRANCIS A. HANDEL
Shaner & Handel Electric Co.
Savanna, Ill.

. . . I've been looking for such shop reports for a long time. They are too expensive to have them made up for us alone. Do you know a company that makes them in quantity at a reasonable price?

J. E. HALL
Cayce Radio & TV Service
Cayce, S. C.

• The shop reports, as well as many business forms and sales aids, are available from Oelrich Publications, 4308 N. Milwaukee Ave., Chicago 41, Ill.—Ed.

Servo Info Wanted

Editor, ELECTRONIC TECHNICIAN:

I am looking for good reference books covering servomechanism applications, something with little mathematics, but devoted to practical circuit arrangements. It should have many illustrations showing working setups. Can you help?

ROBERT S. COE
Manchester, Conn.

• Your best bet is the 2-volume "Basic Synchros and Servomechanisms" published by John F. Rider. It's available for \$5.50 for both volumes from your jobber.—Ed.

Against Part Timers

Editor, ELECTRONIC TECHNICIAN:

Those chiselers who get in after hours for the gravy boat knock off the easy jobs, but let go when the going is hard. One I followed charged \$8, and was at that house about 4 hours. He advised the lady to try a new set because he said hers was not repairable. A new filter, resistor and tube put it in first class shape.

DAVID V. CHAMBERS
Harrington, Del.

Circuit Digest Idea

Editor, ELECTRONIC TECHNICIAN:

As a suggestion, how would it be to print the Circuit Digest index on the lower right hand corner of the cover. This would make the schematics easier to locate when thumbing through the magazines.

EDGAR S. O'ROURKE
Ed's Television
Bear Lake, Mich.

• The suggestion is a good one, but there's many a dollar and many an hour that goes into the design of the cover, and such a listing might not fit in properly. Circuit Digests are conveniently listed each month on the bottom of page 1.—Ed.

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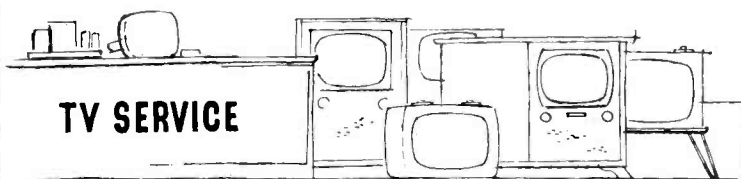
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To subscribe to this service, get in touch with the Hotpoint Distributor nearest you (listed at right). They're ready and anxious to serve you—discuss your problems, supply you with genuine parts, keep you up-to-date on Hotpoint TV. Call or write them today!

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(Distributor's City and State)

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ADDRESS _____

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Editor's Memo

Coming back from the recent Southwestern Electronic Conference in Galveston, I landed in New York's Idlewild Airport in the midst of one of the winter's worst snowstorms. Transportation out of the airport was almost impossible to find, and for several hours the crowd of stranded travelers shifted between near-panic and frustration.

I fell in with three other people, and before we knew it we were having a good time, laughing at the unexpected situation into which all of us were thrown.

The ability to see the humor of difficult situations can be a near life saver. Laughter is one of the unique human traits; animals may seem to laugh or smile, but they don't really. Humor helps you see yourself, to see life itself in a new and refreshing light.

Perhaps my outlook helps explain why *ELECTRONIC TECHNICIAN* always contains some cartoons directly related to electronic subject matter. Frankly, I can't understand why the editors of other servicing magazines keep their pages so bare of cartoons. C'mon brother editors, don't be a Grouchy Gus. Shell out. Give your readers a break. Cartoons don't take up much space.

What's funny to one man is murder to the next. Don't ask me what makes a cartoon funny. I've read psychological books on humor, and I still don't know. Thumbing through past copies of *ELECTRONIC TECHNICIAN*, I ran across several that gave me some extra pleasure. I'll describe some of them briefly, but since the cartoon is basically a sight gag, this word picture cannot really convey the humor.

March '56—Love courtesy the tools of the trade. Cartoon shows a tech carving a heart into a tree with his soldering iron.

May '56—Reliance on children. Tech asks youngster on house call to bring him tools from his truck. Yep, the kid comes back with wrench and jack.

May '56—Part number mixup. Tech at jobber calls shop to recheck transformer number. Component on counter is about 2 ft. high, probably rated 1000 kva.

July '56—Don't be so sure of yourself. Mountain climbers going up slope carry banner "First up Mt. Scrimshaw." Awaiting them on top are microwave techs setting up relay.

Oct. '56—Fear. Tech is using 2-ft. long probes since he got stung by 16 kv.

Dec. '56—The unexpected. Benchman is taken aback by TV pix showing up on scope, while trace is displayed on TV screen.

Dec. '56—Competition. Tech in tube-selling drug store invites druggist over to his shop where prescription department is being installed.

As you see, most of our cartoons have a point. And the point to exercising your sense of humor is that it will help you live happier . . . and longer.

Al Forman

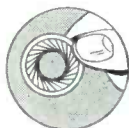
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**664 HIGH-FIDELITY
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Without a doubt, the Electro-Voice 664 cardioid is the world's finest P. A. and all-purpose cardioid. Its amazing versatility is the result of the unique E-V variable D design. The unidirectional, high-fidelity "664" provides highly directional sound selectivity, reduces pickup due to ambient noise and reverberation up to 50%. Proper placement of the 664 discriminates against unwanted sounds, gives accurate, natural pickup of voice and music . . . smooth, peak-free response at all frequencies from 60 to 13,000 cps, *no boominess* from close talking. The 664 so outdistances the field that we confidently guarantee it to **OUTPERFORM** any other P. A. cardioid . . . **OR YOUR MONEY BACK!**



Exclusive, indestructible Acoustalloy Diaphragm—a single moving element—withstands high humidity, temperature extremes, corrosive effects of salt air, and severe mechanical shocks. With the E-V "664" you are sure of dependable, long-life operation indoors and outdoors.

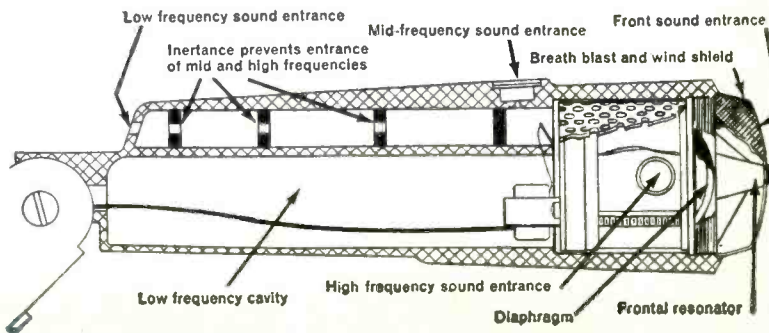


*E-V Pat. Pend.

Model 664. Variable D Super-Cardioid Dynamic Microphone. Uniform response at all frequencies from 60 to 13,000 cps. Output level, -55 db. 150 ohm and high impedance. Impedance changed by moving one connection in cable connector. Low impedance balanced to ground and phased. Acoustalloy diaphragm, shielded from dust and magnetic particles. Alnico V and Armo magnetic iron in non-welded circuit. Swivel permits aiming directly at sound source for most effective pick-up. Pressure cast case. $\frac{5}{8}$ "-27 thread. Satin chrome finish. 18 ft. cable with MC4M connector. On-Off switch. Size: $1\frac{1}{8}$ " diam., $7\frac{3}{16}$ " long not including stud. Net Weight: 1 lb., 10 oz. List (less stand) . . . \$82.50

1. **Model 419.** Desk Stand. Modern, sturdy design (extra). List Price \$10.00.
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Dealers Prove

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Anodizing Is Much More Than a Mere Beauty Treatment

The diamond-hard toughness of this anodized finish provides positive resistance against corrosion—prevents the Color 'Captor from ever turning black and ugly, and locks in, permanently, all the superb performance engineered into the Color 'Captor. You can sell this longer-life feature as a big advantage—and it makes real sales sense to your customers.

Second to None in Performance

A Winegard Antenna broke all long-distance reception records in 1956 (see Radio-Electronics Magazine, Jan. '57). Equipped with optional signal-boosting Power-Pack and patented "Electro-Lens"* focusing, the gold-anodized Color 'Captor is unbeatable for long-distance reception . . . and clear, watchable pictures. Black-and-White or color! If the Winegard Color 'Captor won't bring in a station you want to see . . . nothing will!



Free Display Creates Sales Boom!

Here's the display that has sold thousands of Color 'Captors for dealers all over the nation. By getting the beautiful gold Color 'Captors out where folks can see them . . . dealers are building antenna sales volume they never realized existed! In fact, many dealers report they are now making more money selling Winegard antennas than they are on TV sets!

Get Full Information Now!

Don't you think it's time you shared in the spectacular success of America's most-wanted TV antenna? The coupon below will bring you eye-opening details. Mail it today!



Winegard company

Dept. C3, 3000 Scotten Blvd., Burlington, Iowa

Name _____

Please rush me free 4-color descriptive literature on your gold-anodized Color 'Captor and information on display material.

I'm interested in the complete line of new 1957 Winegard antennas.

Company _____

Address _____

City _____

State _____

Gold Anodized

Winegard Color 'ceptor TV Antenna

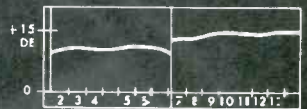
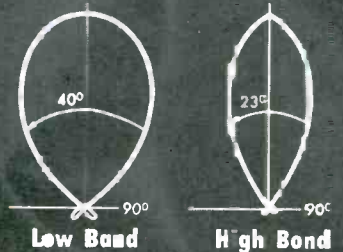
all 12 VHF Channel
Reception For Both
Black-and-White
and Color

Color so bright they sell on sight!

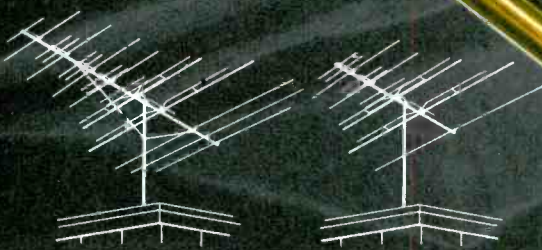
Note:

Each gold Color 'Captor you install helps sell another. Once folks see these bright gold antennas scouting up in their neighborhood, they won't be satisfied until they own the gold antenna, too!

Horizontal Directivity



Gain Chart
CL-4X with Power-Pack



Color 'Captor
Model CL-4X — \$44.90

Color 'Captor
Model CL-4 — \$29.95

If Color 'Captor won't bring in a station you want to see . . . nothing will!

Exclusive Color 'Captor features

- Completely non-corrosive gold-anodized finish.
- Power-Pack—up to 47.1% more sensitivity.
- Pat. "Electro-Lens"* - clearer pictures at greater distance.

Winegard Color 'Captors are consistently advertised in leading national magazines your customers read!



Winegard Co.

3000 Scotten Blvd., Burlington, Iowa
Cable Address: Western Union JRWCO

*Pat. No. 2,700,105 Copyright USA, 1957



"I'M WITH UNIVAC"

People sit up and take notice when you say you're with Univac.®

The mere mention of this world-famous organization sets you apart as someone interesting and important. And rightly so . . . for Univac engineers and technicians are involved in some of the most fascinating scientific work of all time. Their achievements in the field of automatic data processing and automation have revolutionized concepts of national defense, manufacturing, business procedures, communications and transportation.

The special pride you feel when you say "I'm with Univac" is just one of the satisfactions of a career with this world-leader in the field of electronic computers. Investigate the unusual opportunities offered by a career with Univac as a Field Location Engineer or Technician.

Immediate openings for: FIELD LOCATION ENGINEERS • FIELD LOCATION TECHNICIANS

Send complete resumé to:

Remington Rand Univac

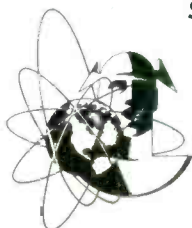
DIVISION OF SPERRY RAND CORPORATION

at any of these three plant locations

MR. D. A. BOWDOIN
Dept. MP-25
2300 W. Allegheny Ave.
Philadelphia, Pa.

MR. R. K. PATTERSON
Dept. MS-25
1902 W. Minnehaha Ave.
St. Paul W4, Minn.

ROBERT MARTIN
Dept. MN-25
Wilson Avenue
South Norwalk, Conn.





Is a Degree Essential for an Electronic Engineering Career?



"Student" Fred Gunther in the IBM school

Fred Gunther has no degree. Yet, today, at IBM, Fred is a Computer Systems Engineer on America's biggest electronics project. His story is significant to every technician who feels that lack of formal training is blocking his road to the top.

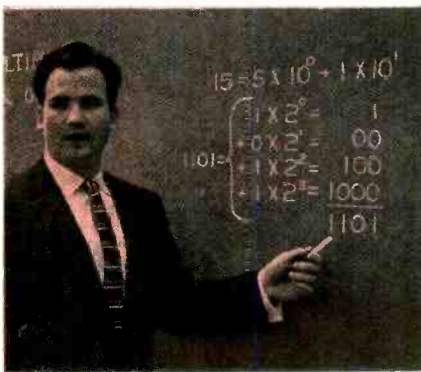
Let's go back to 1950 and watch Fred Gunther, at 18, as he goes about the business of determining his life's work. Fred spent almost a year interviewing with prospective employers. Then, perhaps due to the fact that his high school background didn't prepare him for work in an area of his interest, he entered the Navy for a four-year hitch.

Fred learned something very valuable in the Service, as have many other men who eventually discover the electronics field. His aptitude tests revealed him as an excellent electronics prospect, and he received ten months' training in electronics fundamentals and radar. Upon his discharge in 1955, he was an Electronics Technician, First Class.

Something even more important to Fred's career occurred during his Service hitch. He began to hear such terms as "automation". . . "data processing" . . . "electronic computer." "Then, one evening, while glancing through the paper," he recalls, "I spotted a story about *Project SAGE*."

What is Project SAGE?

SAGE means Semi-Automatic Ground Environment. It is America's giant radar system—a chain of defense that will ultimately ring our country's entire perimeter. Heart of this system is the electronic computers, which digest data filtered in from Texas towers, picket ships, reconnaissance planes, ground observers. The computers analyze this information for action by the Strategic Air Command and other defense units. These computers are the largest in the world. Each contains perhaps a million parts—occupies an entire city block. They are built for the Project by IBM.



Answering instructor's questions

Fred joins IBM

SAGE fascinated Fred, for it embodies the most advanced electronic concepts. And, when he learned that IBM would train him for six months, at full salary, plus a living allowance, to become a *Computer Units Field Engineer*, he seized the opportunity. Fred started his new electronics career in the IBM school, with twenty other technicians. He attended classes 8 hours a day. Courses consisted of some 20 subjects—computer circuitry and units, maintenance techniques—everything he would need to become a full-fledged *Computer Units Field Engineer*.

Assigned to McGuire AFB

His six months' training completed, Fred was assigned in May, 1956, to McGuire Field, where the first of the giant SAGE computers is located. Here he supervised the cable installation for this vastly complicated electronic giant. He helped to set up the computer, interconnect its many sections, check it out and make it ready for operation. Fred spent five months

at McGuire, but his education was not yet completed.

Becoming a Computer Systems Engineer

"I like to think it was due to my interest and grade of work," Fred says, "but at any rate, last November I was invited to return to Kingston for further training—to become, in fact, a *Computer Systems Engineer*. Naturally, I was proud and pleased, for this training would give me a much greater range of understanding . . . make me more valuable to the company and myself . . . and give me a chance to assume actual engineering responsibility." Fred is once more



at the operating console of the computer

putting in a full 8-hour training day—both classroom and lab. By the time you read this message, he will have completed his new education and be ready for assignment as a *Computer Systems Engineer* to an area of his choice.

What does the future hold?

"First off, I'll probably go back to McGuire," Fred says. "My home is nearby and there's still a vast amount of work to be done at this computer site. The future? It's hard to even set a goal in a field as rapidly moving as this, but with my IBM training back of me, the future sure looks good. I've advanced from radar technician to *Computer Systems Engineer* in sixteen months—and received a valuable electronics education besides!"

How about YOU?

Since Fred Gunther joined IBM Military Products and the Project SAGE program, opportunities are more promising than ever. This long-range program is destined for increasing national importance, and IBM

will invest thousands of dollars in the right men to insure its success.

If you have 2 years' technical schooling—or equivalent experience—IBM will train you for 6 months as a *Computer Units Field Engineer*.

If IBM considers your experience equivalent to an E.E., M.E., or Physics degree, you'll receive 8 months' training as a *Computer Systems Engineer*.

After training, you will be assigned to an area of your choice within the United States. You receive salary, not wages, plus overtime pay. In addition, every channel of advancement in the entire company is open,



Home to the family, Pemberton, N. J.

and IBM is a leader in a field that is sky-rocketing in growth. And, of course, you receive the famous IBM company-paid benefits that set standards for industry.

WHY NOT WRITE—today—to Nelson O. Heyer, Room 9403, IBM Corp., Kingston, N. Y.? You'll receive a prompt reply. Personal interviews arranged in all areas of the United States if your résumé of experience and education indicates you have the qualifications.

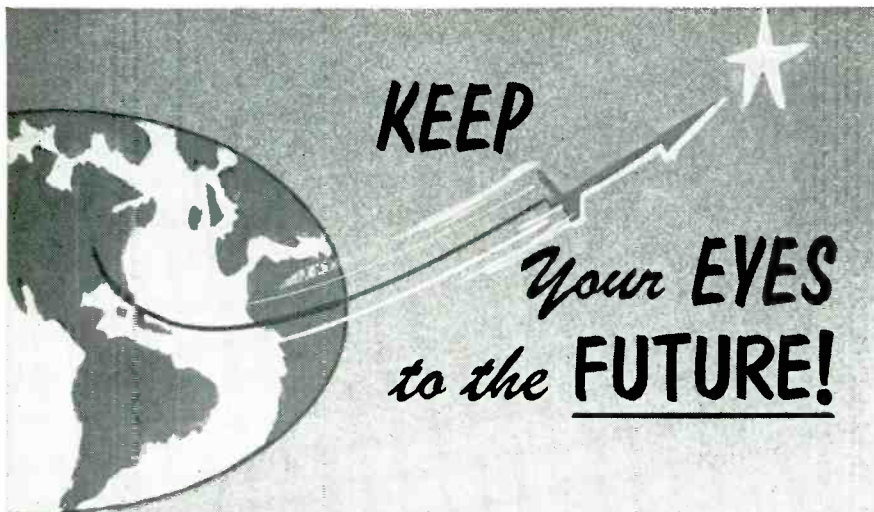
CUSTOMER ENGINEERS: Opportunities are also available, locally, for servicing IBM machines, after training with pay.

Be sure to visit the IBM booth at the I.R.E. Show, March 18 through 21.

IBM

**MILITARY
PRODUCTS**

- DATA PROCESSING
- ELECTRIC TYPEWRITERS
- TIME EQUIPMENT
- MILITARY PRODUCTS



KEEP
Your EYES
to the FUTURE!

Do YOU Know

... the field of ELECTRONICS is the most advanced and fastest growing in the world, offering the largest range of jobs for technicians and engineers in history?

Do YOU Know

... PHILCO TechRep is the world's largest Field Service organization and because of this leadership can offer you—

- unlimited advancement
- opportunity to work any place in the world
- experience in the most advanced fields of electronics and guided missiles
- personal security, real challenge, top salary and compensation for your skills

Do YOU Know

- Philco electronic experts help prepare you for your TechRep Service career
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Do YOU Know

... Philco not only will help you select the position in Electronics best suited to you but can and will provide you with periodic reports as to the openings in our world-wide organization for which you may be qualified.

Get The FACTS About Your Future With Philco:

Send Now to Dept. 18C

for The Complete Story on What Makes The Philco TechRep Division —

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PHILCO TECHREP DIVISION
22nd & LEHIGH AVE., PHILADELPHIA 32, PA.

EMPLOYMENT OPPORTUNITIES

for electronic technicians

For further information about employment openings, write directly to address noted in advertisement, or to:

Personnel Dept.

ELECTRONIC TECHNICIAN

480 Lexington Avenue

New York 17, N.Y.

Positions Wanted

OWNER of TV repair shop seeks position with broad learning potential. Graduate of DeForest Technical Inst. and junior college. In radio since 1940, TV since 1951. Age 47. Paul Ponder, Iberia, Mo.

ELECTRONIC-RADAR troubleshooter, 2 years electronic school, 1 year radar school, presently working for electronic equipment installation firm. Will relocate. Salary \$85-\$90. Age 28, married. Sam Needleman, 1457 45th St., Brooklyn 19, N.Y.

ELECTRONIC TECHNICIAN, self employed, radio repair since 1933, TV servicing since 1952, desires location in Calif. or Fla. Salary \$6000 per annum. Trained in accounting and sales. Age 68, married. Orville E. Hartford, 38 Woodward Ave., Quincy 69, Mass.

ELECTRONIC SPECIALIST with chemical experience, 4 years college, graduate National Radio Inst., owns service business, seeks opportunity. Salary \$475 monthly. Will relocate. Age 39, married. Stanley D. Wickham, 319 Elmwood Terrace, Linden, N.J.

SERVICE MANAGER with 5 years commercial electronic and industrial control experience seeks new position. Will relocate, prefer South or West Coast. Age 22, single. Ken Stephenson, 2013 Davidson Pl., Whiting, Ind.

SERVICEMAN with set repair experience since 1936 seeks position. Will relocate. Salary \$90. Single. Peter Shavel, 332 Maujer St., Brooklyn 6, N.Y.

ELECTRONIC LAB technician for 3 years, plus 5 years as installer, benchman and service manager, seeks work in lab, TV bench, broadcast or instruction. Graduate of National Radio Inst. and DeForest Training. Will relocate N. Miami. Salary \$100. Age 31, single. Box E301, ELECTRONIC TECHNICIAN.

SELF-EMPLOYED TV technician with 7 years radio, TV and audio experience, plus 2 years Army 2-way radio is interested in industrial electronics. DeForest course, now enrolled in Cleveland Inst. of Radio Electronics communications course. Will relocate to warm area. Gordon E. Van Allen, 794 Center St., Ashtabula, Ohio.

SERVICE SHOP owner with 8 years radio-TV servicing experience. Air Force radio school, National Radio Inst. graduate, seeks opportunity. Will relocate. Age 33, married. Kenneth C. Ritchison, Elysian, Minn.

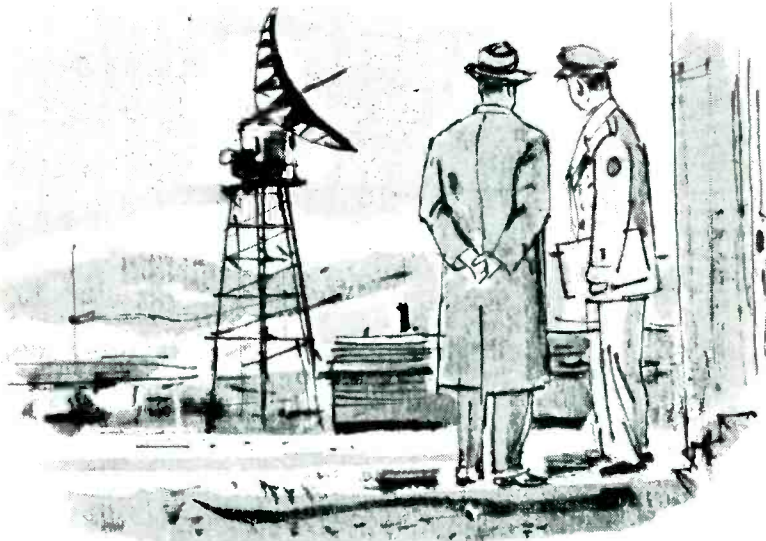
ELECTRONIC TECHNICIAN with 18 years of installation and servicing seeks advancement. location in Southern community. National Radio Inst. graduate. Age 43, married. Box E302, ELECTRONIC TECHNICIAN.

(Continued on page 16)

FROM RCA SERVICE COMPANY:

DOUBLE challenge for alert technicians . . .

- 1** Serve your own future best
- 2** Serve your nation's future, too



Double challenge brightens your future as an RCA technician. First, the challenge of RCA's projects, ranking high on the roster of military defenses. There's the attraction, too, of work far out on electronics horizons, with never a routine rut. At RCA, your sense of accomplishment receives every satisfaction, every reward.

Seven fields of technical work open at RCA . . .

Instructing—Field Engineering—Equipment Maintenance—Equipment Installation—Test and Repair—Technical Writing—Factory Field Support.

Many locations to choose with RCA . . .

You may choose work with RCA at Alexandria, Va.; Cocoa Beach, Fla.; Cherry Hill, N.J.; or Tucson, Ariz.

Talk to RCA Engineering Management in Person!

Will an RCA representative be near *you* in the next 60 days?

Here is our partial schedule . . .

To arrange confidential interview when we are in one of the listed cities—or in a mutually-convenient area—send your resume, today, to:

Mr. James Bell
Employment Manager
Dept. Y-14C
RCA Service Company, Inc.
Cherry Hill, Camden 8, N.J.

March 18, 19—Milwaukee
March 20, 21—Ft. Worth
March 23, 24—St. Louis
March 25, 26—Kansas City
March 28, 29—Chicago
April 1, 2—Denver
April 5—Salt Lake City
April 8, 9—Columbus
April 10—Winston-Salem
April 11, 12—Detroit
April 13, 14—Dallas
April 17, 18—Atlanta



RCA SERVICE COMPANY, INC.

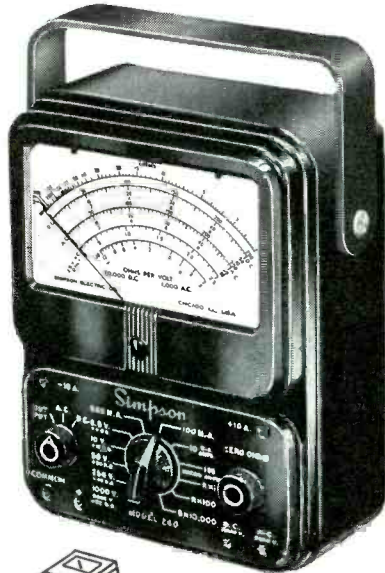
Simpson...the most Complete Line of VOM's

Select the one that fits your needs!

MODEL
260
world's most popular!

Over half a million Model 260's have been sold to date! 20,000 Ohms per volt. You'll find it wherever quick, accurate, electrical checks are needed. It's so handy, so dependable, so sensibly priced! Ask your jobber. Price, including Adjust-A-Vue Handle, only ... **\$43.95**

Carrying Cases from **\$7.75**



MODEL **262**

Deluxe!



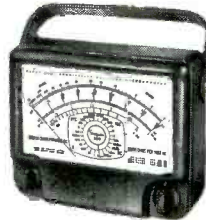
the new VOM with a 7" meter

20,000 Ohms per volt DC and 5,000 Ohms per volt AC sensitivity ... 33 ranges ... compact 7" case with Adjust-A-Vue Handle ... **\$59.50**

Carrying Case ... **\$ 9.95**

MODEL **269**

100,000 Ohms per volt!



Most sensitive VOM

available! A Volt-Ohm-Microammeter with a big 7" meter in a compact 7" case ... 33 ranges ... Adjust-A-Vue Handle ... price complete ... **\$88.00**

Carrying Case ... **\$ 9.95**

NEW!

- ▶ **MIDGETESTER** Model 355—New shirt-pocket size Volt-Ohmmeter **\$34.95**
- MODEL 240**—Small VOM; 14 ranges; up to 3000 volts AC or DC **\$28.95**
- MODEL 230**—Small VOM; 12 ranges; up to 1000 volts AC or DC **\$27.95**
- ROTO RANGER** Model 221—25 Separate meters at turn of a switch **\$75.00**
- LABORATORY STANDARD**—For instrument calibration. Price on application.

Simpson ELECTRIC COMPANY
World's Largest Manufacturer of Electronic Test Equipment

5200 W. Kinzie St., Chicago 44, Ill. • ESTebrook 9-1121
In Canada: Bach-Simpson, Ltd., London, Ontario

(Continued from page 14)

TECHNICIAN with three years of factory auto radio and one year radio-TV servicing seeks location in Southeast, will relocate. Kenneth B. Rector, 11458 Rivard St., Van Dyke, Mich.

RADIO-TV technician now studying industrial electronics and communications seeks opportunity in field. Salary \$75. Location Manhattan or Long Island, N.Y. Age 28, married. Ernest Grandville, 154-40 59th Ave., Flushing, N.Y.

ELECTRONIC TECHNICIAN will graduate Temple U. in June 1957 with Associate's Degree in Electronics Technology. Industrial electronic and military electronic repair experience. Will relocate. Burton Cohen, 1030 Howell St., Philadelphia, Pa.

SERVICEMAN with Armed Forces communications training, 1 year Coyne School, now in National Schools advanced TV-electronic course, has been in radio-TV repair since 1948. First class radio-telephone license. Wishes to locate in S. Calif. Age 32, married. Box E303, **ELECTRONIC TECHNICIAN**.

RADIO repairman, 5 months with TV firm, attended New York Technical School, radio-TV course. Wishes to locate in metropolitan N.Y.-N.J. area. Salary \$50. Age 27, single. William Heinsman, 1516 Broadway, Brooklyn 21, N.Y.

PROPRIETOR of TV-radio service operation for 5 years seeks position in Northeast. Will consider buying service shop. Age 29, married. Box E304, **ELECTRONIC TECHNICIAN**.

ELECTRONIC TECHNICIAN graduating Northwestern Television & Electronics Inst. with 2250 hrs. credit has first class radio-telephone license with radar indorsement. Employed by top mfr. Seeks position in Phoenix, Ariz., area. Delos W. Standen, 3641 21st Ave. S., Minneapolis, Minn.

ELECTRONIC EXECUTIVE, 17 years in industry, presently Education Director of Canadian electronic-TV school, formerly Crosley service manager, GE TV specialist, radar technician and asst. chief engineer of radio station. Seeks position in Los Angeles area. Salary \$600-\$750 monthly. Age 32. John H. Turner, 2029 9th Ave., New Westminster, B.C., Canada.

RADIO-TV serviceman, 30 years experience in field, familiar all brands, has complete test setup. Wishes to relocate in Pittsburgh. J. W. Landon, Wayne, W. Va.

SELF-EMPLOYED electronic technician, 3 years Temple U. Technical School, 7 years own service company working on radio-TV-audio. Wish to relocate in Miami, Fla., or Calif. Salary \$90-\$100. Age 32, married. Arthur C. Coroniti, 3452 Emerald St., Philadelphia 34, Pa.

SERVICEMAN with 5 years experience, training at Radio Electronic Television Schools, operating part-time shop for 2 years. Seek opportunity anywhere, but prefer South. Salary over \$250 monthly. Age 26, married. Gene Davidson, 14320 Wellealey, Dearborn, Mich.

TECHNICIAN graduated from National Radio Inst. in 1946, active part time, seeks full time connection in Detroit area. Steve Wotyniak, 19439 Albany Ave., Detroit 34, Mich.

RADIO-TV repairman, 4 years experience, graduate National Schools. Interested in electronic work in Calif. Milton H. Keller, 2106 33rd St., Two Rivers, Wis.

INDUSTRIAL ELECTRONIC technician rated master tech in present TV bench position seeks opportunity in electronic controls, motors, warning devices, etc. ITI industrial electronic graduate. 6 years TV experience. Have test equipment. Prefer firm maintaining own gear. Box E305, **ELECTRONIC TECHNICIAN**.

HOW TO OBTAIN YOUR FREE LISTING

Simply write to the Personnel Dept., **ELECTRONIC TECHNICIAN**,

(Continued on page 24)

IN GLAMOROUS NEW YORK CITY—ALL EXPENSES PAID PLUS \$100 CASH

WIN A WEEKEND AT THE WALDORF FOR 2

IN THE PYRAMID TWIST-MOUNT CAPACITOR CONTEST

TOTAL—147 WONDERFUL PRIZES—PLUS A PRIZE TO EVERY ENTRANT . . . SERVICEMEN, ENTER NOW! YOU CAN'T LOSE!

IT'S EASY TO WIN ANY ONE OF THESE WONDERFUL PRIZES:

GRAND PRIZE: Weekend at New York's fabulous Waldorf Astoria Hotel for 2, guest of Pyramid. Air transportation from your home to New York and return. Weekend of entertainment including a visit to the famous Gaslight Club, dinner at the Waldorf's Starlight Roof, and breakfast at the Waldorf. Air transportation by CAPITAL Airlines Viscount.

1st PRIZE: One 4-drawer steel file cabinet plus your choice of 50 sets of PHOTOFAC folders. Value: \$120.45.

FIVE 2nd PRIZES: 5 CR-30 PRECISION Cathode Ray Tube Testers. dlr. net \$109 ea.

TEN 3rd PRIZES: 10 CRA-2 PYRAMID Capacitor-Resistor Analyzers. dlr. net \$92.50 ea.

TWO 4th PRIZES: 2 SW-54 NATIONAL Short Wave Receivers. dlr. net \$59.95 ea.

TEN 5th PRIZES: 10 JENSEN professional speaker units consisting of a D-30 lifetime driver unit and RT-20 rectangular horn. dlr. net \$44.40 per set.

FIFTEEN 6th PRIZES: 15 TW CHANNEL MASTER 7 element "traveling wave" TV antennas, Model 350. dlr. net \$33 ea.

EIGHTEEN 7th PRIZES: 18 PYRAMID Pyra-Pak kits consisting of \$69.95 in Pyramid capacitors, metal tool box and tool kit. dlr. net \$29.95.

THIRTY-FIVE 8th PRIZES: 35 PYRAMID gift certificates entitling you to \$10. (dlr. net) of Pyramid capacitors at your distributor.

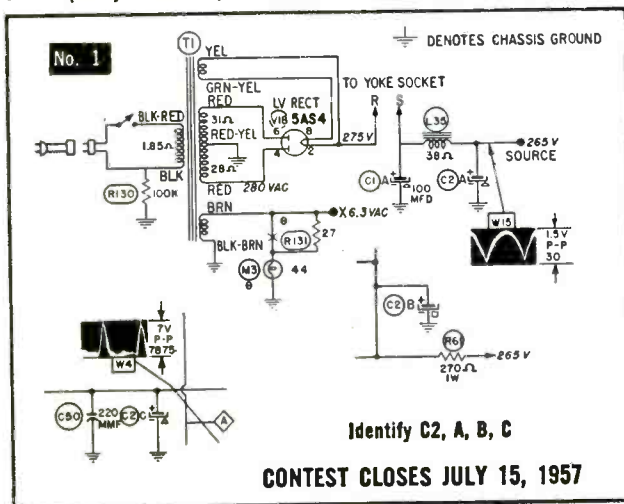
9th PRIZE: WALCO twin-point diamond phono needle. dlr. net \$30. For G.E. Var. Rel. Cartridge.

FIFTY 10th PRIZES: 50 WALCO needles for G.E. twin-point sapphires. \$3.50 dlr. net.

AND to all entrants a kit of 5 bypass and coupling capacitors featuring the Pyramid type IMP.

It's easy to win any one of 147 big prizes—just follow these simple rules: Identify the unnamed Pyramid T-M capacitor in the TV set schematic appearing on this page. Give the Pyramid stock number, name and model number of TV set. Then mail your entry to Pyramid. Use coupon on this page or obtain additional blanks from your distributor. A different schematic will appear in these servicemen's magazines for 4 months. Prizes will be awarded on a points-earned basis as follows: 5 points for Contest No. 1; 10 points for Contest No. 2; 15 points for Contest No. 3; 20 points for Contest No. 4; and 10 points each contest for neatness. Possible perfect score: 90 points. However it is not necessary to achieve a perfect score to be declared a prize winner.

So act quickly...send in your entries early each month...you can't lose.



A PHOTOFAC STANDARD NOTATION SCHEMATIC © Howard W. Sams & Co., Inc.

JUDGES: M. Harvey Gernsbeck, editorial director, Radio-Electronics
Oliver Read, D.Sc., publisher, Radio & Television News
Howard W. Sams, chmn. board, Howard W. Sams & Co., Inc.



HELPFUL HINTS

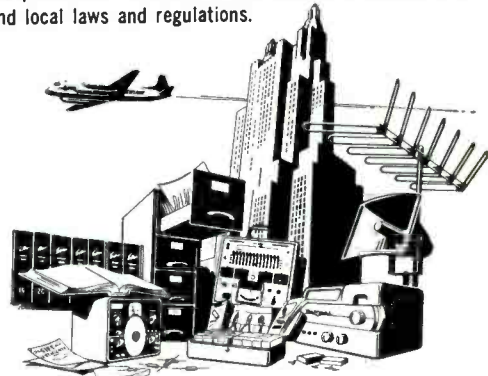
The unidentified capacitor in each entry will be a Pyramid Twist-Mount. All schematics are of TV sets made in the U. S. by a known manufacturer within the past 2 years.

Schematics for reference may be those published by the TV set manufacturers, Howard Sam's Photofacs, or by any other accepted publisher. You may enter as often as you like but be sure to include a box top (showing stock number) of any Pyramid Twist-Mount Capacitor, with your letterhead or business card with each entry.

WHO MAY ENTER

Any Radio-TV serviceman or employee of a Radio-TV service company may enter. Officers, employees, (members of their families) of Pyramid Electric Co. or its advertising agency are not eligible to enter the contest. All entries are limited to residents of the continental U.S. over 21 years of age.

All entries become the property of Pyramid Electric Co., none will be returned and the decisions of the judges are final. In case of ties, duplicate prizes will be awarded. This contest is subject to all federal, state and local laws and regulations.



MAIL THIS ENTRY BLANK NOW!

Pyramid Twist-Mount Contest, Dept J
Pyramid Electric Co.
P.O. Box 655, Tyler Park Station, North Bergen, New Jersey

Entry No. (1) (2) (3) (4)—(check one)—is: Pyramid stock No. _____

Twist-Mount values _____

Set manufacturer's name _____ TV set model No. _____
I enclose a box top (indicating stock number) of any Pyramid Twist-Mount Capacitor together with my business card or letterhead or my employer's.

Contestant's name _____ Position _____

Contestant's address _____

City _____ Zone _____ State _____

Employer's Firm name _____

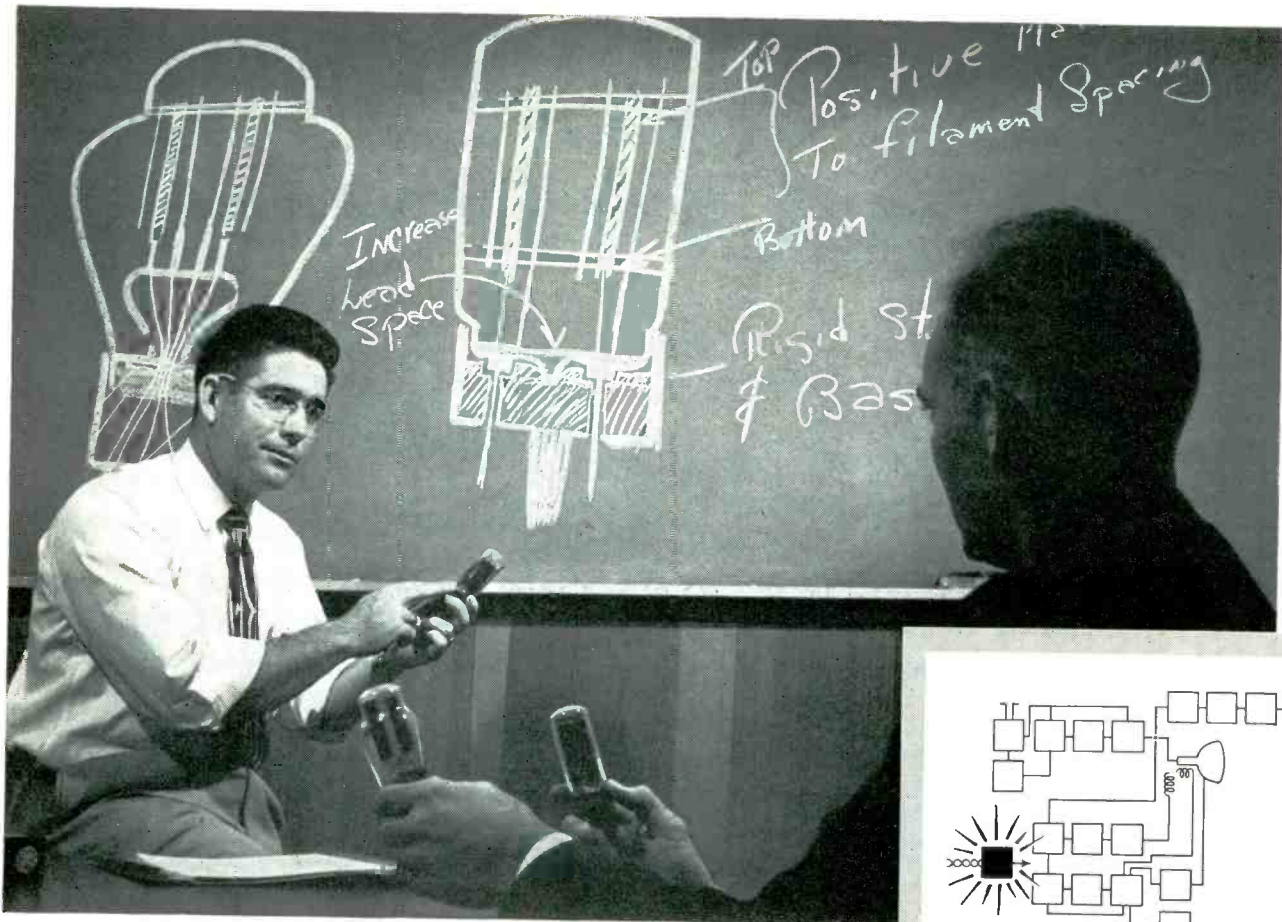
Employer's address _____

City _____ Zone _____ State _____

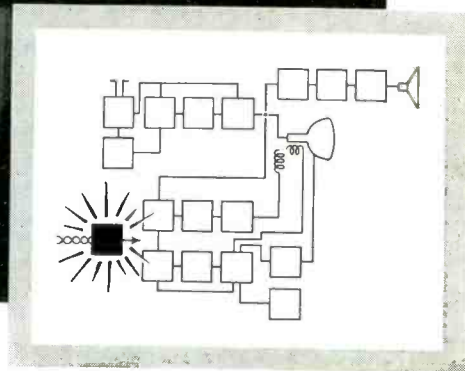
My jobber's name and address _____

ENTER AS OFTEN AS YOU LIKE—FOR ADDITIONAL ENTRY BLANKS
SEE YOUR JOBBER.

Capacitors, Selenium Rectifiers—for original equipment, for replacement
PYRAMID ELECTRIC COMPANY North Bergen, New Jersey



How the 5U4-GA/B's improved base design and double-mica construction lengthen tube life, is explained in detail by J. F. Stephens, General Electric tube design engineer.



Five design improvements give G-E low-voltage rectifier tubes increased performance life!

General Electric's 5U4-GA/B low-voltage rectifier tube features five long-life design improvements that enable you to install full-value performance in customers' sets.

1. Button-stem base! Improved heat conduction reduces electrolysis and consequent air leakage. Widely spaced, rigid leads cut shorts and support base firmly. Notched leakage barriers guard against tube base shorts.
2. Micas top and bottom strengthen tube structure. Filament is centered within plate, lessening the possibility of filament-to-plate arcs.
3. High adherence from improved cataphoretic filament-coating technique helps prevent flaking and filament-to-plate shorts.
4. Getter is at side of tube envelope. As a result, getter flash film won't form on micas to create harmful arc-paths between filament and plate.

5. Increased plate area gives greater heat dissipation . . . cuts gas and reduces back emission . . . extends tube life for increased customer satisfaction.

When testing 5U4-GA/B's, General Electric goes beyond standard life testing. In addition, tubes are checked at absolute maximum ratings in a typical rectifier circuit—further assurance of premium performance under the peak current and voltage conditions of big-screen TV.

There are General Electric tubes of the same high quality for every socket in sets you service. Phone your G-E tube distributor! *Electronic Components Division, General Electric Company, Schenectady 5, New York.*

Progress Is Our Most Important Product

GENERAL  ELECTRIC

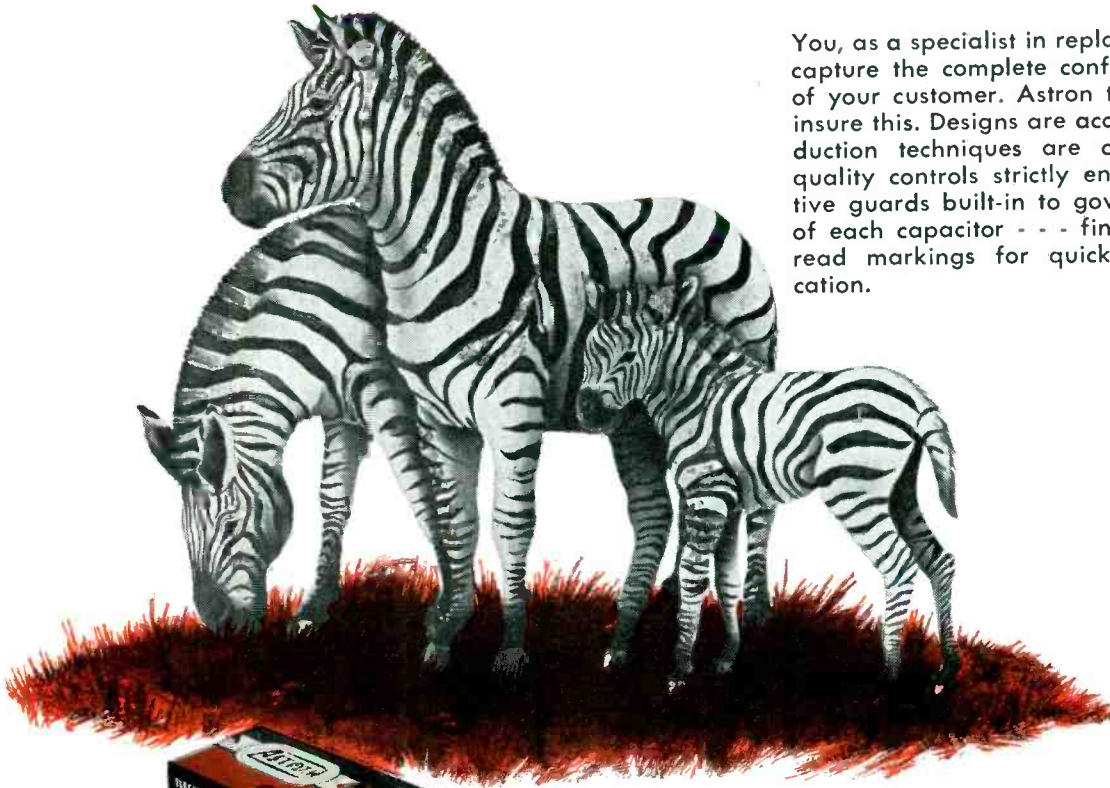
181-1A3

ASTRON "Staminized" CAPACITORS ARE - -

clearly marked

Astron . . . truly a *quality* capacitor to the last detail.

You, as a specialist in replacement parts, must capture the complete confidence and respect of your customer. Astron takes every step to insure this. Designs are accurately tested, production techniques are carefully inspected, quality controls strictly enforced and protective guards built-in to govern staying power of each capacitor - - - finally clear, easy-to-read markings for quick, positive identification.



You can put your trust in Astron, for behind each Astron capacitor is the meticulous quality control that insures you of top performance and the elimination of call backs.

Remember, *your reputation is our business.* Build it, guard it, protect it - - - Buy Astron

*Trademark



FREE Servicing Aid
Save time, use handy Astron pocket-sized Replacement Catalogue and Pricing Guide (AC-4D) — Write Today!



ASTRON
CORPORATION
255 GRANT AVENUE EAST NEWARK, N. J.

Export Division: Rocke International Corp., 13 East 40th St., N. Y., N. Y.

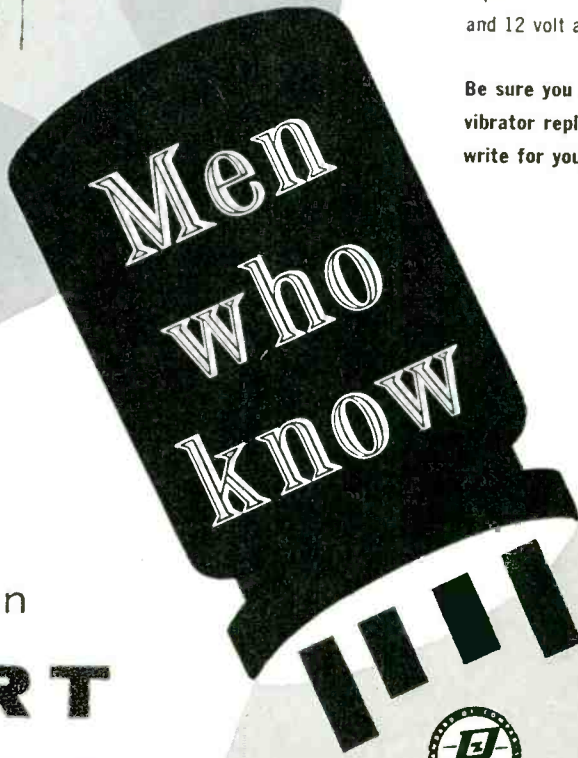
In Canada: Charles W. Pointon, 6 Alcina Ave., Toronto 10, Ontario



Radiart vibrators are the Standard of Comparison for quality, performance and dependability in the industry! Men who know... management, jobbers... and servicemen... ALL agree that experience over the years has dictated that RADIART vibrators are the ones to buy and use.

AND... the complete line of COMMUNICATION vibrators offers the correct replacement for 6 volt and 12 volt applications.

Be sure you have the new vibrator replacement guide... write for your FREE copy...



depend on

RADIART VIBRATORS

...the COMPLETE replacement line



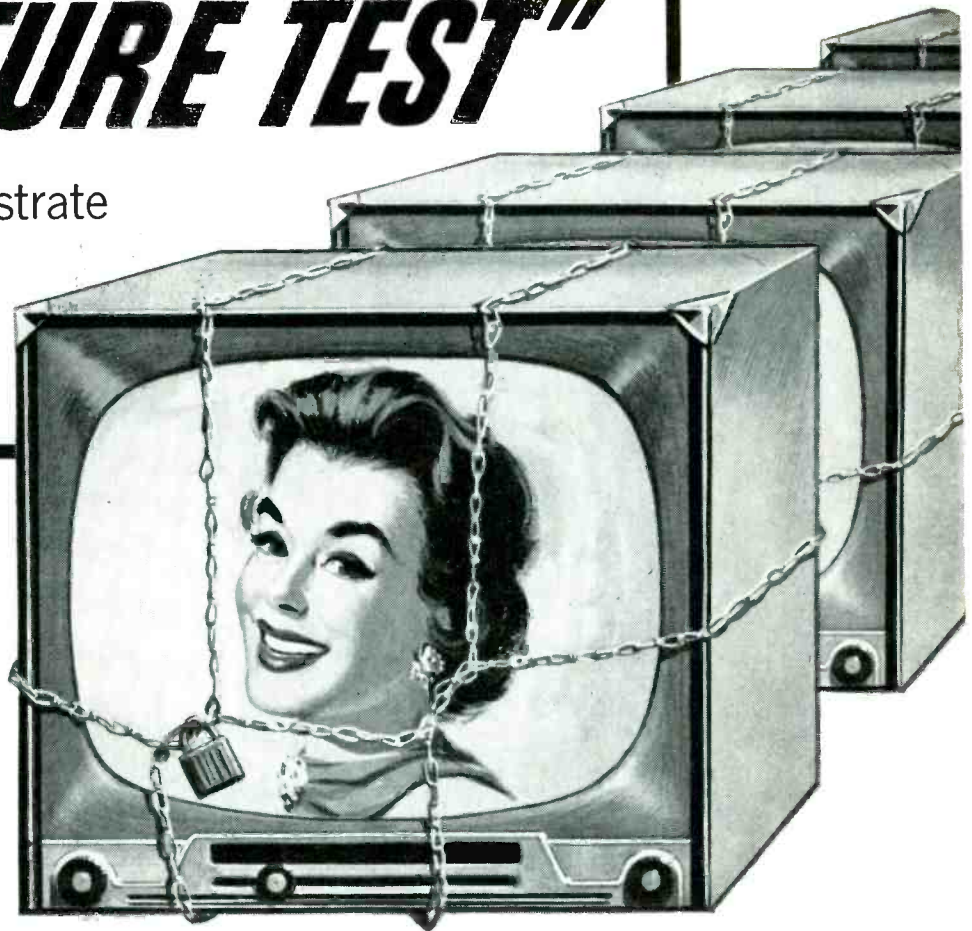
THE **RADIART** CORP.
CLEVELAND 13, OHIO

A Subsidiary of  Cornell-Dubilier

LOCKED TV

"TORTURE TEST"

first to demonstrate
tube brand
superiority!



Locked TV comes to your town . . . with the most impressive, most compelling sales story in the tube industry today. Be sure to make the most of it . . . your Westinghouse Tube Distributor will tell you how.

WESTINGHOUSE PROVES tube quality to make extra sales for you!

IT'S A STANDARD MODEL TV — like your customers and prospects own. But, there's an important difference. It's 100% equipped with Westinghouse RELIATRON® Tubes. And, it's locked tight—can't be serviced, adjusted or repaired. Once it's on, you're off on a performance "Marathon"—a grueling "Torture Test" to prove that Westinghouse Tubes work better; last longer—in any make and model TV. Build your profits by reducing call-backs!

See the famous Locked TV at your Westinghouse

Tube Distributor now . . . watch it pile up the hours—perform for years of average family viewing time.* Yet, the picture will stay bright, clear and steady.

Learn exactly how this means more profit for you. Ask about all the FREE tie-ins you can have: FREE MAILING PIECES—FREE WINDOW BANNERS AND POSTERS—ASK YOUR WESTINGHOUSE DISTRIBUTOR TODAY.

*One Westinghouse "Locked TV" has been running 15,500 hours . . . more than 10 years' average viewing time.

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

...for faster, more profitable
servicing of RCA products



ALWAYS USE **RCA** SERVICE PARTS

One simple formula sums up success in your business . . . faster service equals more profits!

Here are a few of the many thousands of RCA SERVICE PARTS available through your RCA Distributor. Like all of their kind, they are identical mechanical and electrical duplicates of original parts used in RCA Victor TV, Radios and Phonographs. Factory-Tailored, they fit exactly right. This means faster replacement, less time on the bench, and restored top performance. RCA SERVICE PARTS are distinguished by the name your customers know, respect, and trust to do the job right!

Next time you "call" for an RCA Victor TV, Radio, or Phonograph . . . contact your RCA Distributor for Factory-Tailored, RCA SERVICE PARTS —and keep your servicing on the go—profitably!



SERVICE PARTS

Radio Corporation of America, Components Division, Camden, N.J.

RCA PRODUCTS AND RCA SERVICE PARTS — made for each other!

*"I cut testing time in half"
... "doubled our tube sales" **



"Adds to my income and saves me unprofitable call-backs."

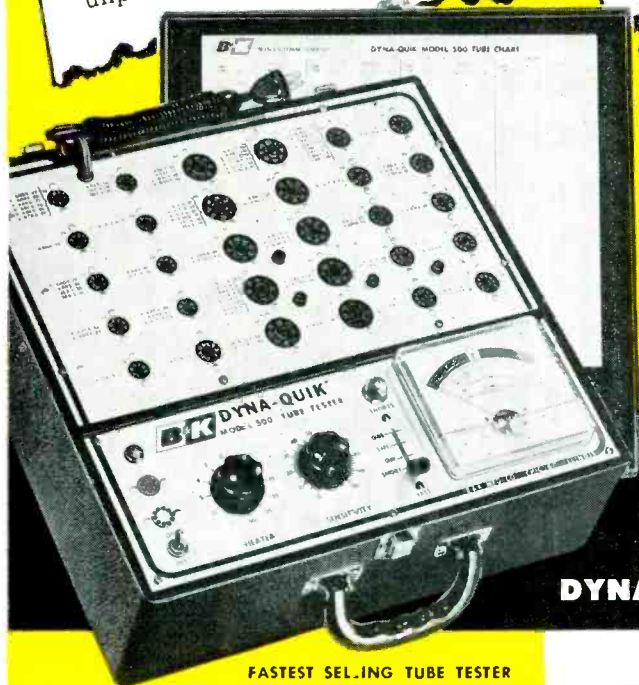
"We have two... one for the shop and one for house calls."

"Paid for itself several times. Really indispensable"

"Best tube tester I've ever owned. Simple to operate. Saves time."

"Makes lots of money for us. Wonderful instrument."

"Serves my purpose best for speed and dependability."



B&K MODEL 500

DYNA-QUIK

DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER

FASTEST SELLING TUBE TESTER
IN THE WORLD

**Tests over 95% OF ALL
POPULAR TV TUBES — IN SECONDS**

Accurately makes each tube test in seconds.
Checks average TV set in minimum minutes

Tests each tube for shorts, grid emission, gas content, leakage, and dynamic mutual conductance.

Ingenious life test detects tubes with short life expectancy.

One switch tests everything. No multiple switching. No roll charts.

Shows tube condition on "Good-Bad" scale and in micromhos. Large 4½-inch plastic meter has two highly accurate scales calibrated 0-6000 and 0-18,000 micromhos.

Automatic line compensation is maintained by a special bridge that continuously monitors line voltage.

Built-in 7 pin and 9-pin straighteners are mounted on the panel.

* NAMES ON REQUEST

**One extra tube sale on each of 5 calls a day
pays for the Model 500 in 30 days**

Enthusiastic comments like those above* come from servicemen all over the country. *Actual experience shows an average of close to 2 additional tube sales per call.*

Instead of the "trial and error" method of substitution testing, the Dyna-Quik 500 quickly detects weak or inoperative tubes. Cuts servicing time, saves costly call-backs, shows each customer the true condition and life expectancy of the tubes in the set, and makes more on-the-spot tube sales. Helps keep customer good-will, give a better service guarantee, and make more profit.

The B&K Dyna-Quik 500 measures *true dynamic mutual conductance*. Completely checks tubes with laboratory accuracy under actual operating conditions right in the home... *in a matter of seconds*. Saves time and work in the shop, too. Simple to operate. Easily portable in luggage-type case. Weighs only 12 lbs. **NET, \$109⁹⁵**

See Your B&K Distributor or Write for Bulletin No. 500-T



Makers of Dyna-Quik, CRT,
Dyna-Scan and Calibrator

B & K MANUFACTURING CO.
3726 N. Southport Ave. • Chicago 13, Illinois



Model 1000 DYNA-SCAN
Picture and Pattern Video
Generator Complete Flying
Spot Scanner. Net, \$199.95



Model 400 CRT
Cathode Rejuvenator Tester.
Tests and repairs TV picture
tubes. Net, \$54.95



Model 750 CALIBRATOR
Designed to check and adjust
test instruments with labora-
tory accuracy. Net, \$54.95

... another
P. R. MALLORY & CO. THE
MALLORY
 service-engineered
 product



All Vibrators are Not alike!

Only Mallory vibrators offer the exclusive new feature . . . electrical contacts *without Contact Buttons*. Thanks to new materials and new design, contact is made directly between the vibrating reed and sidearms.

This new design reduces the weight and mass of the vibrating reed—making this new Mallory vibrator quieter than ever before possible. This completely new concept in vibrator design can give up to 100% longer life by actual field test—and at no extra cost to service-engineer or customer!

This new design is now being used in all current replacement-type vibrators. At your Mallory distributor—*NOW*.

P. R. MALLORY & CO. Inc.
MALLORY

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

- Capacitors
- Vibrators
- Resistors
- Power Supplies
- Mercury and Zinc-Carbon Batteries
- Controls
- Switches
- Rectifiers
- Filters

(Continued from page 16)
 480 Lexington Ave., New York 17,
 N.Y., briefly stating the following:

1. Your name, address and phone number.
 2. Your experience and training, giving number of years.
 3. Area in which you wish to locate. Will you relocate?
 4. Optional: Salary requirements, age and marital status.
- If you are interested, DO IT TODAY!

Business For Sale

ESTABLISHED BUSINESS, main street store and furnished apartment. Box 122, Schuylerville, N.Y.

GOING TV & RADIO SALES & Service business. Good location, low overhead. Established name for 30 years. 3 name brand franchise. 30 miles from Dayton, Ohio. 22,000 population. \$5,500.00 cash. Going South for health reasons. Inquire Box S350, **ELECTRONIC TECHNICIAN**.

ESTABLISHED MOBILE TV Servicing business for sale at \$5,500. Includes modern, well equipped shop in a walk-in truck. One man operation, grossing \$1,000. per month on TV service alone. No sales or installation. Low overhead, office in owner's home. Have 500 customers and getting more every day. Books open. Mobile TV Service, 3736 Marconi Ave., Sacramento 21, Calif.

Note: Anyone considering the purchase of the radio-TV shop advertised here should write directly to the address noted in the ad.

"Business for Sale" and "Help Wanted" listings are available in this section to aid shop management and owners in obtaining qualified personnel or selling their business. This section is not open to manufacturers.

Cost for an announcement in this section is 25¢ per word, with numbers and address words counted. Remittance must accompany insertion order.

Those service shops wishing to have a box number listing instead of including their names and addresses may have one assigned for an extra charge of \$2. All inquiries directed to such box numbers will be routed directly to the shop inserting the announcement.

If you are looking for technician personnel or a buyer for your business, write the announcement, add the cost at 25¢ per word (plus \$2 for box number, if any), and send payment along with announcement to:

Personnel Dept.
ELECTRONIC TECHNICIAN
 480 Lexington Avenue
 New York 17, N.Y.

New Books

HOW TO INSTALL & SERVICE INTERCOMMUNICATION SYSTEMS. By Jack Darr. Published by John F. Rider Publisher, Inc., 116 W. 14 St., New York 11, N. Y. 152 pages. Paper cover, \$3.00.

The author, a most competent electronic technician, has done an excellent job on a subject that offers many opportunities for technicians in radio-TV work. He starts with the basic amplifier and carries the reader through cabling networks, paging, remote and master systems, wireless intercoms and servicing for home and industrial applications. Part of the text is devoted to the mechanical problems of cabling through walls and the like, problems which often trouble the electronic specialist with little carpentry experience. Circuits and photos of commercial units are shown. The intercom manufacturer list at the end has a few needless omissions, but the scope and clarity of the primary text is so excellent as to merit strong recommendation.

RADIO-TV SERVICE PRICING GUIDE. By Robert T. Oelrich and Harold Justice. Published by Oelrich Publications, 4308 Milwaukee Ave., Chicago 41, Ill. 86 pages. Hard cover, ring binder, \$2.95.

Strictly speaking, this is not a brand new book, but its value to technicians not familiar with it merits some favorable comment. It enables prices to be shown to customers for specific jobs. It also helps the service technician give more accurate estimates. All major points from the time for yoke replacement to costs of service contracts are presented. What happens if your TV labor rate is different than the \$5 per hour printed in the book? Simple. The authors have provided duplicate insert pages with the prices omitted; just fill in your own prices and replace the page with the printed price. This handy volume should prove useful in reducing hit-and-miss pricing so commonly encountered.

HI-FI EQUIPMENT YEARBOOK 1957. Edited by Sanford M. Herman. Published by Herman & Stephens, 200 E. 37 St., New York 16, N.Y. 128 pages. Paper cover, \$1.95; cloth cover, \$2.75.

Except for an introductory article, this entire book contains catalog-type technical descriptions, prices and equipment photos of almost every representative piece of hi-fi gear commonly encountered. While the amplifiers, speakers, phono equipment and tape recorders presented may be found in various jobber catalogs, manufacturer brochures and periodical new product pages, this volume performs the service of gathering the material between one convenient set of covers.

P. R. MALLORY & CO. INC.
MALLORY

... the battery line
designed for you

in performance
profit
promotion



• This year's news in batteries is the Mallory Battery Program!

It's more than "just another battery line." It's a brand new concept of battery performance, battery value and battery promotion—all rolled up in a program that produces growing sales for you *all year 'round*.

Get into the fast-growing transistor radio market for mercury batteries—pioneered by Mallory. They end your problems with shelf life... give your customers new standards of long life, constant power, economy. And for tube type portables, you can depend on the new full line of Mallory zinc-carbon batteries.

See your Mallory distributor today... and get full facts on the Mallory Battery Program!

P. R. MALLORY & CO. Inc.
MALLORY

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

• Capacitors • Vibrators • Resistors • Power Supplies • Controls
• Switches • Rectifiers • Filters • Mercury and Zinc-Carbon Batteries



65 ma—#205G1



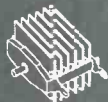
75 ma—#206G1



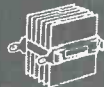
100 ma—#206G1



150 ma—#201G1



200 ma—#207G1



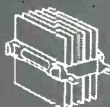
250 ma—#208G1



300 ma—#202G1



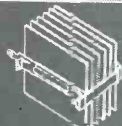
350 ma—#209G1



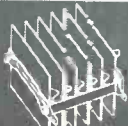
400 ma (compact)—#210G1



400 ma—#203G1

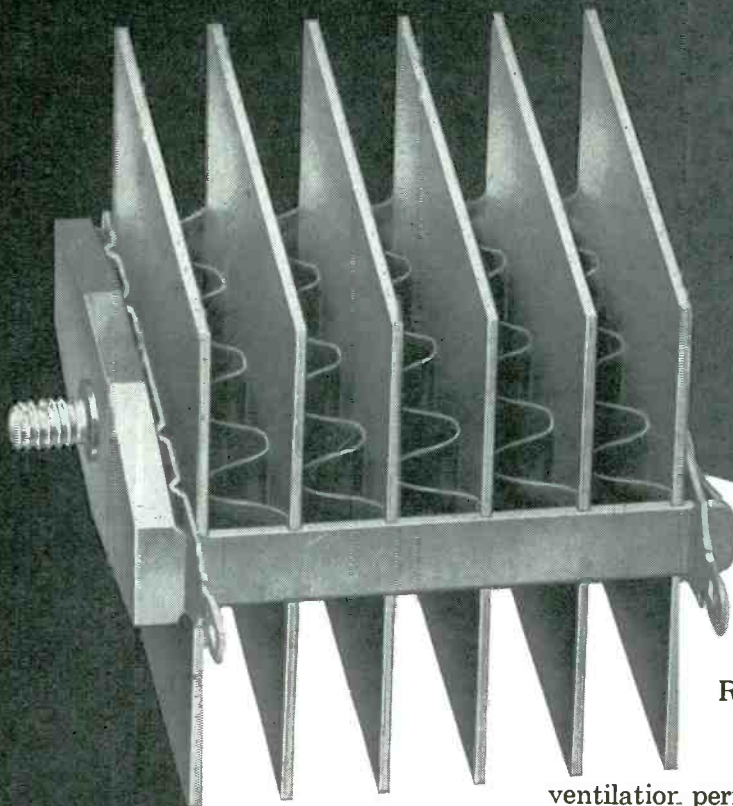


500 ma (compact)—#211G1



500 ma—#204G1

For dependable replacement



easy to install, efficient in operation, RCA Selenium Rectifiers... popular choice of servicemen on the go!

Service technicians appreciate easy-to-install RCA Selenium Rectifiers with modern open design features. RCA's full surface ventilation permits greater heat dissipation, reduces chance of center-core hot spots. One-piece assembly-yoke with molded mounting stud prevents twisting or squeezing stack during installation. They go in faster, operate cooler, more efficiently. Customers appreciate that kind of service!

On your very next selenium rectifier replacement, choose from RCA's comprehensive line, including the smaller sizes for any given current. In 12 types, ratings from 65 Ma to 500 Ma.

Now available through your RCA Distributor!

RCA SELENIUM RECTIFIERS



SELENIUM RECTIFIERS
RADIO CORPORATION OF AMERICA
COMPONENTS DIVISION, CAMDEN, N. J.



Your independent service business can grow

Advertisements like this are appearing every month in all local editions of TV Guide to help you.

Ask your CBS Tube distributor how you can have *your* name, address and telephone number listed on the facing page in your local edition.

Join with other *independent* service-dealers . . . *independent* parts distributors . . . and CBS Tubes. Working together, we can build a strong *independent* service industry.

CBS is taking the lead for you . . . and in an important way. Month after month this advertising campaign is reaching millions of TV homes. And it is telling them why they should always call their neighborhood independent service-dealer whenever their radio or television sets need service.

Remember: Your continuous purchases of CBS tubes make this *independent* service-dealer campaign possible. So help keep it going. Say, "I want CBS tubes!"



CBS-HYTRON Danvers, Massachusetts

A Division of
Columbia Broadcasting System, Inc.



PICTURE TUBES DO GET DIRTY! SO CALL YOUR INDEPENDENT SERVICE-DEALER AND . . .

Have your
Picture Tube
cleaned today!



Just like windows and mirrors, the inside of the glass front on your TV set gets dirty. And the face of your picture tube — the TV screen — gets even more fogged up with dust and dirt, smoke and fumes. See for yourself. Have your picture tube cleaned today. You can't imagine how much clearer . . . brighter . . . and more enjoyable your TV picture will be!

CALL YOUR INDEPENDENT SERVICE-DEALER FOR HIS SPECIAL "PICTURE TUBE CLEAN-UP."

He is *your* neighbor. He pays taxes in *your* community. His children go to the same schools and churches as *yours*. And he knows his standing and reputation depend upon the care and thoroughness with which he services *your* community's radio and television sets. What is more, he is trained to service any make of set. So patronize your neighborhood independent radio and television service-dealer.

© CBS-HYTRON, Danvers, Mass.
A Division of Columbia Broadcasting System, Inc.



Ask him for CBS tubes. There are no better tubes made . . . and CBS tubes have this seal.



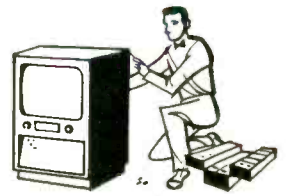
This emblem is one way to identify your independent radio and television service-dealer. Look for it.

Tie-in: Ask your distributor for free window display, P-130. And for free, 4-page PA-131 folder giving complete details about your Independent Service campaign . . . and about other specially imprinted tie-in material.



Independent Service Dealers:

TV-RADIO SERVICE IS YOUR BUSINESS



SERVING YOU IS OUR BUSINESS

That's why we say, use Raytheon TV and Radio Tubes for your replacement work. We have no "captive service" organizations to compete with you for TV and Radio service business — we leave the service business to *you*. Serving *you* is our only interest.

First, we serve you with the finest TV and Radio Tubes — Raytheon Tubes — designed to meet the varying needs of the many set manufacturers and

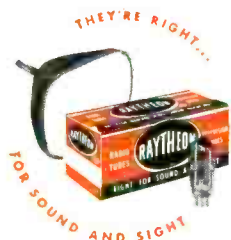
perform perfectly in all makes and models of sets.

Second, we serve you Raytheon Tubes promptly and efficiently through a network of *independent* Raytheon Tube Distributors with trained personnel eager to help *independent* dealers in every way.

Third, we serve you with the exclusive Raytheon Bonded Electronic Technician Program. If you can qualify, you become

part of a nationally recognized and advertised organization, *yet you retain your own independence*. As a Raytheon Bonded Electronic Technician, you're identified as a dependable businessman capable of fast, efficient TV and Radio service on all makes and models of sets. You will have the exclusive Western Union "Operator 25" tie-in bringing business to you, along with many other important advantages.

Ask your Raytheon Sponsoring Bonded Tube Distributor to give you the Raytheon Bonded story.



RAYTHEON MANUFACTURING COMPANY

Receiving and Cathode Ray Tube Operations

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

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



Excellence in Electronics

ELECTRONIC TECHNICIAN

Including
Circuit Digests

An Abundance of Pussyfoots and Pioneers

There are probably few industries which can lay claim to as large a proportion of slow-motion and timid souls on the one hand, and as many constructive and aggressive people on the other, as our own electronic industry. This preponderance of the extremes is not surprising in view of the dynamic nature of the field, the relative youth of the industry and the many new people who have entered it.

The industry is maturing, and with this maturity comes the shakedown process. To say the big-money boys are the ones who will remain is only a half-truth; too many big ones have folded, and a great many small firms are turning enviable profits. The answer is that success is primarily determined by enlightened business techniques, bold action, understanding problems and concentrated effort.

Success is rarely achieved by pussyfooting. Remember the old saying, "He who would please all, pleases none." This is no argument for dissension or needless fighting. On the contrary, it is a strong challenge to push ahead aggressively in cooperation with others who will mutually benefit . . . and let the deadwood fall where it may.

So far we have discussed the problem of decisive versus indecisive action in general terms. Now let's see a few examples of how pussyfoots and pioneers operate in specific phases of the industry.

Technicians

Inertia is the killer here. Take the mythical Pussyfoot TV Service . . . too disorganized to clean up the store, too lax to promote his services, too scared to charge the fair price a job deserves. And of course, this fellow never could get around to joining his local association.

However, that's only one side of the story. Let's look at Pioneer Electronic Service. He follows up every TV call to make sure the customer was satisfied. As audio, communications and industrial elec-

tronics grew he studied up on them, and started to find extra income in maintenance and installation. Rare is the day he misses an association meeting.

Jobbers and Manufacturers

The producers and distributors have their counterparts of the two types of electronic technicians we sketched. There's the two-ends-against-the-middle guy, undercutting the efforts of the very dealer he professes to cater to. He also takes his own sweet time about providing technicians with the material or data needed.

On the other hand, we fortunately have plenty of manufacturers and jobbers who are service minded. They treat technicians as the vital customers they are, reply to the technician requests and support his sales and repair efforts.

Publications

Magazines have their weak sisters too. Watch the publication that's afraid to take an honest stand lest it offend some readers and advertisers. His brand of journalism prefers to hush up industry rackets instead of exposing them to the light of day.

On the opposite side of the fence is the magazine that is willing to stand up and be counted, that doesn't hesitate to spend extra money to serve its readers, and offers its readers space where opposing and controversial views may be expressed.

What's the Score?

The line between pussyfoot and pioneer is not always sharply drawn. But most people can tell one from the other without a scorecard. We suspect there are plenty of both varieties. Nevertheless, we'll bet on the pioneer to succeed.

Mr. Technician, Mr. Manufacturer, Mr. Jobber, Mr. Publisher . . . now is a good time for some critical self-examination!

Tuning In the

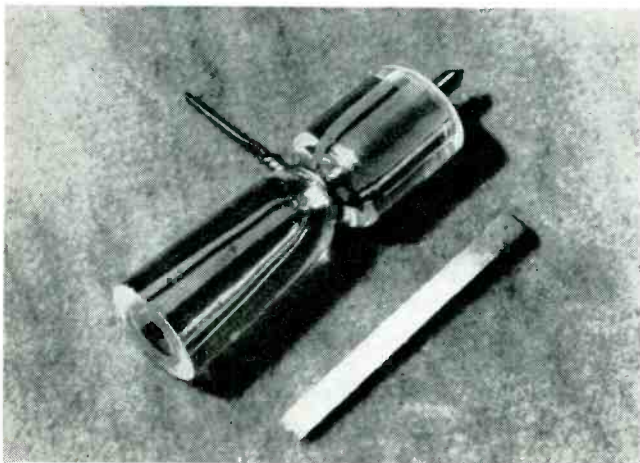
ANOTHER FABULOUS show and convention will be held by the Institute of Radio Engineers in the New York Coliseum, March 18-21. It will feature 840 exhibits of electronic apparatus, and every technician interested in the advanced phases of electronics is urged to visit the show.

AUTOMATION is even entering the TV servicing field. The Dynamatic automatic tube tester made by Tele-Test sets up all tube testing adjustments, voltages and pin connections at once by the insertion of the proper perforated plastic card. When new tubes come out, new cards are issued.

MINIATURE BATTERIES with a projected life of 20 years are in pilot production in GE's Auburn, N.Y., plant. Size is 1 in. long, about 0.3 in. dia., and voltage about 90 v. They are designed for remote equipment and instruments. Present price is \$12.50, but mass production could bring it down to \$1.

TV VIEWERS may be strong, but they're certainly not silent. During 1956 NBC and its associates received 3,000,000 letters from the viewing public. In New York alone, more than 41,000 phone calls and 100,000 telegrams praised or criticized various shows.

HI-FI VIA AN IONIC CLOUD



Small quartz cell is the heart of DuKane's Ionovac, which generates sounds by producing ionized particles exposed to an electric field. Changing the field strength causes the ionic cloud to expand and contract, producing vibrations controllable from 1 kc to 1 mc. In audio applications it eliminates the speaker diaphragm. Other uses include ultrasonics for industry and medicine.



UNIQUE TV MERCHANDISING plan specifically directed to TV technicians has been set up by American Television & Radio Co. The ATR TV sets feature several design advantages, and sell for a bit more than some others. But the important fact is that these sets are sold only through certified independent technicians, numbering on the order of one for each 25,000 population, with no cut-throat or discount house competition. A profitable 40% discount off list is allowed to technicians. Many franchise areas are still open, and **ELECTRONIC TECHNICIAN** editors will be glad to put you in touch with the right people.

300 SHAREHOLDERS of the Bankers Trust Co., New York City, witnessed what is reported as the first closed circuit TV tour of a major financial institution. The Blonder-Tongue equipment setup showed the stockholders the banking operation from the eighth floor to the vaults, two stories beneath the street. Over a mile of cable laid for the demonstration will remain for possible future use of TV with an automation program. Cost of the tour, \$3000.

POLICY STATEMENT by RCA, which presents the company's favorable attitude on cooperation with independent technicians, notes that technical color TV information has been given to 100,000 service techs in 2000 clinics, and that 90% of all RCA sets are maintained by independents. Fair competition with independents was supported, but captive service opposed.

WINNER of GE's Fifth Edison Radio Amateur Award for public service for 1956 was Mrs. Mary Burke, W3CUL, of Morton, Pa. Her longest stretch of operation was 1825 days—five years—without a vacation or single day off. She's handled 312,000 messages since 1949, many to the armed forces overseas. 73.

Picture



MARCH 25-30 is the third annual National Television Servicemen's Week. It is being promoted nationally by RCA with ads in giant consumer magazines encouraging TV viewers to visit their local technicians for service. Post cards, promotion aids, stamps, signs and display material have been put to work to help technicians boost their business. The theme is "Celebrating a Great Partnership," referring to the manufacturer and the independent.

ELECTRONIC INDUSTRY revenue in 1956 was \$11.5 billion, and is expected to more than double in the next decade, reports Arthur L. Chapman, new CBS-Hytron president.

"LOCKED TV" is the heart of the 1957 Westinghouse tube sales campaign. It's designed to build dealer confidence in the long-lived reliability of the company's tubes. Remember that locked and chained set tested at the Lew Bonn Co. in Minneapolis? It's run continuously for over 15,000 hours.

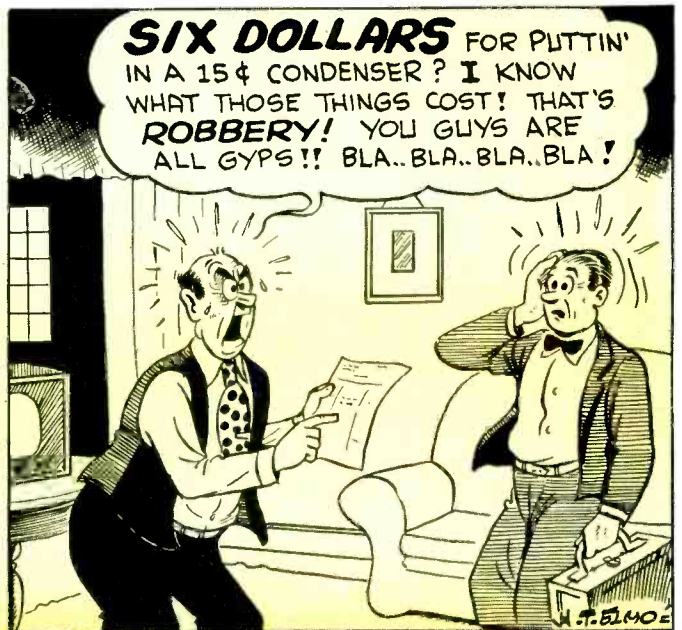
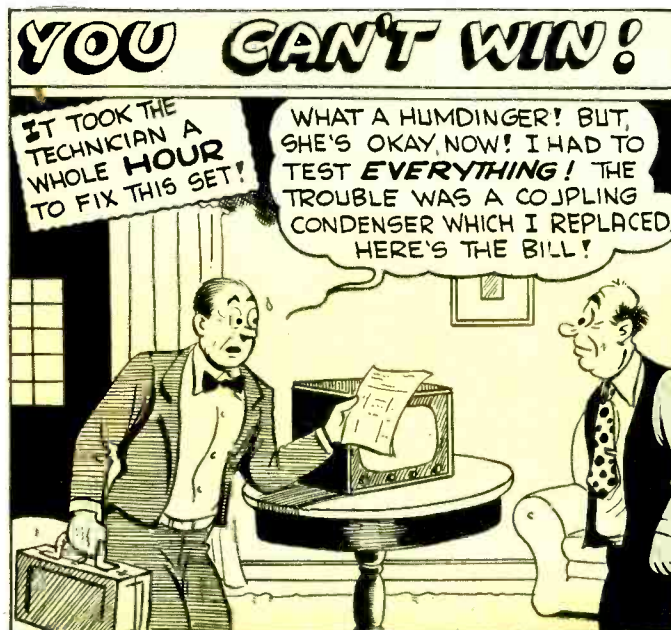
THAT EARTH SATELLITE to be launched between July 1957 and Dec. 1958 will collect space data and radio it back to us. The 20-in. sphere orbits at 18,000 mph, or "Around the World in 90 Minutes." The enclosed 13-oz. transmitter will transmit at 108 mc with a power of 10 to 50 mw. Special tracking receivers will follow its movement, and signals will be recorded on magnetic tape for later study.

CALENDAR OF COMING EVENTS

- Mar. 3-6: 1957 Annual Convention of National Education Assoc., Dept. of Audio-Visual Instruction, Sheraton Park Hotel, Washington, D. C.
- Mar. 18-21: IRE National Convention, New York Coliseum and Waldorf-Astoria Hotel, New York, N. Y.
- Apr. 9-10: First Annual Conference on Electronics in Industry, Campus of Illinois Institute of Technology, Chicago, Ill.
- Apr. 11-13: Ninth Southwestern I.R.E. Conference & Electronic Show & the Second National Simulation Conference, The Shamrock-Hilton, Houston, Texas.
- May 20-23: 1957 Electronic Parts Distributors Show, Conrad Hilton Hotel, Chicago, Ill.
- Aug. 20-23: Western Electronic Show & Convention (WESCON), Cow Palace, San Francisco, Calif.
- Oct. 7-9: 1957 National Electronics Conference, Hotel Sherman, Chicago, Ill.

Build your
AUDIO LITERATURE FILE
See page 40

WHEN IS A TV DEALER a second hand dealer? Inspectors of New York City's Dept. of Licenses thought that a merchant who takes in TV trade-ins on new sets fits the bill, and must have a second-hand license. So a group of irate TV dealers in the Bronx and Manhattan were hauled into court on charges of operating without the licenses. The judge threw the cases out of court.



How To Signal-Trace TV Circuits

Troubleshoot High Voltage, Sync, Video, Sound, Local

ROBERT G. MIDDLETON
Simpson Electric Co.

•Your VTVM is one of the best signal tracers in the shop, with the possible exception of your scope. It is necessary to use with the VTVM a suitable signal-tracing probe, as illustrated in Fig. 1. Tests in television receiver circuits can be made in the horizontal and vertical sync, video amplifier, picture and sound detectors, i-f amplifiers, r-f tuner, intercarrier sound section, etc. Most tests can be made from the top of the chassis. Not only is this method of signal-tracing speedy, but it is convenient when servicing in the home. A few quick tests permit a much more realistic estimate of repair costs. On the bench, signal-tracing tests with a VTVM often make a short and profitable job out of a "dog" assignment.

No High Voltage

In case little or no arc can be drawn from the high-voltage lead to the picture tube, the signal-tracing probe can be utilized to obtain further operating data. Hold the probe tip against the glass wall of the horizontal-output tube at the point of highest indication, as shown in Fig. 2. Operate the VTVM on the 30-volt d-c range. Do not touch the cap of this tube with the probe. A typical indication from 12 to 15-volts shows that the sweep-output level is satisfactory. The trouble will be

Fig. 1—Schematic of signal-tracing probe.

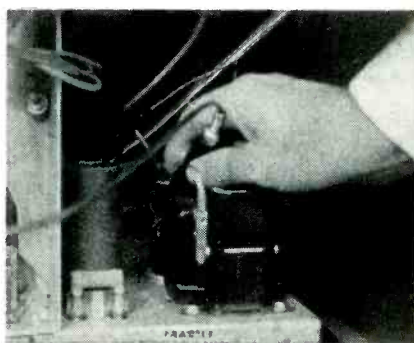
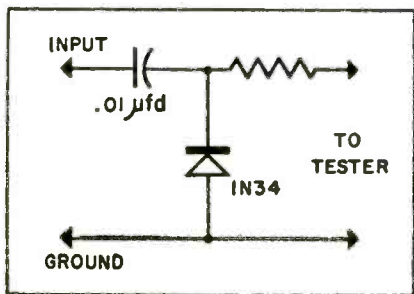


Fig. 2—Probing for horizontal-sweep signal.

found in the high-voltage rectifier circuit.

Weak or zero sweep-voltage level points to trouble in the sweep circuit. In this case, check the drive voltage at the grid of the horizontal-output tube. This is a very essential test, because it shows whether or not the sweep circuit is good up to the grid of the output stage. Use the probe to check the drive voltage. A reading of from 15 to 25-volts shows that the drive to the output tube is satisfactory. A weak or zero reading in this test shows that the horizontal oscillator is not supplying drive voltage to the output stage.

Loss of Sync

A signal-voltage indication can be obtained at the input to each sync stage by pulling the tube and checking the driving signal with the probe. Note that a TV station signal must be tuned in, to make this type of test. Both vertical and horizontal sync signals are present together, up to the differentiating and integrating circuits. Beyond these separation points, horizontal and vertical sync signals can be checked individually. Tests in the sync sections serve to localize either horizontal or vertical sync trouble, or both. Weak or zero readings show that the fault appears ahead of the stage under test.

In case of loss of horizontal sync only, an AFC stage can be checked for proper signal levels. Phase-



Fig. 3—Adapter socket and filter resistor.

detector AFC is very common in present-day receivers — pull the AFC tube and check the signal levels at the plates and cathode terminals of the socket with the probe. One plate of the phase detector will indicate a signal level of approximately 1-volt in a typical arrangement, and the other plate will indicate about 7-volts in normal operation. One cathode will indicate about 7-volts, and the other cathode about 9-volts. Weak or no signal indication points to a fault in the preceding sync circuits, or to a defect in the comparison waveform circuit (between the phase detector and the sweep circuit).

Note on Series-String Heaters

When a receiver utilizes series-string heaters, the tube cannot be pulled to check signal levels, because the entire string is disabled. A test adapter socket, as shown in Fig. 3, is usually most convenient for use in such cases. The adapter plugs into the socket in place of the tube, and the tube is plugged in turn into the adapter. The rim of the adapter is provided with terminal lugs, which make the socket terminals available on the tube side of the chassis. They

With Your VTVM

Oscillator, Bypass Condensers, Sweep and Other Difficulties.

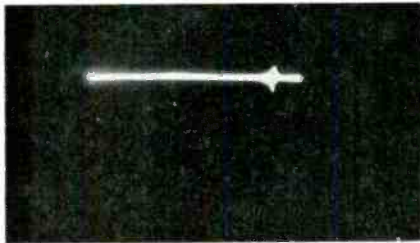
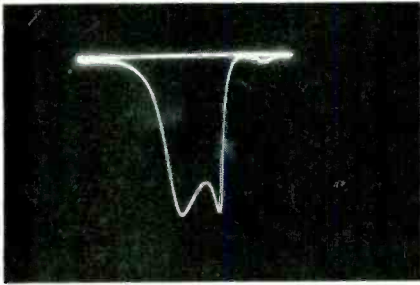


Fig. 4. Top waveform is normal i-f response. Bottom view shows detuning due to loading.

add some capacitance to the circuit and must sometimes be used with caution in high-frequency circuits. Test adapters can be used without question in sync, sweep, and video-frequency circuits. However, in r-f and i-f circuits, difficulty may sometimes be encountered. Fig. 4, shows how the response of a 45-mc i-f circuit can be destroyed in some cases by the detuning effect of the adapter capacitance, which may also throw the i-f amplifier into oscillation. An oscillating i-f amplifier shows up on a voltmeter test by developing a constant and high d-c output from the picture detector—the output voltage is unaffected by the tuning of the front end, from channel to channel, when the i-f amplifier is oscillating. Fig. 5, shows a test being made at the output of a picture detector with the d-c probe of a VTVM.

When disturbance of high-frequency circuit operation is suspected, a short length of insulated wire can be hooked under a tube pin, for meter tests. An inch of wire used in this manner will add negligible capacitance to the circuit under test. Of course, the signal-trac-

ing probe has a small amount of input capacitance, and the probe itself will tend to load down high-frequency and high-impedance circuits. This is one of the limitations of probe application, which must be clearly recognized. In some cases, the loading imposed on an i-f amplifier by a VTVM signal-tracing probe is negligible, as shown in Fig. 6. In some few cases when critical circuits are being tested, the loading may be serious, with the general effect shown in Fig. 4.

In a high-impedance circuit, such as the grid of the vertical-oscillator tube, a VTVM signal-tracing probe can also produce substantial circuit loading. An illustration of this situation is shown in Fig. 7. The top photo shows normal raster height, which is obtained before application of the probe. The lower photo shows the shrinkage in raster height due to circuit loading, which occurs when the probe is applied. Of course, the

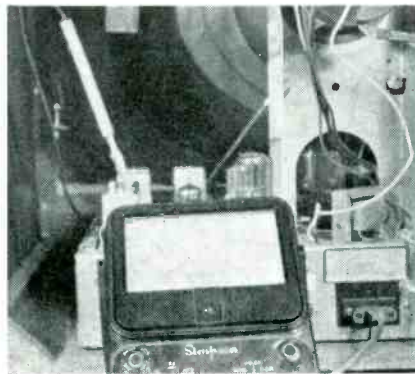


Fig. 5. Use of d-c probe in video detector.

Fig. 6. Minimum loss due to signal tracer.

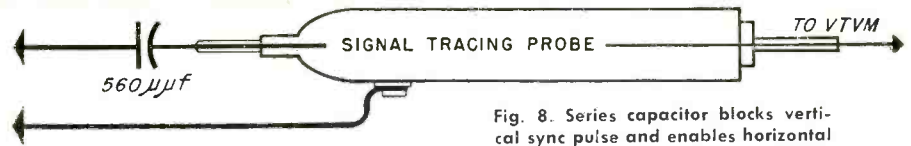
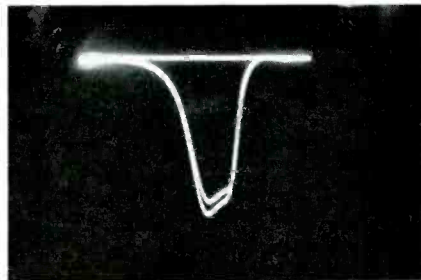


Fig. 8. Series capacitor blocks vertical sync pulse and enables horizontal pulse to be measured on a VTVM.

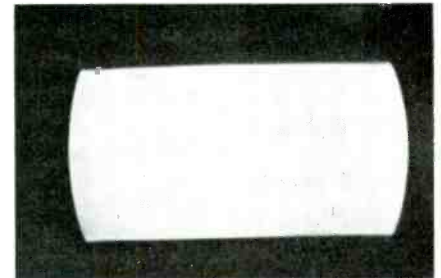
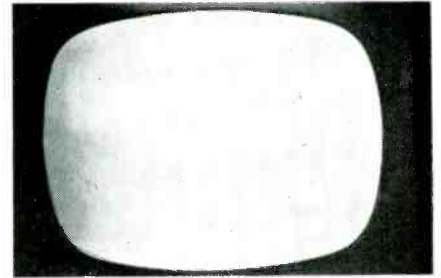


Fig. 7. Top view shows normal raster height. Shrinkage in lower view caused by loading.

amount of loading depends upon the circuit impedance and varies considerably from one receiver to another.

Horizontal Sync Pulse

The output from a sync separator or a sync amplifier contains both horizontal and vertical sync pulses. At times, the technician wishes to distinguish between these with a signal-tracing probe. This can be done by use of suitable filters on the probe tip. For example, when the probe, shown in Fig. 1 is used, a 560- μ f capacitor can be connected in series with the probe tip, as illustrated in Fig. 8. With this arrangement, horizontal sync pulses are measured at nearly 100% peak voltage on the VTVM, but vertical sync pulses are practically eliminated. By this means, the probe can be used to measure the signal voltage of the horizontal pulses alone. The vertical sync pulses are eliminated because of the relatively high source reactance provided by the 560- μ f capacitor at 60 cycles.

Another filter arrangement is illustrated in Fig. 3. Here, a 27,000-

ohm resistor is placed in series with the tip of the signal-tracing probe. This is an elementary low-pass filter, in which the series resistance works into the shunt capacitance of the probe, to form a simple integrating circuit. This is an arrangement which provides about 90% attenuation of horizontal sync pulses, but only 50% attenuation of vertical sync pulses—in practical application, the meter reading is multiplied by 2 to obtain the peak voltage of the vertical sync pulses, within practical limits.

These filter arrangements are very simple, but serve a useful purpose in service checks. More elaborate filters can be constructed.

No Picture

The signal-tracing probe and VTVM can also be used to check the video-signal level at the grid terminal of the video amplifier. A typical indication of ½-volt in this test shows that the level is ok up to the input of the video amplifier. If no signal is found at this point, check the input of the picture detector, point 3 in Fig. 9. An indication of about ½-volt in this test shows that the output from the i-f amplifier is normal, and the trouble will usually be found in the video detector. In case no signal is found at the input to the detector, check for signal at the grid, point 2 in Fig. 9. A reading of about 0.1-volt shows that the circuits are ok up to the grid of the last i-f amplifier. However, if the reading is weak or zero in the preceding test, apply the probe again at the input of the picture detector. Tune the receiver off-channel. Pull the oscillator-mixer tube shield up from the chassis, but resting over the tube, and keep your fingers in contact with the shield. If a meter indication is obtained, it can be concluded that the mixer and

the following i-f stages are operative. The trouble may then be presumed to be found in the oscillator or r-f amplifier stage.

Local Oscillator

The local oscillator can be checked by applying the probe between the floating tube shield on the oscillator tube and chassis ground. An indication of from 5 to 10-volts shows that the output from the local oscillator is sufficient. The trouble may



Fig. 10. Floating shield on oscillator tube.

now be found in the r-f stage. Weak or zero output from the local oscillator points to trouble in this section. Fig. 10 shows how this floating tube-shield test is made.

Loss of Sound

In case sound only is absent, apply the probe at the grid of the audio-output socket, point 8 in Fig. 9. The VTVM will indicate about 4-volts in normal operation. The output stage can be checked by removing and replacing the output tube in its socket; if clicks are heard in the speaker, the stage is operative and operation will be resumed when the

signal is restored. If no signal voltage is present at the grid of the audio-output stage, the FM detector can be checked with the probe and VTVM. To check the ratio detector, measure the signal voltages at the input plate and cathode terminals. A typical indication of 5 or 6-volts shows satisfactory signal level. In case signal voltage is absent, check the audio i-f amplifier tube for input signal.

Open Bypasses

Screen and cathode bypass capacitors can be checked by using the a-c function of the VTVM with the a-c probe. A typical indication at the screen of the horizontal-output tube is 1-volt, approximately; however, an open screen bypass capacitor may cause an indication of about 40-volts.

A normal indication at the cathode of the horizontal-output stage is practically zero, but an open cathode-bypass capacitor develops a voltage indication of about 8-volts. This particular test depends upon the utilization of a cathode biasing resistor and bypass capacitor in the circuit; because some receivers employ grounded cathodes, knowledge of the receiver circuitry is required in this test.

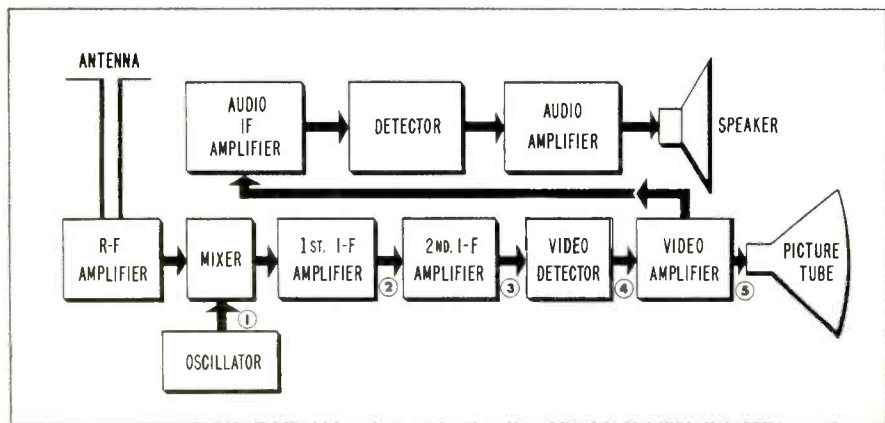
Vertical Sweep

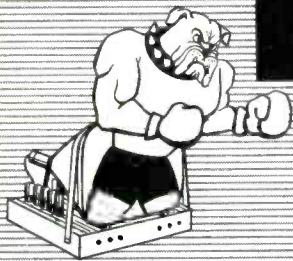
In case vertical deflection is defective, a useful preliminary test can be made with the probe. Measure the drive voltage at the grid of the vertical output tube. An indication of approximately 4-volts is normal. Weak or zero signal indication points to trouble in the vertical oscillator, while normal signal level at this terminal shows that the trouble will be found in the vertical-output transformer or yoke. Of course, sub-normal d-c supply voltage will also cause trouble in the vertical-output stage. This can be checked at the plate terminal of the socket, using the conventional test leads for the VTVM. A measurement of the waveform level can also be made at the high side of the vertical-deflection coils, using the a-c function of the VTVM, with the a-c probe inductively coupled to the coil. An indication of about 1-volt in this test shows approximately normal drive to the vertical-yoke windings.

Objection is sometimes made to signal-tracing tests with a VTVM on the basis that the waveform levels indicated are usually less than the

(Continued on page 62)

Fig. 9. Block diagram of both sound & video portions showing typical test points for signal tracing.





"Tough Dog"

Corner



Difficult Service Jobs Described by Readers

Unstable Vertical Hold

An Emerson, Model #1101, had a very touchy vertical-hold control. It could be turned only a hair and the picture would begin to roll. The first thing checked was the vertical sync coming into the intergrating network. On our scope it looked fine. From there we went further into and finally all the way through the vertical section. All wave forms and peak-to-peak voltages were good. Also all d-c voltages were within tolerance. After scope and voltage analysis failed, I couldn't help but ask myself, even when I was asleep that night, "What could be causing this narrow vertical lock-in range?" I removed each resistor, coupling and by-pass condenser and found them all to be within tolerance.

The next morning, I removed the cathode by-pass condenser in the vertical-output section. This condenser was located near the front of the chassis while the tube was in the rear. I took a new 100- μ f; 50-working volts, capacitor and con-

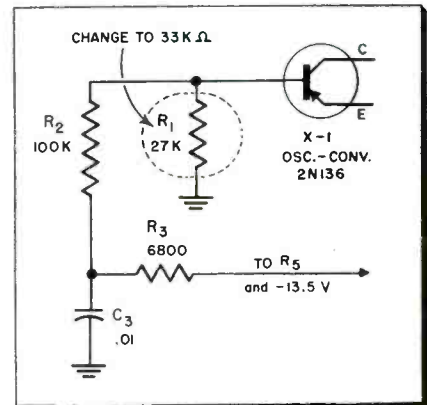
tor up front where the original one was. Once again, no lock-in range. I took a long piece of hook-up wire and fastened it to the negative end of this condenser while the positive end was connected directly to the cathode terminal. From the rear of the chassis I began to slide the wire along the chassis toward the front. The picture stayed locked in until it came within 3 inches from the front apron where the original was grounded. Then the picture began to roll. We all ask, "Why?" One thing sure, this will be hard to forget.—*Paul Noel, York, Penna.*

This sounds like a typical situation often encountered in many sets especially when the output tube is used as a triode (by having the plate and screen tied together). The solution is to insert approximately a 68 or 100-ohm resistor to squelch a parasitic oscillation. In some cases just redressing the leads may correct this problem. It has been found that a parasitic oscillation on the order of 190 to 220 mc is caused by the stray capacitance of the tube and its associated wiring. An equivalent circuit would look like an ultraaudion oscillator.—Ed.

No Low Stations

This GE Model 675, transistor radio, developed an absence of low-frequency stations from about 700-ke. Trouble shooting this radio by using the signal injection method indicated that all circuits with the exception of the oscillator was functioning. A new transistor was substituted, while some improvement was noted, it was not the solution. A new oscillator coil didn't help either. A check of all other components in this circuit still bore no fruit. Now why wouldn't this oscillator function at the lower frequencies? It did work in the upper part of the band. Per-

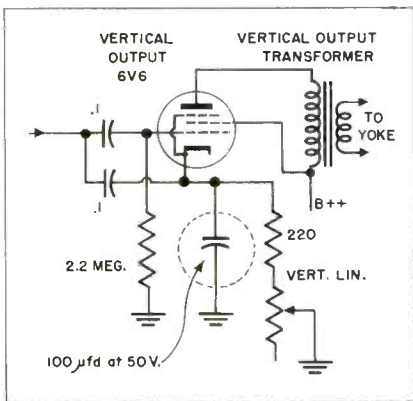
haps it was the battery. For a minute I thought I had found the answer because I had completely overlooked testing the battery. No soap, the battery was right up to snuff. Came the night, the next day, the next night and finally the dawn of the next day. The next idea for failure



Oscillator malfunction in transistor radio.

to oscillate was that the oscillator circuit did not have enough feedback or gain. That is if the gain wasn't high enough to overcome the losses, the oscillator could not sustain the oscillations. So a procedure aimed at increasing the amplification of the oscillator-converter transistor was tried. This is X-1, a GE 2N136, junction transistor.

A 1-megohm potentiometer was connected across R-2. Sure enough when it was varied, the transistor would operate at all frequencies. The test was made across R-2 instead of R-1 to eliminate lifting the resistor R-1 out of the circuit for a series test resistor. Having determined that more negative voltage applied to the base of x-1 would solve our problem, and to keep battery drain down, I decided to increase the value of R-1. Further tests showed that a 33,000 ohm resistor would do the trick.—*James A. McRoberts, Brooklyn, N. Y.*



Vertical output circuit. Emerson Model 1101.

nected it from the cathode pin direct to the ground side of the vertical linearity control. The picture locked in just the way it should. I showed it to the other fellows and they agreed. Next, I mounted the capaci-

Thyratrons & Ignitrons

Typical Circuits — Typical Applications—

ROBERT CORNELL
Technical Editor

• The need for qualified technicians in the industrial electronics field becomes greater and greater with each passing moment. The opportunity for those technicians who are already established in radio and TV to reach into this area is ever present. Knowledge of thyratron and ignitron behavior is of the utmost importance.

In our studies of the high-vacuum tube, also referred to as the hard tube, somewhere in the background we were told that inert-gas filled or soft tubes also had some practical applications, as used in battery chargers and other industrial devices. Even if instruction went beyond that point, the student sometimes didn't. Now, with the advent of more installations and increased demands for service, knowledge of soft-tube characteristics is a must.

The basic differences in tube function and design are brought about by the addition of inert gases such as mercury vapor, argon or helium. These soft tubes are capable of carrying a tremendous amount of current. Some ignitrons can handle up to 10,000 amperes for a short interval. This high-current also means high heat. It isn't unusual to see a tube with a built-in water-cooling jacket, which looks more like something the plumber dreamed up. In the gas-filled tube, unlike the high-vacuum type, the grid cannot decrease or interrupt the flow of current. The tube depends on outside circuit action to limit and when necessary, extinguish current flow. Both the

hard and soft tubes are capable of rectification but our new friends can furnish much higher d-c currents for d-c motors, welders, magnetic holding devices, etc.

The Thyratron

The thyratron is basically a vapor-filled triode and is probably the most important tube in industrial electronics. It consists of a cathode, grid and plate as shown in Fig. 1A and B. Some types look like an ordinary radio tube. There are also tetrode thyratrons which contain another grid. This improves the grid signal sensitivity and reduces grid current. The fundamentals of operation is similar in both types. In the high-vacuum tube a space charge of elec-

Fig. 3—Phase angle determines firing time.

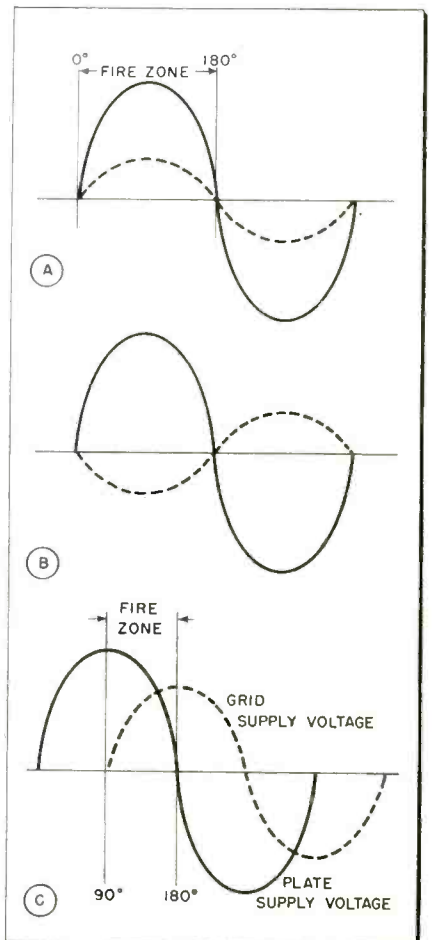


Fig. 2—A resistor-capacitor extinguisher.

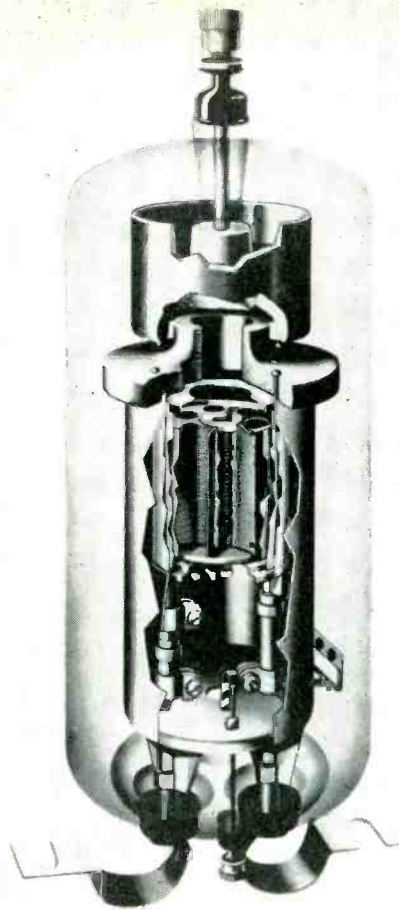
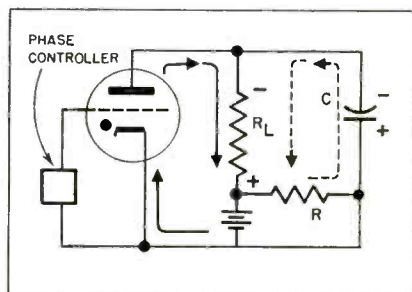
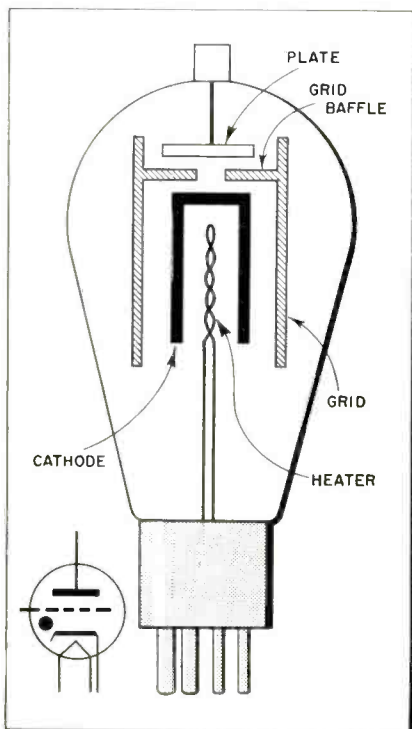


Fig. 1A—Inside view of mercury-vapor thyratron type 255. Designed for heavy duty motor control and A-C welder control. Peak anode current is 80-amperes. Peak forward voltage is 1500-volts. Filament rating is 5-volts at 16-amperes.

Fig. 1B—Triode thyratron drawing and symbol.



in Industrial Electronics

Basic Operation — Methods of Control

trons builds up around the cathode which tends to buck or limit further emission. However, in the thyatron, the collision of electrons with the gas dislodges more electrons from the gas, leaving the gas positively charged or ionized. This is a form of secondary emission. The electrons from the cathode plus those dislodged from the gas travel to the positive plate.

The positively charged ionized gas neutralizes the space charge, thus freeing more electrons from the cathode. If permitted the tube would run away with itself until damaged. The grid can hold the tube at cutoff by being biased in the conventional manner. Once the grid bias decreases enough to permit the tube to conduct, the grid loses all control. The ionized gas surrounds the grid with a positive charge. Placing a higher biasing voltage on the grid in an effort to halt the tube only attracts

more positive ions. The grid is completely enveloped and until the tube is cutoff by some other means, it cannot control the flow of current. Once emission starts and the gas becomes ionized, the action is almost instantaneous. One way to stop the action is to remove the positive voltage on the plate. Three very interesting and important characteristics to be considered are: ionization time, deionization time and critical voltage. Ionization time is the time required for a proper signal on the grid to fire the thyatron. A typical value may be about 10 μ seconds. Deionization time is the time it takes for the gas to become deionized after the plate voltage is removed. When this happens, the tube is extinguished, and the grid can take over once again. The deionization time depends on the type of gas used and may be approximately 300 μ seconds, more or less.

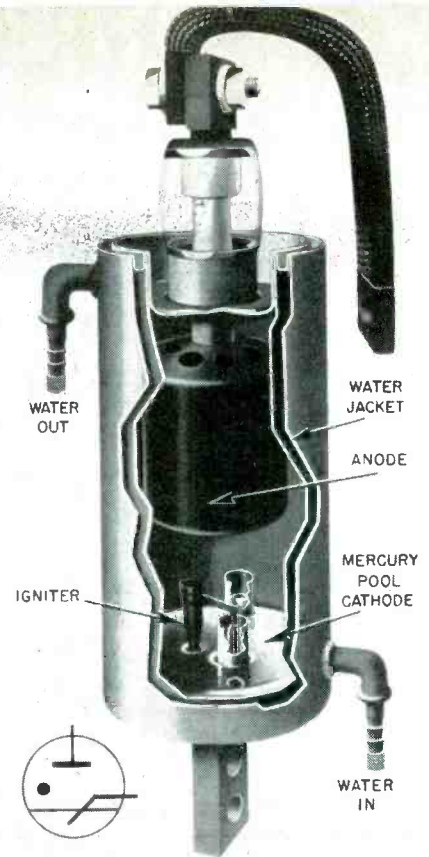


Fig. 4—Cut-away view of the ignition type 5552 and circuit symbol. Some tubes have a thermostat to control the water temperature. See chart in Fig. 5, for tube ratings.

Fig. 5—A typical tube chart showing applications and characteristics of different types of thyatrons and ignitrons.

HYDROGEN THYATRONS									
TYPE NO.	Peak Forward Anode Voltage Max.	Peak Anode Current Max. (Amps)	Average Anode Current Max. (ma)	Pulse Width Max.	DESCRIPTION				
4C35	8,000	90	100	6 μ sec	These tubes are used as drivers for pulsing magnetrons and other oscillators and as high speed switches. Hydrogen-filled, they have extremely low deionization time. They are zero bias tubes. (Triggered by a positive grid pulse. Maximum pulse repetition frequency (art in pulses per second) will depend on the peak forward anode voltage (epv in volts) according to formula: $(epv)^2 \times (prf) = 2.6 \times 10^{11}$ max. Completely interchangeable with 4C35 in every respect except that it has self-contained source of hydrogen providing life expectancy of minimum 1000 hours. Completely interchangeable with 9C22 in every respect except that it has self-contained source of hydrogen providing life expectancy of minimum 1000 hours.				
5C22	16,000	325	200	6 μ sec					
6268/AX-9911	8,000	90	100	6 μ sec					
6279/AX-9912	16,000	325	200	6 μ sec					

MERCURY VAPOR AND INERT GAS THYATRONS - TRIODES AND TETRODES													
TYPE NO.	Heater or Filament Volts	Heater or Filament Amps	Filament Heating Time (sec.)	Tube Drop Volts	Peak Voltage Forward Volts	Peak Voltage Inverse Volts	Anode Current Peak Amps	Average Amps	Max. Grid Volts	Ionization Time μ sec.	Deionization Time μ sec.	Condensed Mercury Temp. Range - °C	DESCRIPTION
2021	6.3	0.6	10	8	650	1300	0.5	2.1	-100	0.5	-	-	High control ratio, temperature independent thyatron with high circuit sensitivity, inert gas filled, negative control characteristics.
AX-105	5.0	10.0	300	16	10000	10000	8.0	4.0	-500	10	1000	+400 to +800	Radiation-cooled mercury-vapor thyatron-tetrode.
AX-255	5.0	16.0	300	12	1500	2500	80.0	12.5	-300	10	1000	+350 to +750	Heavy-duty, mercury vapor thyatron for motor control and A.C. welder control.
AX-260	5.0	25.0	600	10	1500	2000	160.0	25.0	-300	10	1000	+350 to +750	Heavy-duty, mercury vapor thyatron for motor control and A.C. welder control.
678	5.0	7.5	60	15	15000	15000	6.0	1.6	-500	-	-	+250 to +500	Negative-control, w.v. mercury vapor tube. Especially suitable for relay uses where current flow is desired in absence of grid excitation.
1701	2.5	3.0	5	16	2500	5000	1.0	0.5	-500	10	1000	+300 to +800	Radiation-cooled mercury-vapor low voltage thyatron. Similar in structure to 866-A.
5544	2.5	12.0	60	16	1500	1500	40.0	3.2	-750	-	450	-	Xenon filled thyatron with reliable operation over wide temperature range. For electronic control of D.C. motor speed, regulation of current and voltage, counting and timing devices and electronic switching machines.
5545	2.5	21.0	60	16	1500	1500	80.0	6.4	-750	-	500	-	Same as for type 5544 above.
5559	5.0	4.5	300	16	1000	1500	15.0	2.5	-500	10	1000	+400 to +750	Indirectly heated, mercury-vapor triode with negative control characteristics.
5560/FG95	5.0	4.5	300	16	1000	1000	15.0	2.5	-1000	10	1000	+400 to +800	Four electrode, mercury vapor thyatron with negative control characteristics. Designed for applications where the available grid area is very small and where it is desired to actuate the grid from a high impedance source.
5685/CGJ	2.5	21.0	60	9	750	1250	12.8	6.4	-100	-	1000	-	Grid-control, xenon thyatron. Tantalum anode provides good heat dissipation and gettering properties.
5727	6.3	0.6	10	8	650	1300	0.5	0.1	-100	0.5	35 min.	-	Ruggedized version of 2021. Particularly suitable for mobile and aircraft operation where mechanical strength and reliability are important. Designed for relay, timing devices and electronic switching machines.
6098/AOR-9950	3.0	6.5	120	15	13000	13000	4.0	1.0	-100	10	250	+250 to +550	Radiation-cooled mercury-vapor thyatron. Oxide coated filament. Used for stepless control of voltage output and D-C motor control.
6870/AGR-9951	3.0	14.0	120	12	27000	27000	10.0	2.5	-100	10	250	+500 to +450	Same as above for type 6869/AGR-9950.
6786	5.0	15-26	600	12	15000	15000	48.0	10-15	-	-	-	+250 to +550	High voltage, grid controlled mercury vapor thyatron. For industrial RF generators and transmitting equipment.

IGNITRONS High efficiency, rugged construction, for WELDER CONTROL SERVICE.				
TYPE NO.	R.M.S. Volts Range	Max. KVA Demand & Corresponding Average Current K.V.A.	Amps	Type Cooling
5554/681	200-600	300	12.1	Clamp
5552/651	250-600	1200	75.6	Water
5554/679	2400	1200	75.0	Water
5555/652B	2400	2400	135.0	Water
5822	220-600	428	20	Water

IGNITRONS High efficiency, rugged construction, for CONTINUOUS RECTIFIER SERVICE.						
TYPE NO.	Typical D.C. Output Voltage (v)	Max. Peak Inverse & Forward Voltage (v)	Max. Peak Anode Current (A)	Max. Continuous Average Anode Current (A)	Max. Average Current (A) / minute	Type Cooling
5554/679	300*	2100	900	100	200	Water
	600*	2100	600	75	150	
5555/652B	300*	2100	1800	200	400	Water
	600*	2100	1700	150	300	

*Six-phase, double π , single way circuits.

Should the plate voltage be restored before the gas is deionized, the tube will continue to fire regardless of grid bias. Because of this time element, the tube is limited to rather low-frequency applications. Critical voltage is the minimum amount of grid voltage needed to fire the tube.

Control of the Thyatron

There are two considerations here, how to turn the tube on and how to shut it off. To shut the tube off, either an a-c plate voltage source or other removal of positive plate voltage may be employed. When using a-c on the plate, the tube is capable of conducting only on the positive cycles. An RC network can also be used to apply a negative voltage to extinguish the tube as shown in Fig. 2. The solid arrows indicate the direction of electron flow when the tube is conducting. As the voltage drop increases across R_L , the capacitor charges up polarity as marked and eventually extinguishes the tube. The grid control circuit can now hold the tube at cutoff. During this time the condenser can discharge itself through both resistors as indicated by the broken arrows. The circuit is now ready for another cycle.

Several methods can be used to fire the tube. The grid phase-shift method may be used in conjunction with an a-c plate supply. If the grid and plate are in phase with each other, the tube will conduct for a maximum of 180° , as seen in Fig. 3A. When the grid and plate are 180° out of phase no conduction is possible, Fig. 3B. In Fig. 3C, the grid voltage is lagging the plate voltage by 90° . The tube will now conduct for only 90° . A variable phase shifting network may be a simple variable RC or RL circuit. By controlling the phase angle, the number of degrees of conduction may be predetermined. There are other circuit designs which simply raise the grid voltage to the firing point.

The Ignitron

The ignitron is to the thyatron as the "H" Bomb is to the "A" Bomb. The ignitron is a cold-cathode, soft-type tube capable of passing extremely large amounts of current and is usually fired by a thyatron. Since there is no filament or heater to cause electron flow, some other means is used. Fig. 4, is a cross section of the ignitron. An igniter made of boron carbide is in actual contact with the mercury pool cathode. The igniter remains dry due to the very

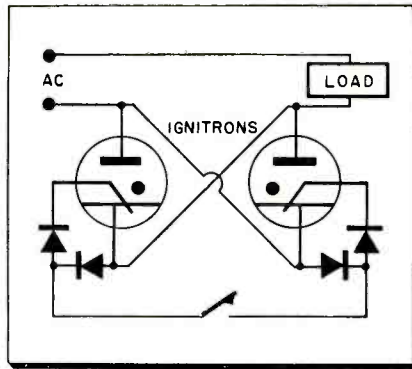


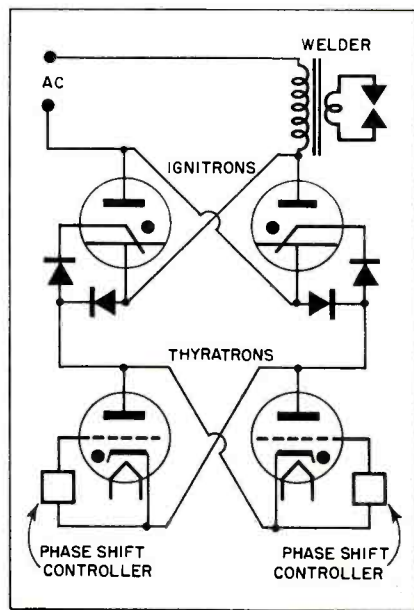
Fig. 6—Ignitrons hooked up back-to-back.

high surface tension, which is a characteristic of mercury especially when in the presence of this metal. When a sufficient amount of positive voltage is applied to the ignitor, electrons released by the cathode cause the gas to become ionized and fires the tube. The dry igniter presents a certain amount of resistance between itself and the mercury pool in spite of its apparent direct contact. This resistance makes it possible for a difference in potential to exist between the ignitor and cathode. It is this potential difference that causes the initial flow of electrons. This differs from thermionic emission found in filamentary type of tubes. Other electrical characteristics can be determined by inspecting the tube chart in Fig. 5.

Use & Control of the Ignitron

The ignitron is capable of performing two basic functions in electronics and under high-current conditions. As previously mentioned, is its ability

Fig. 7—Thyatrions used to fire ignitrons.



to act as a half-wave rectifier. Two of them may be hooked up in a conventional manner to obtain full-wave rectification. The other function is switching. A mechanical contactor could be used, but under high mechanical and electrical stress, a switch would soon break down or burnout. The advantages of using the ignitron, which has no moving parts, as an electronic switch are obvious.

360° Switching Action

When an a-c supply is used to furnish plate voltage, normally conduction could take place for a maximum of 180° . However, by using two tubes back to back as a switching device, it now becomes possible to excite the circuit at any time and to maintain a continuous duty cycle, within tube ratings, as shown in Fig. 6. The rectifiers in the igniter circuit prevent tube damage due to reverse current from the igniter to the cathode. When the switch is closed, first one tube will fire and then the other, depending upon line voltage polarity. To carry electronic control one step further, instead of using a contactor to apply a positive voltage to the igniter, a thyatron can be used as shown in Fig. 7. The ignitron requires approximately 30 amperes of current more or less depending on the tube type. Therefore, thyatrons capable of delivering at least this much current are used. To control the thyatron on the other hand, considerably less current is required and the familiar hard tubes may be used. Sometimes mechanical timing or cycling devices, such as motor driven cams, and perforated wheels with predetermined spaced contacts, are used. In addition to the rectifiers, motor controllers, resistance welders and magnetic holding devices, gas-filled tubes may be found in all sorts of machines and environments; in the hospital, in the factory and in the home. Automatic electronic controlling gadgets are used for heat and light regulation; RF heating, drilling, cooking and washing; photoelectric relays; inverter and voltage regulation; flame control; speed control; elevator control and self-leveler; pyrometers; air cleaner and smoke control; servomechanisms; etc. The variety and ingenuity of design offers a challenge; a challenge well within the grasp of the electronic technician. •

ILLUSTRATION CREDITS

Figs. 1A, 4 and 5, courtesy Ampere Electronic Corp.

Tomorrow's TV Antenna Market

Study shows strong demand in saturated areas.

SAM SCHLUSSEL, SALES MANAGER
CHANNEL MASTER CORP.

• Today's TV dealer must gear his thinking to the fact that the antenna business has become primarily a *replacement* business. This is true of both indoor and outdoor antennas. Simple statistics point up the truth of this market condition. Approximately 75% of all the households in the U. S. now have TV. Counties with 80% or 85% are not uncommon. The growth of this saturation figure from now on will be relatively slow because of economic, geographical, and other factors.

The experience of servicemen themselves further points up the fact that an increasing share of antennas installed today—both indoor and outdoor—is replacing existing installations. It is the so-called "saturated" cities and areas which now represent the greatest potential antenna markets. Cities like New York, Chicago and Philadelphia, which a few years ago were generally considered poor antenna markets because of their high degrees of saturation, are once again very much alive and kicking.

In the case of outdoor antennas, this is largely due to the purchase of second sets, the deterioration of picture quality due to antenna aging, and a growing consumer realization that new antennas can provide better reception quality.

The major replacement factor in the case of indoor antennas is undoubtedly the trend toward new antenna designs offering more esthetic styling and simplified operation.

Color TV

Of course, the real boom in antenna replacement will come with the emergence of color TV. Even now, as the momentum of color TV begins to build, the pattern is developing. The installation of these sets opens the door to the installation of new and better antennas. The discounts that dealers feel they must give to sell a set, is frequently more

than made up by the sale of an antenna. The sales pattern shows that where color TV is bought today, the old black and white set is frequently held as a second set. This often necessitates either a new outdoor antenna to provide sufficient signal for two sets, or an additional indoor model. With color TV the fringe area moves closer to the transmitter, creating the need for better antennas than are now being used in the same areas. And people who are getting by with marginal reception in black and white will find it intolerable in color.

Finally, the simple arithmetic of color TV gives a dealer his most logical argument for selling a new antenna when he sells the set. He has merely to ask the customer a simple question, "Doesn't it pay to protect your new color set investment with a new antenna?" It is true with any TV set and doubly true with color: The antenna is the insurance policy that protects the consumer's investment in the set.

Until recently, manufacturers have considered the dealer the prime target in all their promotional and educational efforts. Programs of this type, of course, must be continued since the dealer's very existence in many cases depends upon his knowledge of the product—both technical and merchandising-wise. For example, our company recently surveyed the dealers of one of the major population centers of New York State. One of the questions asked was, "Have you ever sold an indoor antenna for over \$10.00?" More than 75% said "NO." And yet, on sales like this, the dealer may have made himself more net profit than on the set itself.

Consumer Promotion

The antenna industry is now shifting its educational and promotional emphasis to include the ultimate buyer—the consumer. Since a substantial part of antenna sales must now come from replacements, the dealer's major job today is to tie-in his own local advertising efforts. In the study mentioned above, only 17% of the dealers questioned had ever

conducted any kind of antenna promotion. This is a tremendous mistake and a great loss, because dealers who advertise and merchandise TV antennas usually find that it pays off handsomely.

Is the public ready to heed the dealer who recommends antenna replacement? The signs point very strongly to the fact that the typical consumer is not only ready but actively willing to talk to the dealer about ways to improve his TV reception by getting better picture quality, more channels, etc.

Antenna Check-Ups Welcome

Our company had a booth at the Texas State Fair a short time ago. More than 20,000 questionnaires were filled out by visitors at the Fair on the subject of their TV reception quality. About 70% indicated that there was at least 1 channel on which they were *not* getting good reception. And about 50% said they would welcome a visit by their local TV serviceman to check up on their present antenna installation. This pattern is being repeated all around the country. A dealer in Virginia ran one newspaper ad in September offering a free TV antenna check-up. He was so swamped with requests that he had to farm out the leads to other dealers in his neighborhood. In following up the leads he has found that about 40% of these inspections have been turned into orders for complete antenna replacements.

On the retail level, indoor antennas have become a new kind of product—particularly the more attractive types. The stores like them because they are sold at higher prices with full trade mark-ups. Their appearance has taken them out of the parts store or TV department, and put them up front in America's top department stores and chains.

A woman doesn't wait until the old percolator breaks down before she buys a beautiful new one. The elements of style and obsolescence, as well as functional performance, have to be introduced to antenna merchandising to keep dealer profits growing in a "saturated" market. •

Build Your

Audio Literature File

Manuals and booklets available from manufacturers help speed your hi-fi and public address servicing.

• You can obtain any of the audio literature described here free (unless noted otherwise) simply by filling in your name and address for each item of interest. Cut out all completed coupons and send to:

**Audio Department
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Supply is limited to manufacturer inventory, so fill out your requests immediately to avoid disappointment. **PRINT OR TYPE YOUR NAME.**

For literature requiring prepayment, attach check or money order directly to the appropriate coupons. Where more than one item is described, check either or both desired.

ELECTRONIC TECHNICIAN will route all free and paid requests directly to the manufacturers to expedite prompt delivery to our readers. •

Acro Products Co.

As described in **ELECTRONIC TECHNICIAN**, send me your **PAID** 22-page booklet, "Theory and Operation of the Ultra-Linear Circuit," describing distortion, output transformer influence, and other aspects of amplifier design and performance. Enclosed is 25¢.

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Astatic Corp.

As described in **ELECTRONIC TECHNICIAN**, send me your **FREE** 8-page cross-reference chart CRC-56 listing the needles and many hundreds of phono cartridge replacements for various manufacturers. Check here—

Also **FREE** 12-page microphone catalog S-442 containing specs and applications of mikes for PA, broadcast, hi-fi and industrial. Check here—

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Atlas Sound Corp.

As described in **ELECTRONIC TECHNICIAN**, send me your **FREE** series of two data sheets on new developments including explosion-proof speakers, mike stands and supports, and mike foot switch, complete with photos and technical descriptions.

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Audiogersh Corp.

As described in **ELECTRONIC TECHNICIAN**, send me your **FREE** 6-page bulletin describing features and specs of Miracord record changers, Miratwin cartridges and other phono accessories.

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Bell Sound Systems

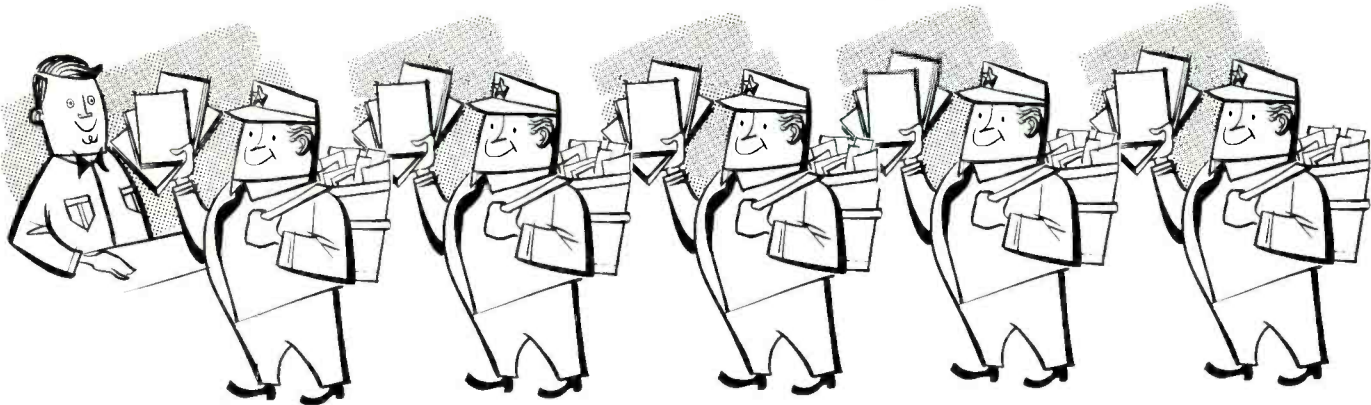
As described in **ELECTRONIC TECHNICIAN**, send me your **FREE** booklet 563-9339 discussing Pace-maker public address equipment, and 4-page bulletin 566-776 describing the Series 5600 fixed and mobile PA amplifiers, mikes, speakers and record players.

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British Industries Corp.

As described in **ELECTRONIC TECHNICIAN**, send me your **FREE** 8-page "High Fidelity Plan Book," which provides photos and technical specs on Garrard changers, Leak amplifiers, Wharfdale speakers, RJ enclosures, River Edge cabinets and Genalex audio tubes.

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Electro-Voice, Inc.

As described in **ELECTRONIC TECHNICIAN**, send me your **FREE** 16-page catalog No. 124, which presents specs and prices on a complete line of mikes, cartridges, speakers, kits and amplifiers. Check here—

Also **FREE** 4-pager on miniaturized ceramic replacement cartridges, with detail drawings. Check here—

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Elgin National Watch Co.

AS described in **ELECTRONIC TECHNICIAN**, send me your **FREE** 20-page catalog 47 showing technical specs and prices of American microphones, arms and cartridges. Check here—

Also **FREE** 4-pager, "Phonograph Cartridge Replacement Chart," listing interchange for 100 manufacturers. Check here—

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Fairchild Recording Equipment Co.

As described in **ELECTRONIC TECHNICIAN**, send me your **FREE** 16-page booklet HF-16, "How Good Is Your Arm?" which discusses resonance, tracking, side thrust, etc., complete with curves. Check here—

Also **FREE** 6-page "In the Groove" telling the how and why of phono cartridges. Check here—

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Harman-Kardon, Inc.

As described in **ELECTRONIC TECHNICIAN**, send me your **FREE** 14-page catalog which presents product descriptions of your hi-fi amplifier and tuner line, plus technical discussion of equipment features. Check here—

Also **PAID** service manual on the TA-10 tuner amplifier (other units on request). Enclosed is 75¢, check here—

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Heath Co.

As described in **ELECTRONIC TECHNICIAN**, send me your **FREE** 22-page booklet "High Fidelity Especially for You," which concisely and clearly covers various aspects of records, pick-ups, styli, amplifiers, speakers and enclosures. A popular approach to the subject.

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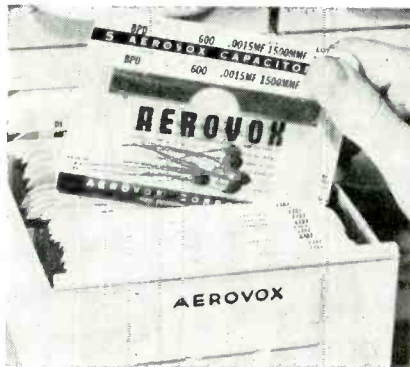
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New Tubes & Components

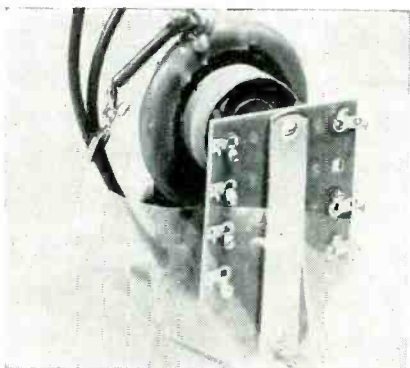
Aerovox PLASTIC ENVELOPE →

Tiny components that have a way of getting shopworn if not actually lost with orthodox packaging are now protected in a transparent plastic envelope. Five pieces constitute a package for smaller types; one piece for the larger. The plastic envelope in turn is mounted on a printed index card whose tab indicates type number, voltage and capacitance. The securely-folded flap of the plastic envelope can be opened to remove pieces. Aerovox Corp., 740 Belleville, New Bedford, Mass. (ELECTRONIC TECHNICIAN 3-2)



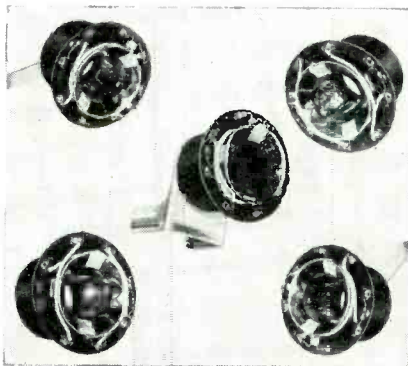
Rogers FLYBACKS →

Two new exact replacement flyback transformers for 30 Admiral chassis TV receivers are packaged in hermetically-sealed plastic containers which keep troublesome moisture and dirt out; extending shelf life indefinitely. The Model EFR 165, is an exact replacement for Admiral part numbers 79D65-1, 2 and 4. The Model EFR 166 replaces part number 79D65-3. In addition, 16 other exact flyback replacements for Admiral are available. Rogers Electronic Corp., 49 Bleecker St., New York 12, N.Y. (ELECTRONIC TECHNICIAN 3-3)



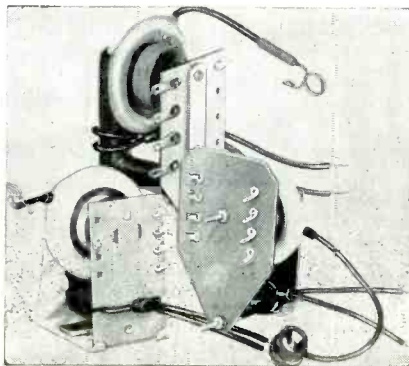
Merit YOKES →

Five exact replacement yokes cover replacements in more than 150 GE models and chassis. These new yokes drop into the chassis as easily as the factory original comes out. Since no cost-cutting advantages in their design and production were taken, the life and performance of these units will reduce call backs to an irreducible minimum. They are: MDF-83 for RLD-013; MDF-84 for RLD-025; MDF-85 for RLD-041 & 045; MDF-86 for RLD-042 and MDF-87 for RLD-052 & 067. Merit Coil & Transformer Corp., 4427 N. Clark St., Chicago 40, Ill. (ELECTRONIC TECHNICIAN 3-1)



Stancor FLYBACKS →

Five new exact replacement flybacks for Muntz, Admiral and Magnavox are exact duplicates. No. A-8291 replaces Muntz part number TO-0039. A-8292 is a replacement for Admiral part number 79D65-1. A-8293 replaces Magnavox part numbers 360552-1/-2/-2A; 360577-1; 360593-1/-2. A-8294 replaces Magnavox part number 360606/-1. A-8295 replaces Magnavox part numbers 360623/-1 and 360614-1. Chicago Standard Transformer Corp., 3501 W. Addison, Chicago 18, Ill. (ELECTRONIC TECHNICIAN 3-4)

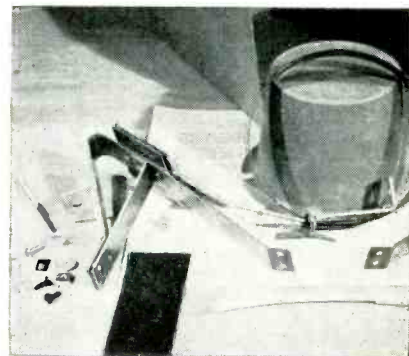


RCA BEAM POWER TUBE

The 5CZ5 is a high-perveance beam power tube of the 9-pin miniature type designed primarily for use as a vertical-deflection amplifier in TV receivers utilizing picture tubes having diagonal-deflection angles of 110° and operation at ulior voltages up to 18,000-volts. The 4.7-volt, 0.6-ampere heater has controlled warm-up time. Radio Corporation of America, Harrison, N.J. (ELECTRONIC TECHNICIAN 3-6)

Colman CRT CONVERSION KIT

Addition of four new kits for conversion from a metal picture tube to an all-glass picture tube in older models of 21" TV sets has been announced. This will enable the use of aluminized tubes in many replacement jobs. The



new kits are as follows: No. C-6 fits Wells-Gardner, Airline, Truetone, Firestone, Coronado and Arlington sets. No. C-7 fits Arvin and Silvertone models. No. C-8 fits RCA 27" sets. No. C-9 fits Crosley models. Kit No. C-6 is illustrated. Colman Tool & Machine Co., Amarillo, Texas. (ELECTRONIC TECHNICIAN 3-10)

Raytheon Tubes

Three new tubes, the 3BU8, 6CN7 and the 25DN6 were announced recently. The 3BU8 is a heater-cathode type twin pentode of miniature construction having a 600-ma controlled warm-up heater, separate plates and #3 grids but a common screen, #1 grid and cathode. One section may be used as a sync separator and sync clipper while the other section is used to generate AGC voltage in TV receivers. The 6CN7 is a heater-cathode type double-diode high-mu triode of miniature construction primarily designed for use as a combined horizontal phase detector and reactance tube. The 25DN6 is a beam-power amplifier with a 600-ma controlled warm-up heater, and is a horizontal-deflection amplifier for use in TV sets having low B+ supply voltages. Raytheon Mfg. Co., 55 Chapel St., Newton 58, Mass. (ELECTRONIC TECHNICIAN 3-5)

Jensen Industries

As described in **ELECTRONIC TECHNICIAN**, send me your **FREE** 18-page manual, the Jenselector, which enables you to pick out the correct needle for any phono. Check here—

Also **FREE** 1957 giant wall chart of hi-fi needle replacements broken down by different manufacturers. Check here—

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Jensen Manufacturing Co.

As described in **ELECTRONIC TECHNICIAN**, send me your **FREE** 6-page data bulletin 165A which presents the entire line of speakers and cabinets. Check here—

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Pilot Radio Corp.

As described in **ELECTRONIC TECHNICIAN**, send me your **FREE** specification sheet and schematic for the FM-530 tuner and AA-410 amplifier (other units on request).

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Permo, Inc.

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Quam-Nichols Co.

As described in **ELECTRONIC TECHNICIAN**, send me your **FREE** 2-page catalog sheet No. 69, which covers the entire line of moderately priced hi-fi speakers, including technical specs and instructions for enclosure construction.

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Rockbar Corp.

As described in **ELECTRONIC TECHNICIAN**, send me your **FREE** 8-page service instructions and 2-page bulletin on the Collaro RC-456 4-speed hi-fi record changer. Check here—

Also **FREE** 20-pager, article reprints and recommended acoustical resistance units for Goodmans speakers and systems. Check here—

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Recoton Corp.

As described in **ELECTRONIC TECHNICIAN**, send me your **FREE** 16-page "Simplified Replacement Needle Reference Guide" and 12-page Section B, "Phonograph Manufacturers Index," Sixth Edition. These manuals expedite speedy correct replacement of some 168 different needle types.

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Shure Brothers

As described in **ELECTRONIC TECHNICIAN**, send me your **FREE** technical data sheets on microphones: 55s Unidyne dynamic type, 100 series carbon type, 777 crystal types and 520SL reluctance type. Check here—

Also **PAID** Reactance Slide Rule which simplifies calculation of resonance, reactance, Q and dissipation problems. Enclosed is 50¢, check here—

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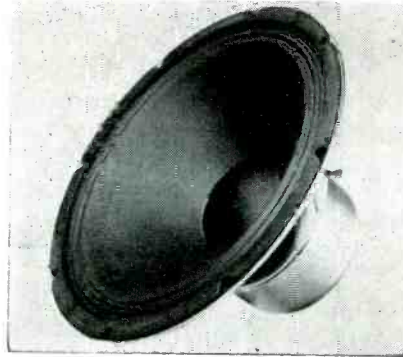
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New Audio Products



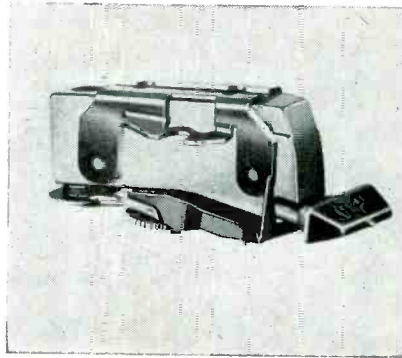
Utah SPEAKERS →

Two new speakers are designed to give quality reproduction at high power level for high fidelity installations. When properly baffled the 35-watt, 15" speaker has a frequency response of 20 to 1,000 cps within 2-db and to 5,000 cps within 5-db; the 20-watt, 12" speaker's response is 45 to 14,000 cps, within 5-db. Features solid brass binding posts, alnico V magnets, shadow-black frontal areas and seamless type cones. Utah Radio Products Corp., 1124 E. Franklin St., Huntington, Indiana. (ELECTRONIC TECHNICIAN 3-16)



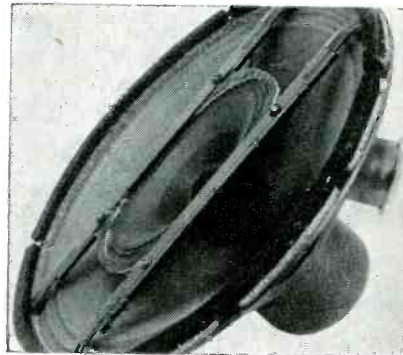
Shure 5-VOLT CARTRIDGE →

The W9 is a new 5-volt phono cartridge with response to 10,000 cps and is designed for improvement and replacement applications. The 3-speed, dual-needle, dual-voltage crystal cartridge will dramatically improve the sound of low-cost low-gain phonographs using one and two tubes. The needle can be replaced without tools and without removing the cartridge from the tone arm. It replaces 69 different cartridges in thousands of phonographs. Shure Brothers, 225 W. Huron St., Chicago 10, Ill. (ELECTRONIC TECHNICIAN 3-17)



Sonotone COAXIAL SPEAKER →

The CA-12 is a new 12" coaxial loudspeaker which features high flux density (woofer, 12,000 gauss; tweeter, 8,500 gauss), low resonant frequency, wide frequency range (40 to 14,000 cycles) and an elliptical cone tweeter for wide-angle dispersion. The 12" speaker uses a large alnico V magnet and a complete L-C dividing network. The exceptionally low price makes it ideal as a second speaker for use in the den or for stereophonic systems. Net, \$19.50. Sonotone Corp., Elmsford, N.Y. (ELECTRONIC TECHNICIAN 3-15)



Reeves TAPE REEL

A new "Quick-thread" reel designed to provide easier and faster loading of recording tape is now regularly supplied with 5" and 7" reels of tape. It features a loading slot accessible at the outer edge of the reel. Tape is inserted in this slot and automatically guided to the hub for instant, secure attachment. When loaded in this manner, the tape can actually be fastened with just one hand in a single operation. Reeves Soundcraft Corp., 10 E. 52nd St., New York 22, N.Y. (ELECTRONIC TECHNICIAN 3-18)

DYAD DUAL REPRODUCER

Improved amplifier performance, minimum bass resonance and IM distortion are only a few of the outstanding features of this new twin reproducer; composed of a 12" woofer and a 5" tweeter mounted coaxially on a sturdy frame. Impedance is 8 ohms at 400 cps; response, 30 to 15,000 cps; power rating, 12-watts program; bass resonance, 20 cps; magnet, 12,000 gauss; crossover, 1,000 cps and weighs 5½ lbs. The Ercona Corp., 551 Fifth Ave., New York 17, N.Y. (ELECTRONIC TECHNICIAN 3-21)

Knight HI FI FM TUNER KIT

A new FM tuner kit combines contemporary cabinet styling with such features as printed circuitry, flywheel tuning, AGC and high fidelity that meets critical listening standards. The tuner can be used with any amplifier that has volume and tone controls. Printed circuit greatly speeds wiring. Stock number 83 Y 751, includes all parts, tubes, cabinet and instructions. \$37.75. Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill. (ELECTRONIC TECHNICIAN 3-20)

Bogen AMPLIFIERS

A completely new line of P.A. amplifiers comprising 12 models offers a new concept in styling. It provides increased efficiency, lower distortion and better low-frequency response than previous lines, plus the added features of easy installation and easy service. The "L" series in the improved line include constant voltage output taps, special filters to improve speech clarity, equalized phono input for all cartridges, separate bass and treble controls and plug-in sockets for low-impedance transformers. The "LX" series has all the features of the "L" series, plus an anti-feedback control and a built-in gain-control circuit which allows changes in gain from distances up to 2,000 feet. David Bogen Co., Inc., Paramus, N.J. (ELECTRONIC TECHNICIAN 3-19)

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THE WR-61B COLOR-BAR GENERATOR

produces crystal-controlled signals spaced at precisely 30-degree intervals... permitting adjustments of all types of demodulators... especially X and Z as well as the conventional R-Y, B-Y, G-Y, I and Q signals. A high degree of accuracy is assured since picture carrier, color subcarrier, sound carrier, bar frequency and horizontal sync pulses are all crystal controlled. Luminance signals at bar edges aid in checking color "fit" or registration. Adjustable subcarrier amplitude permits checking color-sync action. "Darkening" pedestals permit checking gain ratios or chrominance channels without an oscilloscope and without computing the relative phosphor efficiency of the kinescope. The new WR-61B is now accepted as the standard for color-phasing accuracy in many TV stations and network operations.

Price \$259.50*



THE WR-46A VIDEO DOT/CROSSHATCH GENERATOR

saves installation time, enables more precise convergence adjustments. High level video output permits direct connection to color kinescope; eliminates pattern deterioration due to bandpass characteristics of rf, if or vf amplifiers. Result—clear, extremely sharp pattern display. Permits simultaneous display of pattern with broadcast picture in background. Assures convergence adjustments at exact horizontal scanning rates. Switch selection of four separate types of patterns is provided. Vertical sync is frequency-divided from horizontal sync, resulting in interlaced scanning and exceptional freedom from "jitter," "crawl" and sync "hunting."

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has features usually found only in more expensive instruments. It has all the 'scope functions you need to do both Color TV and black-and-white service... Outstanding features include front-panel switching of "V" amplifier bandwidth, response flat to 4.5 Mc in wide-band position; 12-step voltage-calibrated, frequency-compensated "V" amplifier attenuator; simplified, simultaneous waveshape display and voltage measurement on VTVM-type graph scales—peak-to-peak. Read volts directly from screen; sturdy single-unit low-capacitance/direct probe with built-in switch eliminates need for separate probe. Plus many more work-easy features!

Price \$239.50*

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RADIO CORPORATION of AMERICA

COMPONENTS DIVISION

CAMDEN, N. J.

See your RCA Distributor for details on these outstanding RCA test instruments for Color TV!

What's A Good Microphone?

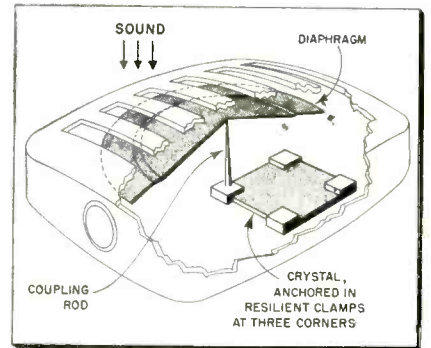
Low Cost & Quality Systems. Indoor & Outdoor Applications.

NORMAN CROWHURST



Low cost crystal or ceramic for home use.

• The answer to a question like this depends upon the purpose or viewpoint. From the manufacturer's point of view, obviously a good microphone is one that sells and since most manufacturers discontinue lines that don't sell, we must conclude that all the microphones on the market are good for some purpose or other. The fact that we have such a wide choice merely shows up the variety of purposes and the fact that one answer will not be right for all of them.



Crystal type takes advantage of piezo-electric effect. Has high output and high impedance.

Broadcast quality condenser microphone has dual field pattern characteristic; cardioid and nondirectional. Has its own matching power supply and cables.

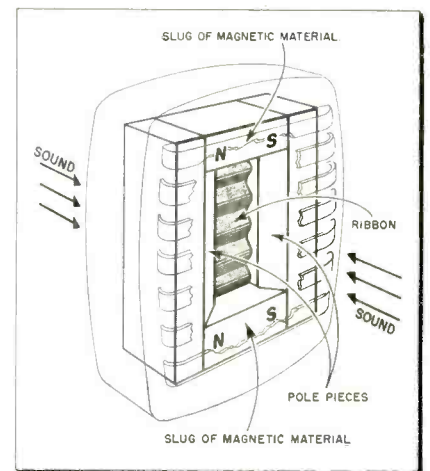


Low Cost System

For use with a low cost home recorder, either for sending messages on tape or for recording family events, a low-cost microphone is needed that will give good discrimination against noise and hum. Either a crystal type or a reluctance type, which may have considerable peakiness in the response, is quite satisfactory for this purpose. Some peakiness is, in fact, desirable here, because it enables an apparently better signal to be recorded on tape with less hum and other background noises.

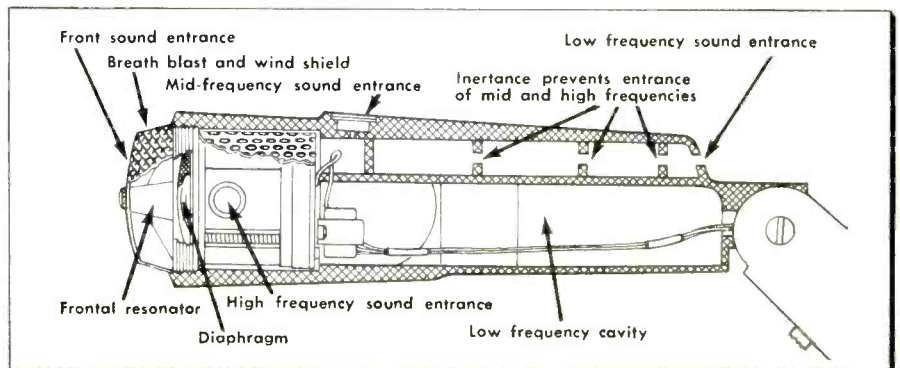
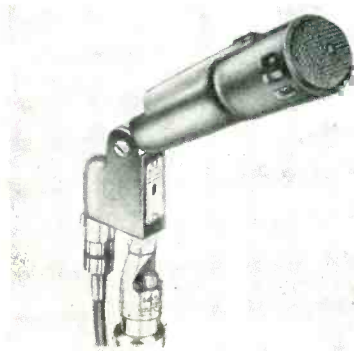
But if you use this same microphone to record your friends' musical efforts in the living room, the results will not sound very good. For
(Continued on page 48)

Current is induced in the ribbon which acts as a moving conductor in a magnetic field.



Cardioid dynamic broadcast quality, see diag.

Three sound-cancelling entrances provide a uniform cardioid pattern at all frequencies.



Audio NEWS LETTER

The folks who viewed the Presidential Inauguration also had the pleasure of hearing every word of the ceremony in high fidelity. The loudspeakers, installed by American Amplifier & TV Corp., were made by University Loudspeakers. The proud manufacturer understandably didn't hesitate a moment to bring this fact to everyone's attention.

Duotone has launched an advertising campaign in Holiday magazine to support technician sales of the firm's phono needles and accessories. Last fall the company opened its campaign in Life magazine.

Reeves Soundcraft Hi-Fi recording tape line, marketed through franchised distributors on an exclusive basis to dealers, is designed to offer dealers price protection. Reeves reports the sales program a complete success.

Model number and marketing inducements for the Electro-Voice Model 664 PA dynamic mike are being combined. Any distributor who orders the unit in quantities of any combinations of the numbers 6, 6 or 4 receives a full ad and promotion package.

The dealer is the key to making a city hi-fi conscious, reports ORRadio vp Nat Welch. He cites Portland, Ore., as an example. It's a booming hi-fi market for no particular reason except that spirited merchandisers have put a lot of push behind their store sales.

The Stentorian 15" wide range concentric speaker at \$159.50 and 15" woofer at \$89.50 have been announced by Barker Sales, importer of British Whiteley products.

A spherical speaker enclosure made of fiberglass laminate looks like that projected earth satellite. So its makers, Wilber Enterprises, call it just that, the Satellite.

**New items
to save time,
make money**

**...literally hundreds of them,
in Centralab's
new Catalog 30**

Tells you what's new at your Centralab distributor. Keeps you up to date on the latest developments that make servicing of radio, TV, and electronic equipment faster and more profitable.

Shows hundreds of new, exciting items it pays you to know about — new values in Packaged Electronic Circuits — new volume controls — new ceramic capacitors — new switches — new transistor amplifiers.

Everything is arranged so that it's easy to find just what you're looking for. Ask your Centralab distributor for your free copy. Or write us today.

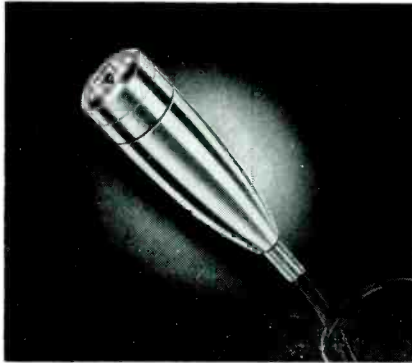
Centralab A DIVISION OF GLOBE-UNION INC.
902C EAST KEEFE AVENUE • MILWAUKEE 1, WISCONSIN
G-95B

What's A Good Microphone?

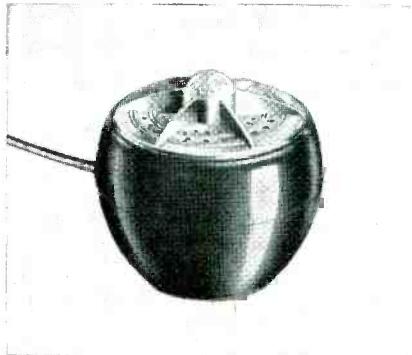
(Continued from page 46)



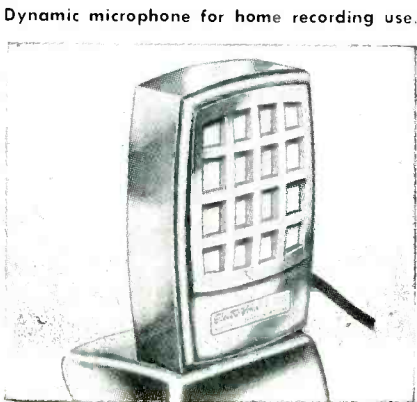
Dynamic broadcast quality variable impedance.



High impedance type for tape recording & PA.



Hand or desk, crystal type for PA & tape use.



Dynamic microphone for home recording use.

this purpose a microphone with a better frequency response, and possibly with some directional characteristics, is more desirable. Probably also a better tape recorder should be used, otherwise you may not get the full benefits of the better microphone. But the best choice of a microphone will depend on just how you can use it.

If you can get the instrumentalists fairly close to the microphone, probably one of the better types of dynamic microphones will give good results. These have a better frequency response than the low-cost crystal or reluctance types. Here, too, a certain amount of peakiness helps to override the inherent deficiencies of the lower cost tape recorder.

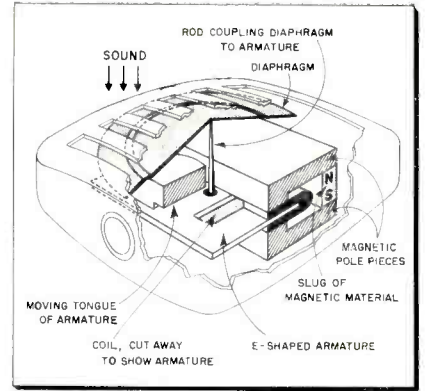
For use with a better recorder, a ribbon or bidirectional type microphone is worth while. It has definite advantages in the living room. The artists, where three or four or more may be playing simultaneously, can be grouped on either side of the microphone, in its sensitive directions. This enables a greater number of people to get effectively close to the microphone, or within a reasonable distance. At the same time it can discriminate against the reverberation effect in the room, which can be quite distressing with other types of microphone.

Indoor Public Address

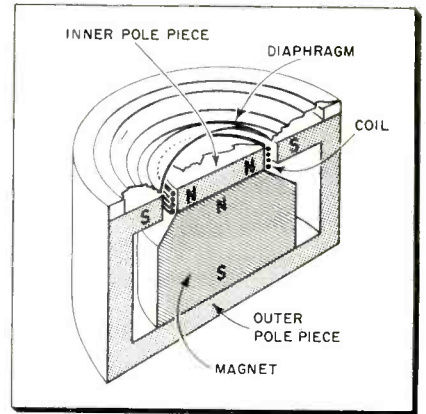
For public address work another group of factors comes into play to determine the selection of the best microphone. The low cost peaky type that sounded so good on speech for recording purposes is quite useless for most public address installations, because of the acoustic feedback problem. Restricting the gain to

(Continued on page 56)

Crystal or ceramic type for PA & home use.



In the reluctance type a magnetic armature provides motion relative to the fixed coil.

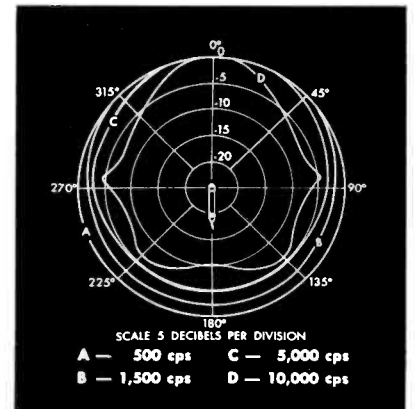


Moving coil or dynamic microphones action resembles a p-m loud speaker only in reverse.



Dynamic quality microphone for PA & tape.

Pattern of a typical omnidirectional mike.



Association News

BEST Serviceman's Week

On March 3rd, the TV servicemen of Arizona are going to celebrate. The Governor will proclaim the week of March 4th as "TV Servicemen's Week." The Mayor will do the same for the city of Phoenix. We have arranged for nine 12-foot windows of the Arizona Public Service Co., plus a number of bank windows to publicize the week. The Better Electronic Service Technicians Association is going to hold a seminar in which they will discuss the following subjects: financing; shop and job organization; customer relations; salesmanship; making money, this includes how to get paid for your labors; tube testing, and lighting and display. Guest speakers from RCA, Sylvania, Triad Transformer and other important companies, will be there. The evening will be capped by a televised dinner.

L. I. Guild Indorses Licensing

The Radio and Television Guild of Long Island gave its endorsement to the licensing of TV repairmen, in principle. Full support was withheld pending 3 considerations which they consider essential for effective licensing.

1. That the TV service industry be assured of full representation in the preparation of any licensing bill within the state of N. Y.

2. That an active member of the TV service industry be a part of any permanent commission that might be established to supervise licensing.

3. That before any local licensing bill is passed an attempt be made to obtain state or at least county wide licensing.

It was brought out that earlier licensing measures in other areas have been prepared by part-time electronic hobbyists and lawyers unfamiliar with the problems of the serviceman. The surprise endorsement of licensing was brought about when the city of Long Beach in Nassau announced its intention to pass such a measure. It is feared that a hodge podge of bills would result if the many villages on Long Island were to follow the example set by the south shore city.

Licensing Fight Takes Unpleasant Turn

Charges of insincerity, childish proposals and inane letters have been hurled. Howard Wolfson of Mercury

(Continued on page 50)

Introducing...

the NEW **PRECISION** MODEL 640

CATHODE CONDUCTANCE TUBE TESTER

The Finest Instrument of its Type — and only \$79⁵⁰

THE ALL-NEW MODEL 640 gives you the ultimate degree of value in a tube-checking instrument designed according to time-proven emission-testing principles, as have been recommended by tube manufacturers and RETMA.

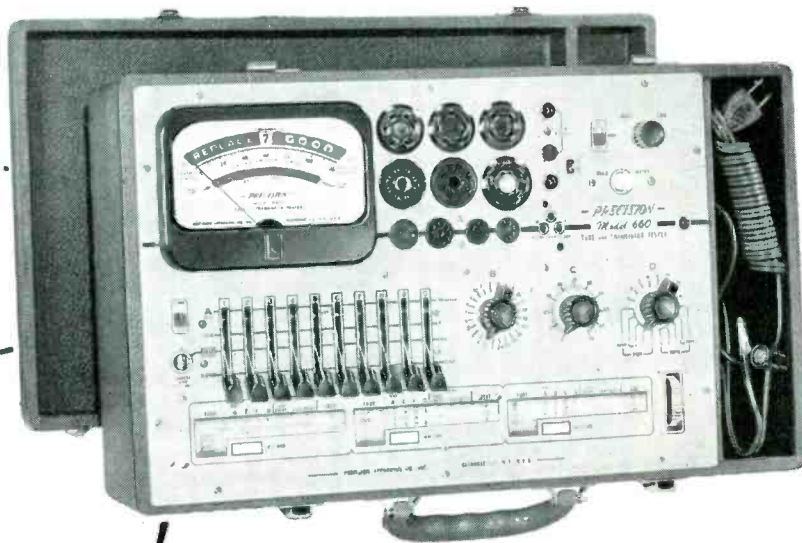
THE ALL-NEW MODEL 640 gives you the highest degree of insurance against obsolescence PLUS the utmost simplicity and speed of operation.

THE ALL-NEW MODEL 640 gives you all this, at such low price, without the slightest sacrifice in the long established **PRECISION** standards of workmanship, quality and reliability.

- Free-point 10-lever element selector system for merit, leakage and short tests.
- Tests all modern TV, FM and AM tube types, including series-string types, tuning eyes, gas rectifiers, etc.
- Filament voltages from 3/4 to 117 volts on 24-position rotary selector switch.
- Dual short-check sensitivity.
- Individual tests for each section of multi-section tubes and ballast tubes.
- Built-in pin straighteners for 7 & 9-pin tubes.
- Extra-large, 5 1/4", rugged PACE meter, ±2% accuracy.
- High-speed, 3-window roll chart with time-saving **PRECISION** "Tube Finder feature."

Model 640: with etched, satin-brushed aluminum panel. Leatherette-covered, solidly constructed carrying case with tool compartment and hinged, removable cover. Case dimensions: 18 x 10 1/2 x 6 1/4 inches. Shipping Wt. 16 lbs. Code: Baker Net Price \$79.50

ALSO AVAILABLE — Model PTA Picture Tube Adapter Cable Net Price \$7.75



and...

the NEW **PRECISION** MODEL 660

TUBE AND TRANSISTOR TESTER

with Picture Tube Beam Current Test

- The only moderately priced instrument which gives you comprehensive I_{cbo}, gain, leakage, etc. tests of all RF, audio, power and tetrode transistors.
- Also incorporates all tube testing features of the new Model 640 described above, plus special circuitry for beam-current testing all popular picture tubes. (Requires accessory PTA picture tube cable adapter).

MODEL 660: same styling, case dimensions and weight as Model 640 described above. Code: Baron Net Price \$99.50

See these new instruments at all leading electronic parts distributors.



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70-31 84th Street, Glendale 27, L. I., N. Y.

EXPORT: 450 BROADWAY, NEW YORK 13, NEW YORK • CANADIAN ATLAS RADIO CORP., LTD., 50 WINGOLD AVENUE, TORONTO, ONTARIO

(Continued from page 49)

Radio Service in Chicago, a member of Associated Radio & TV Servicemen in Illinois (ARTS), has written a letter recently against licensing of the TV-radio service business. Frank J. Moch of Television Electronic Service Association of Chicagoland (TESA), has very strongly challenged Mr. Wolfson's position. Further disagreement broke out when both sides could not get together on a method of discussing this problem. ARTS is in favor of a formal debate open to the public, to be

judged by paid professors of speech, law and business. TESA, on the other hand would like to have a series of open-forum discussions judged by servicemen. Several letters pro and con have been exchanged and circulated by both groups. Some observers feel that this bitter fighting has gone beyond the point of normal disagreement and is doing irreparable damage. There are good and bad points for both sides of this issue. Only intelligent and mature thinking will lead to results that will benefit all concerned.

Audio Literature

(Continued from page 43)

Sonotone Corp.

As described in **ELECTRONIC TECHNICIAN**, send me your FREE 4-page reference chart SAC-6, listing phono manufacturer models using Sonotone cartridges, plus data sheets SAC-1-Rev., and SA-131-Rev. on ceramic cartridges. Check here—

Also FREE 12-page "Phonograph Modernization Manual" discussing performance in technical detail. Check here—

Name

Address

City

State

Turner Co.

As described in **ELECTRONIC TECHNICIAN**, send me your FREE 4-page catalog 975 which shows pictures, specs and prices for a complete line of microphones for PA, mobile, intercoms, recording and broadcast.

Name

Address

City

State

(Continued on page 66)



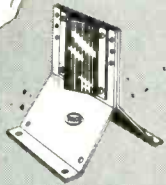
"The 'Edison Electric Institute' will hear about this!"

TELCO TV HARDWARE

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EVERYTHING YOU NEED... QUALITY MADE FOR PROFITABLE INSTALLATIONS!



ROOF MOUNTS



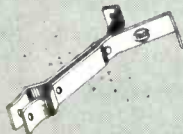
STANDOFFS



ARRESTORS



TOWERS



CHIMNEY MOUNTS



LINE CLIPS



WALL MOUNTS

ALL ACCESSORIES



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Division of G-C • Textron Inc.

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Rockford, Illinois

Right or Wrong in Labor Relations

A roundup of day to day employer-employee problems, and how they were handled. Each incident is taken from a true-life grievance which went to arbitration. Names of some principals involved have been changed for obvious reasons. Readers who want the source of any of these cases may write to ELECTRONIC TECHNICIAN.

CAN YOU FIRE AN EMPLOYEE FOR BEING ABSENT IF HE NOTIFIES YOU IN ADVANCE?

What Happened:

There was no love lost between Manford Short, a technician, and his boss, service manager Tom Atwells. One morning, Short came over to his boss and said that he had to take a day off the following week. "Why?" Atwells asked. Short didn't answer. He just scowled and walked out.

The day before he was to be absent, Short reminded his supervisor, "Better get a replacement for me



tomorrow. I'm not coming in," he said. "You better come in," the service manager shot back. "If you won't give me a reason for your absence, I won't give you permission."

The next day Short didn't show up. When he did return the day after, he was fired. He filed a grievance.

1. I gave my boss plenty of advance notice—a week, in fact.
2. I don't have to give a reason for staying away from my job. After all, I'm not getting paid for the day I took off. The manager is too nose-y anyway.

The company, defending the manager's position, put it this way:

1. A worker has no right to take off without permission unless he is sick.

(Continued on page 52)



FREE INTRODUCTORY OFFER

to acquaint servicemen with ROGERS Quality Components.

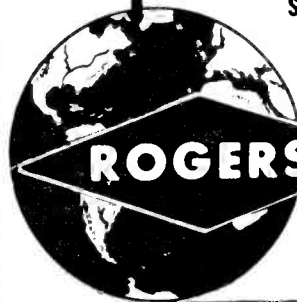
75¢ Rogers Exact Replacement Manual listing over 11,000 sets and 7,000 parts and including the Rogers subscription service of up to date reference material to add to the manual.

50¢ DISCOUNT on any flyback or yoke.



Clip out this valuable coupon and bring it to your nearest ROGERS distributor for this sensational offer!

Write for your nearest ROGERS jobber.



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HUSH

Reg. U.S. Pat. Off.

Chemically engineered for tuners and switching mechanism



Hush comes in a 6 oz. pressure can with sufficient pressure to reach all contacts to wash-away that dirt, leaving clean and positive contacts, protected with a lasting lubricant film.

\$2.25 net

Hush also available in 2 oz., 8 oz. and 32 oz. containers.

EVER-QUIET

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Since 1949 the Original Volume Control and Contact Restorer

EVER-QUIET is a free-flowing liquid that leaves no powder residue. Scientifically designed to seep around the shaft and penetrate the control or potentiometer, cleaning the contacts and leaving a safe protecting film. Harmless to metals, wire or carbon. Will not affect inductance, capacitance or resistance.



\$1.59

Net

6 oz. Spray can
2 oz. and 32 oz.
sizes available.

See your distributor or write to

CHEMICAL ELECTRONIC ENGINEERING, INC. Matawan, New Jersey

(Continued from page 51)

2. He must give a reason for wanting a day off and that reason must be acceptable to management.
3. If everybody took off when they wanted to, how would we run our business?

Was The Company:

RIGHT WRONG

What Arbitrator R. N. Latture Ruled: "On the basis of the evidence presented at the hearing, it seems to the arbitrator that the

Company was not fully justified in discharging Manford Short. Mr. Short has some faults. He was unjustifiably stubborn in his refusal to explain his absence when requested to do so by his manager. However, his action in giving notice well in advance when he wished to be off a day shows a commendable regard for good practice. It is the decision of the arbitrator that Manford Short is entitled to reinstatement in his job without loss of seniority or other rights, and without compensation for time lost."

IS IT A QUIT WHEN A WORKER TAKES A VACATION WITHOUT TELLING ANYONE?

What Happened:

Fred Lord couldn't get the vacation time he wanted. It conflicted with Harry Tyler's who had seniority. The company told Lord he could have those particular two



weeks—if he could get Tyler to change. Tyler said "no." So Lord said he wouldn't take any vacation—he would take vacation pay instead. However, Tyler changed his mind. When the time came, Lord took off on the vacation he'd originally asked for—but he didn't tell anybody he was going. When he returned, the company told him that he'd quit and couldn't have his job back. Lord appealed:

1. He had said nothing whatever to anybody about intending to quit.
2. The company had told him that if Tyler agreed, he could have the two weeks he wanted.
3. When Tyler did agree, he felt he had no reason to think that any further discussion was necessary.

The company didn't go along with this reasoning at all, and claimed:

1. There was two weeks between the time Tyler changed his mind and the time Lord went on vacation. He had plenty of opportunity to tell the company.
2. The schedule was planned on the understanding that Lord would be at work.
3. There was no other reasonable conclusion, but that Lord had quit.

Was The Worker:

RIGHT WRONG

What Arbitrator Joseph Donelly ruled: "Lord informed the company that since he could not get the weeks of vacation he wanted he would not take any vacation, and (Continued on page 64)"



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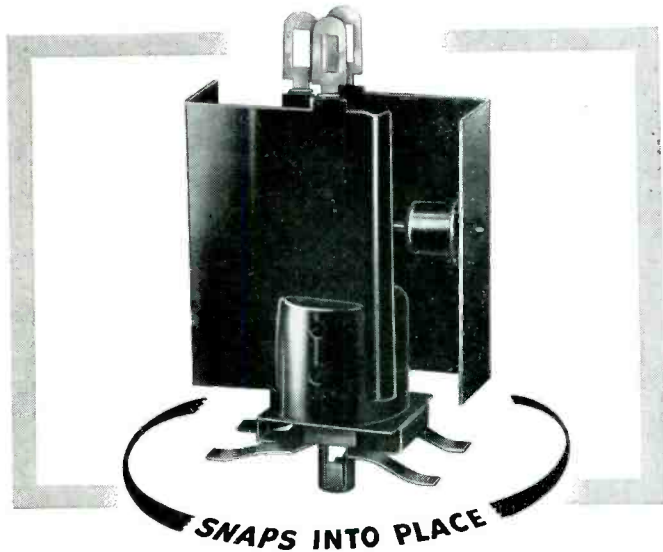


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A General Electric GERMANIUM RECTIFIER specifically designed for TV replacements



- ★ Snap-In Installation
- ★ Competitively Priced
- ★ Full Year's Written Warranty
- ★ Full Power Performance—no aging or fading

TV servicemen in the know are surging to General Electric's *proved* Germanium Rectifier. It's the new rectifier that goes in faster and easier, sustains full power and just about ends return calls on voltage troubles.

General Electric Germanium Rectifiers are backed by a record of more than six years of successful service in the field. The performance of these TV rectifiers has been checked in current television chassis by a leading independent testing organization.

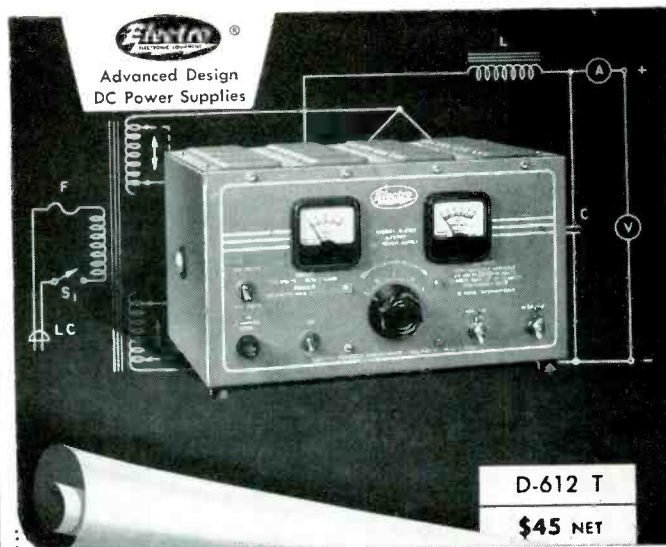
Your outstanding advantage in General Electric Germanium Rectifiers is the ease of installation. They snap into place—faster than the old one comes out. No brackets to add, no drilling, reaming, or tapping to make them fit. And you don't have to install "heavy duty" or super-rated rectifiers to make sure of adequate voltage six months or a year later.

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REPLACEMENT
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The General Electric Germanium TV Rectifier REPLACEMENT GUIDE tells you exactly which model fits your customer's set, and contains other useful data. Get your copy, free...at your G-E tube distributor now. Or, write directly to General Electric Company, Semiconductor Products, Section 58337, Syracuse, New York.

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SPECIALLY DESIGNED to service today's and tomorrow's auto radios

DC Power for TRANSISTOR and Tube Sets
Modern... Self-Contained...
and you get these

4 big advantages

- 1 **2 Ranges...0-8 and 0-16 volts**, continuously variable.
10 amperes continuous duty up to 12 volts. 20 amperes intermittent service.
- 2 **Less than 2% ripple output...** a must for TRANSISTOR radio operation — perfect for tube sets. Prevents transistor damage, reduces audio hum.
- 3 **Conduction-cooled selenium rectifiers...** the entire steel cabinet acts as heat sink — gives over 450 sq. in. of cooling surface. Rectifier life is lengthened... normal rating is doubled. Patented—an exclusive Electro feature!
- 4 **Rugged choke input filter...** gives smooth filter action, better regulation, stable output.



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Tung-Sol Magic Mirror Aluminized Picture Tubes mirror twice the light to create a picture twice as bright. They bring out the best in every set. Install these superior tubes and see the difference . . . the difference that pays off in smooth, callback-free service and satisfied customers. Tell your supplier you'd rather have Tung-Sol Tubes.

Blue Chip Quality

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Magic Mirror Aluminized
PICTURE TUBES

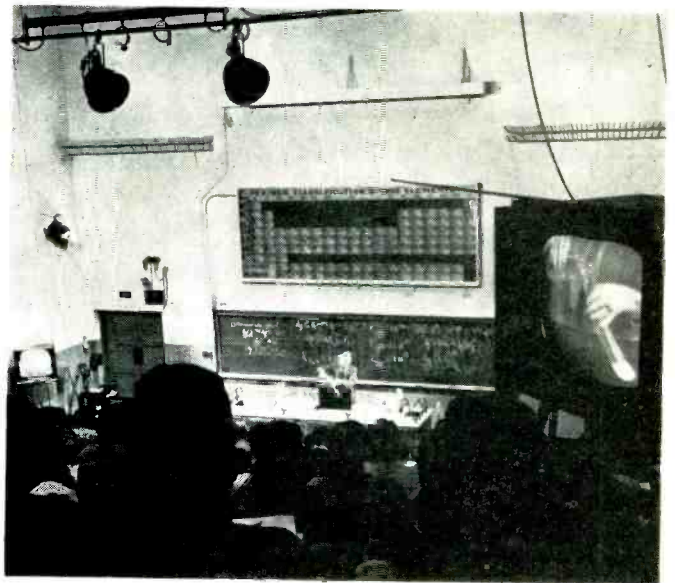
TUNG-SOL ELECTRIC INC., Newark 4 N. J. Sales Offices: Atlanta, Ga.; Columbus, Ohio; Culver City, Calif.; Dallas, Texas; Denver, Colo.; Detroit, Mich.; Irvington, N. J.; Melrose Park, Ill.; Newark, N. J.; Seattle, Wash.

Television Goes to College

• Currently, 4,700 college students in 30 sections of 13 courses are receiving some part of their instruction via television receivers at the Pennsylvania State University. Closed circuit television has been applied on an experimental basis for residential or nonbroadcast instruction at the University since August 1954. Grants totaling \$133,329.00 have been received for the University's television project during the past three years.

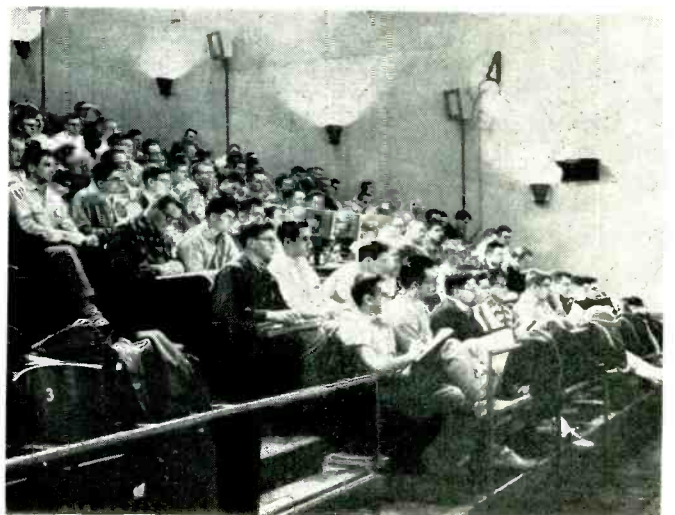
There are 50 hours a week of televised classes, and 19 instructors are participating. The objectives of the television program are: (1) To see to what extent good instruction can be made available to more students as one way of meeting growing enrollment pressures. (2) To improve the quality of university instruction by making it possible to give large numbers of students close-up views of a variety of instructional experiences such as demonstrations, still pictures, charts, guest speakers, discussion panels, films and the like. The main limitation to the coverage by television is the number of receiver rooms equipped.

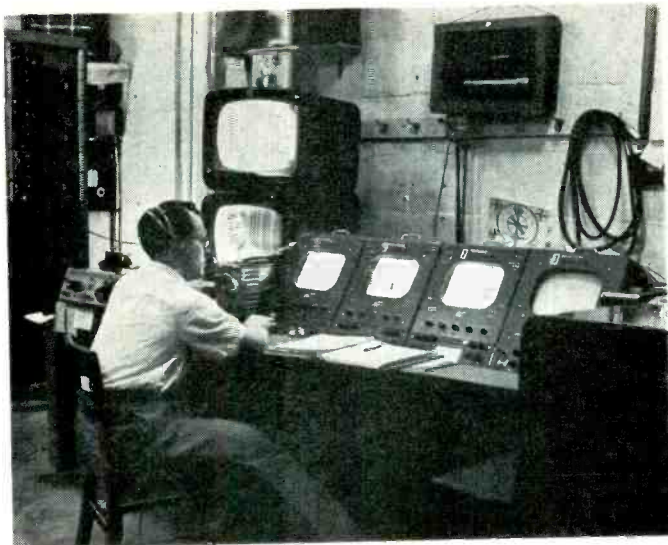
A basic requirement of the television project was that, as far as possible, available standard equipment of acceptable quality, be used. Depending on the size of the class-



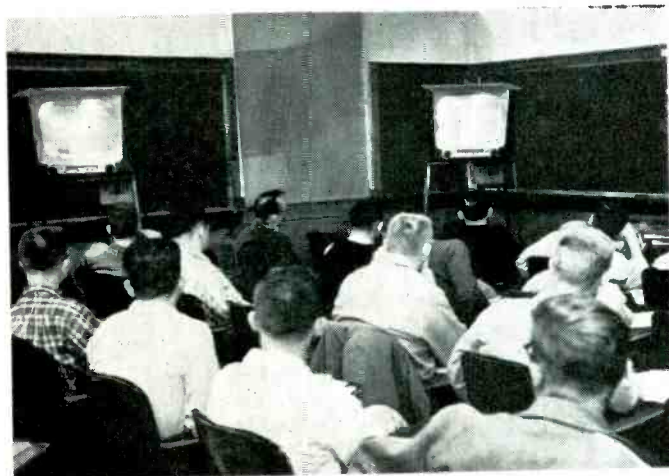
All students receive a close-up view of demonstrations in chemistry.

Dage cameras pick up demonstration and deliver it to 5 other classrooms.





Television control room showing power supplies and monitors in use.



Watching a course in general chemistry in one of the remote classrooms.

room and the number of students enrolled in the various courses, one, two, or up to six sets have been placed in each of the various classrooms. There are 41 Westinghouse TV receivers in use. In order to locate the receivers at a convenient height, and make them easily movable and accessible for servicing, special lightweight metal stands were designed and locally constructed from 1-inch angle iron. Hinged masonite hoods project forward about 15 inches over the top front of each receiver to reduce and eliminate light reflections.

Prior to the use of television receivers in the classroom, groups consisted of from about 30 to 50 in average rooms and up to about 200 in lecture auditoriums. In the latter, demonstrations were observed clearly by only those seated in or near the front rows. Those in the center or rear were less fortunate in viewing experiments and other visual materials. With the use of classroom television, it is possible to accommodate approximately 1,000 students at a single lecture, if necessary, and to give everyone a good view of a great variety of instructional materials.

A Dage audio-video mixer in the control room mixes both audio and video signals and is used to modulate an R.F. carrier on Channel 4, and fed directly into the receiver antenna terminals. A 72-ohm cable carries the composite signal to each of the wired rooms.

Research on the equipment in use, its operation and maintenance, and the effectiveness of television for classroom instruction is part of the Instructional Program. •

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Quality

Tung-Sol receiving tubes for TV, radio and Hi-Fi replacement are exactly the same as those supplied to leading independent set makers. This one quality—Blue Chip Quality—is your assurance of long, trouble-free service that keeps customers with you year after year. Tell your supplier you'd rather have Tung-Sol Tubes.

Blue Chip Quality

ts TUNG-SOL[®]
RECEIVING TUBES

TUNG-SOL makes All-Glass Sealed Beam Lamps, Miniature Lamps, Signal Flashers, Picture Tubes, Radio, TV and Special Purpose Electron Tubes and Semiconductor Products.

What's A Good Microphone?

(Continued from page 48)

avoid the acoustic howl, the person speaking has to get very close to the microphone to get enough output.

So, for public address applications it is best to get a microphone with a pretty flat frequency response. Here, unidirectional properties can help in getting better discrimination against acoustic feedback. The cardioid microphone is more sensitive in one direction and less sensitive in others.

It may come as a surprise relative

to the use of microphones with a directional characteristic to find that loudspeaker positioning is not as important for eliminating acoustic feedback as might be expected, except in outdoor locations. Indoors, it does not matter too much where the loudspeakers are placed, so long as the position of the loudspeakers provides satisfactory coverage of the audience area. Also, of course, the microphones should not be too close to any one loudspeaker. It does not make much difference whether the loudspeakers are on the so-called dead spot of the microphone or not. This is because acoustic feedback

produces a standing wave pattern in the building. This can build up in one of an almost endless variety of patterns. Moving the microphone or loudspeakers does not enable the gain to work appreciably higher. It usually just alters the frequency a little at which feedback starts up, due to a change in the pattern.

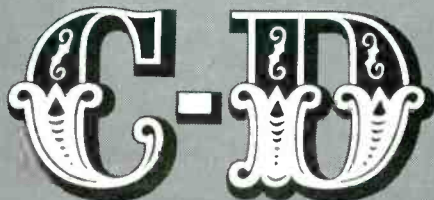
For indoor public address, the ribbon microphone is often the best choice because it has a somewhat flatter frequency response than the unidirectional type, although it has a back sensitivity that may not be always desired. However it gives better discrimination against acoustic feedback in most instances. If the double-lobed pattern of the ribbon proves inconvenient for the job in



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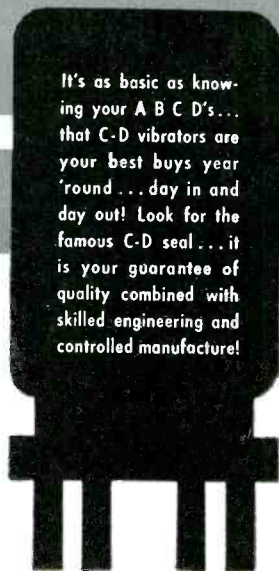


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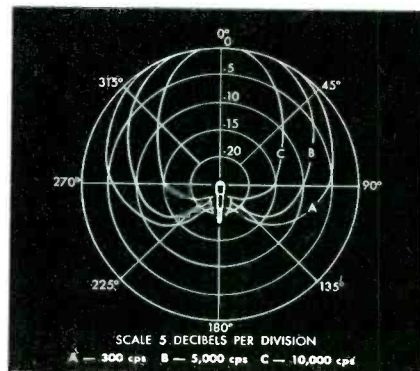
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Plants in South Plainfield, N. J.; New Bedford, Worcester and Cambridge, Mass.; Providence and Hope Valley, R. I.; Indianapolis, Ind.; Sanford, Varina and Fuquay Springs, N. C.; and Venice, California. Subsidiary: The Radiart Corporation, Cleveland, Ohio.



Cardioid design shows directional quality.

hand, a good cardioid type is also a good general purpose indoor PA microphone.

Outdoor Public Address

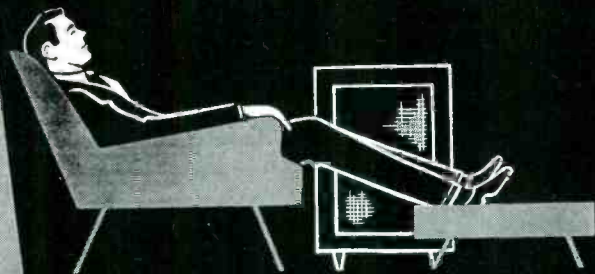
The reason that ribbons are not more favored for PA work in general is because earlier models were not very robust and are susceptible to wind. Some later models have overcome these difficulties and may be used. As feedback is less often a serious factor outdoors, a dynamic type microphone of reasonable quality is quite suitable.

For mobile sound-casting the requirements are different again. Usually projector type loudspeakers are used and the microphone is inside the soundtruck or car, giving suitable separation. Also the announcer is prepared to speak quite closely into the microphone. For these reasons we can use a low-cost high-sensitivity type microphone which will give a good discrimination against picking up noises from the vehicle or passing traffic.

ILLUSTRATION CREDITS

American Elite Inc.; Astatic Corp.; Duotone Co., Inc.; Electro-Voice Inc.; Ronette Acoustical Corp.; Shure Brothers, Inc. •

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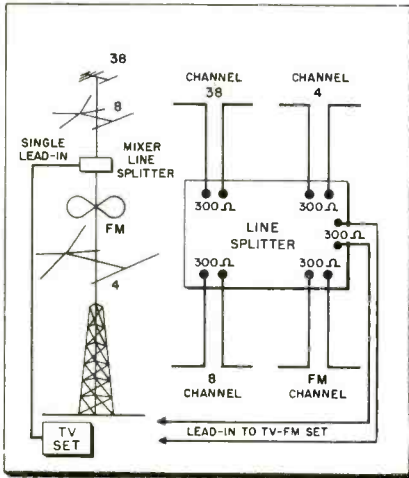
SHOP HINTS



Tips for Home and Bench Service by Readers

Reverse Coupling

I have found it practical in fringe area installations to reverse the hookup of a line splitter and use four different antennas with but a



Coupler used to connect 4 antennas to 1 set.

single lead-in to a TV set. On the line splitter I feed each separate antenna into the output and the single lead-in to the input. Instead of splitting the line this has the effect of mixing four different sig-

nals into the single lead-in.

In one case I have been using a commercial line splitter as a mixer for Channels 4, 8, 38 and an FM station. Results seem to be as good as using four separate lead-ins from each of the antennas stacked on the antenna mast.—Harry J. Miller Sarasota, Fla.

Tuner Substitution

The following gadget enables me to eliminate front-end trouble very rapidly; simply by substituting a tuner known to be good. Two TV front ends are mounted on a board together with an a-c power supply, coaxial leads with alligator clips attached and an AGC control to avoid overload. Two tuners are used to accommodate sets with different i-f frequencies, one for about 20 mc and the other for approximately 40 mc. If a set has low gain or other trouble and the front-end is suspected the tuner of the TV set is switched to an unused channel to avoid oscillation, beat frequencies, etc. Connect the proper lead to the first i-f tube, set the AGC control on the gadget and a difference in picture quality will usually give a

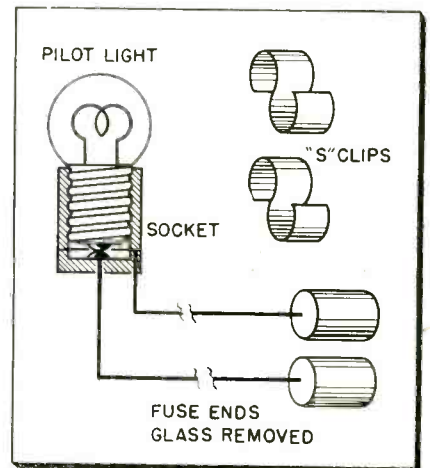
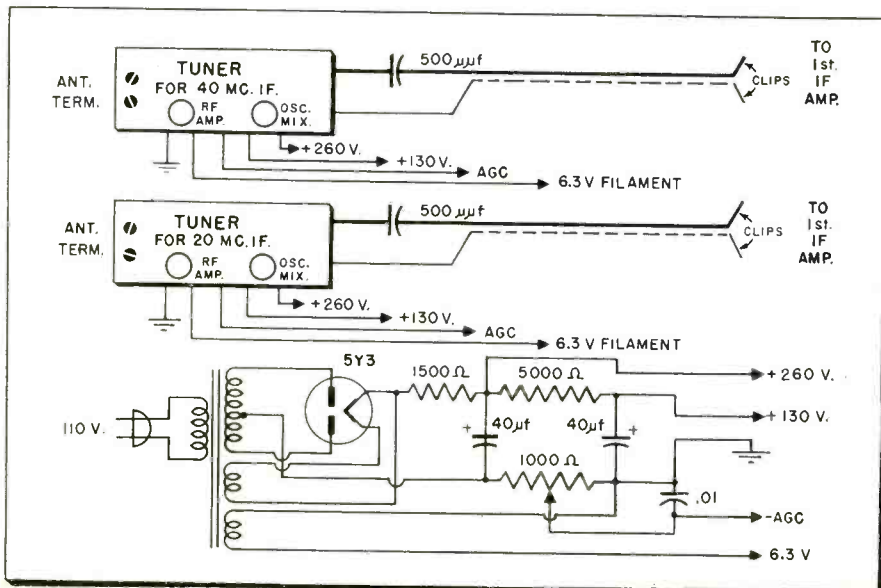
clue as to whether or not one has to dig into the tuner of the set or if the poor gain is caused in the i-f amplifier, demodulator, etc. The component values of the gadget are not critical and were found experimentally. The 1000-ohm control is wirewound, the 5000 and 1500-ohm resistors are 5-watt. The coaxial cable should be of the low-loss type and no longer than necessary.—E. O. Baller, Toronto, Canada.

• It may be necessary to disconnect the lead from the set's tuner, going to the 1st i-f, even though the tuner has been set on an unused channel —Ed.

Fuse Saver

When repairing a TV receiver having a defective or intermittent horizontal sweep circuit, continuous replacement of the fuse can be quite bothersome. I made a little gadget out of an old fuse, pilot light socket

Two tuners and power supply mounted on a board quickly substitutes TV set's front end.



Pilot light adaptor speeds troubleshooting.

and some wire as shown in the diagram. Remove all the glass from the end caps of the old fuse. (No sense in ruining a new fuse.) Solder two wires to the caps and a pilot-light socket. A pair of "S" clips enables me to hook up my little device to any pigtail fuse. Where the fuse

(Continued on page 62)



NOW! Take The "Headache" Out of TV Trouble Shooting

BRAND NEW!

Amazing Handbook Helps You Accurately

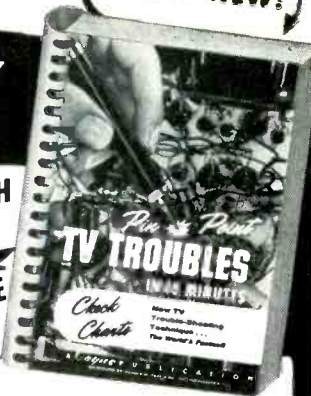
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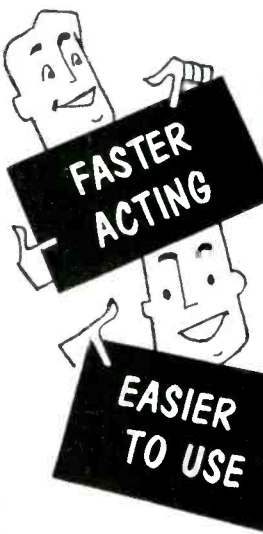
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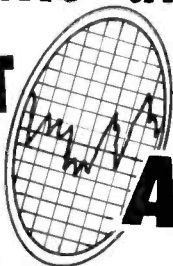


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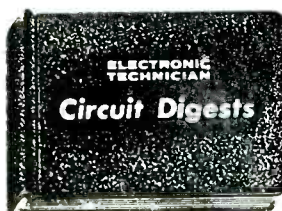
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New Products

JFD MAGIC GENIE

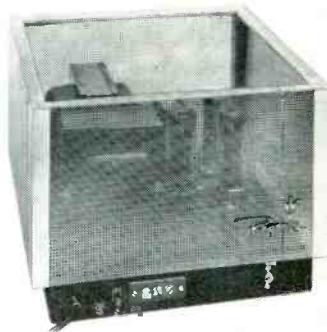
A new TV antenna, designed with the decor-conscious woman in mind. Only the 12-position impedance variation dial shows at the top. The balance



of the antenna, containing its printed circuit is concealed behind the back of the set. Retail for \$14.95. JFD Electronics Inc., 6101-16th Ave., Brooklyn 4, N.Y. (ELECTRONIC TECHNICIAN 3-31)

Regency POWER AMPLIFIER KIT

A 50-watt power amplifier kit will be of interest to hi-fi enthusiasts. Multiple negative feedback circuits. Model HF-50K sells for \$74.50. Regency Div.,



I.D.E.A., Inc., 7900 Pendleton Pike, Indianapolis 25, Ind. (ELECTRONIC TECHNICIAN 3-58)

KTV TOWER

The new line features 5 complete tower kits, 10, 20, 30, 40 and 50 feet high. All are free standing. There are 4 basic sections, all 10 feet high. Withstands 80 mph gales. It may be installed on any pitch roof up to 45° or on ground. KTV Tower & Communication Equipment Co., 5520 S. Shore Drive, Chicago, Ill. (ELECTRONIC TECHNICIAN 3-30)

News of the Industry

ASTRON CORP. announced the appointment of IRVING I. SER as General Sales Manager and MARIO A. DE MATTEO as Assistant Sales Manager.

HERMAN C. BLOOM was named Distributor Sales Manager of ASTRON.

RAYTHEON MFG. announces the appointment of JOSEPH P. ROVETO as manager of semi-conductor diode sales.

JULIUS DORFMAN has been named Manager of special tube sales for RAYTHEON.

BURTON BROWNE ADVTG. announces the appointment of ROBERT E. ABBOTT as Vice President and general manager of the agency.

JERROLD ELECTRONICS has named WALTER GOODMAN as sales manager of its Products Line Div.

FEDERAL ELECTRIC CORP. has elected VICE ADMIRAL RICHARD H. CRUZEN, USN (ret.) as its Vice President.

G. A. GODWIN and **EDWARD L. NUNG** were elected Vice Presidents of P. R. MALLORY & CO. INC. at a Board of Directors Meeting.

CBS-HYTRON has appointed O. LEE BALLENGEE, JR. as Regional Equipment Sales Manager in the Midwest district.

RUSSEL A. SCHLEGEL has been appointed General Sales Manager and **JOHN R. HEMION** has been named Assistant General Sales Manager of WESTON ELECTRICAL INSTRUMENT CORP.

INTERNATIONAL RESISTANCE CO. announces the appointment of **SHERMAN G. WHETSTONE** to Plant Manager and **TERRY A. HALPERN** to Plant Salesman of its Asheville, N. Carolina plant.

RADIO MERCHANDISE SALES, INC. appointed ALBERT GOLDSTEIN as Assistant Sales Manager.

HARRY R. FERRIS has been elected Vice-President and Treasurer of **WEB-COR, INC.**

A. V. NICHOL has assumed responsibility for Value Analysis on all Consumer Products for the **PHILCO CONSUMER PRODUCTS DIV.** of the same company.

CALVIN K. TOWNSEND has been elected President of the **WEST COAST ELECTRONIC MFRS. ASSOC.**

JOHN E. NISKEY has been elected Vice President in charge of manufacturing of **UTAH RADIO PRODUCTS CORP.**

ALLEN B. DUMONT LABS. has expanded its sales staff for renewal TV tubes due to the increasing importance of the renewal market.

GENERAL ELECTRIC has consolidated manufacturing research personnel and facilities into an Equipment Development Operation, with headquarters at Schenectady, in order to meet the growing demand for receiving tubes.

(Continued on page 63)

BEGIN YOUR RADIO ENGINEERING YEAR WITH MORE THAN 800 NEW IDEAS!

No wonder engineers say the radio-electronics year begins in March! This year, the manufacturers and suppliers for this 12 billion dollar and still growing industry require 4 floors of the Coliseum to show you their new ideas.

834 exhibitors representing more than 80% of the industry's productive capacity will display all that's new in equipment, component parts, instruments and production at *The Radio Engineering Show*. Attending the Show gives you an opportunity to talk with the men responsible for these newest advances in radio-electronics. The 55 technical sessions of *The IRE National Convention*, with over 200 new papers presented by 22 different professional groups, will also inform you of up-to-the-minute developments in your specialized field of electronics.

Begin the year right. See and hear all that's new in 1957 radio-electronics. Plan to attend or, better still, make your reservations today!

REGISTRATION: IRE Members \$1.00
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DynaMatic tube tester uses perforated plastic cards to automatically set up socket pin connections & test voltages

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Signal Trace VTVM

(Continued from page 34)

peak-to-peak voltage values measured with a calibrated oscilloscope. However, it must be recognized that reference levels can be determined, if it should become necessary, by means of comparison tests and experience. In case another receiver of the same type is available, comparison checks can be made of waveform levels between the two receivers, with a VTVM and probe and quite accurate conclusions may be reached concerning the absolute levels of the waveforms in the faulty receiver.

Most technicians who have been confronted with numerous "dog" troubleshooting jobs will readily agree to the value of comparison tests in difficult situations. Even when an oscilloscope is used, with a calibrator and special-purpose probes, the waveform data obtained is not always "cut and dried." Manufacturers' service data is sometimes idealized, showing the design engineer's conception of the waveform, which may leave the display open to question. At other times, minor design changes are made in a receiver, which are not accounted for in the waveform data. When such questions arise, a comparison test is very valuable, when it is possible.

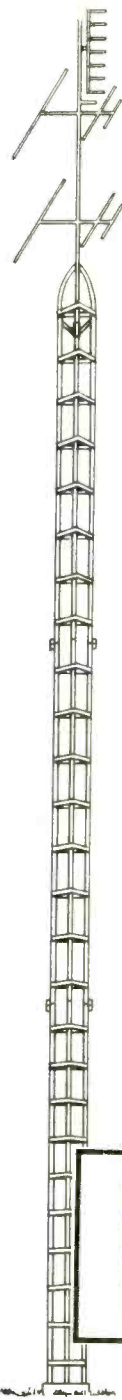
It is not the intention of the foregoing treatment to imply that a VTVM can be used to the work of a scope—at best, a VTVM can only do a good fraction of the job. However, most shops prefer to "crowd" the VTVM to the limit and to fall back on a scope only when absolutely necessary. Hence, it is well to be aware of the full capabilities of the VTVM. •

Shop Hints

(Continued from page 58)

snaps in, just insert the end caps of this gimmick in place of the fuse.

The use of a pilot light in place of a fuse will permit an approximate overload of 1½ times without blowing out and at the same time afford some protection. The brightness level in the bulb is a rough indication of the amount of current in the circuit. A 6.8-volt, 250-ma pilot lamp, #46 and a 2.5-volt, 0.5 ampere lamp, #43, can be used in place of ¼ and ½ ampere fuses respectively. —Joseph L. Valenti, The Bronx, N. Y.



SAFE
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up to
80 m.p.h. . .

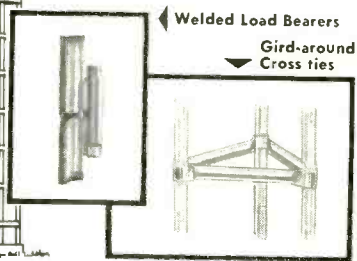
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KTV are the most advanced towers ever designed for residential or commercial use — both in appearance and construction. Tested and proved for greater strength, KTV Towers are available by the 10 ft. section, or in complete kits of 10, 20, 30, 40 and 50 ft. They can be installed on a pitch roof, flat roof, or on the ground. Prices are remarkably low.

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KTV Tower
formerly KUEHNE

AND COMMUNICATION COMPANY
5520 South Shore Drive, Chicago 37, Ill.

(Continued from page 61)

BLONDER-TONGUE LABS. announces its change of address to new and larger quarters at 9-25 Alling St., Newark 2, New Jersey.

Radio transistor kit quantity prices have been reduced up to 14 percent, effective immediately, according to an announcement made by **TEXAS INSTRUMENT INCORPORATED.**

SNYDER MFG. CO. has opened its sixth warehouse in Seattle, Washington.

HI-LO TV ANTENNA CORP. has moved to new and larger quarters at 1122-26 Newport Ave., Chicago, Ill.

A new company has been established called the **KTV TOWER & COMMUNICATION EQUIPMENT CO.** Formerly television tower division of the **KUEHNE MFG. CO.**, the business office of the new organization is at 5520 S. Shore Drive, Chicago, Ill.

A testimonial dinner for **JULIUS FINKEL**, president of **JFD ELECTRONICS, INC.**, in honor of his 70th birthday, will be held at the Hotel Commodore in New York City on March 30, 1957.

Catalogs & Bulletins

Available to you free, unless noted otherwise. Fill in code number on coupon page and mail to Reader Service Dept., **ELECTRONIC TECHNICIAN**, 480 Lexington Ave., New York 17, N. Y.

TV TRANSFORMER REFERENCE: Three pages of reference sheets for about 200 Admiral chassis listing exact yoke, coil, flyback and transformer replacements. All are cross-referenced for quick selection. Issued as supplement to Rogers' giant "Exact Replacement Manual", which may be obtained free from Rogers' jobbers or for 75¢ from Rogers Electronic Corp., 49 Bleeker St., New York 12, N. Y. (**ELECTRONIC TECHNICIAN** No. B3-2)

"HINTS FOR SPEEDIER SERVICING": A 16-page booklet giving full details about the common faults found in CRT and sync circuit, how to recognize them and how to fix them quickly and economically. Available free from Telematic Industries, Inc., 16 Howard Ave., Brooklyn 21, N. Y. (**ELECTRONIC TECHNICIAN** No B3-4)

NEEDLE DATA SHEETS: New needle data sheets produced to provide dealers with a completely fool-proof method of needle identification and to eliminate 98% of needle problems. Free from any Walco distributor. **Electrovox Co., Inc.**, 60 Franklin St., East Orange, N. J. (**ELECTRONIC TECHNICIAN** No. B3-5)

KITS: A 16-page catalog covering test equipment, hi-fi and radio amateur products. Illustrations, descriptions and prices given. The Winter Flyer-1957 is available from **Heath Co.**, 305 Territorial Rd., Benton Harbor, Michigan. (**ELECTRONIC TECHNICIAN** No B3-16)

Your **ERIE** Distributor Has
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for Servicing 1957 Auto Radios

PAC is a group of interconnected capacitors and resistors, combined in a single-insertion unit. Several popular 1957 model automobile and truck radios employ this new concept in component packaging. When servicing these auto radios, a complete PAC (Pre Assembled Circuit) module can be quickly and easily replaced.

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OSCILLOSCOPE KIT
 FOR COLOR TV!

① Check the outstanding engineering design of this modern printed circuit Scope. Designed for color TV work, ideal for critical Laboratory applications. Frequency response essentially flat from 5 cycles to 5 Mc down only 1½ db at 3.58 Mc (TV color burst sync frequency). Down only 5 db at 5 Mc. New sweep generator 20-500,000 cycles, 5 times the range usually offered. Will sync wave form display up to 5 Mc and better. Printed circuit boards stabilize performance specifications and cut assembly time in half. Formerly available only in costly Lab type Scope. Features horizontal trace expansion for observation of pulse detail — retrace blanking amplifier — voltage regulated power supply — 3 step frequency compensated vertical input — low capacity nylon bushings on panel terminals — plus a host of other fine features. Combines peak performance and fine engineering features with low kit cost!

MODEL 0-10
\$69.50
 Shpg. Wt. 27 lbs.

② A new Heathkit sweep generator covering all frequencies encountered in TV service work (color or monochrome). FM frequencies too! 4 Mc — 220 Mc on fundamentals, harmonics up to 880 Mc. Smoothly controllable all-electronic sweep system. Nothing mechanical to vibrate or wear out. Crystal controlled 4.5 Mc fixed marker and separate variable marker 19-60 Mc on fundamentals and 57-180 Mc on calibrated harmonics. Plug-in crystal included. Blanking and phasing controls — automatic constant amplitude output circuit — efficient attenuation — maximum RF output well over .1 volt — vastly improved linearity. Easily your best buy in sweep generators.

Heathkit TV
SWEEP GENERATOR KIT
 ELECTRONIC SWEEP SYSTEM

MODEL TS-4
\$49.50
 Shpg. Wt. 16 lbs.

Heath
COMPANY
 A SUBSIDIARY OF DAYSTROM, INC.
BENTON HARBOR 18, MICH.

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 ...COMPLETE INFORMATION



**TURNER
MODEL
98**

**A
Quality
Cardioid**
at a low price

The Turner model 98 is a directional microphone ideal for use in broadcasting, recording and public address applications. Directional characteristics make it "live" to sounds in front, "dead" to sounds from the rear. Reduces unwanted audience, mechanical equipment, and background noises. Eliminates acoustical feedback in public address work. Check the specifications, compare the prices. You'll see for yourself why the Turner Model 98 is such an outstanding value in cardioid microphones.

SPECIFICATIONS:

Frequency response—65 to 11,000 c.p.s.; Output level—52 db; Impedance—Specify 50, 200 ohm or high; Dimensions—6¼ x 1½ x 1; Cable—Detachable 20 ft. single conductor (high impedance) or two conductor (50, 200 ohm) shielded.

LIST PRICES:

- Model 98 \$59.50
- Model S-98 (with on-off slide switch) 63.50
- Matching G-7 Shockmount stand 8.00
- Models 98 or S-98 with chrome finish add \$10.00 to list prices and specify "chrome finish".
- Matching C-7 chrome Shockmount stand \$9.50.

THE TURNER COMPANY
933 17th St., N. E.,
Cedar Rapids, Iowa

IN CANADA:
Canadian Marconi Co.,
Toronto, Ontario and Branches

EXPORT:
Ad Auriama, Inc.,
89 Broad St., New York 4, N. Y.

ELECTRONIC VOLT-OHMMETER: Form 415 lists special design features and specifications on a new portable electronic volt-ohmmeter. This small sized portable has a curved plastic face and is designed to lie flat in normal use. Hickok Electrical Instrument Co., 10523 Dupont Ave., Cleveland 8, Ohio. (ELECTRONIC TECHNICIAN No. B3-10)

ELECTRONIC PRODUCTS: Catalog No. 57 has 64 pages and lists all of the manufacturers electronic products, giving catalog numbers, descriptions, illustrations and prices. Free from Walsco Electronics Corp., 3225 Exposition Place, Los Angeles, Calif. (ELECTRONIC TECHNICIAN No. B3-14)

Labor Relations

(Continued from page 52)
would take his vacation pay. Several witnesses testified that this was the understanding of the employer, and it was common knowledge in the shop. Tyler testified that when a man has made a selection on the vacation preference sheet, the company does not generally discuss the selection with him unless there is a conflict. Ordinarily, therefore, Lord would be acting properly had he followed his selection without further notification to the company. However, the matter of Lord's vacation was discussed with the company. The decision was that he would take no vacation, and despite any general policy to the contrary, certainly there was an obligation to again discuss with the company any new plans for a vacation. Although he had two weeks in which to do so, he did not discuss any vacation plans with the company. It must be reasonably presumed that he knew he should, and that he knew that the company was planning on his services for that two weeks. Without reasonable cause, Lord failed to report for his scheduled work hours and the company was justified in concluding that he had quit his employment."



"They used to run a gas station."

MODERN MASTERPIECES — TRIO'S ZEPHYR FAMILY TV ANTENNAS

WING DIPOLE
AND THE NEW
WING DIRECTOR
FOUND ONLY IN
TRIO'S
ZEPHYR FAMILY

ZEPHYR ROYAL

FOR THE MAXIMUM

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FOR EXTREME DISTANCE

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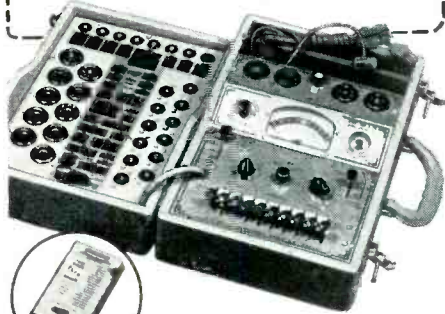
TRIO Manufacturing Company GREGGVILLE, ILLINOIS

EXPORT SALES DIV., SCHEEL INTERNATIONAL INC., 5909 N. Lincoln Ave., Chicago, U.S.A. Cable Address: HARSCHHEEL
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New! Revolutionary!

SECO TUBE TESTER

offers most complete tube checking available!



New! Faster!
Tube set-up
chart for all
current tubes.

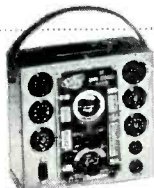


Contained in
handsome
portable
carrying case!

1. Grid-Circuit Test—all tubes
2. Dynamic Mutual Conductance Test on pre-wired panel
3. Cathode Emission Test by free point selector system

Outstanding performance and accuracy . . . wide range . . . saves you valuable time by eliminating call-backs due to obsolete or incomplete testing. Justifiably culls and sells more tubes for you.

Dynamic Mutual Conductance Test of all popular radio and TV amplifier tubes made on pre-wired chassis. Designed for speed — tube set-up data printed on panel. Master unit provides Cathode Emission Test for all tubes. Both units incorporate nationally accepted grid-circuit test developed by Seco. Handy new "flip-chart" lists complete tube set-up data. Fast . . . easy to use . . . operates like telephone index. Completely self-contained — mounted in handsome light green carrying case. Easily portable — only 13 1/2" x 9" x 6" — weight 11 1/2 pounds. Model 107 Tube Tester. . . . \$139.50 Net



*Dependable! Accurate!
Quickly spots grid errors
and leakage in critical
amplifier tubes!*

Model GCT-5 Grid-Circuit TUBE TESTER

(U.S. Patent No. 2,784,372)

Checks over 95% of all tubes subject to "control grid error." Saves valuable service time . . . electron ray tube indicates faults at a glance! Just 6 1/2" x 6 1/2" x 2 1/2" . . . weight: 4 pounds.

Wired and tested. . . . \$29.95 Net
Complete, easy to assemble kit. . . . \$19.95 Net

ATTENTION GCT-5 OWNERS: New 1957 replaceable etched aluminum panel is now available. Lists all of the newest and most popular transconductance tubes. Mounts in place in seconds . . . brings your GCT-5 up to date with the newest tube types. Order from your distributor.



*No disconnecting! No
charting! Checks complete
horizontal coil circuit —
not just individual com-
ponents!*

Model FB-4 FLYBACK CIRCUIT and INDUCTANCE ANALYZER

Nothing faster . . . 100% accuracy. Checks complete horizontal coil circuit . . . not subject to obsolescence due to variables in engineering design.

Model FB-4 \$38.95 Net

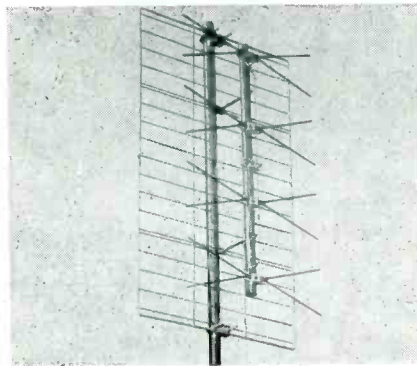
WRITE TODAY—for complete information and descriptive literature on all Seco test instruments.



MANUFACTURING CO.
5015 Penn Ave. So., Minneapolis, Minn.

Clear Beam UHF ANTENNA

A new UHF antenna which is especially designed for reception of translator channels. Designated the "Kat's Whisker," Model KW4S, the new unit



has been cut and tuned to provide peak performance of up to 18 db on channels 70 through 83. Clear Beam Antenna Corp., Canoga Park, Calif. (ELECTRONIC TECHNICIAN 3-7)

EPL POWER SUPPLY

D-c power supply operates on 115-volt, 50/60 cycle input. It provides a continuously variable source for voltage from 0 to 32-volts, for all current loads from 1 to 15 amperes. Can be used for testing and servicing radios, transistor circuits, relays, solenoids, plating operations and other electronic equipment. Electro Products Laboratories, 4500 N. Ravenswood Ave., Chicago 40, Ill. (ELECTRONIC TECHNICIAN 3-12)

Reps & Distributors

TODD-TRAN CORP. announces the appointment of **ROD BUTCHART** as jobber sales rep in Michigan.

The Heart of America Chapter of **THE REPRESENTATIVES** has announced its 1957 Distributor Conference will be conducted at Excelsior Springs, Missouri, September 15-19.

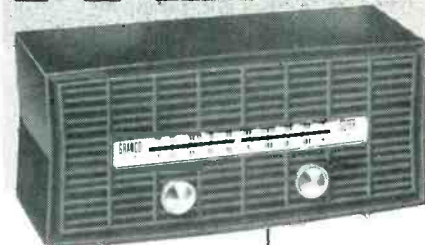
J. Y. SCHOONMAKER CO., electronics mfrs.' reps, announces its move into new and bigger quarters at 5328 Redfield Ave., Dallas, Texas.

SNYDER MFG. CO. announces the appointment of **H. M. RICHARDSON & CO.** as its rep in Minn., N. Dakota and S. Dakota.

HENRY P. SEGEL CO., INC., mfrs. reps, has opened new quarters at 386 Washington St., Brookline, Mass.

GEORGE HARMAN has joined **PAUL HAYDEN ASSOC.**, mfrs' reps, and will cover the Florida area excluding Tallahassee and points West. **R. WADSWORTH** has also joined and will cover Georgia, S. Carolina, cities of Tallahassee and Chattanooga.

NEW



GRANCO

HIGH FIDELITY
FM-AM TUNER

JUST PLUG IT IN . . .

to phonograph,

hi-fi system,

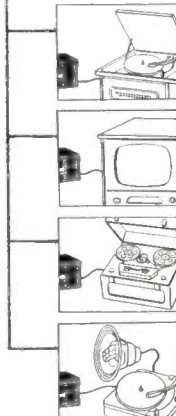
tape recorder

or TV set

for the best in

FM-AM

radio listening!



A new adventure in sound from leading sound specialists . . . a most versatile FM-AM tuner of fine quality, designed to provide the best static-free FM as well as AM radio reception by simply "plugging it in" . . . yet, in the Granco tradition of producing much more for much less, **priced lower than any other available tuner.**

More than just a component, this elegantly styled tuner easily connects to any instrument with an amplifier and speaker and affords complete radio listening pleasure . . . FM and AM.

- Exceptional sensitivity and selectivity insure superlative FM and AM reception
- 6 tubes plus selenium rectifier
- Famous Granco coaxial tuner for smooth, sharp, no-interference, drift-free tuning
- Straight A. C. chassis
- A complete package — built-in antennas eliminate installation
- Compact decorator cabinet fits handsomely into any decor

T-270 FM-AM TUNER only **\$54.95***
LIST

— TECHNICAL FEATURES —

2.5 volts maximum audio output — tuning knob and OFF-AM-FM phono switch knob
FM Section: 5 microvolts sensitivity for 20 db. quieting — 88-108 mc. frequency range — 20-15,000 cycles flat audio frequency response — 220 kcs. at 3 db. down selectivity — 1.0% total harmonic distortion for 2.5 volts RMS output — built-in antenna. **AM Section:** 20 microvolts sensitivity per meter (on loop stick) — 535-1650 kc. frequency range — 8 kc. selectivity at 2 times down — 2.5% total harmonic distortion at 1 volt RMS output — built-in antenna.

FM means GRANCO



*Price slightly higher South and West

For complete information and specifications, contact your Granco distributor or write

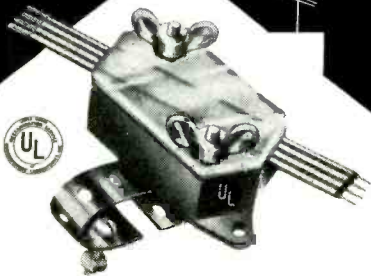
GRANCO PRODUCTS, INC.

36-07 20TH AVE. • LONG ISLAND CITY 5, N. Y.

— the leader in FM and UHF



4-WIRE 16-CONTACT ROTATOR LIGHTNING ARRESTER



Today's only UL approved rotator lightning arrester.
16-positive contacts for sure and easy installation.

NO. **AT104** LIST **\$1.50**
(wall mounting)

AT104S **1.75**
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"World's largest manufacturer of TV Lightning Arresters"



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Turn your unneeded equipment into dollars. CORNELL-DUBILIER's pocket-size monthly magazine gives you space for a Sell-Swap & Buy ad. The ad is FREE—the magazine is FREE. Mailed to your home every month for the asking—use coupon.

CORNELL-DUBILIER ELECTRIC CORP.
DEPT. RT-37, SOUTH PLAINFIELD, N. J.
OK! Send me "The Capacitor"—Free

Name _____ Please Print!
Address _____
City _____ Zone _____ State _____
My occupation or job title is _____

(Continued from page 50)

University Loudspeakers

As described in ELECTRONIC TECHNICIAN, send me your FREE 4-page brochure "To Help You Plan a Sound System," which contains acoustic design chart and speaker specs. Check here—

Also PAID 32-page booklet "Speaking About Loudspeakers," popular explanation of different speaker arrangements. Enclosed is 10¢, check here—

Name

Address

City State

Utah Radio Products

As described in ELECTRONIC TECHNICIAN, send me your FREE catalog S-156, which lists over 100 replacement speakers for TV, audio and radio. Check here—

Also, FREE spec sheets on the G series 15", 12" and 8" speakers. Check here—

Name

Address

City State

Webcor

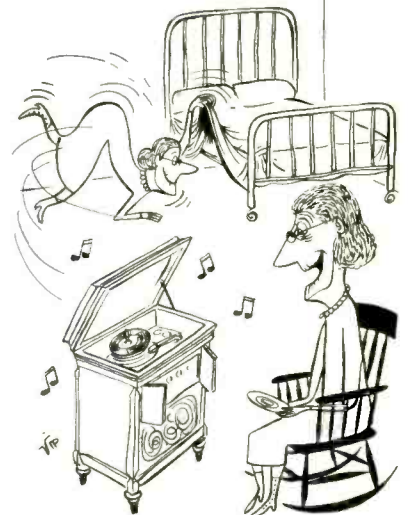
As described in ELECTRONIC TECHNICIAN, send me your FREE 4-page supplement 6B, showing parts, prices, circuit and construction for the hi-fi phono. Check here—

Also PAID 28-page booklet 79P343 giving detailed mechanical service instructions for the 141 diskchanger. Enclosed is 25¢, check here—

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City State



"Gosh, Martha, these records sound so clear with this JENSEN NEEDLE that you'd swear those musicians were right here in this very room."



Priced to Sell!



At
All
Distributors



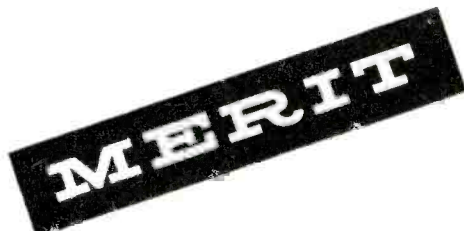
products of the month . . .



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FIRST
WITH
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*exact
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MDF-81 replaces Philco parts 32-9648, 32-9670, 32-9680

HVO-63 replaces Zenith part S-19408

MDF-80 replaces Motorola parts 24C702958, 24C703260, 24C703260B, 24C711217, 24K711268, 24K711584

P-2964 filament transformer, 6.3 at 0.5 amps; for amateur, amplifier, industrial

HVO-66 replaces Motorola parts 24K736488

MDF-84 replaces G.E. parts RLD-025

BC-356 miniature IF input transformer for printed circuits—455KC

MDF-82 replaces Dumont parts 21011061, 21011062, 21011742, 89012702, 89013321

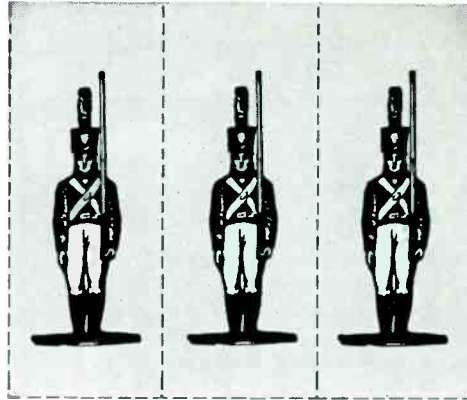
MDF-85 replaces G.E. parts RLD-041, RLD-045

A-3009 driver transformer, turn ratio 2.5:1, for mobile or portable radio

BC-357 miniature IF output transformer for printed circuits—455KC

BC-348 sub-miniature IF input transformer for battery radios—455KC

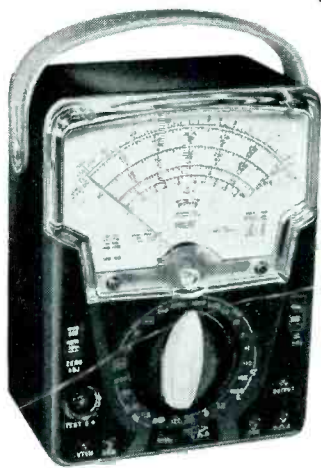
performance matched
test equipment
for black and white
and ALL COLOR TV TESTING



basic

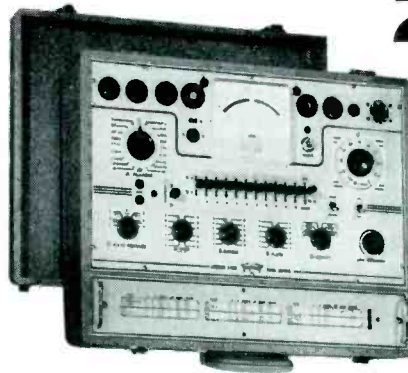
fundamental

essential



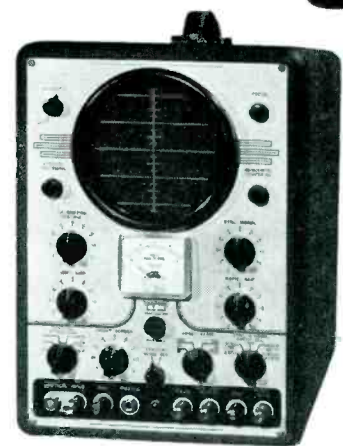
**MODEL 631
VOM-VTVM**

two in one tester for 100% service—VOM covers 90% of your usage, battery operated VTVM available for the other 10% when you need it. **\$64.50**



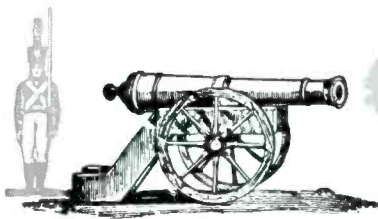
MODEL 3423

four in one—mutual conductance tube tester, transistor tester, germanium diode tester, selenium rectifier tester—checks for accuracy as circuit demands depending on the tolerance of the circuit. The patented circuit for the tube testing employs actual signal (4KC) for grid and DC bias voltage making it independent of line voltage hum. It also has a complete coverage of all tube types—six plate voltages (including 0-10 variable). Micromhos scales read 0-1,800, 0-6,000, 0-18,000 and 0-36,000. Leakage measured directly on meter 0-10 megohms. **\$199.50**



MODEL 3441-A

three in one scope—oscilloscope, peak-to-peak meter, audio oscillator—essential for more than 50% of your Black and White Servicing—all Color Servicing. 10 mv sensitivity. 4.5 mc bandwidth. **\$249.50**



BENTON BROWN ADVERTISING

TRIPLET

These three units provide the ideal basis for the complete servicemen's test setup for black and white and color TV. You will want to consider also Model 3438 Dot Generator, Model 3439 Color Bar Generator, Model 3434-A Sweep Generator and other Triplet units.

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Combination
V-O-M—VTVM



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For Best Testing
Around the Lab,
Production Line
or Bench



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The Popular
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V-O-M



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Production Line
V-O-M



310
The Smallest
Complete V-O-M
with Switch



630-T
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666-HH
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for
Field Testing



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The First V-O-M
with 10,000
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666-R
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YOU
QUALIFY...

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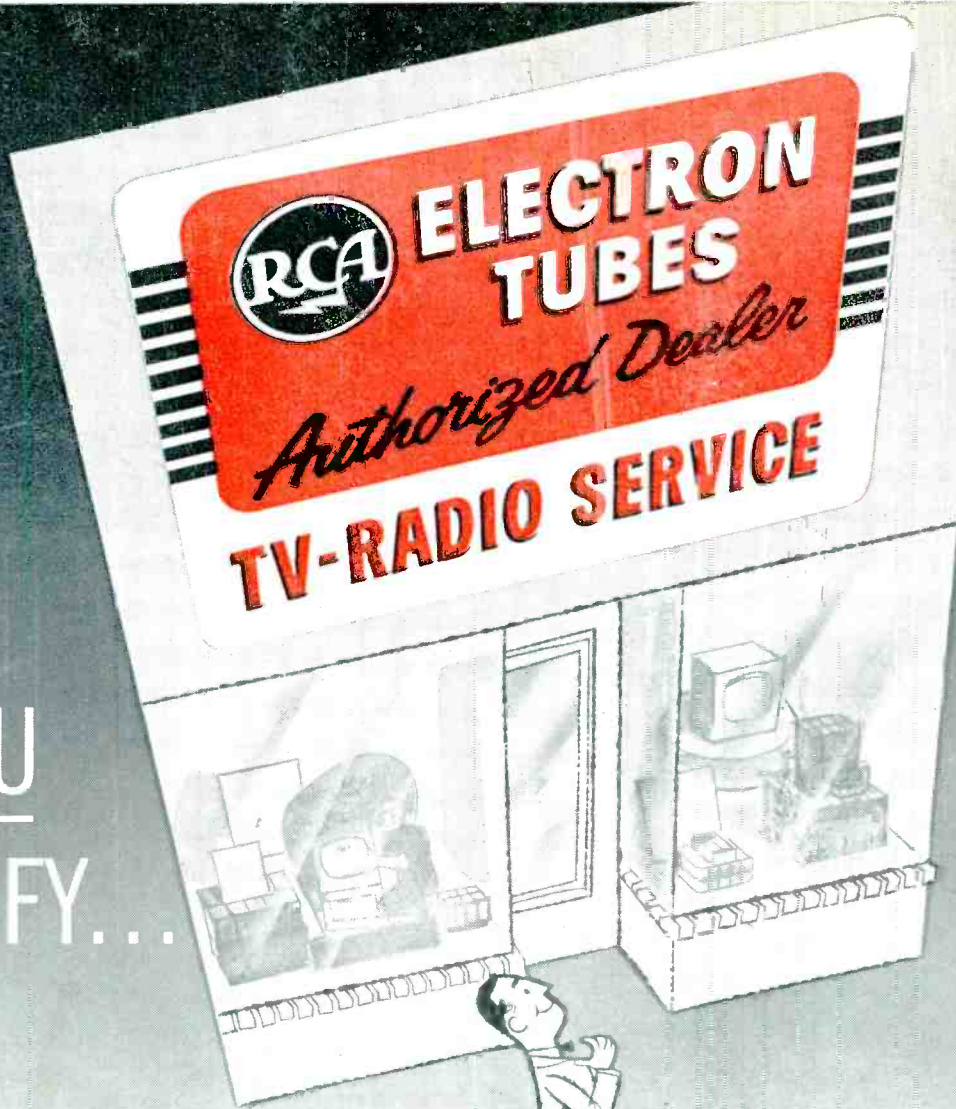
"Authorized RCA Electron Tube Dealer"?

Ask your RCA distributor how you can enjoy the prestige and profit of this powerful service dealer program. It will pay you to check into the requirements at once—and identify yourself and your shop with the greatest name in electronics—RCA. Once you qualify, you can use the arsenal of promotion materials prepared exclusively for "Authorized RCA Tube Dealers"—outdoor and indoor signs, displays, direct mail, newspaper ad mats, radio scripts, decals—everything to tell your customers you're an "Authorized RCA Electron Tube Dealer"!



RADIO CORPORATION of AMERICA

Tube Division, Harrison, N. J.



3rd Annual
**NATIONAL TELEVISION
SERVICEMEN'S WEEK**
March 25-30

This is RCA's annual salute to its business partners—the TV-Radio Service Technicians of America. Big color ads in March 23rd issues of TV Guide and the Saturday Evening Post, and March 25th issue of Life—tributes on NBC network radio and TV shows, including March 16th TV Emmy Awards program and March 23rd Perry Como show. Be sure to have all your customers and prospects tune in these gala shows to see your NTSW tribute.