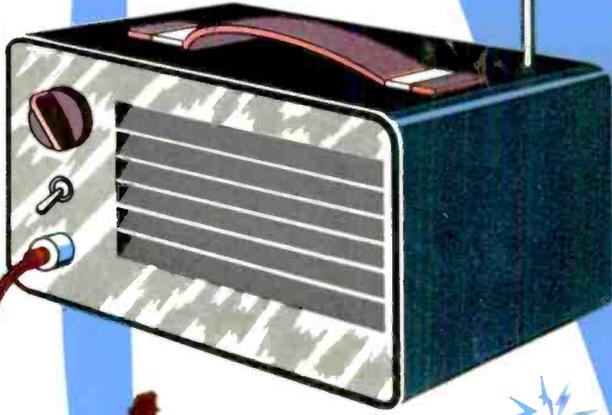
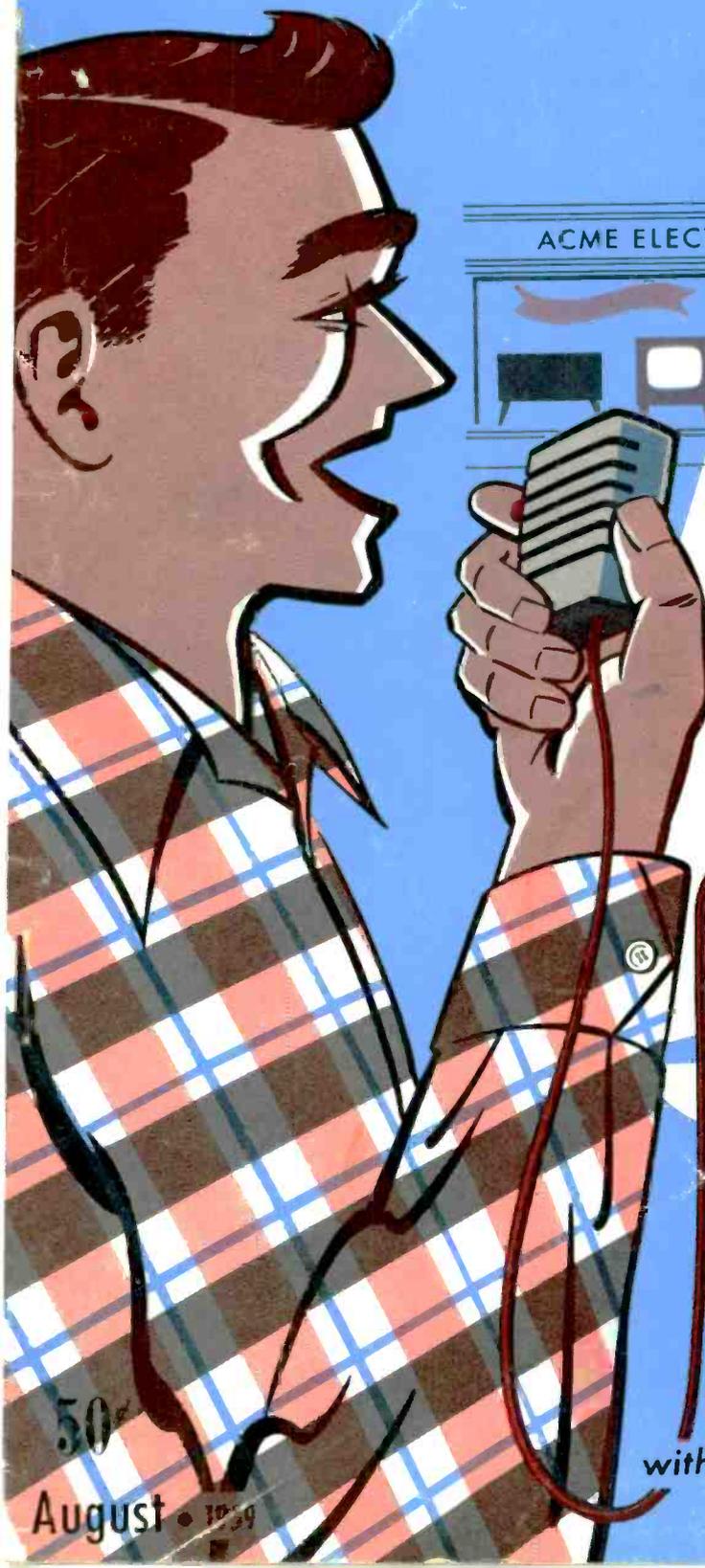


ELECTRONIC TECHNICIAN

Now Including
SERVICE
Magazine



COMMUNICATIONS FOR ALL
with **CITIZENS BAND RADIO**

50¢
August • 1959

HEAR PAGING Clearer...Easier

SAVE MONEY, TOO!



advanced engineering assures

CLEARER COVERAGE with FEWER SPEAKERS
...improves efficiency...reduces listener fatigue

Every installation further proves the efficiency, utility, and economy of E-V sound projectors. Messages become easier to understand without listener fatigue. At the same time, you save cost by using fewer speakers for proper coverage of the listening area. Wherever paging is required, get the benefit of natural voice reproduction.

Choose the Type Designed to Meet Your Paging Needs

WIDEST DISPERSION. Exclusive CDP dual-diffraction design* gives uniform, wide angle coverage at all frequencies . . . no dead spots, no hot spots. Exclusive E-V compound horn reduces compression distortion to as low as 2% at full power—thus assuring minimum listener fatigue at any sound level. High efficiency performance cuts the need for costly high power amplifiers.

CONCENTRATED COVERAGE. E-V newly designed reentrant projector provides highest intelligibility at lowest cost where sound must be concentrated. Handles twice the power of conventional speakers, for greater penetration.

Model 847 25-watt CDP. Has two coaxially-mounted horns working from opposite sides of a single diaphragm. Special edgewise-wound voice coil provides 18% greater efficiency. Wide-range response: 250-10,000 cps. Sound pressure level: 114 db. Dispersion: 60° x 120°. Imp.: 16 ohms. Indestructible fiberglass horn. Size: 11 1/4" x 7 3/4" x 10 1/4" deep. Net wt. 6 1/2 lbs.

List Price, \$46.33

Model 847-45 CDP with 45-ohm voice coil for intercom applications.
List Price, \$47.83

Model 844 30-watt Reentrant. Diecast aluminum horn, with removable driver, and universal mounting bracket. Designed for easy servicing with field-replaceable voice coil. Wide-range response: 250-10,000 cps. Dispersion: 90°. Sound pressure level: 120 db. Imp.: 8 ohms. Size: 9 1/4" diam. x 8 1/4" deep. Net wt. 5 lbs. 10 oz.

List Price, \$34.50

Model 844-45 Reentrant with 45-ohm voice coil for intercom use.
List Price, \$36.00

(Sound pressure level measured at 4 ft. on axis from 500 to 1500 cps with full rated input.)

E-V sound projectors are extra-rugged for long-life service indoors or outdoors. They are weatherproof, blastproof, splashproof. Actual comparison on the job proves their superiority.

*Design Patent 169,904

Write for Bulletin 258A to Dept. 89-T

No Finer
Choice than

Electro-Voice®

Other Popular Models in the Complete E-V Line

For large area sound reinforcement: Model 848 30-watt CDP or Model 848LT 30-watt Long-Throw CDP, at \$75.00 list. For high-fidelity voice and music: the E-V Musicaster at \$80.00 list. Remember too, you get even better sound when you choose an E-V high-fidelity professional microphone from today's most complete line.

ELECTRO-VOICE, INC. • BUCHANAN, MICHIGAN



Model 847



Model 844



848 CDP



848LT CDP



Musicaster



ELECTRONIC TECHNICIAN

Now Including
SERVICE
Magazine

World's Largest Electronic Trade Circulation

August, 1959

ALBERT J. FORMAN *Editor*
ARTHUR P. SALSBERG *Technical Editor*
B. V. SPINETTA *Assistant Editor*
C. F. DREYER *Consultant Art Director*
PAT DRUMM *Reader Service*
M. FARRIS *Editorial Assistant*

Address all mail to
480 Lexington Ave., New York 17, N. Y.
Telephone YUkon 6-4242

HOWARD A. REED *Publisher*

BUSINESS DEPARTMENT

W. ZURKAN *Eastern Sales Manager*
N. McALLISTER *Production Manager*
I. HUTCHINS *Accounting Supervisor*
M. RUBIN *Circulation Manager*
J. PREVET *Asst. Circulation Manager*
P. H. DEMPERS *Regional Manager*

5010 W. Howard St., Skokie, Ill.
Telephone ORchard 5-1355

CHRIS DUNKLE & ASSOCIATES

California Representative
740 S. Western Ave., Los Angeles 5, Calif.
Telephone DUNkirk 7-6149

420 Market St., San Francisco 11, Calif.
Telephone SUTter 1-8854

BERNIE EDSTROM *Regional Manager*
15605 Madison Ave., Cleveland 7, Ohio
Telephone LAkewood 1-7900

JOHN R. KIMBALL & CO.

Mountain States
420 Market St., San Francisco 11, Calif.
Telephone DOuglas 2-9183



ELECTRONIC TECHNICIAN & Circuit Digests, including Service, August, 1959. Vol. 70, No. 2. \$5.00 a copy. Published monthly by Electronic Technician, Inc. Publication office, Emmett St., Bristol, Conn. Editorial, advertising and executive offices, 480 Lexington Avenue, New York 17. Telephone YUkon 6-4242.

Entered as second class matter at the Post Office at Bristol, Conn., June 10, 1954. Subscription rates: United States and Canada, \$4.00 for one year; \$6.00 for two years; \$8.00 for three years. Pan-American and foreign countries: \$7.00 for one year; \$10.00 for two years; \$14.00 for three years. Copyright 1959 by Electronic Technician, Inc., New York. H. Reed, President; A. Forman, Executive Vice-President. Title registered in U. S. Patent Office. Reproduction or reprinting prohibited except by written authorization of publisher. Printed in U.S.A. by Hildreth Press.

FRONT COVER

For business and personal uses, many thousands of people are becoming interested in Citizens Band radio, which allows two-way communications without FCC tests. Service dealers selling these units should read the question and answer series starting on page 32. To service this equipment technicians must pass the FCC 2nd class radiotelephone exam as explained on page 81.

FEATURES AND ARTICLES

Legal Classification of Picture Tubes.	
Citizens Band for Service Dealers. (Editorials)	29
"Tuning in the Picture"	30
Citizens Band Q & A	Marty Bellan 32
"Tough Dog Corner"	Jack Darr, F. A. Salerno 49
Ways and Means of Equalizing	Norman Crowhurst 50
Let's Look at those New Semiconductors	J. T. Cataldo 52
Understanding Square Waves	R. G. Middleton 54
"TV Millie" Enters Master Antenna Field	Herb Gerson 57
Building a Technical Library	58
Shop Hints	J. C. Thompson, M. E. West 64
Free Literature	66
Electronic Artificial Larynx	68
New Tubes & Components	70
Latest Test Equipment	73
New Audio Products	75
Care of Soldering Irons	A. B. Kaufman 76
Overseas TV Developments	78
Prepare for Your FCC Operator License	81
Metropolitan Detroit TV Repair Survey	84
Soviet Electronics Exhibition	92

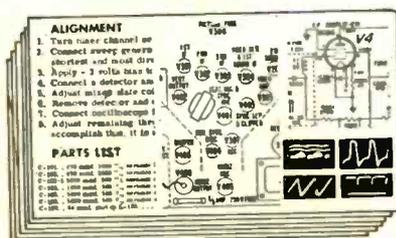
DEPARTMENTS

Editor's Memo	4	Audio Newsletter	23
Letters to the Editor	6	Calendar of Coming Events	31
News of the Industry	13	New Products	74
Reps. & Distrs.	18	Association News	86
Catalogs & Bulletins	20	New Books	99

CIRCUIT DIGESTS

IN THIS ISSUE

- GENERAL ELECTRIC: TV Chassis U4
- HOFFMAN: Stereo AM-FM Receiver Chassis 1130
- MAGNAVOX: Stereo Amplifier Chassis 182
- MOTOROLA: TV Chassis TS-556
- PHILCO: TV Portable AC-DC Chassis 10AT10
- RCA: TV Color Chassis CTC9A, B, F, H, N & P



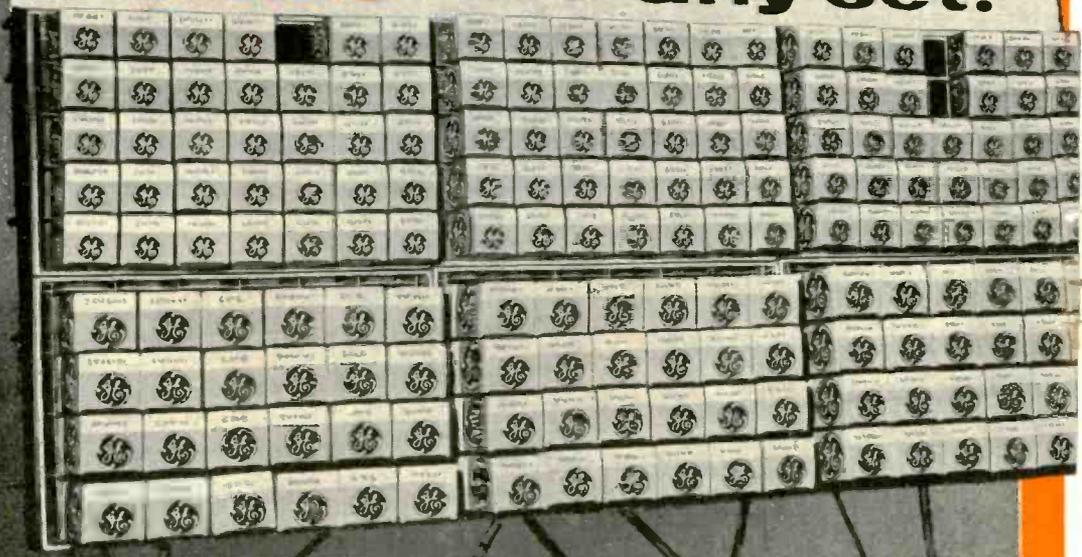
New G-E PROFIT* PROGRAM

* REPLENISHMENT OF INVENTORY PROGRAMMED TURNOVER



SERVICE-DESIGNED tubes

Best for any set!



Display rack with wall hanger \$23.95, or free with purchase of 650 General Electric tubes. Rack with floor easel, \$25.95 or 700 G-E tubes.

Streamlines Your Tube Sales for Fast Turnover, Top Volume!



Missing cartons show what tube types you should reorder.



Your tube inventory can easily be checked at a glance.



A second display will accommodate additional supply of tubes.



Rack can be hung on a wall if floor space is not available.

A General Electric "first"...that sells more tubes, saves record-keeping, *provides the tubes you need when you need them!* This is G.E.'s new PROFIT* Program, packaged for you in the finest, most complete tube display rack ever offered to TV technicians.

See (left) how easy it is to select types... how stock rotation is assured by orderly tube removal and replacement! Note the Display's ample dimensions—44" high plus 16" for easel base; 40½" wide—providing plenty of space for a scientifically planned tube inventory!

If you invite customer self-service, the Display is ideal for that purpose. Also, your stock

of tubes can be checked visually at any time. Missing cartons tell you what types to reorder, and how many, since the type numbers of all tubes taken out can be recorded in back. Book-keeping is virtually eliminated.

Over-stocking and tube shortages: both are banned by the Balanced Inventory feature. Your tube dollars work harder than ever before. See your nearby G-E tube distributor today about General Electric's Service-Designed Tube Display with brand-new, built-in inventory control! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.*

Progress Is Our Most Important Product

GENERAL  **ELECTRIC**

2-111-222

Never over or underheats!

Gives more reliable soldering!



NEW

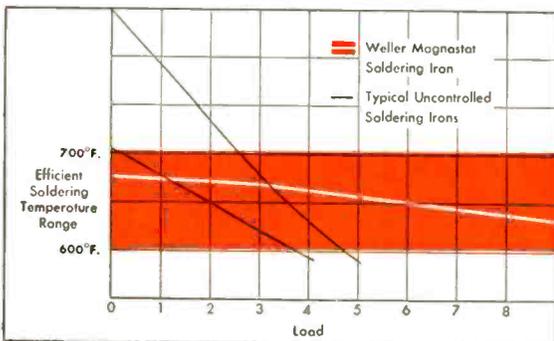
Weller®

SOLDERING IRON

*with built-in MAGNASTAT
Temperature Control*

A revolutionary new soldering tool from Weller—long-time leader in the soldering field. Automatically maintains correct soldering temperature—and it's all self-contained. Sensing device is in the tip. Unmatched for reliable TV, radio, printed circuit and other precision soldering. 3 models available for all your service requirements from controlled lower temperature to heavy electrical soldering. Priced from \$9.00 list, up.

SOLDERING IRON PERFORMANCE — Temperature vs Load



Order From Your Distributor or Write for Bulletin

WELLER ELECTRIC CORP. 601 STONE'S CROSSING ROAD
EASTON, PA.

Editor's Memo



It may seem strange to hear of a businessman giving away money to his customer, but that's exactly what one service technician did.

The technician had to pull the set to the shop. He made the necessary repairs, and presented a very fair bill—\$18. The lady of the home was outraged at how high the price was, and it took some diplomacy to collect.

But that didn't end the matter. She continued to complain after the bill was paid. Couldn't part of the bill be cut off? The technician told her that he had made a very reasonable charge, and it just wasn't fair to reduce it. She kept after him. In utter frustration and desperation, he told her that there was only one thing he could do. He gave her back the full \$18. She was stunned.

The next day our hero received a phone call from the lady. She told him how she had cried after realizing how unfair she'd been. One sleepless night convinced her that her conscience would never be clear until the \$18 was paid back—which was the very next day. This technician and customer now understand and respect each other.

In our own publishing operation we frequently—and reluctantly—must chase money away. Every day many subscription applications and payments come in from hobbyists and young students who want to receive the magazine. Since ET is not sold on the newsstands, they must try to get it by mail.

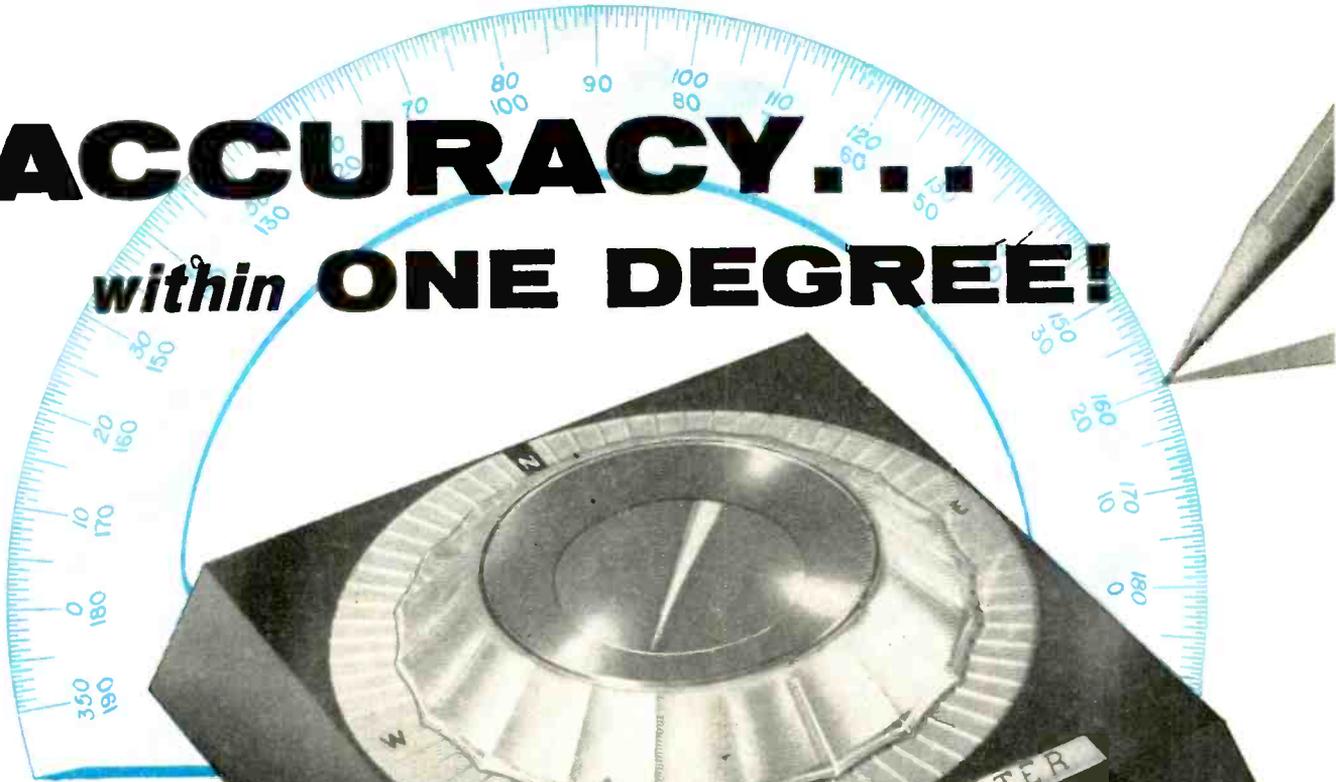
Unhappily, we must return the money with the explanation that ET is devoted exclusively to professional technicians. Our basic policy is to furnish servicing information and news to the trade. It would be a disservice to technicians and dealers to dilute our efforts. Worse still, professional servicing magazines distributed among hobbyists only encourage do-it-yourself, incompetent repairs by inadequately trained people, and take business away from the truly active technicians who are the backbone of the industry.

I suppose some readers will write to tell me that money isn't everything, but what's in second place doesn't come anywhere near it. Or maybe I'll be told that there's one thing money can't buy—poverty.

Well, I'd agree with you! The only qualification is that there is more money in the long run by setting high standards and ideals, and sticking with them even if you must pass up some tantalizing dough today.

Al Forman

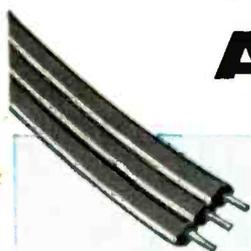
ACCURACY...
within **ONE DEGREE!**



model no. 9524
\$49⁹⁵
list



NEW
CHANNEL MASTER[®]
AUTOMATIC TENN·A·LINER



REVOLUTIONARY ROTOR PRINCIPLE
Permits Use Of
3 CONDUCTOR WIRE!

Big Price Advantage

Take Your Choice:
 Save about 25% below the cost of 4 conductor wire of similar quality...

Or
 Step up from a lower quality 4 conductor wire to a top quality 3 conductor wire at no increase in cost.

Big Performance Advantage

On runs of 100 feet or more, however, 4 conductor wire is recommended, with the fourth conductor doubled up on the power line. This reduces line loss, brings more voltage to the rotator, and provides higher torque than rotators which must use 4 conductors.

3 conductor rotor wire is sold only through Channel Master distributors!

CHANNEL MASTER CORP.

ELLENVILLE, N. Y.

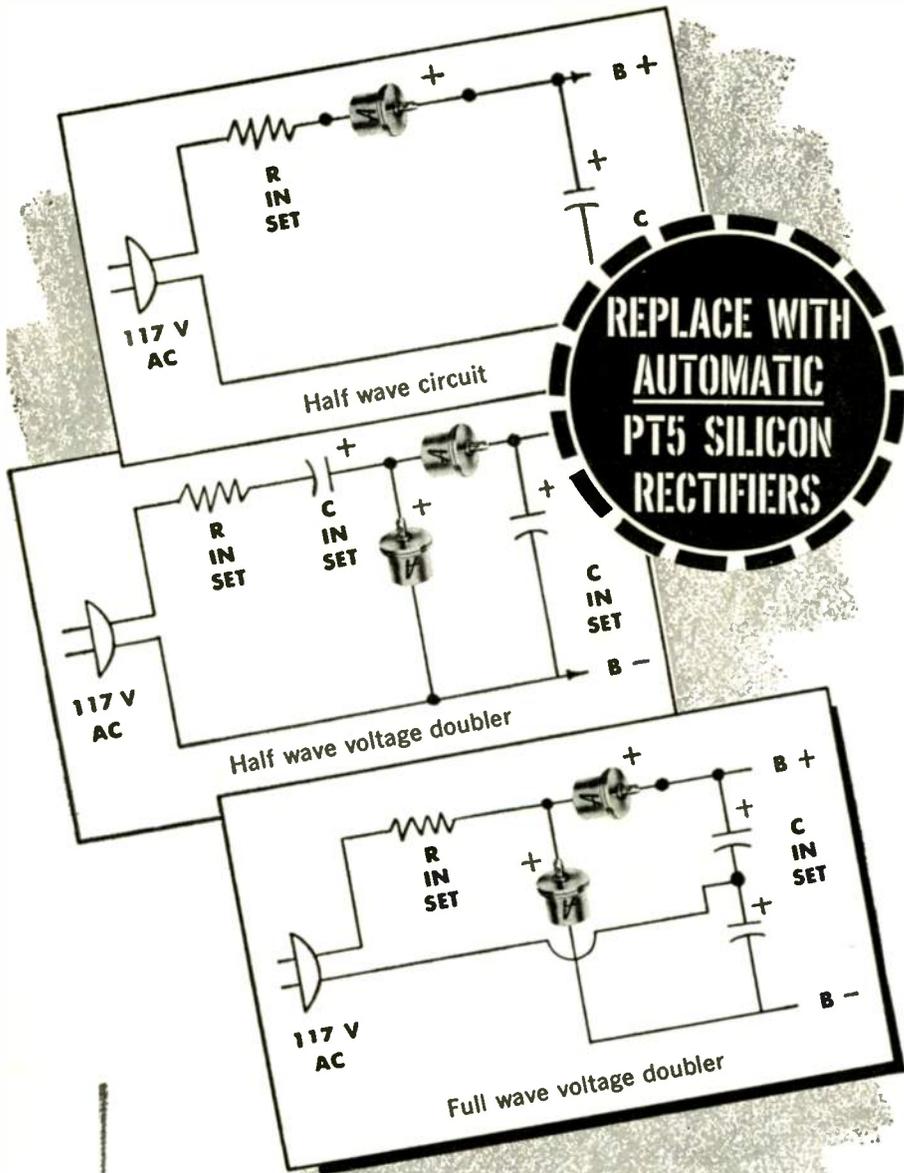
It's here! The world's first automatic rotator that lets you aim your antenna *exactly* where you want it... not 6, 10, or 15 degrees off course... but right on target, *accurate to one degree!*



the first entirely new automatic in five years!

- **New dual synchronized motor design** provides absolute control over antenna direction. You can even make one degree adjustments.
- **No relays, springs, or excessive linkage** to mar performance. Fewer moving parts mean longer life, more dependable performance.
- **Noiseless nylon gears** end irritating "whirr."
- **No solenoids** to cause electrical interference on the TV screen.
- **New circuit design** delivers full voltage, produces higher torque to turn heaviest antenna arrays.

3 Tenn-A-Liner Models to Choose From



LETTERS

To the Editor

Foreign Tubes

Editor, **ELECTRONIC TECHNICIAN**:

About a month ago I had occasion to service a Dutch auto radio with tubes from Holland. I would have given my right arm to know the American tubes which could be used as replacements. You can imagine my joy when, lo and behold, there was all the info I needed on page 38 of your June issue—the Guide to Foreign Tubes. ET is tops with me.

WILLIAM H. LEMIENS

LeMiens Radio & TV Service
Patchogue, N.Y.

Omitted Association

Editor, **ELECTRONIC TECHNICIAN**:

Due to a failure on the part of our publicity director, the Radio & Television Association of Pittsburgh was not listed in your 1959 roster of associations. You can surmise that we feel badly about this omission since we are the oldest association in Pittsburgh. Most of our members subscribe to **ELECTRONIC TECHNICIAN** regularly, and regard it as the Bible of the Industry. Our present officers are: Pres. John F. Cochran; 1st VP Francis P. Skolnik; 2nd VP Stephen Mykita; Secy. Tom Ging; Treas. Edmund Roberts.

PATRICK W. DAVIS, JR.

Publicity Chairman

RTSA of Pittsburgh
Pittsburgh, Pa.

Worth the Money

Editor, **ELECTRONIC TECHNICIAN**:

In answer to Louis Montoya's letter [May 1959] regarding the \$25 fee for technicians in New York's proposed certification law, I have only this to say. If it is not worth \$25 to get rid of some of the fly-by-nighters and other unethical and unqualified operators, then he should be glad he lives in Los Angeles and not New York. I would personally be willing to give more for a good license bill.

O. DALE BURDGE

Dale's TV & Radio
Franklin, Ohio.

For Sale

Editor, **ELECTRONIC TECHNICIAN**:

I wish you had a classified page where we could sell surplus equipment. I have an RCA 630 chassis and a Nor-elco projection system that's new, and I would sell both for only \$50.

JOE DEBIAK

Oakfield TV Service
R #2, Three Oaks, Mich.

(Continued on page 10)

Every TV circuit
works better with

AUTOMATIC

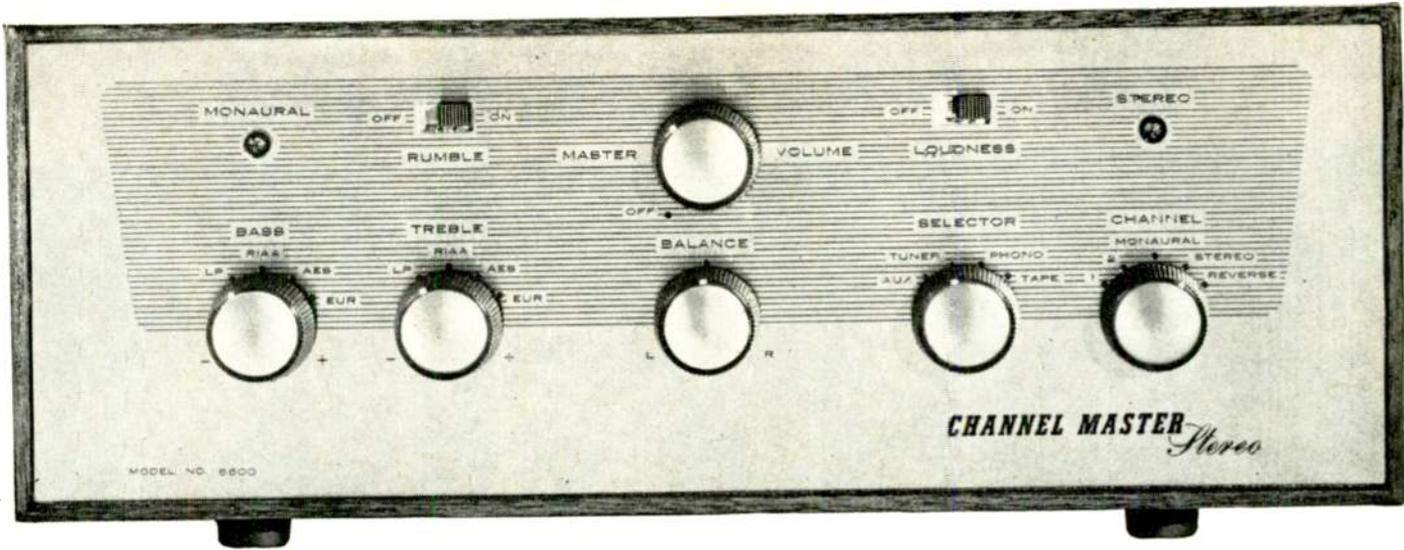
PT5 SILICON RECTIFIERS

the universal replacement
preferred by TV set manufacturers

Cut down expensive inventory, eliminate intricate installations — install the Automatic PT5 for top performance and maximum picture brightness!



GENERAL INSTRUMENT DISTRIBUTOR DIVISION
240 Wythe Avenue, Brooklyn 11, N. Y., EVergreen 8-6000



Channel Master puts Stereo Brilliance within the reach of everyone!



the superbly engineered
CHANNEL MASTER
Stereophonic Amplifier
model no. 6600, only

\$999⁹⁵
audiophile net

Channel Master AM/FM TUNER

Extreme sensitivity and high selectivity assure clear reception of every station. model no. 6610

\$84⁹⁵
audiophile net



Channel Master PATENTED MINSTREL SPEAKER SYSTEM

Sound that rivals big cabinet systems ...in a mere fraction of the space.

series 6630 **\$29⁹⁵**

audiophile net



16 WATTS PER CHANNEL

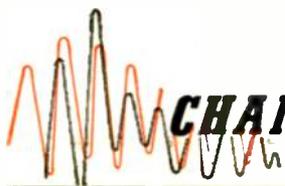
If you've been led to believe that high price is the only measure of high fidelity, just listen to the Channel Master model 6600! For here is an amplifier which, at its original price, was universally acclaimed by critical audio experts. Now this quality instrument, providing the ultimate in stereo reproduction and listening pleasure, is available at a new lower price that brings it within the reach of virtually everyone.

Performance Specifications

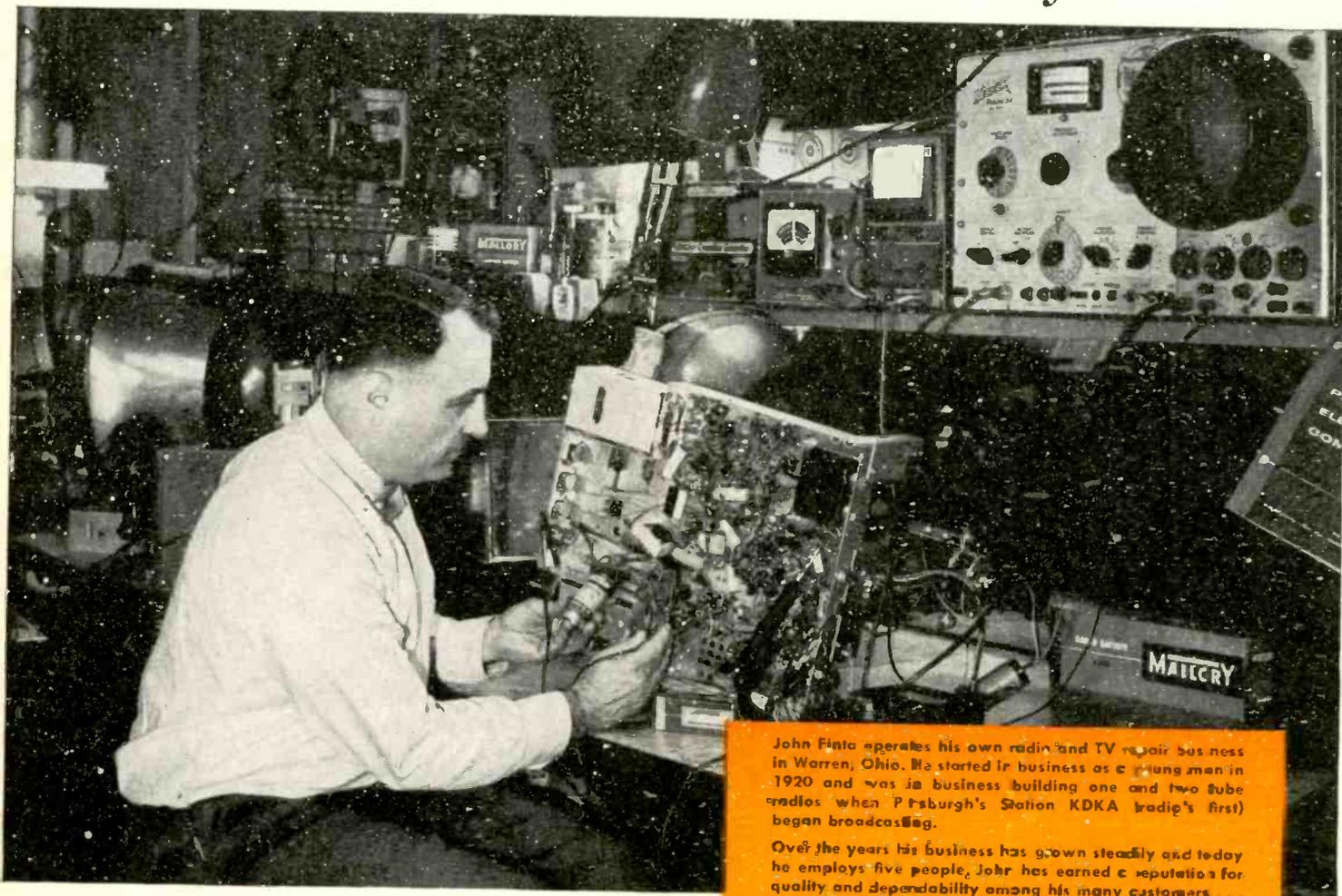
FREQUENCY RESPONSE: Uniform from 20 to 30,000 cycles at 1 watt \pm 1 db.
POWER OUTPUT: 16 watts per channel (total 64 watts peak).
HUM AND NOISE: Phono: better than 60 db below 10 millivolts at full output.
Tape: better than 55 db below 3 millivolts at full output. All channels better than 80 db at full output at minimum volume.
DISTORTION: Less than 1% at full output.

Sold only through
Channel Master Distributors

CHANNEL MASTER works wonders in Sight and Sound



Service Technician John Finta Says...



John Finta operates his own radio and TV repair business in Warren, Ohio. He started in business as a young man in 1920 and was in business building one and two tube radios when Pittsburgh's Station KDKA (radio's first) began broadcasting.

Over the years his business has grown steadily and today he employs five people. John has earned a reputation for quality and dependability among his many customers... a reputation that is bringing him new customers as well as making fast friends of the old.

Cut Call-Backs with These Quality Mallory



Gems—5 rugged, moistureproof, Mallory "Gem" tubular capacitors in an easy-to-use dispenser that keeps your stock fresh and clean—easy to find—no more kinks in lead wires. They're your best bet for outstanding service in buffer, bypass or coupling applications.



RMC Discaps®—are a product of the world's largest producer of ceramic disc capacitors. Long the original equipment standard, Mallory RMC Discaps are now available for replacement. They come in a handy 3" x 5" file card package... easy to stock, simple to use.



FP Electrolytics—The Mallory FP—the original 85°C capacitor—now has improved shock-resistant construction and leakproof seal. Its etched cathode construction—standard in all FP's—assures hum-free performance. High ripple current ratings fit the toughest filter circuits.

...“Mallory Components Make Every Job a ‘Sure Thing’”

“Nothing gets under your skin more—or eats into your profits deeper—than time consuming, expensive call-backs. But, there’s one sure way to stop them: use only quality replacements.

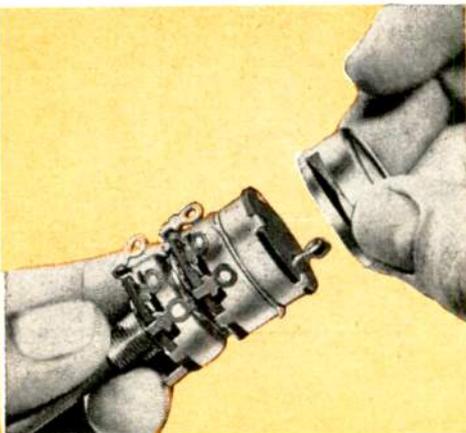
“You know you’re getting the best when you ask for Mallory . . . and you don’t pay premium prices, either. You see, Mallory components are service-

engineered to give long, trouble-free life. They’ve been thoroughly tested and ‘punished’ in the Mallory lab, far beyond any beating they’ll ever get in actual service.

“This is the kind of quality you get across the entire line of Mallory components . . . capacitors, controls, resistors, vibrators, rectifiers and batteries.”



Products...

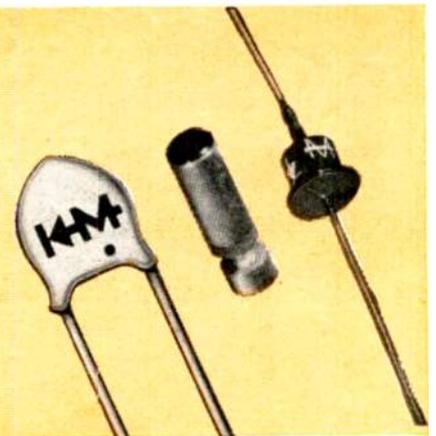


Sta-Loc* Controls—New Sta-Loc design enables your distributor to custom build, in just 30 seconds, over 38,000 combinations—eliminates waiting for out-of-stock controls. You can replace the line switch by itself, without unsoldering control connections.



Gold Label* Vibrators—On critical auto radio servicing, use the Mallory Gold Label Vibrator. It gives longer, trouble-free service life. Mallory Gold Label Vibrators feature Mallory exclusive buttonless contact design.

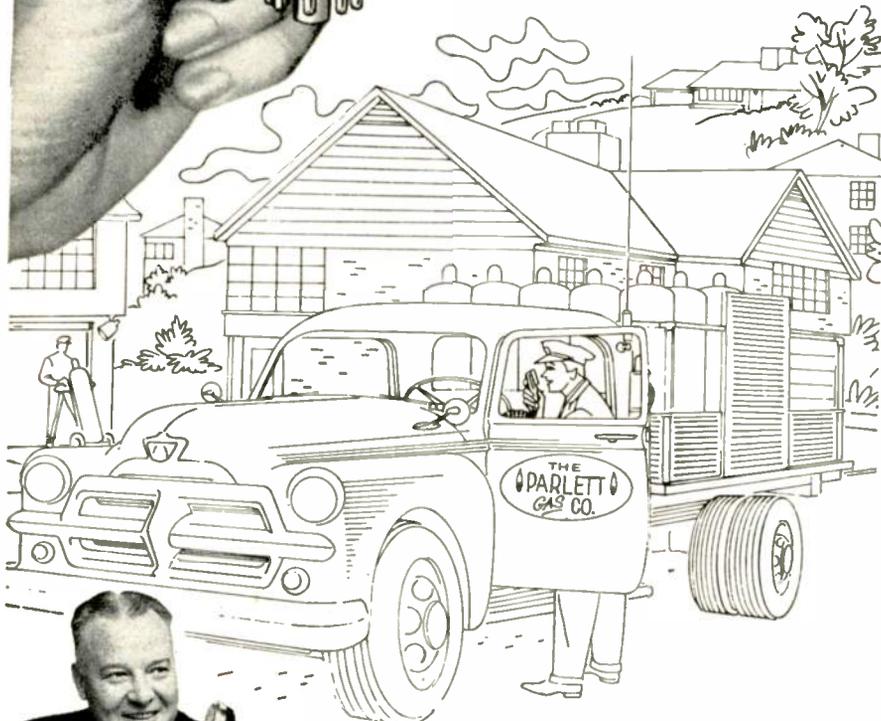
*Trade Mark



Silicon Rectifiers—New Mallory design gives far longer life, lower forward voltage drop, and reverse leakage current than conventional types . . . exceed the requirements of military humidity tests. In convenient kits for replacement of selenium rectifiers in radio and TV.

Parlett Gas Company
counts on

RCA Power Tubes



for uninterrupted
2-way radio service

"The four-year record of RCA Power Tubes in our mobile radio equipment has been one of steady dependability, all-round top performance," reports C. J. McAllister, Vice-President and General Manager, Parlett Gas Company, Waldorf, Maryland.

The year-in, year-out reliability of RCA Power Tubes has helped Parlett serve its LP-Gas customers with rapid deliveries, and with prompt and effective service to meet any emergency anywhere in its territory. Whenever superior performance and long-term endurance are critical, RCA Power Tubes are the natural choice of economy-minded fleet operators.

When you need quick delivery of RCA communications tubes, contact your local RCA Industrial Tube Distributor. He's set up to serve you with the complete line of RCA industrial tubes.



RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

For the name of your nearest RCA Industrial Tube Distributor,
call Western Union by 'phone number, and ask for Operator 25.



(Continued from page 6)

Association Pro & Con

Editor, *ELECTRONIC TECHNICIAN*:

I agree with Clyde Marvis' letter [June 1959] against joining associations. I don't deny that a lot of men in the associations are worthy and know their business, but they also have a lot of dead wood. One of them took a six-week course in TV, and thinks he knows all about it. Another never used anything but a 1000 ohm/volt meter and no scope for fixing TV. Then there was the metal to glass tube conversion by one of their members. Electronically it was OK, but the only thing that held the CRT in the set was the yoke. If associations want to police the industry, fine; but they better start at home first. Also, \$120 per year is a lot of money to belong to an association. In the two or more years that the association has been in effect here, I fail to see that it has done any good.

LOUIS C. HEBEL

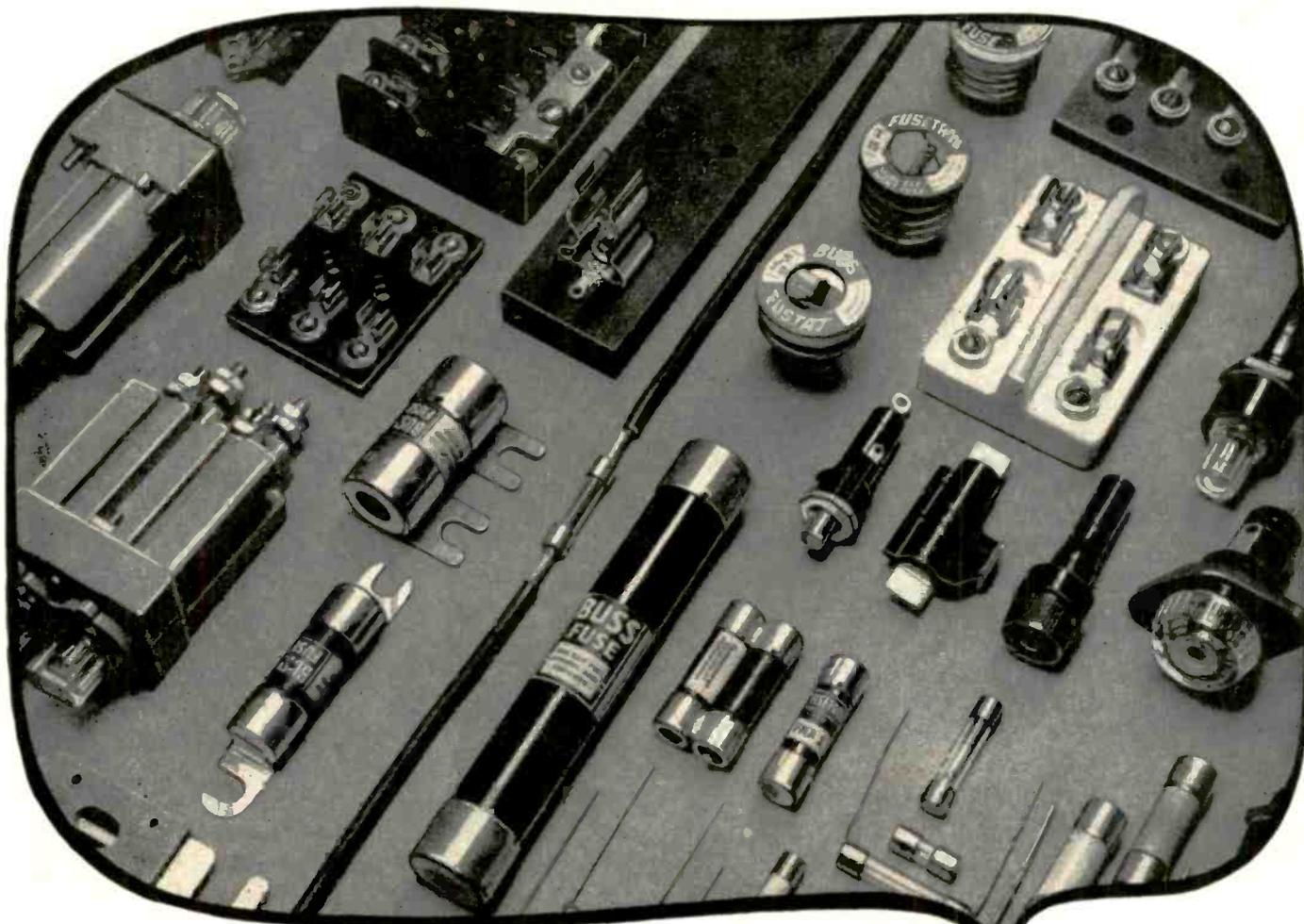
H & H Radio & TV
Oakland, Calif.

... Mr. Marvis' letter is not the first of its kind. We in association work are constantly confronted with the sideline heckler. In most cases this type of individual is sincere but grossly misinformed. He seems to think that this industry will always be independent. Mr. Marvis implies that association members are crooks, banding together to right their wicked names. I for one would not spend the endless hours that I do working for the betterment of my chosen field if I were a thief. It is the internal bickering within the trade that prevents any substantial gains from being made. Ironically enough, in the same June issue of ET there was an article on printed circuits by Mr. Mihalic of GE. I wonder how often Mr. Marvis cursed the early printed circuits. I wonder if he realizes that the improvements being made in printed circuits today are due to the suggestions made in cooperative discussions between manufacturers and service associations. Would Mr. Marvis care to sit down with a group of association men and match wits? He too might become an enlightened member of this proud profession. We'd welcome him.

GEORGE CARLSON
Secretary

Empire State Federation of Electronic
Technicians Associations
Jamestown, N.Y.





To Assure You Safe, Trouble-Free Electrical Protection

every BUSS Fuse is electronically tested!



Before a BUSS or FUSETRON fuse ever leaves the plant, it must meet our high quality control standards.

Each fuse is tested in a sensitive electronic device that automatically rejects any fuse not correctly calibrated, properly constructed and right in all physical dimensions.

Thus . . . by selling and installing BUSS and FUSETRON fuses you have one more way to help safeguard your reputation for service and reliability.

Complete Line For All Your Fuse Needs

Single-element fuses for circuits where quick-blowing is needed.

Single-element fuses for normal circuit protection.

Dual-element, slow-blowing fuses for circuits where harmless current surges occur.

Indicating fuses where signals must be given when fuses open.

BUSS fuses range in size from 1/500 amperes up — and there's a companion BUSS line of fuse clips, blocks and holders.

Your customers Know and prefer BUSS fuses

The ready acceptance of BUSS fuses is built on the millions upon millions of BUSS fuses used in homes and industry over the past 44 years. When you furnish BUSS, your customers instantly recognize that you are providing them with the finest electrical protection possible.

For more information,
write for BUSS bulletin SF8.

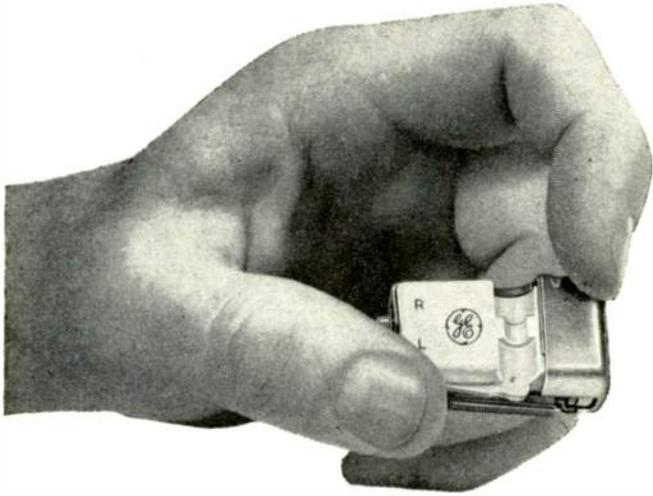
BUSSMANN MFG. DIVISION,
McGraw-Edison Co.
University at Jefferson, St. Louis 7, Mo.

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

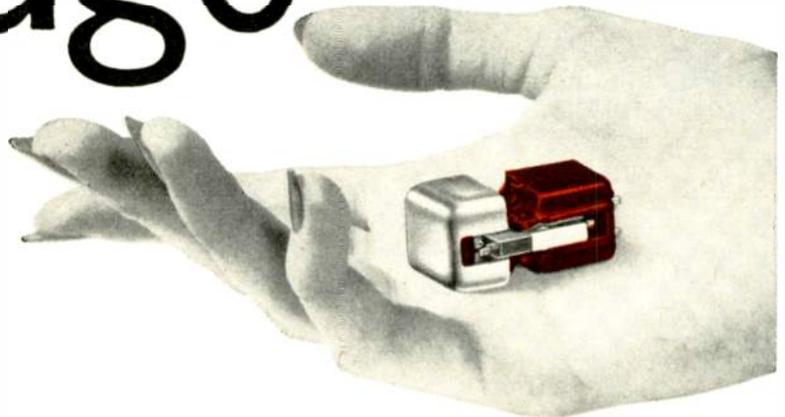
BUSS makes a complete line of fuses for home, farm, commercial, electronic, electrical, automotive and industrial use.



the all-new VR-22 stereo cartridge



VR-225 .5 mil diamond stylus. For professional-type tone arms, \$27.95.



VR-227 .7 mil diamond stylus. For record changer or turntable, \$24.95.

Now, outstanding in all four critical areas of stereo cartridge performance—**Compliance**—Tracks precisely, not a trace of stiffness. **Channel Separation**—Up to 30 db for maximum stereo effect. Nothing higher on the market! **Response**—Smooth and flat for superior sound from 20 to 20,000 cycles (VR-225), 20 to 17,000 cycles (VR-227). **Virtually hum-free**—triple shielded against stray currents. **This is our masterpiece. We urge you to hear it.**

GENERAL  **ELECTRIC**

Audio Components Section, Auburn, N. Y.

News of the Industry

INTERNATIONAL RESISTANCE CO. has been joined by **WILLIAM J. WERHEIM** as Sales Mgr. for precision resistor products.

HOFFMAN ELECTRONICS Semiconductor Div. names **RICHARD W. GRIFFITHS** Gen. Sales Mgr. and **HENRY F. SCHOEMEHL**, Dir. of Product Marketing at Evanston, Ill.

NEW YORK TRADE SCHOOL will offer a revised course in Industrial Electronics to prepare young men as electronic technicians starting September 8, 1959. It was developed in cooperation with the EIA. A description of the course may be obtained from the school at 304 E. 67th St., N.Y.C.

WESTINGHOUSE "Winner Take All Giant Jackpot Contest" entry forms may be obtained from distributors. Entrants estimate the total dollars-and-cents retail value of all the items shown and described in the picture for the contest. The four first prize winners will receive all items shown in the picture.

P. R. MALLORY & CO. Distributor Div., announces the "Go Places With Mallory" contest in which the winner will receive an all-expense paid weekend for two in Mexico City. An American Airlines Flight Bag Kit containing an official entry blank which permits the technician to enter by telling which line of Mallory components he likes best, is available for a limited time. Included in the flight bag is an assortment of eight different lines of replacement components at a special introductory price.

RAYTHEON CO. has elected **WILBERT E. STEVENSON** Vice Pres. Plans for the purchase of assets and business of **SORENSEN & CO., INC.**, manufacturers of controlled power supply equipment, were announced. Five new Dist. Mgrs. have been appointed to field sales posts: **STANLEY C. OLSEN**, North Central Dist. including Minn. and N. and S. Dakota, headquarters in Minneapolis; **JAMES M. IGOE**, Ind. and Ky., headquarters in Indianapolis; **ALLEN W. MERRIAM, JR.**, N. Calif. Dist., headquarters in San Francisco; **CHARLES B. DOUGLAS** and **ROBERT W. SPENCER** for Southwestern Dist. with headquarters in Dallas and Houston, respectively. The Semiconductor Div. plans to construct a transistor plant which will eventually employ more than 2,000 persons at Lewiston, Me.



Built for **WET WEATHER!**

MARINE CORE
TWIN LEAD 

— up to 93% less signal loss!

In moisture, salt spray or areas of heavy industrial contamination, AMPHENOL's new 214-103 Marine Core Twin Lead provides amazing low-loss performance. Measured signal loss of polyfoam Marine Core submerged is 20% less than other foam type lines, 25% less than tubular lines, and up to 93% less than standard twin leads. Marine Core gives vital signal protection where other twin leads fail!

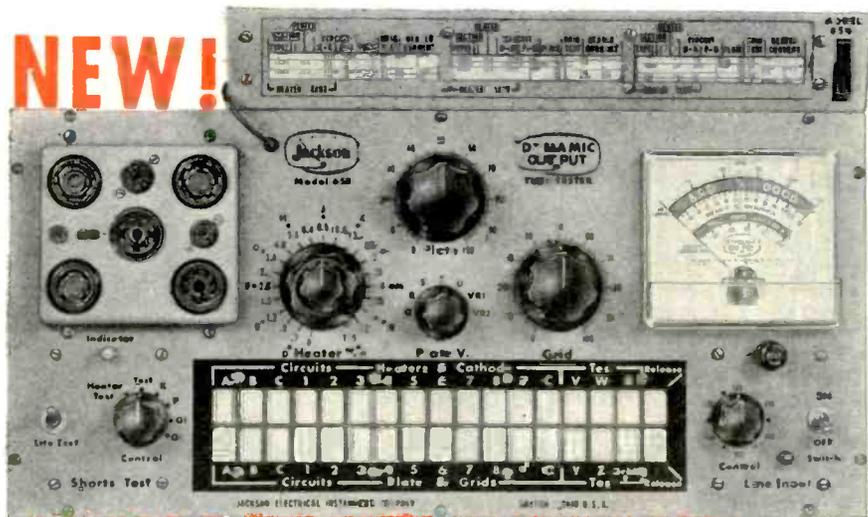
Extremely flexible, Marine Core's performance secret is simple: Proper spacing ratios between conductors and between conductors and line surface, a discovery of AMPHENOL engineers.

A tough, brown virgin polyethylene jacket protects Marine Core's double self-sealing cores of polyfoam. Conductors are 7/28 pure copper for longer life. Availability: Coils of 50, 75 and 100 ft., put-ups of 500 and 1000 ft.

AMPHENOL

AMPHENOL DISTRIBUTOR DIVISION
Amphenol-Borg Electronics Corporation
BROADVIEW, ILLINOIS

NEW!



DYNAMIC[®] OUTPUT 658 TUBE TESTER BY JACKSON

Makes More . . . and more accurate tests
Than Any Service Tube Tester Ever Made!

At last, here is a tube tester that will test practically every tube the average serviceman will ever encounter. Faster, more versatile, more accurate for more types, the new 658 is the ideal choice for service, laboratory, and engineering applications.

DYNAMIC OUTPUT PRINCIPLE—8 voltage positions for plate, screen and voltage regulators. Variable DC voltage, plus variable AC signal voltage is applied to control grid. The meter then reads only the AC component in the plate circuit. A much more valid test than mutual conductance, because it considers the entire output curve of the tube, not just a small portion.

TESTS NEW 12-VOLT PLATE HYBRID TUBES—Ample current capacity for even high current space charge grid tubes. The 658 is the only tester made with this capability.

TRUE RECTIFIER TESTS—AC voltages are applied to diodes and rectifiers. Meter then reads plate current—the only valid test for rectifiers. Easily handles even high current rectifiers up to 250 ma.

GRID LEAKAGE TESTS—Highly sensitive grid leakage test indicated directly on special meter scale. Sensitivity of 15 megohms.

TESTS "EYE" TUBES UNDER DYNAMIC CONDITIONS—Eye can be opened and closed to determine accurately its operating limits.

HEATER-CURRENT TESTS ON SERIES STRING TUBES—Actual current is read directly on meter scale.

HEATER CONTINUITY CHECK WITHOUT WARM-UP—No wasted time if the heater is burned out.

TESTS ALL VOLTAGE REGULATOR AND REFERENCE TUBES—Actually indicates striking voltage and control voltage range.

PLUS THESE AND MANY MORE FEATURES

Famous Jackson Push-Button Sequence Switching
New Silicon-Rectifier Balanced double-bridge circuit
Triple Shorts Sensitivity Tests to suit each tube
231 Heater voltage combinations from 0.6 to 120 volts
Fused line for overload protection. Panel mounted fuse

Famous Jackson Life-Line Test
Grouped tube sockets for easy accessibility
Complete data for testing more than 1,200 types
Compact portable case—21" l. x 13 3/4" w. x 7" d.
Sockets for 4, 5, 6, 10ktal, octal, miniature 7 and 9 pin tubes plus two for sub-miniatures

SEE IT AT YOUR DISTRIBUTORS OR WRITE TODAY FOR LITERATURE

\$189.95



THE JACKSON ELECTRICAL INSTRUMENT CO.
16-18 S. Patterson Blvd., Dayton 2, Ohio
In Canada: The Canadian Marconi Company

WORKMAN TV PRODUCTS INC. has moved. The new address: Box 5397, Sarasota, Fla.

JOHN RIDER, INC. has appointed **CHAPMAN & HALL LTD.** as sole agents for the U.K. and Europe.

MOTOROLA, INC. Semiconductor Products Div. has reduced prices on its silicon Zener diode line from 10% to 40%.

EICO has acquired a contiguous area of 20,000 sq. ft. to expand the Engineering & Sales Depts., bringing their total factory area to 60,000 sq. ft.

GENERAL INSTRUMENT appointed **MAURICE FRIEDMAN** Vice Pres. and Gen. Mgr. of the Semi-Conductor Div. with plant and headquarters at Newark, N.J.

HEATH CO. reports the following appointments to two newly created positions: **JACK E. ARNDT**, Consumer Product Line Mgr.; and **ROGER S. WHITLOCK**, Technical Product Line Mgr.

GENERAL ELECTRIC Communications Products Dept. announces the following appointments: **KENT J. WORTHEN**, National Sales Mgr. for two-way radio; **L. R. SHEELEY**, National Sales Mgr. for Computer Dept., Phoenix; and **ROBERT L. CASSELL-BERRY**, Acting Mgr. of Technical Products Operation. The Semiconductor Products Dept. has established three sales regions covering the entire U.S. with the following sales managers: **C. J. GOODMAN**, Eastern; **C. R. CURTISS**, Central; and **H. W. GEBHARDT**, Western. Each regional sales mgr. will be responsible for sales of transistors and component rectifiers through the dist. sales mgrs.

RCA Electron Tube Div. has made the following appointments: **JOSEPH E. KELLEY**, Mgr., Mdsq., Distributor Products Div.; **G. WALLACE CRAWFORD**, Mgr. Operations Planning; **ARNOLD E. LINTON**, Mgr. Mfg. Planning, Receiving Tube Operations; **FREDERICK J. LAUTENSCHLAEGER**, Plant Mgr. at Harrison, N.J.; and **WILLIAM B. BROWN**, Plant Mgr. at Woodridge, N.J. The newly created post of Administrator of Color TV Market Dev. will be filled by **H. W. (HANK) SHEPARD**. **RCA SERVICE CO.** reports the appointment of **HAROLD METZ** to a newly created position of Vice Pres., Technical Educational Programs.

(Continued on page 18)

New Developments from



Matched Pairs for Higher Fidelity

Typical of premium-performance CBS receiving tubes are these audio output tubes. Their critical audio characteristics are matched to help minimize harmonic distortion in push-pull amplifiers. The 6BQ5, 6V6GT, 5881 and 6550 matched pairs reduce distortion even below that attainable by controls for balancing plate currents.



Professional 55 Stereo Cartridge

This is the professional's version of the popular Columbia CD. Designed for transcription turntables, it uses a .5-mil diamond stylus, and features superior linearity . . . separation . . .

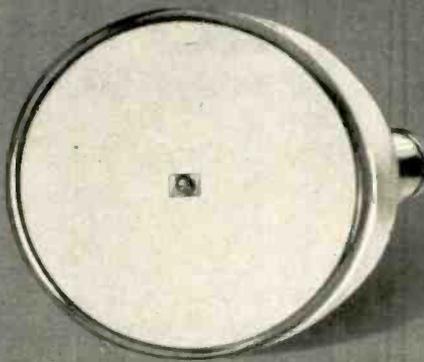
needle-point impedance . . . low mass . . . freedom from hum and distortion . . . output level . . . ruggedness. Includes 4 plug-in equalizing networks. Another fine Columbia audio component.



CBS PALOMAR
Silver Vision

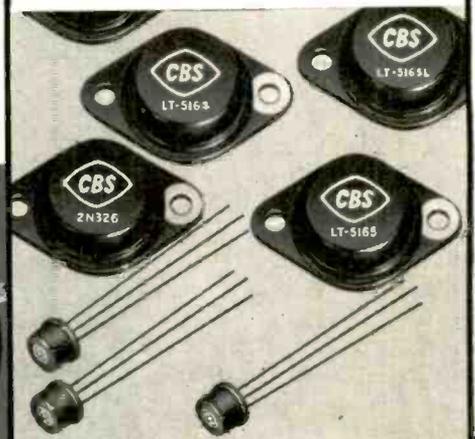
Premium or Budget TV Tubes

A CBS original! Sell your customer whichever he wants: premium-performance CBS Silver Vision or budget-priced CBS Palomar. Either is easy to sell because of top brand prestige. Either stays sold because of top performance in its field. Recommend these dependable national-brand CBS picture tubes with confidence.



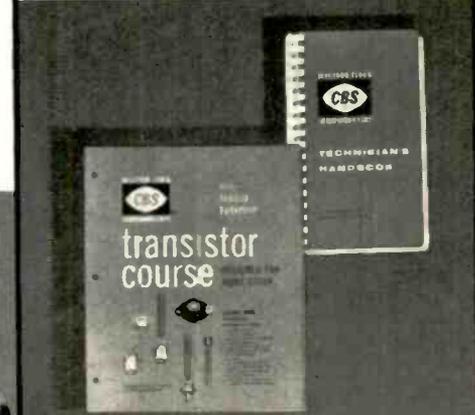
Ultrahigh-resolution C-R Tubes

New UHR tubes offer still another addition to CBS industrial tubes . . . most inclusive line in the industry. They can compress into 1/20 square inch all detail on the face of a 21-inch picture tube. They make practical many advanced military and industrial applications requiring resolution beyond the capabilities of the unaided human eye.



New Semiconductor Lines

Drawing on its experience in NPN switching transistors and PNP power transistors, CBS Electronics now adds a comprehensive group of NPN power transistors for use in complementary circuits. Its line of NPN switching transistors has been more than doubled to meet increasing demands by computer manufacturers.

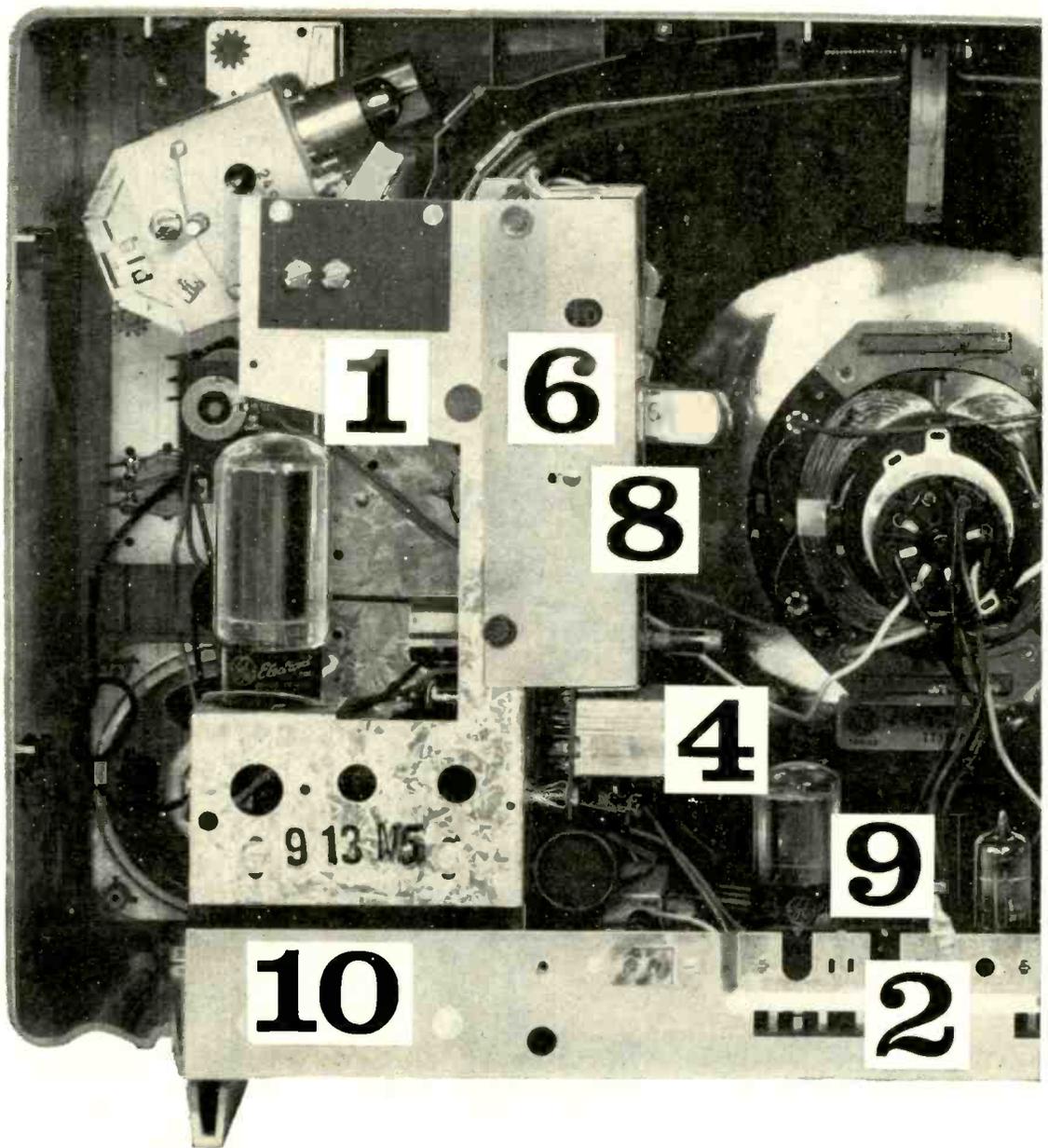


Revised Transistor Course and Technician's Handbook

Expanded CBS Transistor Home-Study Course (still only \$25.00) makes it easy to learn about transistors by making practical transistor devices from readily available parts. Opens up advancement opportunities. 1959 Technician's Handbook, designed for the technician, is compact, handy, modern. Its 550 pages include receiving, picture, special tubes and semiconductors . . . only \$1.85. See both at your distributor's.

WATCH FOR MORE *reliable products* through *Advanced-Engineering*

CBS ELECTRONICS, Danvers, Massachusetts
Electronic manufacturing division of
Columbia Broadcasting System, Inc.



Now all 1960 General Electric TV sets have wonderful "Designer" TV serviceability! This means that in at least 9 out of 10 repairs you need not pull the chassis or the picture tube.

It's much simpler to circuit trace or replace parts, get at the key check points. Tubes are directly replaceable. And all fuses are accessible.

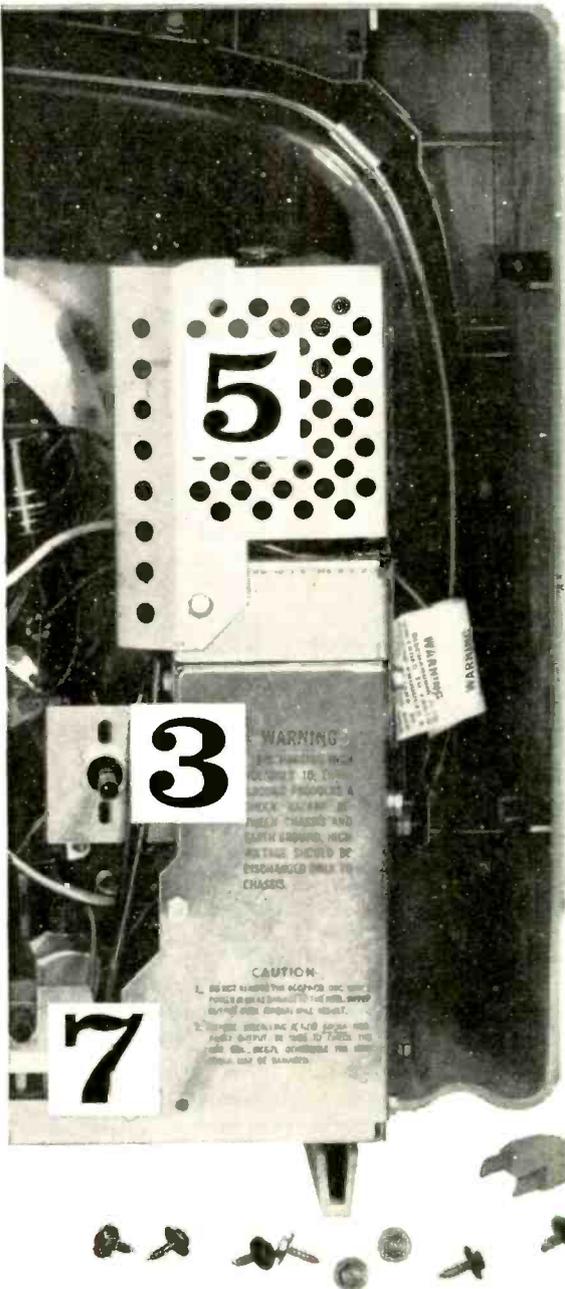
This leads to a higher home completion rate. Result: greater productivity. You make more calls.

Attribute this to Precision Etched Circuitry—another contribution to General Electric quality and performance.

Another thing you'll like: You can get at both sides of the printed board *while the chassis is still in the cabinet*. And the painted schematic gives you a "road map" to follow—a great time-saver in a situation where time means money.

Is it any wonder that service men are discovering that General Electric makes not only the finest sets in television—but the easiest-to-service sets, too! General Electric Company, Television Receiver Department, Syracuse, New York.

1. Both line and high-voltage fuses are readily accessible and replaceable.
2. Vertical linearity and height controls easily reached without removing back.
3. Width switch to adjust picture width to line voltage—accessible without removing back.
4. Video detector shield easily removable, and video detector may be unsoldered from circuit without removing chassis or picture tube.
5. All tubes are service designed and accessible. Tapered tube pins and special sockets insure easy



NOW! DO 9 OUT OF 10 REPAIRS WITH- OUT PULLING CHASSIS OR PIX TUBE

ON ANY

'60 GENERAL ELECTRIC TV SET!

removal and positive contact.

6. Both sides of the printed board may be reached without removing chassis or picture tube.
7. Horizontal hold control can be adjusted very easily without removing the back.
8. Precision Etched Circuitry has a painted connection diagram on component side of the board for easy circuit tracing.
9. All components are mounted on only *one* side of Precision Etched Circuitry boards.
10. Power transformer on *all* models.

Progress Is Our Most Important Product

GENERAL  ELECTRIC

Manager, Product Service
General Electric Company
Department TV 201
P.O. Box 1122, Syracuse, New York



Please send me a *free* copy of:
FACTS ABOUT PRINTED CIRCUITRY.

Name _____

Address _____

City _____ State _____

ET-8

Precision cutting... a simple job

with the new

Centralab

SK-2

SHAFT-KUT

TOOL



Now you can cut controls and control the cut . . . precisely and exactly. CENTRALAB's Shaft-Kut Tool is a precision instrument, *guaranteed* to make a really simple job of cutting shafts to the exact size you need.

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

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

Centralab
B-5931

A DIVISION OF GLOBE-UNION, INC.
902H E. KEEFE AVE. • MILWAUKEE 1, WIS.
IN CANADA: 569 Bayview Ave., • Toronto 17, Ont.

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

(Continued from page 14)

SIMPSON ELECTRIC CO. reports the following appointments: MEL BUEHRING, Dir. of Sales; WILLIAM JOHANSEN, Sales Mgr. of Instrument Div.; LOWELL DE WOLF, Sales Mgr. of Automotive Div.

CBS ELECTRONICS received the NATESA award for "outstanding service in creating better customer relations." FRANK M. HICKEY has been appointed to the new post of Merchandising Mgr. for industrial product sales.

Reps & Distributors

INTERNATIONAL RECTIFIER Distributor Sales Div. has named THE ROD BUTCHART CO., Michigan rep.

JERROLD ELECTRONICS CORP. Distributor Sales Div. has appointed THE JIM HASTIN SALES CO., of Honolulu as sales rep for the Hawaiian Islands.

VIS-U-ALL PRODUCTS CO. reports the appointment of a new Canadian rep., DESSER E-E LTD., Montreal and NORWESTERN SALES CO., Seattle, covering Wash., Ore., N. Idaho, N. Mont., Alaska and British Columbia.

ELECTRONIC WHOLESALE SUPPLY CO., INC., 3920 Bragg Blvd., Fayetteville, N.C., was organized for the purpose of wholesale distribution of electronic components including two-way communications in eastern N.C., on June 1st.

GENERAL ELECTRIC announces an open door policy and a progressive step beyond simple technical training will be an important part of all future TV service training schools. Forty-two product service trainers, representing the Major Appliance Div. distributors, took part in a two day training session to familiarize them with the 1960 product line.

TECHNICAL APPLIANCE CO. honored four sales reps at a silver anniversary celebration for selling TACO antennas since the company started 25 years ago: AL BRUNING, A. H. BRUNING CO., Chicago; JOHN OLSEN, JOHN O. OLSEN CO., Cleveland; JACK HEIMANN, HEIMANN CO., Minneapolis; and JAMES BACKER, JAMES J. BACKER CO., Seattle.

(Continued on page 20)



Fewer Returns

Returns of Tung-Sol Tubes are consistently lowest of all!

How about your returns?

It's no accident when servicemen the country over find that Tung-Sol Tubes consistently have the lowest return rate of all.

There's a reason for this outstanding record of performance and dependability: It's Tung-Sol *one-grade* quality. This one and *only one grade* of tubes is engineered to the highest initial equipment specifica-

tions. As a result—when you install Tung-Sol Tubes, you're installing the same type of tubes leading set makers have relied upon for a long time, too.

If call backs are costing you time, money and aggravation, it's probably time you told your distributor you'd rather have Tung-Sol Tubes. Tung-Sol Electric Inc. Newark 4, N. J.

 **TUNG-SOL[®]**

Blue Chip Quality

ELECTRON TUBES • SEMICONDUCTORS

**THE
TREASURE CHEST
THAT'S
NEVER EMPTY**



FILLED WITH "GOOD-AS-GOLD" C-D CAPACITORS. Here's the smart, modern way to keep your working capacitor stock shipshape. Each chest comes with a fast-moving assortment of C-D "Preferred" type twist-prongs, "Blue Beavers," and Mylar Tubulars—buy them and you get the chests **FREE**. Speed up your work...establish customer confidence with Consistently Dependable C-D capacitors from your own Treasure Chests. See them at your distributor or write for Bulletin to Cornell-Dubilier Electric Corporation, South Plainfield, New Jersey.



Consistently Dependable
CORNELL-DUBILIER
SERVICE CAPACITORS

(Continued from page 18)

ADMIRAL CORP. has named **GRIF-FIN DISTRIBUTING CO.** for major appliances and electronic products in the Denver area, succeeding **ADMIRAL's** Denver Div. which discontinued operations in favor of the independent distributorship.

VOCALINE CO. has appointed the following sales reps: **THE BILRAY ORGANIZATION**, Ind. and Ky.; **MEL FOSTER CO.**, N. and S. Dakota, Minn. and W. Wis.; **W. R. RETZLOFF CO.**, Tex., Okla., La., Ark.; and **L. E. BARNHART**, Miss., Tenn. and Ala.

CONTINENTAL MFG., INC. has appointed six new regional reps: **SAMUEL N. STROUM CO.**, Pacific Northwest; **JOSEPH RIGOR**, Chicago; **T. H. ELLIS & CO.**, Kansas City; **L. R. MASSEY CO.**, Ark., Tenn., Ala., Miss.; **HILKER CO.** N. and S. Carolina; and **KEENE SALES CO.**, New England.

MARTY BETTAN, mfr's rep metropolitan N.Y. area, announces he will communicate with his office via Citizens Band radio while in motion between distributor calls. Mr. Bettan invites all reps interested in forming a local network where a single frequency can be standardized to contact N.Y. distributors and reps.

Catalogs & Bulletins

RELAYS: A new 44-page catalog lists and describes relays, steppers, sensitrols, solenoids, etc., most of which are carried in stock in production quantities. Universal Relay Corp., 42 White St., New York 13, N. Y. (ELECTRONIC TECHNICIAN B8-11)

ANTENNAS: A group of new antennas is described on a catalog sheet. Model number, name, element, number of antennas to a carton and length of antenna are given. Also covered are FM antennas and a TV antenna kit. S & A Electronics, Inc., 1025 Nevada St., Toledo 5, Ohio. (ELECTRONIC TECHNICIAN B8-9)

POWER & GAS TUBES: Form PG-101D is a 32-page booklet containing technical data for more than 175 tube types, of which 19 are new. Description, dimensions, ratings, operating values and a base or terminal-connection diagram are provided for each type. Photographs of representative tube types in each tube family are included. Price 30¢. Send order with payment to: Commercial Engineering, RCA Electron Tube Division, Harrison, N. J.

TUBE TESTERS: A new folder illustrates and describes the various models in the firm's line of tube testing equipment for TV technicians. Highlighted is the new Model V1003, tube-transistor-battery checker. Vis-U-All Products Co., 640 Eastern Ave. S. E., Grand Rapids, Mich. (ELECTRONIC TECHNICIAN B8-12)

SEMICONDUCTOR DEVICES: TE-1340A is a new condensed catalog listing the firm's line of silicon and germanium products. Package photos and data charts give range of performance. Transiron Electronic Corp., 168 Albion St., Wakefield, Mass. (ELECTRONIC TECHNICIAN B8-10)

TUBES: "Call-back Insurance" is the title of Bulletin PA-222. In four pages, it describes simple circuit modifications and adjustments the technician can make to help eliminate premature failure of replacement tubes. CBS Electronics, Danvers, Mass. (ELECTRONIC TECHNICIAN B8-1)

OSCILLOSCOPE PROBE: HP Journal, Vol. 10, No. 9-10, provides technical data on a new clip-on oscilloscope probe for measuring and viewing current waveforms. Illustrations, graphs and specifications are included. Hewlett-Packard Co., 275 Page Mill Rd., Palo Alto, Calif. (ELECTRONIC TECHNICIAN B8-4)

SILICON POWER RECTIFIER: Data sheet presents complete description, data and specifications for new silicon power rectifiers with peak inverse voltages ranging from 50 to 400 volts, in 50-volt steps. Syntron Co., 582 Lexington Ave., Homer City, Pa. (ELECTRONIC TECHNICIAN B8-13)

SEMICONDUCTORS: Literature is available covering a new line of semiconductors. Basic specifications, applications and charts showing performance characteristics are included. Ohio Semiconductors, Inc., 1035 W. Third Ave., Columbus 8, Ohio. (ELECTRONIC TECHNICIAN B8-7)

CAPACITORS: Bulletin 152D describes Series TF tantalum foil capacitors, and gives data concerning performance results of these units. Made to order and stock capacitor values are listed along with the equivalent MIL type designations. Ohmite Mfg. Co., 3634 Howard St., Skokie, Ill. (ELECTRONIC TECHNICIAN B8-8)

MINIATURE TEST EQUIPMENT: New illustrated catalog JBB gives detailed information on miniature test equipment for electrical appliance and electronic servicing as well as accessory components and equipment. Specifications and prices provided. Industrial Devices, Inc., 982 River Rd., Edgewater, N.J. (ELECTRONIC TECHNICIAN B3-14)

Transistor Radio Servicing CAN be Highly Profitable



The ONLY Complete Transistor Radio Service Lab
Everything you need for less than \$50



Check Transistors, Diodes, Rectifiers . . .

SENCORE TRC4 TRANSISTOR CHECKER

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



Replace Batteries During Repair . . .

SENCORE PS103 BATTERY ELIMINATOR

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



Find Defective Stage in a Minute . . .

SENCORE HG104 HARMONIC GENERATOR

New signal generator designed primarily for fast signal-tracing of transistor radio circuits. No need to unsolder all transistors. Provides RF, IF and audio signals *simultaneously*, drastically cutting service time. Traces from speaker to antenna. Clear 1000 cycle note signal is heard in speaker from all good stages. Signal weakens or stops at defective stage. Equally as effective for testing TV, hi-fi and other audio circuits also. Size, 3½x4½x1¼". With batteries. DEALER NET..... 9⁹⁵



Turn page for other

SENCORE
Time Savers

See your Parts
Distributor
NOW!

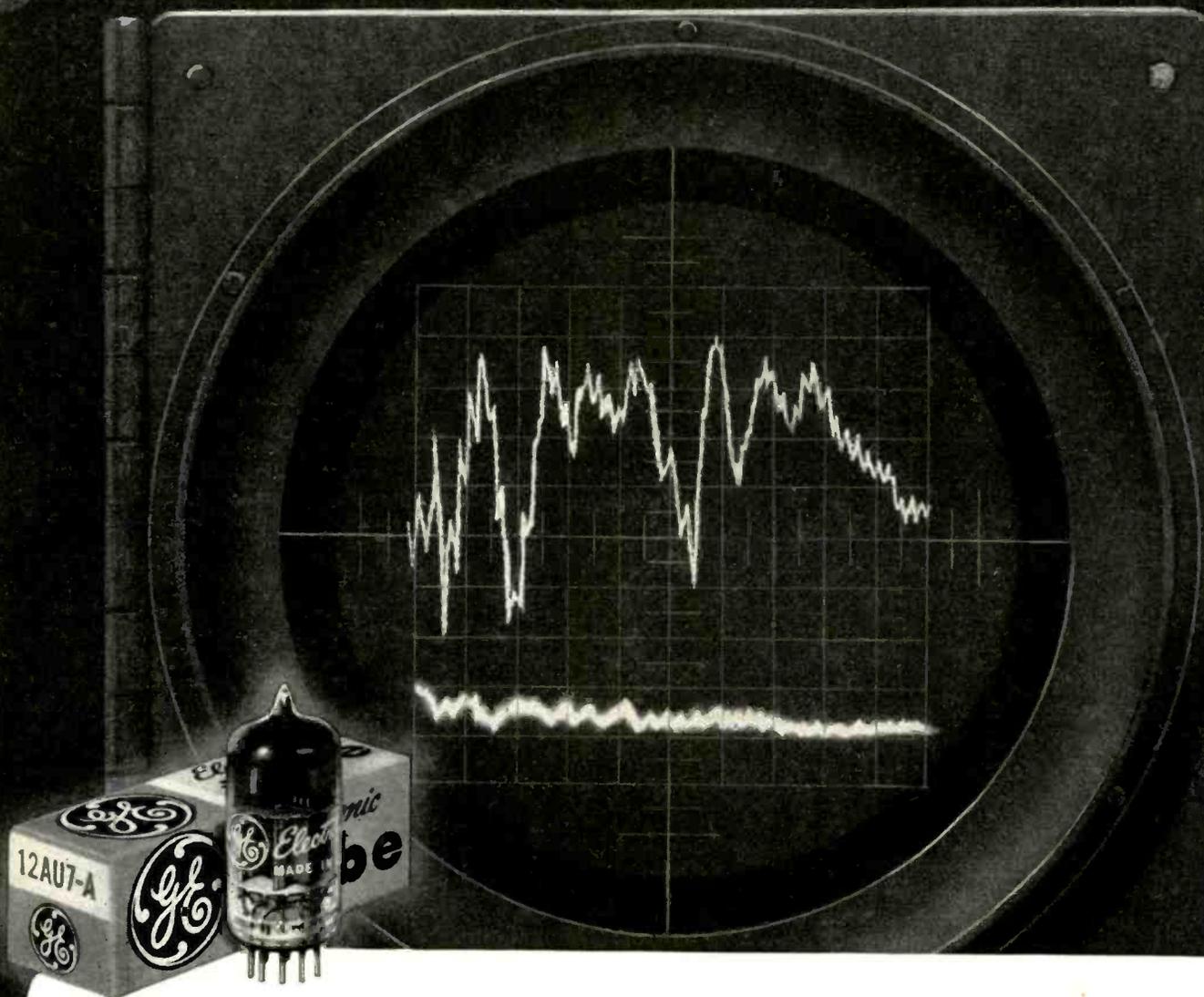
SENCORE
ADDISON 2, ILLINOIS

TEST INSTRUMENTS: A colorful, illustrated, 4-page folder and two catalog sheets give features, specifications and prices for test and measuring instruments. Gyra Electronics Corp., 518 N. Spring Ave., La Grange Park, Ill. (ELECTRONIC TECHNICIAN B8-2)

TOWERS: Literature is available describing TV towers and accessories for home and commercial installations. Featured are the 40-ft. and the 50-ft. packages. Other packages are 10, 20 and 30-ft. All have exclusive construction features. KTV Tower & Communication Equipment Co., P. O. Box 294, Sullivan, Ill. (ELECTRONIC TECHNICIAN B8-5)

KIT: A new citizen's band transceiver kit is featured on the cover of the firm's current 28-page catalog. Also included are nine new kits and a high fidelity component chart. Health Company, Benton Harbor, Mich. (ELECTRONIC TECHNICIAN B8-3)

INDUSTRIAL TEST INSTRUMENTS: A short form catalog provides four pages of information including model number, frequency range, features, general description and illustrations of instruments designed to simplify measurement problems. Marconi Instruments, Sales & Service Div., 111 Cedar Lane, Englewood, N. J. (ELECTRONIC TECHNICIAN B8-6)



SEE HOW G-E 12AU7-A's ARE BETTER!

Bottom scope trace shows Service-Designed Tube's low-microphonic performance compared with ordinary 12AU7-A (top).

APPLY equal vibration to both tubes, and you get the results shown above. General Electric's Service-Designed 12AU7-A has far lower microphonics. No more TV "shakes and jitters." In hi-fi, tone is rich, round, undistorted when you install this finer General Electric dual triode. Here's the ideal tube to create goodwill and boost your repeat business.

Heart of the Service-Designed 12AU7-A's design is a short compact cage with heavy-duty micas, rigid under all conditions. And quality merely *starts* there! This G-E volume-seller is better manufactured, better tested. See your General Electric tube distributor! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.*

Progress Is Our Most Important Product

GENERAL  ELECTRIC

2-111-206

Audio NEWS LETTER

AMERICAN MICROPHONE announces the X-206 crystal mike @ \$7.95.

TURNER introduces Series 250 communications microphones from \$16 to \$36.50.

GELOSO releases circular on the 256/60 combination recorder & dictation machine.

AUDIOTEX introduces the Taperaser @ \$33, and a counter rack that's free with order.

PARKWAY SPECIALTIES announces the Aud-0-Gril stereo control @ \$12.95 in cabinet.

WALCO stylus pressure balance and turntable level kit lists @ \$2.50; 6 diamond needles on new display card. List is \$99.70.

CONTINENTAL introduces the TA-20 AM/FM tuner @ \$89.95 with cover, and the SA-30 stereo amplifier @ \$99.95 and ST-10 @ \$44.95. Ratings are 15 and 5 watts/channel, respectively. New reps are: Samuel Stroum, Seattle; Joseph Rigor, South Bend; T. H. Ellis, Kansas City; L. R. Massey, Greenwood, Miss.; Hilker Co., Winston-Salem; Keene Sales, Boston.

CONSUMERS UNION Director Dexter Masters has written to us to state their official policy: No liaison with manufacturers, no discussion of findings with equipment designers, etc. CU's claim that they welcome suggestions from industry engineers is open to question. For example, a voluntary offer of technical assistance by hi-fi authority Norman Crowhurst is not turned down; it's simply ignored.

Servicemen! SAVE TIME...SUBSTITUTE THE SENCORE WAY

The Fastest, Surest Method Known!

Substitute for Capacitors, Resistors

SENCORE H-36—THE "HANDY 36"

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

24 RESISTORS from 10 ohms to 5.6 megohms
10 CAPACITORS from 100 mmfd to .5 mfd
2 ELECTROLYTICS, 10 mfd and 40 mfd
DEALER NET..... 12⁹⁵

Substitute for Electrolytic Capacitors

SENCORE ES102 ELECTRO-SUB

Usable from 2 to 450 volts, D.C.

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

Substitute for Fuse Resistors During Repair

SENCORE FS3 "FUSE-SAFE" CIRCUIT TESTER

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

Substitute for Bias Batteries During Repair

SENCORE BE3 "ALIGN-O-PAK"

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

UNIVERSAL TV JUMPER CORD

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

See your Parts Distributor Now!

SENCORE

ADDISON 2, ILLINOIS

Turn page for other

SENCORE
Time Savers

MAGNECORD announces the Model 728 "Professional" tape recorder, 7-1/2 and 15 ips. Flutter & wow 0.15% @ 7-1/2 ips, s/n 55 db per channel.

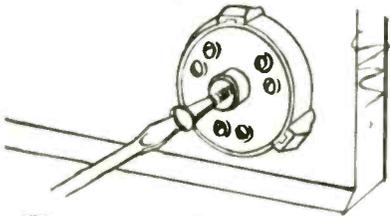
FIDELIVOX-FIDELPAC divisions of Waters Conley announce a continuous one-reel tape magazine. Loop holds up to 3 hours. Attachment with preamp is \$119.95; self-contained unit is \$179.95.

FISHER introduces 7 stereo consoles and 2 phonos from \$229.50 to \$2595. Top of line, President III, has 42 tubes on 5 chassis, tuner and recorder.

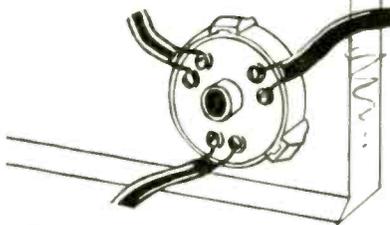
FIRST ANNUAL Stereo & Hi-Fi Show in Spokane, Wash., will be held Oct. 2-4 at the Davenport Hotel. Details are available from Wally Vawter, N. 1405 Monroe St., Spokane, Washington.

(Continued on page 25)

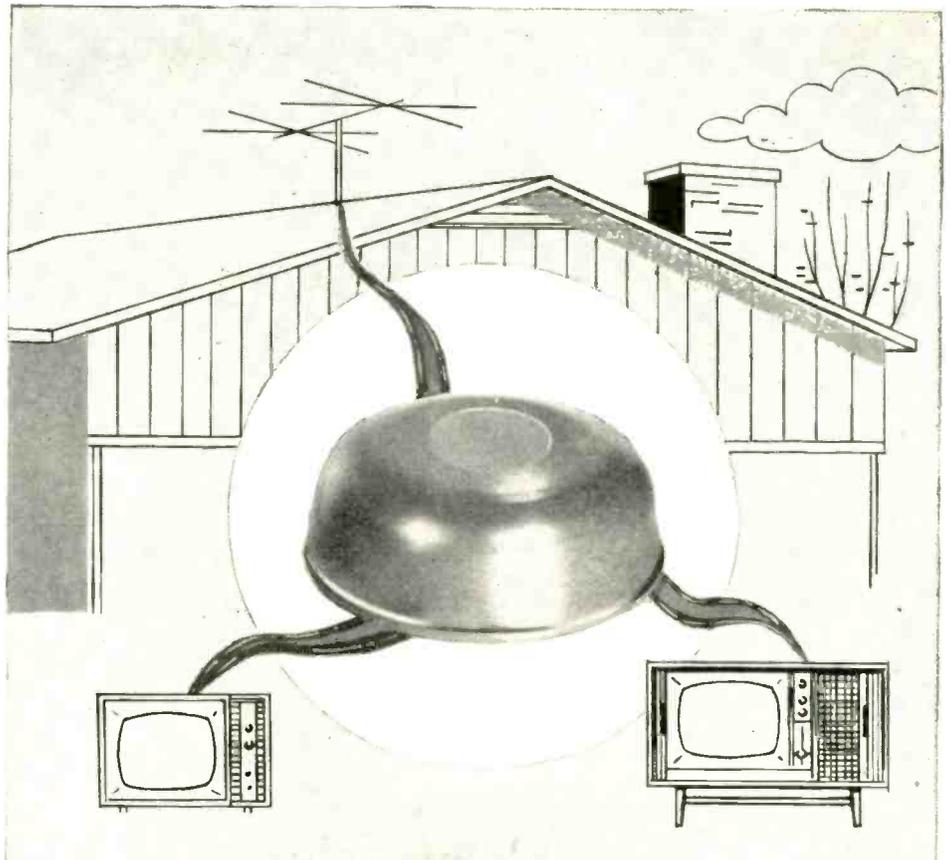
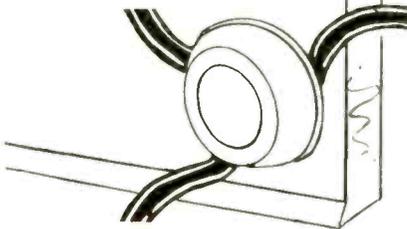
1. Fasten Coupler to Wall or Mast



2. Measure TV or FM Leads Exactly, Then Attach to Coupler



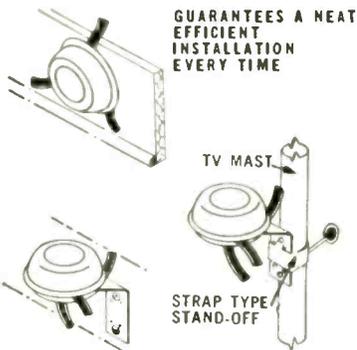
3. Snap Cap On For Easy, Neat Installation



NEWLY DEVELOPED*

2-SET COUPLER

THAT GOES ON FAST AND EASY!



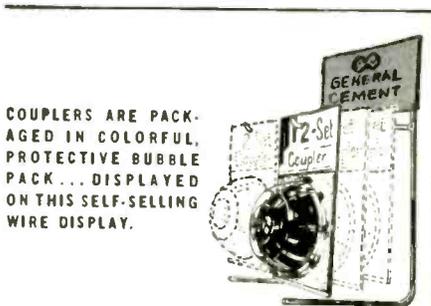
GUARANTEES A NEAT EFFICIENT INSTALLATION EVERY TIME

TV MAST

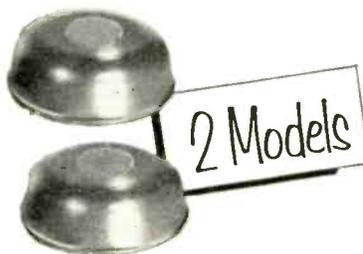
STRAP TYPE STAND-OFF

*This coupler is mounted **BEFORE** leads are attached.

Now at last you can get 2-Set TV or FM Couplers engineered for highest efficiency and easier, neater installations. They're designed for mounting against a wall or on a mast before attaching leads, eliminating guesswork and messy connections. Couple two TV or two FM sets, or one of each . . . enjoy greater signal strength on both!



COUPLERS ARE PACKAGED IN COLORFUL, PROTECTIVE BUBBLE PACK . . . DISPLAYED ON THIS SELF-SELLING WIRE DISPLAY.



STANDARD model will couple any two sets to one antenna. Perfect match without interference. For most receiving areas.

No. 8917

List \$2.50

LOW LOSS model is similar to Standard, except it is designed and engineered specifically for fringe areas.

No. 8919

List \$3.50

GENERAL CEMENT MFG. CO.

division of Textron Inc.

Western Plant: Los Angeles 18, California

Main Plant: ROCKFORD, ILLINOIS, U.S.A.



FREE new G-C Catalog and other literature. Send postcard today!

(Continued from page 23)

RCA's stereo cartridge tape recorder will be advertised @ \$299.95.

ASTATIC announces a 59" x 33" x 28" glass covered showcase for microphones.

VIDAIRE introduces SE-8 & SE-16 stereo speaker equalizers with L-pads.

BOZAK introduces the Spinet speaker system in 2-way and 3-way versions. Enclosure measures 14-1/2" x 23-1/8" x 11-1/2".

PORTABLE ORGAN retail sales of \$30,000,000 covering 200,000 units under \$250 is reported for the past 10 months.

IHFM CALIFORNIA show arrangements have been completed: San Francisco, Brooks Hall, Jan. 27-31; Los Angeles, Shrine Exposition Hall, Feb. 10-14.

DYNAKIT introduces the Mark IV 40-watt amplifier using matched EL-34's driven by a 7199. Distortion rating is 1%.

ROBINS introduces record care kits ESK-1 @ \$2; ESK-2 @ \$3; ESK-3 @ \$5. Also, Gibson Girl Tape Kare Kit TK-4H @ \$3.50, and announces line of Kink/Less patch cords. Firm appoints reps: Ted Sharaf, Ft. Lauderdale; Hilker Co., Winston-Salem; W. R. Retzloff, San Antonio.

RIGO conducted hi-fi show schedule is: Sept. 11-13, Milwaukee; Sept. 25-27, Rochester; Oct. 30-Nov. 1, Buffalo; Nov. 6-8, Seattle; Nov. 13-15, Portland; Nov. 20-22, Phila. Rigo will manage ERA Detroit show, Oct. 16-18. Survey of show attendees indicated planned expenditures for phono or components are: \$100-26; \$200-102; \$300-164; \$400-216; \$500-165; over \$500-272; no answer-605. Also, 849 preferred a changer, 700 a turntable, 97 no answer.

Check TUBES, VIBRATORS THE SENCORE WAY

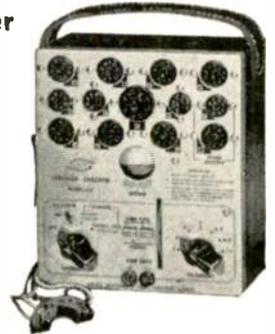


America's Most Popular Tube Tester more than 25,000 now in use

SENCORE LC3 LEAKAGE CHECKER

Whips those "tough dog" tube troubles . . .

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



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

NEW . . . replaceable Roll Chart prevents obsolescence.

Check Filaments of All Receiving Tubes and Picture Tubes



FC4 FILAMENT CHECKER

For fast, easy checking of all tube filaments, without pulling chassis. Neon light goes out if tube filament is good. Also acts as continuity and voltage tester. Neon lamp glows when 115 v. AC is applied by cheater cord, providing a check on power to TV set. Size, 3 1/2 x 4 x 1". With leads. DEALER NET..... **2⁹⁵**

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



VB2 "VIBRA-DAPTOR"

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

See your Parts Distributor NOW!



SENCORE

ADDISON 2, ILLINOIS

ATLAS announces the TW-9 bidirectional enclosure for two 8" speakers.

SHURE is offering a \$13,-995 Rolls-Royce in a 25-word contest: "I like Shure high-fidelity stereo cartridges because . . ." Entrants need not make any purchase, but if they do buy a Shure cartridge, a trip for 2 to England is added to the prize. Contest ends August 31.

OLSEN RADIO introduces CA-121 remote speaker & control @ \$5.19.

GRANCO announces a \$19.95 FM tuner which may be attached to TV sets, phonos, recorders, etc. It's 5 in. sq. by 3". Also, an FM clock radio is priced @ \$39.95; AM/FM clock @ \$49.95. Other stereo consoles are \$195 to \$795.

(Continued on page 27)

WIN everything in this picture

JUST BY ESTIMATING WHAT IT'S WORTH!



*It's still
not too late
to enter the
fabulous
Westinghouse*

GIANT JACKPOT CONTEST

You can win absolutely everything shown in this picture, simply by estimating its total retail value. The closest estimate will win it all! Enter now! Enter often! Still 2 more Giant Jackpot pictures to go!

Never before a contest so easy to enter...so easy to win! Don't miss this opportunity to win a whole truckload of valuable prizes! Final contest closes in four weeks. You can enter the two remaining contests as often as you like... win from hundreds of other prizes if you miss the top award!

Just 3 easy steps to enter...

1. Ask your Westinghouse distributor for a supply of official entry forms... several for each contest you want to enter.
2. Estimate the total dollars-and-cents retail value (exclusive of local sales and Federal excise taxes) of all the items shown and described in the picture for the contest you are entering. You'll receive an information leaflet with your entry blanks which shows photographs of all four Giant Jackpots.
3. Write your estimate on the Entry Form and mail along with the end panel from a Westinghouse 5-pak tray which reads "Westinghouse Electronic Tubes" or a reasonable facsimile to: "Jackpot," Westinghouse Electric Corp., Box 367, New York 46, New York.

That's all there is to it... Just look what you can still win!

2 first prizes: "Winner Take All"— everything shown in a Giant Jackpot picture.

2 second prizes: Your choice of Westinghouse Refrigerator, Freezer, Laundromat, Dryer, Two Different Ranges, Room Air Conditioner, Stereo-Fidelity.

2 third prizes: Your choice of Westinghouse Refrigerator, Freezer, Dryer, Range, Air Conditioner.

24 fourth prizes: Your choice of two Westinghouse Immerse-A-Matic appliances with a control unit.

50 fifth prizes: Your choice of Westinghouse Spoutless Coffee Maker or Portable Mixer.

120 runner-up prizes: Westinghouse Dog-O-Matic Hot Dog Cooker.

THIRD CONTEST STARTS AUGUST 31, 1959! GET ENTRY BLANKS AND OFFICIAL RULES FROM YOUR WESTINGHOUSE DISTRIBUTOR!

YOU CAN BE SURE...IF IT'S **Westinghouse**
Electronic Tube Division Elmira, N.Y.

If your distributor does not handle Westinghouse tubes send his name and address to Westinghouse, Box 284, Elmira, New York. Don't miss this big opportunity!

(Continued from page 25)

FANON names reps: Charles Segal, Boston; Marvin Kirkby, Minneapolis.

WEBCOR's new phono line offers a third stereo channel for bass notes of 150 cps and below.

IHFM has acted to head off separate classified phone directory listings under "stereo," recommending that it be cross-referenced with "high fidelity."

NESHAMINY announces the Z-400 speaker system @ \$134.50. It includes the 11" Model 350 woofer and electrostatic tweeter in 15" x 26" x 13-1/2" enclosure.

BOGEN releases specs on its metered MXM mixer-preamp priced @ \$237.50. Response is 20-20,000 cps \pm 2 db; hum -60 db; output 18 dbm @ less than 1% distortion; low impedance input sensitivity 0.4 mv.

SONIC INDUSTRIES introduces line of 3 stereo consoles from \$129.95 to \$269.95, 5 portable phonos \$39.95 to \$119.95, and 7 components which include a dual 5-watter @ \$34.95, dual 20-watter with preamp @ \$99.95, and \$99.95 tuner.

ORR INDUSTRIES has merged with 25% owner AMPEX CORP. Orr stockholders will receive one share of Ampex for 2.2 shares of Orr. Ampex has set aside 209,000 shares for this transaction, which will bring total shares outstanding to 2,418,304.

JAPANESE MANUFACTURERS are focusing more attention on the U.S. hi-fi market. Remember, these companies shipped over 2,500,000 radios to this country last year. Transistorized tape recorders and phonos will be the goal of the next big push. In 1958, Japan exported some 100,000 amplifiers to the U.S., most of them of the inexpensive variety for radios. More high priced units may be in the offing.



Pinpoint in Seconds...

HORIZONTAL & VERTICAL SWEEP TROUBLES

NEW
SENCORE
Time Saver

The missing link in TV service . . .

SENCORE SS105 SWEEP CIRCUIT TROUBLE SHOOTER

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

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

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

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

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

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

Size, 7x6x3 1/2". Wt. 4 lbs.
For 110-120 volts, 60 cycle AC.

DEALER NET **39⁵⁰**



HORIZ. OSC.	VERT. OSC.
HORIZ. O.P. STAGE	VERT. O.P. STAGE
HORIZ. FLYBACK XFORMER	VERT. O.P. XFORMER
HORIZ. DEFLEC. YOKE	VERT. DEFLEC. YOKE

See Your Parts Distributor NOW!

SENCORE

ADDISON 2, ILLINOIS

UNITED AUDIO names Stang Sales at N.Y.C. rep for Dual changers.

AMPLIFIER CORP. of AMERICA has put into production the TransFlyweight, an 8 lb. professional, transistorized completely battery-operated tape recorder which exceeds NARTB standards for frequency response, flutter, wow and dynamic range. Motor batteries last 40 hours; amplifier batteries 175 hours.

SARGENT-RAYMENT announces AM/FM stereo tuner SR-1000 @ \$184.50.

DEPARTMENT STORES racked up their largest percentage sales gains in 1958 in radio-phono departments, reports the National Retail Merchants Association. Stores grossing \$5-\$10 million were up 8% over 1957; \$10-\$20 million up 15% in radio-phonos; \$20-\$50 million up 18%; over \$50 million up 20%.

Mr. Service Dealer...

YOUR PHILCO DISTRIBUTOR IS HEADQUARTERS FOR A COMPLETE SELECTION OF GENUINE PARTS

Bendix

Automatic Electric Washers • Automatic Electric Dryers • Duomatic Washer-Dryer Combinations • Automatic Gas Dryers • Gas Duomatic Washer-Dryer Combinations.

CROSLEY

Radio • Television • Refrigerators • Ranges • Freezers • Air Conditioners • Automatic Dishwashers.

PHILCO-Bendix

Automatic Electric Washers • Automatic Electric Dryers • Duomatic Washer-Dryer Combinations • Automatic Gas Dryers • Gas Duomatic Washer-Dryer Combinations.

PHILCO

Radio • High Fidelity • Stereophonic High Fidelity • Television • Refrigerators • Electric Ranges • Freezers • Air Conditioners • Automatic Electric Washers • Automatic Electric Dryers • Duomatic Washer-Dryer Combinations • Automatic Gas Dryers • Gas Duomatic Washer-Dryer Combinations.

Don't Settle for Less than Genuine Replacement Parts



COMPLETE PARTS CATALOGS—All models of all products listed above are completely covered in separate Philco catalogs on Electronics, Appliances and Home Laundry. See your Philco Distributor today for this valuable information.

PHILCO[®]
Accessory Division

WORLD WIDE DISTRIBUTION

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

PHILCO . . . Famous for Quality the World Over

ELECTRONIC TECHNICIAN

Now Including
SERVICE
Magazine

Legal Classification of Picture Tubes

A move is underway by the office of the Attorney General of the State of New York to regulate picture tube nomenclature. Drafting such legislation is important not only to electronic technicians in that state, but to service people throughout the country. Legislation adopted in New York State often serves as a precedent and model for many other states.

What the Attorney General is attempting to do is to submit a bill which will require accurate labelling of picture tubes. If a tube has received a "hot shot" but is using the same gun and screen, this proposed law would prevent the seller from calling it "re-conditioned."

A problem arises when we consider the picture tube rebuilder—and this includes small companies as well as the prime manufacturers—who use the old glass envelope with all other new parts and materials. Is the completely rebuilt tube "new" or "rebuilt"? Some rebuilders claim that the glass does not wear out, and for all practical purposes a fully rebuilt tube is new. On the other hand, other rebuilders, and the glass envelope manufacturers, of course, believe that a picture tube cannot be called new even if just the glass has been reused. It seems likely that the Attorney General will agree with this latter view.

Once the law defines the nomenclature of a picture tube—new, rebuilt, repaired, reconditioned, re-

processed, etc.—the next step is to require that the tube be so labelled and the consumer adequately informed. The question arises as to how much of the responsibility rests on the service technician to inform the consumer.

There have been cases where technicians have replaced a defective picture tube with a rebuilt, have let the consumer assume it was a brand new tube, and charged accordingly. On the other hand, the technician must rely upon what the distributor tells him is the condition of the tube. It appears probable that the law, if it should be passed at the next session of the legislature, will make the manufacturer, distributor and technician all responsible for divulging the correct information.

An element that has clouded the issue is the manner in which a tube may be reconditioned. Is a hot shot adequate? Should there be a different designation for tubes that have had new guns installed as compared with tubes with new guns and screens?

We believe that carefully worded legislation can do much to bring order out of the confusing and often misleading nomenclature applied to reconditioned picture tubes.

Until that day, when nomenclature is fixed by law, it behooves every technician to find out from his distributor what the exact condition is, to so notify the consumer and, for his own safety, to have a record of having done so.

Citizens Band For Service Dealers

This month's cover focuses attention on a most attractive opportunity for sales and service. Citizens Band Radio offers inexpensive two-way communication for businesses and private individuals. License requirements are so simple that anyone can operate the system.

As thousands of Citizens Band users buy their equipment—prices are generally in the \$100-\$200 range—a real market for maintenance is developing. In addition, a number of manufacturers are selling directly to dealers in quantities which allow 25-33% discount. One company selling through distributors

provides for a split in the 40% discount; that is, 20% for the distributor and 20% for the dealer.

In order to service Citizens Band equipment, it is necessary for the technician to hold a second Class Radio-Telephone license from the FCC. There are some excellent correspondence school training programs and books on this subject which will help prepare you for the tests.

Don't fail to look into this potentially profitable opportunity. The editors will be pleased to send you the names and addresses of some leading manufacturers making Citizens Band equipment.

Tuning In the

HEART IN HIS HAND. Herman Nisonoff, a patient with a serious heart condition, is able to walk around, thanks to a two-pound battery powered electronic device which he carries in his hand. A wire runs from the "pace-maker" into the jugular vein in his neck, and down into the heart chamber. Another wire is embedded in the chest skin over the heart. When the natural physiological processes that keep his heart beating fail, as they have frequently done in the past year, the electronic pulses take over, triggering the heart beat action with a 2-3 volt signal.

LONGER LIFE is claimed for the new 100 ma heater tubes developed by Sylvania in cooperation with Arvin Industries. In the past, tubes have used 150 ma heaters. The five types of tubes available—all directly interchangeable with conventional 150 ma types—are those traditionally found in five-tube superhet radios: 18FW6 for i-f, 18FX6 for converter, 18FY6 for detector, 36AM3 for rectifier and 32ET5 beam power pentode.

ATOMIC CLOCK



Dr. Harold Lyons, Hughes Aircraft inventor of the atomic clock, examines the tubular heart of the unit which will house a stream of ammonia molecules that generates a stable current. The clock which "ticks" 24 billion times per second, and is accurate to within 3 seconds in 3,171 years, will be orbited into space. The clock's ticks will be converted to radio pulses which will be transmitted to earth. Purposes of this development are to check Einstein's special law of relativity, measure the geometric shape of the earth and check light and radio wave velocity.



"You're the greatest!"

TV PRODUCTION for the first five months of 1959 totalled 2,211,712 sets against 1,790,840 for the same time last year, reports the Electronic Industries Association. Radio output totalled 5,677,421, including 2,262,390 auto sets, compared with the 3,876,737, including 1,229,086 auto sets, made during January-May 1958. FM radio production in May 1959 totalled 48,841 units.

COLOR TV—How's It Doing? The answer depends on which expert happens to be talking. According to Herbert Riegelman, General Manager of GE's Television Receiver Department, "Color TV's potential is of such questionable consequences and of such great risk to our distributor and dealer organization, we do not feel justified in jeopardizing our monochrome position simply to be able to say that we are in the color TV business. . . . color TV is not off the ground." On the other hand, Jack S. Beldon, Vice Pres. and General Manager, RCA Victor Home Instruments, states: "Every indication points to a thriving market in color television as well as black and white."

JAPANESE ELECTRONICS are causing quite a stir among American manufacturers. Though most set producers have not announced any cooperative plans with Japanese companies, there are at least two eastern companies that are having their transistor radios made in Japan, and sold in the U.S. under their own label. Another company in the mid-west manufactures its own radios using some Japanese parts. Component producers in the replacement market, as well as a number of hi-fi manufacturers, are showing concern that the Japanese may make inroads in the distributor field.

Picture



SERVICE CONTRACT income may be prorated over the period of the contract, according to a recent U.S. Court of Appeals decision which reversed a ruling of the Internal Revenue Service. In a case involving Bressner Radio Inc. vs. the Commissioner of Internal Revenue, the court held that the Commissioner was not correct in stating that the TV contract income was received under a "claim of right" with no restriction on its disposition. It said: "Until all the events have occurred, both as to cost and time of performance for which the petitioner has been paid, the receipts do not ripen into taxable income." Therefore, the income is prorated over 12 months instead of being declarable upon receipt. This case involved only about \$55,000 but the legal decision could affect federal tax collections of about a billion dollars in the first year. The same principle applies to dance studios, health clubs and other services.

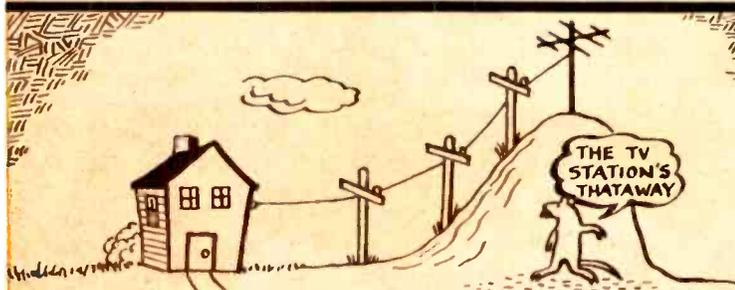
TV LICENSE bill has been introduced by Rep. Foley (Democrat-Maryland) to regulate service technicians in the District of Columbia. Annual license fees presented in HR-7714 are as follows: contractors, \$25; technicians, \$15; apprentices, \$5.

UHF TV TRANSLATORS, 200 of them, are operating in the U.S., serving more than one million people who receive no direct service from TV stations. According to Ben Adler, President of Adler Electronics, a cost analysis indicated that a 1 watt VHF translator cost \$2,420 and that the cost of a VHF 10 watt translator was almost exactly equal to a UHF unit of the same power.

CALENDAR OF COMING EVENTS

- Aug. 13-16: Appliance Profession Ass'n second Annual Convention, Mark Thomas Inn, Monterey, Calif.
- Aug. 18-21: Western Electronic Show & Convention (WESCON), Cow Palace, San Francisco, Calif.
- Aug. 21-24: NATESA Convention, Congress Hotel, Chicago, Ill.
- Sept. 21-25: Instrument Society of America, International Conference and Exhibit, International Amphitheatre, Chicago, Ill.
- Sept. 30-Oct. 1: Industrial Electronics Symposium, Mellon Institute, Pittsburgh, Pa.
- Oct. 2-4: First Annual Stereo & Hi-Fi Show in Spokane, Wash. Davenport Hotel.
- Oct. 5-7: Fifth National Communications Symposium, Hotel Utica, Utica, N. Y.
- Oct. 5-10: 1959 New York High Fidelity Music Show, New York Trade Show Bldg., New York, N. Y.
- Oct. 7-9: IRE Canadian Convention & Exposition, Exhibition Park, Toronto, Canada.
- Oct. 12-15: National Electronics Conference, Sherman Hotel, Chicago, Ill.
- Oct. 15-18: Texas Electronics Assn., Houston Chapter, Rice Hotel, Houston, Texas
- Oct. 26-28: East Coast Aero & Navigation Electronic Conference, Baltimore, Md.
- Oct. 28-29: Michigan Industrial Electronics Exposition, Detroit Artillery Armory, Oak Park, Mich.
- Oct. 29-31: 1959 Electron Devices Marketing, Shoreham Hotel, Washington, D. C.
- Nov. 3-5: MAECON (Mid-America Electronic Convention), Municipal Auditorium & Hotel Muehlebach, Kansas City, Mo.
- Nov. 4-6: National Automatic Control Conference, New Sheraton Hotel, Dallas, Texas
- Nov. 9-11: Radio Fall Meeting, IRE-EIA, Syracuse Hotel, Syracuse, N. Y.
- Nov. 9-11: Fourth IRE Instrumentation Conference and Exhibit, Atlanta Biltmore Hotel, Atlanta, Ga.

RANDOM NOISE



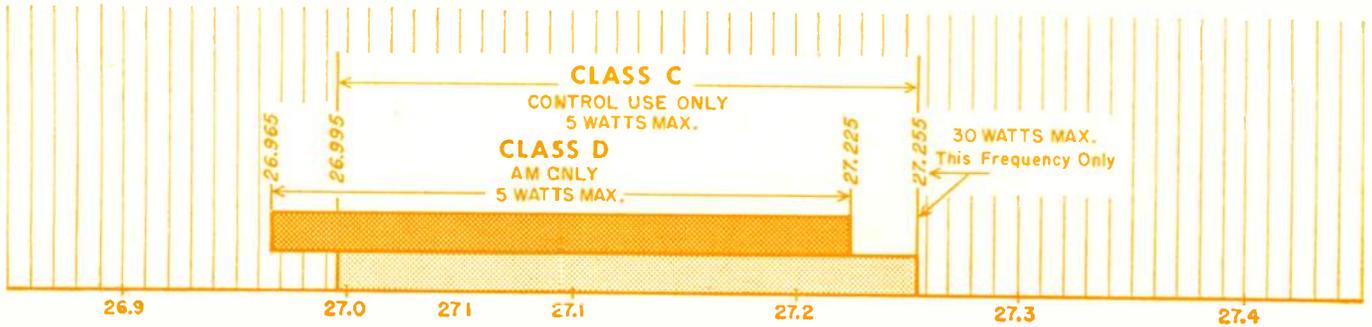
NATIONAL COMMUNITY TV ASSOC. REPORTS THAT THERE ARE MORE THAN 750 COMMUNITY ANTENNA (CATV) SYSTEM IN THE U.S. THEY SERVE 700,000 FAMILY SUBSCRIBERS IN SMALL COMMUNITIES IN 42 STATES, COVERING 2.5 MILLION VIEWERS. \$100 MILLION HAS BEEN INVESTED IN THESE SYSTEMS

BBC HAS DEvised A WAY TO TRANSMIT TV NEWS FILM ACROSS THE ATLANTIC OVER THE PHONE CABLE - HALF MINUTE OF FILM IS SENT IN 55 MINUTES - ALTERNATE FILM FRAMES ARE SCANNED TO PRODUCE 25 FIELD/SEC PICTURE

COMING SOON

THIS YEAR TABLE RADIO SALES ARE UP 29%, PORTABLES UP 15%, TV UP 6%, CLOCK RADIOS UP 24%. MOTOROLA REPORTS CAR RADIO SALES UP 40%

TOM HIGGINS JR.



Citizens Band Q & A

Here's What You Can Tell Your Customers

When They Ask About The New 2-Way Radio Service

MARTY BETTAN

• By authorizing a Citizens Band radio service, the Federal Communications Commission made two-way communications readily available to all. Doctors, tow truck operators, boat owners, delivery services and individual citizens with a wide variety of interests are buying transmitters and receivers at relatively moderate cost. This radio service opens many new sales and repair opportunities for electronic technicians and dealers.

A few years ago, the 465 mc band allocation was made for this purpose, but because of the peculiarities of this frequency, performance in many areas was not successful. Allocation changes were made which took away frequencies from the 10 mc wide UHF band, and set up the new 27 mc band. This lower frequency is becoming increasingly popular, and constitutes the focus of this roundup of frequently asked questions and their answers.

Question:

Who can get a Citizens Band license?

Answer:

Any United States citizen over 18 years of age. A minor under 18 years of age can operate a Citizens Band transmitter under the license of an adult providing that adult is in attendance.

Question:

How do you get a Citizens Band license?

Answer:

To obtain a Citizens Band license no test is required. The interested

*For complete details, see "Citizens Radio Service" in the Feb. 1959 issue of **Electronic Technician**.*

Copies of the new Part 19, FCC Citizens Radio Rules, effective Sept. 11, 1958, may be obtained for 10c from Supt. of Documents, Government Printing Office, Washington 25, D. C.

party writes the Federal Communications Commission, Washington 25, D.C., requests Form 505, and fills out all questions pertaining to Citizens Band Class D license.

Question:

What are the restrictions placed on Citizens Band operators?

Answer:

The restrictions placed on the Citizens Band operator are few. They are: No profane or obscene language. The use of the channel should be as brief as possible because many others are using this same channel. The F.C.C. refers to Citizens Band operation as "Wireless Party Line" and all the rules applying to party

line telephone apply to Citizens Band radio. Also, the commission restricts power to a maximum of 5 watts input.

Question:

What antenna shall I use, and how high may it be?

Answer:

The success or failure of the entire Citizens Band program will depend upon the proper answer to this question. The law regarding the height of the antenna is as follows. "The height of a Class D antenna may not be more than twenty feet at the highest point above ground, building, or other structure on which they are mounted. This height must not exceed twenty feet as measured from the surface on which the antenna support is mounted to the uppermost point of the antenna itself."

As to the selection of the antenna, hours could be spent in discussion. However, as a rule of thumb you can follow these suggestions: Any form of indoor antenna limits the range drastically. Where the customer only has use for limited range the indoor type of antenna will be more than sufficient. By limited range we mean one to two miles. For proper station-to-station or station-to-mobile operation, the fixed station should have a vertical ground plane type of antenna mounted as high as possible within the terms of the law. For point-to-point communications over distances of ten to twenty miles

(Continued on page 90)

Here's how the NEW



PROGRAM

Builds Television-Radio
Repair Profits for You!

The New



Program Means

More TV-RADIO repair business for you

90-Day TV-RADIO



Every customer gets a written repair bond from you! Here is the most dynamic goodwill builder in TV servicing history—and it's exclusively yours! As a Raytheon Bonded Dealer you will have working for you the salespower of an official 90-day repair bond. You give each customer his own document, distinctively embellished in gold, along with a handsome, matching cellophane-lined envelope. The document is so impressive he'll keep it among his most important papers. The bond provides space for your itemized bill listing all parts and services, along with the Bonded Dealer Code of Ethics, and an official gold seal of the bonding company.

Never before has there been a business-building plan of this kind—backed by the largest consumer advertising program in Raytheon history.

because your service includes this exclusive

Repair Bond

The RAYTHEON Bonded Dealer Program
is a selective deal for leading independent dealers

Here at last is the profitable way for leading independent service dealers to cash in on the prestige of the nationally respected *Raytheon Brand Name*. You get all the benefits and advantages of a nationwide service program, yet you're the boss!

Only *qualified*, local independent repairmen with adequate service facilities can participate in the exclusive, protected RAYTHEON BONDED DEALER PROGRAM! This gives you the competitive advantage of being *the man* for your prospects to call. It gives you the salespower of being local HEADQUARTERS for BONDED TV-RADIO SERVICE.

It's dynamic! The Raytheon Bonded Dealer

Program is the most complete profit plan in the industry. You get top-quality Raytheon products, technical service, sales aids, promotion materials, business-building local advertising materials, news of the latest service developments—and more. There's never been anything like it before! And, profits prove that it really pays to be a RAYTHEON BONDED SERVICE DEALER.

That's not all! Raytheon backs you with the most comprehensive advertising campaign you've ever seen. Dealers coast-to-coast are cashing in on Raytheon's dramatic advertising. It's a tremendous localized program that tells all in your town that you're the man to see for bonded TV-Radio service . . .

it features . . .



Your Name in TV



Now... FREE 90-day Repair Bond
from Your Raytheon **BONDED** TV Service Dealer

Now there's an important TV service! Only a Raytheon Technician gives you expert repair work, including parts, for 90 days. Bonded Technicians are selected for their abilities, and integrity.

LOOK FOR THIS SIGN OF DEPENDABLE SERVICE



TV REPAIR GUIDE
SAVE THIS LIST

- LOUISVILLE** HARBOR TV REPAIR 20 State St. LO 6-5483
JORDON'S RADIO-TV 123 Bellaire Place, SR 7-5627
ANDERSON TV RADIO 36 Woody Lane FE 6-8925
STANDARD TELEVISION 29 West St. LD 9-8263
CATLIN'S TV-RADIO 298 Ivy Place HI 7-9273
MODERN TELEVISION Center Shopping Cen. LO 6-2345
- LEXINGTON** MIKE'S TV-RADIO 28 East State St. LE 6-4856
TRIPLE T REPAIR 298 N. Center St. HI 8-7563
LEXINGTON TV SERVICE 29 State St. LE 6-2378
- DWENSBORO** BERT'S TELEVISION 28 Main St. DW 9-3278
HILL TV SERVICE 29 Hill St. TE 7-2378
- EVANSVILLE** BENNETT TELEVISION 7 Whitefish Road MA 9-4578
MCCURRY A.J. TV SERVICE 27 North Main St. KI 8-4637
NOBLE RADIO & TV 29-45 Saturn St. LD 9-6452
HARVEY RADIO REPAIR 74 East Chester Road KI 8-7564
GEORGE'S TELEVISION 2 N. Village Road GL 8-4657
W. E. TV REPAIR 2764 Center St. WE 8-5649
PUCKETT TELEVISION 43 South Ave. DE 4-8567
- NEW ALBANY** ART'S TELEVISION 78 North Main AL 8-5478
LYNCH TV SERVICE 35-67 Kelchum St. HE 9-5746

TV GUIDE
24,600,000
READERS



"Your set's all fixed, ma'am... and here's your Free 90-day Repair Bond"

You'll only hear these welcome words from a Raytheon Bonded TV Technician. He's the only service dealer who brings you the protection of a written bond. It guarantees all repair work, and all replaced parts, for 90 days—and it's backed by Raytheon, world-famous manufacturer devoted exclusively to electronics. Call any

Bonded Technician, and you'll get expert service, full facilities, fair prices, an itemized bill, factory-warranted Raytheon tubes, and a written 90-day Repair Bond! Look for the Raytheon Bonded Dealer emblem in store signs, ads, and the Yellow Pages. And save the listing on the next page! (Why miss any good program?)

LOOK FOR THIS SIGN OF DEPENDABLE SERVICE



RAYTHEON DISTRIBUTOR PRODUCTS DIVISION WESTWOOD, MASS.



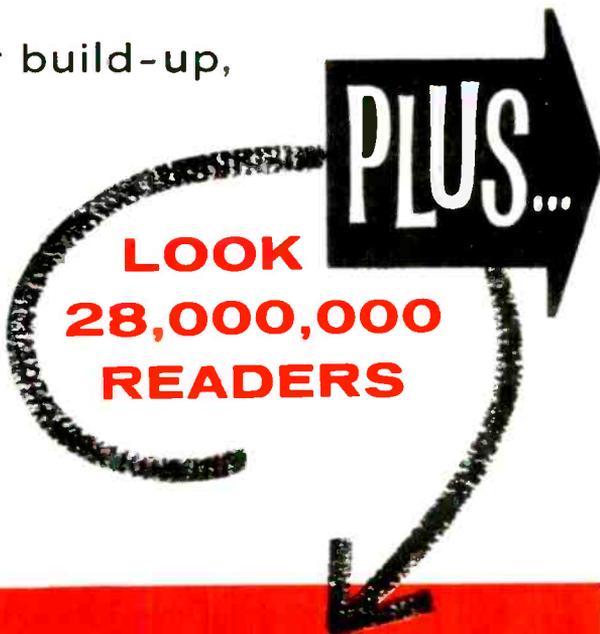
TV REPAIR GUIDE
SAVE THIS LIST

- LOUISVILLE** HARBOR TV REPAIR 20 State St. LO 6-5483
JORDON'S RADIO-TV 123 Bellaire Place, SR 7-5627
ANDERSON TV RADIO 36 Woody Lane FE 6-8925
STANDARD TELEVISION 29 West St. LD 9-8263
CATLIN'S TV-RADIO 298 Ivy Place HI 7-9273
MODERN TELEVISION Center Shopping Cen. LO 6-2345
- LEXINGTON** MIKE'S TV-RADIO 28 East State St. LE 6-4856
TRIPLE T REPAIR 298 N. Center St. HI 8-7563
LEXINGTON TV SERVICE 29 State St. LE 6-2378
- DWENSBORO** BERT'S TELEVISION 28 Main St. DW 9-3278
HILL TV SERVICE 29 Hill St. TE 7-2378
- EVANSVILLE** BENNETT TELEVISION 7 Whitefish Road MA 9-4578
MCCURRY A.J. TV SERVICE 27 North Main St. KI 8-4637
NOBLE RADIO & TV 29-45 Saturn St. LD 9-6452
HARVEY RADIO REPAIR 74 East Chester Road KI 8-7564
GEORGE'S TELEVISION 2 N. Village Road GL 8-4657
W. E. TV REPAIR 2764 Center St. WE 8-5649
PUCKETT TELEVISION 43 South Ave. DE 4-8567
- NEW ALBANY** ART'S TELEVISION 78 North Main AL 8-5478
LYNCH TV SERVICE 35-67 Kelchum St. HE 9-5746

Guide and Look!

It's a dynamic year-round consumer build-up, with local impact!

Every month of the year Raytheon runs powerful ads selling Bonded TV-Radio Service in all 51 regional editions of TV Guide. What's more, there's a full two-page spread in LOOK Magazine! And all these ads feature the names and addresses of Raytheon Bonded Dealers! Ask your Raytheon distributor how you can get your name listed. There's never been an ad campaign like this, and it's for Raytheon Bonded Service Dealers—only!



LOOK
28,000,000
READERS



Now...Free 90-day Repair Bond
from your Raytheon BONDDED TV Service Dealer

Now there's an important difference in television service! The next time your set gets in a jam, call a Raytheon Bonded TV Technician. You'll not only get expert service—you'll get a free 90-day written bond, backed by Raytheon, world-famous manufacturer devoted exclusively to electronics. It's the TV service idea that set owners have wanted for years. This written bond guarantees all repair work, including

all replaced parts, for 90 days. Every Raytheon Bonded Technician has been selected on his record. He's proved himself in skill, experience, and integrity. He has complete service facilities. He charges fair prices, and always gives an itemized bill that lists all repairs and replacement parts. Best of all, he uses first quality, factory-warranted Raytheon electronic tubes.

Look for the emblem of your local Raytheon Bonded TV Technician, in store signs, advertisements, and the Yellow Pages. Idea: Cut out the listing on the right, and place in your phone book! It's your key to fast, dependable, bonded TV repairs and carefree viewing.

RAYTHEON DISTRIBUTOR PRODUCTS DIVISION - WESTWOOD, MASS.

These TV Service Technicians Guarantee All Work at Fair Prices

<p>LOUISVILLE HARBOR TV REPAIR 20 East St. LO 5-5483 JOHNSON'S RADIO TV 121 Barber Place SE 7-5677 ANDERSON TV RADIO 35 Moody Lane TE 8-8975 STANDARD TELEVISION 29 West St. LO 5-8222 CALLIN'S TV RADIO 1000 W. Main St. LO 5-2376 Center Shopping Ctr. LO 5-2345</p> <p>LEICESTER WILEY TV RADIO 1416 Main St. LE 8-6856 TRIPLE T REPAIR 208 N. Center St. HI 8-7343 LEIGHTON TV SERVICE 128 Main St. LE 8-2376</p> <p>OWENSBORO HOLT'S TELEVISION 221 West St. OW 8-3276 HILL TV SERVICE 25 West St. LE 7-2376</p> <p>EVANSVILLE LINDSEY TELEVISION 1000 North Main St. 8-8578 MCCURRY'S TV SERVICE 27 North Main St. HI 8-8837 MOBILE RADIO & TV 29 S. Spring St. LO 8-6543 HARVEY RADIO REPAIR 74 East Center Road HI 8-7344 GEORGE'S TELEVISION 100 N. Center St. HI 8-6857 M. R. TV REPAIR 174 Center St. HI 8-6645 PICKETT TELEVISION 43 South Ave. HI 8-6547</p> <p>NEW ALBANY HARRIS TELEVISION 28 North Main St. 8-8478 VICTORY TV SERVICE 15-87 Alcorn St. HI 8-8146</p> <p>ASHLAND HARBOR TV REPAIR 20 West St. LO 5-5483 JOHNSON'S RADIO TV 121 Barber Place SE 7-5677 ANDERSON TV RADIO 35 Moody Lane TE 8-8975 STANDARD TELEVISION 29 West St. LO 5-8222 CALLIN'S TV RADIO 1000 W. Main St. LO 5-2376 Center Shopping Ctr. LO 5-2345</p> <p>GLASGOW WILEY'S TV RADIO 28 East Main St. LE 8-6856 TRIPLE T REPAIR 208 N. Center St. HI 8-7343 LEIGHTON TV SERVICE 128 Main St. LE 8-2376</p> <p>COVINGTON HOLT'S TELEVISION 221 West St. OW 8-3276 HILL TV SERVICE 25 West St. LE 7-2376</p>	<p>DANVILLE BERNHEIM TELEVISION 9 Sherman Road NA 8-6578 MCCURRY'S TV SERVICE 27 North Main St. HI 8-8837 MOBILE RADIO & TV 29 S. Spring St. LO 8-6543 HARVEY RADIO REPAIR 74 East Center Road HI 8-7344 GEORGE'S TELEVISION 100 N. Center St. HI 8-6857 M. R. TV REPAIR 174 Center St. HI 8-6645 PICKETT TELEVISION 43 South Ave. HI 8-6547</p> <p>FRANKFORT ARTE'S TELEVISION 28 North Main St. 8-8478 LINDSEY TV SERVICE 1000 North Main St. HI 8-8578</p> <p>MIDDLESBORO HARBOR TV REPAIR 20 West St. LO 5-5483 JOHNSON'S RADIO TV 121 Barber Place SE 7-5677 ANDERSON TV RADIO 35 Moody Lane TE 8-8975 STANDARD TELEVISION 29 West St. LO 5-8222 CALLIN'S TV RADIO 1000 W. Main St. LO 5-2376 Center Shopping Ctr. LO 5-2345</p> <p>MADISONVILLE HARRIS TELEVISION 28 North Main St. 8-8478 VICTORY TV SERVICE 15-87 Alcorn St. HI 8-8146 LINDSEY TV SERVICE 1000 North Main St. HI 8-8578</p> <p>RICHMOND HARRIS TELEVISION 28 North Main St. 8-8478 VICTORY TV SERVICE 15-87 Alcorn St. HI 8-8146</p> <p>MAYSVILLE BERNHEIM TELEVISION 9 Sherman Road NA 8-6578 MCCURRY'S TV SERVICE 27 North Main St. HI 8-8837 MOBILE RADIO & TV 29 S. Spring St. LO 8-6543 HARVEY RADIO REPAIR 74 East Center Road HI 8-7344 GEORGE'S TELEVISION 100 N. Center St. HI 8-6857 M. R. TV REPAIR 174 Center St. HI 8-6645 PICKETT TELEVISION 43 South Ave. HI 8-6547</p> <p>WINCHESTER HARRIS TELEVISION 28 North Main St. 8-8478 VICTORY TV SERVICE 15-87 Alcorn St. HI 8-8146</p>
--	--

RADIO Stars of TELEVISION MOVIES

*remind customers in your town to look for your
name in TV GUIDE and LOOK!*

They're on famous **NBC**



Starring such personalities as

- ★ FIBBER McGEE & MOLLY ★ ED "Archie" GARDNER
- ★ ERNIE KOVACS ★ BOB & RAY
- ★ AND MANY OTHER STARS

*... ALL working for you, round-the-clock,
throughout the weekend.*





MONITOR

weekend Radio Spectacular

All weekend long they sell
the RAYTHEON Bonded Service Program for you!

It's a weekend-long show lasting from 8 p.m. Friday through 12 midnight Sunday. About once every 15 minutes throughout the weekend on Monitor, more than 10,000,000 radio listeners are told about the Raytheon Bonded TV-Radio Repair Service, the 90-day Repair Bond, and—You! Never before has such a concentrated barrage of sales messages been presented to the public. Listeners are told to look for the bonded seal in your window; to look for your name and address in TV Guide and LOOK.

Think of it! Stars like: Ed "Archie" Gardner, Bob & Ray, Fibber McGee & Molly, Ernie Kovacs, and many others, working for you on your local NBC radio station—and Raytheon foots the bill!

Here's how you can cash in.....▶

Tune up for Profits

with the
NEW



Let every TV and Radio set owner know that you're Headquarters for this sensational program!

YOUR PLACE
OF BUSINESS...



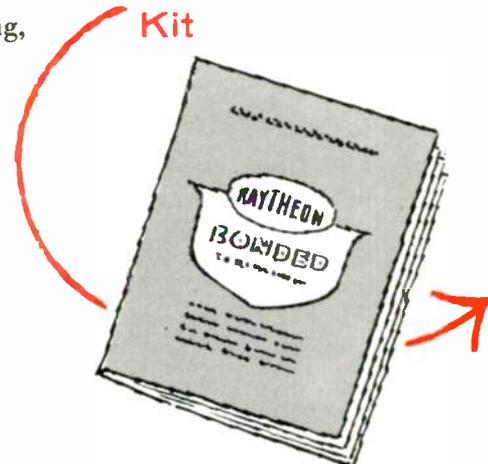
Here's all the advertising and promotional material you need for your own...

Local, Hi-Impact Merchandising Program

You get everything you need to tell 'em and sell 'em! Yours *free* when you sign up as a RAYTHEON BONDED SERVICE DEALER... identification materials, publicity, newspaper mat ads, radio and TV spot commercial scripts, window displays, the impressive, official Raytheon Bonded Certificate—and more.

All these sales-tested merchandising materials come to you in the Bonded Dealer's Merchandising Kit. These colorful advertising and promotion pieces are tailored to your needs. Each is an eye-catching, sales-building device to build your business and profits. Only Raytheon gives you this complete individualized package.

**FREE
Merchandising
Kit**

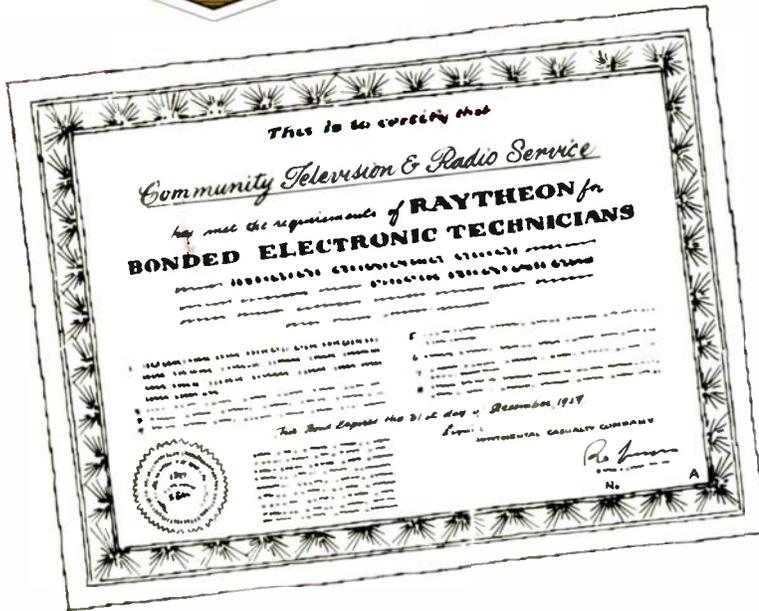


Free Merchandising

gives you everything you



Yours free, when you sign up as a Raytheon Bonded Dealer. It's a complete advertising and promotion program tailored to your needs!



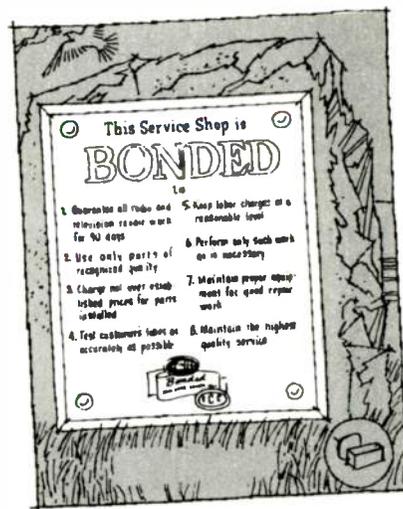
Bonded Dealer Certificate (SPQ 7202)

Certifies that you are a qualified Raytheon Bonded Service Dealer. Prominently displays your name. It's a handsome two-color, 11" x 14" certificate . . . comes in a glassine case ready for framing. Lets all who come into your place of business know that they can count on you for reliable repair service. Even has the Code of Ethics which builds customer's confidence.



Identification Card (SPQ 7225)

Official pocket-sized card identifies you as a Bonded Service Dealer. Wherever you call, customers will see by your card that they can depend on you as a qualified TV-radio serviceman whose work is backed by the exclusive Raytheon Bond. The handy pocket pass goes wherever you go—ready for instant use.



Creed Display for Counter or Window (SPQ 7201)

This eye-catching display will let all who pass by know that you subscribe to the Raytheon Code of Ethics. They'll know that you use top-quality Raytheon tubes and replacement parts . . . charge fair prices . . . guarantee all TV-radio repair work for full

90 days. It's a brilliant full-color display, varnished to retain its beauty. Built-in easel for easy setup anywhere.

Kit . . .

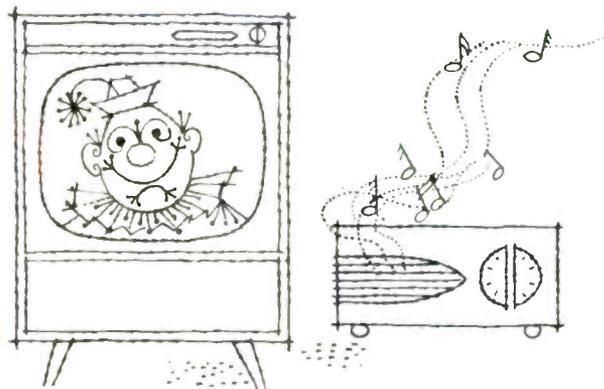
need to be HQ for this profitable program!



FRANK'S RADIO SERVICE
APPOINTED BONDED
ELECTRONIC TECHNICIANS

Publicity Release (SPQ 7232)

Announces your appointment as a Raytheon Bonded Service Dealer. It's important news for your community. All you do is send this announcement to your local paper with your name and address. Professionally written, it gives all the details that interest prospective customers . . . tells them that you are a selected, qualified service dealer . . . tells them about your 90-day guarantee, backed by bond.



Radio-TV Spot Commercial Scripts (SPQ 7233, 7238)

Just right to reach customers at home, in car or out-of-doors. You have a choice of 15-second or one-minute spots for both TV and radio. These highly listenable spots tell your prospects that you're Headquarters for the Raytheon Bonded Repair Service. Best of all, with them you can cover prospects round-the-clock.



Newspaper Ad Mats

(SPQ 7266, SPQ 7267, SPQ 7268,
DLQ 7000)

They're sure to be read! They tell the facts of the Raytheon Bonded Program . . . tell everyone that you're the man to see for bonded TV-Radio repair service. And, only you can cash in on these dramatic advertisements. You get them "all set" ready to run.

YOU ALSO GET FREE

1. **One hundred 90-day Customer Bonds.**
(Additional quantities available through your Raytheon distributor.)
2. **Business Builder Book (SPQ 7044).**
3. **Samples of Direct Mail Postcards.**
4. **Samples of Business Aids**
Letterheads • Billheads
Envelopes • Calling Cards
Job Repair Tickets
Pressure-sensitive Repair Stickers
5. **And a selection of lithographed displays with window streamers.**

PLUS...



Window Decal (DLQ 7001)

Easy to apply, this striking red and gold decal identifies your place of business to all who pass by. Lets them all know that you have been selected as the Raytheon Bonded TV-Radio Repair Service . . . invites customers to come in and see you day and night.

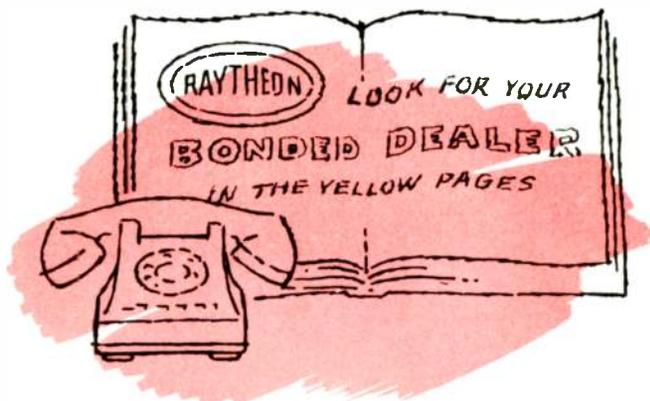


Your Distributor backs you with

Your local Raytheon Tube Distributor is ready to pitch in with prompt service and merchandising

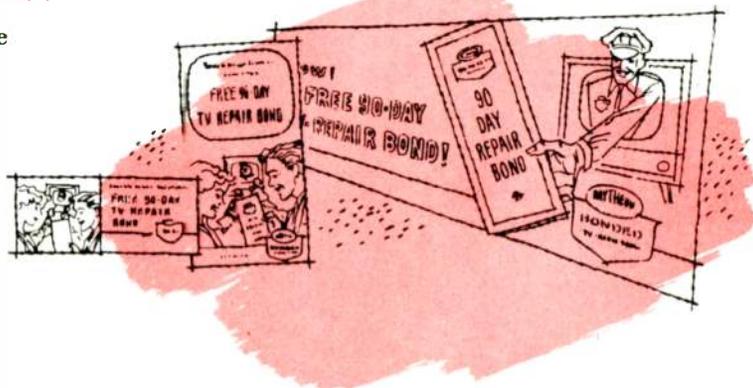
Your Name in Your Local Classified Telephone Book

Your name and address can be listed under the special Raytheon Bonded TV-Radio section in the Yellow Pages of the telephone book in your community. You get additional value from this deal because the telephone company carries on its own program of popularizing the Yellow Pages. Just about everyone checks the Yellow Pages for service when in need. Here's your opportunity to cash in on their reading habits.



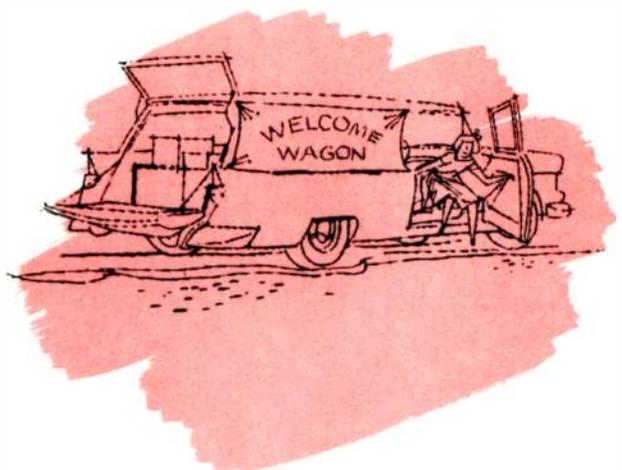
Your Name on Outdoor Spectaculars

Colorful, eye-catching outdoor billboards in prime shopping areas . . . car and bus cards—all part of the Raytheon Bonded Service Program. And, you can have your name displayed prominently. Call your Raytheon Distributor for details on how you can have your name on these sure-fire sales builders.



"Welcome Wagon" Working for You

Gives the "Glad Hand" to new residents in town—as they arrive. Gives you exclusive representation as the Raytheon Bonded Service Dealer. Each new resident gets a gift in your name—you get a head start towards their service business. You also get names and addresses of new homeowners for follow-up action. "Welcome Wagon" is the nationally recognized "ice-breaker" for new business.



AIDS like these!

cooperation. See him soon for profitable deals exclusive for Bonded Dealers only!

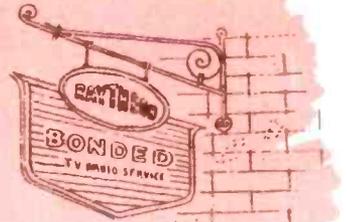
Eye-Catching Window Valance

Smartly designed in red and gold, this colorful valance will really dress up your place of business . . . will give your storefront a whole new look. It sparks up your windows, makes your entire place of business more attractive.



Outdoor Sign

Finished in colorful metal—and featuring the Raytheon Bonded Service Dealer seal. Eye-catching sign identifies your store as headquarters for the Raytheon Bonded Repair Service to all who walk or drive by. Ready for fast, easy installation on side of building, on store front or in parking area.



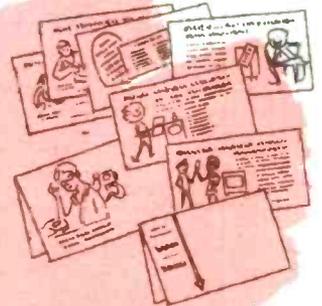
Truck Identification

Large, impressive Bonded Dealer decal, easy to apply to side of car or service truck. Weather-resistant, it will really dress up your vehicles . . . it's a traveling advertisement for your services! What's more, it identifies you as the Raytheon Bonded Service Dealer.



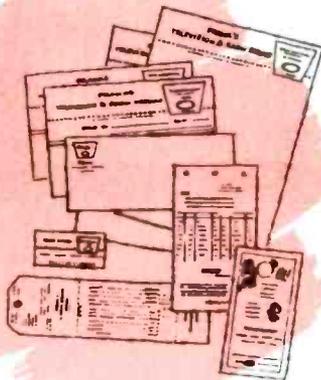
Direct Mail

One of the most economical methods for developing service business. You get a complete campaign that sells the bonded dealer guarantee . . . features your name and address. The informative, colorful tested sales builders—available with or without your imprint.



Business & Shop Aids

A complete series of professionally designed printed materials . . . business cards . . . letterheads . . . billheads . . . job repair tags . . . reminder stickers for repeat business. Everything you need to get full benefits from the Raytheon Bonded Dealer Program. CHECK FREE SAMPLES THAT YOU GET WITH YOUR ORIGINAL KIT.



And, Coming Soon:

- RAYTHEON BONDED DEALER PUBLICATION
- BONDED DEALER AWARD PROGRAM
- TECHNICAL ADVISORY SERVICE
- INDUSTRIAL SERVICE REFERRAL PLAN

A complete program ready to go to work for you ▶

You can put this powerful bond to work building customer confidence on every call



RAYTHEON BONDED
TV-RADIO Service Dealer we agree to:



(DEALER MUST FURNISH ITEMIZED INVOICE WITH THIS BOND.)

The Service work which we have completed as specified on the above invoice is guaranteed against defective workmanship and materials. Charges have been paid in full. This guarantee covers parts and labor installed at this time as itemized on the invoice. It does not cover damages arising from accidents, attempted repairs, neglect or abuse by the owner.

YOUR ITEMIZED INVOICE GOES HERE

This Bond covers work performed on _____ (DATE)

as listed in the attached invoice No. _____
This Bond expires on date from date of invoice.

Dealer Signature _____

THIS BOND IS SUBJECT TO THE FOLLOWING CONDITIONS: Liability of Principal and of Surety with respect to the above dealer is Five Hundred and no/100ths (\$500.00) Dollars in the aggregate to all claimants in any one year and Ten Hundred and Fifty and no/100ths (\$250.00) Dollars for any one claim involving any single repair job.



Signed
CONTINENTAL CASUALTY COMPANY



Provided by

Illustration is one-half actual size

Remember . . . your customers will see and learn about this bond throughout the year in

- TV GUIDE
- NEWSPAPER ADS
- LOOK
- OUTDOOR POSTERS
- NBC MONITOR
- CAR CARDS



Sign up!

Clip . . . Fill in and Mail Coupon Today!

Join today! The RAYTHEON BONDED DEALER PROGRAM is *the* outstanding profit plan for *independent* dealers like you. There are no dues! No fees! No gimmicks! It's open to recognized local, independent service dealers who believe in serving the public with top-quality materials . . . skilled services . . . fair prices.

Your efforts will be backed by the Raytheon Bond . . . National Advertising . . . Local Promotions . . . the *FREE* Bonded Dealer Merchandising Kit . . . Display Materials . . . the best Distributor Service in the Industry . . . new bigger and better PROFITS!

All you do to join is cut out the form below, fill in, check off the materials you desire and mail to RAYTHEON. Raytheon will notify your sponsoring Raytheon Tube Distributor who will arrange all the details. If you are accepted as a Bonded Dealer, your distributor will work with you to see that you get *all* the benefits of the Raytheon Bonded Dealer Program.

That's all there is to it! It's easy—but best of all it's profitable—sign up today and cash in on this dynamic, exclusive profit program!



Send this form
in today →

MAIL TO:

Mr. William Grey
RAYTHEON
55 Chapel St.
Newton 58,
Mass.

Cut along
dotted
lines



YES—I'm interested in taking full advantage of the nationally advertised Raytheon Bonded Dealer Program. I understand that there are no dues or fees involved, and that this program is limited to full-time, independent TV-Radio service dealers.

Check which you want:

- FREE Merchandising Kit*
- My name listed in TV Guide and LOOK*
- Yellow Page listing*
- Store identification*
- Truck decal*
- Direct Mail material*
- Business Aids*
- _____

FIRM NAME: _____

BUSINESS ADDRESS: _____

CITY: _____ ZONE: _____ STATE: _____

TELEPHONE NO.: _____

YOUR SIGNATURE & TITLE: _____

*Mail to Mr. William Grey, Raytheon, 55 Chapel St.,
Newton 58, Mass.*

This is the
program
you've asked for...

- builds customer confidence and repeat business for you
- puts your name before your prospects through year-round local and national advertising

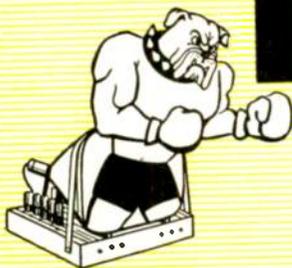


- gives you the *exclusive* use of an official *90-day repair bond* for each customer
- backs you with full-time promotional support.

Sign up NOW...
to build for the future!

DISTRIBUTOR PRODUCTS DIVISION
55 CHAPEL STREET • NEWTON 58, MASS.





"Tough Dog"

Corner



Difficult Service Jobs Described by Readers

Deceiving Vertical Sync

My first look at a Philco 8L41 chassis indicated trouble in the vertical section; unstable hold and linearity controls not operating properly. Eliminating tubes, I immediately suspected leaky capacitors in the shaping networks, couplers, etc.

Two capacitors were replaced, resulting in proper operation of the set. "Cooking" the set while working on another one, I returned to it. Nothing

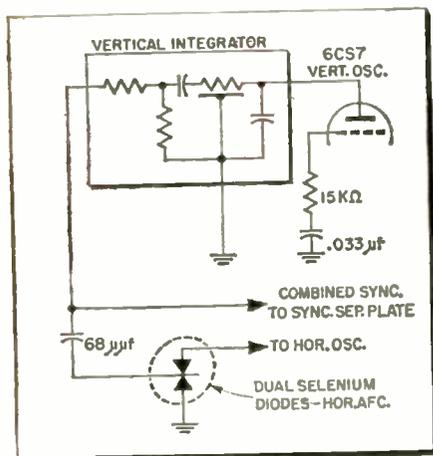


Fig. 1—Defective horizontal afc selenium dual diodes affect the vertical sync section.

operated properly! The vertical hold caused the picture to fold up in the center and flip-flop in all directions. Height and linearity controls produced erratic results. I checked the newly replaced capacitors again and they proved to be good. Incidentally, the horizontal stability was fine.

Desperate, I decided to remove the vertical sync, isolating the vertical circuit to see if it could be held by the free-wheeling oscillator. Disconnecting the printed circuit vertical integrator to open the sync input presented another problem. Although

the vertical picture could now be stabilized, the horizontal stability was extremely poor. Connecting the integrator again caused the same vertical symptoms to reappear. Examining the circuit as shown in Fig. 1, I noticed that both horizontal and vertical sync branched off to the two oscillators at a point between the vertical integrator and horizontal afc. The selenium dual diode measured 1 meg on one side and 150K on the other. Replacing the dual diode promptly cleared up the difficulty.—*Jack Darr, Mena, Arkansas*

Intermittent Negative Picture

A call was made on an Emerson chassis number 196B that appeared to have AGC overload symptoms; the picture was negative and the sync was erratic. The 6AL5 AGC rectifier was changed without any improvement. Next tubes replaced were the i-f's and r-f amp and, out of sheer desperation, the sync tubes. Failing to correct the trouble, I removed the set for a bench check.

Once on the bench, I realized that I hadn't checked out the video amplifier tube. Although having reservations about the tube affecting the set in this manner, I replaced it. To my surprise, the new 6CB6 snapped the picture right in. Placing the set aside, I continued to operate it in the event something else developed.

About two hours later, the picture went negative again. Now "a rat race" ensued. As quick as I would touch the circuitry with my test prods, the picture would snap into place even faster. Monitoring the AGC circuit with my voltmeter while the set was cooking, I noticed that there was no appreciable voltage change whether the set was operating properly or showing a negative picture. Connecting an AGC bias box

did not change this result.

After a period of time, the best I could come up with was a slight voltage change on the control grid of the video amp tube between the two conditions. I thereby replaced the coupling capacitor. It didn't help!

Finally, an opportunity presented itself; the picture went negative and remained in that condition for awhile. Concentrating on the video amp circuit, shown in Fig. 2, my voltmeter read zero when applied to the screen.

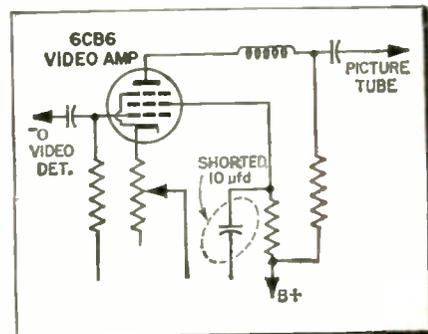


Fig. 2—An intermittently shorted screen bypass capacitor causes a negative picture.

Immediately thereafter, the picture came back and the screen voltage was normal. Replacing the 10 μfd decoupling capacitor and the screen resistor, I let the set operate for a few hours with good results. The 10 μfd capacitor was evidently intermittently shorting.—*Frank A. Salerno, Long Island City, N. Y.*

TOUGH DOGS WANTED!

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

Ways And Means Of Equalizing

Here's Why Hi-Fi Recordings Are Never "Flat."

Understanding Frequency Response Is Key To

Appreciating Preamp & Cartridge Performance.

NORMAN CROWHURST



Fig. 1—At a constant voltage, signal amplitude increases as frequency decreases.

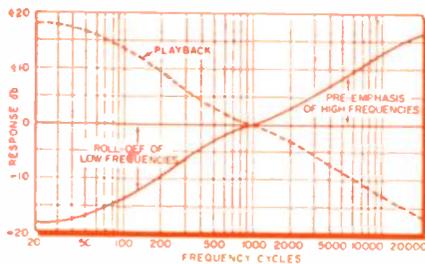
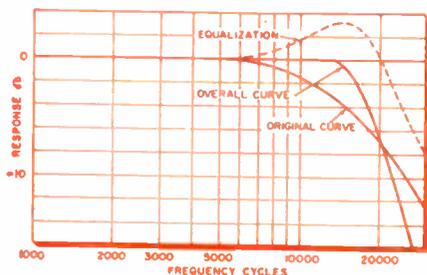


Fig. 2—An artificial response inserted into the recording characteristic is indicated by the solid equalization curve. The broken curve shows the playback equalization necessary to obtain true sound reproduction.

Fig. 3—Equalization corrects high frequency deficiency, thereby improving the response.



• With everything going stereo these days, the high fidelity market is in a state of flux. Fortunately, compatibility has been emphasized to avoid obsolescence of existing equipment, LP discs and pre-recorded tape. A part of this compatible program is the retention of equalization characteristics for disc and 7½ inch tape.

Record Equalization

Equalization, the deliberate distortion of frequency for corrective purposes, has a number of uses in audio circuitry. One of its most common uses is to alter the recording characteristics employed in cutting records and playback of these records. The standard forms of recording head and playback pickup employ the constant velocity principle. In this method, the movement of the cutting stylus is determined by the velocity of the stylus movement for an applied voltage. (Ceramic and crystal pickups, although constant amplitude devices, base their recording characteristics on the RIAA equalization curve.)

Therefore, with a constant voltage applied to the coil of the cutting head, the cutting stylus will move in one direction until the voltage is removed or the direction is reversed, when it will then move in the opposite direction. Since the velocity is the same, a higher frequency will reverse the direction of the cutting stylus sooner than a low frequency signal and consequently, the stylus excursion is shorter. It can be seen in Fig. 1 that with a given voltage, a high frequency wave will have a smaller stylus displacement (amplitude) than a low frequency signal. Velocity is represented graphically

as the slope of the wave form at its zero point. Drawing a number of different frequencies with the same slope or velocity, it may be seen that the amplitude of the sine wave in its total excursion is inversely proportional to frequency. If the frequency is doubled, the stylus has to travel half its distance. If frequency is multiplied by 10, the distance traveled by the stylus is divided by 10.

If this relationship between stylus movement and frequency were maintained for recordings, it would mean that the amount of movement at 20 cycles would have to be 1000 times as great as the amount of movement at 20,000 cycles. If, in addition to this, we consider the additional fact that the intensity of frequencies at the lower end of the audio spectrum is naturally greater than that of frequencies at the higher end, it means that the probable amplitudes at 20,000 cycles would only be about 1/10,000 of the probable amplitudes at 20 cycles.

In effect, if we reduce the amplitude of movement at 20,000 cycles to as little as 10 millionths of an inch, we still need to have an amplitude at 20 cycles of 1/10 inch, which would mean the groove spacing would be extremely large.

To offset this difficulty, recordings have a standard characteristic which decreases the amplitude at the low frequencies and accentuates the amplitude at high frequencies. Decreasing the amplitude at low frequencies results in closer groove spacing due to the reduced stylus excursion.

If the movement of the high end was only on the order of 10 millionth's of an inch, the desired musical sound would not be much louder,

Mechanical and electrical considerations dictate the use of equalization circuits to provide true reproduction of recorded sound. Cartridges and transducers, such as microphones, frequently incorporate equalization to offset inherent deficiencies or compensate for deliberate insertion of distortion in the frequency response.

if as loud, as the extraneous noise due to particles in the groove. Therefore, the amplitude is increased at the upper end before using a velocity recording characteristic to allow the program to defeat background noise.

In playback, the cartridge stylus will be able to track more efficiently, without the handicap of tremendous low frequency grooves.

The artificial response put into the recording characteristic is shown in Fig. 2. This requires an equalizer in the recording studio to produce this response before making the recording.

When this record is played back with a velocity type pickup such as the ordinary magnetic, moving coil or ribbon types, the reverse characteristic has to be applied to restore the final frequency response to its original condition.

All high quality playback preamplifiers must provide for equalization to enable true sound reproduction. In the not too distant past, record manufacturers used individual equalization curves. Playback equipment, therefore, had to counterbalance these curves by including numerous phono equalization switch positions. Since 1954, the majority of manufacturers agreed upon one standard equalization called the RIAA curve.

Other Equalizers

Record cutting and playback is not the only use for equalization. Many kinds of transducers also possess frequency characteristics which may need equalizing to obtain faithful reproduction. The recording cutter head may have a low frequency loss, quite apart from its constant velocity

characteristics, due to the mechanical properties of the cutter head. Similarly, a playback pickup may have a characteristic that should be corrected, in addition to the playback characteristic just described. For example, crystal cartridges usually require high frequency boost while magnetic cartridges usually need low frequency boost.

Sometimes microphones have frequency characteristics which introduce a loss at the low or high end of the frequency band. It is desirable to accentuate frequencies that are deficient to secure a flat overall response as in Fig. 3.

Checking Response

To ascertain the kind of equalization required, it is necessary to know the characteristic of the component. This means that a standard frequency response has to be established against which a check must be made.

In the case of recording and playback characteristics of a cutter head or pickup, there is a very simple means of checking the frequency characteristic of the record itself. When the grooves are held up to the light, a band of light is reflected. If a spot source of light is used, such as a single filament lamp, the band of reflected light has hard or sharp edges, which are due to the limits of reflections occurring at the point where the angle of the groove is at maximum.

For this reason, if different frequencies are recorded at different points across the disc, with the same maximum velocity, the width of the band of light seen will be uniform and a constant velocity recorded disc will look as shown in Fig. 4.

To obtain the response of the recording cutter head, a number of grooves are cut experimentally, with the same voltage input at different frequencies, and the record result is examined under a filament lamp. Any discrepancy from constant velocity can then be corrected by an appropriate equalizer until the overall recording response is flat. This is quite apart from the equalization to produce the desired recording characteristic mentioned earlier. Similarly, a recording that has been made at constant velocity can be used with

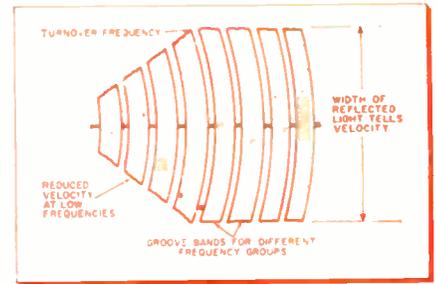


Fig. 4—Constant velocity cut discs appear as shown when grooves are held to a light.

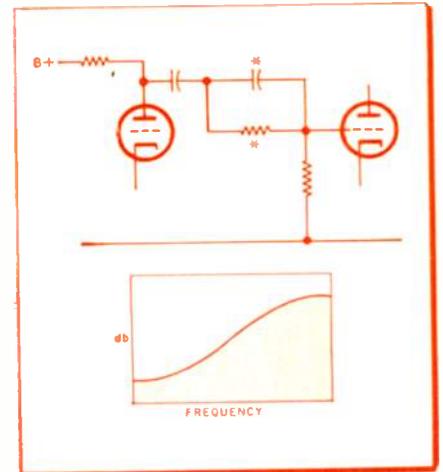


Fig. 5—A simple equalizing circuit to produce a low frequency slope, depending on the circuit values of components with asterisks.

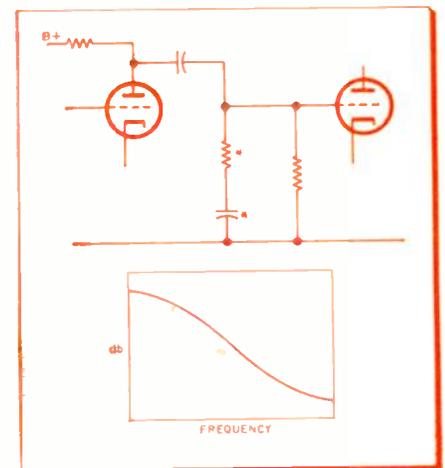
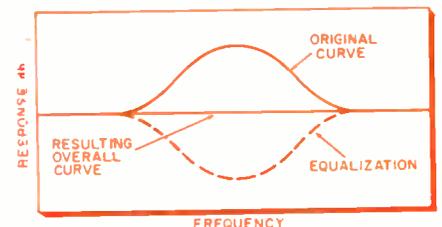


Fig. 6—High frequency slope circuit determined by the value of asterisk components.

Fig. 7—Frequency response "bump" is corrected by a corresponding equalization "dip."



(Continued on page 72)

Let's Look At

Those New Semiconductors

Characteristics Of Zener Diodes, Variable Capacitor Functions And Contact Protectors Are Explored

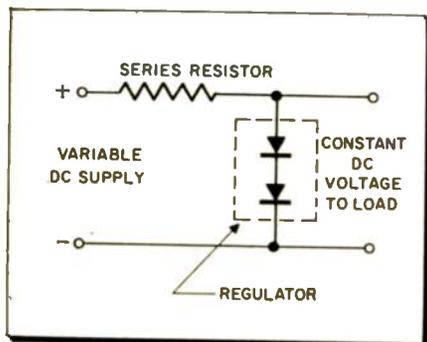
J. T. CATALDO
INTERNATIONAL RECTIFIER CORP.

Versatile and relatively trouble-free new semiconductors are being closely inspected by manufacturers of appliances, industrial electronic equipment and electrically operated machinery for utilization in their new equipment designs. Applications include diodes used as capacitors, contact protectors and voltage regulators.

• When is a rectifier not a rectifier? In increasingly more applications nowadays, semiconductor diodes and rectifiers are demonstrating their ability to be a number of components at the same time. They are finding their way into computers, AM-FM radio sets, and industrial power equipment; not as rectifiers at all, but as voltage regulators, variable capacitors and contact protectors.

The silicon rectifier possesses two distinct characteristics, a forward

Fig. 1—The selenium regulator is connected in parallel across the load in this shunt regulator. A dropping resistor is connected in series with the voltage source and load.



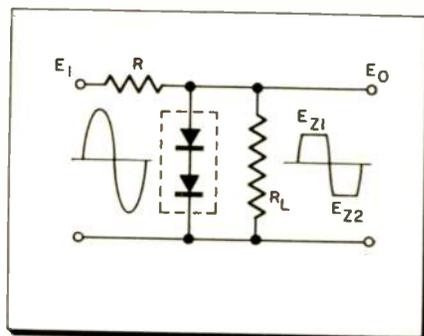
and reverse, as well as a host of minor characteristics which have been regarded in the past as being either detrimental or beneficial . . . depending on the requirements of the particular application under research. It is evident today that each characteristic can be useful, depending on the function that the circuit performs.

In the early stages of selenium rectifier production, the forward characteristic was effectively used as a voltage regulator. One of the most common applications was that of a filament voltage regulator for d-c filaments of vacuum tubes. Military equipment of the period benefited widely in space and weight reduction through this application.

Selenium regulators utilizing the forward characteristics are still recommended for regulation of relatively low d-c voltages in the order of 1.5 volts.

The silicon zener diode of today, a semiconductor whose manufacture can be controlled to a great degree, is performing essentially the same function. However, it can be readily produced to close tolerances for much higher voltages. Zener break-

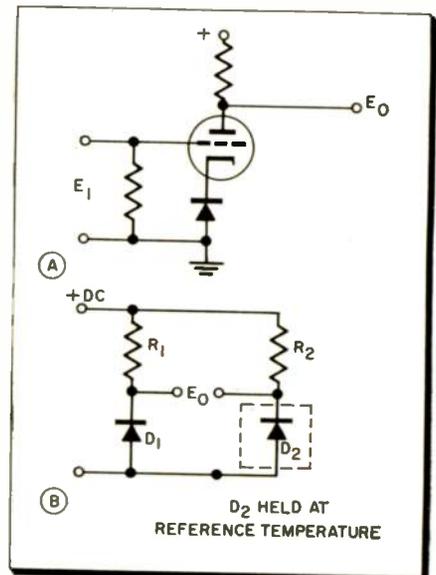
Fig. 2—Double anode zener diode regulates a-c signal with good temperature stability.



down voltage, the counterpart of vacuum tube inverse peak voltage, occurs when voltage is sufficient to break through the diode's barrier region and become a conductor. However, the barrier region may heal itself when the excess inverse voltage is removed, whereas a vacuum tube would probably be permanently damaged by arcing between plate and cathode. The breakdown voltage of a zener diode is dependent on the resistivity of the silicon itself.

Silicon zener regulators far surpass other types of regulating elements in many applications. In addition to being extremely small in comparison to selenium regulators or tubes, they are rugged, capable of handling high temperatures and have the especially attractive feature of apparently trouble-free life. Silicon

Fig. 3—Additional applications of zener diodes are as a cathode bias element shown in (A) and temperature sensitive bridge in (B).



TYPICAL ZENER DIODE APPLICATIONS

BASIC INDUSTRY	PRODUCTS	APPLICATIONS	TYPES							
			750 mw. type	1 watt type	3.5 watt Type	10 watt Type (and higher)	Multiple Junction	Double Anode	Reference Element	
ELECT. MEASURING INSTRUMENTS	Inst. Movements	Meter Protection	•						•	
	Digital Voltmeters	Reference, Bias	•	•						•
	Oscilloscopes	Regulators, Bias	•	•				•		
	D.C. Amplifiers	Reference, Limiters							•	•
	Diode Testers	Meter Protection, Regulator	•	•						
	Signal Generators	Limiter, Bias	•						•	
	Transistor Testers	Regulators, Limiters	•	•					•	
	Voltage Calibrators	Regulators, Limiters	•	•					•	
	Continuity Checkers	Go-No Go Indicators	•	•						
	Recorders	Reference, Bias	•						•	
	Telemetry Equipmt.	Reference						•	•	
COMMUNICATIONS	Comm. Receivers	Noise Limiting							•	
	Radio Transmitters	Bias, Regulators	•	•	•	•	•	•		
	TV Transmitters	Bias, Regulators	•	•	•	•	•			
	Facsimile	Bias, Regulators	•	•	•	•	•			
	Airborne Comm.	Regulators, Limiters	•	•					•	
	Telephone Systems	Limiting	•						•	
	Alarm Systems	Threshold Control	•							
	Radar Systems	Regulators, References	•	•	•	•	•		•	
INDUSTRIAL CONTROLS	D.C. Adjustable Voltage Drives	Regulators, References	•	•	•	•				•
	Engine-Generators	Regulators			•	•				
	Alternator Exciters	Regulators		•	•	•				
	Auto Light Control	Regulators	•	•	•					
	Auto. Temp. Control	Temp. Sensors	•							
	Cont. Process Controls	References, Regulators	•	•	•	•	•			•
	Electronic Timers	Threshold Control	•	•						
	Frequency Reg.	References, Bias	•							•
	Furnace Control	Regulators, Temp. Sensors	•			•				•
	Mag. Amplifiers	Reference, Regulators	•	•					•	•
	Servo Amplifiers	Bias, References	•	•						•
	Remote Solenoid Control	Regulators	•	•	•	•				
		Quality Control System	References							•

diodes do not deteriorate in storage, as do many other types of regulators; moreover, these extremely capable units can be supplied in almost any desired voltage range above 3.9 volts. They can operate over a broad current range, whereas other types are restricted to specific voltages and very limited current ranges.

Diode Applications

A zener diode can be used as a shunt regulator in the simple shunt circuit shown in Fig. 1 for selenium. The only difference being that the reverse characteristic is used and therefore its connection into the circuit is reversed.

An important feature of the zener diode is its temperature stability. It may be successfully used where the circuit elements are subject to large temperature variations. These diodes are obtainable with positive, negative and essentially zero coefficients. Therefore, the zener diode may be used as a reference element when an absolute standard must be maintained. The temperature coefficient features are also valuable when com-

pensating for a component that tends to drift in an opposite direction.

Regulation of an a-c signal can be readily accomplished with a double anode zener diode in the circuit of Fig. 2. The double anode unit has the advantage of a stability of better than $\pm 1\%$ over a temperature range of -55°C to plus 100°C . This is achieved by taking advantage of the negative coefficient of the forward characteristic of one zener with the positive coefficient of another, since they are internally connected in series with reverse polarities. There are numerous other applications for zener diodes. Some of the more popular ones are shown in Fig. 3.

Variable Capacitor Use

The recent emergence of silicon diodes as variable capacitors demonstrates another facet of these versatile units. Research and development engineers have long been measuring capacitance of silicon junction diodes, with the aim of increasing their frequency response in rectifying applications. A side result of this testing was a completely new circuit ele-

ment in which variations in applied voltage are used to produce changes in capacitance.

Since the essential capacitance of a capacitor depends inversely on the thickness of the dielectric between the two conducting plates, there are in the reverse-biased silicon diode all of the necessary requirements for a variable capacitor. The capacitance of this voltage sensitive device can be varied over extremely wide limits by simply varying the voltage across it.

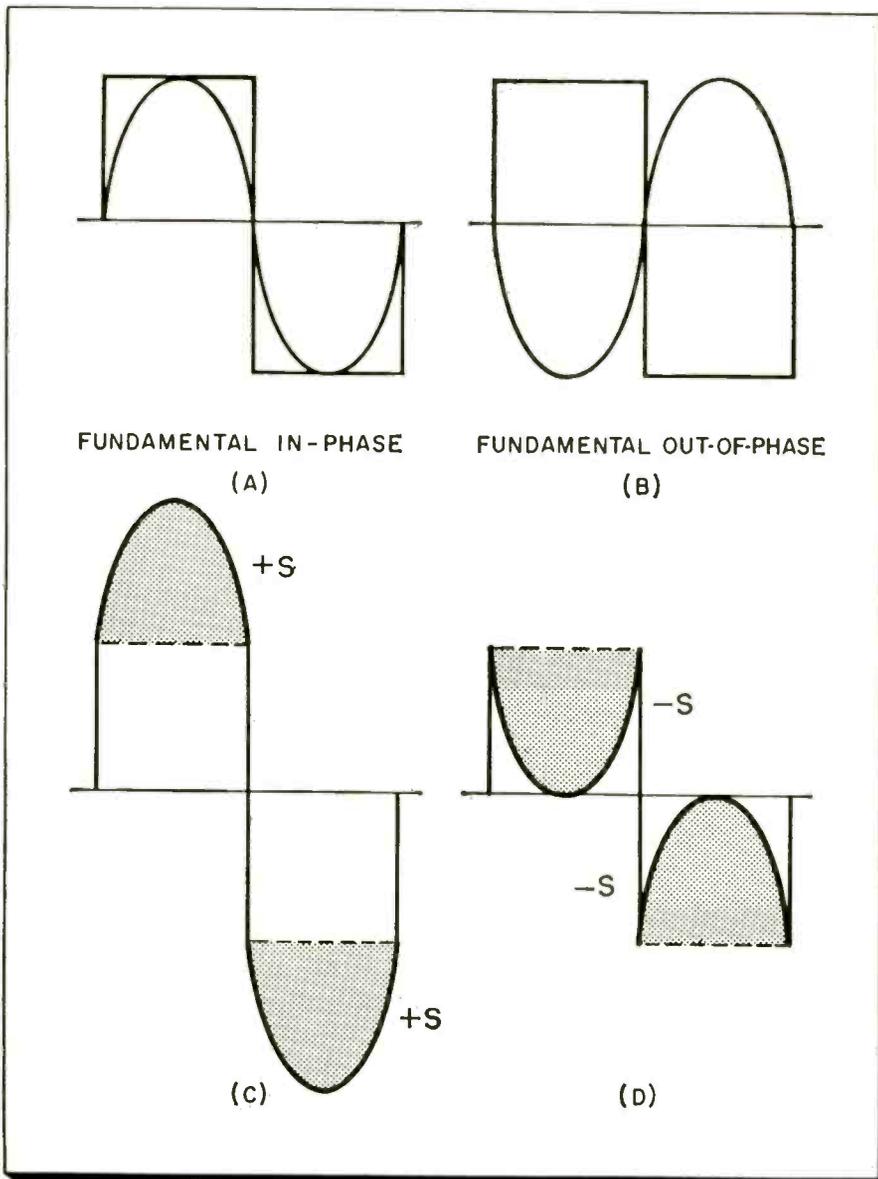
Fig. 4 illustrates the basic circuit for application of a Semicap silicon variable capacitor in a tuned circuit. In most cases, the circuit Q will be adequately high when this simple circuit is used, and if "C" is chosen much larger than the maximum capacitance of the diode, then the frequency range will be determined by the available capacitance range of the diode. It can be seen that the diode replaces a reactance tube which might be used to accomplish the same function. Aside from the obvious advantages of a silicon

(Continued on page 88)

Understanding Square Waves

Complex Waveforms Can Be Analyzed By Simple Inspection

Fig. 1—A fundamental sine wave in-phase with the square wave is shown in (A). The area it adds to the square wave is indicated by the shaded portion in (C). An out-of-phase fundamental (B) subtracts from the area of the square wave as shown in (D). It can now be seen that the square wave's total area change between the two phase conditions is "4S."



ROBERT G. MIDDLETON

Sweeping through the harmonics of a complex waveform with a search voltage will display its frequencies and voltages on a scope screen. Using this basic method, square wave analysis is greatly simplified.

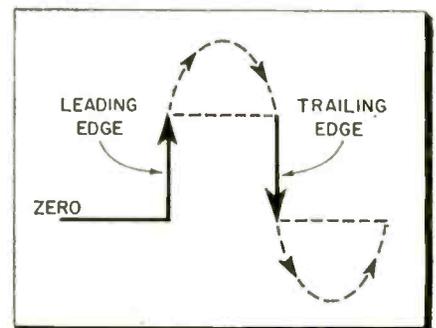
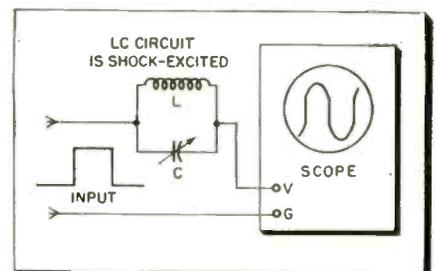


Fig. 2—Ringing of an LC circuit is sustained by the same leading and trailing edges.

Fig. 3—A simple scope test set-up verifies that a ringing circuit will respond to the fundamental frequency of a square wave.



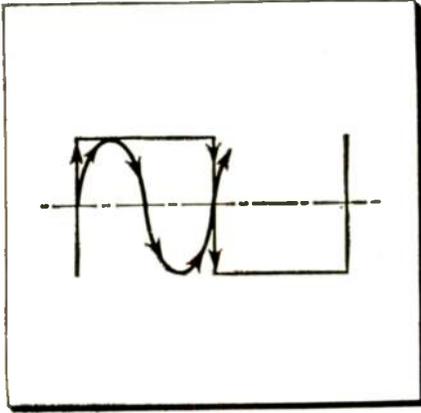


Fig. 4—A second harmonic cannot “ring in” a square wave since the action of the leading edge is cancelled by the trailing edge.

● The ability to interpret complex waveforms will give the technician a better insight to advanced troubleshooting techniques and prepare him for the increasingly involved theoretical developments taking place in the electronics field today.

One type of complex waveform, the square wave, is considered to contain a sine wave at the square wave's fundamental frequency and all the odd harmonics of that fundamental. In an effort to “see” this fundamental frequency, visualize how a resonant circuit, tuned to this frequency, will respond when driven by a square wave voltage. The result should be similar to Fig. 2. A test set-up as shown in Fig. 3 will verify this result.

The fundamental, therefore, occupies the period and phase depicted in Fig. 1a. For convenience, the sine wave is shown as having the same peak voltage as the square wave, although any other theoretical peak voltage may be used with the same results. Analyzing the composition of this square wave by simple inspection will enable the technician to understand their proper voltages, frequencies and phases without resorting to intricate mathematical equations.

Fig. 1a shows a sine wave in-phase (ringing phase) with the square wave, while Fig. 1b shows the same wave out-of-phase with the square wave. When the fundamental sine wave is combined with the square wave, the effect is as indicated in Fig. 1c and 1d.

Assuming the area added by one

half of the sine wave in Fig. 1c as “S”, it is evident that the in-phase condition increases the square wave's area by “2S”. It is also obvious, that the out-of-phase combination in Fig. 1d decreases the area by “2S”. This is a total area change of “4S” between an in-phase and out-of-phase condition.

Changing the fundamental frequency to the second harmonic will produce no apparent change in the waveform. The LC circuit will not resonate at a second harmonic as shown in Fig. 4, due to the action of the leading edge being cancelled out by the trailing edge.

Examining the area changes in Fig. 5, it can be seen that an even harmonic (in this instance, the sec-

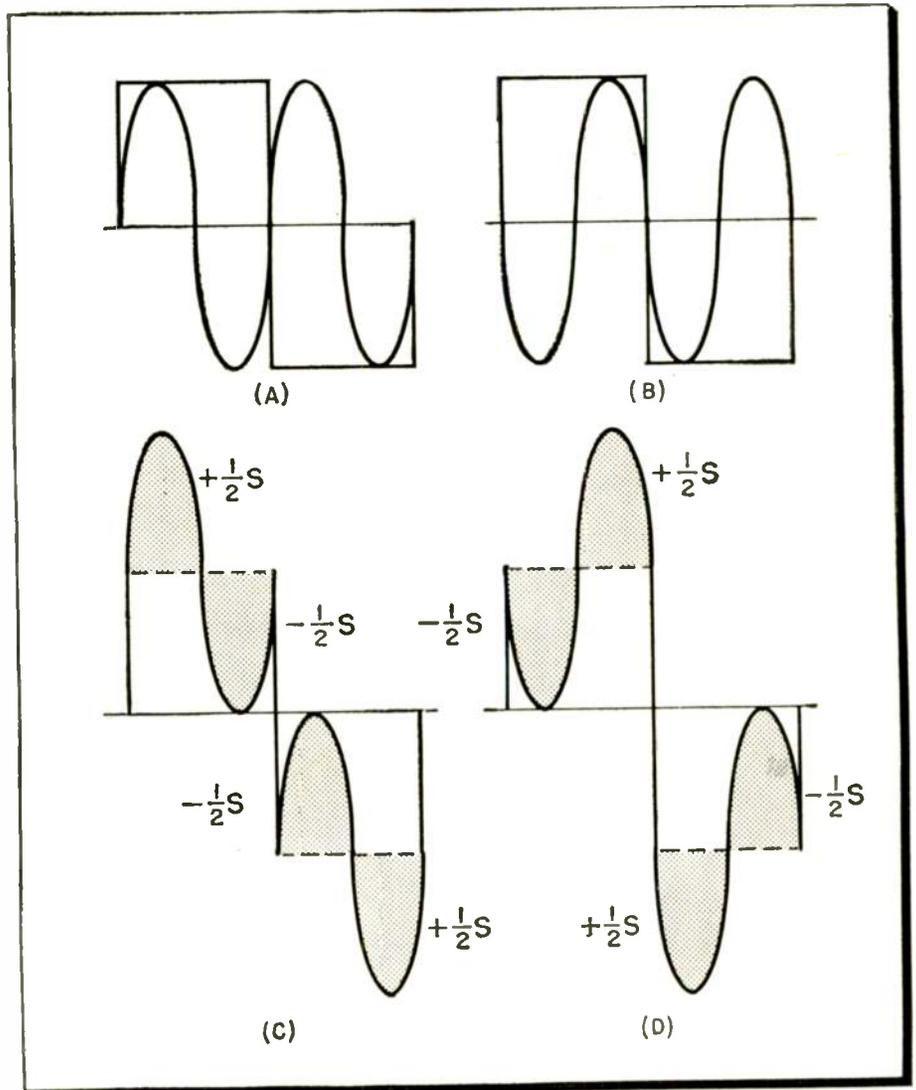
ond harmonic) does not change the area of the square wave. The positive portion of the sine wave will counterbalance the negative area change with a result of zero area change.

Odd Harmonics

Proceeding to the third harmonic as in Fig. 6a, this odd harmonic, unlike the second harmonic, does ring in and thereby creates an area change. The LC circuit can absorb energy at the leading and trailing edges and it will be noted that the fundamental and third harmonic have the same phase and go through zero at the identical time the square wave passes zero.

(Continued on next page)

Fig. 5—An even harmonic, regardless of phase, will not change the area of a square wave.



The voltage of the third harmonic may be observed by the area changes in Fig. 6c. When combined in-phase with the square wave, the area change is "2/3S", since the positive and negative sides of the wave both contain two "1/3S" areas that cancel each other, leaving a single "1/3S" area increase in both the negative and positive sections of the square wave.

Again, when the third harmonic is combined out-of-phase, as in Fig. 6d, an area change (decrease) of "2/3S" is maintained. This is a total area change of "4/3S".

Comparing this total area change of "4/3S" with the area change of the fundamental shown in Fig. 1, "4S" or "12/3S", it is evident that the total area change of the third harmonic is one third that of the funda-

mental. This indicates that the third harmonic has a voltage equal to one third of the fundamental voltage.

It is obvious that this same procedure will result in a zero area change with a fourth harmonic, give a fifth harmonic at one fifth the fundamental's voltage, throw out the sixth harmonic, give a seventh harmonic at one seventh the fundamental's voltage, ad infinitum. This will verify the fact that a square wave is comprised of a sine wave at the fundamental frequency and its odd harmonics.

Square Wave Voltage

All voltages, with the exception of the fundamental, can now be visualized as a fraction of the fundamental's voltage. The fundamental volt-

Fig. 6—A third harmonic will "ring in" a square wave. Combined in and out-of-phase with a square wave, it will produce a total area change one third that of the fundamental.

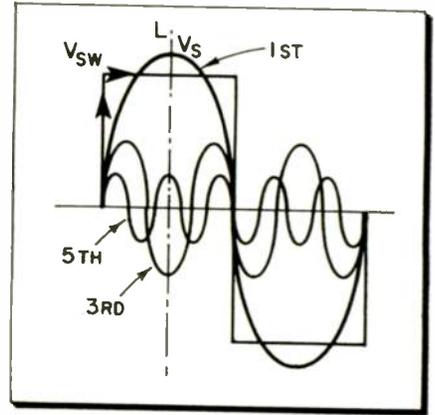
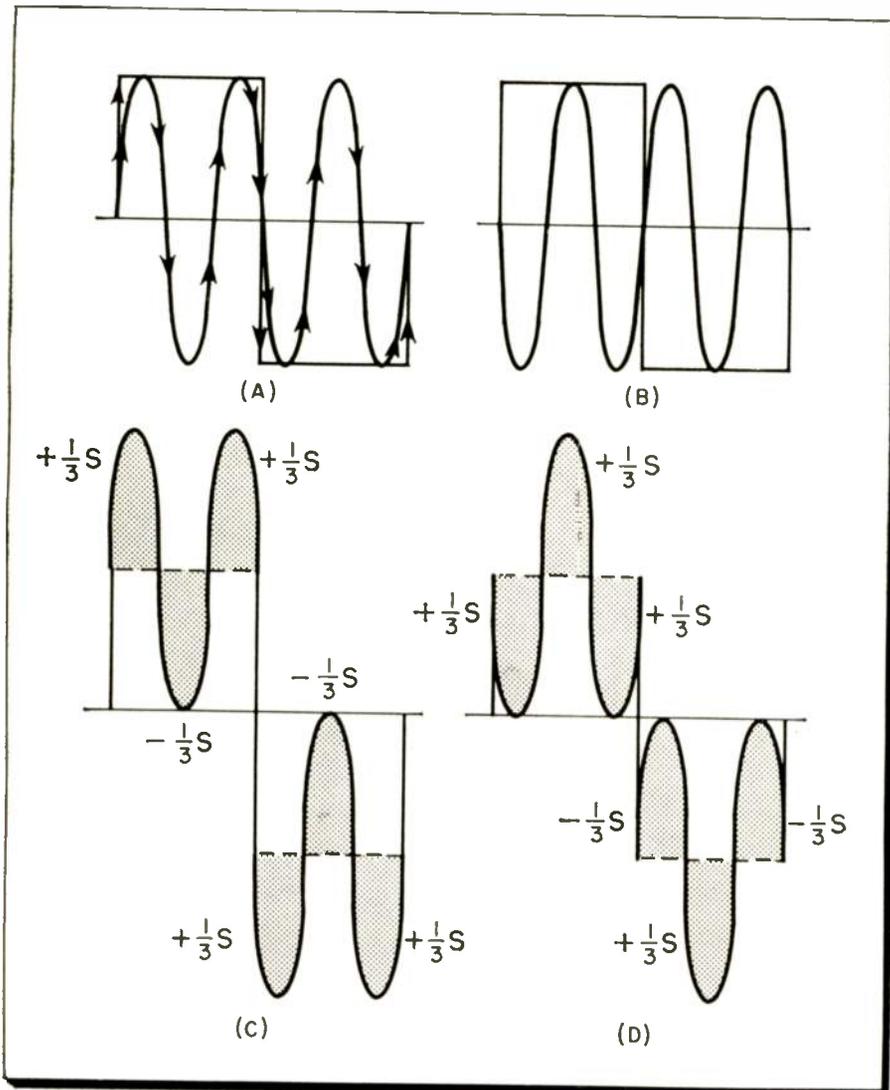


Fig. 7—Commencing with the fundamental, successive sine waves alternately add and subtract to reach the final square wave peak.

age may be ascertained as follows:

Referring to Fig. 7, it may be seen that all the sine waves have maximum values through line L. Each successive sine wave, commencing with the fundamental, alternately adds and subtracts, to finally give the peak value of the square wave. Therefore, using only arithmetic, the voltage of the square wave is given by:

$$V_{sw} = V_f - 1/3 V_f + 1/5 V_f - 1/7 V_f + 1/9 V_f - 1/11 V_f + 1/13 V_f - 1/15 V_f, \text{ etc. . . .}$$

where V_{sw} is the peak voltage of the square wave and V_f is the peak voltage of the fundamental.

By taking a large number of terms, we can come very close to the actual voltage of the square wave. Eight terms indicate a square wave peak voltage of .75 of the fundamental peak voltage. Extending the calculations much further, the peak voltage of the square wave will approach 0.785 with respect to the fundamental. Therefore, considering a larger number of harmonics will not produce any significant difference in the relative peak voltage of the square wave. It is also now apparent that the square wave has a fundamental with a peak value greater than its own peak value. The peak value of the fundamental is 1.27 times the square wave's peak voltage value.

This approach to waveform analysis not only conforms with circuit response, but enormously simplifies breaking down a waveform into its respective components without using the engineer's mathematics tool, calculus, and yet enabling the technician to understand the subject just as well. ●

"TV Miltie" Enters Master Antenna Field

Master Antenna Installations Double Technician's Income

HERB GERSON,
BLONDER-TONGUE LABS.

• Milton Fenigstein, operating under the name "TV Miltie," initially entered the Master Antenna installation field in 1958, and is now claiming the title "Master TV Antenna King" in the Long Island, N.Y., area.

Although owning a relatively successful TV service business, TV Miltie promptly accepted a builder's proposal in 1958 to erect TV antennas for 112 apartment dwellings. After discussing preliminary layouts and details with the builder, Miltie visited his distributor and requested Master Antenna information. Reinforced with price breakdowns and manufacturers' installation literature, Miltie outlined the benefits of using a Master Antenna to the builder. These included equally strong reception for every TV set, low maintenance charges, improved appearance of the property and prestige.

The builder, apparently impressed by these features, requested a demonstration. Miltie readily complied with this request and installed a Master Antenna, consisting of one high gain antenna and two low cost boosters for 8 apartments, and a separate antenna to one of these apartments. The results were gratifying and the builder immediately accepted Miltie's proposal.

Other jobs followed; 180 apartments, then 128 apartments; until Miltie was firmly settled in this allied field. The initial contracts allowed TV Miltie to retain ownership of all the equipment. The Lessee agreed to pay TV Miltie a \$12.00 installation fee and \$1.50 per month for rental and maintenance of equipment for each apartment. The Lessee, of course, can be individual tenants that have grouped together for the Master Antenna or the owner of the



Basement installation of master antenna boosters. Maintenance is simplified by marking each twin-lead with the apartment number.

building. Other contract plans evolved as TV Miltie's business expanded, depending on the building and negotiations. In some instances, the owner of the building obtains title to the equipment.

Once the installation is completed, Miltie's only obligation is to maintain the systems. This obligation, however, has enabled Miltie to expand his one man shop to include two additional workers and double his net income.

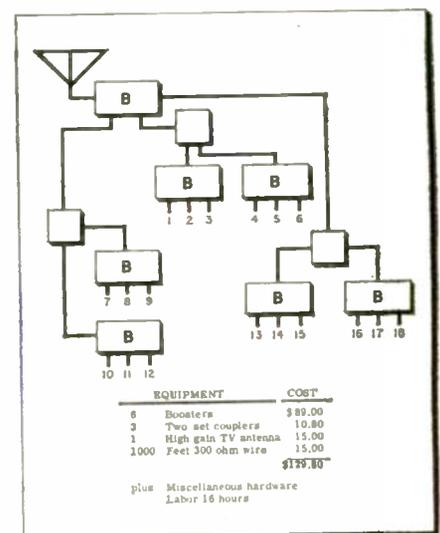
Miltie's Master Antenna work has created a clientele that is closely tied to him, and offers many valuable TV service leads and sales opportunities. As an example, Miltie reports a June gross income of \$1000 from a 100-apartment building that requires his Master Antenna maintenance services. This is exclusive of

his maintenance fees, which average \$400 per month for his total installations to date. In addition, his productive time is increased due to more efficient routing of service calls made possible by the proximity of his customers.

Landlords are businessmen and realize value for their investments. Master Antenna systems are wise investments for them because it increases the value of their property, affords an opportunity in many cities to allow an automatic rent increase and lessens the possibility of lawsuits due to leakage from roof damage. These incentives are introduced by Miltie via realty newspaper advertisements.

Miltie's rental and maintenance checks afford a steady source of income and offset the seasonal effects on TV service. In addition, it enables him to budget his expenditures much more accurately than in the past and provides a reasonable amount of income security. •

An 18 apartment master TV system block diagram with typical equipment net prices.



Improve Your Skills By

Building a Technical Library



HOME AIR CONDITIONING INSTALLATION & REPAIR

By J. Derman, F. Makstein & H. Seaman. Both theory and practical construction designs are examined, along with maintenance techniques and procedure for determining size of air conditioner required. Covers motors, compressors, condensers, evaporators, regulating valves, circuits and other system elements. Soft cover, 160 pages. Price \$3.50.

INDUSTRIAL CONTROL CIRCUITS

By Sidney Platt. Excellent starting point for TV technician interested in learning about industrial electronics. Non-mathematical text explains circuitry and operation of power controls, relays, timers, photoelectric devices and instrumentation found in factories. Practical applications shown. Soft cover, 200 pages. Price \$3.90.

★ RIDER COMBINATION MANUAL

At a cost of less than 3¢ per page this new Volume 25 is a servicing library in itself. The 12" x 15" pages plus foldouts contain schematics, parts lists and a wealth of troubleshooting data on TV sets, transistor radios, home radios and hi-fi. Covers all major brands and chassis. Pages removable from binder. Hard cover, 978 pages. Price \$27.

FUNDAMENTALS OF RADIO TELEMTRY

By Marvin Tepper. This well-illustrated basic book tells how missiles and satellites relay data to earth. Topics include multiplexing, receiving stations, data recording and digital techniques. Telemetry standards and bibliography in appendix. Soft cover, 136 pages. Price \$2.95.

SHOOT TV & RADIO TROUBLE FAST

By Harry G. Cisin. The first part of this book relates to symptoms, faults and remedies for ac-dc radios. The second part covers TV, with each practical test and repair explanation related to a specific problem. Printed circuits are discussed. Soft cover, 40 large pages. Price \$1.50.

BASICS OF DIGITAL COMPUTERS (3 vols.)

By John S. Murphy. Using the easy-to-learn picture book technique, these three volumes explain the theory and functions of digital computers. Very little mathematics. Covers counting systems, computer language, programming, memories, logic diagrams, flip-flops, clamping, input-output and data processing. Soft cover, 416 pages. \$7.50/set.

IMPEDANCE MATCHING

By Alexander Schure. Divided into five major sections, this informative book covers power transfer, impedance matching devices, matching at audio and r-f, and matching in transistor circuits. Complete with tables, schematics and computation examples. 128 pages. Price \$2.90.

RADIO OPERATOR'S LICENSE Q & A MANUAL

By Milton Kaufman. This sixth edition gives you the information you need to pass FCC license examinations. In question and answer form similar to actual FCC tests, all eight elements are covered, including law, radiotelephone, radiotelegraph, aircraft and ship radar. Abbreviations, code, etc. included. Hard cover, 736 pages. Price \$6.60.

HOW TO SERVICE TAPE RECORDERS

By C. A. Tuthill. Starting with basic magnetic principles, the test goes through the recording operation, recorder mechanisms and circuitry. In addition to an explanation of the functions of the various recorder elements, the techniques for repairing various troubles and making tests are presented. Soft cover, 160 pages. Price \$2.90.

★ MARINE ELECTRONICS HANDBOOK

By Leo G. Sands. This informative text covers the many electronic devices used on boats, including radiophone, sound systems, direction finders, depth sounders, steering devices, radar and power sources. Schematics are given for commercial units now on the market. Information on troubleshooting is provided. Soft cover, 232 pages plus pullouts. \$3.95.

GUIDE TO MOBILE RADIO

By Leo Sands. This fundamental, yet practical book on 2-way radio covers base stations, transmitters, receivers, antennas, remote controls, power supplies, portable gear, field survey, selective calling, licensing and maintenance. One section examines useful test instruments. Soft cover, 160 pages. Price \$2.85.

HOW TO RUN A SMALL BUSINESS

By J. K. Lasser. Here is a basic business guidebook for service dealers and other operators of retail and small manufacturing firms. Covers record keeping, avoiding frauds, tax management, credit sales, insurance programs, how to buy an established business, financing and other important topics. Hard cover, 400 pages. Price \$4.95.

★ RADIO ENGINEERING HANDBOOK

Edited by Keith Henney. Here is a virtual encyclopedia of electronics, including circuits, curves, data tables, formulas and highly technical explanations. Among many subjects covered are communications, RLC, microwaves, speakers, semiconductors, measurements, amplifiers, avionics and much more. Hard cover, 1800 pages. \$25.

OBTAINING & INTERPRETING TEST SCOPE TRACES

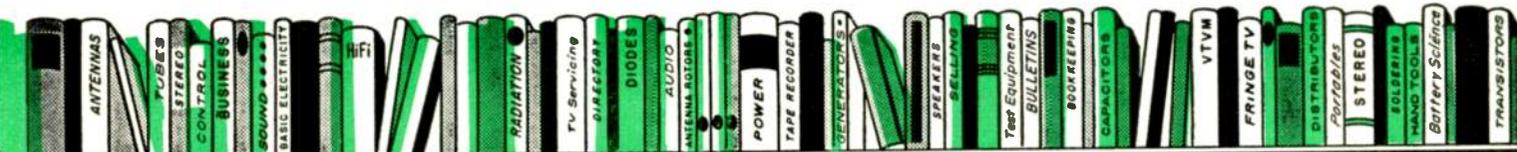
By John F. Rider. This handbook shows how to get the most out of your oscilloscope. Over 800 traces are shown, including sine, square, rectangular, trapezoid, sawtooth differentiated and integrated types. Explains scope connections, manipulating controls and test setups. Soft cover, 190 pages. Price \$2.40.

SMALL APPLIANCE SERVICING

By P. T. Brockwell, Jr. This volume gives you professional small appliance servicing techniques and business procedures. Illustrated instructions tell how to test units. Covers irons, toasters, mixers, roasters, coffee makers, waffle irons, rotisseries and others. A profitable sideline for TV technicians. Hard cover, 180 pages. Price \$4.50.

ELECTRONIC TECHNICIAN editors have carefully selected these books by the world's leading technical publishers. Order direct from our Book Department. Fill in coupon or separate sheet. Money-back guarantee.

★ Star denotes book listed here for the first time.



SERVICING TRANSISTOR RADIOS

By Leonard D'Airo: After a brief discussion of fundamentals, the text goes into radio circuits, servicing techniques, tests, measurements and dictionary of transistor terms. Interchangeability chart covers a variety of close replacements, including number and type. Soft cover, 224 pages. Price \$2.90.

Books Described Previously

BASIC TELEVISION (5 vols.)	\$10.00
INTRODUCTION TO PRINTED CIRCUITS	\$ 2.70
BASIC ELECTRONICS (5 vols.)	\$10.00
INTRODUCTION TO COLOR TV	\$ 2.70
INTRODUCTION TO UHF CIRCUITS & COMPONENTS	\$ 7.50
PROFITABLE RADIO TROUBLE-SHOOTING	\$ 5.95
ELEMENTS OF MAGNETIC TAPE RECORDING	\$ 7.95
MANDL'S TELEVISION SERVICING	\$ 6.50
CLOSED CIRCUIT & INDUSTRIAL TV	\$ 4.95
ELECTRONIC MUSICAL INSTRUMENT MANUAL	\$ 7.50
REPAIRING RECORD CHANGERS	\$ 5.95
TRANSISTORS IN RADIO AND TELEVISION	\$ 7.00
HANDBOOK OF BASIC CIRCUITS, TV, FM, AM	\$ 7.50
PINPOINT COLOR TV TROUBLES IN 15 MINUTES	\$ 5.95
PORTABLE AND CLOCK RADIOS	\$ 2.75
PINPOINT RECORD CHANGER TROUBLES	\$ 3.95
TV DOCTOR	\$ 1.00
VACUUM TUBE CHARACTERISTICS	\$ 1.80
BASIC PULSES	\$ 3.50
STEREOPHONIC SOUND	\$ 2.25
FUNDAMENTALS OF TRANSISTORS	\$ 3.50
INDUSTRIAL ELECTRONICS HANDBOOK	\$22.50
REPAIRING HI-FI SYSTEMS	\$ 3.90
A-C CIRCUIT ANALYSIS	\$ 1.80
AUDIO MEASUREMENTS	\$ 2.90
ELECTRONICS IN INDUSTRY	\$ 8.50

To order above books, write in title and price on coupon.

ELECTRONIC COMMUNICATIONS

By Robert Shrader. Starting with electronic fundamentals, this comprehensive reference text goes through transmitters, FM, antennas, TV, shipboard radio, loran, radar and communication law. Chapters end with two sets of questions, one to prepare the reader for commercial FCC exams, the other for amateur licenses. Hard cover, 937 pages. Price \$13.

TV CONSULTANT

By H. G. Cisin. Rapid TV trouble-shooting methods used here pinpoints cause of problem according to 24 sound symptoms. 213 pix symptoms and over 75 raster symptoms. Checks for each problem are noted. Also presented are explanations of rapid alignment technique and UHF servicing. Soft cover, 70 large pages. Price \$2.

Also See New Books on Page 99

FREE!!

STATION LISTINGS BOOK

With every book order for \$7.50 or more, you will be sent—without charge—a copy of the 64-page reference book, "Jones North American AM-FM-Radio-TV Station Listings." It lists over 5000 stations from official FCC information. Covers the United States and possessions, Canada, Cuba, Mexico and West Indies. Stations are cross-referenced by geographic location, by frequency and by call letters. Lists AM and TV network affiliations and AM operating power. A wealth of broadcasting information!

ELECTRONIC MARKETERS
(ELECTRONIC TECHNICIAN Book Dept.)
480 Lexington Avenue
New York 17, N.Y.

I plan to build my technical library. Please send me the books I have indicated below. You will pay postage. I understand that if I am not satisfied with any book for any reason, I may return it to you prepaid in good, clean condition within 7 days of receipt and receive a complete refund. If my order is for \$7.50 or more, I will receive a free copy of the Station Listings Book.

Enclosed is my check or money order, in full payment, made out to ELECTRONIC MARKETERS.

- ___ Home Air Conditioning Installation & Repair @ \$ 3.50
- ___ Industrial Control Circuits @ \$ 3.90
- ___ Rider Combination Manual @ \$27.00
- ___ Fundamentals of Radio Telemetry @ \$ 2.95
- ___ Shoot TV & Radio Trouble Fast @ \$ 1.50
- ___ Basics of Digital Computers @ \$ 7.50
- ___ Impedance Matching @ \$ 2.90
- ___ Radio Operator's License Q & A Manual @ \$ 6.60
- ___ How to Service Tape Recorders @ \$ 2.90
- ___ Marine Electronics Handbook @ \$ 3.95
- ___ Guide to Mobile Radio @ \$ 2.85
- ___ How to Run a Small Business @ \$ 4.95

- ___ Radio Engineering Handbook @ \$25.00
- ___ Obtaining and Interpreting Test Scope Traces @ \$ 2.40
- ___ Small Appliance Servicing @ \$ 4.50
- ___ Servicing Transistor Radios @ \$ 2.90
- ___ Electronic Communications @ \$13.00
- ___ TV Consultant @ \$ 2.00

BOOKS IN PREVIOUS ISSUES:

Enclosed is total payment of \$ _____ @ \$ _____
(If you have New York City address, add 3% sales tax)

Name _____
Address _____
City _____ Zone _____ State _____

Winegard's

GOT EVERYTHING...

NOW, THERE ARE THREE COLOR'CEPTOR MODELS!

SUPER COLOR'CEPTOR MODEL SCL-4

NEW SUPER COLOR'CEPTOR HAS FOLD-OUT DRIVEN ELEMENTS, NEW TYPE BOOM SUPPORT AND 2 ONE PIECE WRAP-AROUND MAST CLAMPS.

Now the powerful new Super Color'Ceptor adds a third dimension to the popular Color'Ceptor series. 14 elements including the patented electro-lens* director system. All channel—black and white and color, completely factory pre-assembled with new type fold-out driven elements *Bright Gold Anodized* Model SCL-4 — \$38.95 list.

*U. S. Pat. 2,700,105, Canada 511,984.



THE COLOR'CEPTOR MODEL CL4 — America's Most Copied Antenna. The one antenna consumers know by name. For superior reception, black and white and color — all channels 2-13. 11 elements. *Bright Gold Anodized*. Patented Electro-lens director system. Installs easy — sells fast. Model CL-4. \$29.95 list.

COLOR'CEPTOR WITH POWER PACK MODEL CL-4X. Most Powerful All Channel Antenna Made. Adds 5 directors and 2 reflectors to regular Color'Ceptor to make most powerful performing antenna on the market. Guaranteed in writing to outperform any all channel antenna made. 18 elements. All channels, 2 to 13. Black and white and color. *Bright Gold Anodized*. Model CL4X — \$44.90 list.

COLOR'CEPTOR ONLY ANTENNA GUARANTEED TO PERFORM TO YOUR CUSTOMER'S SATISFACTION.

Winegard's Gold Bond Guarantee guarantees satisfaction on your customer's home or Winegard refunds the full list price — and you still keep your profit. It's the strongest guarantee in the industry.

WINEGARD ANODIZING — More than a beauty treatment, Winegard Anodizing is the most permanent corrosion-proof finish you can give aluminum. Exclusive Winegard Gold pigment (unlike dyes) is *bright* and *sunfast* — lasts far longer than the usual short-cut finishes. Only Winegard has it!

ADVERTISED MONTH AFTER MONTH IN LIFE!

Write today for complete bulletins — specify models!



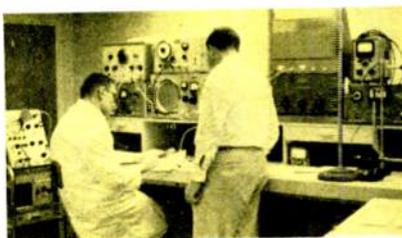
the most complete line of antennas for your profit and progress

VHF - UHF - FM

Why stock incomplete lines that don't have step-up sell? Antennas that are short on features short-circuit your cash register! Sell Golden Winegard — full line — best known, most advertised in LIFE, Better Homes & Gardens, Successful Farming, Sunset, TV Guide.



WINEGARD RESEARCH AND DEVELOPMENT LABORATORY



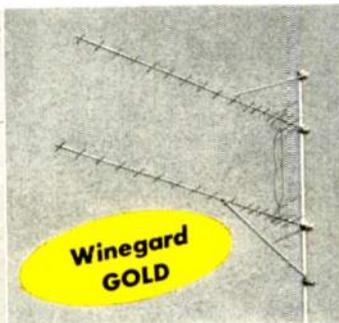
Continuous experimentation and testing go on in Winegard's ultra-modern electronic laboratory. A few Winegard firsts developed from research are—First Gold anodized antennas, First All Channel VHF Yagi, First and only Patented Electro-Lens Design, First One Piece Wrap-around Mast Clamp, First Universal Roof Mount, First Transcoupler Yagis and more.



MODEL TC1 — BEST ANTENNA EVER DESIGNED FOR STACKING BECAUSE OF NEW WINEGARD TRANSCOULER FEATURE—A LINEAR TRANSFORMER THAT SWINGS INTO POSITION FOR PERFECT STACKING ASSURES PERFECT 300 OHM MATCH All channels VHF — use single or stack 2 bays, for 100% power increase Patented Electro-lens director system. Extremely high gain on channels 7 to 13. Bright Gold Anodized Model TC1 — \$19.95 list



TRANSCOULER YAGIS — NEW SUPER EFFICIENT TRANSCOULER YAGIS 3, 6, 12 ELEMENT. Absolutely the most efficient cut-to-channel and broad band yagis ever built. Use a three element where a five was used, a six for a ten, and a twelve for really tough reception problems. Unique Transcoupler bars swing into position for perfect 300 ohm match and simplest stacking ever devised. In stacking, 100% of power is delivered from both bays. Bright Gold Anodized, wide spaced design. 42 different models.



TRANS'CEPTOR MODEL 20/20 NEW 40 ELEMENT UHF TRANSLATOR ANTENNA. Super powerful, precision engineered for translator channels 72-83 (800-900 mc). This stacked array incorporates 40 wide spaced elements for maximum signal pick-up. Has combined power of UHF corner reflector and a UHF yagi. Model 20/20 packed two to carton with stacking bars. \$20.60 list . . . single bay \$9.95.



"TURNSTILE" FM ANTENNA MODEL FM3T — NEW FM ANTENNA HAS UNIQUE OFFSET MOUNT. Mounts on same mast as TV antenna Picks up all directions 100 miles and more Delivers maximum results all across the FM band of 88-108 mc. 2 bays give 40% power increase 3 bays 68%. 4 bay 96% Completely factory pre assembled Bright Gold Anodized Model FM3T — \$11.95 list

Model FM3A "Turnstile" — has same antenna head as above but includes universal roof mount** lead in wire, etc. Complete kit Model FM3A. \$17.95 list.

WINEGARD ENGINEERING FOR "SPECIAL AREA" ANTENNAS. Winegard offers special antennas individually engineered for an area problem. You are invited to take advantage of Winegard's ultra-modern antenna research and testing facilities.

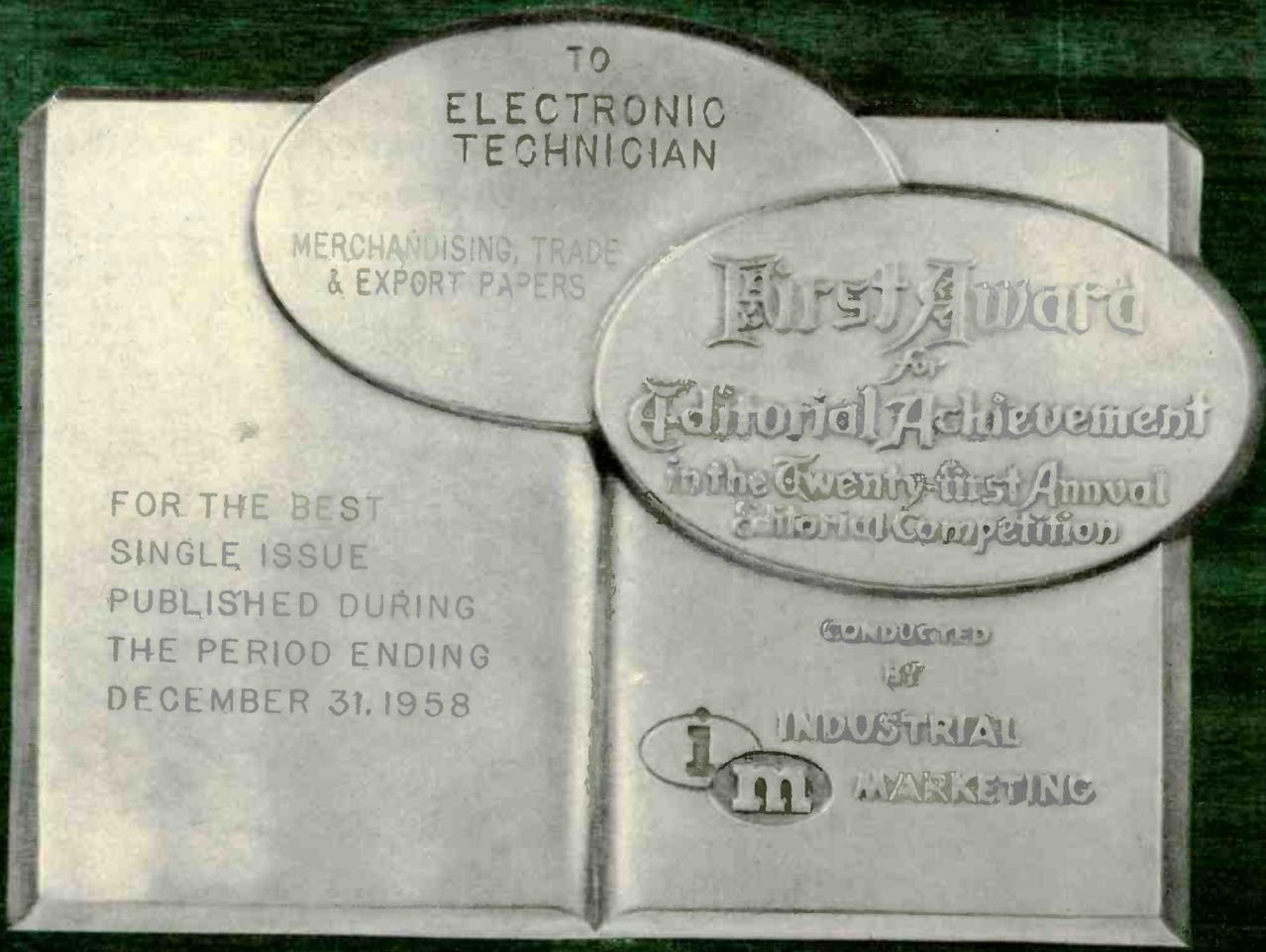
WINEGARD ECONOMY LINE ANTENNAS START AT JUST \$2.44 LIST. Write for complete information on full line of plain aluminum ECONOMY kits and antennas.

Winegard Co.

3019-8 Scotten Burlington, Iowa

Buy the Leader
and be one!





World's Largest Electronic Trade

ELECTRONIC



**FIRST
AWARD**

for **EDITORIAL
EXCELLENCE**
to **ELECTRONIC TECHNICIAN**

In the 1959 Industrial Marketing Annual Editorial Competition for Business Papers there were five hundred fifty-five entries. This annual event in the publishing field is the counterpart of the "Oscar" and "Emmy" awards in the entertainment field. The coveted **FIRST PRIZE** in its division for the **BEST SINGLE ISSUE** published in 1958 was awarded to **ELECTRONIC TECHNICIAN**—for its monumental September Issue on the subject of Stereo.

A RECORD of FIRSTS and EXCLUSIVES

It's no accident that Electronic Technician took first prize. E.T.'s record of industry leadership in its editorial service and beyond the printed page are indicated by these firsts and exclusives:

1. E.T.'s Annual Buyers Directory is the only one in the industry.
2. E.T.'s Circuit Digest Section is the most costly reader aid in the field.
3. E.T.'s Business Statistics are industry standards, included every year in such references as the World Almanac.
4. E.T.'s exposure of the reprocessed tube racket, its test report on consumer ratings, and disclosure of illegal radiation reflect aggressive and constructive journalism.

SHEER EDITORIAL INTEGRITY is the basic reason why

* **MORE ELECTRONIC MAINTENANCE TECHNICIANS SUBSCRIBE TO ELECTRONIC TECHNICIAN THAN TO ANY OTHER ELECTRONIC TRADE MAGAZINE IN THE WORLD.**

* **MORE ADVERTISERS PLACE MORE ADVERTISING IN ELECTRONIC TECHNICIAN THAN IN ANY OTHER ELECTRONIC MAINTENANCE TRADE PUBLICATION.**

Circulation—80,000* ABC PAID. (Publisher's Estimate subject to ABC Audit)

TECHNICIAN

480 Lexington Avenue, New York 17, N. Y. • YUkon 6-4242

SHOP HINTS



Tips for Home and Bench Service

Aligning Auto I-F's

In auto radio production, wax is normally dropped into the i-f core to prevent it from moving after alignment. The wax must be melted before attempting to turn the core, or damage to the transformer will occur.

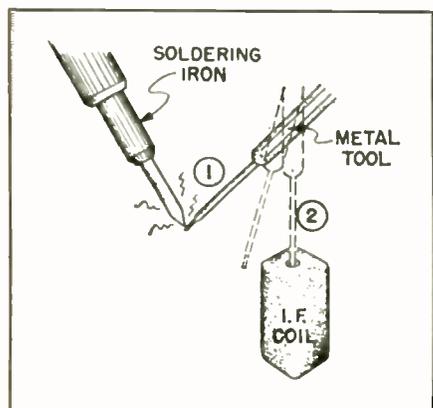


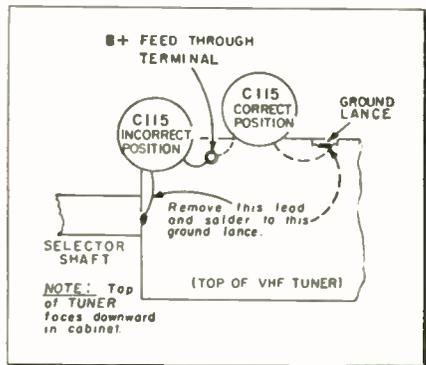
Fig. 1—Heating an alignment tool unfreezes wax dropped into i-f cores during production.

To prevent damage, simply heat the tip of a small metal alignment tool and insert it into the wax as shown in Fig. 1. Repeat this two or three times until the wax is melted and the core turns easily. Avoid forcing the core.—Delco Radio Div., General Motors Corp.

TV Tuner Revision

Symptoms such as a weak picture, increased snow in fringe areas or

Fig. 2—Regrounding a tuner capacitor improves RCA series 170 portable receiver operation.



interference beats can be caused by capacitor C115 (0.039 μ f) in Fig. 2 being improperly grounded. A visual check of this capacitor can be made by removing the VHF tuning knob and observing the front edge of the tuner through the opening. If the capacitor is grounded at the front edge of the tuner instead of the ground lance located on top of the tuner, midway between the front rear, it should be unsoldered and grounded to the proper location.—RCA Service Company, Camden, N. J.

Tube Socket Repair

On occasion, a tube socket pin may break and a spare pin is not readily available. Rather than replace the entire defective socket with a similar type usually stocked, repairing the

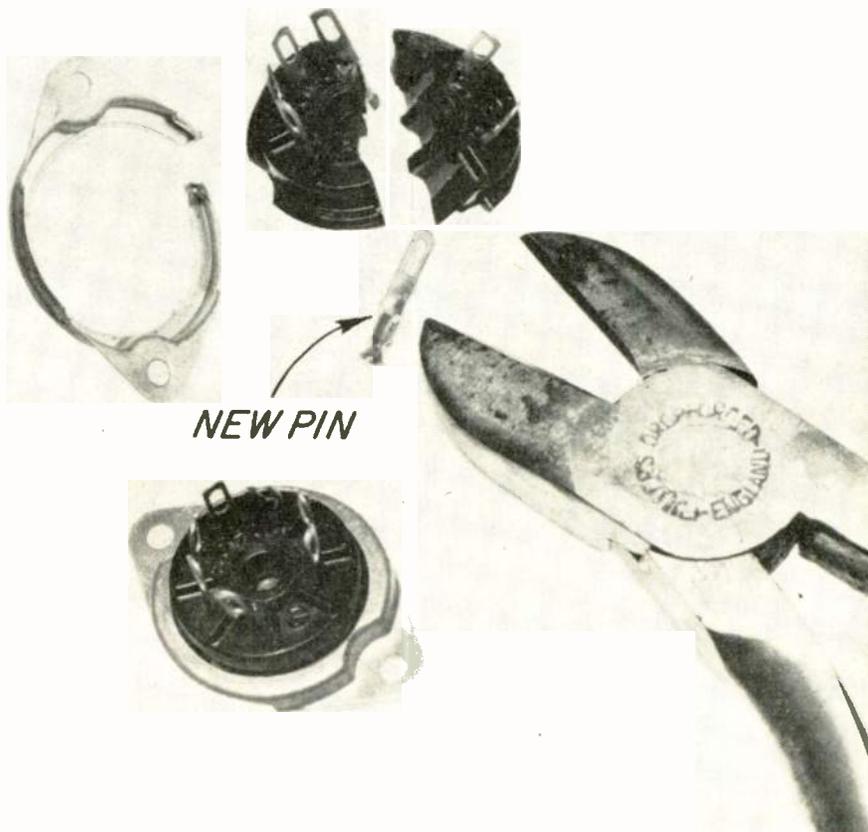
socket will save considerable time and avoid the possibility of a wiring error.

Cut the bakelite of a similar type socket with a pair of diagonal cutters and remove a good pin, see Fig. 3. Then, remove the broken pin of the original socket by exerting pressure from the bottom with a small punch or screwdriver. Insert the new pin into the original socket from the top of the chassis, pulling it through with needle nose pliers.—M. E. West, Lenoir, N. C.

SHOP HINTS WANTED!

\$3 to \$10 for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do. Photos are desirable. Unacceptable items will be returned. Send your entries to "Shop Hints" Editor, ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

Fig. 3—A new socket pin avoids time-consuming replacement of an entire defective socket.





**Dependability
is a
built-in
feature
of
all
Delco
Radio
Service
Parts!**



Take speakers, for instance. Delco electronic speakers are built rugged for long life and resistance to extreme weather conditions. You can rely on them for exceptional power handling and rich distortion-free tone.

Delco's popular 8-inch "Hi-Fi" speaker, No. 8007, provides the most power and tonal range for the money. Designed for replacement use and high fidelity audio systems, it's a good, fast seller with price and quality appeal.

For speakers, transistors, transformers and other fine parts for Delco and other radios, see your Delco Electronic Parts Distributor. He carries the complete line. Other extras you get with Delco are • Wide selection of special application parts • Complete technical training program • Effective warranties • Dealer identification signs.

Stock with Delco Electronic Parts—more dependability and reliability for your customers, more profit for you.

DELCO
DEPENDABILITY
RADIO
RELIABILITY

Division of General Motors • Kokomo, Indiana

Available everywhere through
Electronic Distributors
associated with



FREE LITERATURE

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

corresponding to the items of interest. Cut out and mail to **ELECTRONIC TECHNICIAN**

1 Capacitors: Elmenco dipped mylar paper capacitors, available in 5-paks on a merchandising rack, are described in a 2-page bulletin, #101. (1B8: Arco Electronics, Inc.)

2 Master TV Systems: Catalog sheets and specification folders form a bidder's guide for master TV systems: Illustrations of components and their technical specs; cost sheet and installation instructions are included. (2B8: Blonder-Tongue Labs.)

3 Two-Way Radio: Literature is available on the Comco model "707 Jetcom." Although designed for airline operation in jet service vehicles, this unit has wide application. (3B8: Communications Co.)

4 Test Instruments: A new catalog provides illustrations, descriptions, specifications and prices of the firm's line of test instruments. Wired and kit. (4B8: EICO)

5 Tuners: Literature covers AM-FM tuner Model-085-ER featuring an etched wiring board, two i-f stages, limiter, and Foster-Seeley discriminator circuit. (5B8: Erie Resistor Corp.)

6 Two-Way Radio: Citizens Band 2-way radio communication equipment, operating in 27 mc band, is described in new literature. (6B8: Globe Electronics)

7 Two-Way Radio: G-11 citizens communicator 2-way radio for class D use, operating on 22 channels within 11-meter range, is covered in a new booklet, "11-meter Citizens Band Radio." A technician-dealer plan is also available. (7B8: Gonset Div.)

8 Coils: A new 88-page TV coil replacement guide, catalog #160, gives complete coverage of TV coils and provides a quick reference source for replacement. Thousands of original parts are cross-referenced to the firm's equivalents. 300 new chassis listings are included. (8B8: J. W. Miller Co.)

9 Components: New 32-page illustrated catalog, #30, lists more kinds of components than previous editions, and an increased selection in the long-established varieties. (9B8: Ohmite Mfg. Co.)

10 Test Instruments: A 4-page illustrated catalog describes the firm's line of test instruments, in kit form. Features, specifications and prices are included. (10B8: Paco Electronics Co.)

11 Dealer Program: As described in 16-page brochure, bonded program provides business aids and listings in yellow pages, *TV Guide* and *Look*. Free merchandising kit available to full-time independents only. (11B8: Raytheon)

12 Service Aids: Catalog #59 contains 16 pages of products designed to shortcut shop work. It includes: compounds, stroboscopes, sprays, magnetic base lamp, speaker cone cement, etc. (12B8: R-Columbia Products Co.)

13 Power Transformers: Data sheets cover 3 new power transformers for use with silicon rectifiers. Designed to supply the d-c voltages for transistors through a full wave bridge or bridge rectifier from 115 v. 60 cycle source, these transformers may also be used in voltage doubler circuits at one-half the rated current. (13B8: Triad Transformer Corp.)

CUT HERE

Use this coupon, or your letterhead, before September 20, 1959

1. Circle free literature numbers. 1 2 3 4 5 6 7 8 9 10 11 12 13

2. For more data on new products and bulletins write code numbers

3. Fill in your name and address. Mail promptly.

Name

Position Firm

Address

City Zone State

1. Circle numbers of free literature desired.

2. For more data on new products and bulletins described in this issue, write in **ELECTRONIC TECHNICIAN** code number found at end of each item.

3. Fill in name and address. Mail to **ELECTRONIC TECHNICIAN**, 480 Lexington Ave., New York 17, N. Y.

GET *more!* DO *more!* MAKE *more!*

PROFIT PROFESSIONALLY ON EVERY CALL WITH

NEW **B&K**

**LOW-COST PROFESSIONAL
Model 550 DYNA-QUIK
DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER**



Model 550

NET **\$119⁹⁵**

MODEL 550 DYNA-QUIK TUBE TESTER

Tests Each Section of Dual-Section Tubes Separately

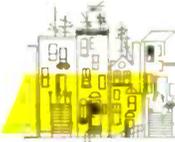
Great new value in professional quick-check at small cost. Provides more tube sockets to test more tubes faster. Accurately checks most of the TV and radio tubes usually encountered in everyday service work. Tests each section of dual-section tubes separately. Measures true dynamic mutual conductance. Checks tubes for shorts, grid emission, gas content, and leakage. Completely tests each tube in seconds, checks average TV set in a few minutes, in home or shop. One switch tests everything. Fast, convenient reference listings on socket panel. Patented circuit provides automatic line voltage compensation. 7-pin and 9-pin straighteners on panel. Handsome, luggage-type carrying case. Net, \$119⁹⁵

MODEL 650 DELUXE DYNA-QUIK

Today's Finest Portable Tube and Transistor Tester

Accurately checks over 99% of the tubes most widely used in television receivers, plus popular home and portable radio tubes. Tests over 600 tube types. Lists over 125 most popular tube types, with settings, on socket panels for maximum operating speed. Complete listing in fast, index-type selector. Measures true dynamic mutual conductance. Tests each section of multiple tubes separately for GM, Shorts, Grid Emission, Gas Content and Life. Includes 16 spare sockets and ample filament voltages for future new tube types. Transistor Section checks transistors, diodes, and selenium rectifiers. Luggage-type carrying case. Net, \$169⁹⁵

Every service-technician now can easily check tubes the B&K professional way! Only with a *genuine dynamic mutual conductance tube tester* can you make a complete and accurate test under the actual dynamic operating conditions of the TV set. The compact new "550" is not just an emission checker. *It completely checks more tubes faster*—with laboratory accuracy. And the cost is so amazingly low, it pays its way over and over again! Take a tip from thousands of professional servicemen—use B&K Dyna-Quik. There is nothing like it.



Get More for Your Money

—IN SPEED, ACCURACY, AND VALUE



Save Customers

—SAVE CALL-BACKS, SAVE COST



Sell More Tubes

—MAKE MORE MONEY PER CALL



Model 650

B&K

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

Canada: Alfa Radio Corp., 50 Wiegold, Toronto 10, Ont.
Export: Empex Exporters, 277 Broadway, New York 7, U.S.A.

See Your Distributor or Send Now for Bulletin ST24-T

Electronic Artificial Larynx

Medicine & Electronics Team Up To Provide For Lost Vocal Cords

• Since 1926 the Bell System has made available to laryngectomees and others who have lost use of their vocal cords, an artificial larynx. The present model is an air-actuated mechanical device utilizing a vibrating metal reed to generate sound. Introduced into the person's mouth, this sound is then formed into speech by normal movements of the vocal tract.

For hygienic and other reasons, the present mechanical artificial larynx has not been completely satisfactory. Nevertheless, thousands of afflicted persons have regained their ability to speak and carry on normal activities by using the mechanical device. There are several thousand of these artificial larynges in use.

Today there are more than 35,000 individuals in this country who have had their larynx removed. Some lesser numbers have had a partial laryngectomy. Available data indicates that the frequency of surgical procedures on the larynx has increased steadily during the past six years. In the United States alone the present rate of laryngectomy operations is about 2,500 per year. And the problem isn't limited to this

country. Many of these laryngectomees can learn to communicate by esophageal speech, for which an artificial larynx is not required. But a sizable number are unable to master esophageal speech, and their only means of speaking is with an artificial larynx.

During 1955 and 1956 a considerable number of suggestions was received for improving the mechanical artificial larynx, both from members of the medical profession and users of the device. Subsequently, arrangements were made to discuss the matter with staff members of the National Hospital for Speech Disorders, an organization comprising some of the nation's foremost surgeons specializing in surgery on the larynx.

On the basis of meetings with this group, Bell Telephone Laboratories undertook a formal investigation of the problem. The medical specialists were most helpful in providing statistical data and assisting in conducting tests on the speech of laryngectomees.

Through such cooperation as this, plus a background of research in acoustics and electronics, an artifi-

cial electronic larynx, that is in many ways superior to the old mechanical type, has been brought to the development stage.

With a minimum of difficulty and training, laryngectomees can use the new electronic larynx to speak conversationally. It is especially effective when conversing over the telephone. By means of a finger-operated combination push-to-talk switch and inflection control, the user can easily control the pitch of his artificial voice, thus giving his speech a natural sounding quality previously unobtainable.

The underlying principle of the new artificial larynx is a vibrating transducer held against the throat. Completely self-contained and cylindrically shaped, it measures only 1¾ inches in diameter by 3¼ inches long—thus acceding to complaints of laryngectomized people for an unobtrusive device. Included in this one small package is a modified telephone receiver serving as the throat vibrator, a highly-efficient transistorized pulse generator with pitch control, and a battery power supply.

(Continued on page 101)

Electronic artificial larynx utilizes a modified telephone receiver to transmit sound into person's throat. Voice can be made to sound natural by manipulating pitch control switch while talking.

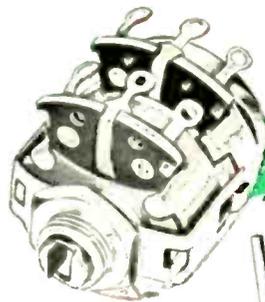


While F. E. Haworth (r) speaks by means of artificial larynx, H. L. Barney takes reading on a sound-level meter. Output speech volume is equivalent to that of normal talker.





Stereo balance made easy with Clarostat dual channel controls Series AD47

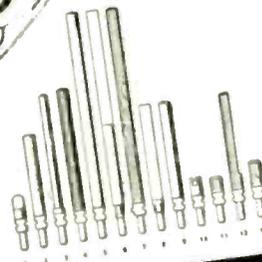


In stock, high-quality balance for stereo sound—Clarostat dual-channel ½-watt carbon controls. Two completely isolated pots on a common shaft that permit a variety of balancing operations on the input side of dual channel amplifiers. A wide range of values meets every usual requirement.

- FOR VOLUME CONTROL
- FOR TONE CONTROL
- FOR BALANCE CONTROL
- FOR BIAS CONTROL

Write for complete catalog...

with your choice of shaft ...



Takes any one of 13 standard shafts. Offering choice of length and configuration.

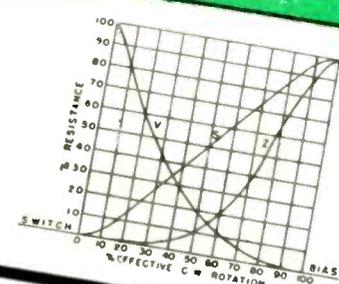
with or without switch ...



Series SWE "AD-A-SWITCH" permits easy, fast attachment in the field. Various pole arrangements and current ratings.

in appropriate tapers ...

S, V, and Z tapers available. Permits best control for specific amplifier characteristics.



% Effective C.W. Rotation	S Taper Resistance (ohms)	V Taper Resistance (ohms)	Z Taper Resistance (ohms)
0	0	100	100
20	10	80	80
40	20	60	60
60	30	40	40
80	40	20	20
100	50	10	10



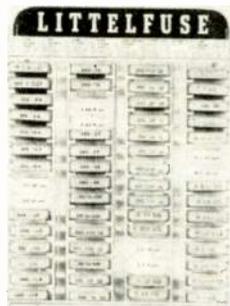
Controls and Resistors
CLAROSTAT MFG. CO., INC., DOVER, NEW HAMPSHIRE
 In Canada: CANADIAN MARCONI CO., LTD., TORONTO 17, ONT.

New Tubes & Components

For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 66.

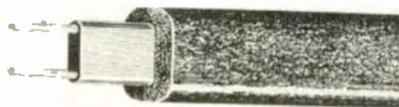
Littelfuse FUSE RACK →

The Fusemaster is a new wall-mounting rack containing 60 different types (300) fuses. The fuses are those most commonly needed. The clear plastic rack has a printed board backing that tells when a particular fuse type is out of stock. Blank white pressure sensitive labels, for altering the inventory listing on the back board, are furnished with the rack. The back is pre-drilled to facilitate easy wall mounting. Littelfuse, Inc., Des Plaines, Ill. (ELECTRONIC TECHNICIAN 8-2)



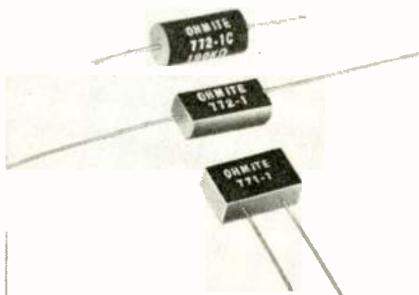
Belden CABLES →

PERMOHM is a new 300-ohm TV lead-in cable. It provides constant impedance, and offers lower losses and better reception of VHF, UHF and color signals in all areas, and improves reception in fringe areas where long leads are used. Constructed of copperweld conductors and virgin polyethylene primary insulation encapsulated in cellular polyethylene. Available in 50', 75' and 100' lengths. Packaged in display merchandisers, 500' dispenser cartons and 100' spools. Belden Mfg. Co., 415 S. Kilpatrick Ave., Chicago 44, Ill. (ELECTRONIC TECHNICIAN 8-5)



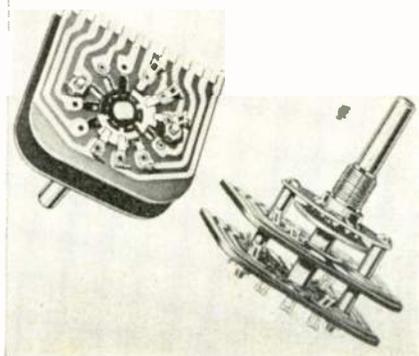
Ohmite FILM RESISTORS →

There are 7 different sizes and a total of 3 styles in the expanded line of metal film precision resistors. Most of the sizes are rated ½ watt at 125°C. The largest and highest resistance units are rated 1 and ½ watts, respectively, at these temperatures. They provide a resistance range to one megohm. Sizes are even smaller than before. Covered in Bulletin 155. Ohmite Mfg. Co., 3625 Howard St., Skokie, Ill. (ELECTRONIC TECHNICIAN 8-3)



Centralab SWITCHES →

Printed circuit switches, series 20, are rated at 2 amperes 15 volts d-c, 150 ma at 110 volts a-c (make and break, resistive load); voltage breakdown is 1000 volts RMS and the switches have a rotational life of 10,000 cycles minimum. Constructed of laminated phenolic sections 1¾" high and 2" wide. Available with multiple and staked single or dual section assemblies, with combinations from one pole-12 positions through 6 pole-2 positions. Covered in Bulletin EP-757. Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis. (ELECTRONIC TECHNICIAN 8-4)

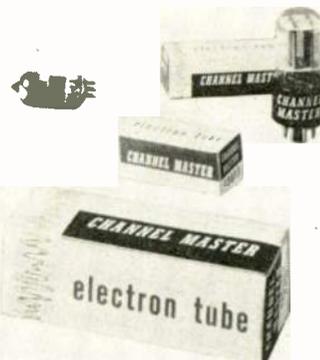


CBS AUDIO TUBE

The new 50FY8 miniature triode-pentode combines the voltage and power amplifiers. It features low plate and screen voltage requirements, and provides 2.7 watts output in single-ended class A operation. A pair of 50FY8's are the only tubes required in a stereo amplifier utilizing the CBS modified simplex circuit. Such an amplifier can provide up to 3.5 watts per channel. Described in Bulletin E-334. CBS Electronics, Danvers, Mass. (ELECTRONIC TECHNICIAN 8-6)

Channel Master TUBES

Announcement is made of the firm's entry into the receiving tube field. Premium quality tubes are manufactured exclusively for them by the Nippon Electric Co., in Japan, one of that country's largest producers of electronic equipment, and are sold through Chan-



nel Master distributors. Initially, 22 of the fastest moving receiving tube types are being sold. A complete line of TV picture tubes, now sold on the West coast only, will soon be available nationally. Channel Master Corp., Ellenville, N. Y. (ELECTRONIC TECHNICIAN 8-1)

Westinghouse TV PICTURE TUBE

Type 23BP4, a new 110° cathode ray tube, provides 20 square inches more viewing surface when compared to conventional 21" picture tubes. Features: safety panel sealed to the tube by epoxy resin; double faceplate construction which eliminates the implosion glass; laminated panel for increased safety and smaller horizontal and vertical deflection angles that prevent the electron beam from grazing the neck of the tube. It provides increased picture brightness and contrast with less distortion and glare. Westinghouse Electronic Tube Div., P.O. Box 284, Elmira, N. Y. (ELECTRONIC TECHNICIAN 8-7)

NEW DIFILM[®] BLACK BEAUTY[®] MOLDED CAPACITORS

BEAT THE HEAT AND HUMIDITY!

Now Sprague's new DIFILM BLACK BEAUTY MOLDED CAPACITORS have taken the steam out of heat and humidity problems. These capacitors are so good you can *boil 'em* for 24 hours without affecting their performance.

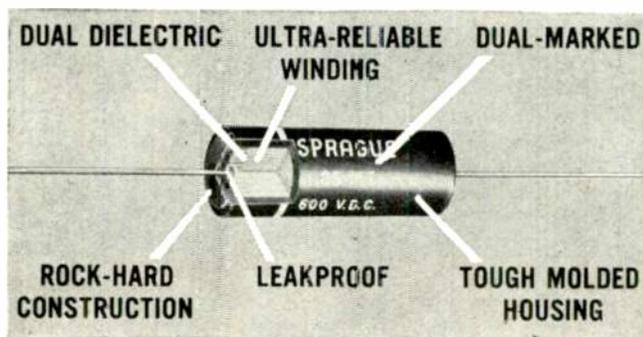
Unlike straight polyester film tubulars, these capacitors operate in a 105°C environment *without derating*.

And the heart of these new DIFILM capacitors can't be beat. It's a dual dielectric which *combines the best advantages of both Mylar* polyester film and the highest grade of paper dielectric*. A rock-hard solid impregnant fills every void and pinhole in the film.

Talk about *reliability!* . . . these capacitors have it. DIFILM capacitors are actually low cost versions of the Sprague capacitors now being used in every modern military missile. The basic reliability and outstanding performance of missile-type Sprague capacitors are all yours in this outstanding new development. Why take chances when you can get the best—DIFILM BLACK BEAUTY MOLDED TUBULARS . . . at regular prices.

For the complete DIFILM BLACK BEAUTY story, write for Bulletin M-759 to Sprague Products Company, 65 Marshall St., North Adams, Mass.

*DuPont trademark



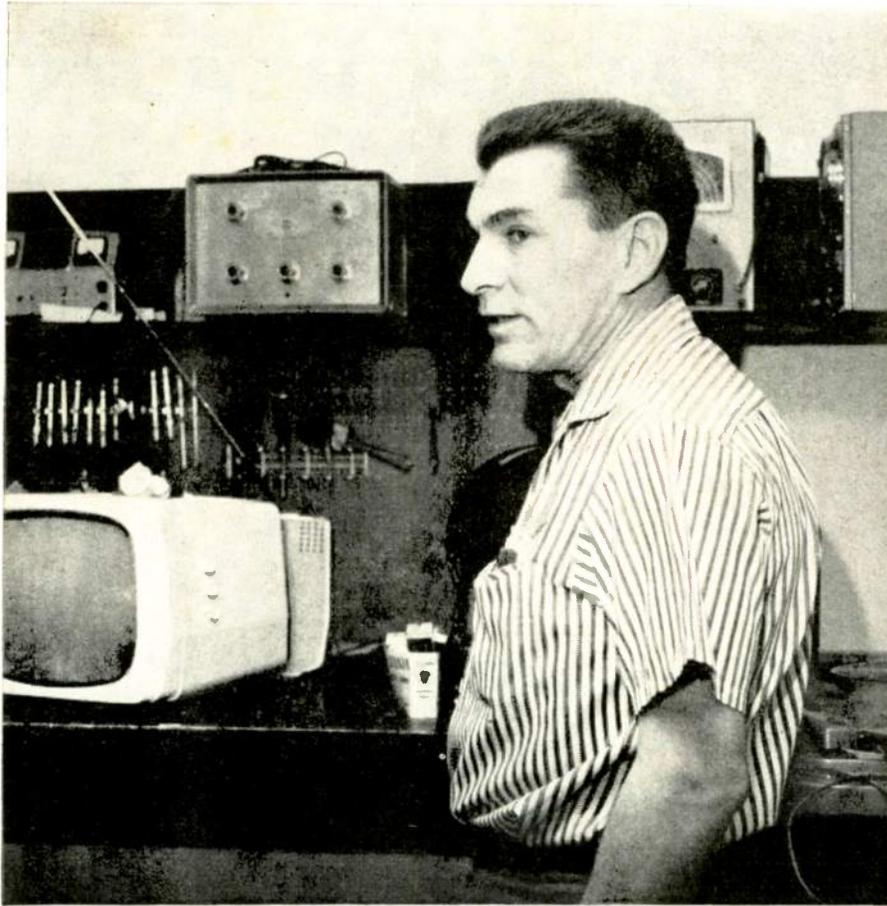
DIFILM BLACK BEAUTY CAPACITORS are now packed in reusable, rigid plastic Klee-Pak[®] boxes at no extra charge.

The major capacitor improvements come from

SPRAGUE[®]

world's largest capacitor manufacturer

SPRAGUE RESEARCH IS CONSTANTLY PRODUCING NEW AND BETTER CAPACITORS FOR YOU



“The Yellow Pages and word-of-mouth are our two top sources of new business”

*says Weber E. Hopkins, Pres.,
State Electronics, Inc., Salt Lake City, Utah*

A New Standard in TELEVISION Service

We SOLVE Your TV Problems at HU 5-8211

Call Weber Hopkins
or
Call "Gene" Migliore
or
Call Clive Wahlin

Repairs are Quick & Complete ON ALL MAKES
With Salt Lake's Best Service Guarantee
Open 9 to 6 Mon. Thru Fri. 9 to 1 Sat.
2927 Highland Drive

STATE ELECTRONICS INC.
An Association of Master Technicians & Engineers

STATE ELECTRONICS BUILDS IDENTITY and business with this 1/4-page ad (reduced) under TELEVISION-REPAIRING plus listings under 8 classifications and trade-marks.

“Between our Yellow Pages ad and customers’ recommendations, we get more service calls than we can handle. Last year we received over 6,000 calls and turned down more than 1,000 because we couldn’t handle them. We credit our Yellow Pages advertising with 30 per cent of this business.”

TV set owners who want to know where to go for reliable service turn to a friend for a suggestion. So often that friend is the Yellow Pages! Build an AWHERENESS of your business through the Yellow Pages and build your business. Call the Yellow Pages man at your local Bell telephone business office now.

Nothing builds business like AWHERENESS—and nothing builds AWHERENESS like the Yellow Pages—the buying guide that tells people WHERE to buy.

Equalizing

(Continued from page 51)

a pickup to determine the response of the pickup.

Equalizing Circuits

How are equalizing circuits made? They are circuits built up from comparatively simple electronic building blocks. Utilizing reactances, an equalizer can be designed to produce a slope in the frequency, as well as peaks and dips. Fig. 5 and 6 show simple circuits to produce a slope at low or high frequencies. The circuit values are chosen for the desired result.

Sometimes a frequency response has a bump or peak as shown in Fig. 7. In this instance, a dip must be incorporated into the equalizer to counterbalance the response rise and achieve a flat response. A circuit pro-

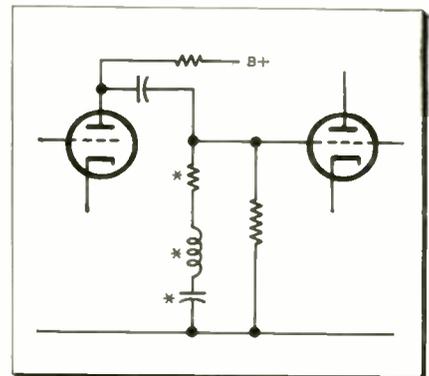


Fig. 8—Circuitry counterbalances unwanted rise in the middle of a frequency response. Components with * determine frequency.

ducing this type of equalization is shown in Fig. 8. At the point where the dip is required, the reactances of the inductor and capacitor neutralize each other and the resistor pulls down the response. At other frequencies, the inductive and capacitive reactances, no longer cancelling each other, are added to the resistor and the response rises until reaching the same position it would be if the three components were not added across the circuit.

Proper equalization will enable equipment to reproduce sound with its natural frequency response, however, it should not be used to correct an inadequate or defective amplifier. ●

Latest Test Equipment

For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 66.

Sencore GENERATOR →

Model HG-104 Transistorized Harmonic Generator simplifies servicing of transistor radios, which often have the transistors soldered into the circuit. By signal tracing to the defective stage with the HG-104, only the faulty transistor need be unsoldered. It provides i-f and r-f signals simultaneously eliminating time consuming set-up and frequency selection. Other applications include trouble shooting tube radios TV, hi-fi and other circuits. \$9.95 Sencore, Addison, Ill. (ELECTRONIC TECHNICIAN 8-9)



Triplett LO-OHMMETER →

Model 308, hand-size Lo-Ohmmeter, has range features including scale length of 3/16" to the 0.1 ohm position. Ranges are Ohms 0-50, 0-500, 0-5,000. 1 ohm center scale on 0.50 range; lowest reading 0.1. Applications include testing motors, armatures, fields, shorts between generator windings and grounds, shorts on TV or radio chassis wiring, etc. Elastic strap can be used to anchor it firmly in the palm of the hand. Triplett Electrical Instrument Co., Bluffton, Ohio. (ELECTRONIC TECHNICIAN 8-8)



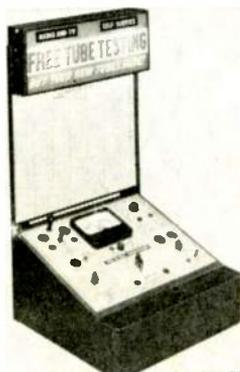
B&K CIRCUIT ANALYZER →

Model A107 Dyna-Sweep Circuit Analyzer connects to 1075 Television Analyst for driving source. It provides vertical and horizontal sync and driving pulses; tracks down troubles in the horizontal and vertical output circuit; checks for shorted turns, leakage, opens, and continuity. It enables check of output circuit both from the grid of the horizontal output tube and from the plate of this stage. Operates on 110-120 volt 50-60 cycle a-c. \$49.95. B&K Mfg. Co., 3726 N. Southport Ave., Chicago 13, Ill. (ELECTRONIC TECHNICIAN 8-10)



Vis-U-All TESTER →

Model 13, a restyled self-service tube, battery and vibrator tester, features the addition of a vibrator tester, exclusive new battery tester and added storage space. The merchandising value of this unit has been increased greatly by these additions, and because of the growing popularity of portable radios and the sale of replacement batteries. Model V13 is also available in counter types, such as V13C, illustrated. These units replace models V11 and V12. Vis-U-All Products Co., 640 Eastern Ave., Grand Rapids 6, Mich. (ELECTRONIC TECHNICIAN 8-11)



H-P OSCILLOSCOPE

Based on a new design principle, "sampling" oscilloscope Model 185A provides a clear and steady display of pulses requiring resolution up to 500 mc. Presentation is on a 5" cathode ray tube face and no optional magnification is needed. Calibrated sweeps are compatible with the bandwidth of the oscilloscope and vary from 1 to 100 msec. An outstanding feature is its rise time—approximately 0.7 msec. It displays fast repetitive waveforms by sampling successive signals. Hewlett-Packard Co., 275 Page Mill Rd., Palo Alto, Calif. (ELECTRONIC TECHNICIAN 8-14)

RCA BATTERY TESTER

WV-37B is designed to test virtually every tube-portable and transistor-portable radio battery. Features include a single switch control; a large meter to indicate battery condition and reads "Replace-Usable-Good" with an addi-



tional scale expressed in percentage of voltage output of the battery test. Front panel has 8 blank write-in spaces for testing future radio types. Leads and probes are permanently attached. RCA Electron Tube Division, Harrison, N. J. (ELECTRONIC TECHNICIAN 8-12)

Motorola GENERATOR

Model T1034-A FM signal generator covers 6 r-f frequency bands between 25 and 960 mc. Ranges are 25-32, 32-41, 41-54, 140-175, 400-470, and 890-960 mc. Each range is calibrated to an accuracy of $\pm 0.5\%$. It covers 4 i-f bands of 2.0-4.2, 4.1-6.0, 6.8-9.4 and 69.0-76.0 mc. Output voltage: continuously variable from 100,000 μV to 0.1 μV calibrated from -8 to -128 dbm. An internal 1,000 cycle oscillator provides a modulating signal which produces 0-15 deviation. Operates from a 117 VAC power source and draws 70 watts. Motorola Inc., Communications & Industrial Electronics Div., 4501 W. Augusta Blvd., Chicago 51, Ill. (ELECTRONIC TECHNICIAN 8-13)

New Products for Technicians

For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 66.

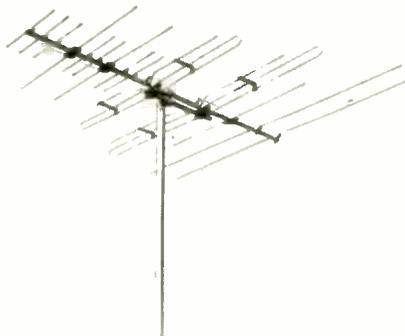
Walsco 2-SET COUPLERS →

Standard Coupler, #1600, and Ultra Low Loss Coupler, #1602, can be mounted on wall or mast prior to attaching the leads. A snap-on cap completes the installation. #1600, a resistive dividing network, is recommended for use in all areas within 20-24 miles of the transmitter. It provides good isolation between TV and FM receivers with only a moderate loss of power. #1602 is intended for locations farther away from the station. \$2.50 and \$3.50 respectively. Walsco Electronics Mfg. Co., Rockford, Ill. (ELECTRONIC TECHNICIAN 8-15)



Winegard ANTENNA →

Super Color'Ceptor, model SCL-4, a gold anodized antenna, features 14 elements of which 2 are driven elements factory assembled to the antenna boom and fold out. It incorporates the Electro-Lens director system providing flat frequency response across the entire VHF band. Construction includes a single antenna boom with a new type of super-strength parallel boom brace. This is the latest addition to the firm's all-channel yagi Color'Ceptor line. Winegard Co., 3000 Scotten, Burlington, Iowa. (ELECTRONIC TECHNICIAN 8-16)



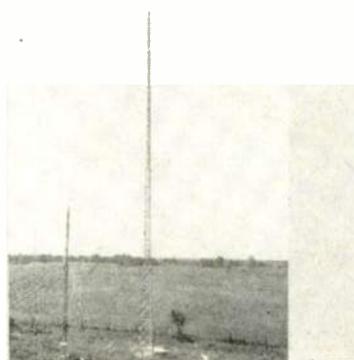
Ungar SOLDERING TIPPLETS →

A higher heat retaining characteristic is featured in the #823 Pyramid and 824 Chisel tipplets. Utilizing a larger diameter design, $\frac{3}{16}$ ", they provide more effective heat transfer and faster heat recovery on production line soldering applications. They are designed for use with Ungar's 47½ watt, #4045, Heating Unit which delivers an 800° temperature. Constructed of tough copper alloy and available unplated or iron clad with a special nickel plating. 1¼" long. Ungar Electric Tools, Inc., 4101 Redwood Ave., Los Angeles 66, Calif. (ELECTRONIC TECHNICIAN 8-17)



Rohn TOWER →

Model "SS" heavy-duty communication tower is designed for a self-supporting height of 130'. It is constructed by using 13 different tower sections of varying weight, structural strength and taper. The sections can be used in many combinations to fulfill different antenna weight and subsequent windloading requirements. All sections are hotdipped zinc galvanized after fabrication; 10' long; tapered sections partially disassembled. Rohn Mfg. Co., 116 Limestone, Bellevue, Peoria, Ill. (ELECTRONIC TECHNICIAN 8-18)



Handicraft PLIERS

Lock-Griplier, a new 5½" tool, has a special locking device at the top to hold the jaws closed, freeing one hand for other duties. The casehardened steel jaws are cam-actuated. Pistol grip construction and levered trigger permit application of strong pressure with minimum physical effort. Handicraft Tools, Inc., 48-41 Van Dam St., Long Island City 1, N. Y. (ELECTRONIC TECHNICIAN 8-22)

Kurman RELAY

Series 51C Midget Relay is claimed to be the smallest, lightest plate circuit relay offering self-wiping contacts. DC operation only. Standard adjustment, 10 milliwatts. 51CB44D factory adjusted for 5 milliwatts; others can be field adjusted. 1 amp. contact rating. Adjustable 2 amp SPDT screw contacts. New rigid front pile-up. Variations, including 5 amp contacts, H.S. military relays, coils to 20,000 ohms available. Mounting 2 #6-32 tapped holes on 0.437" centers. Kurman Electric Co., 191 Newel St., Brooklyn 22, N. Y. (ELECTRONIC TECHNICIAN 8-21)

Int'l Rectifier SILICON POWER RECTIFIERS

A new series of low-cost 25 to 35 amp, 50 to 500 PIV-rated silicon power rectifiers are designed to provide exceptional performance, including operation to 130°C base temperature. Features include: a four-layer seal, a new technical advancement termed "Quad-Sealed," to assure high resistance to humidity, shock, vibration, etc., and an over-sized anode lug, of eyelet construction, which removes heat from the rectifier junction. Covered in Bulletin XSR-310. International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif. (ELECTRONIC TECHNICIAN 8-20)

Switchcraft AMPLIFIER

The "Mix-Amp," a new miniature transistorized amplifier the size of a package of cigarettes, can be used with a microphone in cable circuits up to 30' long, and is ideal for phono pickups. It overcomes loss in the Switchcraft "Mini-Mix" and four-channel microphone mixers; and provides a 3 db. gain. It is equipped with a "Hi-Lo" impedance switch. In "Hi" position when used as a straight amplifier, without mixer, it has a 200,000 ohm input and provides a 6 db gain. In "Lo" position, a 25 db gain with input impedance of 5000 ohms. Frequency response 20 to 20,000 cycles. Switchcraft, Inc., 5555 N. Elston Ave., Chicago 30, Ill. (ELECTRONIC TECHNICIAN 8-19)

New Audio Products

For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 66.

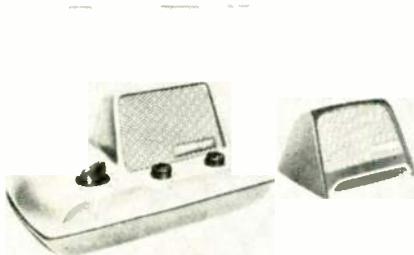
Electro-Voice MICROPHONES →

Three new microphones are introduced by Electro-Voice: Model 729, shown, is a cardioid type designed for PA, amateur radios and home recorders. Frequency response is 60 to 8,000 cps. \$24.50. Model 644 uses a combination cardioid and distributed front opening. Frequency response is 40 to 12,000 cps. \$110.00. Model 652 is a thin dynamic unit that can be used for lectures and broadcasting where microphones should not be obvious. An added 3 to 6 db boost is available in the 6,000 cps range. \$120.00. Electro-Voice, Inc. Buchanan, Mich. (ELECTRONIC TECHNICIAN 8-33)



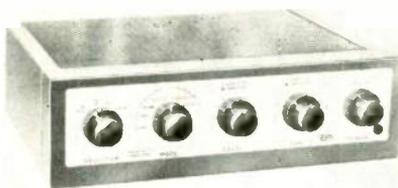
Bogen INTERCOMS →

Two new multiple station intercom systems claim performance challenging much higher priced systems. Models CHM6 master station, \$45.95, for up to 6 stations, has a volume control, press-to-talk button and a 7 position selector, including "all" and "mute" positions. Similar to CHM6 is model CHM12, \$49.95, for up to 12 stations. Both master stations contain three stages of amplification. Model CHR remote stations, \$12.95, contain matching alnico magnet speakers. Bogen-Presto Co. P.O. Box 500, Paramus, N. J. (ELECTRONIC TECHNICIAN 8-34)



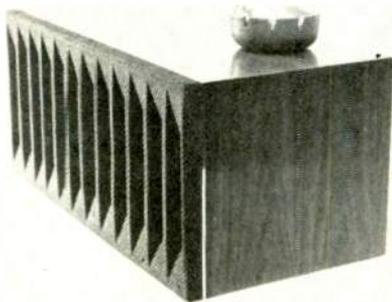
Eico STEREO AMPLIFIER →

Model AF-4 is a new low-priced stereo amplifier that features five front panel controls; input selector, mode, level, tone and power on-off. A single tone control is used for both bass and treble frequencies. Dual level and tone controls may be operated separately or together through use of a mechanical clutch. Other features include a check position for stereo balancing and five pairs of separate inputs. \$38.95 in kit-form. \$64.95 wired. Electronic Instrument Co., 33-00 Northern Blvd., Long Island City, 1, N. Y. (ELECTRONIC TECHNICIAN 8-35)



Audax SPEAKERS →

Two new shelf-type speaker systems, Models CH-80 (shown) and CA-100, include unusual grille cloth. It is reported that the novel "vacuum molded" fabric is instrumental in limiting loss of high notes, due to its porous composition. Model CA-80, \$99.95, contains two 8-inch extended range speakers. Model CA-100, \$139.95, has two 10-inch woofers and two cone tweeters. Both units are finished on all four sides and have detachable legs for use as floor models. Audax, Inc., 38-19 108th St., Corona 68, N. Y. (ELECTRONIC TECHNICIAN 8-36)



Stromberg-Carlson PHONO SYSTEMS

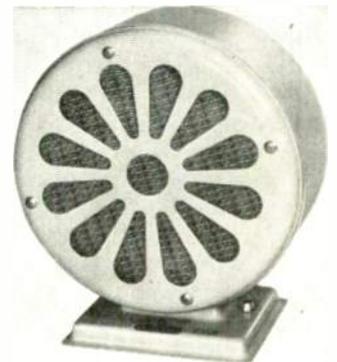
A new "Audiophile Series" features interchangeable components with a choice of 16 cabinet styles. A recently developed quarter-wavelength "Acoustical Labyrinth" together with a choice of five new speaker systems, identical to their shelf-type speaker line, is also offered. The French Provincial unit shown, SP-963, incorporates a Garrard RC-88 changer, SR-445 AM-FM stereo tuner, ASR-444 60 watt amplifier and RS-405 "Acoustical Labyrinth" speaker system. Stromberg-Carlson Co., 1400 N. Goodman St., Rochester 3, N. Y. (ELECTRONIC TECHNICIAN 8-38)

Sonotone STEREO CARTRIDGE

An improved version of Sonotone's "8T" cartridge, model "8TA", reports a flat frequency response from 20 to 15,000 cps. with gradual rolloff to 20,000 cps. Tracking force is 3 grams for professional arms and 4 grams for changers. Channel separation is 20 db. The unit incorporates a rumble suppressor to minimize vertical turntable motion. Dual turnover 0.7 mil sapphire stylus or 0.7 and 3 mil turnover stylus, \$14.95. Dual diamond/sapphire turnover stylus is \$19.50. Sonotone Corp., Elmford, N. Y. (ELECTRONIC TECHNICIAN 8-39)

Atlas SPEAKER ENCLOSURE

A new two-way speaker enclosure, model TW-9, is designed for 8-inch cone speakers. The new "Armour plate" baffle is said to have great strength and internal acoustic treatment to render it free from resonance and me-



chanical vibration. The unit is especially suited for use in corridors and other locations where bi-directional sound is to be distributed. A universal mounting plate offers a wide variety of mounting positions. Atlas Sound Corp., 1449 39th St., Brooklyn 18, N. Y. (ELECTRONIC TECHNICIAN 8-37)

Care of Soldering Irons

*Technical Analysis Shows Causes Of Reduced Tip Life.
Proper Maintenance Methods Described.*

ALVIN B. KAUFMAN

Soldering irons, one of the technician's service tool staples, can offer greater servicing efficiency and longer life by following simple maintenance procedures. The advent of printed circuits further increases the importance of this tool.

• One of the most indispensable tools at the technician's disposal is the soldering iron, yet it rarely receives proper maintenance. The care of soldering irons and tips is to a great extent influenced by the line voltage and tip material or plating solder used.

The life of the soldering iron element itself is primarily dependent upon line voltage. Improper line voltage may result in the user complaining of too hot or cold tip temperatures, or excessively short iron life. Examination of this parameter reveals the reason for these complaints. With a purely resistive iron element, power developed is expressed conventionally as I^2R or more conveniently as E^2/R . The squaring factor is of utmost importance. A 47½ watt @ 110 Volt iron element at 100 Volts would develop 39 watts, while at 120 Volts, 56.5 watts; and at 130 Volts, 66 watts. At 130 Volts, power would increase 40% for the 20 volt line increase. This significant increase in element temperature would be accompanied by a radical decrease in life. Increased filament voltage in a vacuum tube or tungsten lamp to 118% of the rated voltage (e.g. 110 to 130 V),

decreases life expectancy to only 20%. The resistance wire temperature at 100% rated voltage, and the associated oxidizing or carbonizing elements around a soldering iron element will determine its life at rated and over-rated voltages. It is, therefore, essential to monitor line voltage, and take corrective action where indicated.

On-Off Operation

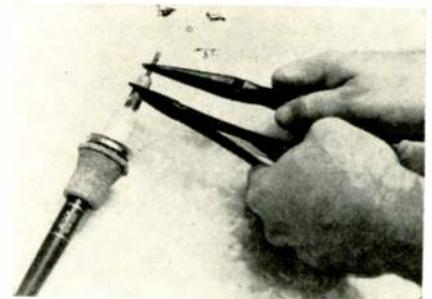
Soldering iron element life is also dependent, to a lesser extent on the frequency of line voltage and the number of on-off operations. The use of d-c vs. a-c is not an important factor, with a properly designed iron, although it should be noted that thermostatic irons generally cannot be used on d-c unless a polarized plug is used. The thermal shock on heating and cooling a soldering iron shortens its life. Experience with illumination lamps indicates that if the off period is to be less than one-two hours it is more economical to leave them on. The same parameter to a less degree applies to the soldering irons. Except for possible fire hazard (in an unattended shop), the iron should not be turned off for coffee breaks or lunch periods.

Soldering irons should not be handled roughly, such as rapping against a bench for solder removal, since this may shorten iron life, and is definitely an eye hazard.

Solder Iron Tips

Soldering iron tip life is dependent upon the solder and flux used, as well as the tinning and cleaning method. The proper flux for electronic work, rosin, does not cause tip erosion. Next to silver, copper has the highest (volume) thermal

conductivity; and it is this property, coupled with its ready ease of tinning, that accounts for its popularity and efficiency as a soldering tip.



Proper tiplet removal is accomplished by firmly grasping the iron barrel and tiplet with pliers and rotating the tip out.

However, copper has the objection that it pits and dissolves quite rapidly on extended periods of use, and therefore requires frequent and periodic dressing. This erosion of the solder tip is not due to erosion by the flux, but rather to the solvent action of molten solder on the metal tip.

Copper alloy tips are in use, which employ tellurium, nickel, and other metals as alloying elements. The efficiency of these tips is not as good as straight copper, but they are mechanically stronger and resist cleaning and solder erosion better.

Perhaps the most successful application of the multiple-metal (or core) concept is the use of the iron or steel-coated copper tip. In these tips the copper is coated with a very thin layer of a ferrous metal. Advantage is taken of the high thermal conductivity and capacity of copper, and at the same time the low solubility and pitting resistance of the ferrous coating is utilized. While the efficiency of these tips is not as high as that of straight copper, they have

nevertheless proved very successful from the standpoint of iron tip economy. Quality iron plated tips are overcoated with silver plate for ease in initial tinning.

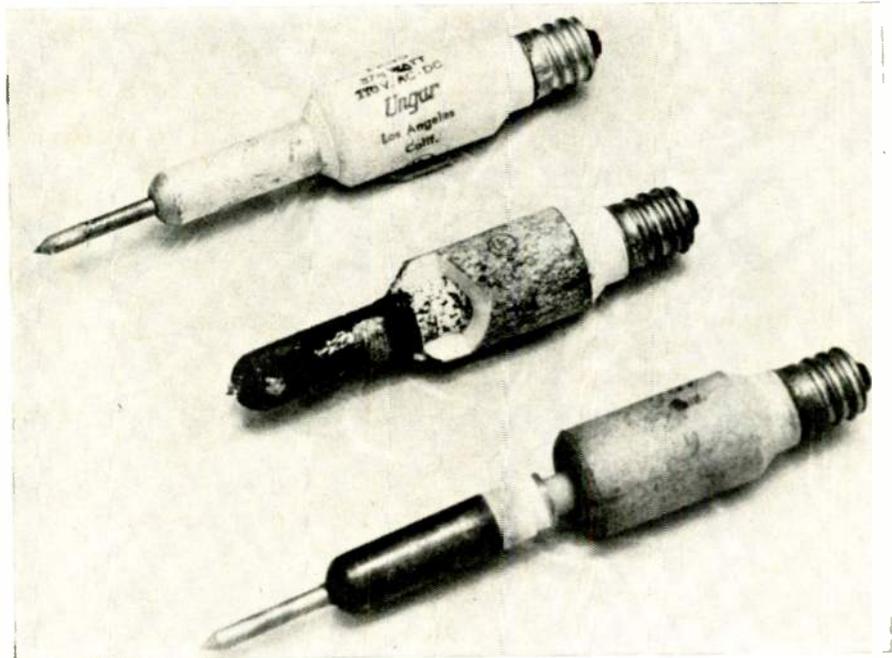
Electronic manufacturers have found that tip life and, more important, reliability of the solder connection is inter-related with cleaning and tinning practices. The direct insertion of the iron tip into a paste or liquid flux is not desirable as a cleaning or tinning operation. The high iron temperature inactivates rosin flux and causes contamination and eventual change in its characteristics. It does not perform a satisfactory tinning operation.

Cleaning Tips

If the iron tip is in good condition, a wiping cloth may be used for cleaning or to prepare it for re-tinning. The wiping cloth is, however, not recommended where printed circuit wiring is involved. Such a cloth may impart lint or threads to the iron tip. Subsequently these materials are imbedded in the solder connection. The carbonization of these materials may result in a poor connection or a leakage resistance across adjacent wire strips or connections.

Undyed (white) cotton duck, as a rag wiper, or a pad is generally found to be good for iron tip cleaning. This material has no lint and is sufficiently coarse to clean off oxides in order to permit tinning with rosin flux. Although popular cleaning methods include the steel wire brush and file, they may destroy the oxide protective coating of the iron tips. The file should generally be used only for retipping the iron bit where excessive pitting of the copper or copper alloy tip requires it.

A novel and proven tip cleaning method is the use of a sponge pad. Tests by a leading electronics manufacturer indicate a 300% increase in plated tip life with this cleaning method versus those previously noted. The sponge pad is kept constantly moist by water in the container which holds it. This material has no lint, does not carbonize, and does not present the fire hazard possible with rags and other combustible cleaners. The tip is subject to the least wearing or erosion of all the cleaning methods described. Increased tip life is obtained, especially



The lower two tipleets have been damaged through improper removal and inadequate maintenance. In order to prevent oxides from freezing the tip into the heating unit, the screw-in tip threads should be greased with a high temperature lubricant. However, large electric thread for the heating element should be free of lubricant.

on iron plated tips and tipleets, while no sacrifice is made in cleaning efficiency. The solder dross is removed leaving the tip clean and smooth, thus avoiding another source of damaging contamination.

General Maintenance

Good soldering practice is summarized: Keep tip well tinned and retin immediately after wiping clean. When storing for overnight or longer periods of time wipe tip clean and retin so that tip surface is well covered with solder, then cool the iron. On initial iron operation, tin tip as soon as it reaches soldering temperature. On iron plate or other tips where tinning, with use, has become difficult, retin as iron reaches soldering temperature with an acid or chloride flux. When tip has been tinned in this manner, subsequently flow rosin core solder over the entire surface, wipe clean, and retin with rosin core, thus removing all traces of corrosive flux.

Enclosed iron rests should not be used with soldering irons. Tubular iron holders, for example, do not allow the soldering iron to dissipate heat freely by convection and radiation. Their use creates excessive tip and element temperature. This results in severe tip oxidization and short iron element life. On the other

hand, an iron rest is essential to prevent scorching some table top materials and to supply a convenient and safe iron rest area. In all cases the use of an open or "bird cage" iron rest is suggested. The "bird cage" is a tubular style, enclosed iron rest, fabricated of perforated sheet to allow air convection.

One final, but important, note on soldering iron care: Screw-in tips or tipleets should have their thread thoroughly greased with a high temperature lubricant. The oxide forming on the threads may otherwise freeze the tip into the heating unit. Inasmuch as tip temperature generally exceeds 650°F and may be as high as 1100°F, a standard lubricant is worse than useless. It will carbonize and freeze the tip in itself. Numerous lubricants are available for this use. Tips or tipleets should be removed while iron is hot. Both the soldering iron barrel (not the ceramic or pencil type) and tip should be grasped with pliers, after iron is hot, and the tip rotated out. On pencil irons, failure to use this technique may pull the metal barrel out of its ceramic holder. Needless to say, the electric thread on screw-in pencil iron tips need not and should not be lubricated. •

Illustrations: Courtesy of Ungar Electric Tools, Inc.

Overseas TV Developments

Activity Increasing In East And West European Countries

• Overseas television developments reported during the first quarter of 1959 show a sharp increase in both the number of transmitting stations put into operation, and the number of receivers in use, reports the U.S. Information Agency.

No countries inaugurated television during the period under review, but a number reported a great surge of interest in TV, while a few fell short of expectations.

The number of overseas television transmitting stations of all kinds—including centers, relays, experimental stations, etc.—increased from 739 to 855. Of these, 714 were in Free World countries and 141 in the Communist Bloc, indicating an expansion of 97 new stations in the former, and 19 in the latter.

Western Europe put 85 new transmitting stations on the air. Of these, Italy accounted for 42, raising the number of transmitting stations in the national TV network to 294. West Germany also increased its network by 26 transmitters.

In other Free World areas, the Far East had nine new transmitting stations, Latin America three, while the Near Eastern, South Asian, and African area had none, despite many promises.

In the Communist Bloc, the Soviet Union installed 15 new transmitting stations, consisting of seven centers and eight relays. The other four new transmitters went on the air in Hungary, Poland, and Rumania.

Reported growth in television sets

in use overseas amounted to about 2,750,000, twice as many as reported in the last quarter of 1958. Of the 25,600,000 sets in use, 21,750,000 were in the Free World, showing a gain of 2,200,000 sets; and 3,850,000 were in the Communist Bloc—an increase of 550,000 during the quarter.

Western Europe led the Free World with more than 16 million sets in use, while the Far East almost reached the 3 million mark. Hardly any increases in sets in use were reported by Latin American countries, but the Near Eastern, South Asian, and African area reported a considerable percentage gain, though the actual number was only about 50,000.

In the Communist Bloc, the Soviet Union claimed to have 3 million sets in use, second only to the United Kingdom, though West Germany and Japan were catching up fast. As previously reported, most of the remaining sets in the Communist Bloc were in Czechoslovakia and East Germany. No new information is available on television sets in Communist China.

The Iron Curtain

The Communist bloc countries are concentrating heavily on building their television networks, so that they can have an intra-bloc network called "Eastvision," which will be a counterpart of the West European Eurovision network. When this is ac-

complished, they expect that the two will be combined into an all-European TV network.

East German television schedules will operate on a 40-hour week during 1949, the Bayerische Staatszeitung revealed, and cooperation among the Satellites in regard to television network procedures is also planned. As soon as the inter-Satellite television linkage, known as "Eastvision," is fully established, the weekly claimed, transmissions from famous theaters or from concerts of famous orchestras anywhere in Eastern Europe can be relayed through the stations at the East German frontier with West Germany. There are also other plans by which the East German television network will try to make its programs interesting to West German audiences. Thus, it is planned, the paper went on, to televise the newest French, Italian, Indian, or West German motion pictures, and the East German films are to be televised on the day of their premieres. At the end of each day, the East German television program planners have scheduled a summary of events of the day, and this program is to contain political overtones, the Bayerische Staatszeitung claimed. For these telecasts, special transmission equipment is to be located in East German industrial centers. Finally, the paper said, East German educational television programs for West German consumption will encompass lectures, experiments, and language instruction.



Austria

It is estimated that there are about 30,000 receiving sets in the homes of people who understand German in Czechoslovakia, Hungary, and Yugoslavia. Most of these are in Czechoslovakia where good direct reception of the Austrian TV program is possible in a considerable part of the country. The Yugoslav TV network also occasionally picks up and re-broadcasts the Austrian TV program from the Graz and Klagenfurt transmitters.

Denmark

The Danish Ministry of Education has adopted a proposal submitted by the Radio Council concerning a reorganization, effective April 1, 1959, of the administration of sound broadcasting and television. Danish TV has so far been a special department of Statsradiofonien, but now there will be two program directors, one for radio, and the other for TV.

Television price reductions of 5 to 15 per cent have been advertised in the Danish retail trade. Reasons advanced for this development are rumors of the Government's intention to permit limited imports of TV sets; the desire of retailers to clear their shelves of 1958 models; and the appearance in the TV trade of SAM-KOB, a retail outlet operated by the labor unions, which has been able to sell TV sets at prices lower than those of normal retailers.

Finland

According to the technical chief of the Finnish Radio, the Finnish television viewing public will be able to see programs from "Eurovision" by the end of the year. The transmissions are planned via Stockholm and a relay station on the Aaland Islands which will transmit the telecasts to Turku for relay throughout Finland. Six new TV stations are to be completed in Finland by the end of this year.

France

According to the new statutes for radio and television, the Radio-diffusion-Télévision Française (RTF) becomes a public enterprise with an autonomous budget. However, it still remains under the authority of the Ministry of Information.

The license fee for television sets has been raised to 7,500 francs, but this will mean a reduction for those who possess both a radio as well as a TV set. License fees were fixed previously at 2,000 fr. for a radio set and 6,000 fr. for TV. The new law went into effect on July 1, 1959.

West Germany

On January 14, 1959 the Federal Cabinet instructed the Federal Ministry for Posts and Telecommunications (BPM) to establish a television transmitting network for broadcasting a second TV program. Conse-

quently, the BPM will erect a network of 28 TV transmitters to operate in Band IV, together with a radio relay network for picture and sound modulation circuits. The system is to be completed in 1960. The Cabinet's decision, however, refers only to technical facilities, and does not specify problems of program production, or the much-discussed question of a reorganization of the radio and TV structure.

In January the leading manufacturers of radio and TV sets terminated price control practices. However, two weeks later after prices had dropped about 18 per cent, controls were reinstated. Forty per cent of the market still has uncontrolled prices, as all manufacturers did not revert to the former practice.

The number of television sets in use is increasing by more than 5,000 daily, and the three millionth licensed set is expected sometime in August of this year. If this rate of growth is maintained, there should be more than ten million sets in use in about five years.

Gibraltar

According to the official magazine of the Union of Spanish Radio Amateurs, a 10 kilowatt television transmitter, using West European standards (625 lines), will be constructed atop the "Rock" in Gibraltar to serve southern Spain and North Africa.

Italy

The Italian television network continues to grow at a tremendous pace. Forty-two new satellite transmitters were added during the quarter for a grand total of 294 transmitting stations covering the land.

Malta

Trade sources report that Rediffusion (Malta) Ltd., a subsidiary of Broadcast Relay Service (overseas) Ltd., is planning to install a "piped" television service in Malta. The Television Importers Association (T.I.A.) formed about two years ago, objects to this kind of "canned" TV and has offered to form a Company with the object of installing and operating a TV station on terms to be agreed on with the Government. There are about 4,000 TV set owners in Malta who are getting continental fare of a high standard from the Italian TV program radiating from the Monte Lauro transmitter in Sicily.

Netherlands

The remaining programmed expansion of the Dutch television transmitting system calls for the construction of two more transmitters with a power of 50 and 100 kilowatts which are expected to be completed in 1960.

According to an article in the *Economic Statistical Information*, the number of TV sets in the Netherlands will probably increase by more than one million sets during the next four years.

Norway

The first stage of the construction work on the Oslo Television Center, begun in November last year is expected to be completed by August 1, 1959. The studio layout is expected to be ready for use in September, and the TV link connections with Sweden and Denmark in October of this year, at which time Norwegian television is expected to go into regular operation.

Portugal

The Radio Televisão Portuguesa (RTP) with its network of five

transmitting stations now covers 87 per cent of Portugal with its evening programs. The technical equipment (transmitters and other mechanical apparatus) is excellent and the image is especially good. The newsreel coverage is very good and both national and international events are fully covered. However, the quality of live presentations is on the whole very poor, due to the lack of adequate studio space. There is little likelihood of improving the quantity and quality of live material until the new studio in Lisbon is completed.

Spain

The Barcelona television station is now operating on an experimental basis. According to the press, technicians are now working on a series of regional TV stations which will be linked with Eurovision through the Barcelona station. A new station is now being installed in the Guadarrama mountains at an altitude of 2,300 meters which, with a power of 200 kw. and a radius of reception of 300 kilometers, will be one of the most powerful in the world.

It is estimated that there are at present about 50,000 TV sets in Madrid and 15,000 in Barcelona. To further encourage television, the press reports, 20,000 new sets will be sold to the public at a price of 10,000 pesetas (\$174). An otherwise unconfirmed news source also reports that a commercial TV service will be permitted in Spain.

Sweden

Stimulated by Christmas purchases and the opening of six new TV transmitters at the end of 1958, sales of TV sets spurred spectacularly during the first quarter of this year for a total of approximately 400,000 sets. Plans call for the expansion of TV transmitters from the present 14 to 42 by mid-1960. The Budget recently presented to the Riksdag allocated 13.2 million kroner (\$2.6 million) for construction of transmission facilities, and 7.9 million kroner (\$1.6 million) for operating expenses during FY 1960. Decision was deferred on increasing the present 14 hours a week of television transmission.

United Kingdom

The eighth television transmitter of the Independent Television Authority (ITA) opened on January 15 at Burnhope, near Durham in the northeast of England. It serves an area containing a population of well over two and a half million, and raises the number of viewers covered by ITA transmissions to 85 per cent of the population.

There has been a great deal of discussion lately about the advisability of changing from the 405 line standard of British television to the 625 line system in use in Western Europe. In a preliminary recommendation designed to assist the Government in preparing for the CCIR assembly in Los Angeles, the Television Advisory Committee suggested a qualified United Kingdom position of 8 mc/s channels in Bands IV and V and a line standard of 625 lines. This recommendation was carefully qualified as for "planning purposes only." The reference to a 625 line standard was based on interest in a "common European position," and the Committee "reserved on actual adoption of such line standard in the UK pending further study."

A recent BBC report stated that in the last two years the number of people with TV sets in their homes had risen from about half to about two-thirds of the population. Out of an adult population of 37,800,000 about 24,500,000 had TV sets at home at the end of 1958. The average amount of viewing had risen from 11½ to 12½ hours a week.

Yugoslavia

According to a Belgrade announcement, the first stage of the Yugoslav Television network, which will include transmission of programs from the Belgrade, Zagreb, and Ljubljana studios, will be completed soon. The second stage which will begin during the summer of 1959, will connect Sarajevo, Skoplje, and Titograd with the main network. Sarajevo will be connected with the Zagreb transmitter through relay stations which will be built on Vlasic mountain and on either Ozren or Psunj mountains. Sarajevo itself will also have a transmitter at nearby Mali Kum. Bosnia-Herzegovina will start receiving programs by the end of 1960. •

Prepare For Your FCC Operator License

Lucrative Service Opportunities Await Licensed Techs

• The FCC license is one of the few valuable "free" offerings available today. The opportunities afforded the technician by acquisition of an FCC Radiotelephone Second-class Operator license are multifold. As an example, the technician cannot enter the rapidly growing and profitable Two-Way and Citizen Band radio servicing field without it. Further, it is easier to sell this equipment when service and maintenance facilities are available.

In addition, it is difficult to speculate on the future need and availability of the FCC license. Electronic advances may one day require that certain consumer equipment be serviced only by FCC licensed technicians.

Increased income, prestige and future income protection are just a few of the factors that demand getting your "ticket" now. The only requirements at present are: Be a citizen of the United States and pass a written examination covering the class license desired. Minimum or maximum ages are *not* a consideration; nor is telegraph code knowledge needed for a Radiotelephone license.

The Second-class Radiotelephone license has been suggested, rather than a First-class one, simply because both licenses entitle the holders to the same service and operating authority, excepting broadcast stations, and the examination for the former is less difficult. No doubt, self-esteem will provide the incentive to secure a First-class license after receiving a Second-class one.

Federal Communications Commission license examinations are divided into various divisions, depending on the type of license wanted. The Second-class Radiotelephone license requires passing three examination elements: Element I, Basic Law; Element II, Basic Operating Practice, and Element III, Basic Radiotelephone. An additional division, Element IV, Advanced Radiotelephone, must be passed for a First-class license. Many questions are of the multiple choice type, whereby the number of the correct answer is recorded in the applicable space.

The minimum passing grades for each element is 75% and though one or more elements are failed, a lower license for the elements that were passed is automatically issued. Therefore, once obtaining a Second-class license only the fourth element examination must be taken for the First-class license.

Examinations are held at FCC Regional offices at least once per week, and in many major cities, every day. In addition, examinations are conducted at many other locations four times per year. For further information, contact your local Federal Communications Commission office. The listing may normally be found in the telephone directory under "United States Government." •

**See Following Page
for Sample FCC
QUESTIONS & ANSWERS**

SAMPLE FCC RADIOTELEPHONE EXAM QUESTIONS

Element I Basic Law

1. What must a person do whose operator license or permit has been lost, mutilated or destroyed?
2. In radio telephony, what are the distress, urgency, and safety signals?
3. Is the holder of a radiotelephone third-class operator permit authorized to make technical adjustments to the transmitter he operates?
4. How soon before expiration of an operator license or permit should application be made for renewal?

Element II Basic Operating Practice

1. Why is it advisable to listen on a channel before transmitting?
2. What is the significance of the word "over" when transmitted at the end of a radiotelephone communication?
3. Why should a radiotelephone transmitter be kept off the air when voice transmissions are not in progress?
4. What must the operator do if he is told he is interfering with a distress call?

Element III Basic Radiotelephone

1. If the diameter of a conductor of given length is doubled, how will the resistance be affected?
2. What is the sum of all voltage drops around a simple direct-current series circuit, including the source?
3. What is the meaning of "power factor"?
4. Define the term "decibel"?
5. What is the maximum rated current carrying capacity of a resistor marked "5,000 ohms, 200 watts"?
6. Draw a simple schematic diagram showing a tuned-plate tuned-grid oscillator with series-fed plate. Indicate polarity of supply voltages.
7. Draw a simple schematic diagram of a method of impedance coupling between two vacuum tubes in an audio-frequency amplifier.
8. Draw a simple schematic diagram of a triode vacuum tube connected for grid-leak detection.
9. Explain how you would determine the value of cathode-bias resistance necessary to provide correct grid bias for any particular amplifier.
10. What determines the speed of a synchronous motor?
11. List the main advantages of a full-wave rectifier as compared to a half-wave rectifier.

12. What type of indicating instrument is best suited for use in measuring radio-frequency currents?
13. What will be the effect upon the resonant frequency if the physical length of a Hertzian antenna is reduced?
14. What is meant by an "harmonic"?
15. What is the difference between a milliwatt and a kilowatt?
16. What is the purpose of a wave trap in a radio receiver?
17. What is the conductance of a circuit if 6 amperes flow when 12 volts d-c is applied to the circuit?
18. What is meant by "low-level" modulation?
19. How is automatic volume control accomplished in a radio receiver?
20. What is the purpose of a "dummy antenna"?
21. What is the principal function of a swinging choke in a filter system?
22. What is a multivibrator and what are its uses?
23. What is the purpose of bypass condensers connected across audio-frequency amplifier cathode-bias resistors?
24. What is the purpose of a center-tap connection on a filament transformer?
25. What is the purpose of a squelch circuit in a radio communication receiver?

ANSWERS

Element I Basic Law

1. Immediately notify the Commission.
2. Distress—"Mayday," repeated three times
Urgency—"Pan," transmitted three times before the call.
Safety—"Security," repeated three times.
3. Yes, but only in the presence of an operator holding a First or Second-class license, whether telephone or telegraph.
4. Within one year before expiration.

Element II Basic Operating Practice

1. To insure that there will not be any interference with communications already in progress.
2. Transmission ended; response expected.
3. To prevent interference with other stations using the channel.
4. Cease transmissions immediately.

Element III Basic Radiotelephone

1. Resistance will become one quarter of the original value.
2. Zero.
3. The factor by which the product of volts and amperes must be multiplied to obtain true power.
4. A unit that expresses the ratio between two

- sound power levels or two electrical power levels.
- 200 milliamperes.
- Refer to Fig. 1
- Refer to Fig. 2
- Refer to Fig. 3
- Since the bias is equal to the IR drop across the cathode resistance, divide the desired d-c bias voltage by the total d-c cathode current (at no signal).
- Line frequency and the number of pairs of poles.
- Better output voltage regulation and smaller filter components for a given ripple percentage.
- Thermocouple type. (Another type, no longer in general use, is the hot-wire meter).
- Resonant frequency will be increased.
- An harmonic is a whole multiple of an original frequency, called the fundamental.
- Milliwatt is one thousandth of a watt, while a kilowatt is one thousand watts.
- In general, the wavetrap prevents the effects of any undesired frequencies from appearing in the output.
- Conductance is 0.5 mho.
- Low-level modulation is modulation produced in an earlier stage than the final one.
- AVC is accomplished by feeding back a negative d-c bias which is proportional to the

- average magnitude of the received carrier wave, into the control grids of the i-f and r-f amplifiers.
- A "dummy antenna" is used in order to test the operation of a transmitter with a minimum of radiation.
- A "swinging choke" is used to improve the regulation of the power supply under conditions of varying loads.
- A "multivibrator" is a form of relaxation oscillator which is rather unstable in the free running condition, but may be completely stabilized by the application of suitable sync voltages. It requires two tubes for operation and has a frequency range extending approximately from 1 cycle per minute to 100,000 (or more) cycles per second. Some uses are: frequency dividers, sawtooth generators, harmonic generators, square wave and pulse generators.
- The cathode bypass condenser prevents variations of bias during excitation of the amplifier.
- To prevent hum voltages from modulating the normal signal.
- A "squelch" circuit is used to render a receiver inoperative during the periods when no carrier wave is present.

Information Credit: Based on material from "Radio Operator's License Q & A Manual," by Milton Kaufman; published by Rider.

Fig. 1—Simple schematic of a tuned-plate tuned-grid oscillator with series-fed plate.

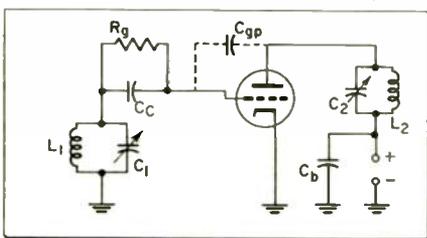


Fig. 2—Schematic shows impedance coupling between two audio vacuum tubes.

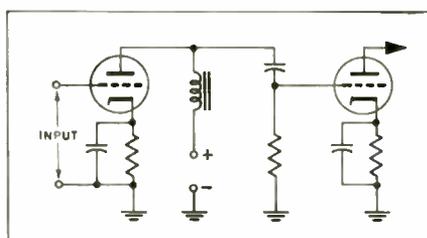
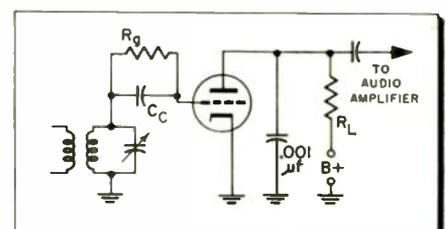


Fig. 3—Schematic diagram shows triode vacuum tube connected for grid-leak detection.



10 DAY FREE TRIAL

Convince yourself at no risk that CENTURY instruments are indispensable in your every day work. Send for instruments of your choice without obligation . . . try them for 10 days before your buy . . . only then, when satisfied, pay in easy-to-buy monthly installments — without any financing or carrying charges added.

NEW Battery Operated Peak-to-Peak **VACUUM TUBE VOLT METER** Model VT-1

WITH LARGE EASY-TO-READ 6" METER —

featuring the sensational new **MULTI-PROBE** Patent Pending

No extra probes to buy! The versatile MULTI-PROBE does the work of 4 probes

- ① DC Probe ② AC Probe ③ Lo-Cap Probe ④ RF Probe

The VT-1 is a tremendous achievement in test equipment. With its unique MULTI-PROBE it will do all the jobs a V.T.V.M. should do without the expense of buying additional probes. No longer do you have to cart around a maze of entangled cables, lose time alternating cables or hunting for a misplaced probe. With just a twist of the MULTI-PROBE tip you can set it to do any one of many time-saving jobs. A special holder on side of case keeps MULTI-PROBE firmly in place ready for use.

FUNCTIONS

DC VOLTMETER . . . Will measure D.C. down to 1.5 volts full scale with minimum circuit loading, and give accurate readings of scale divisions as low as .025 volts . . . Will measure low AGC and oscillator bias voltages from .1 volts or less up to 1500 volts with consistent laboratory accuracy on all ranges . . . Zero center provided for all balancing measurements such as discriminator, ratio detector alignment and hi-fi amplifier balancing.

AC VOLTMETER . . . True Peak-to-Peak measurements as low as 3 volts of any wave form including TV sync, deflection voltages, video pulses, distortion in hi-fi amplifiers, AGC and color TV gating pulses . . . Scale divisions are easily read down to .1 volts . . . Measures RMS at 1/20th the circuit loading of a V.O.M. . . . Unlike most other V.T.V.M.'s there is no loss in accuracy on the lowest AC range.

ELECTRONIC OHMMETER . . . Measures from 0 to 1000 megohms . . . Scale divisions are easily read down to .2 ohms . . . Will measure resistance values from .2 ohms to one billion ohms . . . Will detect high resistance leakage in electrolytic and by-pass condensers.

RF and LO-CAP MEASUREMENTS . . . With these extra VT-1 functions you can measure voltages in extremely high-impedance circuits such as sync and AGC pulses, driving saw tooth voltages, color TV gating pulses, mixer output levels, I.F. stage-by-stage gain and detector inputs.

OUTSTANDING FEATURES

- Completely portable — self powered with long life batteries — permits use everywhere
- New advanced pentode amplifier circuit assures amazingly low battery drain
- Large 6" 100-microampere meter, many times more sensitive than meters used in most V.T.V.M.'s
- Laboratory accuracy performance — 2% of full scale on DC, 5% of full scale on AC
- Simplified multi-color easy-to-read 4-scale meter
- No heat operation assures rigid stability and accuracy
- Immune to power line fluctuations
- Amplifier rectifier circuit with frequency compensated attenuator — a feature found only in costly laboratory instruments
- Meter completely isolated — practically burn-out proof
- Hand-crafted circuitry eliminates the service headaches of printed circuitry
- 1% resistors used for permanent accuracy
- Separate RF ground return for low-loss RF measurement
- Micro-phonie type co-axial connector
- Matching cover protects instrument face — snaps on and off instantly.

SPECIFICATIONS

- DC Volts — 0 to 1.5/6/30/150/300/600/1500 volts
- AC Volts (RMS and Peak-to-Peak) — 0 to 3/12/60/300/1200 volts
- Ohms — 0 to a billion ohms, 10 ohms center scale — Rx1/10/100/1K/10K/100K/1M
- RF — Peak reading demodulator supplied for use on all DC ranges
- Zero Center — available on all DC volt ranges with zero at mid-scale
- Decibels — from -10 Db to +10/22/36/50/62 based on the Dbm unit: 0Db-1mW in 600 ohms
- Impedance — 11 megohms DC, 1 megohm AC, 10 megohms Lo-Cap
- Input Capacity — 130 mmfd. RMS, 250 mmfd. Peak-to-Peak, 25 mmfd. Lo-Cap



SIZE:
W-7 3/8"
H-9"
D-4 1/4"

Model VT-1 — fully wired and calibrated, housed in hand-some hammertone finish steel case, complete with MULTI-PROBE, and thorough instruction manual covering \$58.50 Net all the applications in detail.

FAST-CHECK TUBE TESTER Model FC-2

Simply set two controls . . . insert tube . . . and press quality button to test any of over 700 tube types completely, accurately . . . IN JUST SECONDS!

Over 20,000 servicemen are now using the FAST-CHECK in their every day work and are cutting servicing time way down, eliminating unprofitable call-backs and increasing their dollar earnings chose the FAST-CHECK above all other tube testers.

PICTURE TUBE TEST ADAPTER INCLUDED WITH FAST-CHECK
Enables you to check all picture tubes (including the new short-neck 110 degree type) for cathode emission, shorts and life expectancy . . . also to rejuvenate weak picture tubes.

RANGE OF OPERATION

- ✓ Checks quality of over 700 tubes types, employing the time proven dynamic cathode emission test. This covers more than 99% of all tubes in use today, including the newest series-string TV tubes, auto 12 plate-volt tubes. OZ4s, magic eye tubes, gas regulators, special purpose hi-fi tubes and even foreign tubes.
- ✓ Checks for inter-element shorts and leakage.
- ✓ Checks for gas content.
- ✓ Checks for life-expectancy.

SPECIFICATIONS

- No time consuming multiple switching . . . only two settings are required instead of banks of switches on conventional testers
- No annoying roll chart checking . . . tube chart listing over 700 tube types is located inside cover. New listings are added without costly roll chart replacement
- Checks each section of multi-section tubes and if only one section is defective the tube will read "Bad" on the meter scale mounted on panel
- Large 4 1/2" D'Arsonval type meter is the most sensitive available, yet rugged — fully protected against accidental burn-out
- Special scale on meter for low current tubes
- Compensation for line voltage variation
- 12 filament positions
- Separate gas and short jewel indicators
- Line isolated — no shock hazards
- Long lasting etched aluminum panel.

NOTE: The Fast-Check positively cannot become obsolete . . . circuitry is engineered to accommodate all future tube types as they come out. New tube listings are furnished periodically at no cost.



SIZE: W-14 1/4" H-11 1/4" D-4 3/8"

Model FC-2 — housed in hand-rubbed oak carrying case complete with CRT adapter

\$69.50 Net

CONVENIENT TIME PAYMENT PLAN — NO FINANCING CHARGES

ALL CENTURY INSTRUMENTS ARE GUARANTEED FOR ONE FULL YEAR

The extremely low prices are made possible because you are buying direct from the manufacturer.

CENTURY ELECTRONICS CO., INC.

CHECK INSTRUMENTS DESIRED

- Model VT-1 Battery Vacuum Tube Volt Meter . . . \$58.50
\$14.50 within 10 days. Balance \$11 monthly for 4 months.
- Model FC-2 Fast-Check Tube Tester . . . \$69.50
\$14.50 within 10 days. Balance \$11 monthly for 5 months.

Prices Net F.O.B. Mineola, N. Y.

SHIPPED ON APPROVAL

111 Roosevelt Avenue, Dept. 508, Mineola, New York

Please rush the instruments checked for a 10 day free trial. If satisfied I agree to pay the down payment within 10 days and the monthly installments as shown. If not completely satisfied I will return the instruments within 10 days and there is no further obligation. It is understood there will be NO INTEREST or FINANCING charges added.

Name _____ Please print clearly

Address _____

City _____ State _____

Metropolitan Detroit TV Repair Survey

Study Provides Interesting Consumer Thoughts On TV Service

• A house-to-house TV repair survey was undertaken by Wayne State University students under the direction of Dr. H. Webster in metropolitan Detroit, April, 1959. 15 different areas were visited and the occupants questioned at length, followed by a prepared questionnaire.

The results of this pilot survey, as outlined in Tables 1 through 6, reveal some interesting statistical information. Table 1 indicates approximately 25% of the families questioned had more than 1 TV set in their homes. This increased 2 and 3 set ownership trend belies sales saturation theories, since 75% of the families have yet to purchase their second set.

The local TV shop was the most popular repair source for some 43% of the respondents, while 16% used so-called free lance service techni-

Table 1
Number of TV Sets Owned

Number of sets per family	Interviewed	Percent
1	284	75.8
2	89	23.7
3	2	0.5
Total	375	100.0

cians or part timers as shown in Table 2. Dealer service departments were favored by 11.2%, factory service by 10.1%.

The importance of quality service and maintenance of good public relations is further emphasized since Table 3 shows that one third of the methods used to choose a technician was on the basis of someone's recommendation. A good reputation is an

intangible asset that should be carefully nurtured and protected.

Respondents' replies to their opinion of fair prices for TV service calls indicate that popular acceptance of prices were respectively \$4, \$5, \$3 as shown in Table 4.

Drug store tube checkers are evidently diverting a substantial portion of the legitimate TV technician's tube sale income. Table 5 shows that 36% of the interviewed people have used these retail outlets. However, several persons said they used drug store checkers on week-ends and holidays, when regular TV establishments were closed. This market appears to be growing and the TV technician must be more aggressive to retain his share of this market. •

Information Credit: TSA News, Michigan.

Table 2
TV Repair Agency Used

Agency	Interviewed	Percent
Local repair shop	162	43.2
Freelance serviceman	61	16.3
Store of purchase	42	11.2
Immediate family	42	11.2
Factory agency	38	10.1
Friend	3	0.8
Don't know	20	5.3
No answer	17	1.9
Total	375	100.0

Table 4
What Is A Fair House Call Charge?

Price	Interviewed	Percent
\$2.00	6	1.6
2.50	2	0.5
3.00	86	22.9
3.50	6	1.6
4.00	100	25.6
5.00	91	24.2
6.00	2	0.5
Other	18	4.8
Don't know	64	17.0
Total	375	100.0

Table 6
Brands Of TV Sets Owned

Brand	Interviewed	Percent
RCA	77	16.8
Admiral	65	14.1
Motorola	54	11.8
GE	37	8.0
Philco	36	7.8
Muntz	27	5.9
Zenith	26	5.6
Westinghouse	23	5.0
Emerson	16	3.5
Crosley	13	2.8
Capehart	9	2.0
Magnavox	9	2.0
Bendix	7	1.5
Silvertone	7	1.5
Sylvania	7	1.5
Stramberg-Carlson	7	1.5
Olympic	5	1.1
Hallcrafters	4	0.9
Hotpoint	4	0.9
DuMont	3	0.7
DeForest	2	0.4
Sentinel	2	0.4
Spartan	2	0.4
Truetone	2	0.4
Other*	16	3.5
Total	460	100.0

*Other represents 16 brands mentioned only once.

Table 3
Choosing A TV Technician

Method	Interviewed	Percent
Friend	113	33.9
Neighborhood shop	75	22.5
Dealer recommendations	73	21.9
Classified phone directory	31	9.4
Mail advertising	5	1.5
Other*	36	10.8
Total	333	100.0

*Majority of these families never had set repaired.

Table 5
Drug Store Tube Checker Use

Response	Interviewed	Percent
Have not used	238	63.5
Have used	134	35.8
No answer	3	0.7
Total	375	100.0

Servicing is easy and profitable with...

RCA VoltOhmysts

✓ *Built, tested and calibrated to High RCA Standards*

POPULAR



RCA WV-98A Senior VoltOhmyst®
Improved circuitry makes the "Senior" RCA's most popular VTVM—provides 3% accuracy full scale on both ac and dc measurements with less than 1% tracking error. Direct reading of peak-to-peak voltages means faster trouble-shooting. Large, full-vision meter (26 sq. in.) is a breeze to read. Features high input resistance (11 megohms on all dc voltage ranges), rugged die-cast aluminum case, electronically protected meter, 200-microampere meter movement, precision multiplier resistors with $\pm 1\%$ accuracy—and many, many more!

\$79^{50*}

PROFESSIONAL

The "Master" has accuracy and stability necessary for many special industrial or lab applications as well as for permanent mounting in your service shop. Big 7½" mirror-backed meter reduces meter pointer parallax. Peak-to-peak voltage scales are ideal for recurrent-pulse and complex-wave measurements, even with dc present. Measures dc current from 10 microamperes to 15 amperes.



RCA WV-87B Master VoltOhmyst
Measures dc voltages accurately in high-impedance circuits, even with ac present. Reads rms values of sine waves. Frequency response: flat at power-line frequencies up to 1500 volts.

\$137^{50*}

PRACTICAL

ALL NEW! addition to RCA Volt-Ohmyst family! Incorporates features that make it the most practical factory-wired instrument available at this low price.



RCA WV-77E VoltOhmyst
NEW—sleeve on handle stores probes and cables! NEW—fuse in the resistance-divider network for the "OHMS" function prevents accidental burnout! NEW—special circuit minimizes effect of residual gas in bridge tube! NEW—color-coded scales for easier, faster readings! NEW—ultra-slim probes, extra-flexible cables!

\$49^{95*}

(also available in kit form—\$29.95*)

*User Price (Optional)

SPECIAL OFFER! Now—for a limited time—get new booklet "Servicing is Easy with an RCA VoltOhmyst" (\$1.00 value)—FREE with the purchase of any of the above instruments!

For individual technical data bulletins on any of these instruments, see your nearest RCA Test Equipment Distributor, or write RCA Commercial Engineering, Section H-46-W, Harrison, New Jersey.



RADIO CORPORATION OF AMERICA
Electron Tube Division

Harrison, N. J.

RCA TEST EQUIPMENT—preferred by professionals!

AVAILABLE AT YOUR RCA TEST EQUIPMENT DISTRIBUTOR

Association News

California

ITSD, Los Angeles Co., asks their members to report any "night crawlers" to the Bureau of Internal Revenue and/or their local administration for tax evasion in their initial association news issue, Newsletter.

SRTT, Glendale and San Fernando Valley Chapters, installed new officers. Glendale Chapter: Pres., Ralph Johonnot; V. P., Everett Pershing; Sec'y., Gene Sheppard; Treas., Jim Scarsborough. Valley Chapter: Pres., Arnold Meyer; V. P., Robert Al-bright; Sec'y., Ernest Larsen; Treas. George Gilmer.

RTA, Santa Clara Valley, reports attending an enlightening technical clinic on basic set-up of a color TV set. The meeting is seen as a spring-board for a 10 week color course under the direction of Bob McLean, field rep for L. J. Meyberg.

APA, Los Angeles, reports receiving Federal Government approval for development of an aptitude examination to test household appliance technicians. The purpose of this examination, explains Roy Harmon, occupational analyst for the Department of Employment, California, is to develop trainees through better screening methods. This is expected to result in fewer "dropouts" of apprentices by giving the trainee an insight to his own abilities. The exam will be only one of the factors used to determine the qualifications of the candidate. When the test is developed, it is expected to be distributed nationally to the offices of the U. S. Employment Service.

Illinois

NATESA urges technicians to be selective in their parts purchasing. The association hits "captive and factory service" as a sales tool and profit booster at the technician's expense.

ARTS, Chicago, reports that licensing legislation in their State, opposed by ARTS, has been defeated.

Massachusetts

ETG, Boston, elects new officers: Pres., Larry McEvoy; V.P., George Catavolo; Sec'y., Jim Kelley; Treas., and Director of Education, Don Cicolini.

Michigan

TSA News, association publication of TSA, Michigan, reproaches the service industry for their inability to unite and believes that it is due to
(Continued on page 98)

For Checking Miniaturized Equipment, Pyramid's Model RC-1 New Resistance-Capacity-Ratio Bridge Tester. Budget priced . . . outstanding quality instrument . . . the RC-1 saves you both time and money. Precision-engineered, Pyramid's new model RC-1, Resistance-Capacity-Ratio Bridge Tester has a special low voltage bridge and stable vacuum tube amplifier for safe testing low voltage electrolytics such as commonly used in transistorized receivers.

Pyramid's RC-1, Resistance-Capacity-Ratio Bridge Tester is a functionally designed, sturdy, compact, lightweight unit, ideal for use by technicians, servicemen and engineers in radio, television (color as well as black and white), industrial electronics and all related fields.

PYRAMID MODEL RC-1 FEATURES:

- Special 3 volt amplifier for checking low voltage electrolytics used in miniaturized equipment such as transistor radios, etc.
- Capacity Ranges—from 10 mmfd. to 2000 mfd.
- Resistance—from .5 ohms to 200 megohms in 4 ranges.
- Ratio Test—provides quick reactance or resistance ratio between any two capacitors, inductors or resistors—range: .05 to 1 and 20 to 1. It can be used also to determine turns ratio of transformer windings within this range.
- Leakage Tests—handles all types of capacitors at rated voltages between 0 and 500V DC.
- Power Factor—0 to 60% (on capacitors from .1 mfd to 2000 mfd).
- Capacitor Test Voltages—variable between 0 and 500V DC in 17 steps.

PRICE: Dealer Net—\$44.95

For further information about the RC-1 see your Pyramid distributor or write for complete technical data to: Pyramid Electric Company, Union City, N. J. EXPORT: 458 Broadway, N. Y. 13, N. Y. • CANADA: Wm. Cohen, Ltd.—7000 Park Ave., Montreal.

**WESCON
Booth 1401**



BURTON BROWNE, New York



Superior's New MODEL 77

VACUUM TUBE VOLTMETER WITH NEW 6" FULL-VIEW METER



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

- ✓ Model 77 completely wired and calibrated with accessories (operating instructions, probe, test leads and carrying case) sells for only \$42.50.
- ✓ Model 77 employs a sensitive six inch meter. Extra large meter scale enables us to print all calibrations in large easy-to-read type.
- ✓ Model 77 uses new improved SICO printed circuitry.
- ✓ Model 77 employs a 12AU7 as D.C. amplifier and two 9006's as peak-to-peak voltage rectifiers to assure maximum stability.
- ✓ Model 77 uses a selenium-rectified power supply resulting in less heat and thus reducing possibility of damage or value changes of delicate components.
- ✓ Model 77 meter is virtually burn-out proof. The sensitive 400 microampere meter is isolated from the measuring circuit by a balanced push-pull amplifier.
- ✓ Model 77 uses selected 1% zero temperature coefficient resistors as multipliers. This assures unchanging accurate readings on all ranges.

✓ **AS A DC VOLTMETER:** The Model 77 will measure any voltage up to 1500 volts with negligible loading. It is indispensable in receiver and Hi-Fi Amplifier servicing and a must for Black and White and Color TV Receiver servicing where circuit loading cannot be tolerated. A special feature permits accurate zero center measurements necessary for the true alignment of Foster-Seely (Armstrong) FM detectors, Ratio Detectors and the newer Gated Beam Detectors.

✓ **AS AN AC VOLTMETER:** The old-fashioned laboratory AC V.T.V.M. was cumbersome, erratic and required several dial manipulations to arrive at a reading. The Model 77 when connected to a circuit will quickly and simply measure its RMS value if sine wave, and its peak-to-peak value if complex wave. Pedestal voltages that determine the "block" level in TV receivers, sync. pulses and saw tooth voltages are easily read with the Model 77.

✓ **AS AN ELECTRONIC OHMMETER:** Because of its wide range of measurement in the resistance range (from .2 ohms to 1,000 megohms) the Model 77 will be your most frequently used resistance meter. Leaky capacitors which may not show up on other resistance meters, show up glaringly when tested with the new Model 77. Because of its sensitivity and low loading, intermittents are more easily found, isolated and repaired.

**Model 77—Vacuum Tube Voltmeter
Total Price \$42.50**

Terms: \$12.50 after 10 day trial, then \$6.00 monthly for 5 months if satisfactory. Otherwise return, no explanation necessary.

Traditionally, the V. T. V. M. has been the one instrument used for voltage measurements where low drain or wide frequency response is essential. And now, the Model 77 V. T. V. M. by taking advantage of new developments including modern balanced push-pull circuit design, etched circuitry, an extra large meter and other improvements provides such measurements quicker, with a higher degree of accuracy and with better readability.

The Model 77 will measure DC with negligible loading AC of ANY FORM WAVE; whether sine wave, pulse wave, saw wave, square wave or other complex wave forms. It will measure all AC from 30 cycles to over 5 megacycles and will do so without additional accessories or cables.

SPECIFICATIONS

- DC VOLTS—0 to 3/15/75/150/300/750/1500 volts at 11 megohms input resistance.
- AC VOLTS (RMS)—0 to 3/15/75/150/300/750/1500 volts
- AC VOLTS (Peak to Peak)—0 to 8/40/200/400/800/2000 volts.
- ELECTRONIC OHMMETER—0 to 1000 ohms/10,000 ohms/100,000 ohms/1 megohm/10 megohms/100 megohms/1,000 megohms.
- DECIBELS —10 db to +18 db, +10 db to +38 db, +30 db to +58 db. All based on 0 db = .006 watts (6 mw) into a 500 ohm line (1.73v).
- ZERO CENTER METER—For discriminator alignment with full scale range of 0 to 1.5/7.5/37.5/75/150/375/750 volts at 11 megohms input resistance.

Model 77 comes complete with operating instructions, probe and test leads. Use it on the bench—use it on coils. A streamlined carrying case, included at no extra charge, accommodates the tester, instruction book, probe and leads. Operates on 110-120 volt 60 cycle. Only

**\$42⁵⁰
NET**

SHIPPED ON APPROVAL NO MONEY WITH ORDER — NO C. O. D.

Try it for 10 days before you buy. If completely satisfied then send \$12.50 and pay balance at rate of \$6.00 per month for 5 months. No Interest or Finance Charges Added. If not completely satisfied, return to us, no explanation necessary.

MOSS ELECTRONIC, INC.
Dept. D-657, 3849 Tenth Ave., New York 34, N. Y.
Please rush one Model 77 on approval. If completely satisfied I agree to pay \$12.50 within 10 days after receipt and \$6.00 per month thereafter. Otherwise I will return, positively cancelling all further obligation.

NAME
ADDRESS
CITY ZONE STATE
All prices net, F.O.B., N.Y.C.

MORE PICTURE POWER

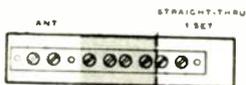
new
BLONDER-TONGUE
**B-24
POW-R
BOOSTER**



\$24⁹⁵
list

*it's a powerful booster
...or an amplified coupler!*

**provides sharp, clear TV pictures on
1, 2 or more TV sets with only 1 antenna**



'straight-thru' circuit provides up to 10 db gain as a powerful one-set booster



'couple-two' circuit provides up to 5 db gain (per set) as an amplified two-set coupler



'straight-thru' circuit and B-T 4-set coupler provide no-loss 4-set distribution system

Employs new frame-grid tube 6DJ8 new circuitry to achieve highest signal gain and "lower-than-cascode" noise factor. Provides full broadband amplification covering low and high VHF channels. May also be used as FM-TV coupler. Features "NO-STRIP" 300 ohm terminals for positive, electrical contact in seconds. Has "on/off" switch.

Improve TV reception today on 1, 2 or more TV sets with a single antenna.



Available at parts distributors. For details write: ET-8.
BLONDER-TONGUE LABORATORIES, INC.
9 Alling Street • Newark 2, N. J.

In Canada: Telequipment Mfg. Co., Ltd., London, Ont. Export: Morhan Export Corp., N. Y. 13, N. Y.
hi-fi components • UHF converters • master TV systems • industrial TV cameras • FM-AM radios

New Semiconductors

(Continued from page 53)

diode's small size and ruggedness as compared with a reactance tube, it is also worth noting that filament or plate supplies are not needed, thus reducing hum which might be generated. The extremely low power dissipation in this application insures that the diode will operate almost indefinitely.

The type of diode to be used is principally dependent upon the bias which will be applied to it. This bias plus the oscillator voltage must not exceed the peak inverse voltage rating of the diode. Sufficient biasing of the diode will prevent the oscillator output from driving the device into the forward or conducting direction, which would result in clipping.

Selenium Contact Protectors

Still another example of a rectifier that does not rectify is the selenium unit. Selenium diodes have proved

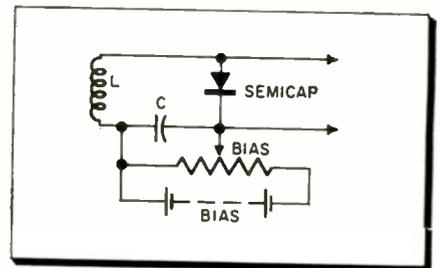


Fig. 4—A semicap silicon diode is used as a variable capacitor in a tuned circuit.

to be extremely effective and inexpensive contact protectors for a wide range of circuits. They have the attractive advantages of small size, long life and ease of mounting, over other methods of contact protection.

Of the alternative methods, the capacitor-resistor combination is costly and bulky. While providing arc reduction, it can sometimes draw excessive charging currents.

The non-linear characteristics of semiconductor diodes are demonstrated here to unique advantage, since their resistance decreases with increasing voltage in the blocking direction. When the generated voltage is high, the reverse resistance of

the diode is low, and will allow considerable current to flow, which quickly dissipates the induced energy. The induced voltage across the coil will drop very rapidly, and this in turn lowers the back voltage across the diode cell. As the reverse voltage drops, the cell resistance increases and the current decreases proportionately.

Typical circuits illustrating the use of selenium diodes in contact protection are shown in Fig. 5. The choice of which circuit to use will depend upon three factors: (1) supply voltage; (2) maximum permissible in-

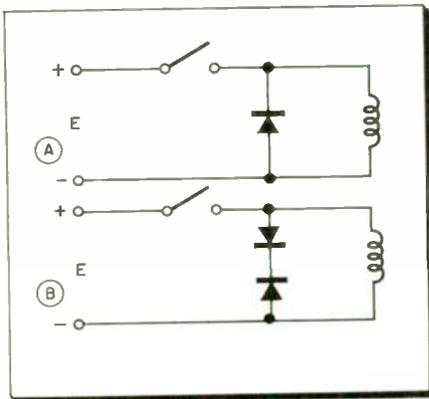


Fig. 5—Circuit choices are available when using selenium diodes as contact protectors. Circuit (B) is used with an a-c supply voltage.

duced voltage, and (3) maximum allowable time delay in de-energizing the coil.

The circuit of Fig. 5A has a low forward resistance and the circulating current will tend to flow for a much longer time than it takes for the current to decay in an unprotected circuit. If decay time is important, then the circuit of Fig. 5B should be used. If the supply is a-c, then this circuit is absolutely necessary, since the suppressor must block voltages of both polarities equally.

The applications described are but a few of the countless possible uses of rectifiers and diodes as completely new and different circuit elements. They have also proved themselves useful as noise limiters, temperature sensors, Go-No-Go indicators, meter protectors, and components of matrix systems in computers and telephone systems. As their capabilities become more widely known, numerous other functions will be performed by these versatile components, especially in conjunction with transistors and switching circuitry. •

More PROFITS from stereo conversions with ERIE...

FREE

this colorful
COUNTER SALES KIT
complete with
display packaged
STERIEO
CARTRIDGE



yours when you buy six **STERIEO** cartridges

Here's a real promotion package with built-in plus profit. This eye-catching display keeps the new STERIEO Cartridge out where your trade will see it...ask about it...buy it. And a starter supply of 250 fact-packed folders is included with the display.

ERIE'S high quality STERIEO ceramic cartridge can be your door-opener to profitable stereo conversion business. Compare these specifications with any other ceramic cartridge, then order your new STERIEO display kit.

SPECIFICATIONS

Frequency response: 20 to 16,000 cps. • Tracking force: 5 grams.
Output: 0.5V, each channel • Channel separation: 20 DB

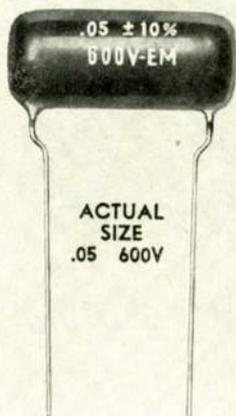
ERIE Electronics Distributor Division
ERIE RESISTOR CORPORATION
Erie, Pennsylvania



ELMENCO

DIPPED MYLAR* - PAPER CAPACITORS
MINIATURIZED ±10% TOLERANCE

designed to
withstand
4 times
more humidity
than the best molded capacitors
used in the past!



MINIATURIZED

50% Smaller than other brands

- RELIABILITY that meets computer and missile requirements
- CONSTANT HIGH TEMPERATURE OPERATION at 110°C at full rated voltage
- LONG TERM STABILITY ... no drift, no shift
- HIGHER INSULATION RESISTANCE
- ALL VALUES ±10% TOLERANCE
- PRINTED CIRCUIT and TRANSISTOR application

ask for the ARCO

dp "5 PAK"

at your distributor

Each value individually packed
5 capacitors to a "5 Pak"
in a moisture proof transparent bag
for easier handling.

For complete information write for bulletin A5P



*DuPont Trademark



ARCO electronics inc.

64 White Street, New York 13, New York

Branches: Dallas 19 • Las Angeles 35

Citizens Band Q & A

(Continued from page 32)

where no mobile stations are involved, three-element beams will be necessary. Here again terrain will affect the actual mileage. Distances as high as thirty miles are not beyond achievement.

Question:

Can I use my Citizens Band equipment while I am in motion in my car?

Answer:

Some cities, such as New York City, specifically prohibit the use of radio telephone equipment while in motion. The operator must pull over to the side and bring his car to a full stop before using the equipment. However, every area has its own regulations and it would be advisable for the user to contact his local law enforcement agencies to find out the legality of operating while in motion.

Question:

What type of antenna shall I use in my car?

Answer:

For proper operation, a vertical whip 8'7½" long would be the most efficient type of antenna for mobile use. This whip would represent a full quarter-wave antenna. However, many manufacturers are supplying base-loaded mobile whips averaging in size 73" with a base-loaded coil to make up the electrical difference of a quarter-wave length. The efficiency of such an antenna is not greatly affected; the average citizen would probably find it more practical to use in place of the larger whip.

Question:

Are there other frequencies I can use, or am I confined to the frequency of the crystal that comes with the unit?

Answer:

The F.C.C. has allocated twenty-two channels and you may use any one or all of these channels providing the frequency of the transmitter is kept to within 0.005% of the crystal frequency.

Question:

Who may service and maintain transmitters?

Answer:

The law specifically says that only the holder of a second class radio

telephone license may maintain and service Citizens Band equipment. It would be well worth your while to have at least one member of your organization secure a second class radio telephone license so that you may legally service this equipment.

Question:

What is the range of a Citizens Band transmitter?

Answer:

All Citizens Band units operating in the 27 mc range have a limited ground wave characteristic. It is the ground wave that we will be dependent upon for successful operation. The distance of the ground wave will depend completely upon the terrain, antenna height and atmospheric conditions.

To come out and make a blunt statement that the range is "X miles," is pure guesswork. Tests made at the author's location in Flushing, N.Y., show the range to vary as follows: From home to the downtown Flushing area, the range is approximately 3½ to 4 miles. Because of the high buildings and the noise from fluorescent and neon signs one could hear the mobile station in the car, but the car had difficulty in hearing the base station. Another example, from home going due East there was complete and perfect contact with the car for 10½ miles. Another example, from home to the Queens entrance to the Queens-Midtown tunnel—complete contact. This distance was approximately six miles.

One night while demonstrating the unit we heard two other stations on our channel. We broke in and found both were operating from Coney Island, a distance of approximately 20 miles. In midtown Manhattan, one would assume based on above experiences that the distance would run from one to four miles. •





TWO-WAY RADIO

communications equipment

VHF-EM FOR:

- MOBILE
- AIRCRAFT
- MARINE
- MOTORCYCLE
- PORTABLE
- BASE

VHF-FM FOR:

- AIRPORT VEHICLES
- GROUND STATIONS
- POINT-TO-POINT

VHF

- ANTENNAS
- REMOTE CONTROLS
- ACCESSORIES





COMCO'S ALL NEW

"580" FLEETCOM

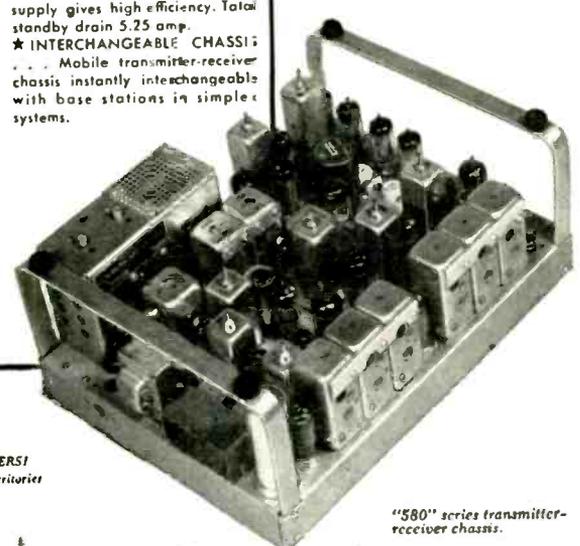
VHF-EM MOBILE RADIO

The new "580" is compact, light weight, has high performance, and features an original concept in Mobile equipment packaging by combining the control head, speaker, and transistorized power supply in one small easily mounted case assembly.

FEATURES

- ★ **HIGH PERFORMANCE**... meets "split channel" technical requirements, all FCC and FCDA requirements.
- ★ **FULL POWER OUTPUT**... 35 Watts in 25-50 Mcs. 25 Watts in 144-174 Mcs.
- ★ **BUILT-IN RELIABILITY**... Preproduction Models field tested in 5 states and 3 foreign countries before starting production.
- ★ **SMALL AND LIGHT WEIGHT**... Chassis in case 13"x9½"x5½". Control-power Supply-Speaker case 5"x5"x3½". Complete Mobile installations 24 lbs.
- ★ **EASY TO INSTALL**... "Two-unit" package so small most installations are under dash.
- ★ **LOW COST**... Complete mobile package

\$398 f.a.b. factory



ATTENTION DEALERS!
Write for available territories



DESIGNERS AND MANUFACTURERS OF RADIO COMMUNICATIONS EQUIPMENT

COMMUNICATIONS COMPANY, Inc.

FOUNDED 1938 CORAL GABLES, MIAMI 34, FLORIDA

SERVICEMEN KNOW!

Here they pay less and get the best

HUSH®

Chemically-Electronically, engineered for Tuners and Switching Mechanisms.

When New HUSH is applied it will wash-away that dirt, leaving clean and positive contacts protected by a lasting lubricant. New HUSH is made from the finest solvents and it contains Electro-Silicone oils.

Also available—2 oz., 8 oz., 32 oz. containers 6 oz. Spray can **\$2.25 net**

EVER-QUIET®

Since 1949

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.

Also available—32 oz. containers 6 oz. Spray can **\$1.59 net**
2 oz. Bottle & dispenser **79c net**

CHEMICAL ELECTRONIC ENGINEERING, INC. Matawan, New Jersey





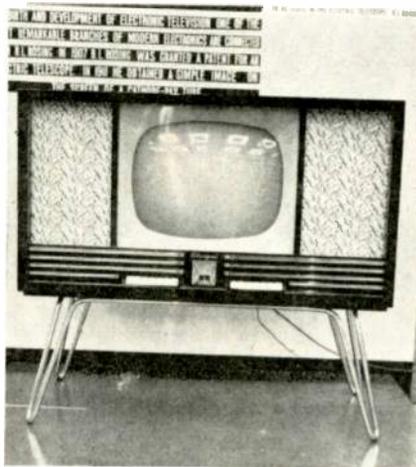
Soviet Electronics Exposition

This summer the Soviet Union is conducting the USSR Exhibition of Achievements in Science, Technology and Culture at the New York Coliseum in New York City. At the same time, the United States is operating a similar exhibit in Moscow as part of a cultural exchange.

A major section of the Russian exhibit is devoted to electronic developments. Interwoven with credits to A. S. Popov, "Inventor of radio," and claims that there are no illiterates or unemployed in the Soviet Union, were a number of industrial and consumer electronic products indicating a fairly advanced electronic technology, almost equivalent in many respects to that in the United States.

Typical of the TV receivers displayed was the Almaz-203, a 21" set covering 12 TV channels in the 48.75 to 229.75 mc range. It also covers FM

stations in the 64.5 to 73 mc band. The picture tube is a 53LK6B 110° deflection type. The set uses 22 receiving tubes, 13 germanium diodes and printed circuits. It operates from



Deluxe Russian TV receiver features 12 push-button controlled channels, multiple speakers.

110, 127 or 220 volt lines at 50 cps. Power consumption is 185 watts on TV, 60 watts on FM. The wooden cabinet has a high gloss finish similar to many of the German radios sold in this country.

Among the many other TV models is the Mayak 12-tube with 35LK2B picture tube. It is quite similar to our 17" portables. For the more prosperous, there is the Symphonia with stereo tape recorder. This unit has 31 tubes and 25 germanium diodes.

Another unit shown was the Sputnik-2 with 10" picture tube operating on semiconductors. Power source is a 12 volt storage battery from which it drains 14 watts. Weight of the unit is 15.9 pounds.

Among the radios displayed, there is a wide range, from Volna, an old fashioned looking three tube super-het for long and short wave, using printed circuits, to some fancy and

NEW MASTER ANTENNA SYSTEMS EQUIPMENT by entron

FEATURING AN ALL BAND AMPLIFIER

ANTENNA FILTER and FILTER BASE

AF-5



Antenna Filter
Fixed Tuned Single
Channel Design
Sharp Selectivity

FB-7



Filter Base
Mixes Multiple Antennas
Designed for Mixing
Non-Adjacent Channels
in any Combination

SURFACE and FLUSH MOUNTING OUTLETS

OB-700 Series

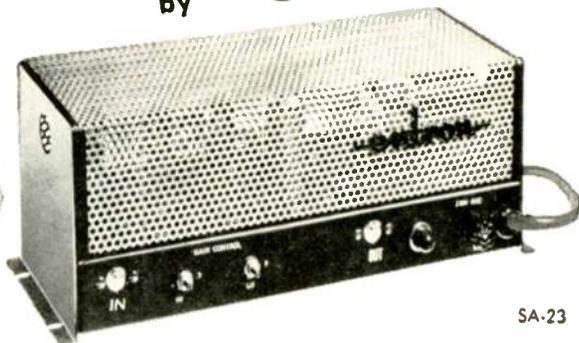


OP-615



Response Flat from AM thru VHF Bands
Complete AC Isolation
Available in 75 and 300 Ohm Plug
and 300 Ohm Screw Type

For complete information send for Catalog F1102



SA-23

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

The Skill's Built In



P. O. Box 287 Bladensburg, Maryland
APleton 7-9585

FREE Send for booklet on Design and Installation of Master Television Antenna Systems

expensive looking units styled on the German pattern. Typical of the latter is the Spidola AM/FM 16 tuber with three speed changer. It offers seven speakers and motor tuning.

In addition to many laboratory research instruments and microwave devices, the Russians are displaying an underwater TV system operating at either 625 lines @ 25 frames or 525 lines @ 30 frames. Another device of interest is a portable TV camera for



The "Latvia" table model radio-phonograph combination made in USSR is designed to receive standard broadcast, FM and short wave. Note "German styling."

remote broadcast pickup. It can operate within a range of 500 meters. Signal to noise is 50 db or better.

Those technicians who are also radio amateurs, may be interested to learn that Russian hams had 685,000 two-way contacts in 1958 with 263 countries. Included among these contacts were 226,000 with U.S. hams.

For one of the first exclusive reports on TV servicing in the Soviet Union, see the July 1958 issue of ELECTRONIC TECHNICIAN.



"Did anyone call while I was out?"

Sylvania Audio-Power Transistors



Here are two problems you won't have to face when you replace with Sylvania

Problem No. 1:

Which type replaces which?

Sylvania has the most complete line available. And your Sylvania distributor has them in stock. The full line listed here equips you to replace the output transistors of every major auto-radio make. To make your job easier, Sylvania has prepared an interchangeability chart—available from your Sylvania Distributor.

Sylvania's Auto-radio Transistor line

2N155	2N242	2N296	2N350	2N677
2N176	2N250	2N301	2N351	2N677A
2N235	2N255	2N301A	2N399	2N677B
2N235A	2N256	2N307	2N401	2N677C
2N235B	2N257	2N307A	2N419	2N678
2N236B	2N285A	2N326	2N420	2N678A

Problem No. 2:

The broken mica washer

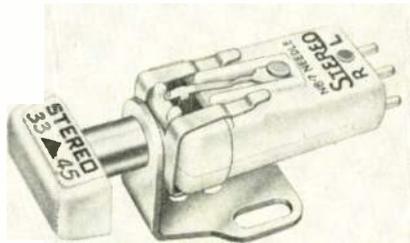
More often than not the mica washer flakes when you remove the output transistor from the auto radio chassis. To save you time and money, Sylvania now packs a tight-fitting mica washer with every transistor. Next time you need an audio power transistor—get it from your Sylvania distributor and ask for Sylvania by name.

 **SYLVANIA**
Subsidiary of
GENERAL TELEPHONE & ELECTRONICS 

SYLVANIA ELECTRIC PRODUCTS INC.
Semiconductor Division
100 Sylvan Road, Woburn, Mass.

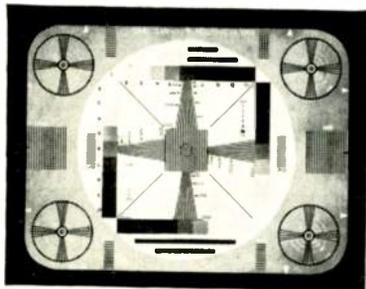
Astatic STEREO CARTRIDGES

A new series of three high output stereo cartridges report 50 to 10,000 cps frequency response; 20 db channel separation and 10 gram stylus pressure. The models are as follows: 70TS, original equipment cartridge used for narrow pickups; 74TS, direct replacement cartridge (shown); 76TS-TB, original equipment cartridge with mounting bracket for $\frac{1}{2}$ to $\frac{7}{16}$ inch mounting centers. All models use Astatic needles N8-7 and N8-3. Astatic Corp., Conneaut, Ohio. (ELECTRONIC TECHNICIAN 8-50)



Columbia STEREO CARTRIDGE

A new high compliance stereo cartridge, the Professional 55, is designed for use with transcription turntables. The cartridge features a 0.5 mil diamond stylus, 1.5 gram tracking force and is reported to be shock-proof and unaffected by humidity and tempera-



TV TIPS FROM TRIAD

NO. 4 IN A SERIES

There was a hopeful gleam in the serviceman's eye as he threw the burnt-out coil on the parts distributor's counter. "Glad to see you now have the Triad line," he said. "Do you by chance have a high-voltage coil that would stay IN that callback I picked up today?"

"Sure thing," said the counterman, examining the coil. "However, Triad's TV Guide points out that just replacing the coil on that particular flyback doesn't help much. Seems the high plate current raises the temperature of the whole flyback and 6CD6 to where something just has to give."

"One more strike and I'm out," said the serviceman. "What do I do?"

"Triad suggests their complete D-97-R unit—which gives good width and high voltage—but runs cool. As much as 50 milliamps less plate current."

"Sold. I never did like soldering high-voltage filament windings, but if it does the job, I'll buy it."

* * *

MORAL: Triad Transformer Corporation dedicates itself, in part, to making life easier for Professional Television Men, with such helps as (1) bonus information and (2) their series of Television Service Aids. Your card or letter to 4055 Redwood Avenue, Venice, California, will bring your "Callback Stopper Check Chart"—with the story of heat-reducing flybacks such as the D-97-R.

ture. Specifications include a frequency response of 20 to 15,000 cps, lateral and vertical compliance of 2, channel separation 20 db and output voltage .4 volt. Miniaturized plug-in equalizing networks are supplied for low and high level inputs. CBS-Hytron, Danvers, Mass. (ELECTRONIC TECHNICIAN 8-51)

Sonotone BATTERY CARTRIDGE

A new flashlight battery cartridge incorporates two of the company's new sinter-plate, nickel-cadmium battery cells of the sealed, rechargeable type, combined with a charger. Housed in a shockproof and leakproof metal case with a removable cap. To recharge, cap is removed and the cartridge is plugged



directly into any 110-volt a-c outlet. An overnight recharge is sufficient. The cartridge slips easily into any flashlight now using "D"-size cells. No adapters are needed. 12 different sizes of cells are available; is rated at 4.2 ampere hours; the smallest is rated at 75 ma hours. All sizes are 1.25 volts. Cartridge price: \$7.95. Sonotone Corp., Elmsford, N. Y. (ELECTRONIC TECHNICIAN 8-26)

**Arco SELF-SERVICE
CAPACITOR DISPLAY**

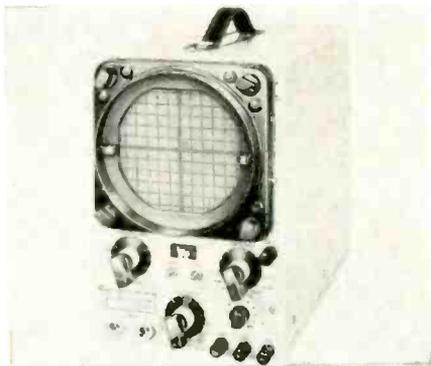
A supermarket type of capacitor merchandising display is being set up at parts distributors as a shopping aid to electronic technicians. The self-service racks contain a wide assortment of miniaturized Elmenco dipped mylar-paper capacitors in both 600 and 1600 volt ratings. These epoxy coated



types are claimed to be four times more humidity resistant than previous molded types, and have been featured in RCA consumer advertising. This display contains a wide selection of "5 Paks," transparent bags with five capacitors in each. Another benefit of the display is the reminder value it has for technicians. Arco Electronics, Inc., 64 White St., New York 13, N. Y. (ELECTRONIC TECHNICIAN 8-32)

Waterman CRAFTSCOPE

Model S-16-A is a professional type oscilloscope specifically designed for TV and Hi-Fi applications. It is claimed to be the smallest 5" oscilloscope on the market. It weighs 18½ lbs., and is contained in a case only 12½" x 7" x ½", smaller than most narrow band 3"



scopes. Features d-c to 7 mc response, wide range repetitive sweep and ease of operation. Conveniences for the technician include: "Two line-Two Frame" positions on the horizontal sweep, trace inversion, direct vertical calibration and hi-sensitivity vertical amplifier. \$245. Waterman Products Co., 2445 Emerald St., Philadelphia 25, Pa. (ELECTRONIC TECHNICIAN 8-28)

look what
\$29⁹⁵
buys in
high fidelity
equipment!

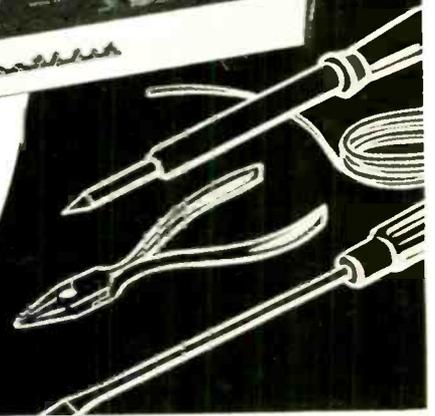


Manufacturer
of the finest
electronic equipment
in kit form



A complete 14-watt hi-fi amplifier-preamplifier combination in one stylish unit . . . and at less than half the price you would expect to pay!
Only

\$29.95



14-WATT HI-FI ECONOMY AMPLIFIER (EA-3)

From HEATHKIT audio labs comes an exciting new kit . . . New Styling, New Features, Brilliant Performance! Designed to function as the "heart" of your hi-fi system, the EA-3 combines the preamplifier and amplifier into one compact package. Providing a full 14 watts of high fidelity power, more than adequate for operating the average system, the EA-3 provides all the controls necessary for precise blending of musical reproduction to your individual taste. Clearly marked controls give you finger-tip command of bass and treble "boost" and "cut" action, switch selection of three separate inputs, "on-off" and volume control. A hum balance control is also provided.

NOTE THESE OUTSTANDING SPECIFICATIONS: HARMONIC DISTORTION, less than 2% (20 cps-20 kc) at 14 watts. I.M. DISTORTION, less than 1% (60 and 6,000 cps. 4:1) at 14 watts. FREQUENCY RESPONSE, 20 cps-20 kc, ±1 db at 14 watts. HUM & NOISE, mag. phono input, 47 db below 14 watts, tuner and xtal phono input, 63 db below 14 watts. A truly remarkable buy for the beginning or advanced audiophile.

ORDER DIRECT BY MAIL OR SEE YOUR NEAREST HEATHKIT DEALER

ALL PRICES F.O.B. BENTON HARBOR, MICH. PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.



many more kits
to choose from!

Send for this free catalog describing over 100 easy-to-build kits in hi-fi-test-marine and amateur radio fields.

HEATH COMPANY

Benton Harbor 24, Mich.

a subsidiary of Daystrom, Inc.

name _____
address _____
city & state _____

New Stereo Speaker Design

A stereo speaker system which departs from previous designs has been developed by University Loudspeakers, Inc., White Plains, New York. It consists of two 8" midranges and tweeters facing out of the left and right sides of a single 30" wide cabinet. A dual voice coil woofer faces the rear. Two doors open from the front forming deflectors, which prevent the higher frequency sounds from being beamed directly to the listener. See Fig. 1 for construction layout and circuitry.

This compact arrangement is claimed to provide a very large stereo listening area in the room. It accomplishes this by a bounce effect for frequencies above 150 cps. Note Fig. 2. When the sound paths are traced back to the points of intersection behind the rear wall, these points represent virtual sound sources that are different distances from the listener. The resulting

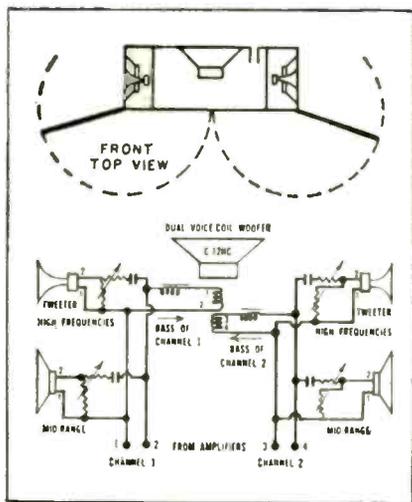


Fig. 1—Position of doors may be varied to affect sound pattern of each channel. Variable resistors shown are tweeter brilliance controls and midrange presence controls.

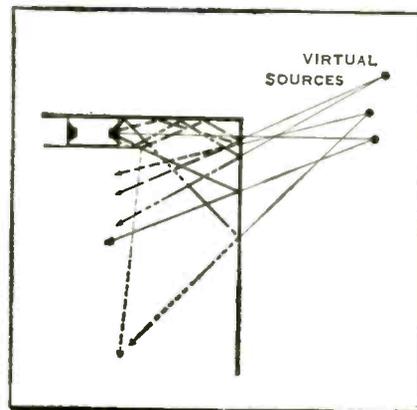
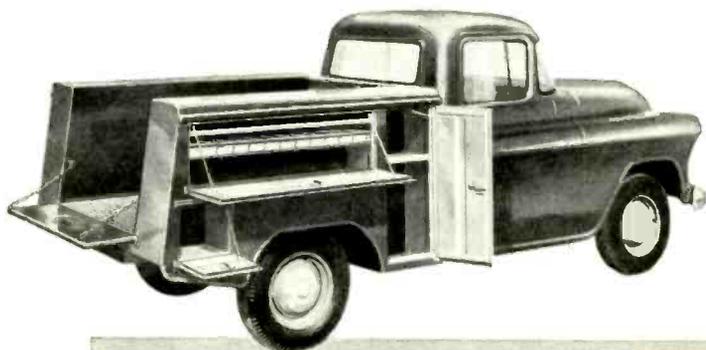


Fig. 2—Frequencies above 150 cps bounce off rear and side walls to cover room with stereo effect. Sound acts as if coming from virtual image source behind wall.

sound field thereby obtains depth as well as breadth.

This "Trimensional" system, as it

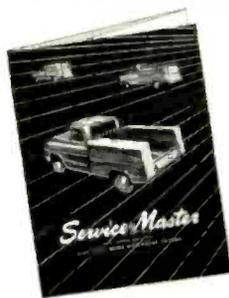
is called by the manufacturer, need not be placed only in the center of the wall, as in Fig. 3A. By arranging the door position as shown in Figs. 3B and C, the enclosure may be positioned in or near the corner of a



Service-Master costs so much less in the long run that it's actually false economy to settle for any other make. Here's a truck body that has class . . . starting with the way it's put together and ending with the way it stays together without constant upkeep through the life of several chassis. See one, go over it carefully, get all the facts, compare and you'll know why Service-Master is your very best service body buy!

POWERS
Service-Master®
TWO MODELS . . . FOUR SIZES
 for 1/2, 3/4, 1 and 1 1/2 ton chassis

A standard Model SM-15 (3/4 ton) Service-Master is shown at top left. Below is the same model with a Canopy Top. All bodies are available for immediate delivery in all 48 states.



Before you buy any service body . . .
SEND FOR THIS FREE 6-PAGE FOLDER
 It's loaded with valuable information



McCABE-POWERS BODY COMPANY
 5900 NO. BROADWAY • ST. LOUIS 15, MO.

room, and still obtain the required sound reflection.

Presence and brilliance controls are included for each channel. They also affect loudness of the channels.

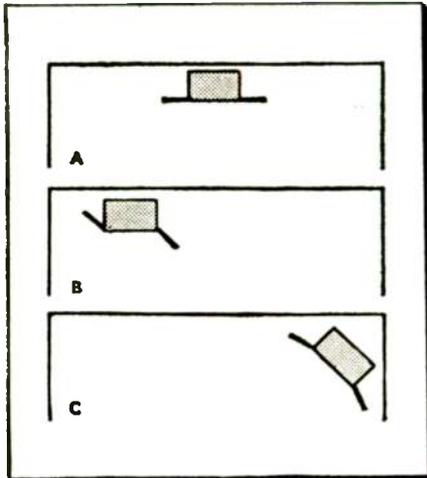


Fig. 3—Reflector door may be adjusted to accommodate positioning in room.

This allows adjustment for tonal balance to compensate for sound absorption variations produced by adjacent furniture or different wall treatments.

Model TMS-2, 30" wide, 25" high, 12½" deep, is priced at \$258 in mahogany.

Raytheon TUBES

Twenty-three new industrial control types are: Ignitron, rated from 600 to 1200 KVA, 54-140 amps peak current, 1051A, 1052A, 1053A and 5550; Thyatron, rated from 2-77 amps peak current, 1250-5000 peak inverse volts, 3C23, 710/60A, 710L, 715, 740, 7402, 740P, 760, 760L and 760P; Rectifiers for induction heating, dielectric heating and motor speed control applications include full-wave types 604, 604L, 606, 606L and half-wave types 615, 623, 635, 635L and 635P. Also, seven new receiving tube types: 3CY5, 7 pin miniature tetrode; 6DT5, 9 pin miniature beam power pentode; 6EH8, 9 pin miniature triode pentode; 6J6A, 7 pin twin triode miniature; 9AU7, 9 pin miniature double triode with a 450 ma heater; 9BR7, 9 pin miniature duo-diode-triode for use as a sync separator and 12AZ7A, 9 pin miniature double triode with controlled heater warm-up characteristics. Raytheon Mfg. Co., 55 Chapel St., Newton 58, Mass. (ELECTRONIC TECHNICIAN 8-29)

Coming Next Month
STEREO 1960
Special section in
ELECTRONIC TECHNICIAN

These STANCOR girls protect you by testing every yoke

This is part of the yoke testing department at Chicago Standard. Here every yoke is tested in an actual operating sweep circuit to assure you of trouble-free no-callback performance.

This is just one of the many steps in the thorough STANCOR testing process. Each yoke is breakdown tested at a minimum of twice its normal operating voltage . . . and also gets a complete mechanical and physical inspection.

For your further protection, STANCOR yokes are cosine wound to shape on specially designed forms. You don't have to worry about undue strains and weak spots in the coils—these only occur in yokes where the coils are bent after winding, never in STANCOR yokes.

Have you read "Stan Cor's Corner," a new publication of service tips and other useful information? Ask your distributor for your free copy.



CHICAGO STANDARD TRANSFORMER CORPORATION
3513 WEST ADDISON STREET • CHICAGO 18, ILLINOIS

It's Easy
to Install
This

CITIZENS BAND 27 MC ANTENNA

DESIGN permits rapid mounting similar to that used for TV antennas—on 1¼" mast, tubing, chimney mounts, sidewall brackets, etc.

PROVEN PERFORMANCE: Full half-wave coaxial type widely used in communications. Maximum performance by resonating to operating frequency. Eliminates uncertainty of flexible wire ground plane systems. And requires no loading coils!

FINEST CONSTRUCTION: All aluminum seamless tubing, with weather-proof UHF coaxial connector. Aluminum casting main support. Weighs only 2 lbs., 14 oz. Overall height a full 17' 6".

MODEL CO-27 ★ PRICE ONLY \$14.95

Free literature from
HI-PAR PRODUCTS CO.
FITCHBURG, MASS.



Association News

(Continued from page 86)

lack of individual industry participation and leadership. The TSA Board of Directors, replying to NATESA's rejection of their membership application, state: "We admire, to a degree, the manipulation . . . to block our membership in NATESA. With a hasty formation of TESA, Michigan, . . . we now find a NATESA bylaw roadblock and our 'rank and file' members are told they can join ESA because ESA is now the NATESA affiliate in Detroit. ESA, comprising a membership that is less than 15% of TSA's membership and counting among its members some who are not qualified for membership in TSA, is now ready by the alchemy of mockery to receive TSA into membership. . . . We have stated our case. It is not our intention to carry on a running word battle with the present leadership of NAT-ESA. To do so would be a reflection on the many fine friends we have among the NATESA membership. Our hope is that . . . Service Dealers . . . can find a common ground to meet and unite in a truly national voice."

Missouri

TESA, Missouri, elects new officers: Pres., Vern Towner, Sec'y., Earl Steffes; Treas., Carl Adcock; Northeast V. P., Dennison Houghton; Southeast V. P., Barney Lewis; Southwest V. P., Gene Hoss; Northwest V. P., King Camden.

Ohio

ETAT, Toledo, appeals for support of TV License Bill No. 134. Very few contributions have been made to date towards their \$1,760 quota, in spite of previous clamoring for a License Bill.

Wisconsin

TESA, Wisconsin, now has five affiliates with NATESA. In addition to TESA, Milwaukee and TESA, Green Bay, three new affiliates, Madison, Sheboygan and Janesville have been added.

Canada

ESDA, Vancouver, B. C., elected the following officers: Pres., Jack Davies; V.P., John McFarland; Sec'y., W. Lawson; Treas., W. Gerry Morton. Two directors, Thomas Rigby and Don Klein, were also named.

A BIG, NEW PROFITABLE MARKET
and the perfect equipment to serve it!



G-11 GONSET Citizens' Communicator 2-WAY RADIO

Now . . . FCC assigns 22 channels within 11-meter range for Class D use—personal or business! Easy to license . . . no exam, U.S. Citizens merely complete simple FCC form.

Technician/Dealers . . .

Gonset G-11 offers you . . . the perfect inexpensive equipment to serve this big, profitable market. Demonstrate . . . sell . . . install . . . maintain.

Multiple and repeat sales . . .

G-11 units can operate together as a system. Examples: industrials . . . buildings . . . yards, warehouses . . . aviation . . . branch businesses. Every industrial account you have is a hot prospect!

Dependable . . .

FCC type accepted. No tuning, full crystal control . . . RF stage . . . ANL . . . adj. squelch . . . panel speaker . . . p-t-t control . . . built-in power supply, 5 watts input (FCC max). 3 models—115 VAC, 12 VDC, and 6 VDC . . .

124.50 per unit

w/mike & trans/rec crystals for 1 channel

Send today for complete information and free booklet.

GONSET DIVISION DEPT. ET-1,
Young Spring & Wire Corp.
801 South Main Street, Burbank, Calif.

Gentlemen: Rush complete details on your technician dealer plan and free booklet: "11-meter Citizens' Band Radio"

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

GONSET

Division of Young Spring & Wire Corporation

801 SOUTH MAIN ST., BURBANK, CALIFORNIA



TACO TV ANTENNAS

WRITE FOR COMPLETE TACO TV-FM-AMATEUR CATALOG.
TECHNICAL APPLIANCE CORPORATION, Sherburne, N. Y.

....For your good! Nothing spells customer satisfaction as much as performance—and that's exactly what a Taco antenna provides. For more years than any other antenna manufacturer, Taco has provided the TV technician with the antennas best suited for all reception requirements. Try one on that next installation and see for yourself...

DON'T SAY "BRIGHTENER"
SAY

Perma-Power

UNIVERSAL

TV TUBE BRITENER

Engineered for quality . . .
and fully guaranteed!

Model C-301

For use in Series
or Parallel Wired Sets

List Price \$4.45



Unique design allows operation as constant voltage or constant current transformer. Gives 6.3 or 7.8 volts output with Isolation on Series or Parallel sets. Works on electrostatic or electro-magnetic focus picture tubes. Relieves Cathode-Filament shorts without Boost output.

DON'T SAY "BRIGHTENER"
SAY

Perma-Power

VU-BRITE

Engineered for quality . . .
and fully guaranteed!

Model C-401
Model C-402

For use in Series Sets
For use in Parallel Sets

List Price \$1.49

The price leader for brightening most sets! Auto-former type transformer increases filament voltage to 7.8 V. Works on electrostatic or electro-magnetic picture tubes.



Don't say "brightener"
Say PERMA-POWER

The Standard of All Comparison
Available from your parts distributor

PERMA-POWER COMPANY

3104 H N. ELSTON AVE., CHICAGO 18, ILL.

New Books

Book marked with an asterisk (*) may be obtained prepaid from Electronic Marketers, Book Sales Division of Electronic Technician

*PROPERTIES, PHYSICS & DESIGN OF SEMI-CONDUCTOR DEVICES. By John N. Shive. Published by D. Van Nostrand Co. Inc. 487 pages, hard cover. \$9.75.

This latest addition to the Bell Lab Technical Series presents a comprehensive study of semiconductor devices. A large range of semiconductors are discussed, including the thermistor, varistor and photoelectric cell. Descriptions of the various devices and a complete explanation of their properties and applications provide a single book study of semiconductor developments. Though primarily directed towards the reader with a substantial physics background, the illuminating diagrams and clearly written text is sufficient to enable the technician to obtain a better understanding of semiconductors.

*THE AUDIO ENCYCLOPEDIA. By Howard M. Tremaine. Published by Howard W. Sams & Co., 1278 pages, hard cover. \$19.95.

Here is a technical reference par excellence. A library of information has been packed into 26 sections, including basic sound, motors, mikes, attenuators, equalizers, filters, coils, mixers, VU meters, amplifiers, components, speakers, power supplies, and much, much more. Of notable interest is the 122 page section on test equipment, which includes photos and circuits for many commercial instruments, such as bridges, vtvm's, frequency meters, flutter meters, oscillators, distortion meters, sound level meters and others. The 120-page section on making measurements is most helpful, showing many practical circuit hook-ups. Incidentally the text is presented in an interesting question and answer style. Typical question: "How may a phase inverter driving a push-pull output stage be balanced for minimum distortion?" All told there are over 1600 illustrations covering more than 3400 topics.

CBS ENGINEERS HANDBOOK, Volume I and II. Published by CBS Electronics, 100 Endicott St., Danvers, Mass. Over 700 pages, hard cover. \$10.00.

As the title indicates, this handbook has been prepared especially for the electronic engineer. It features complete data for receiving, special purpose and picture tubes. CBS semiconductors are also completely described. Easy-to-read basing diagrams and characteristic curves should be particularly attractive to design engineers. Its reference capability is further enhanced by an optional periodic supplement service that includes revised and new data for up-to-date information. 16-ring metal binders allow simple insertion and removal of material.

(Continued on page 100)

TUBE PROBLEM:

An amplifier manufacturer was plagued by noise, microphonics and hum that developed in the high gain stages of his amplifiers. Sonotone engineers were consulted on the problem.

SONOTONE SOLVES IT:

Sonotone engineers discovered that they could correct all three complaints by redesigning just one tube.

RESULTS:

The heater element was changed to a coil heater, eliminating the hum. And rigid controls on the mount structure and processing reduced microphonics and noise. This resulted in the Sonotone reliable type 7025. It's now available for initial equipment and replacement purposes.

Let Sonotone help solve your tube problem, too.

Sonotone

Electronic Applications Division, Dept. TT-89

ELMSFORD, NEW YORK

Leading makers of fine ceramic cartridges, speakers, microphones, tape heads, electron tubes.

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

NEWEST
BEST BUYS FROM

EICO

ripple
at full load
is only
0.005%



with new
**Model 1020
POWER &
BIAS SUPPLY
FOR**

TRANSISTORIZED EQUIPMENT

Wired \$27.95 Kit \$19.95

- Checks All transistor radios.
- includes power transformer, full-wave silicon diode rectifier circuit, electrolytic capacitor input filter followed by a two-power transistor (2-2N256) cascaded filter circuit providing extraordinary ripple rejection.
- output voltage: 0-30 VDC continuously variable, monitored by dual-range voltmeter (0-6, 0-30 VDC).
- continuous output current capacity: 150 ma @ 0-12 V; 200 ma @ 12-24 V; 300 ma @ 24-30 V.
- 0.5A fuse protects against short circuit.
- comparable in purity of output and in voltage & current capacity to transistorized supplies selling for several hundred dollars.
- ideal for laboratory, development & service work on transistors & transistorized equipment.
- rugged grey wrinkle steel case 5" x 4" x 5 1/2".

**SERIES/PARALLEL
R-C COMBINATION
BOX #1140**

Wired \$19.95
Kit \$13.95

Exclusive with EICO—1350 possible combinations! Switching facilities permit selection of any resistance or capacitance alone, or 1350 combinations of same in series or parallel. Standard EIA resistance values (1W) from 15 ohms to 10 megs in decade multiples of 15, 22, 33, 47, 68, 100; standard EIA capacitance values (most 600V) from 0.001 to 0.22 mfd. All 10% accuracy. Open & short circuit positions provided. Convenient jack-top binding posts. Compact: 6 1/4" h, 5 1/2" w, 2 3/8" d.



**FAST
TUBE & CRT
FILAMENT
TESTER #612**

Wired \$5.95
Kit \$3.95

Includes batteries

Fast filament checking of series string & all other TV & radio tubes (9-pin, octal, loctal, 7-pin); 14-pin, 12-pin, 8-pin CRTs; bayonet & screw-type pilot lamps; cartridge fuses. Just plug tube into tester socket, observe indicator lamp—no fiddling with controls or switches. Self-powered for convenience & safety. 7-pin & 9-pin miniature tube pin straighteners provided. Compact: 6 1/4" h, 3 3/4" w, 2" d.

Compare these best buys at your neighborhood EICO distributor. For free catalog on 65 models of EICO test instruments, hi-fi & "ham gear, write to Dept. ET-8.

EICO Electronic Instrument Co., Inc.
33-00 Northern Boulevard
Long Island City 1, N. Y.

Electro-Ionic Static Controls

• A new development, the Ovitron, is a self-contained, permanently sealed device that presents an unusual approach to switching controls. Its schematic diagram, shown in Fig. 1, resembles a storage battery, however, the similarity ends here.

The principle of operation is based upon a small energy stimulus applied to an electrolytic bath through a grid control element, causing the non-conducting surface film of two load-connected electrodes to instantly change to a conductive state.

Advantages

This device is static and therefore, does not present problems of wear and malfunctioning of linkages and contacts. It is said that shock and moisture do not affect its operation. Switching response speed is presently comparable to magnetic amplifiers and it is reported that much greater speed will be obtainable. Unusually heavy current load carrying ability is another feature of the Ovitron. In addition, production promises low costs since the unit does not require critical accuracy or rare materials.

Operation

The interesting operation is accomplished as follows: Both load carrying electrodes are coated with an oxide film, causing them to act similar to rectifiers back-to-back. The two semi-permeable electrode

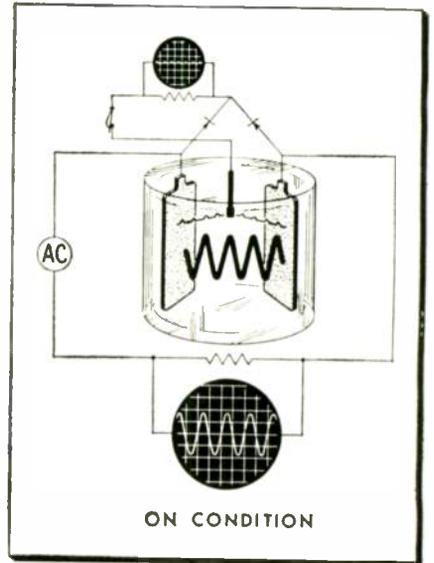


Fig. 1—A self-energized method of excitation can be achieved by using two diodes which block a-c to the grid, allowing a pulsating d-c potential of the proper polarity.

surfaces are polarized and metal ions are forced into the structure of the oxide film, changing the film to a conducting state. The load now "sees" two conducting electrodes and current passes between them through the electrolyte.

The electrodes and grid element do not react to the electrolytic bath and by utilizing a catalyst, small amounts of gases (formed by the grid current only) are returned to the solution. This enables the device to achieve a self-regenerative process which prevents depletion of the electrolytic fluids.

(Continued from page 99)

PRACTICAL ELECTRONICS. By Robert Hertzberg. Published by Arco Publishing Co., Inc., 480 Lexington Ave., 17, N. Y. 136 pages, clothbound. \$2.50.

***BASIC ELECTRONICS.** By Bernard Grob. Published by McGraw-Hill Book Co. 524 pages, hard cover. \$9.25

A new "How To" book reports on recent construction-kit projects including ham equipment, electronic test equipment and other assembled devices. Troubleshooting and component identification techniques to aid the audiophile is also presented. In addition there is informational material on transistors, microwaves and FCC license exams. The well illustrated and clearly written volume should appeal to the amateur radio operator and audiophile.

Here is a book that presents the fundamentals of electronic circuits in a manner that will enable the beginning radio-TV service student to acquire a firm foundation for more advanced courses. The text is presented with a minimum of mathematics and is amply illustrated. The student will certainly appreciate the summaries and self-examinations, with answers, at the end of each chapter. The subject matter is fairly elementary for the experienced technician.

HOW TO INSTALL AND SERVICE AUTO RADIOS (2nd edition) by Jack Darr. The 2nd edition of this extremely informative and practical book brings auto radio installation and servicing right up to date. All the new tricks of the trade are to be found here. The techniques applicable to the most modern auto radios—signal-seeking tuners, hybrid auto radios, transistor auto radios, conversion from 6 to 12 volt operation, and many more new things are explained in great detail. The author, an expert in this field runs a very successful auto radio and mobile radio installation and service shop. This 2nd edition contains practical, proven solutions and is really a money making "tool" #159, \$3.25.

HOME AIR CONDITIONING Installation & Repair by J. Derman, F. Makstein, H. Seaman. This modern, completely practical text by three experts in the field of home air conditioning, enables anyone to understand the organization, operation, installation and repair of all types of home air conditioners. Starting with the principles of the process of cooling air, it covers all facets of home air conditioners.

Both electrical and mechanical components are fully identified, described and illustrated, permitting instant recognition of the parts. Function of each part, its contribution to the entire unit is explained in detail. Troubleshooting and repair techniques are completely covered plus information on how to pinpoint specific troubles by their symptoms. Typical window and package installations are discussed in detail.

Tells how to select the proper unit to meet the requirements set by windows, walls, floors, ceilings, the cubic dimensions of the space to be served and the number of people for which the unit will be used. #211, \$3.50.

REPAIRING PORTABLE AND CLOCK RADIOS by Ben Cross and David Guessin. You can learn all about portable and clock radios—their circuitry, their repair, in this modern book. Beginning with typical portable radio circuits, emphasis is placed on filament circuitry and how major problems of current dispersion are handled. Transistor circuitry is covered. Stress is placed on portable radio power supplies for battery circuits and battery and AC-DC circuits. Numerous battery testing techniques explained. Covers repair, replacement and alignment plus a detailed discussion of probable mechanical trouble, replacement procedures and short-cuts. Tips on extending the life of the set, are discussed. Clock radios, their circuitry, a wide variety of clock movements, how to adjust them and locate defects #224, \$2.75.

BUILD EXTRA SUMMER PROFITS with these RIDER BOOKS

REPAIRING TELEVISION RECEIVERS, by Cyrus Glickstein. The most modern completely practical book, written by an expert with long experience in television receiver repair. Devoted to troubleshooting and repair techniques which are modern, yet down-to-earth. Covers the use of simple as well as elaborate test equipment #191, Only \$4.40.

3rd SUPPLEMENT to the RECEIVING TUBE SUBSTITUTION GUIDEBOOK, by H. A. Middleton. A must for every technician! Contains more than 830 latest receiving tube substitutions • more than 200 picture tube substitutions • more than 230 American to European tube substitutions • more than 200 European to American tube substitutions • a cumulative index listing the tube types treated in the basic book and all 3 supplements. It pays for itself almost immediately! #139-3. Soft Cover, 72 pp., 8 1/2" x 11", illus. Only \$1.35.

RECEIVING TUBE SUBSTITUTION GUIDEBOOK, by H. A. Middleton. #135—Soft cover, 224 pp., 8 1/2" x 11", illus., \$3.00.

FIRST SUPPLEMENT, #139—Soft cover, 48 pp., 8 1/2" x 11", illus., \$.99.

SECOND SUPPLEMENT, #139-2—Soft cover, 48 pp., 8 1/2" x 11", illus., \$.99.

ADVANCED TV SERVICING TECHNIQUES, by Zhar and Schalkkraut. A complete advanced TV servicing course, developed by the Radio-Electronics-Television Manufacturers Association. Shows how to use every conceivable type of test equipment, how to service every part of a TV receiver. Explains latest techniques. Soft cover, 8 1/2" x 11".

MAIN TEXT, 192 pp., illus. #161, \$3.60.

LABORATORY WORKBOOK, 32 pp., #161-2, \$.95.

TV PICTURE TUBE-CHASSIS GUIDE, by Rider Lab Staff. This easy-to-use TV tube type chassis guide covers all picture tube types used in TV receiver production from 1946 to February 1957—over 7,000 listings. Organized by chassis number, and in some cases, by models so that the technician can immediately locate the correct picture tube type simply by knowing the chassis number, #204, Only \$1.35.

Dept. ET-8
JOHN F. RIDER PUBLISHER, INC.
116 West 14th Street, New York 11, N. Y.

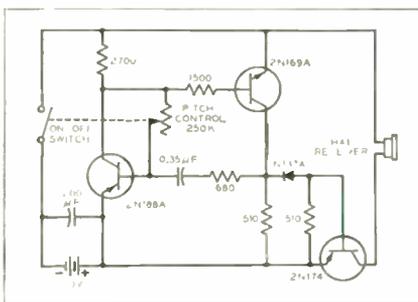
Artificial Larynx

(Continued from page 68)

In order to miniaturize the new artificial larynx, experimental units were built using modular techniques. However, by employing printed-circuit techniques it is anticipated that an even more compact unit can be built.

To use the unit, the laryngectomized person presses the vibrator against his throat. Switching on the pulse generator with his finger, he transforms vibrations transmitted into his throat cavities into speech sounds by normal use of the articulatory mechanisms (throat cavity, tongue, mouth, teeth, and lips) in his vocal tract.

Output speech volume obtained with the artificial larynx is equal to that of a person speaking at a



Efficient pulse generator with pitch control. Circuit parameters are adjusted to yield maximum acoustic output with minimum current.

normal conversational level, though the sound is a bit buzzy and mechanical. Nevertheless, the frequency spectra of vowel sounds show that the frequency range transmitted into the person's throat is sufficient for satisfactory production of such sounds. And while intelligibility tests give results lower than those of normal speech, they are superior to those of any other artificial larynx. Users of the new artificial larynx can achieve a sentence intelligibility of 97% or more, depending on their experience.

Because the artificial larynx requires an economical, self-contained power source, circuit parameters had to be adjusted to yield maximum acoustic output with a minimum of current drain. Accordingly, two transistors are used in a relaxation oscillator whose frequency is controlled by a variable resist-

HOW TO MAKE MONEY

Selling Commercial Sound

Here today and here tomorrow — Commercial Sound is a steady-profit 12-months-a-year business of sales, installation and servicing with lots of customers right in your own neighborhood. Take advantage of the Atlas complete line of speakers — manufactured, advertised and supplied directly by Atlas. Speakers for every application, a mike support for every purpose — plus a wide variety of accessories so necessary for a complete professional installation.

Good markets in stadia, racetracks, athletic fields, etc.

Profitable markets in swimming pools, amusement parks, clubs, schools, etc.

Excellent markets in industry, factories, warehouses, etc.

Write for latest catalog and selling aids to help you get profitable commercial sound business.

ATLAS SOUND CORP.
Dept. ET-8
1443 — 39th St.
Brooklyn 18, N. Y.

In Canada: Atlas Radio Corp.
Toronto, Canada

Channel King®
INDOOR TV ANTENNA



Extends to 42"
Retracts to 0"

THE TRULY UNIQUE AND
ADVANCED
INDOOR ANTENNA

**HIGH
PROFIT
SALES**

- Ⓜ Hands NEVER touch Antenna arms
- Ⓜ SINGLE DIAL adjusts arms and signal
- Ⓜ FAST, positive wider range tuning
- Ⓜ UNBREAKABLE, flexible stainless steel arms
- Ⓜ COMPACT, attractive appearance

See your Distributor . . . Or write for
Literature and Specification Sheets
 ✓ Attention Repts. . . Some Choice Areas Open.

**MARJO TECHNICAL PRODUCTS
COMPANY**
 1146 E. Henry Street, Linden, N. J.

ance, and whose pulse width is determined by a feedback network. The output is a negative pulse which occurs at a frequency of about 100 cycles-per-second. This repetition frequency may be varied from about 100 to 200 cycles by a rheostat which the user operates by pressure on the push-to-talk switch—or inflection control—while speaking, thus changing the pitch of his voice. For use by women talkers, the frequency range is adjusted to 200 to 400 cycles, to correspond with the normal range of pitch of a woman's voice.

A third transistor acts as a single-ended power output stage that amplifies the pulses applied to it from the relaxation oscillator. A diode serves to isolate the multivibrator from the power amplifier input impedance during the period between pulses, and is necessary for stable operation. Because a large pulse is required for sufficient acoustic power output at low frequencies, the relaxation oscillator drive circuit has heavy current requirements.

Two 5.2v mercury cells in series provide the power necessary to operate the artificial larynx continuously for a period of approximately 12 hours. These batteries have a 250 ma hour rating with a maximum permissible current drain of 25 ma. With push-to-talk operation such as the laryngectomized patient requires, 12 hours of continuous operation should be equivalent to several days or even weeks of normal talking.

An alternative to using the self-contained mercury cells for powering the artificial larynx is a small a-c power supply which can be fed from a normal outlet at home or in the office. When the artificial larynx is plugged into the power supply, its batteries are disconnected from the circuit. •

SEE circuit of first commercial transistor TV set . . . in this month's CIRCUIT DIGESTS.



you'll find industrial servicing items faster in the

'59 MASTER

Complete descriptions, illustrations, prices for more profitable TV-radio-audio-industrial servicing. You can buy, sell and bill direct from the MASTER—world's largest electronic catalog at your jobber . . . only \$3.50. \$4.50 in Canada

FREE—24-page **PANEL LAMP CHART** at your jobber, or send 10c to:

THE RADIO-ELECTRONIC MASTER
 60 T Madison Ave., Hempstead, N.Y.

IF YOU MUST SPEND YOUR MONEY
 Why not get something for it?
 get **QUIETROLE**



IN BOTTLES 2, 4 & 8 oz. Dropper with 2 oz. SPRAY-PACK "CAN"

QUIETROLE
TRADE MARK REG. U.S. PAT. OFF.

Costs little more than the poorest substitutes. Why take less than the BEST...

No Product can match its merit . . .
 None can equal its quality . . .
 It's the answer to noisy controls and switches

QUIETROLE is the original product of its kind
 MFG BY **QUIETROLE Company**
 SPARTANBURG, South Carolina
 IN CANADA: ACTIVE RADIO and TV DISTRIBUTORS
 • 58 Spadina Ave., Toronto 28, Ontario

BINDERS FOR YOUR ELECTRONIC TECHNICIAN

. . . to keep your copies for convenient reference
 \$3.50 each—Postpaid

Canada and Foreign—please add 50¢ for additional mailing costs

ELECTRONIC TECHNICIAN

480 Lexington Ave.
 New York 17, N. Y.

Please ship . . . "ELECTRONIC TECHNICIAN Magazine Binders." I enclose \$.....

(please print)

Name

Street & No.

City..... Zone... State....

INDEX TO ADVERTISERS

August, 1959



"Stop playing your pancakes and start eating them, or I'll take away that Jensen Cartridge!"

American Telephone & Telegraph Co. 72
 American Television & Radio Co. 103
 Amphenol-Borg Electronics Corp. 13
 Arco Electronics Inc. 90
 Atlas Sound Corp. 101

B & K Manufacturing Co. 67
 Blonder-Tongue Laboratories, Inc. 88
 Bussmann Manufacturing Co. 11

CBS Electronics 15
 Centralab Div., Globe-Union, Inc. 18
 Century Electronics Co., Inc. 83
 Channel Master Corp. 5, 7
 Chemical Electronic Engineering, Inc. 91
 Chicago Standard Transformer Corp. 97
 Clarostat Mfg. Co. Inc. 69
 Communications Co., Inc. 91
 Cornell-Dubilier Electric Corp. 20

Delco Radio Div., General Motors 65

EICO 100
 Electronic Technician 62, 63, 102
 Electro-Voice, Inc. Cover II
 Entron, Inc. 92
 Erie Resistor Corp. 89
 E-Z Hook Test Products 103

General Cement Manufacturing Co. 24
 General Electric Co. 2, 3, 12, 16, 17, 22
 General Instrument Distributing Div. 6
 Gonsel Division 98

Heath Co. 95
 Hi-Par Products Co. 97

Jackson Electrical Instrument Co. 14
 Jensen Industries, Inc. 103

Mallory & Co., Inc., P. R. 8, 9
 Marjo Technical Products Co. 102
 McCabe-Powers Body Co. 96
 Mess Electronic Distributing Co. 87

Perma-Power Co. 99
 Philco Corp. 28
 Pyramid Electric Co. 86

Quietrol Co. 102

Radio Corporation of America 10, 85, Cover IV

Raytheon Co. 23-48
 Rider Publisher, John F. 101
 Rohn Manufacturing Co. Cover III

Service Instruments Corp. 21, 23, 25, 27
 Simpson Electric Co. 104
 Sonotone Corp. 99
 Sprague Products Co. 71
 Sylvania Electric Products Inc. 93

Technical Appliance Corp. 98
 Triad Transformer Corp. 94
 Tung-Sol Electric, Inc. 19

United Catalog Publishers 102

Weller Electric Corp. 4
 Westinghouse Electric Corp. 26
 Winegard Co. 60, 61

Introducing
ATR CUSTOMIZED
 Karadio



Can be installed in dash or under dash as desired!

for
small import cars
 and
compact U.S. cars

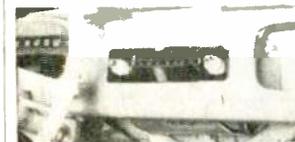


There is a trim plate kit for YOUR CAR!

ATR CUSTOMIZED
 Karadio

• VIBRATOR-OPERATED with Tone Control

The ATR Customized Karadio is a compact, new, self-contained airplane-styled radio for small import and compact American cars. This economical unit is perfect for all small cars because it can be easily and inexpensively installed in-dash or under-dash on most any make or model automobile—and its powerful 8-tube performance provides remarkable freedom from engine, static, and road noises. ATR Karadios are built to look and fit like original equipment with sleek, modern styling and solid, single-unit construction. They offer many customized features and provide highest quality fidelity—yet cost far less than comparably designed units. The ATR Customized Karadio comes complete with speaker and ready to install... and is the ideal way to add fun and value to your small import or American automobile!



ATR KARADIO
 ... is ideal for small import cars or compact American cars! Unit is

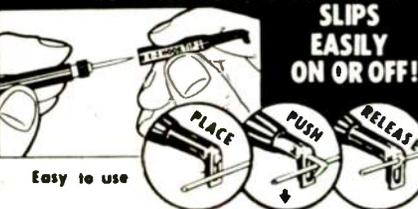
completely self-contained—extremely compact! Can be mounted in-dash or under-dash—wherever space permits! For 6 volt or 12 volt!

SEE YOUR JOBBER OR WRITE FACTORY

• "A" Battery Eliminators • DC-AC Inverters • Auto Radio Vibrators

ATR AMERICAN TELEVISION & RADIO CO.
 Quality Products Since 1931
 SAINT PAUL 1, MINNESOTA, U. S. A.

MAKE YOUR STANDARD TEST PRODS
TEN TIMES
 MORE EFFECTIVE IN SECONDS
 WITH THE **E-Z-HOOK TIP**
 CONVERTS YOUR STANDARD TEST PROD TO A SELF-HOLDING CONNECTOR



SLIPS EASILY ON OR OFF!

Here are the TEN E-Z-Hook Tip advantages:

1. Easy to attach — slips easily over test prod tip.
2. Stays on—special chuck holds tip firmly on prod.
3. Easy to connect or disconnect — patented design operates with light forward pressure.
4. Safer checks — hands stay clear of wiring.
5. Won't slip off — exclusive hook design clamps firmly around conductor.
6. Eliminates intermittents — spring pressure insures positive contact.
7. Eliminates adjacent shorts — insulated design gives maximum protection.
8. Connects anywhere — fits large or irregular shaped conductors.
9. Frees your hands — holds test prod for you.
10. Makes testing easier — saves time — eliminates aggravation.

No. 56-1 E-Z-HOOK TIP Only 89¢ ea.

ORDER THROUGH YOUR PARTS DISTRIBUTOR

E-Z-HOOK TEST PRODUCTS
 Dept. ET-8 1536 Woodburn Ave.
 Covington, Ky.

Canadian Rep.: Len Finkler & Co., Toronto, Ontario

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

The **SIMPSON 260** TRADEMARK outsells all other VOMs combined!



Buy the VOM that's famous for
ruggedness and dependability

260
VOLT-OHM-MILLIAMMETER
AC-DC

\$43⁹⁵

Complete with Leads and
Operator's Manual

Proof that the 260* is your *best investment* comes from hundreds of thousands of users who have made it the leading VOM over the years. But convince yourself! Take a 260 apart. Check the workmanship and materials. Examine the components. Analyze the circuits. Then put it through its paces in actual day-in-day-out service. You'll soon discover why the 260 is the world's best seller. See your Electronic Parts Distributor for the *preferred* VOM.

D.C. Voltage (20,000 ohms-per-volt):
0-250mv; 0-2.5 v; 0-10 v; 0-50 v; 0-250 v;
0-1000 v; 0-5000 v.

A.C. Voltage (5000 ohms-per-volt): 0-2.5v;
0-10 v; 0-50 v; 0-250 v; 0-1000 v;
0-5000 v.

Resistance (with 0.1 uf internal series
capacitor): 0-2.5 v; 0-10 v; 0-50 v; 0-250 v.
Volume Level in Decibels (Zero DB equal

to 1 milliwatt across a 600-ohm line): -20
to +10 DB; -8 to +22 DB; +6 to +36
DB; +20 to +50 DB.

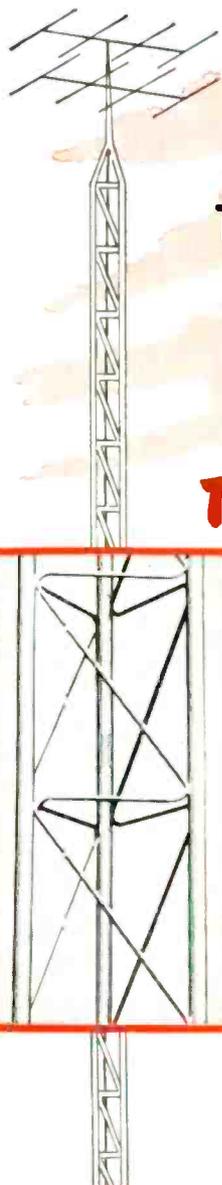
D.C. Resistance: 0-2000 ohms (12 ohms
center); 0-200,000 ohms (1200 ohms
center); 0-20 megohms (120,000 ohms
center).

Direct Current: 0-50 ua; 0-1 ma; 0-10
ma; 0-100 ma; 0-500 ma; 0-10 amp.

*Trademark

Simpson ELECTRIC COMPANY

5208 W. Kinzie St., Chicago 44, Ill.
Phone: ESTebrook 9-1121
In Canada: Bach-Simpson Ltd.
London, Ontario



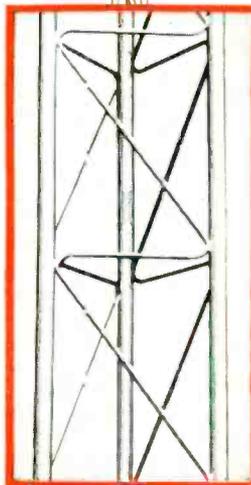
LOOK TO ROHN

for ALL TV installation needs!

LOOK TO THE FOREMOST NAME IN THE COMPLETE LINE OF HOME TV, AMATEUR AND COMMUNICATION TOWERS, PLUS A COMPLETE LINE OF INSTALLATION NEEDS. You'll find that the ROHN line is complete. It gives you better products

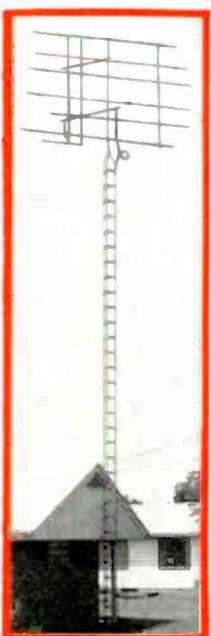
at a better price. Practically all ROHN products are available in the finest of finishes... hot-dipped galvanizing! Rely on the dependable name for ALL your needs —ROHN... today one of the largest manufacturers of a complete line of this type equipment.

TOWERS



No. 25 The ROHN No. 25 tower is one of the finest ever designed... a full 33% stronger and more durable than "similar sized" towers. This is achieved by amazing zig-zag cross bracing design combined with highest grade steel and heavy-duty steel side-rail tubing. This superior strength means that this tower can ordinarily be installed self-supporting to 50 feet or guyed to 200! It is truly the finest tower of its kind for home television reception.

No. 6 This ROHN tower features the well-known "magic triangle", the cross-bracing construction that is unequalled in strength and durability. Also available self-supporting, or guyed to about 150 feet.

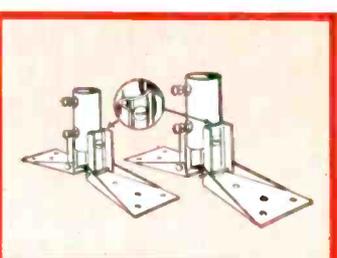
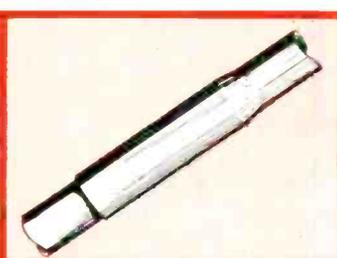
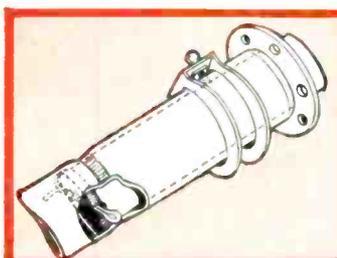


Fold-over The No. 25, as well as heavy-duty No. 40 communication tower, can be converted into "fold-over" towers for amateur use... the only tower of its kind. They let you work "on the ground!"

Communications FIVE complete lines of communication towers are available to fulfill practically any need, including a 130 foot true heavy-duty communication tower that is completely self-supporting and guyed models up to 600 feet!

Complete communications catalog sent on request!

PLUS ALL THESE ROHN DESIGNED ITEMS



Telescoping masts—Unexcelled in design, structure and strength, with several exclusive features! All popular sizes, heights and weights available.

Roof towers—Available in 10, 5 and 3 foot heights. Most of them are collapsible for easy shipping. Ideal in use—a ROHN "big-seller".

Tubing—Just what you want: 6" expanded end with 1/2" taper to form a solid locking joint! High carbon steel. Available 5, 10 foot lengths, 1 1/4", 1 1/2" diameter, 16 and 18 gauge.

Bases—Wide variety of roof mount bases. Special locking feature. Also available is cast aluminum roof mounts and many other types.

Get the full and complete catalog from your ROHN representative.

ROHN Manufacturing Company

116 LIMESTONE, BELLEVUE
PEORIA, ILLINOIS

ROHN Manufacturing Company
116 Limestone, Bellevue
Peoria, Illinois

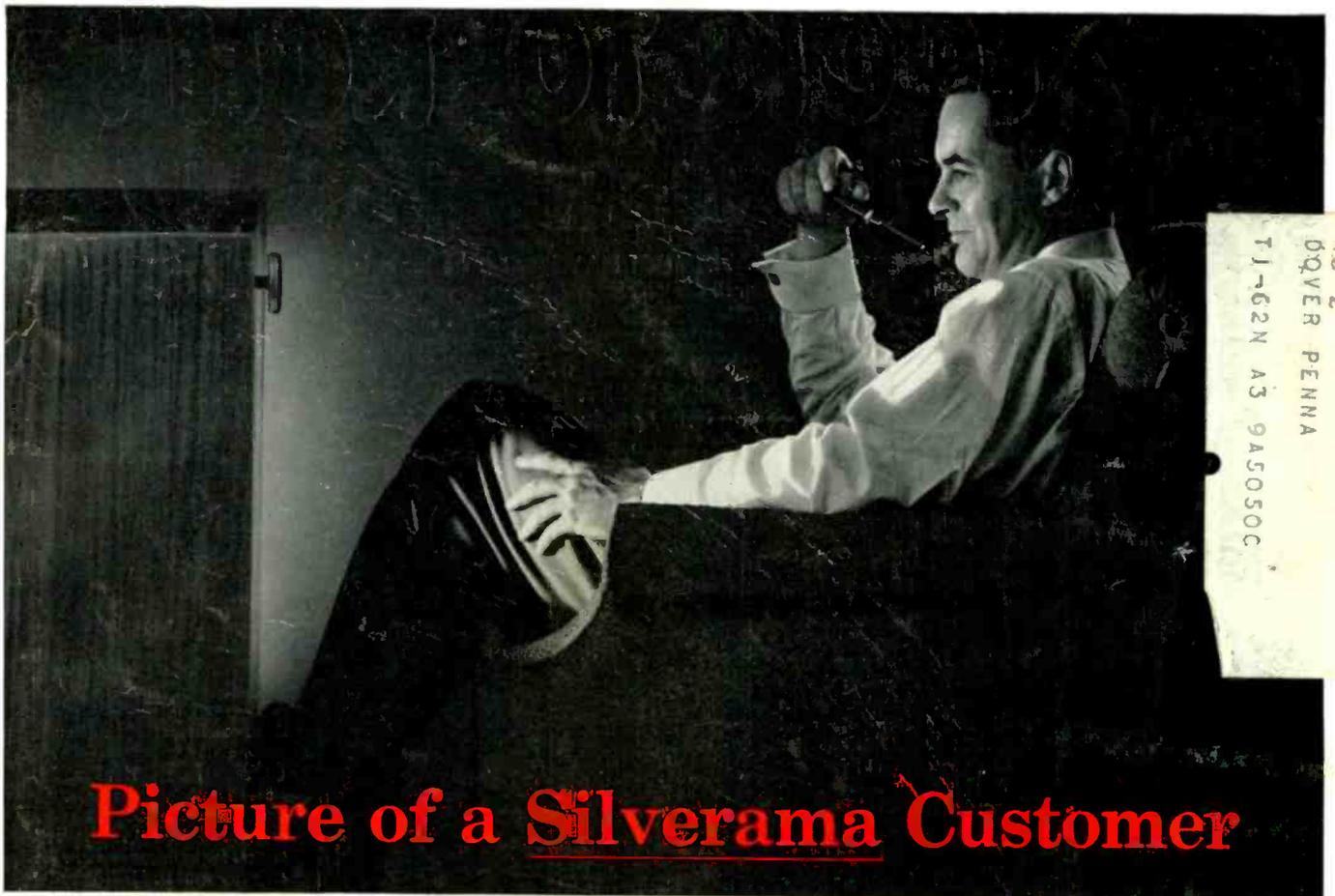
Please send me literature on full line of ROHN products.

Firm _____

Name _____ Title _____

Address _____

City _____ State _____



Picture of a Silverama Customer

This man needed a replacement picture tube for his TV set—and he wanted the best. So his TV technician installed an RCA Silverama—the premium picture tube made of all-new glass and all-new parts. It's the finest picture available today—just right for the customer who expects top quality and top performance.

Sell RCA Silverama with the assurance that you're delivering a completely new tube—a premium product that can command a premium price and premium profits for *you!*

★ ★ ★ ★ ★

Is **your customer budget minded?** Offer him an RCA Monogram—factory-rebuilt by RCA to dependable quality standards. There's no finer rebuilt made—just right for the customer whose primary consideration is price.

Sell RCA Monogram with assurance—your customers will get satisfactory performance—and you will have fewer call-backs.

Remember...

- RCA picture tubes—warranted for one full year and fit virtually every make and model TV set.
- RCA picture tubes—backed by a brand name you can sell with confidence.
- RCA picture tubes—pre-sold by an extensive and continuing national advertising campaign.

GET THE FULL DETAILS FROM YOUR AUTHORIZED RCA DISTRIBUTOR TODAY!



RADIO CORPORATION OF AMERICA

Electron Tube Division

Harrison, N. J.