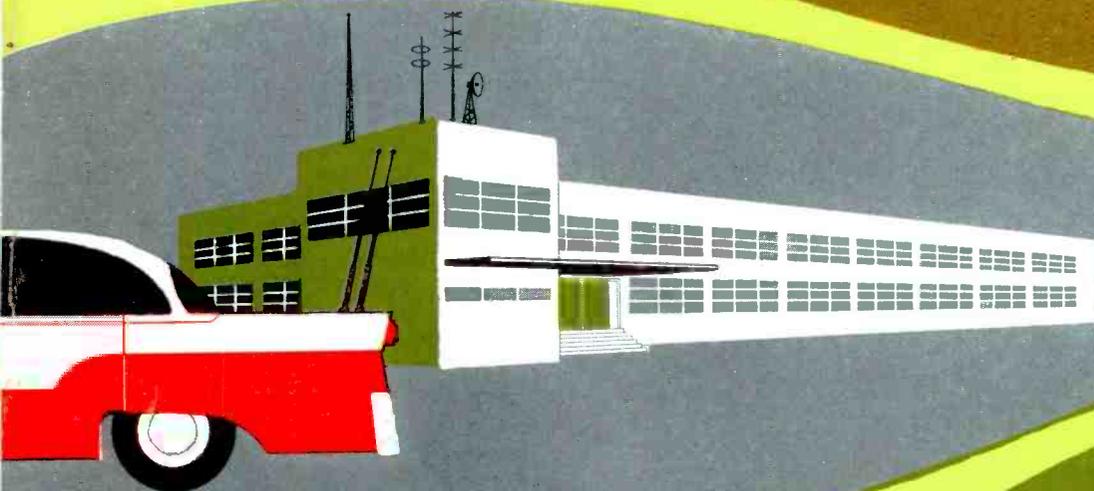
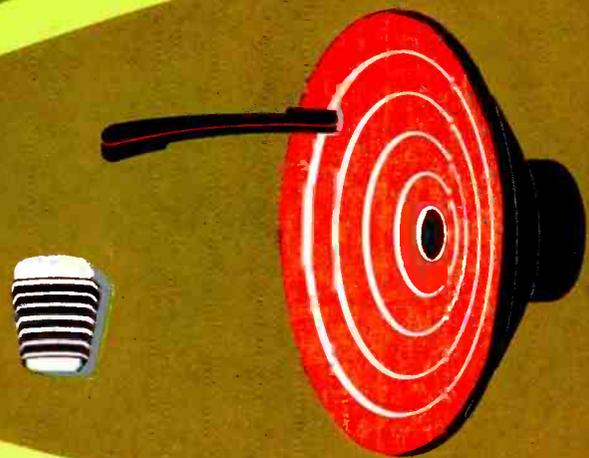
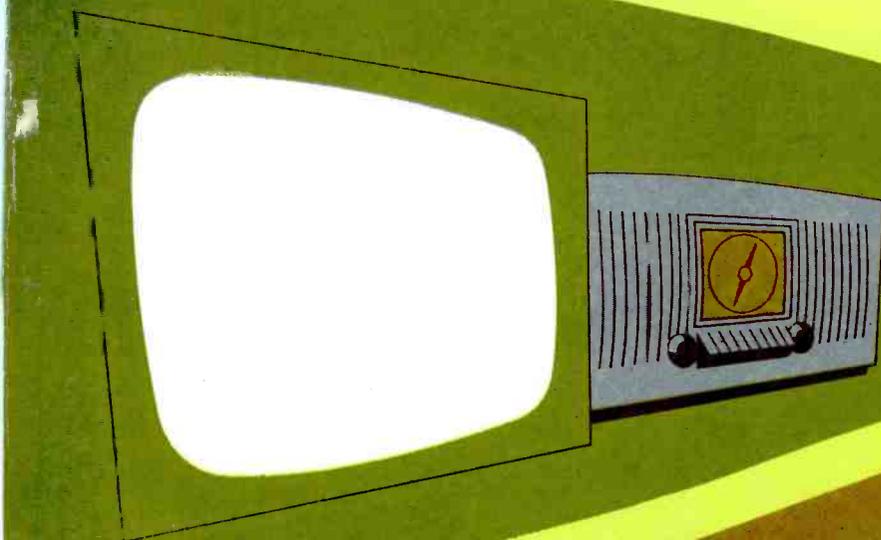
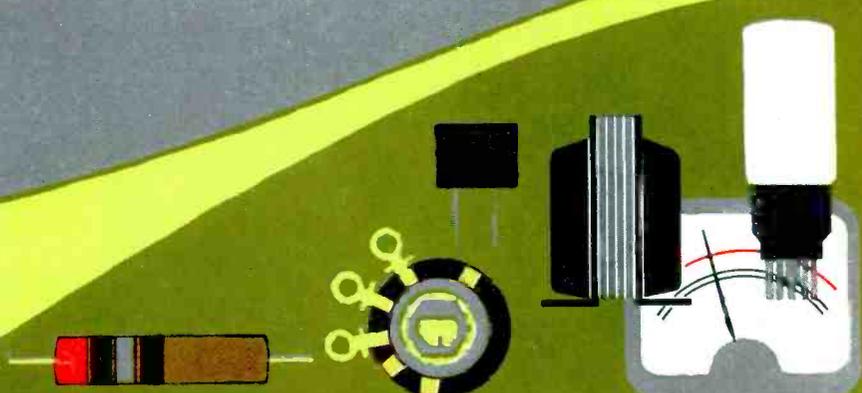


# ELECTRONIC TECHNICIAN

Including 16 pages of  
**Circuit Digests**



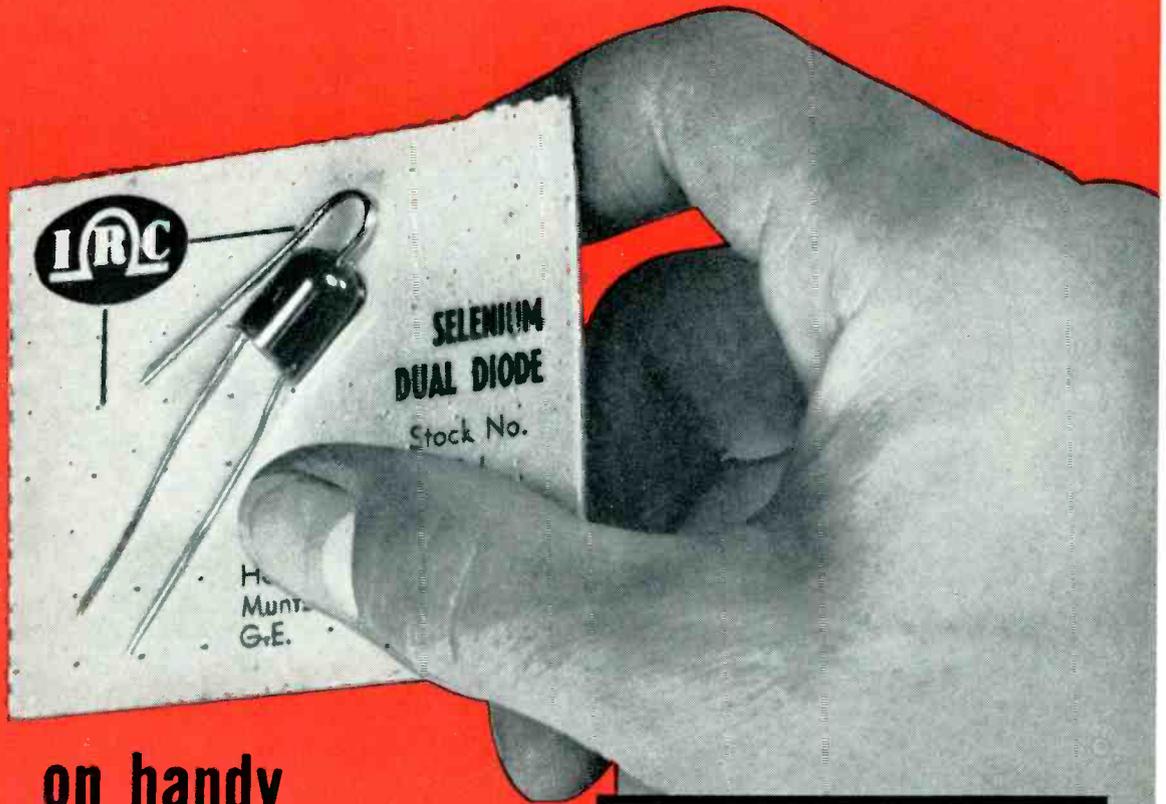
50¢



November • 1956

Caldwell-Clements Company

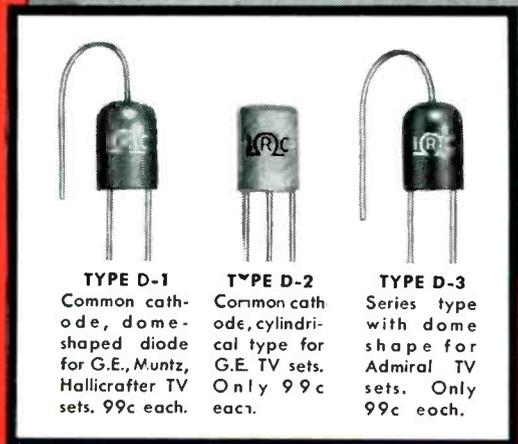
# New **IRC** Dual Diodes



## on handy "skin-packed" cards

Now that many TV set manufacturers are using selenium dual diodes instead of vacuum tube diodes, there's a new replacement market for you. And here are the three best ways to meet replacement needs . . . IRC's new exact duplicate dual diodes! These units are especially designed to provide exact duplicate replacements. What's more, each and every one is completely identified on an individual card and fully protected from dirt, dust, and handling by revolutionary IRC "skin-packing".

**ORDER FROM YOUR IRC DISTRIBUTOR**



**TYPE D-1**  
Common cathode, dome-shaped diode for G.E., Muntz, Hallicrafter TV sets. 99c each.

**TYPE D-2**  
Common cathode, cylindrical type for G.E. TV sets. Only 99c each.

**TYPE D-3**  
Series type with dome shape for Admiral TV sets. Only 99c each.

Wherever  
the Circuit Says



## INTERNATIONAL RESISTANCE CO.

Dept. 576, 401 N. Broad St., Phi a. 8, Pa.

In Canada: International Resistance Co., Ltd.,  
Toronto, Licensee

Send complete details about the new IRC Selenium Dual Diodes.

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COMPANY \_\_\_\_\_

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CITY \_\_\_\_\_ STATE \_\_\_\_\_

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ELECTRONIC TECHNICIAN & Circuit Digests, Nov. 1956. Vol. 64, No. 5. \$5.50 a copy. Published monthly by Caldwell-Clements Co. Publication office, Emmett St., Bristol, Conn. Editorial, advertising and executive offices, 480 Lexington Avenue, New York 17. Telephone PLaza 9-7880.

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 1956 by Caldwell-Clements Co., New York. 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, Bristol, Conn.

NOVEMBER, 1956

**FRONT COVER** The scope of the electronic technician's repair and sales work is portrayed by drawings of TV and radio receivers, home and commercial audio systems, and communications and industrial electronic facilities. At lower right are some prime components from among the many hundreds encountered by the electronic technician every day.

## FEATURES and ARTICLES

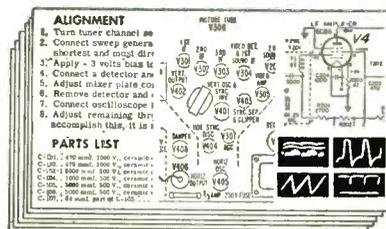
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MOTOROLA: Portable Hi-Fi phono Chassis HS-543  
RCA: TV Chassis KCS102B, D

# CHANNEL MASTER PUTS NEW SELL IN

DEALERS HAVE SOLD MORE *CHANNEL MASTER* T-W AND SHOWMAN ANTENNAS DURING THE PAST 60 DAYS THAN ANY OTHER ANTENNA DURING ANY 60 DAY PERIOD IN TV HISTORY  
*Isn't it time you called your Channel Master distributor?*

- ★ Full-Color Ads
- ★ 2-Page Spreads
- ★ Full-page Ads



Month after month... all thru the prime TV buying months... this continuing series of sales-stimulating ads is creating loads of lively new prospects... right in your own selling area.

**55,000,000**  
ads building new  
customers and sales for you!

# NATIONAL ADVERTISING TV ANTENNAS!

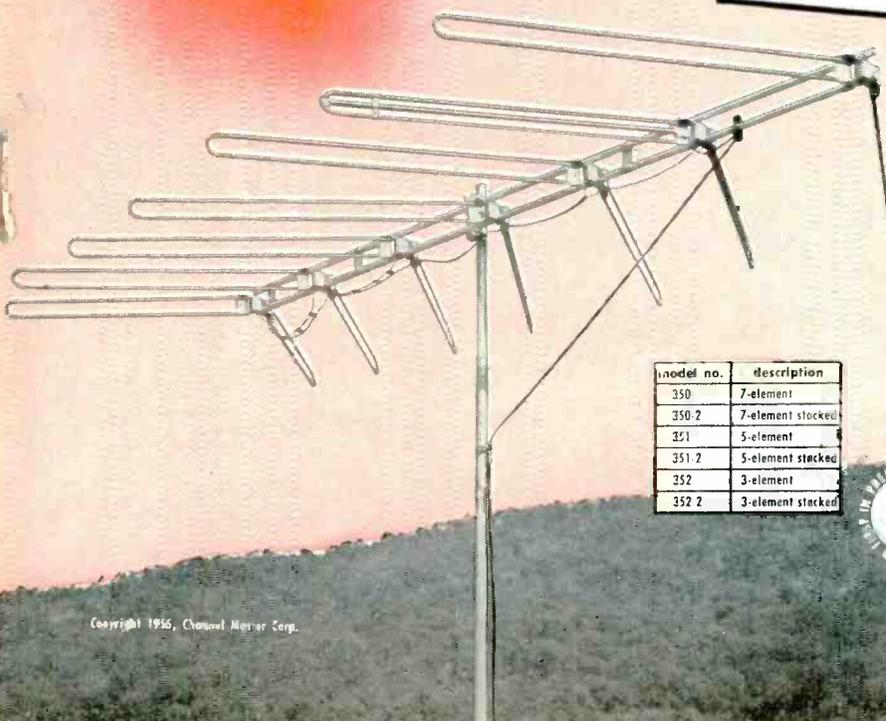
## "Showman" INDOOR ANTENNA FOR VHF OR VHF-UHF

This smartly styled antenna overcomes consumer objection to ugly "rabbit-ear" antennas. Exclusive "Metro-Dyne" electronic tuning brings in pictures sharp and clear on all channels. Tuning knob with channel markings just like a TV set makes channel selection so easy. It's the most powerful indoor antenna ever developed . . . and it's backed with an UNCONDITIONAL MONEY-BACK GUARANTEE. Engineered for Black and White and COLOR.

model no.	description	type
390B	Mahogany & Gold	VHF
390	Blond & Gold	VHF
390C	Ebony & Silver	VHF
390D	Mahogany & Gold	VHF-UHF



Tremendous consumer response emphasizes desire for better TV antennas . . .  
*and* there are no antennas on the market today that compare with these fabulous new Channel Master models.



## T-W OUTDOOR ANTENNA

The revolutionary new T-W is the very first TV antenna to use the "Traveling Wave" principle. This unique design electronically reinforces signals . . . eliminates "ghosts" and "snow" . . . rejects all unwanted signals and interference. In gain, front-to-back ratio, and mechanical strength, the T-W is unequalled by any other Broad Band antenna. Engineered for Black and White and COLOR.

model no.	description
350	7-element
350-2	7-element stacked
351	5-element
351-2	5-element stacked
352	3-element
352-2	3-element stacked

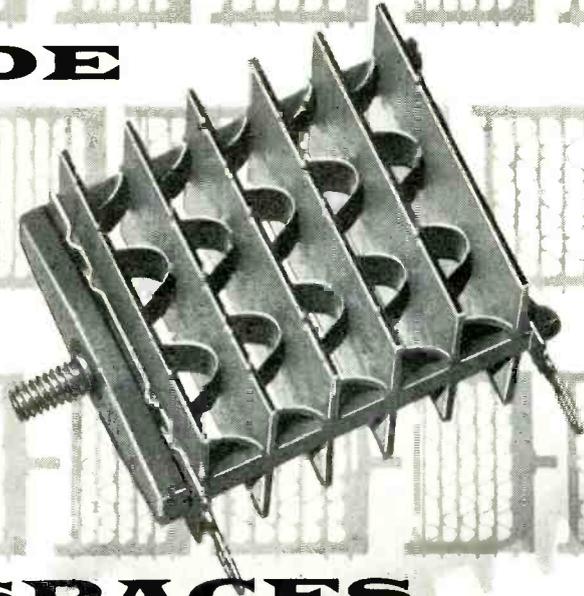


**CHANNEL MASTER CORP.**

ELLENVILLE, N. Y.

WORLD'S LARGEST MANUFACTURER OF TV ANTENNAS AND ACCESSORIES

**WIDE**



**OPEN**

**SPACES**

**keep operating temperatures down—dependability up!**

RCA SELENIUM RECTIFIERS utilize modern design—*full surface ventilation* with no chance of center-core hot-spots. Note the corrugated spring-steel separators which provide positive multiple-area contacts with each plate. This open construction facilitates free-flow of air and efficient cooling of the plates, and minimizes the possibilities of overheated components in compact TV, radio, and phonograph designs.

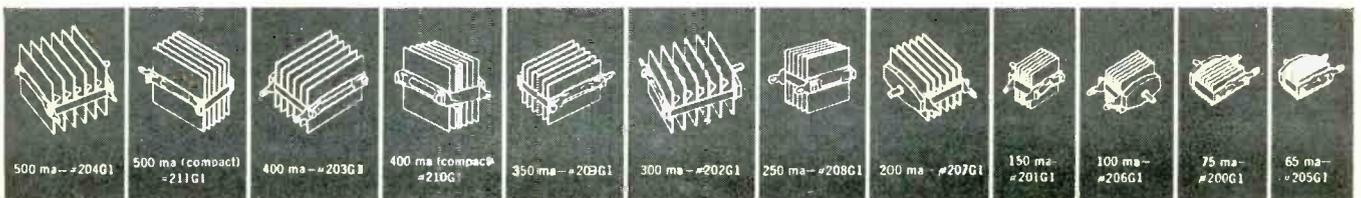
The one-piece assembly-yoke with the molded mounting stud prevents *twisting* or *squeezing* the stack during installation. Rigid construction minimizes the possibility of "barrier" breakdowns—*gives greater assurance of dependability in operation.*

So, when you need a replacement selenium rectifier, ask your distributor for a dependable, long life RCA SELENIUM RECTIFIER. Available now in 12 types, ratings from 65 Ma to 500 Ma.



## SELENIUM RECTIFIERS

Radio Corporation of America • Harrison, N. J.



CLIP FOR REFERENCE

MORE

# HOTPOINT

# TV

# TUBE CHARTS

Hotpoint TV, America's newest major TV line, publishes this tube chart as a service to servicemen.

Complete service information on all Hotpoint TV sets is now available from Hotpoint TV Distributors. If you have not yet ordered yours, clip this chart for temporary reference, then contact your Hotpoint TV Distributor immediately.

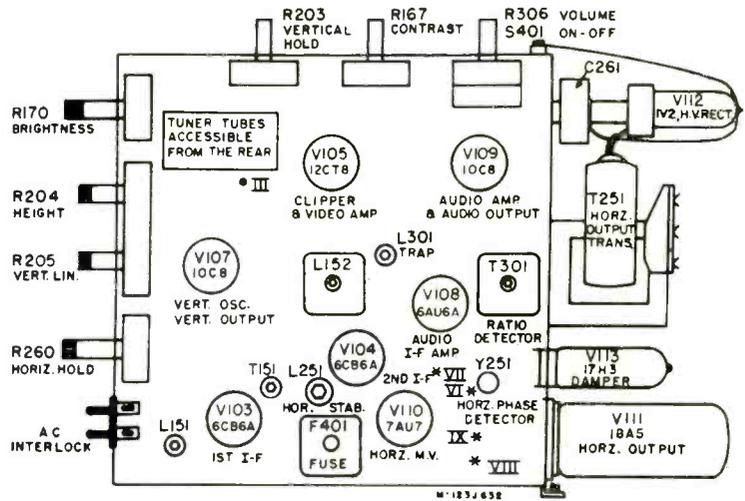
*Published as a service  
to servicemen by*

## Hotpoint Co.

*(A Division of General Electric Company)*

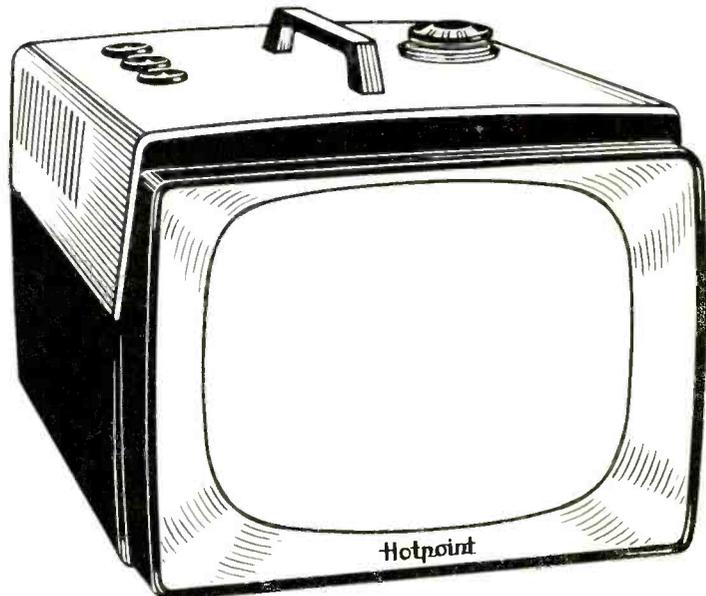
5600 West Taylor Street

Chicago 44, Illinois



**CHASSIS HS-T-56**—Covers Hotpoint TV Models 9S101 and 9S102.

this is the  
**Hotpoint**  
13½ lb. Portable

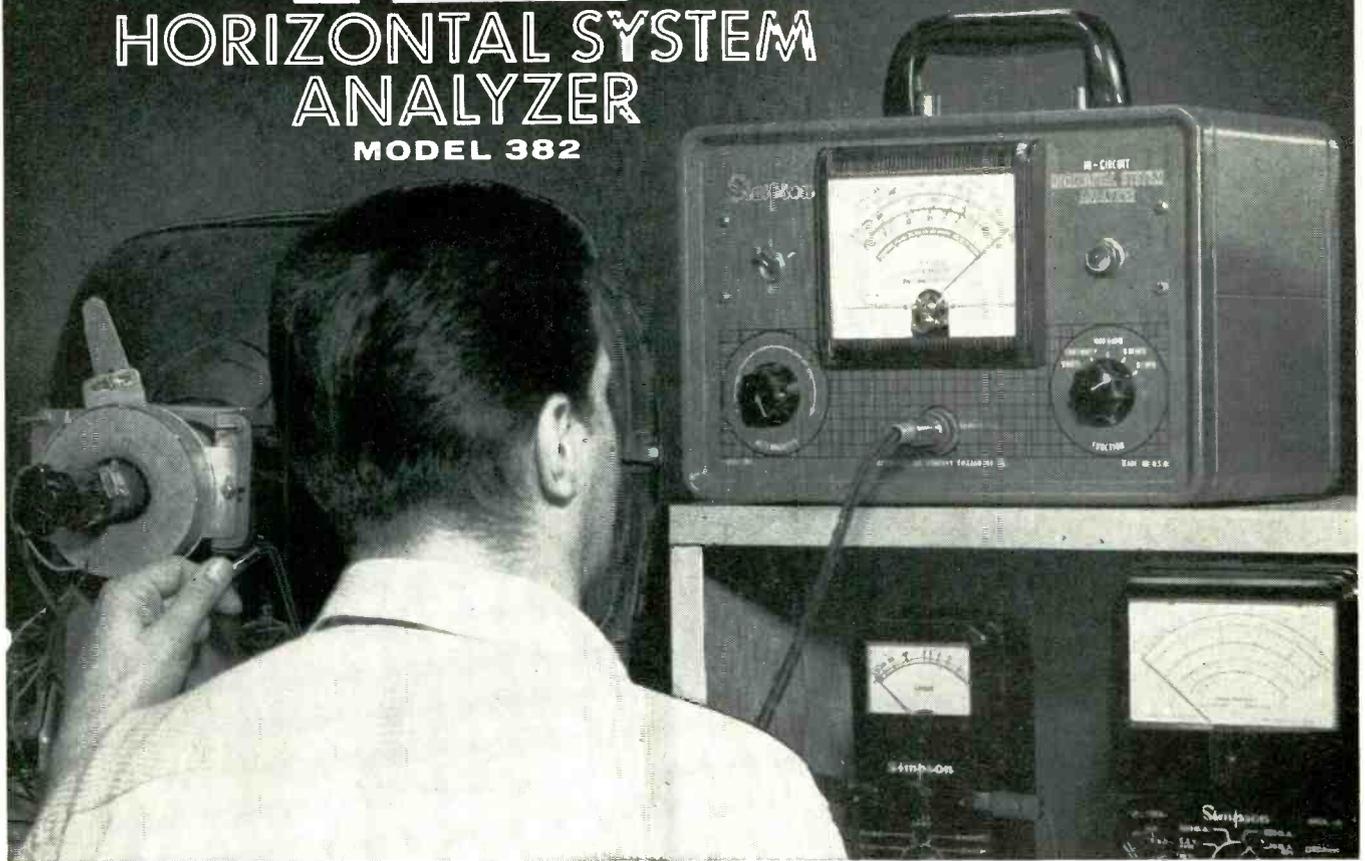


lightest of all  
the TV Portables!

# NEW! Simpson

## IN-CIRCUIT HORIZONTAL SYSTEM ANALYZER

### MODEL 382



- saves time in running checks on TV horizontal deflection systems

- tests capacitors, too!

Model 382 is the world's most complete "testing package" for analyzing TV horizontal deflection systems. With this *one* instrument, you can:

- (1) Check any winding in the horizontal system (transformer or yoke) for *shorts* and *opens*. Even one shorted turn is clearly indicated on a large 4½" meter. Uses reliable, time-proven Q-type test.
- (2) Check flyback and yoke system *IN-CIRCUIT* (disconnect only plate cap of output tube). High-Q systems are checked on a quick-reading, Good-Bad scale (most present day sets use the High-Q system); low-Q systems on comparative logging scale.
- (3) Measure capacitance value (and check for open capacitors)—direct-reading scales indicate

from 10 mmf to 0.1 mfd—no bridge to balance. Measures capacitance to better than 10%.

(4) Make continuity checks of *any* wire-wound component, such as width coils, linearity coils, oscillator transformers; check capacitors for direct shorts; check out wiring harnesses, switch contacts, etc. Can check many other components for Q, either directly or by logging scale.

With Model 382, preliminary tests of horizontal systems can be made *in-circuit*. Then, if desired, individual tests can be made of each winding and component in the system. Over-all size of Model 382 is 7¼" x 8" x 11⅜". Compare this *complete IN-CIRCUIT* Horizontal System Analyzer with any competitive unit, and you will choose the Simpson Model 382.

Model 382 with  
special test cable and  
Operator's Manual...

**\$69<sup>95</sup>**



See Your Jobber, or Write for Bulletin No. 2082

## SIMPSON ELECTRIC COMPANY

5200 W. Kinzie Street, Chicago 44, Illinois • Phone: EStbrook 9-1121 • In Canada: Bach-Simpson Ltd., London, Ont.  
WORLD'S LARGEST MANUFACTURER OF ELECTRONIC TEST EQUIPMENT

# JERROLD Introduces

# TRAP-EASE\*

**Revolutionary New TV Filter Knocks Out Adjacent Channel Interference... Opens New Sales Market For The Television Trade!**



**Only \$19.95 List**

This tunable "deep notch" antenna trap (greater than 50 db) permits TV viewers to remove "beat" or "herringbone" patterns caused by strong adjacent channel sound or video carriers. Permits clear reception of even weak distant stations.

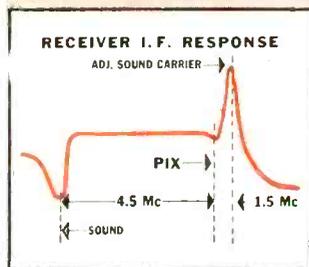
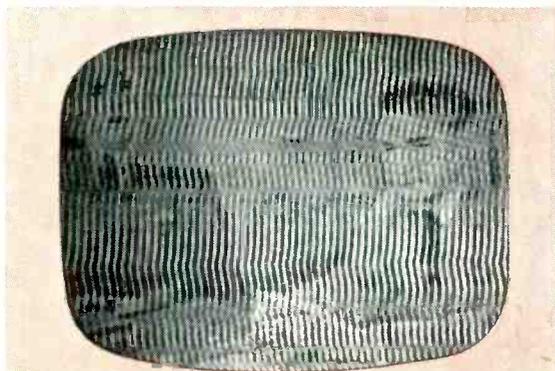
Works with any TV receiver and any 300 ohm antenna that would normally bring in pictures from the distant stations if the interfering adjacent channel was not on the air. Does not affect reception of regularly viewed channels.

**BRINGS IN PICTURES FROM OUT OF NOWHERE! TRAP-EASE**

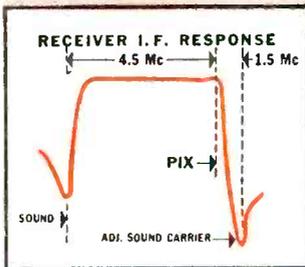
**Before TRAP-EASE is Installed**

**After TRAP-EASE is Installed**

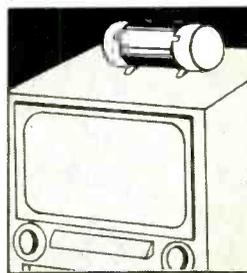
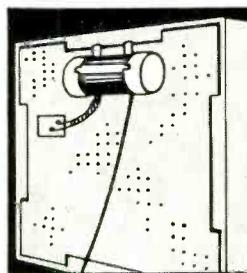
**EASILY INSTALLED ON ANY TV SET!**



In case shown Receiver AGC is held down by a strong adjacent channel sound carrier. This lowers receiver gain and prevents proper reception of the desired channel. "Beat" or "Herringbone" pattern is predominant on the screen.



The adjacent sound carrier has been suppressed by some 50 db, which: (1) Enables the signal level of the desired channel to control the AGC action of the receiver. (2) Completely removes the "beat", leaving a clear, strong picture.



**TRAP-EASE SELLS ITSELF**

Let the amazing performance of the Jerrold Trap-Ease do its own selling. One demonstration and the Trap-Ease sells itself with the greatest of ease. Simple to demonstrate either in your store—or in the customer's home.

**MONEY BACK GUARANTEE**

Never before a TV accessory that achieves such startling results. Contact your Jerrold distributor today for details on the complete sales promotion package available to you.

**TWO MODELS AVAILABLE**

Low Trap-Ease (Model HQ-91) covers Channels 2 to 6.  
High Trap-Ease (Model HQ-92) covers Channels 7 to 13.

**JERROLD ELECTRONICS CORPORATION**

**2218 Chestnut Street · Philadelphia 3, Penna.**

Simply connect the Trap-Ease in series with the antenna lead-in and mount on rear or top of TV receiver. Handsome contemporary design and soft color tones of the unit harmonize with today's modern or traditional cabinet decor.

\*©Jerrold Electronics Deep Notch Adjacent Channel Trap

# Top Performers Separately ...A Great Team Together!



## PRECISION

**Model E-200C**  
**SIGNAL-MARKER**  
**GENERATOR**

**Model E-400**  
**SWEEP SIGNAL**  
**GENERATOR**

The famous E-200C — used by more than one half of the country's service technicians — and the popular E-400 incorporate the well-known **PRECISION** design principle of maximum engineering-per-dollar at a sensible price.

Each instrument performs its own specific function with maximum reliability and accuracy. As a team, they work together with utmost simplicity as a complete source of signals for alignment of FM, AM and TV (monochrome and color).

### —Model E-200C—

- Direct Frequency Reading continuous dial calibrations from 88KC to 240 MC.
- Accuracy — 1% on All Bands exceptional frequency stability
- 0-100% Variable Internal Modulation provides up to 300% greater signal audibility
- AVC-AGC Substitution Voltage (built-in) continuously variable from 0-50 volts DC
- Extra-Large Tuning Dial with Vernier Drive 9 easy-reading bands
- Each Instrument Individually Calibrated against PRECISION's laboratory standards

**Model E-200C Deluxe:** (illustrated)  
In custom-styled blue-grey, hooded steel cabinet; two-color satin-brushed aluminum panel. Case dimensions: 11½ x 13 x 6⅞ inches. Complete with tubes, coaxial output cable and illustrated manual "Servicing by Signal Substitution." **\$95.00 net price**

### —Model E-400—

- Direct Frequency Reading — 8 Bands dial calibrated from 3 to 900 Mc.
- Saves Time on Front-End Alignment channel numbers 2 thru 13 directly calibrated on tuning dial
- Internal Retrace Blanking Circuit simplifies alignment eliminates return traces
- Wide-Band Sweep . . . 0-15 Megacycles for best TV front-end and I.F. alignment
- Narrow-Band Sweep . . . 0-1 Megacycle for best FM and TV sound I.F. alignment
- Crystal Marker-Calibrator (Built-in) 2.0 and 4.5 Mc. crystals furnished

**Model E-400 Deluxe:** (illustrated)  
In custom-styled, blue-grey hooded steel cabinet; two-color satin-brushed aluminum panel. Case dimensions: 11½ x 13 x 6⅞ inches. Complete with tubes, test cables, 2 crystals and comprehensive instruction manual. **\$160.00 net price**

Available at leading electronic parts distributors:  
The complete **PRECISION** line of signal generators, cathode-ray oscillographs, vacuum-tube voltmeters, volt-ohm-milliammeters, tube testers and accessories for all phases of electronics, radio communications, color and monochrome TV, etc.



**PACE**  
THE METER OF PRECISION

**PRECISION Apparatus Company, Inc.**

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

Export: 458 Broadway, New York 13, N.Y., U.S.A. • Cables: MORHANEX  
Canada: Atlas Radio Corp. Ltd. • 50 Wingold Ave., Toronto 10, Ontario

## Editor's Memo

"The man who needs a new machine tool is already paying for it," is the way one manufacturer of lathes and milling machines advertises his products. True enough. But this doesn't apply only to manufacturers in heavy industries. It applies to home owners (cheap insulation means higher fuel bills), farmers (machinery cuts man-hours), and of course, service shops.

Inefficient equipment, made obsolescent by new innovations, raises your unit cost, and may reduce the quality of your product or service as well. In addition, greater efficiency brings with it more satisfied customers, and justifiable self-satisfaction for a job well done. Is your tube tester ready to check the latest tubes on the market?

When it comes to high production or service costs, gagsters will often recall the tale of the manufacturer who reported that every item he sold for \$2 actually cost him \$2.25. "Then how do you manage to keep going?" he was asked. "Large volume," was the mysterious reply.

The U.S. has a very high business birth rate—and almost as high death rate. Last year the number of business firms rose to a record 4,252,000, reports *Fortune*. This is an increase of 37,000 over 1950, BUT it is the result of an average 355,000 births and 318,000 failures.

OK, business is a risk. But what are the actual survival odds? Well, a new business set up today has a 50-50 chance of surviving two years later under the same ownership; a 33% chance of lasting four years; and a 20% chance of lasting 10 years. Incidentally, only half of all the firms operating today were in existence and under the same ownership seven years ago. This pattern of dynamic change presents opportunities for successful expansion, as well as risk of financial failure.

At this point, I'd like to note that (as the cigarette ads used to say) something new has been added to **TECHNICIAN's** name. It's the word "electronic." From here on out our name is **ELECTRONIC TECHNICIAN**, which is more descriptive of our readers' interests and horizons in the fastest growing industry of the 20th century.

No major editorial changes are planned. Perhaps, as Shakespeare said in *Romeo and Juliet*, "What's in a name? That which we call a rose by any other name would smell as sweet." To our wonderful friends and readers who have selected us as the preferred source of electronic servicing information, we hope that our new name — **ELECTRONIC TECHNICIAN** — will "smell sweeter still."

*Al Foman*

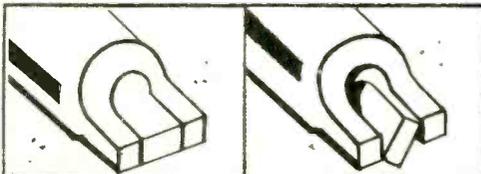
Precision Quality Alloy Blade . . . Tough Tenite Handle

**MAKES TUNER  
ALIGNMENT  
EASIER . . .  
FASTER!**



**TUNING SLUG**

**RETRIEVER**



**HOW TOOL WORKS**

**CLOSED** . . . Use as a screw starter; adjust Standard Tuner slotted slug.

**OPEN** . . . Rotating section of blade turns against slug, holds tight for withdrawal.

**TWO SIZES . . .**

**No. 9096 12" Retriever**

**No. 9097 15" Retriever**

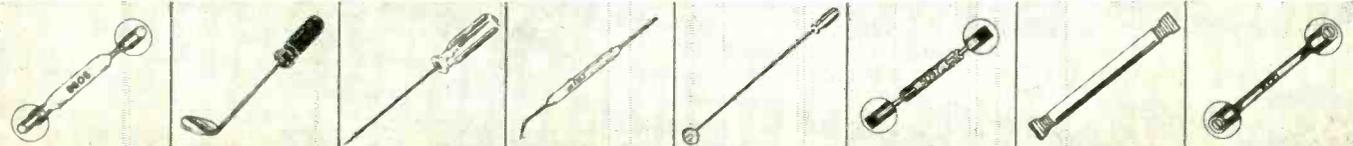
The G-C TUNING SLUG RETRIEVER fits into the wide slotted tuning slug of Standard Coil Tuners. No more worries about turning the slug too far . . . this tool can reach in there and help you back it off!

**GENERAL CEMENT MFG. CO.**

Division of Textron Inc. • 400 South Wyman Street • Rockford, Illinois

FREE! Your copy of the big 80-page illustrated G-C Catalog. Send postcard.

**More Than 100 G-C Special Service Tools! . . . Here's A Few!**



**G-C Nylon Hex Wrench**  
For Zenith, Admiral, etc. No. 8606

**G-C Inspection Mirror**  
Plastic handle, glass mirror. No. 5090

**G-C Non-Magnetic Beryllium Tool**  
For TV focus adjustments. No. 9110

**G-C Print-Kote Solder Aid Probe**  
Designed for printed circuits. No. 9093

**G-C "X-57 Long Slim" Screwdrivers**  
Rugged, break resistant, insulated. No. 8988

**G-C K-Tran Tool**  
Designed for K-Tran and IF transformers. No. 5097

**G-C Nut & Hex Screw Starter**  
Dual purpose tool for easy starts. No. 9147

**G-C 2-in-1 Long Reach Aligner**  
For No. 4 & 6 studs, 7" long. No. 8722

# NEW MASTER VOLT OHMYST®

Accuracy of  
±3% full scale  
on both AC and DC



**RCA-WV-87B—offers many time-saving work-simplifying features for laboratory, production, servicing—can help improve the quality of your work!**

The WV-87B is housed in a durable metal case for general use around the service shop or the lab or for shelf- or rack-mounting on the production line. The unusually large meter face, clearly calibrated scales, and VoltOhmyst circuit permit extraordinary ease and speed in taking highly accurate readings. Helps you work better, faster, more efficiently. You can be positive of the measurements you take when you use the RCA Master VoltOhmyst.

RCA WV-87B Master VoltOhmyst—newest addition to the world-famous line of RCA superior-quality Test Instruments—is available through your RCA DISTRIBUTOR. Price \$137.50†. See him now for details and literature or write RCA, Commercial Engineering, Section K46W, Harrison, N. J.



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

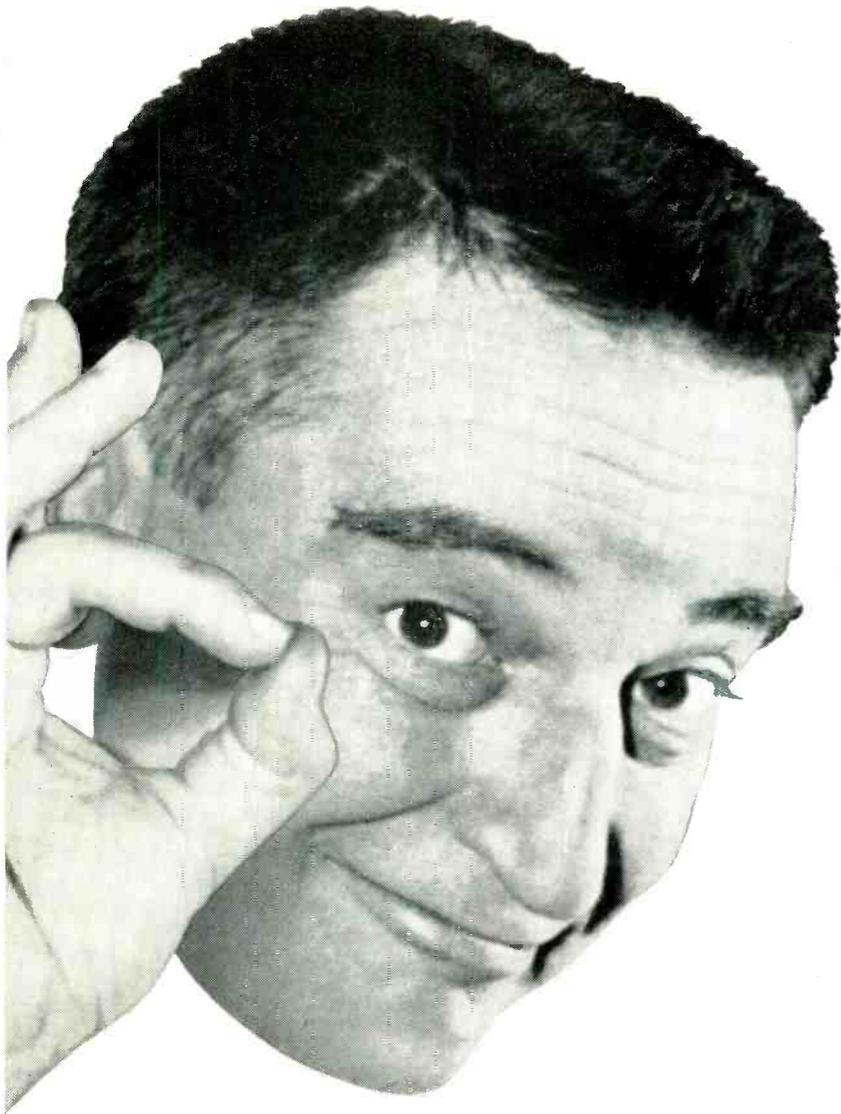
### Check these outstanding features:

- wide-vision open-face extra-large (7½") meter scale
- mirror-strip on scale to eliminate needle-to-scale parallax
- two-color, separate scales for speedy peak-to-peak and rms voltage readings
- work-simplifying single probe with built-in switch for all Ohms and DC/AC Voltage measurements
- high stability circuit free from effects of line voltage variations
- meter tracking error only ±1% or less
- accuracy of ±3% full scale on all AC and DC ranges
- DC current readings as low as 10 μa.

ELECTRICAL SPECIFICATIONS			
Operation	Ranges	Input R, C	Freq. Response
DC Volts	0 to 1500 (7 ranges) Low Scale, 0 to 1.5	*11 meg., 2 μμf	
AC Volts (RMS, sine waves)	0 to 1500 (7 ranges) Low Scale, 0 to 1.5	0.83 to 1.5 meg. 75 μμf to 85 μμf	30 cps to 3 Mc** (for source impedance of 100 ohms)
AC Volts (Peak-to-Peak values, sine or complex wave forms)	0 to 4200 (7 ranges) Low Scale, 0 to 4		
Direct-Current	0 to 15 a. (9 ranges) Low Scale, 0 to 500 μa		
Ohms	0 to 1000 megohms (7 ranges)		
MECHANICAL SPECIFICATIONS Height: 10"; Width: 13½"; Depth: 7"; Weight: 8 lbs.			

\*1100 meg. with WG-289 Probe and WG-206 Multiplier Resistor.  
\*\*Crystal-Diode Probe WG-301A available to extend range to 50 Kc to 250 Mc within ±10%.

†User price (optional) Complete with WG-299C DC/AC-Ohms Probe, Low-Capacitance Flexible Cable, Current Leads, Ground Lead, Instructions.



**here's how you  
can get more  
service calls  
...repeat  
customers**

Garry Moore is advertising your special "Picture Tube Clean-Up" September 14 through November 23.

When your telephone rings and you're asked for the Garry Moore "Special Picture Tube Clean-Up," grasp the opportunity. Clean the picture tube faceplate and protective glass. *Then check the set for any needed service.* But be sure you have CBS tubes in your caddy. Your customer will want them if tubes have to be replaced.

CBS Tubes, through the Garry Moore "Special Picture Tube Clean-Up," get you into new television homes where you can check sets for necessary service. What's more, CBS is building "every-six-months check-ups" for you.

**NEW  PICTURE TUBE CLEANER**

**in the handy easy-to-use squeeze bottle**

Just S-Q-U-I-S-H it on and wipe it off! It's the perfect cleaner for the picture tube faceplate and protective glass. Quickly dissolves accumulated grime, dust and smoke. Gets glass clean. Leaves no annoying reflective film.

Just right for your caddy . . . won't break or leak. Now available in the big 6 oz. squeeze bottle at your CBS Tube distributor's.

6 oz. squeeze bottle only **39¢** net

*Ask your CBS Tube distributor for your FREE trial bottle*



**CBS-HYTRON**  
Danvers, Massachusetts

A Division of  
Columbia Broadcasting System, Inc.

*See Garry Moore building new business for you . . . Fridays 10:30 to 10:45 A.M., EST, over the CBS Television Network. Tie in . . . get new business and more profits.*

... another  
**MALLORY**  
service-engineered  
product



It pays to  
know what's  
*inside*...

Capacitors may *look* alike. But there's a big difference in how they perform ... and that's why there's a big difference in what's inside Mallory FP electrolytics.

**Fabricated plate** anode construction, pioneered by Mallory, provides high ripple current capacity, low impedance, peak service even at high ambient temperatures. FP's as made by Mallory, are the only fabricated plate capacitor available for replacement work.

**85° C construction**, standard in FP's for years without premium price, eliminates need for voltage de-rating.

**Etched cathode** gives low RF impedance, prevents loss of capacitance with age.

**Leakproof seal** eliminates loss of electrolyte, yet retains the venting feature.

Be particular about your capacitors. Always ask for Mallory FP for the best in service and value. Call your Mallory distributor today!

P. R. MALLORY & CO. Inc.  
**MALLORY**

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

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

## LETTERS

### To the Editor

#### **Dangerous Radiation**

Editor, ELECTRONIC TECHNICIAN:

News stories have reported that "fractional amounts" of radiation are emitted by TV receivers in their cabinets. The term "fractional amounts" is vague, but Nobel prize winner Dr. H. J. Muller reports that life span is shortened one to two years for every 10 years of cumulative exposure to 0.3 roentgen (a "fractional amount?") per week. This is a subject of concern to TV technicians who are exposed to unshielded crt's, particularly color and 24-27" sets with 25 to 30 kv potentials.

JAMES E. WEDDLE

Maysville, Ky.

• TV manufacturers report no radiation danger of consequence, but this finding is not based on substantial research.—Ed.

#### **Technicians Abroad**

Editor, ELECTRONIC TECHNICIAN:

We read your Editor's Memo on "What is a TV Technician" (Aug. 1956 issue) with enjoyment. We would like to suggest to the editor of our own magazine to reprint your article, making small alterations in the wording so that it will be suitable for a British audience.

S. J. MURDOCH  
Radio & TV Dept.

Harrods Ltd.  
London, England

#### **New Product Info**

Editor, ELECTRONIC TECHNICIAN:

After I read each of your excellent issues, I like to keep it in its new condition permanently. Could I order more technical information on new products and bulletins without tearing out the coupon provided?

NELSON I. ROSE

Rose TV Service Co.  
Philadelphia, Pa.

• Sure thing. Just jot down the new product or bulletin code numbers at the end of each item on your letterhead.—Ed.

#### **Radio—Pro & Con**

Editor, ELECTRONIC TECHNICIAN:

... please get schematics on tough jobs. Who needs circuit diagrams on 5-tube ac-dc's? Amateurs?

DAVID CHAMBERS

Harrington, Del.

... publish more articles on radio. This subject is practically forgotten.

DAVID HORN

Bronx, N.Y.

## Texas Licensing

Editor, ELECTRONIC TECHNICIAN:

We noted in your September "Letters" one written by Robert Russell, President of the Electronic Technicians Association of Houston, Texas, in which many errors and misconceptions exist. First, there is no such organization as NATESA of Houston. The bill he refers to is sponsored by a completely autonomous organization, H.A.T.S., chartered by the State of Texas. Second, we have seen the bill and find nothing that would indicate a "grab for power" or attempt to fix prices. The bill has been reviewed by public officials and accorded much commendation.

FRANK J. MOCH  
Executive Director

National Alliance of TV  
& Electronic Service Assoc.  
Chicago, Ill.

Editor, ELECTRONIC TECHNICIAN:

Re Mr. Russell's letter, NATESA is not concerned in this matter. The Houston Association of TV-Electronics Servicemen, like all NATESA affiliates, enjoys complete local autonomy. This is a Texas matter for Texans. The Texas Committee for Licensing TV-Electronics Servicemen consists of housewives, public officials, consumers, civic groups, clubs and others. These people, and we hope to enlist 10,000 Texans, are not convinced it is a "grab for power." In fact, the whole theory of the campaign is, "that which is good for the public, is good for the industry." Price fixing is against the law in Texas; the way to reduce consumer costs is by increased management efficiency. Despite this, the Houston branch of the Texas Electronics Assoc., an affiliate of the new American Electronic Council (not Mr. Russell's group) intends to fight the licensing proposal. A question posed in the NATESA Scope is whether TEA-AEC people could pass the exam required in the proposal.

F. B. KOEPNICK  
Chairman

Texas Committee for Licensing  
TV-Electronics Servicemen  
Houston, Texas

### "They'll Do It Every Time"

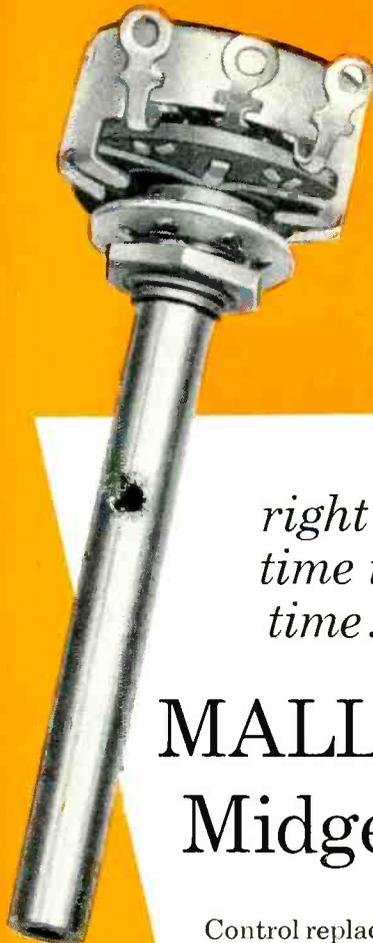
Editor, ELECTRONIC TECHNICIAN:

A recent copy of the *Boston Evening American* carried the syndicated Jimmy Hatlo cartoon, "They'll Do It Every Time." It showed the TV technician soaking his customers on a repair job. One character calls him "Jesse James." When is such publicity going to stop? There are still people around who do not believe that the majority of TV technicians are honest.

JOHN L. MANCINI

John's Television Co.  
Winthrop, Mass.

• Cartoonist Hatlo featured the unreasonable TV customer a while back. Cartoonists apparently earn their keep with a wide assortment of entertaining "digs."—Ed.



... another  
**MALLYORY**  
service-engineered  
product

*right every  
time in less  
time...with*

## MALLYORY Midgetrols®

Control replacements are faster  
... and every job is sure to satisfy ... when you use Mallyory Midgetrols.

Line switches are a cinch to attach; no need to take the control apart.

Custom-fitted shafts take only seconds; just cut to length and insert the kind of tip your job needs.

Long, quiet life assures customer satisfaction...ends costly call-backs.

Get Midgetrols from your Mallyory distributor, in resistance values and tapers to fit all popular TV and radio circuits.

P. R. MALLYORY & CO. Inc.  
**MALLYORY**

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

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



## The Equation that Shook the World!

A hasty scrawl on a scrap of paper ushered in the Atomic Age. Through this equation, Dr. Albert Einstein revealed to mankind the awesome secret of atomic fission, with all of its tremendous power for good or evil.

This is the kind of a world we live in . . . a world where knowledge is power in a truer sense than ever before. It is an exciting world.

Univac® has added a new dimension to the world of science, processing data with a speed that crowds many lifetimes of research into a few hours.

Squarely in the midst of this exciting world are the engineers and scientists of Remington Rand Univac. Their potential for growth and achievement (and the rewards that go with them) is unlimited. *You can be one of them.*

### Immediate Openings for:

**ELECTRONIC DESIGN ENGINEERS** — Must have degree and be experienced in pulse circuitry, digital computers, or data processing equipment.

**ELECTRO-MECHANICAL DESIGN ENGINEERS** — Should have bachelor's degree in Engineering. However, extensive mechanical design background may substitute for some college. Men selected will do basic preliminary design and layout of small mechanisms. Requires original ideas and application of logical analysis to design problems.

Send complete resumé to:

***Remington Rand Univac***

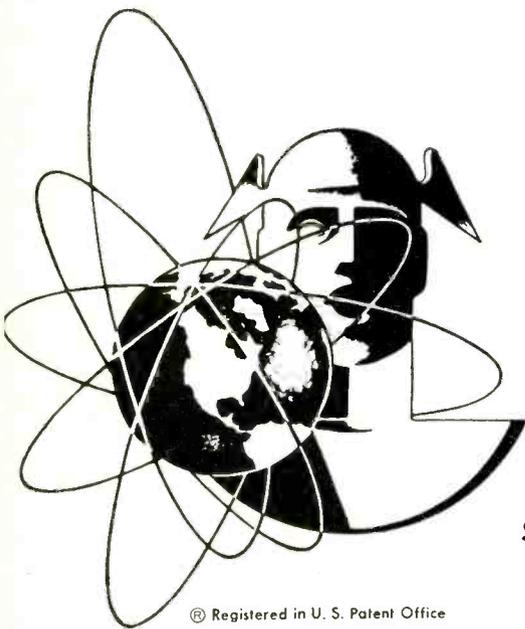
DIVISION OF SPERRY RAND CORPORATION  
at any one of these four plant locations

D. A. BOWDOIN  
Dept. PN 25  
2300 W. Allegheny Ave.  
Philadelphia, Pa.

FRANK KING  
Dept. NN 25  
Wilson Avenue  
South Norwalk, Conn.

J. WOODBURY  
Dept. SN 25  
1902 W. Minnehaha Ave.  
St. Paul W4, Minn.

CAL BOSIN  
Dept. YN 25  
315 Fourth Ave.  
New York City



® Registered in U. S. Patent Office

# new Sylvania TV SHOW

launches a dramatic new advertising program for TV Service Dealers



Biggest TV news this fall for you as a service dealer is Sylvania's new adventure thriller "The Buccaneers." Packed with exciting pirate lore, Sylvania's new TV show offers entertainment for the entire family.

And it offers you a brand-new opportunity to build your service business through a dramatic new consumer advertising campaign, "TV SMOG."

Millions of TV set owners will be reminded that TV Smog comes from old worn out picture tubes and receiving tubes. And they'll be reminded to see the service dealer who displays the Sylvania Radio & TV service sign for a TV Smog check-up.

To supplement this powerful TV advertising, a complete campaign in *TV Guide* magazine will also steer the TV set owner to you for a TV Smog check-up.

Get behind this TV Smog promotion: identify yourself as the dealer in your neighborhood who features "Silver Screen 85" picture tubes and Sylvania's quality brand receiving tubes.

And keep in touch with your Sylvania distributor for new Buccaneer promotion pieces and premiums.

SYLVANIA ELECTRIC PRODUCTS INC.  
1740 Broadway, New York 19, N. Y.  
In Canada: Sylvania Electric (Canada) Ltd.  
Shell Tower Building, Montreal

LIGHTING • RADIO • ELECTRONICS  
TELEVISION • ATOMIC ENERGY



# SYLVANIA

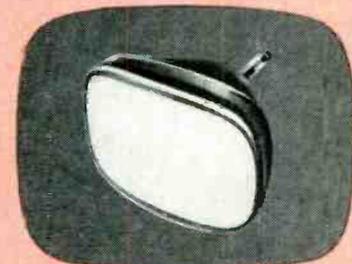
"Buccaneers" seen Saturday.  
CBS Network carries  
"TV SMOG" commercials, sells service



... get a "TV SMOG" rating on your set



... the serviceman who displays this sign



... will install a genuine "Silver Screen 85"



... and replace worn-out receiving tubes with Sylvania's quality brand

# "SURE, I use **CLEAR BEAM** **Antenna Kits**...they've doubled my installation business!"

Using Clear Beam Antenna Kits makes sense right from the start! Attractive packaging and do-it-yourself label creates customer interest in a new or replacement antenna—makes it a cinch to sell complete installations.

Servicemen installing Clear Beam Antenna Kits have eliminated "loose stock" inventory problems and are now able to price installation jobs accurately and profitably due to fixed material costs!

Start doubling your installation business with Clear Beam Antenna Kits now. Display them in your shop—show them from your service truck—let Clear Beam's self-sealing antenna kits clinch extra installation sales for you!



Kits for Conicals, Arrows, Yagis, Dipoles, UHF VHF complete with mast, lead-in and all necessary hardware ready to install!



**CLEAR ANTENNA CORP.,**  
**BEAM CANOGA PARK, CALIF.**

Warehouses in Seattle, Portland, San Francisco, Honolulu, Dallas, Kansas City, Detroit, Baltimore

## Reps & Distributors

**SNYDER MFG. CO.'s** Antenna-Electronics Div. has adopted a new policy of using manufacturers' reps, Ben Snyder, pres., announced.

**MASTRA CO,** Cleveland, announces the appointments of four new manufacturers' reps. Morton L. Friedman Co., W. B. Gollhofer. The Possner Co., and Ramano & Kroeger Co.

**CARMINE-PADEN ASSOC.,** newly formed rep firm, operates in the states of Mo., Kan., Iowa, Neb., and Southern Ill.

**M. CLIFFORD AGRESS** has been appointed to represent **GENERAL TRANSFORMER CO.'s** line of military and commercial transformers in the Conn. and New England States.

**HENRY LAVIN ASSOC.** rep firm has moved to its own building on Route 5A, Meriden, Conn.

**WALL MFG.** has named **DON SMITH SALES** of Seattle to rep soldering iron line in Pacific Northwest.

**GRAMER YARBOUGH** has become a principal in the Los Angeles rep firm of **SAMUEL SIEGEL.**

**PERLMUTH ELECTRONIC ASSOC.,** Los Angeles reps, have added five men: R. YOUNG, W. SMITH, G. COWPERTHWAIT, H. DICKINSON, and H. KOHNEN.

**LAND-C-AIR SALES** of Tuckahoe, N. Y., have opened their new warehouse and office at 154 Marblehead Rd.

Three reps appointed by **TRICRAFT PRODUCTS** are: **JACK GEARTNER CO.** of Miami Beach, **MERICAN CO.** of New York City, and **MORTON L. FRIEDMAN** of Chicago.

**E. V. ROBERTS & ASSOC.** have added **KEN SHUMWAY** and **CARL DATA** to the staff.

**MAGNECORD's** three rep appointments are: **LOREN F. GREEN** of Chicago for Wis.; **ROBERT WHITESELL** of INDIANAPOLIS for Ind. and Ky.; and **EASTERN ELECTRONIC SALES** of New Haven for New England.



"Now that you satisfied your lifetime desire to see one 'FARAD,' can we get back to work?"



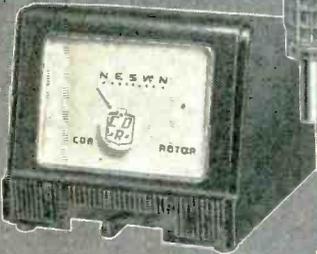
AR 1 and 2



AR-22



TR-2



TR-4



TR 11 and 12



Everything You Need for Profitable Rotor Sales

# CDR ROTORS

## have EVERYTHING



### THE COMPLETE LINE

... a model for every need... whatever the application there is a CDR Rotor that meets the situation best!

### PRE-SOLD FOR YOU!

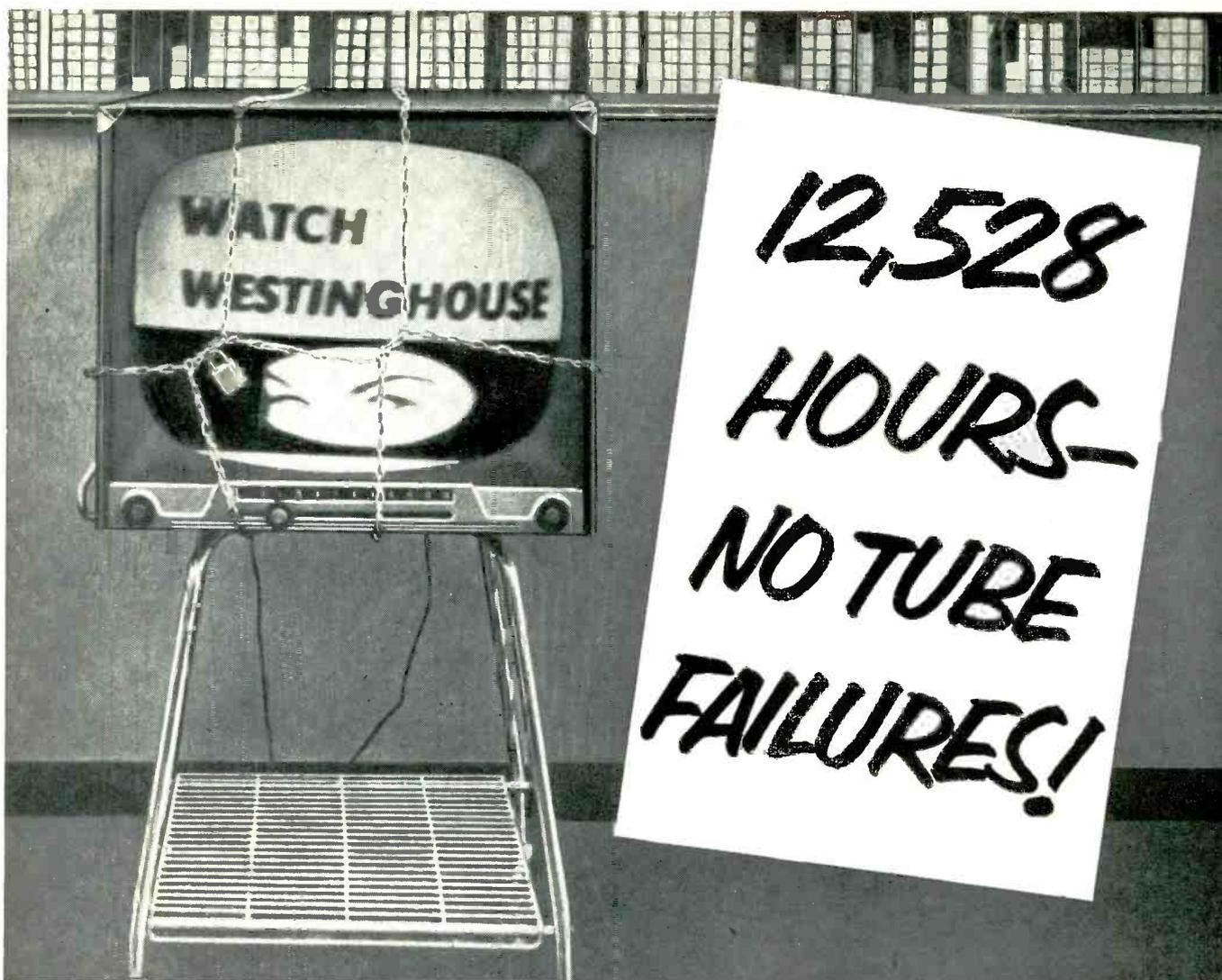
The greatest coverage and concentration of full minute spot announcements on leading TV stations in every major rotor market is working for YOU...pre-selling your customers!



**CORNELL-DUBILIER**  
SOUTH PLAINFIELD, N. J.



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



At the Lew Bonn Company, lock and chain are still on this now-famous TV set. And the total useful life of its Westinghouse RELIATRON Tubes is still to be discovered.

## Westinghouse 12,000-hour Locked-TV Marathon Shows how "Pre-Ship" tube test cuts call-backs

On April 25, 1955, the Lew Bonn Company set out to demonstrate the superior performance of Westinghouse RELIATRON® Picture and Receiving Tubes . . . and to prove the benefits of the Westinghouse policy of testing every tube in the warehouse *before final shipment!* They started one of the most amazing marathons in years!

A TV set, chained and locked, was put on display in the showroom of the Lew Bonn Company, Minneapolis. The set was equipped completely with Westinghouse Reliatron tubes—all taken right from stock!

Here's what happened: at first check, 5,472 hours later, all tubes were reported perfect. At second check, 8,784 hours (or over *six years'* viewing time) later, still no failure! After 9,144 hours, still perfect! Now the tubes have chalked

up 12,528 hours—and they're still going strong!

*What made possible this superior tube performance?* Westinghouse manufacturing quality, for one thing! For another, PRE-SHIP TESTING . . . rigorous, six-step testing of tubes for shorts, open circuits, excessive gas, loose mounts, defective glass, and bad seals—all the common causes of call-backs—all done at the local warehouse, *just before the tubes are shipped to your distributor!*

This unique testing policy is insisted upon by Westinghouse as the only way of assuring quality-perfect tubes every time . . . the best way to eliminate costly call-backs, win customer confidence. Stock up on Westinghouse tubes —"pre-ship tested" to guarantee dependability and top performance. Call your Westinghouse distributor today!



**WATCH WESTINGHOUSE**  
WHERE **BIG** THINGS ARE HAPPENING FOR YOU!

6ET-4116A



*One gift you can give yourself . . .*

## PROFITS FROM YEAR-END RCA BATTERY SALES

More portable radios will be found under the Christmas trees this year than ever before. And just as sure as there's a Santa, there's a clause that says portables need batteries—RCA Radio Batteries. So, give yourself a gift of year-end battery profits. Ask your RCA distributor to fill in your stock with consumer-accepted RCA Radio Battery types. Then, play up your RCA Battery line. Promote yourself into a big share of both the new-set business and the replacement business that's coming as sure as '57. And, with RCA's national advertising and colorful promotional material supporting your efforts, you're sure to wrap up a cheerful package of profits for yourself this year.



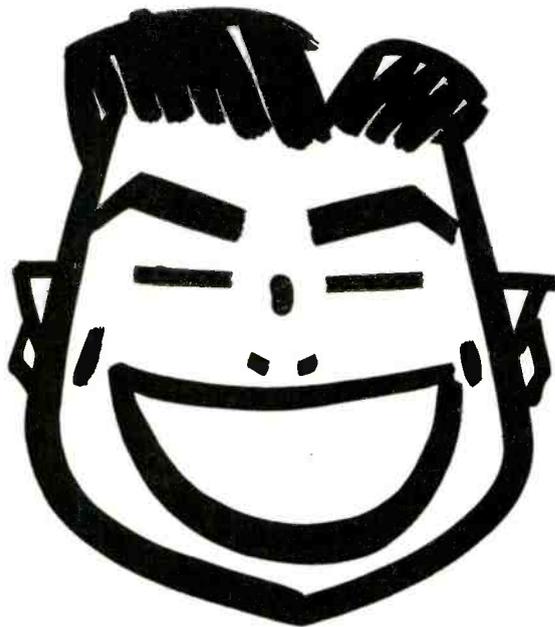
**RADIO BATTERIES**

RADIO CORPORATION OF AMERICA • CAMDEN, N. J.

Page from the



## RECOGNITION MANUAL



### SMILING SAM

This jovial space salesman may be recognized by the ear-to-ear grin and good natured greeting. A walking toothpaste ad, he keeps smiling whether he lands a new account or has a 12-page ad contract canceled.

Smiling Sam operates on the theory that his irresistible smile is a more potent sales tool than a solid circulation audit or a winning reader survey. (Well, it worked on that sweet young media buyer, didn't it?)

Rumors claim that **ELECTRONIC TECHNICIAN** space salesmen were caught smiling several times during the past few months. They are not to be confused with Smiling Sam (it says here). They are simply smiling about their commission increase resulting from **ELECTRONIC TECHNICIAN's** 15.4% ad gain during the first seven months of '56 over '55, while competing magazines in the field, sad to relate, showed ad losses of 2% to 17%.

#### **ELECTRONIC TECHNICIAN**

CALDWELL-CLEMENTS CO., 480 Lexington Ave., New York 17, N. Y. PLaza 9-7880



"People with selective ears are a hardy, determined lot." So noted one observer at the recent Hi-Fi Show in New York. Undaunted by the newly imposed admission charge, hordes of audiophiles jammed the show, seemed to enjoy every minute of it. One exhibit with attendance momentarily down reproduced the sound of a rifle shot (or was it a howitzer?) at about 95 db or thereabouts. In a flash dozens of visitors flocked to the exhibit.

The Pickering display at the show featured an electrostatic speaker system covering 25 to 25,000 cps. Tweeters of this type are no rarity, but the system included electrostatic woofers as well! Very interesting, but the low frequency units are not for sale.

New York has no monopoly on the golden ear. Chicago's High Fidelity Show at the Palmer House, Nov. 2-5, certainly rates a five-star credit.

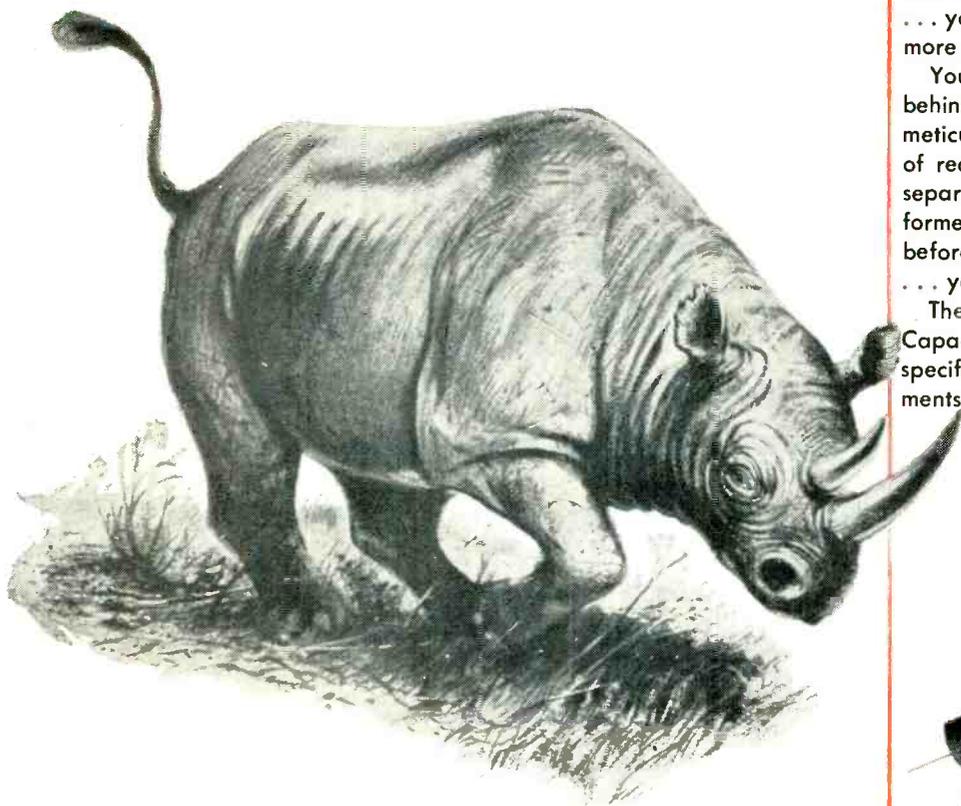
Another hi-fi manufacturer using the two-step distribution plan has given it up. After an unsuccessful two-year attempt, Newcomb has decided that most of the industry prefers the direct factory to dealer to consumer policy. A number of audio "dealers" are actually distributors of other electronic products.

Noteworthy new audio products: Bell's stereo tape system; Wilcox-Gay's Coronet recorder with built-in clock radio; Telectro's rugged Model 1000 recorder; Dynamic's remote speaker selector switch; EMC's \$1.50 tape recorder head maintenance kit; Metzner's Starlight transcription arm with "wrist action" balanced head; Audiomation's tape programming system for wired and FM music service; Fenton's B&O 53 low-hum mike; Ercona's Rogers amplifiers and controls; and AMI's hi-fi system.

**ASTRON "Staminized"  
CAPACITORS ARE**

**rugged**

ASTRON CAPACITORS HAVE THAT BUILT-IN "NO-CALL-BACK" CONSTRUCTION!



Only the very finest of raw materials pass Astron's "Selected Purchasing System". Astron's special production techniques build extra rugged capacitors that create complete customer satisfaction . . . your key to repeat business and more profit.

You can put your trust in Astron, for behind each Astron capacitor is the meticulous quality control that insures you of real staying power . . . over 10 separate production line tests are performed, plus a 100% final inspection before any capacitor is sent out by Astron . . . your guarantee of top performance.

There is an Astron "Staminized" Capacitor built especially to fill the specific, exacting replacement requirements of any job you tackle.



Safety Margin  
"SM" Minimate\*



Safety Margin  
"SM" Twist Prong



Safety Margin  
"SM" Cardboard Tubular



Blue-Point (R) Molded  
Plastic Paper Tubular

**FREE Servicing Aid**



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

**ASTRON**  
CORPORATION

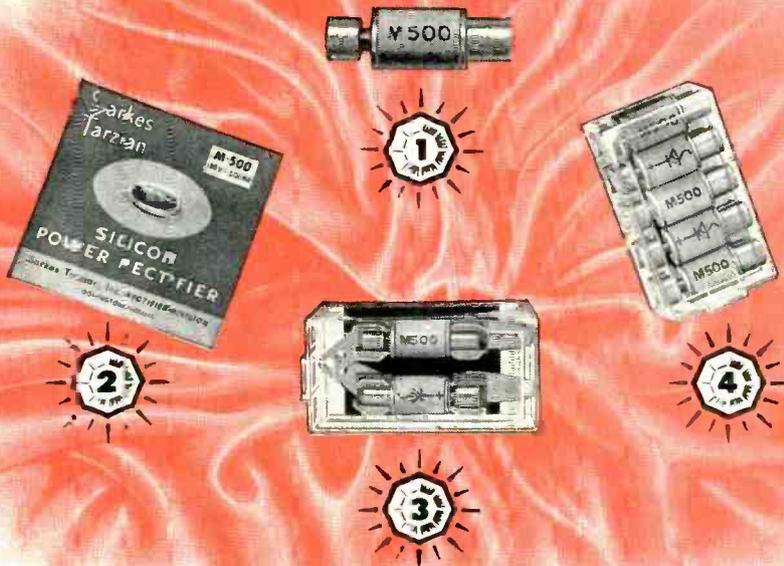
255 GRANT AVENUE EAST NEWARK, N. J.



\*Trademark

WEST COAST WAREHOUSE: 9041 WEST PICO BLVD., LOS ANGELES - EXPORT DIVISION: ROCKE INTERNATIONAL CORP., 13 EAST 40TH ST., N. Y., N. Y. - IN CANADA: CHARLES W. POINTON, 6 ALCINA AVE., TORONTO, ONTARIO

# Miraculous!



## REJUVENATE *with* **SARKES TARZIAN SILICON RECTIFIERS**

*Rejuvenate television sets by increasing voltage output  
(20 volts) in doubler circuit.*

- ① 500 Mil. Silicon Rectifier (actual size).
- ② Display card with replacement unit.
- ③ Voltage doubler holder and units.
- ④ Replacement Ten-Pack.

One type to replace all selenium rectifiers in TV sets.

Write for full details or see your distributor.

**RECTIFIER**

**Sarkes  
Tarzian, INC.**

**DIVISION**

DEPT. T-3, 415 NORTH COLLEGE AVE., BLOOMINGTON, IND.

In Canada: 700 Weston Rd., Toronto 9, Tel. Murray 7535

Exports: Ad Auriema, Inc., New York City

## Catalogs & Bulletins

**TEST EQUIPMENT:** Folder and other descriptive literature illustrates and details tube testers and other electronic test equipment, both in kit form and factory wired. Precise Development Corp., Oceanside, N. Y. (ELECTRONIC TECHNICIAN No. B11-3)

**DUTCH BRAND TAPE:** "Tool up with Tape" is the title of a colorful 12-page catalog describing four different kinds of electrical tape. Illustrations show many useful applications. Form No. 74-10-50. Johns-Manville, 7800 S. Woodlawn Ave., Chicago 19, Ill. (ELECTRONIC TECHNICIAN No. B11-4)

**ANTENNAS:** Descriptive flyers, in color, illustrate the new line of antennas, and show installation procedure. Winegard Co., 3000 Scotten Blvd., Burlington, Iowa. (ELECTRONIC TECHNICIAN No. B11-5)

**DEALER PRICE LIST:** An illustrated general catalog covering consumer products, TV distribution units, TV installation accessories and closed-circuit TV equipment. Specifications and trade prices are shown for each item in the line. Copies available at no charge from company's sales dept. Blonder-Tongue Labs., Inc., 526-536 N. Ave., Westfield, N. J. (ELECTRONIC TECHNICIAN No. B11-6)

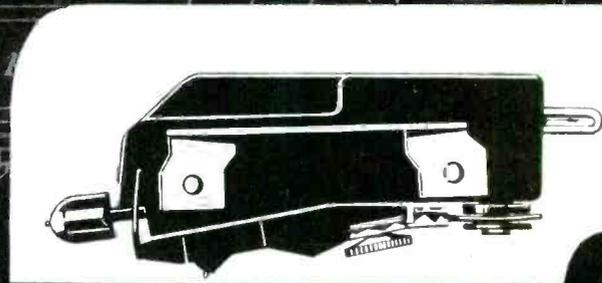
**CAPACITORS:** Form TMR-1 is an 18-page booklet containing pertinent information about the Twist-Mount electrolytic capacitor line, available in single, dual, triple and quadruple units. Capacitors are designed for 85°C operation and are assembled in aluminum containers, providing maximum protection against moisture. Pyramid Electric Co., 1445 Hudson Blvd., North Bergen, N. J. (ELECTRONIC TECHNICIAN No. B11-7)

**PHONO CARTRIDGES & RECORDING HEADS:** The RM-56 is a pocket size replacement manual designed to increase distributors' turnover of phono pickup cartridges and magnetic recording heads. The manual gives complete replacement information and technical data on ceramic and crystal pickup cartridges and magnetic recording heads. Available free from Shure distributors or from Sales Dept., Shure Brothers, Inc., 222 Hartrey, Evanston, Ill. (ELECTRONIC TECHNICIAN No. B11-12)

**TUBE REPLACEMENTS:** Television Picture Tube Replacement Guide (ERT-702B) is a wall chart to aid service dealers in selecting picture tube replacements. Chart lists both aluminized and non-aluminized tube replacements, where available, for each of the 223 tubes. Available through authorized GE tube distributors. General Electric Co., Schenectady 5, N. Y. (ELECTRONIC TECHNICIAN No. B11-9)

Give your customers  
fine music reproduction

with their conventional  
phonographs by installing the



SHURE

# "Twin-Lever" Ceramic Phono Cartridge

### MODEL WC10

List Price ..... \$9.50  
with two sapphire needles

### MODEL WC10D

List Price ..... \$34.00  
with a 1-mil diamond and a  
3-mil sapphire needle

The WC10 "Twin-Lever" Improvement Cartridge has a peak-free frequency response from 40 to 12,000 cps. It makes conventional phonographs sound better than new—and its low list price enables you to make a sale every time you suggest a "Twin-Lever" Cartridge.

The "Twin-Lever" replaces and outperforms 157 three-speed, plastic-cased cartridges, crystal or ceramic, turnover or single needle.

It is easily installed in any tone arm with standard 1/2" mounting centers. Needle replacement can be accomplished in seconds—without tools—with the cartridge in the arm.

SHURE

*The Mark of Quality*  
IN ELECTRONICS SINCE 1925

**SHURE BROTHERS, INC.**

Microphones—Electronic Components

208 HARTREY AVENUE • EVANSTON, ILLINOIS

## Association News

### HATS Newly Organized

The Houston Assoc. of Television Servicemen is newly organized, and affiliated with the National Alliance of Television and Electronic Service Assoc. F. B. Koepnick was elected president; Tony Battaglia, vice-president; I. Miller, secretary; and Jack Domino, treasurer. This group has come out in support of a state licensing law.

### RTGLI Electronics Fair

The Radio and TV Guild of Long Island reports great progress in the Electronics Fair of L.I., which will be held at the N.Y. State University of Farmingdale. More than half of the exhibit booths have already been reserved. Among those manufacturers and sales outlets to make early reservations are: American Standard, Arvin Radio, Bogen, Carduna Sales, Channel Master, Chanrose Dist., Clarostat, GE, Grundig Majestic, Island Radio Dist., JFD, Kingston Electronics, Meissner, National Teltronics, Oxford, Precise, RCA,

Raytheon, Snyder, Sprague, Sylvania, Thordason, University, Vidair, Westinghouse, and Winston. The speaking program for the fair is also rapidly taking shape. A comprehensive series of discussions, on developments in color and b&w reception, and on new test equipment, and service management, is planned. One of the scheduled speakers is Al Forman, editor of Electronic Technician, who will speak on the "Future of Service."

### ARTS Election

The Assoc. Radio & Television Servicemen, Ill., held their semi-annual business meeting and elected as Chairman, Howard Wolfson; vice chairman, Joe Ehlinger; secretary-treasurer, Delman Kotriba; and sergeant at arms, George Neize. Member representatives for the S, W, and N. sections of the city were also appointed, Martin Nebojsic, Anthony Bauman, and Yuki Minaga, respectively.

### RCA Insurance Plan

Available to members of the Radio Television Technician's Assoc. of Pasadena, is a new health and accident insurance plan. Revision in the dues structure now provides for automatic membership in the Calif. State Electronic Assoc.

### CETA Technical Lectures

As part of an extensive upgrading program, the Certified Electronics Technicians Association has launched a series of technical lectures. Marty Bettan, national sales manager for All Channel, gave the program a great start at the Prince George Hotel in New York City. Much attention is being focused on the coming CETA national elections. Ed Tillin, the president, has suggested that all the new officers be selected from the members at large who have not held any previous positions. This would presumably double the number of people who are active in organizational matters.



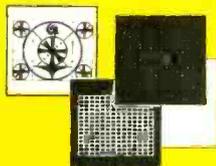
"Now we'll see how many ohms from your nose to your elbow."

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**3 SLIDE  
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1. Indian Head Pattern
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Plus One Clear Acetate

These are broadcast quality and assure high-definition TV images. You can also transmit slides of any subject you wish.

Simplify and speed servicing with this unique, new, COMPLETE FLYING SPOT SCANNER. Produces composite video and sync signal that operates any standard VHF black and white or color TV receiver. Easily reproduces standard Indian Head test pattern or any other pattern—in home, shop or store—for proper TV set alignment; enables you to make all color TV static and dynamic convergence adjustments with stable White Dot and White Line patterns. Can be used with one or more standard TV receivers or fed into master antenna system. Reproduces from any film transparency. Transmits messages typed or written on clear acetate. Size: 16½ in. long, 10¾ in. high, 9½ in. wide. Net wt. 28 lbs. . . . . **\$1995 NET**

### Model 950 Dyna-Scan Pickup and RF Generator Only

Make your own picture and pattern generator. Just connect Model 950 to any properly modified 10-inch TV set which acts as your external flying spot scanner. Size: 3½ in. high, 10½ in. wide, 5 in. deep. Complete with 3 slide transparencies and 1 clear acetate. Net wt. 5 lbs. . . . . **\$6995 NET**



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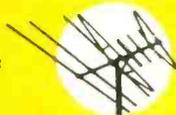
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Trio's Zephyr and Zephyr Royal, the leaders of the 1956 season, are brought to you in the 1957 models improved and perfected, and destined to remain the champions. This famous antenna family is expanded by the Zephyr-Mite, newest addition to the Zephyr family. Trio's Zephyr family features the "Wing" dipole—the composite dipole that brought the power of the Yagi to every channel! Add to this the "Wing" director, the revolutionary new director specifically

designed to enhance the power and sensitivity of the "Wing" dipole—and you have a combination that is unequalled in the TV antenna field today for the maximum in performance. The "Wing" dipole and "Wing" director are exclusive features of the Trio Zephyrs—features that make Trio "the choice antenna line."

Trio's recognized quality construction features the internationally famous Insta-Lok clamps—the clamps that "protect" the element!

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GRIGGSVILLE, ILLINOIS

COPYRIGHT 1956 TRIO MFG. CO. EXPORT SALES DIV., SCHEEL INTERNATIONAL INC., 4237 N. Lincoln Ave., Chicago, U.S.A. Cable Address: HARSHEEL

## An Open Letter To Independent TV & Radio Service Dealers

Way back in the forties when you had only to combat the suspicion and mistrust of the public — a mistrust created through unfavorable and unfair criticism in press and magazine — the Raytheon Manufacturing Company, recognizing this threat to your existence, started the Raytheon Bonded Electronic Technician Program in a sincere effort to help you survive. This program has helped thousands upon thousands of independent service dealers from coast to coast to establish themselves as reputable businessmen, increase their profits and gain the full respect of their customers.

The program has been carefully controlled. Membership in the Raytheon Bonded Dealer group has been kept limited and selected for 2 reasons: (1) Raytheon wants only the finest service organizations to bear this proud distinction, and (2) it represents a substantial investment for every dealer registered.

Today, the growth of Manufacturers' Service Organizations creates new problems for you in maintaining and increasing the business you have worked so hard to earn. To help you win and keep customer confidence, we are going to lift the quotas on the number of Bonded Dealers we will back. We know that many of you operate to standards that will enable you to qualify for the Raytheon Bond. We recognize your need for this support and gladly offer this helping hand.

We regret that this offer can be made for a limited time only. If you are interested in getting the help of the Raytheon Bond, get in touch with your Raytheon Sponsoring Bonded Tube Distributor right now. He will be delighted to show you how the Bond will help you build your business. And helping you — the independent service dealer — to prosper is something we at Raytheon are dedicated to do.



Receiving and Cathode Ray Tube Operations  
Newton, Mass.



# ELECTRONIC TECHNICIAN

Including  
**Circuit Digests**

*Our New Name is*

**"ELECTRONIC TECHNICIAN"**

Effective with this November 1956 issue, our new name is **ELECTRONIC TECHNICIAN**. The word "electronic" has been added to our former name to reflect the great scope of our readers' activities and interests, while specifically describing the many fields in which they operate.

"Electronic" is the one common denominator of all fields which utilize electronic components and circuitry. Whether the marvelous device be a simple phono oscillator, a somewhat complicated television receiver, or an enormously complex guided missile control, it's still the electronic technician who keeps the equipment in working order. Though the specializations may vary, the basic knowledge, techniques and mental approach are the same for all.

The electronic technician may operate his own shop, work in a retail service department, be employed by a large manufacturer, or work for the government. He covers home and industrial television, hi-fi, radio, two-way communications, public address systems, and industrial controls—to mention a few electronic devices. He is the vital backstop for the engineer, the emergency troubleshooter for layman and specialist alike.

In times of military emergency, our nation is critically dependent on skilled technicians. Traditionally, the armed forces and industry have drawn the required talent from the service trades. In today's Electronic Age, the electronic technician is perhaps the most important. He is, so to speak, the man behind the electronic circuit behind the gun.

Except for those continuous refinements and improvements periodically instituted, we plan no major editorial changes. Frankly, as evidenced by the fact that **ELECTRONIC TECHNICIAN** has more paid subscribers than any other servicing publication, we honestly believe that we have served our readers' interests successfully. To this end we will continue to channel our efforts, improving existing services and developing new services for the electronic industry. Though no publication has ever achieved flawless perfection, at least we will strive for it.

The same publishing team will proceed in high gear. Our publisher, M. Clements, who was the first to conceive and manage an electronic magazine, who has been manager of the two oldest publications in the field, will energetically continue to bring his more than 28 years of electronic publishing experience to bear. Our editor, Al Forman, and general sales manager, Howard Reed, will continue to carry out their respective editorial and advertising responsibilities with the same high enthusiasm and determination.

With the panorama of new electronic products continually entering the market, with the industry's current annual business volume of close to \$10 billion expected to rise to \$15 billion by 1960, and with the dependence of public, industry and government on electronic skills, we can not help but look forward optimistically to the growing role of the electronic technician . . . and the role of **ELECTRONIC TECHNICIAN** in serving him.

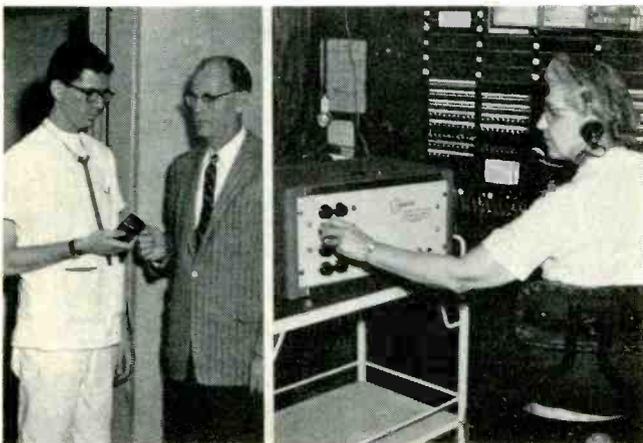
# Tuning In the

**TUBE RACKET.** Stanley Seltzer, 27-year old TV technician of 1770 Davidson Ave., Bronx, N.Y., was arrested on Oct. 18, 1956 on an 18-count grand jury indictment charging fraudulent sale of reprocessed receiving tubes. Trademarks and code numbers had been forged, and branding machinery was found in Mr. Seltzer's shop. Tests by GE engineers on 1000 tubes found 86% defective. The first break came when an unidentified TV dealer became suspicious of the 80% discounts offered. (For details, see "Inside Story of the Reprocessed Tube Racket," first exposed in our July 1955 issue.)

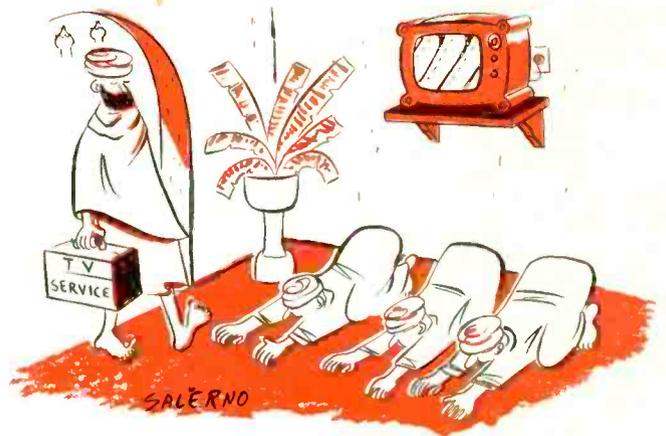
**BREAKFAST CEREAL** used to be "shot from guns," as the ads would say. Now, GE engineer C. H. Zierdt, Jr. reports transistors being fired from mortars to test shock impact. The jolt is equal to 8000 g's, but 60% to 75% of the transistors are still capable of operating at full power. However, tubes are still holding their own in rugged work, like controlling atomic reactors while subjected to maximum radiation and 450°C temperatures.

**LITTLE EVA**, short name for "black light" evaporo-graph developed by Baird Associates, enable you to see a house a mile away or a man 200 yards away in total darkness. Non-electronic Eva is similar to a camera, except that it focuses infrared radiation that various bodies give off onto an oil film. Depending on the amount of radiation, the oil evaporates away from point to point, presenting an image in reflected light similar to oil film on water.

## HOSPITAL COMMUNICATIONS



Continued growth of electronics in commercial applications is shown by new Pagemaster selective radio paging system installed by Stromberg-Carlson in Rochester's Strong Memorial Hospital. Switchboard operator (r) transmits code to doctor (l), who hears buzz from miniature receiver. This system supplements, but does not replace, hospital's standard audio paging arrangement employing loudspeakers.



**MARINE RADIO** boost will result from newly proposed FCC regulation making it unlawful for a U.S. vessel transporting more than six passengers for hire to operate within U.S. jurisdiction without an efficient radiotelephone installation. Boats and the radios they carry will be on display at the 47th Annual Motor Boat Show at the New York Coliseum, Jan. 19-27, 1957.

**VIDEO AND RADIO** communications system being installed in hotels by Jerrold Electronics not only carries programs to guest rooms, but sends messages to tiny transistor powered mike-speaker units carried by hotel service personnel. These units are plugged into special radio jacks.

"**WAMOSCOPE**," a radically new type of cathode-ray tube for radar, TV and other electronic display applications developed by Sylvania in cooperation with the Naval Research Lab., represents a significant step in the simplification of electronic equipment, including radar and TV systems. Microwave signals go directly from the antenna into the tube, where, in a single envelope, the signals are amplified, detected, and displayed on the tube's fluorescent screen. The "Wamoscope" is just under 2 ft. in length, with a screen diameter of 5 in. However, there is no practical limitation to the size of the tube face or the type of screen.

**FIRST VOICE LINK** by cable between North America and Europe has been inaugurated by AT&T. Other cables now in operation are suited solely for telegraph, while the new \$42,000,000 system can handle 36 telephone conversations at the same time. That's about three times the traffic now transmitted between this continent and Great Britain by radiotelephone.

**TUG-O'-WORDS SITUATION:** When the professional technician makes a social call at the home of the Hi-Fi hobbyist.

# Picture .....



**ELECTRONIC GAMES** are a relatively untapped market for manufacturers, and we wouldn't be at all surprised to see such existing sports as electronic shooting galleries modified for home use. The engineering journal *Electronic Industries* suggests the elevation of the lowly pin-ball machine to electronic status to challenge the player's skill. We second the motion. Electronic technicians could have some fun while making an extra servicing dollar.

**TV GOES TO SCHOOL.** New York state to undertake educational TV project. The experiment will cost \$179,000. Aim is the help solve problems caused by overcrowding and teacher shortage. Students will be able to question the instructor by a two-way audio system.

**AUTOMATION** may bring revival of skilled artisans, predicts Dr. Douglas Ewing, RCA vp. Referring to possible disheartening consumer reaction to standardized products, he stated that the small workshop may once again produce the individualized products which appeal to a variety of consumer tastes.

**DO IT YOURSELF** tube testing continues unabated. Newest entry is the E-Z Tube Tester made by Calex Mfg. of Seaford, N.Y. (See "Do It Yourself Tube Testers—Friend or Foe?" in the Nov. 1955 issue.)

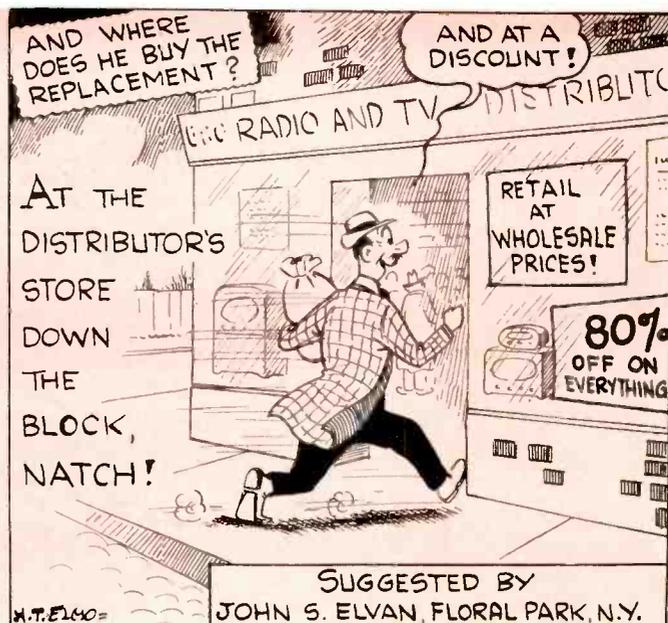
**ANTENNA** sales are holding up nicely, and manufacturers are promoting the product heavily. Winegard is pushing an ad campaign in consumer as well as trade publications, and JFD has prepared a promotional package with various prizes.

## CALENDAR OF COMING EVENTS

- Nov. 2-5: High Fidelity Show, Palmer House, Chicago, Ill.
- Nov. 26-30: International Automation Exposition, Trade Show Bldg., 500 Eighth Ave., New York, N. Y.
- Dec. 5-7: Second IRE Instrumentation Conference, Atlanta Biltmore Hotel, Atlanta, Georgia.
- Dec. 10-12: Eastern Joint Computer Conference, Hotel New Yorker, New York, N. Y.
- Feb. 6-9: Los Angeles High Fidelity Show. Location still to be determined.
- Mar. 3-6: 1957 Annual Convention of National Education Assoc., Dept. of Audio-Visual Instruction, Sheraton Park Hotel, Washington, D. C.
- Mar. 18-21: IRE National Convention, New York Coliseum and Waldorf-Astoria Hotel, New York, N. Y.
- Apr. 14-27: United States World Trade Fair, New York Coliseum, New York, N. Y.

**NATIONWIDE RADAR NETWORK** for earlier and more reliable storm warning service has been announced by Raytheon and the U. S. Weather Bureau. The units can track hurricanes up to 250 miles away. Equipment delivery is scheduled for early 1958.

**SMART MERCHANDISING.** The publishers of the **RADIO ELECTRONIC MASTER** catalog report service technicians boosting product sales on house calls by selling right out of catalog pages. It seems that customers are more inclined to buy when they see a picture and description of the item in print.



# Use and Interpretation of

## Connections Between Generator, Equipment under Test and

JAMES A. McROBERTS

• Square wave testing is a rapid, easy way to troubleshoot distortion in video and audio amplifiers, as well as circuits which work at these frequencies although they do not amplify. Contrasted to the more customary tests with a single-frequency signal generator, the square wave yields information with one application at one frequency about the performance of the amplifier at frequencies ten times as great (the 10th harmonic) and one tenth (the 10th subharmonic) the applied square wave frequency. Thus, a 400-cycle square wave will furnish useful informa-

Fig. 1A—Three of the many component waves of a square wave. B—Added together, they begin to take on the square-wave appearance.

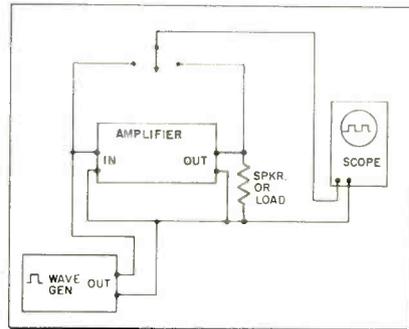
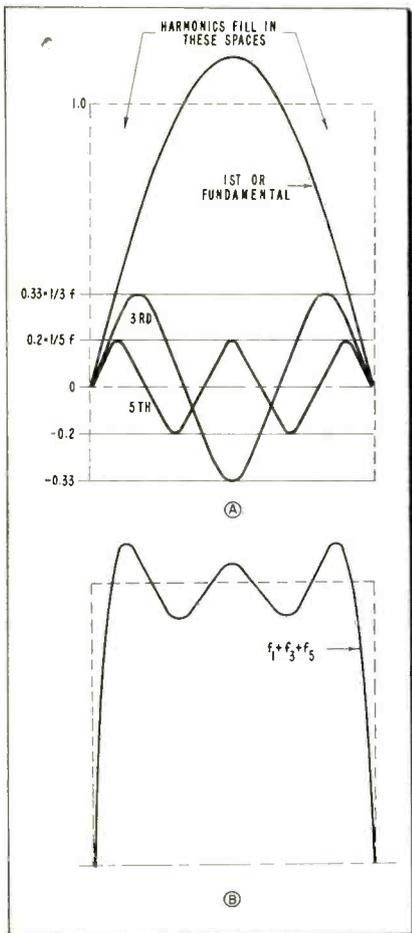


Fig. 2—Arrangement for square-wave testing.

tion down to 40 cycles and up to 4000. With an additional check at 1000 cps, the upper audio frequency of 10 kc is reached. For Hi-Fi equipment, a test at 2000 cps will check to 20,000 cps (20 kc).

Video test frequencies may conveniently be 100 cps, 10 kc, and 400 or 500 kc, furnishing relatively complete information from 10 to 4,000,000 cps. The intermediate check at 10 kc may be omitted for most work.

### What Is a Square Wave?

An understanding of how a square wave tells the story is vital to the interpretation of the resulting patterns. A square wave is essentially a combination of sine waves—like the power supply sine waveshape—with certain very definite amplitudes (heights as viewed on a scope) and phase relations. Fig. 1 shows a square wave broken down into some of its components.

The basic component of the square wave is a sine wave of exactly the same fundamental frequency. In Fig. 1A, half a cycle of this sine wave is shown against the background of half a cycle of the square wave (in broken lines). Also shown are additional sine waves that are 3rd and 5th harmonics of the fundamental sine wave. If we add these various sine waves together to produce a single complex waveform that contains them all, we get the shape shown in Fig. 1B, which is also drawn against the background of the square wave. Notice that the new composite waveform is begin-

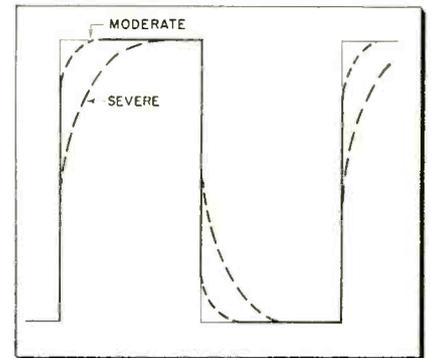


Fig. 3—Attenuation of higher frequencies.

ning to resemble the square wave. The rise and fall at either side of the composite waveform is beginning to steepen so that it is almost straight-sided; the top, though still irregular, is beginning to flatten out.

If we add to this shape the 7th, 9th, and 11th harmonics, the process continues: the sides become more nearly perpendicular and the "wiggles" at the top continue to flatten off. To get a truly perfect square wave, we would have to carry on this process indefinitely. Notice that we are adding *odd* harmonics of the fundamental. Thus a square wave is defined as any fundamental sine wave with an infinite number of its odd harmonics.

There are other requirements for the making of a square wave. Notice in Fig. 1A that all harmonics start and end with the fundamental. To put it more precisely, the fundamental and all the odd harmonics are in the same phase.

Nor is that the end of our demands; there is just one more requirement. Also notice in Fig. 1A that the fundamental has the highest amplitude; the 3rd harmonic is lower and the 5th still lower. The higher the harmonic, then, the lower its amplitude, according to a fixed pattern. The 3rd harmonic has  $1/3$  the amplitude of the fundamental; the 5th has  $1/5$  the amplitude, etc.

Examining one of the higher harmonics, we note that the 11th, for example, would have an amplitude of  $1/11$  of the fundamental. This means that, if we were using a 10-volt square wave, even the 11th har-

# Square Wave Patterns

## Oscilloscope; What Distortions in the Output Wave Mean

monic would have an amplitude of nearly one volt—actually 0.9 volt. It has enough amplitude so that, if it were removed from the sequence, its absence would be noted in the composite square wave. As we will show, this becomes important in testing.

Another point: if we were to arbitrarily consider one of the harmonics as the fundamental, we could look upon the original fundamental as a subharmonic. In other words, we would be looking down at frequencies below the fundamental to observe changes. We now turn to some circuit precautions before we attempt to interpret patterns.

### Hook-Up Hints

A common error in hooking up a square wave generator and attempting analysis is that we simply have to connect the generator directly to the scope to obtain a square wave of beautiful shape, then hook the generator to the apparatus under test and connect the scope to the output. Would that this were so!

Instead, connect the input of the amplifier or other unit under test to the output of the generator. Connect the amplifier to its load. View the *input* to the amplifier (with this connected load), making any necessary adjustments of the impedance match to obtain a square wave. Then connect the oscilloscope to the output, or across the load, of the amplifier. If the impedance is different at this end, make the necessary adjustments or insert the necessary matching network. (The subject of impedance match is not our problem here.) A suggested form of setup is shown by the block diagram of Fig. 2, presuming input and output are of the same impedance or nearly so.

The output of an amplifier or other device will be a perfect square wave only if it passes all pertinent harmonics and all the pertinent subharmonics without relative attenuation or exaggeration. Of course, the output of an amplifier will be greater in height on the scope unless the attenuator on the scope cuts it down—but the *shape* will be the

same if it is not distorted by relative attenuation or by a phase shift. Phase shift is also indicated relatively, as we shall see.

Fig. 3 shows a square wave outline (solid line) with the effects of moderate and severe high frequency attenuation—that is, attenuation of the higher harmonics of the applied square wave. By increasing the frequency setting of the square wave generator, the case of slight attenuation will usually become one of severe attenuation. Varying the frequency in this way enables the operator to pinpoint the frequency at which severe loss takes place. The rounding off of the corner of the square wave results from loss of the fill-in provided by higher harmonic orders. After the voltage has reached maximum, it stays there until the reversals of the original square wave takes place; therefore there is no rounding at the trailing edge or corner. The presumption is that no phase shift occurs in this situation.

With a phase shift, both corners may be rounded off, and other patterns, treated later, may result.

Fig. 4 shows low frequency loss. Two curves illustrate severe and slight loss; the severe loss approximates complete loss of the fundamental. No appreciable phase shift is evident.

Going still further into low frequency loss, we have the differentiation curves of Fig. 5. A differentiation circuit—shown in the insert—acts to pass only the high har-

monics. It will pass the leading edge and the trailing edge only. We might consider a differentiator as a cause of extreme loss of the low frequencies.

Fig. 6 shows a loss at about 3 to 5 times the fundamental frequency of the square wave with other frequencies unaffected. It is a dip in the flat top of the square wave and might be caused by a trap circuit. The very high harmonics are preserved, else there would be a rounding off of the entire corner—compare with Fig. 3, in which all high frequencies are lost

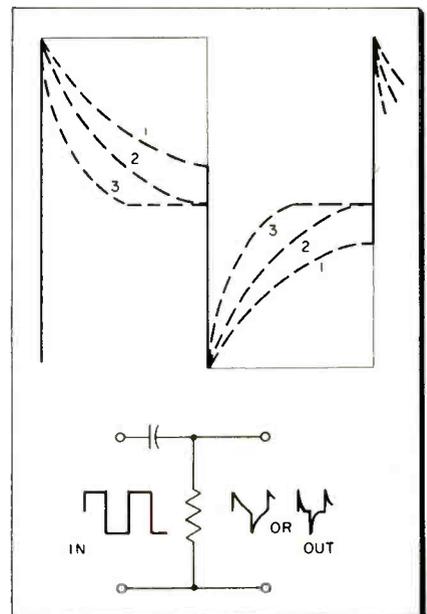


Fig. 5—Effect of a differentiation circuit.

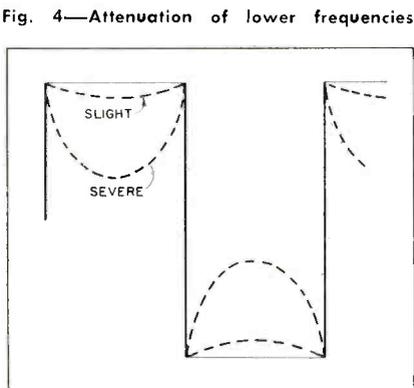
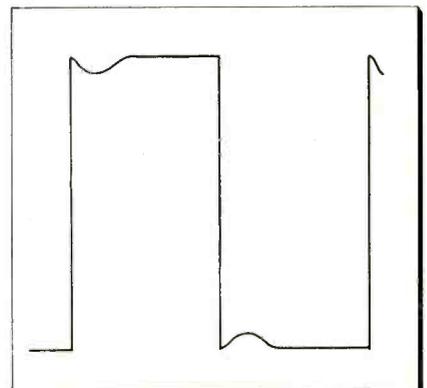


Fig. 4—Attenuation of lower frequencies.

Fig. 6—Loss at one frequency (trap action).



progressively with increasing frequency. Closer determination of the exact frequency at which the loss occurs may be achieved by manipulating the frequency control of the square-wave generator to center the dip (approximating Fig. 4). The generator setting will then show the fundamental frequency at which the loss exists.

### Peak in Fundamental

Excessive amplitude of the fundamental without phase shift will result in a rise of the flat top from the leading edge to the center and a decrease as the trailing edge is approached—a bowing upwards, such as Fig. 7 shows. This situation is likely to arise in a video amplifier that is overcompensated at low frequencies. Note that some amplifiers have a relatively sharp low-frequency cutoff to prevent hum from becoming prominent but TV video amplifiers must pass substantial blocks of video information at very low frequencies. They may be overcompensated in this effort however.

Wavy oscillatory lines at the beginning of a flat top—whether positive or negative—indicate oscillation or ringing. These decay in accord-

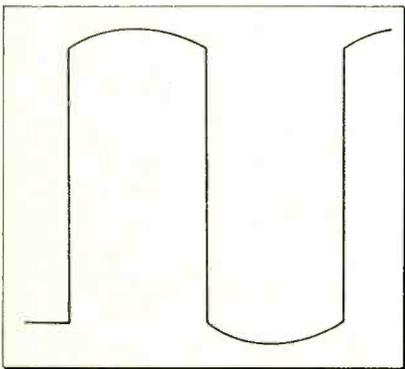
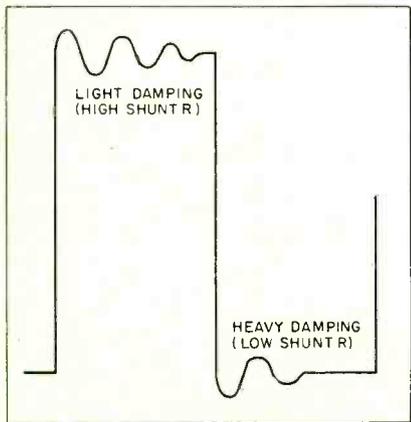


Fig. 7—Boosting of the lower frequencies.

Fig. 8—Ringing, with 2 degrees of damping.



ance with the damping of the oscillatory circuit. A circuit lightly damped will have a longer ring with less decay of the wave on the flat top. Fig. 8 shows both rapid and slow decay due to a light or large amount of damping.

The oscillatory rings superimposed on the flat top are similar for both the negative and positive cycles. Here the rapidly damped case is shown on one half cycle (the lower) while the slower decay of the lightly damped case is depicted on the other half cycle (positive) for the sake of illustration.

Fig. 9 displays a case encountered often in a resonant circuit or some combination of circuits that accept frequencies near some particular setting of controls or tend to resonate at some frequency. The case of Fig. 9 will be encountered for a

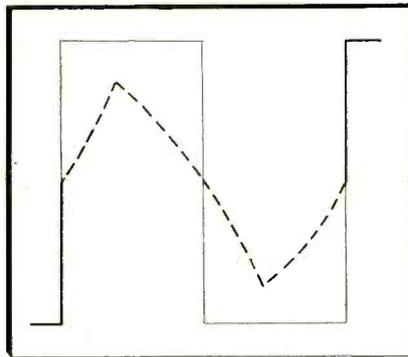


Fig. 9—Effect of resonance at one frequency.

given frequency and will become typical of poor high or low frequencies at other settings of the square-wave generator's frequency dial(s).

Many responses, either true (or nearly true) square waves will show a spike at the upper left corner (beginning of positive flat top) or at the start of the negative flat top. (The scope intensity may have to be turned up and the wave spread to observe this spike, since it is often a high-speed trace and relatively faint.) Such a spike indicates a feed-through of the very high frequencies by some means. The layout of Fig. 2 might produce such a spike due to capacity between the input and the output leads to the switch, and to capacity between the switch blades in addition.

The spike is really a differentiation performed at each leading edge, bypassing the main part of the apparatus, which may attenuate the remainder of the square wave by contrast.

The wave of Fig. 9 might well be one example of a phase shift of those odd harmonics that are nor-

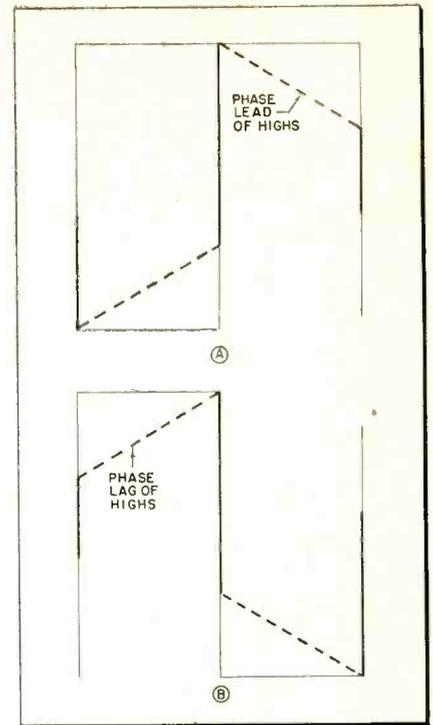


Fig. 10A—Phase lead of the highs (lag of the lows). B—Phase lag of highs (lead of lows).

mally subtracted from the fundamental, so that they add to it instead. These would add up to a hump atop the fundamental and still display apparent evidence of both high and low frequency deficiencies. In this connection, we might observe that the formula for the square wave comprises subtraction of  $1/3$  the third harmonic, addition of  $1/5$  the fifth, subtraction of  $1/7$  the seventh, and so on alternately.

### Phase Shift Tilts Top

Fig. 10 displays two types of tilts of the flat top with different heights of the leading and the trailing edges with respect to the horizontal zero axis. If the leading edge is higher than the trailing edge (Fig. 10A), the flat top will slope from the start of the top becoming less when reversal of the wave takes place. Such a pattern indicates a phase condition in which the higher frequencies lead the lower frequencies of the output square wave.

A similar wave pattern demonstrating high frequency lag is shown in Fig. 10B, where the slope increases from the leading edge to the trailing edge. The junction of the leading edge with the flat top is lower on the voltage (vertical) scale than the junction of the trailing edge with the flat top.

Either case of phase lead or lag  
(Continued on page 61)



## ARE YOU COLOR-BLIND?

NOT IF YOU CAN READ THIS... BUT THE ANTENNAS YOU INSTALL COULD BE...

**T**HE age of color ushers in your greatest challenge as well as your greatest antenna selling opportunity since the advent of television. For even the finest color TV receiver cannot deliver a satisfactory picture if the eye of the receiver—the television antenna—is "color-blind."

Exhaustive tests by leading color receiver manufacturers have proved that an antenna must possess the following electrical characteristics to render true color reception:

1. Sufficiently high gain to override set noise and provide a clear color picture.
2. Flat response. Gain variation of not more than 1 db within 1.5 mc. below and .5 mc. above the color subcarrier.
3. Narrow unidirectional polar pattern.
4. Close impedance match to help effect a low V.S.W.R. to eliminate line reflections.

11 months ago, the JFD engineering staff undertook an intensive antenna research program. Their objective: to develop a select group of antennas that more than satisfied these stringent color requirements. The results: 8 outstanding antennas, so color-perfect in performance, that we have designated them as the NCB\* Colortenna line, signifying Non Color Blind performance.

8 COLORTENNA models to choose from assure you of the right antenna answer for every location or reception problem. They spell out a great new profit opportunity for you... in replacement antenna sales... in new set sales, in trade-in sales—black and white, or color. Because now, for the first time, you can guarantee your prospects and customers both the finest black and white TV today, as well as the truest color performance possible in the future when they decide to buy.

Spearheading your antenna sales break-through will be the most spectacular sales promotion in antenna history—the NCB\* COLORTENNA Sell-A-Bration!

Every COLORTENNA you sell earns you merit points for all-expense paid trips to Europe, America or any place you want to go—and a host of free valuable gifts from minks to Chris Craft cruisers. Plus newspaper advertisements, displays, streamers, direct mail, TV-radio spots, and give-aways selling you and your JFD NCB\* COLORTENNA performance guarantee.



\*NON COLOR-BLIND



deep-fringe areas  
SHUT-OUT HELIX  
Model SX992-SX996



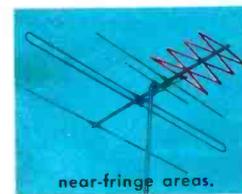
deep fringe areas  
WONDER-HELIX  
Model WX811



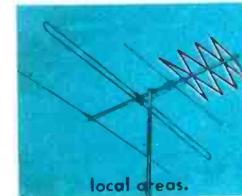
fringe areas  
POWER-HELIX  
Model PX911



fringe areas  
STAR-HELIX  
Model SX711



near-fringe areas  
SUPER-HELIX  
Model RX511



local areas  
JUNIOR HELIX  
Model JX311



fringe areas  
UHF 4-BOW HELIX  
Model UX211



local UHF areas  
UHF CORNER-HELIX  
Model UX411

JOIN THE  
  
**SELL-A-BRATION!**



Win an MG Sports Car!

Write your own ticket  
to exotic faraway places  
... fabulous prizes  
... or even both!

JFD is putting its promotion dollars where they count – in *your* pocket – not just for 3 months but for the next 6 months, yes, the *entire* selling season – longer than any other similar program. It's our way of saying thanks for every NCB\* **COLORTENNA**® you sell. You not only help yourself to fabulous *free* trips and prizes but you cash in on the big *antenna replacement* market that nation-wide **COLORTENNA**® advertising will crack wide open for you.

Every **COLORTENNA**® you sell earns merit points for American Express all-expense paid trips to Paris, Rome, Switzerland, Hawaii, Mexico, Bermuda, Havana, Miami, Las Vegas – or *any* place you name. You go *when* you want to go, *where* you want to go, *how* you want to go or...

If you prefer merchandise prizes, take your pick from over 900 of America's most wanted products – mink coats, MG sports cars, diamond rings, living room suites, Chris Craft cruisers, power mowers, and other wonderful gifts. You can't miss. *Every* point counts. *Everybody* wins.

Your JFD distributor has your NCB\* **COLORTENNA SELL-A-BRATION** portfolio waiting for you. It doesn't cost you a cent – no entry blanks – no red tape. Get started *now* and *write your own ticket* in the greatest give-away in antenna history.

**SALES PROMOTION EXCITEMENT FOR YOUR STORE!**

- window streamers
- newspaper mats
- TV slide commercials
- displays
- TV film commercials
- radio commercials
- cards
- mailers, stickers
- bumper signs

JFD MANUFACTURING COMPANY, INC., BROOKLYN 4, N. Y.  
*world's largest manufacturer of TV antennas and accessories*  
 International Div.: 15 Moore St., N. Y. C. • Canadian Div.: 51 McCormack St., Toronto 14, Ont.



# Power Transformer Checks

*Picture Story: Test the Replacement, Avoid Costly Errors*

H. LEEPER

The so-called low-voltage power transformer in the TV set often must be replaced when no wiring diagram is available. In cases where the transformer has had a winding burn open or has otherwise become defective, of course, the cause of the defect or overloaded condition, such as shorted circuit elements, must first be found and corrected before substitution of a new transformer is made.

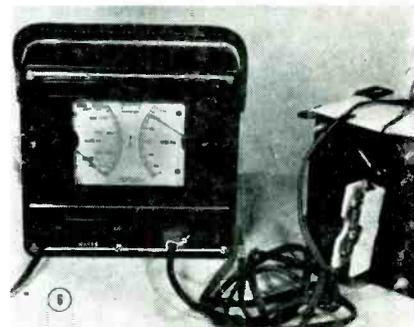
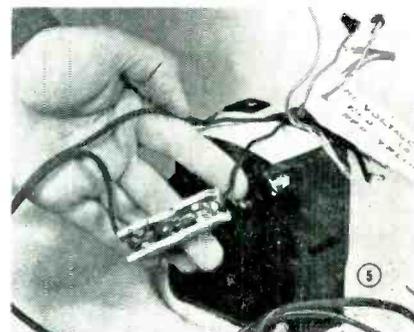
Once this has been done to avoid the possibility of a repeat burn-out, let's assume that you have a replacement of suitable capacity and ratings. You may not have a wiring diagram for it. Perhaps you do, and you wish to check the diagram. The illustrated data presented here will be useful.

## Test Procedure

Fig. 1: The transformer shown is for a small TV receiver. It weighs about 8 pounds. The leads from the various windings should be inspected where they enter the transformer case. Cut or damaged insulation, if undiscovered, leads to further trouble. Make especially sure that the tubing over the heavy filament leads extends through the transformer opening and is in good condition.

Fig. 2: An ohmmeter (a VTVM is shown) may be used to pair up the filament leads and to locate the high-voltage (B-plus) rectifier wires. Late-model transformers usually follow the color code discussed later in this article. The black leads ordinarily connect to the 115-volt primary. For this transformer, the resistance of this winding is slightly less than 20 ohms. This is a normal figure, although there will be some variation from one transformer to another.

The solid red leads ordinarily connect to the rectifier plates (B-plus) and show over 500 ohms for this entire secondary. The red-yellow lead is the center tap for this same winding. Resistance between it and either of the two red leads in this case is less than 300 ohms. A filament wind-



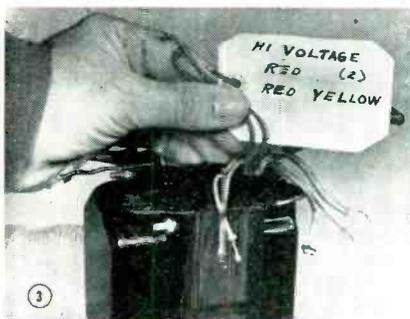
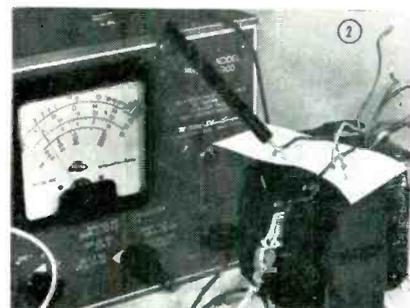
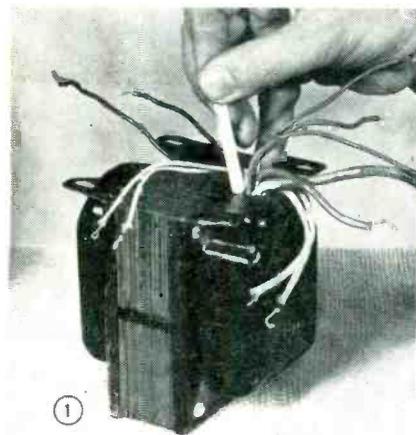
ing will show only about 1 ohm.

Fig. 3: After location of the three leads to the step-up winding, a suitable tag may be attached to them to eliminate later confusion.

Fig. 4: It is also a good idea to cover the exposed terminals of these leads with tape, as a safety measure in subsequent tests.

Fig. 5: For additional checking, a line cord is connected to the primary leads, with a fuse holder connected in series. A fuse rated between 2 to 5 amperes, depending on the transformer, is inserted in the holder. Be sure to keep the exposed portions of the filament leads separated.

Fig. 6: If an indicating wattmeter is available, the transformer should  
(Continued on page 53)



# Muzak: A Money Making

*Background music business for technicians offers*

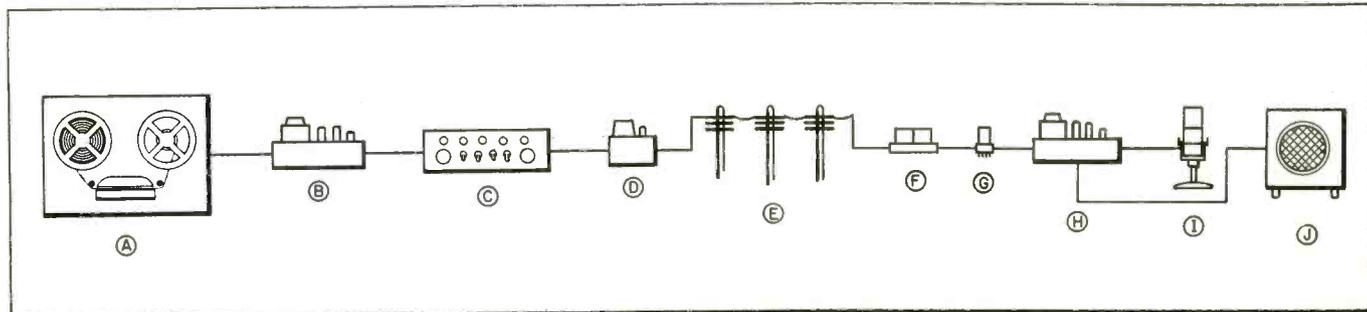


Fig. 1: At central studio distributor location, (A) Tapes are played on transport system with synchronized timer, (B) through amplifier, (C) and control unit which obeys coded signals on tape to start, stop and switch over to second machine. Signals are sent (D) through matching network, compensating for losses in (F) Bell System transmission lines

which are capable of transmitting up to 12 kc. At subscriber location, (F) incoming signal is acted on by repeater coils to eliminate noises and compensate for losses in line, (G) terminating and equalizing equipment being added when difficult acoustical conditions prevail. (H) Amplifier, (I) microphone for paging and PA use, (J) to speaker.

• Across the U. S., Canada, Mexico and Hawaii, many thousands of restaurants, offices, industrial plants, hotels, banks and stores use background music to create an attractive atmosphere for customers and employees. Various called musicasting, functional music, storecasting and the like, this system feeds carefully selected music via telephone lines or FM broadcast (with commercials "beeped" out) from a central sound studio to the numerous establishments. See Fig. 1.

The largest and oldest company in the booming background music business is Muzak Corp., which produces the musical tapes, sends these recordings to exclusive franchised dealers, engineers specialized sound equipment, has huge volumes of audio components made to its specs, prepares business procedures for its distributors, and promotes background music sales. Muzak alone has an estimated 500,000 speakers in use, and some 50,000 specially-arranged musical selections in its library, with 7,000 of them active and new ones added at the rate of 30 per month.

There are three ways an electronic technician can earn money with Muzak: 1) Installation and servicing work for existing franchised distributors; 2) As an exclusive franchised distributor in areas not yet covered; 3) "Spot" installation sales and service work.

The first approach, primarily for electronic technicians with audio



ALBERT J. FORMAN  
EDITOR, ELECTRONIC TECHNICIAN

know-how in larger towns and metropolitan areas, consists of individual jobs that are undertaken for Muzak distributors when there are peak work loads which the distributor's own techs cannot handle. To obtain this type of subcontract business, contact your local Muzak distributor, stating your audio-electronic experience, and equipment and facilities available. Your name will then be kept on file, and you may be called upon when the work load is sufficient to require your services. If you can not locate the distributor in the phone book, address your inquiry directly to Muzak Corp.

### Franchised Distributors

Muzak already has franchised distributors in 130 areas, covering about 60 to 70% of the U. S. population, and just about all major cities. However, in those communities with less than 100,000 population, not covered by existing franchises, there is an excellent opportunity for techs who

have their own shops to obtain junior franchises.

As a junior distributor, you are given 10 giant volumes which tell you everything you need to know about running a background music business. You purchase the specially designed tape player to be set up in your shop as a central studio source. Then you lease your background music service to local plants and business establishments. The music is fed from your studio to your subscribers via leased telephone lines. The speakers and amplifiers for making the subscriber installation are purchased by you at moderate cost from Muzak.

Each month you receive approximately 18 completely different reels of tape, of 8 hours playing time, consisting of 2900 tunes scientifically programmed. The programming is geared to provide three types of music, one suitable for offices, a second for industry, and a third for public areas. These tapes are exchanged every 36 days for fresh, new programming. A standard franchise receives three 8-hour reels per day. Program sequence is never repeated in the same area. After playing, the tapes must be returned.

A basic appeal of the junior franchise arrangement is that once the central player and subscriber installations are set up, you have a steady source of income which only requires a small part of your time for tape handling and occasional

# Opportunity in Audio

*excellent prospects in sales and service.*

maintenance. Sales stay in force a long time. Contracts are usually three years.

To the subscriber there is also an attractive inducement. Research studies have shown that employees are more productive and customers more inclined to buy when the proper background music is played. Since the same music is shared by a number of subscribers, the cost to each is much lower than a single collection of tapes or records played in one particular store. Also, the quality is high, and the number of selections is, for practical purposes, limitless.

The cost for the central studio equipment is under \$2000. Over the past 20 years there have been no franchise failures. The junior franchise distributor also pays Muzak \$75 per month for the tapes, plus 10% of gross billings, which covers the parent company's many expenses on behalf of its distributors.

The cost to the subscriber for music 'round the clock varies over a wide range, depending on how many speakers and amplifiers the distributor must obtain and install under the lease agreement, how far the telephone company lines must run from the studio to the subscriber, etc. For example, there have been small

stores known to pay under \$25 per month, while certain large offices and industrial plants pay as much as \$1000 monthly.

## Spot Installations

In those instances where potential subscribers are beyond the reach of regular distributors because of distance, Muzak is available in the form of "spot" installations. Large, isolated businesses such as industrial plants can benefit by purchasing their own background system, in-

stalled and serviced by a local tech, and supplied with a continuous flow of tapes from Muzak.

Financially this can work out very nicely for the tech. A substantial profit is available on equipment installation, maintenance contracts, and sale of the equipment. Generally the profit runs upwards of 30% on equipment. There are additional profit opportunities for the tech in supplying sound systems where needed.

*(Continued on page 45)*

Fig. 2: M8R tape transport-amplifying systems and timing-control units, shown as A, B and C in Fig. 1, are designed for 8-hour unattended operation with 4800-ft. reels. 73.5" x 27.5".



## CASE HISTORY

### *of one-man background music business*

Wired Music Co., 604 E. Capitol Ave., Little Rock, Arkansas, is a one-man Muzak outlet run by Roger P. Gould. Last year he was serving about 80 firms in the area, using three tape machines 24 hours a day. One type of music is played for doctors' offices, hotels, restaurants, supermarkets and other public places. More stimulating music goes to industrial plants and other work areas. Subscriber costs range from \$18.50 per month for one speaker in the downtown area to some \$200 for a multiple-outlet industrial account. The firm's annual income runs around \$40,000.

# Guide To Foreign Tubes

## Substitution Guide, Nomenclature Guide, American Equivalents, Base Diagrams

ROBERT CORNELL, TECHNICAL EDITOR  
ELECTRONIC TECHNICIAN

• The increasing number of foreign made radios and high fidelity sets on the American scene are providing the technician with additional sources of income. As in our own domestic equipment the greatest amount of servicing required is tube replacement. There is really no reason to send the set back to Europe because the tube markings indicate an EB91 instead of a 6AL5, or an EBC90 in lieu of a 6AT6.

### European & American Equivalents

You can service these foreign made sets in the same profitable manner. Table 1, is a substitution guide and will enable you to determine the American equivalent. In

compiling this information, only those tubes were listed which required no modifications, and where direct interchangeability was indicated. There are other combinations of interchange possible, in some cases requiring rewiring and socket changes. Some minor differences in nomenclature were noted, however these appeared to be the exceptions to the rule. Since it was felt that the interchangeable table should be of maximum utility these numbers were also listed.

### Nomenclature Guide

Table 2 is a nomenclature guide. The tube type is indicated by a series of letters and numbers such as ECC82. It generally consists of 2 or 3 letters followed by 2 or 3 figures. The first letter indicates filament

voltage or current. The second and subsequent letters indicate the general class of tube. The first figure represents the type of base. The second and third figures are serial numbers indicating a particular design.

EABC80 ..... E 6.3 V Heater.  
A Single diode.  
B Double diode.  
C Triode.  
8 B9A base.  
0 Serial number.  
PL820 ..... P 300 ma heater.  
L Output pentode.  
8 B9A base.  
20 Serial number.  
UCH42 ..... U 100 ma heater.  
C Triode.  
H Hexode.  
4 B8A base.  
2 Serial number.

(Continued on page 58)

Table 1—American & European Equivalents

American Type	European Type	American Type	European Type	American Type	European Type
OE3	85A1	6AJ8	ECH81	6J7G	Z63
OG3	85A2	6AK5	EF95	6K7G	KTW63
1A3	DA90, 1D13	6AK8	EABC80	6L6	EL37, KT66, 5881
1A7GT	DK32	6AL5, 6058	EB91, DD6, D77, D152, ED2, EAA91	6N8	EBF80
1AB6	DK96		EL91, N77, N144, 7D9	6Q7G	DH63
1AC6	DK92, X18, 1C2	6AM5		6SL7GT	ECC35*
1AH5	DAF96			6SN7	ECC33*, B65
1AJ4, 1AF4	DF96	6AM6	EF91, SP6, Z77, 6F12, 8D3	6T8	EABC80
1B3	DY30, U41			6U5G	Y61, Y63, 6M1, 63ME, EM35
1C5GT	DL35, N14	6AQ5	EL90	6V4	EZ80
1H5GT	DAC32	6AT6	EBC90, DH77	6X4	EZ90
1L4	DF92, 1F2	6AU6	EF94	6X5GT	EZ35, U147
1M3	DM70	6AV6	EBC91	7C6	DH149
1N5GT	DF33	6BA6	EF93	12AT6	HBC90
1R5	DK91, X17, 1C1	6BE6	EK90	12AT7	ECC81, B152, B309
1S5	DAF91, ZD17, 1FD9	6BQ5	EL84	12AU7	ECC82
1T4	DF91, W17, 1F3	6BR5	EM80	12AV6	HBC91
1U4	DF904	6BW4	EZ81	12AX7	ECC83
3C4	DL96	6BX6	EF80, Z152, Z719	12BA6	HF93
3Q5GT	DL33	6C4	EC90, L77	12BE6	HK90
3S4	DL92, N17, 1P10	6C9	ECH42	12SN7GT	B36
3V4	DL94, N19, 1P11	6CA7	EL34	25L6GT	KT32
5U4G	GZ34, U52	6CD7	EM34, 64ME	35W4	HY90
5V4G	GZ32	6CN6	EL38	5OC5	HL92
5Y3G/GT	U50	6DA6	EF89	85A1	OE3
5Z4	GZ30	6F5G	H63	85A2	OG3
6A8G	X63	6F6G	KT63	1639	EBC33
6AB4	EC92	6F15	EF41	6267	EF86
6AB8	ECL80, LN152	6H6G	EB34*, D63		
6AG5	EF96	6J5G	L63		
6AG6	EL33, KT61, N147	6J6	ECC91		

\*Different heater current. Not a direct replacement for series connection.

# "Coffee Pot" Sound Systems

*Restaurants and diners are important users of intercoms and other audio gear. Opportunities for technician sales and service.*

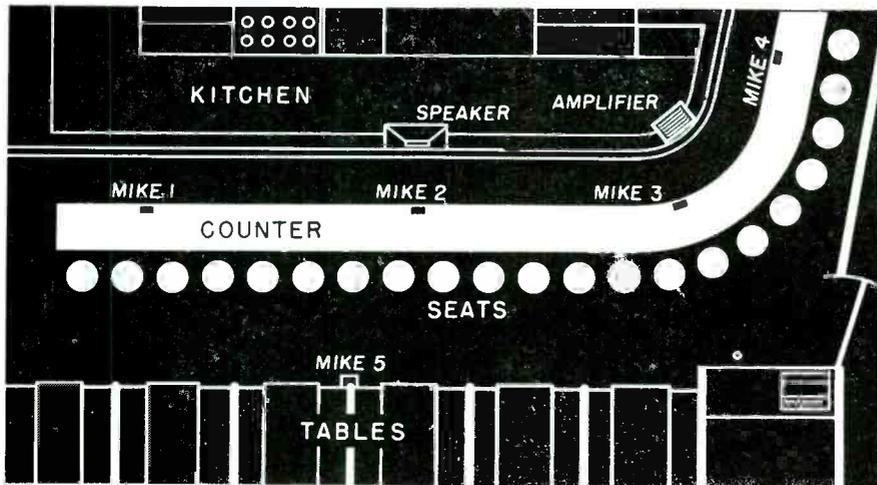


Fig. 1—Typical coffee pot sound system put amplifier where it won't get hurt by its enemies—see text. Numbers refer to 'mike' stations, the more the merrier!

A. R. CLAWSON

• Numerous small restaurants of the "coffee-pot" type exist in the service area of every service technician, and offer him considerable additional revenue in audio equipment sales and service. Boy, do those units gobble up tubes—they run day and night! Some special techniques and precautions are desirable in such sound system jobs.

Heat, grease, humidity, and fumes are the principal enemies of sound systems in a restaurant. Keep these factors in mind in choosing and servicing audio equipment.

### Equipment Choice

Power requirement is low—as small an amplifier as 3 to 5 watts with reasonable gain will work satisfactorily. The prime function of most such sound systems is to permit counter men and waiters to call certain of their orders into the kitchen. Therefore, the general arrangement is like Fig. 1. Here we have a plurality of microphone call-in stations feeding an amplifier which drives a small speaker in the kitchen. Quite often, the owner wants a talk back system, so sell him an intercommunication system;



the layout lends itself well to this duty.

"Back connected" speakers are desirable for the several microphone stations (standard mikes can be used). All the speaker voice coils may be run to the amplifier input with ordinary rubber or plastic covered electric light cord (a substitute for low Z cable) which is waterproof, or cable. (Do not choose ac/dc type equipment for this service because of the dampness and consequent shock hazard.) At the amplifier, the voice coil lines may be connected to an output transformer which should have secondary taps. The taps permit the adjustment to the total impedance of the speakers used as mikes. The primary of the output transformer feeds the high impedance input of the amplifier. Actually it is acting as an input transformer with reversed function, viz., primary is secondary, etc. Fig. 2 shows the schematic hookup.

(It's a good idea to connect the chassis to an external ground to prevent a "hot floating" chassis.—Ed.)

Electric light cord feeds the speaker in the kitchen. Do not install the amplifier in the kitchen unless it is unavoidable. The kitchen is hot, humid, and the entire unit will soon be covered with a coating of grease from cooking. Mount the speaker in a suitable box with louvres to avoid as much grease entry as possible. Endeavor to place it away from any stove, griddle, or other hot spot. If an intercom system is employed, run the push-to-talk wiring into the space outside the kitchen, even at the expense of

(Continued on page 47)

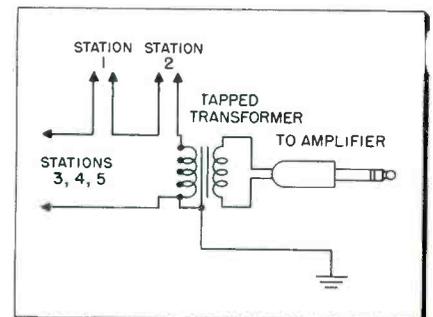
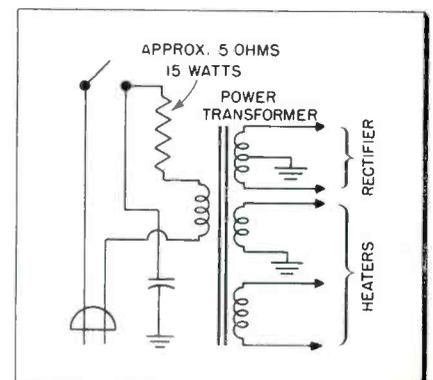


Fig. 2—An output transformer (universal tapped variety) serves as an input transformer. Preferably hook the voice coils in series for easier servicing—individual ones can be shorted out in testing.

Fig. 3—Schematic depicting installation of primary ballast resistor to prolong tube and component life due continuous duty under adverse operating conditions.



# Service for Profit

## How One Service Department Was Taken Out of the Red

BRUCE ADAMS

"Get my TV service operation out of the red and I'll make it worth your while."

That is what owner Emil C. Gauggel told Clinton (Chuck) Chichester when Chuck was made TV service manager at Gauggel's in Hamden, Conn. Chichester set to work cutting costs by eliminating unnecessary calls, inaugurating an improved purchasing program for replacement parts, launching a vehicle maintenance program, and improving routing of calls. He also put a half-hour limit on home calls, resulting in more calls being made per day, and instituted a COD policy.

Within a year, he had increased the revenue of a two-and-one-half man department, saddled with a heavy load of warranty work, from \$12,000 to nearly \$15,000. Dealer Gauggel lived up to his promise by starting to pay Chichester a straight  
(Continued on page 63)



If repair does not result after house call has gone one-half hour, owner is told that further work in home would be a waste, that chassis must go to shop. This means more calls per day, more revenue.



Returning defective parts to manufacturers immediately has resulted in savings of \$500 per year. Parts used to "hang around the bench" until warranty period had expired. This \$500 saving is just for small parts, does not include \$400 worth of picture tubes which were always returned.



Damage to sets, though not frequent, is costly when it does happen. By way of prevention, each set is protected with a cover, carried by two men.

Purchase of a picture-tube analyzer and restorer has increased revenue. The flat \$5 charge on every old set "brought back from the dead" has more than made up the cost of the equipment. Customer reaction is favorable: the fee is paid gladly when it is understood that the alternative is the price of a new picture tube.



Smart buying means lower prices and more profit. Parts are ordered in large quantities from regular sources, resulting in best discounts plus fast fill-in service.

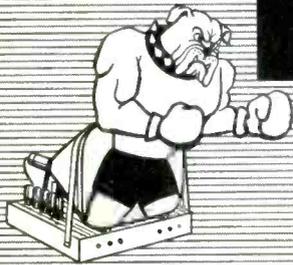
Dealer Gauggel cooperates with service department efforts by instructing customer on phone in several ways of trying to restore set to operation by ordinary adjustment. This eliminates many unnecessary warranty and other nuisance calls.



The company's vehicles are taken in for check before small troubles become big ones. In addition, men are coached in handling trucks properly. The firm feels it makes out best by buying panel trucks that are somewhat used instead of new, then trading them in before troubles become too frequent.

Careful routing of calls increases each man's daily total. Calls taken in afternoon and following morning are placed on routes starting in early afternoon. Maximum wait is thus one day, and excess cost of rushing around to handle the most exacted call first is avoided.





# "Tough Dog"

# Corner



## Difficult Service Jobs Described by Readers

### Dual Sound Channels

We installed a UHF strip in a Standard Coil tuner on a TV set using a 21 mc IF. Both sound and picture were present, and to the customer's satisfaction. We collected our fee and continued on to the next job. A few days later the customer complained that the sound and picture did not make sense, apparently she was getting sound from one channel and picture from another. Another trip to the customer's home revealed that there were indeed 2 different sound channels and 1 video present on the newly installed strip. Since the sound channels came in on different positions of the fine tuning control, the solution was to adjust the oscillator so that the unwanted sound did not fall within the range of the fine tuning control. The problem is common in neighborhoods where FM stations are operating and UHF conversions are made on Standard Coil tuners, using the K, Q, or F/G strips. We have not discovered the situation to exist in sets using a 42 mc IF, or in tuners using other types of strips. This is the way it happens. Suppose Channel 20 is tuned in on a set using a "K" strip, with a 21 mc IF. Channel 20 operates on 506-512 mc, with the picture carrier at 507.25 mc and the sound at 511.75 mc. However, the picture is carried on the entire 4.5 mc band from 506 to 511 mc (4.5 mc bandwidth). The oscillator of the K strip must be tuned to a subharmonic of 528.25 ( $507.25 + \text{the } 21 \text{ mc IF freq.}$ ). Any subharmonic of this frequency,  $\frac{1}{4}$ ,  $\frac{1}{6}$ ,  $\frac{1}{8}$ , will beat with the incoming UHF carrier to give the desired picture. Also the difference frequency 486.25 ( $507.25 - 21 \text{ mc}$ ) will also furnish video to the IF stages, but in this case without the sound. Hence there is a multitude of subharmonics to which the oscillator can be tuned to give a satisfactory picture, but

only one which will give the proper accompanying sound. A few short calculations will indicate that many of the frequencies to which the strip can be tuned, has beat-notes at the sound, or picture IF of the set in the FM band (88 to 108 mc). It is possible to receive a satisfactory picture from a UHF station with accompanying sound from an FM broadcasting station with no correlation between the two. Apparently the cascade tuners and the sets having 41 mc IF stages, as well as the convertors and independent UHF tuners do not have this difficulty.—*Charles R. Maduell, Jr., New Orleans, La.*

### Sound in the Sync

In our shop we rate this Admiral 19F1Z, as the one most likely to make a TV technician take to farming.

The set was perfectly normal so far as picture and sync were concerned providing the volume control was at minimum. As the volume was increased slight sound bars appeared and a bad horizontal jitter developed in time with the audio until at full volume the picture was moving back and forth over a space of at least one inch.

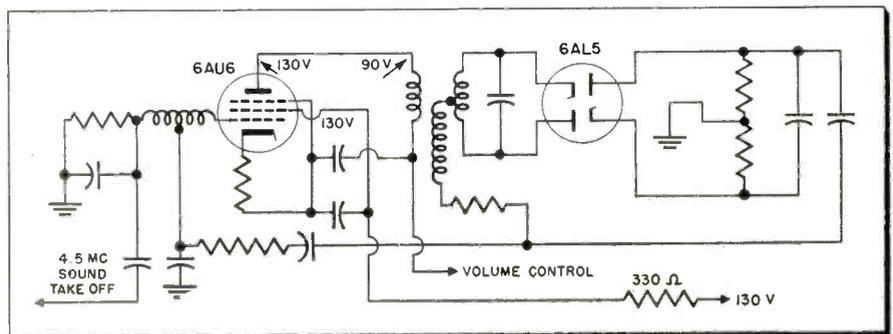
The first conclusion reached was,

of course, "filters," all it would need was a new filter on the low B+ line from the cathode of the 6W6 sound output tube. This was not the case. As the filter capacitors in question are part of a multiple "can" a leakage between sections was suspected or an open ground inside the can. A complete four section capacitor assembly was tried.

As this produced no results the next logical step was to attempt to trace the source of audio modulation with a scope. All tubes had been checked in the home before the chassis was brought into the shop. With the scope audio modulation could be seen at any point on the low or high B+ lines but any attempt to locate the source of this modulation proved futile. It was found, however, that some modulation was present even at minimum volume.

The next step was a check of voltages in the sound circuitry under no signal conditions. These proved to be normal except for the 6AU6 plate, measured at the ratio detector transformer connection it was correct at 90volts, at the tube socket it measured 130volts! Re-heating this connection cleared up the trouble and restored the set to normal but left a problem to be solved.—Why?—*K. Bramhan, Vancouver, B.C.*

Defective 6AU6 plate connection causes sound in sync.



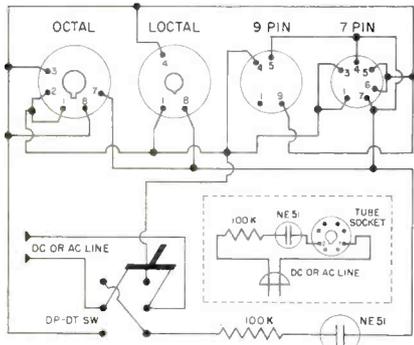
# SHOP HINTS



## Tips for Home and Bench Service by Readers

### Tube Filament Checker

The large number of radio and TV sets using tubes whose filaments are connected in series, and the serviceman's desire to reduce the time spent on each repair has created a demand for a simple and rapid test for an open heater. This checker is capable of detecting filamentary troubles in



Filament tester

approximately 80% of the cases encountered in the field.

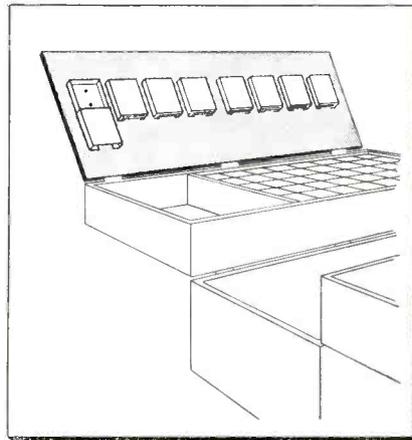
A good tube will cause the neon to glow in one of the two switch positions. A tapped filament will check good in both positions. This device will operate on 90 volts or better, AC, DC, or battery, and draws a minimum amount of current.—*H. M. Layden, New York, N.Y.*

### Printed Circuits

Printed circuit boards may simplify the manufacture of TV sets, but in a service shop they seem to create confusion. When viewed from the underside, a printed board looks like a map of roads going in all directions. The components are placed on the top of the board and are connected to these little roads. To discover which little road a resistor or condenser is connected to appears to be the problem. To simplify, I suggest placing a light, such as a lux lamp, pointed toward the printed circuit board from the top. Place a pencil on the component you wish to identify with the circuit and view from the underside of the board.—*Martin L. Stahl, Jr., Boca Raton, Florida.*

### Anti-Fuse Fumbler

Don't blow your fuse while searching your tube caddy for the correct size circuit protector. Remove the fuses, slide the cover from the box, punch or drill 2 small holes in the bottom, and attach these boxes to the plywood lid, as illustrated. Use small 1/2 inch wood screws. Replace covers



Fuse rack

and fuses. The fuse size and type can be marked on the top of each box.—*J. E. Williams, Knob Noster, Mo.*

• This idea can also be used on those tube caddies not equipped with lids over the tube compartment. Often in those boxes that do not have covers the tubes shift from one side to the other, and fall out as the box is opened. A 1/4 inch plywood board can be made to cover these tubes and the fuse boxes fastened to this board. This cover may be friction fitted or hinged.—*Ed.*

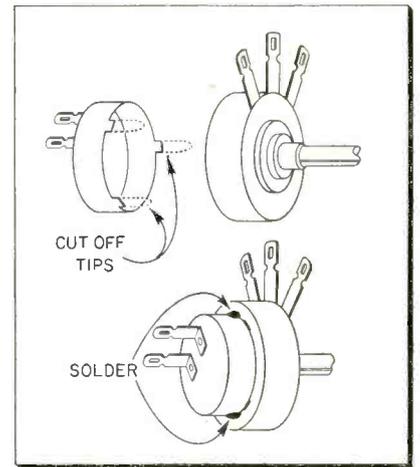
### AGC Prescription

In most cases an aspirin will help. In many cases, I have found that a horizontal amplifier tube will check satisfactorily in a tube checker, but it will not function properly in the set. On those receivers deriving the AGC pulse from the horizontal output, with poor AGC action, the first thing to do is change the 6BQ6, or 6BG6, regardless of how the tube

checks out. Do not rely on this as a cure all. The more usual sources of this difficulty should not be overlooked. They are in part, gassy, leaky or shorted tubes, defects in the horizontal circuit, and defects in the load circuit of the flyback transformer. Defective damper tube, linearity coil and condensers, width coil, yoke, etc. and the flyback itself will affect the amplitude of the AGC pulse.—*Robert Lipzen, Los Angeles, Calif.*

### Switch Replacement

To replace a defective switch mounted on the back end of a potentiometer, without having to go to the expense of a completely new combination control, I have been using this quick method. In some cases it isn't even necessary to remove the control from the chassis.



Switch assembly

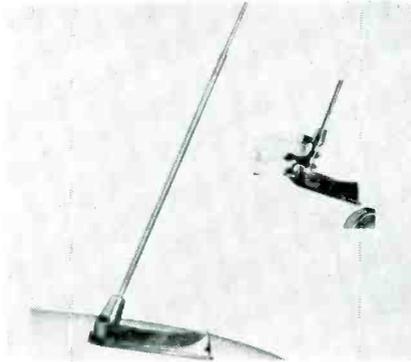
Pry the old switch off with a knife-blade or a small screwdriver. Straighten the tips of the new switch, and cut them down to about 1/16th of an inch. With both control and switch in the on position, place the switch on the control and tack solder in two or three places.—*Leon Beyer, Holland, Michigan.*

• Before soldering, check to see that the control is functioning properly.—*Ed.*

# New Antennas & Accessories

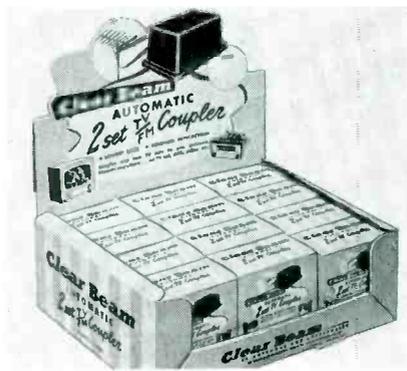
## Snyder ELDORADO →

An auto radio antenna, which can be easily adjusted to fit the lines of any automobile and is designed for fender mount or twin rear deck installation. This antenna is triple-chrome plated, and has a die-cast base assembly. Super-mount provides a snug fit. Can be positioned to point forward, vertical, or rearward. Model TC-15 extends from 23" to 56", suggested retail is \$10.00. Model RD-15, a dual kit, extends from 13" to 27" is \$20.00. Snyder Mfg. Co., 22nd & Ontario Sts., Philadelphia, Pa. (ELECTRONIC TECHNICIAN No. 11-18)



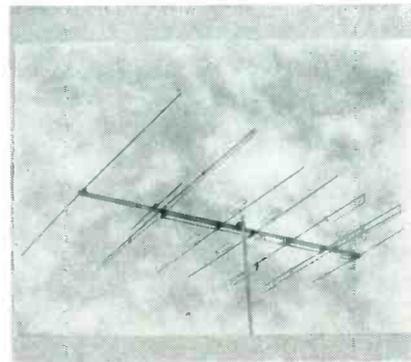
## Clear Beam TV-FM COUPLER →

Eliminates the need for installing a special FM antenna to receive FM broadcasts when an all-channel VHF antenna is already in use. The coupler is of all-weather construction using a plastic housing for indoor or outdoor mounting. Electronically filters the FM portion of the signal and feeds it to the FM tuner and permits other TV signals to pass on to the TV set. Other features are low loss, minimum inter-action and no distortion. May also be used to hook-up 2 TV sets. Clear Beam, 21341 Roscoe Blvd., Canoga Park, Calif. (ELECTRONIC TECHNICIAN No. 11-19)



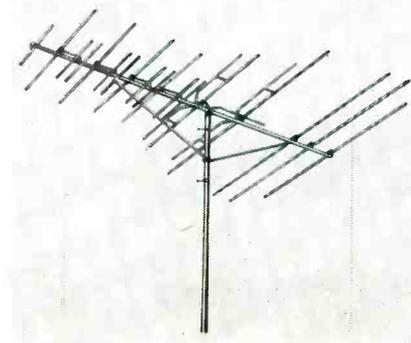
## Taco TOPLINER →

The antennas (4 models available) represent a complete departure from previous broad-band antennas, with resulting higher gain and better all-around electrical characteristics. Electrically, the antenna has been built around a new antenna connecting delay line, which maintains optimum impedance match to the transmission line and has a single lobe pattern. Models 40, 50, 60 & 70 are designed for the various areas ranging from metropolitan to extreme fringe. Technical Appliance Corp., Sherburne, N.Y. (ELECTRONIC TECHNICIAN No. 11-20)



## Winegard COLOR 'CEPTOR →

A high gain fringe area antenna made for color TV, is designed to provide top quality performance within a fifty mile radius. A new eighteen-element yagi has a high front-to-back ratio. Another plus is its low standing wave ratio, insuring maximum transfer of signal to the set without live reflections. High uniform gain across each of the 12 UHF channels is reported. Utilizes Power-Pack adapter, gold anodized aluminum, packaged in a 5-color carton, and sells for \$29.95. Winegard Co., Burlington, Iowa. (ELECTRONIC TECHNICIAN No. 11-21)



## Channel Master T-W

The T-W's "traveling wave" principle reinforces picture signals electronically by providing for an equal flow of current in every dipole on each of the VHF channels. All but one of the antenna's elements are driven elements. It is claimed that the T-W is the highest-gain antenna ever developed. A single-bay of the fringe area model has higher gain than a wide-spaced, single-channel 5-element yagi on each high band channel. It has front-to-back ratios exceeding 10:1. Channel Master Corp., Ellenville, N.Y. (ELECTRONIC TECHNICIAN No. 11-22)

## Rohn ROOF MOUNT

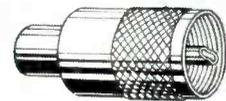
This specially designed, cast roof mount snaps into place when upright, then securely locks into position by merely tightening a hinge bolt. Masts can be installed by one man in a matter of seconds. Rohn Mfg. Co., Bellevue, Peoria, Ill. (ELECTRONIC TECHNICIAN No. 11-23)

## Crown Controls TENN-A-LINER

The 1957 model of the CAR6B utilizes a new design that was created to assure greater eye appeal. A new dial offers greater readability, with instant and positive directional indication; even when the rotator motor is not operating. Other features are, finger tip operation, an extremely sturdy and dependable operating mechanism and a positive action brake which prevents wind milling. Crown Controls Co. Inc., New Bremen, Ohio. (ELECTRONIC TECHNICIAN No. 11-24)

## B-T SOLDERLESS CONNECTORS

Two new solderless cable connectors for a wide variety of coaxial cables, are the model P-11S for RG-11/U, and the model P-59S for RG-59/U cables. Unique features include a 2-step thread to clamp the outer jacket and ground



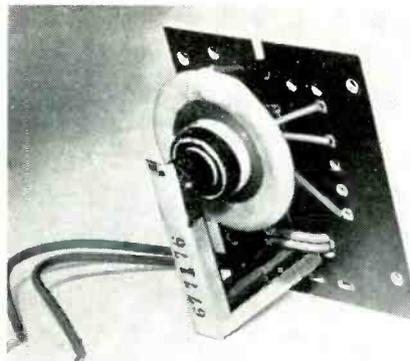
MODEL P-59S

the shield, and an easily inserted tubular spring which locks the center conductor to insure positive electrical contact. No special tools are required. Shell and body are made of brass, and the center pin is silver plated phosphor bronze. B-T Labs Corp., 526-536 N. Ave., Westfield, N.J. (ELECTRONIC TECHNICIAN No. 11-9)

# New Tubes & Components

## Rogers FLYBACK →

A new high voltage and horizontal output transformer, designed as an exact replacement for transformers in 109 different Emerson TV models, has been announced. Included with each flyback is a schematic showing connection of this exact replacement between the 1B3GT high voltage rectifier, 12AX4-GTA damper and 12CU6 output. Model EFR-124 replaces 7 Emerson parts numbers: 738091, 738096, 738099, 738100, 738106, 738107 and 738111. Rogers Electronic Corp., 43 Bleeker St., New York 12, N.Y. (ELECTRONIC TECHNICIAN No. 11-3)



## RCA 6CD6-GA →

The 6CD6-GA is a high-perveance beam power tube of the glass-octal type, and is designed especially for use as a horizontal-deflection amplifier tube in TV sets. The 6CD6-GA is smaller and more compact than the 6CD6-G, but features a modified mount design to permit operation at higher ratings. It has a maximum plate dissipation of 20 watts, and a maximum peak positive-pulse plate voltage of 7000 volts. The 6CD6-GA is unilaterally interchangeable with the 6CD6-G. RCA Tube Division, Harrison, N.J. (ELECTRONIC TECHNICIAN No. 11-2)



## Federal PHONOMOTOR →

A lightweight, compact and rugged 3-speed phonomotor, equipped with either a metal or a plastic 8" turntable and a dynamically balanced friction drive, for use in portable or small size phonographs is available. Can be had for operation on 95 or 117 volt 60 cycles. The phonomotor is shock mounted to minimize vibration. A 3-speed indicator plate is available as an optional feature. A unique idler wheel helps reduce wow and rumble. Federal Telephone & Radio Co., 35 Central Ave., E. Newark, N.J. (ELECTRONIC TECHNICIAN No. 11-1)



## Raytheon TV TUBES

4 new TV tubes. 3A2, 5B8, 6AU4GTA, & 8CG7. The 3A2 is a heater-cathode type double ended miniature for use as a 1/2 wave rectifier of high-voltage pulses produced in the scanning systems of color TV sets. The 5B8 is a heater-cathode type medium-mu triode and sharp cutoff pentode, miniature, for use as a VHF oscillator and mixer in series string TV sets. The 6AU4GTA is identical to the 6AU4GT except for higher maximum dc output current and peak plate current ratings. The 8CG7 is identical to the 6CG7 except for a heater rating of 450 ma. Raytheon Mfg. Co., 55 Chapel St., Newton, Mass. (ELECTRONIC TECHNICIAN No. 11-4)

## Sprague LITL-LYTIC

As the result of improved manufacturing techniques, the maximum rated operating temperatures of the subminiature electrolytic capacitors has increased to 85° C. Sprague Electric Co., 65 Marshall St., N. Adams, Mass. (ELECTRONIC TECHNICIAN No. 11-6)

## Clarostat PUSH-PULL-SWITCH

Turning a control on or off at any setting and without disturbing that setting is the purpose of the switch control. The concentric shaft push-pulls for the switching action, and rotates for the control setting, both functions being independent of one another. Clarostat Mfg. Co. Inc., Dover, N. H. (ELECTRONIC TECHNICIAN No. 11-5)

## IRC FUSE RESISTOR

Now offered, a new completely insulated type FR fuse resistor which functions as a resistor under normal conditions and as a fuse under abnormal situations. Can be easily plugged into a receptacle. International Resistance Co., 201 N. Broad St., Phila. 8, Penn. (ELECTRONIC TECHNICIAN No. 11-7)

## Sylvania TRANSISTORS

A new type of power transistor, the 2N242, for automobile radios, is hermetically sealed and resembles a small flat-crowned hat. Its use eliminates the vibrator, power transformer and associated components in automobile radio sets, substantially increasing the reliability of these receivers and cutting down the drain on car batteries. Also announced was a "do-it-yourself" radio kit containing 6 transistors, a crystal diode, and a 40-page manual including instructions for making the radio and 20 other practical applications of the tiny electronic devices. Sylvania Electric Prod. Inc., San Francisco, Calif. (ELECTRONIC TECHNICIAN No. 11-31)

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# Muzak

(Continued from page 37)

To summarize the two arrangements, when you are a junior franchised distributor, you own all the equipment and lease the background music service to subscribers. When you make a spot installation, the customer to whom you sell it owns the equipment, and you provide maintenance; tapes are supplied to the subscriber directly from Muzak in New York.

It should be noted that much of the money needed (a few thousand dollars) to get into the background music business can be obtained through bank loans, since most of the required capital is directly invested in equipment.

## Equipment

One of the most attractive features of Muzak playback equipment is that operation is automatic and self-synchronizing, within 2 seconds per 8 hrs., requiring no regular attention except for changing reels once every eight hours. See Fig. 2. Thus this one visit per day does not interfere with other business activities.

Reels of tape are 4800 ft. long, twin-tracked, and play 4 hrs. per side at 3¾ ips, with automatic reversal. Very good audio quality, which Muzak calls "controlled high fidelity," is attained at the low tape speed by a carefully regulated overmodulation of certain frequencies to give the hi-fi feel to music sent over high quality telephone lines.

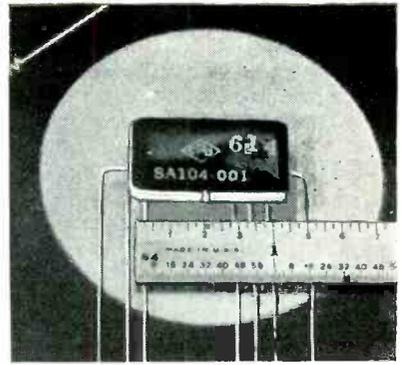
To check on anyone who might wish to copy Muzak recordings, all tapes have a special coded signal superimposed on them—a kind of electronic watermarking. This protects the firm's music rights and key to its scientific programming.

For techs in unfranchised areas who are seeking a profitable sideline, and have some capital to invest, there's no doubt about it: Muzak can be a money making opportunity.

**FOR MORE INFORMATION**  
Address your inquiries to: Mr. Edward Hochhauser, Jr., Vice President, Muzak Corp., 229 Fourth Ave., New York 3, N.Y.

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# New Products for Technicians

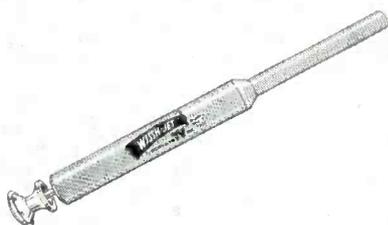
## Eico REDI-TESTER →

A multi-range ac/dc voltmeter, ammeter, ohmmeter, wattmeter, and a leakage checker. It locates defects in electrical appliances, motors, house wiring, furnace control, air conditioning, automotive equipment, TV, and radio tubes and parts. Its instruction book is a storehouse of valuable information, and contains an introduction to electricity, complete operating method, and procedures and diagrams for common repair jobs. Factory wired \$15.95. Kit form \$12.95. Eico, 84 Withers St., Brooklyn 11, N.Y. (ELECTRONIC TECHNICIAN No. 11-28)



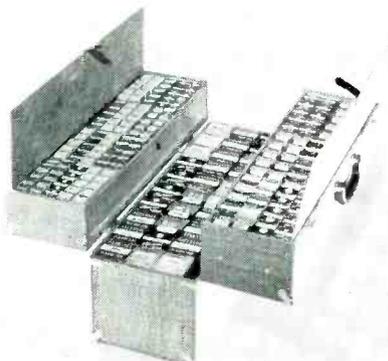
## Workmen WHISS-JET →

New pressure injector control cleaner, cleans and lubricates controls in the home and shop without removing the set from its cabinet. Sturdy mechanical construction and corrosion resistant. Easy to use, remove knobs from the control, screw end of the injector onto control mounting bushing, and depress plunger to inject desired amount of cleaner needed. Simple to fill. Whiss contact cleaning formula also available sells for \$2.90 a quart. The injector is \$3.75 dealer net. Workmen TV Inc., Teaneck, N.J. (ELECTRONIC TECHNICIAN No. 11-8)



## Mastra TNT TOTE BOXES →

Two new low priced boxes are known as the Blue Line. The Thrift Kit model XX is 16½" x 13" x 8", and provides over 1600 cubic inches of usable space. Constructed of sturdy ¼" plywood, it is covered outside with a specially treated soil and wear resistant textured blue fabric. The model 22 "Super" is a larger box 22¼" x 13" x 8". Other features are: nickel plated hardware, steel reinforcements, and lifetime molded handles. Model XX retails for \$9.95. Mastra Co., 2104 Superior Ave., Cleveland 14, Ohio. (ELECTRONIC TECHNICIAN No. 11-11)



## Acme VOLTAGE STABILIZER →

Corrects voltage fluctuation in less than 1/30th of a second. Output voltage stabilization is automatically obtained by a parallel combination of a fixed capacitance and a magnetic core inductance. Voltage stabilization is further improved with a compensating winding. Electrical isolation between input and output circuits is provided. Cannot be damaged by overloading. As the percent of overload increases above the rated value, the output voltage decreases. Acme Electric Corp., Cuba, N.Y. (ELECTRONIC TECHNICIAN No. 11-10)



## Centralab NEEDLE FILE

Made in Switzerland, these high grade carbon steel files are 5½" long. There are seven shapes: round, half-round, flat, square, oval, triangular, and knife edge. All have No. 0 cutting surface. Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis. (ELECTRONIC TECHNICIAN No. 11-15)

## Unger SOLDERING KIT

Designed for the do it yourself market, is a new all-purpose, heavy duty, precision soldering and electrical kit which contains a heavy duty soldering handle, 2 interchangeable tips, and all the electrical repair essentials such as electrical terminals, trouble light, circuit tester, electrician's tape, resin core solder, and a 20 page "How to do it" booklet. Unger Electric Tool Co., PO Box 312, Venice, Calif. (ELECTRONIC TECHNICIAN No. 11-14)

## Walsco SERVICING KIT

Contains all the needed aids to speed economical repair and replacement work on any printed circuits. Consists of a "Solder-ease" tool with probe for tightening contacts and a fork on the opposite end to handle wires while soldering, a can of silicone resin lacquer that protects the repaired area with a tough film, copper foil with thermoplastic backing, solder wire, and washers with a flux layer, tweezers, a fiber glass brush, and solder solvent. \$4.95 dealer net. Walsco Electronics Corp., 3225 Exposition Pl., Los Angeles 18, Calif. (ELECTRONIC TECHNICIAN No. 11-17)

## A-MP FLAG TYPE FASTONS

A new line of junior faston flag type terminals with insulation support has features which make them handy to apply in usual positions. The insulation support absorbs wire vibration and adds strength to the connection. They accommodate wire sizes 22 to 14. Aircraft-Marine Prod. Inc., Harrisburg, Pa. (ELECTRONIC TECHNICIAN No. 11-12)

## Astron SWING BIN BABY

The third member of the swing bin family, the new baby will contain 45 Blue-Point capacitors in 9 popular values. Designed as another aid to servicemen to keep the caps out of the middle of the workbench, and hangs safely on the wall. Astron Corp., E. Newark, N.J. (ELECTRONIC TECHNICIAN No. 11-13)

## Coffee Pot

(Continued from page 39)

slightly increasing the installation cost.

### Service Ideas

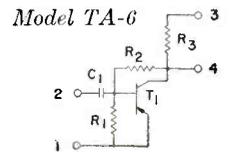
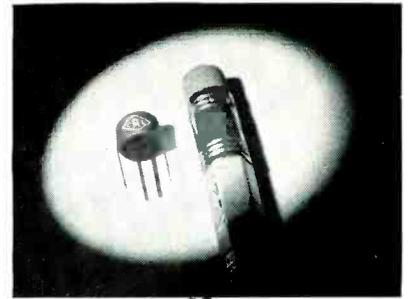
Visualize the amount of water and garbage thrown around during a rush hour period. Point it out to the owner. Sell him a relocation job for the amplifier. Equally important sales (to him) is a set of covers. Put a tight fitting cover on the bottom of the amplifier and seal the edges with black pressure tape. Install a cover with louvres—(no wire mesh, etc.) over the tube deck to minimize grease and fume entry.

Continuity of service is vital to the restaurant owner. Since there are very few tube types in the system, some techs sell him a set of replacement tubes that he can plug in himself. The thinking is: You may lose a few service jobs, but you can make that up easily in good will and other work. For example, guards against mechanical and water damage for cables and other components. plus word of mouth recommendation to his many customers. Sell a monthly inspection and degreasing operation. (Wipe off the grease with his paper napkins moistened with some gasoline or naphtha.)

Sell a power reduction job. Almost all these units have power to spare, so install a resistor in series with the power transformer primary; use a fusible resistor as employed on series string TV sets. Should be a 15-watt with a few ohms resistance, say 5 or so. Tube and component life will be prolonged, but constant use will provide you with plenty of business despite the fewer calls. The schematic, Fig. 3, shows the connection.

If the electrolytic capacitors go bad, replace with over-rated (as to voltage) units, preferably types designed for tropical duty. Endeavor to avoid cardboard type electrolytics in this work. Use hermetically sealed types, i.e., canned jobs. Replace any defective transformers with potted units that are sealed—remember the high humidity! Often the rectifier tube socket will develop an arc over due to grease and fume deposits. Spray it with high voltage plastic or lacquer at the first opportunity after having removed grime deposits with gasoline and allowed to dry. Give the same treatment to the out-

(Continued on page 59)



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-  This is a complete amplifier housing capacitance, resistance, transistor, and wiring. Gain, 24 db. Noise level, less than 1/2 millivolts. Supply voltage, 1.35 v.
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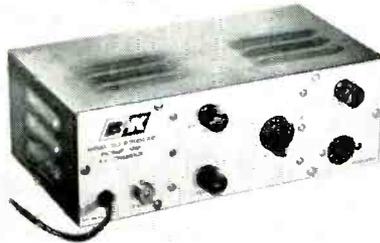
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# Latest Test Equipment

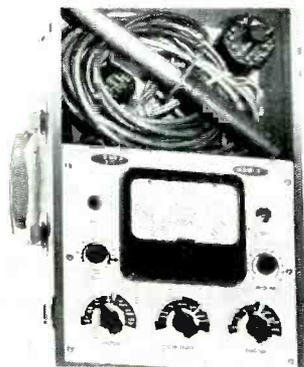
## B&K DYNA-SCAN →

A "do-it-yourself" Pickup and RF generator enables you to make your own picture and pattern video generator at low cost. You simply connect the Dyna-Scan to any properly modified 10-inch TV set so that the CRT of the set acts as your external flying spot scanner tube. This combination produces a composite video and sync signal that operates any TV set on any VHF channel. Provides closed-circuit TV and can be used as a video paging system. \$69.95 net. B&K Mfg. Co., 3731 N. Southport Ave., Chi. 13, Ill. (ELECTRONIC TECHNICIAN No. 11-26)



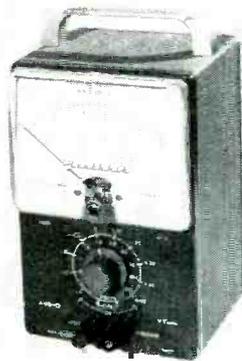
## Philco SERVICE KING →

Simplifies servicing both b&w and color receivers and cathode ray tubes. It is connected between the TV set and CRT to measure video drive, K-G1 voltage, K-G2 voltage and cathode current. When used with 3 gun color sets this information is available separately on each gun. In addition it is a complete dynamic (with normal anode voltage applied) CRT tester that checks emission, grid control, gas, leakage, and cut-off voltage of each gun. Philco Corp., Philadelphia, Penna. (ELECTRONIC TECHNICIAN No. 11-50)



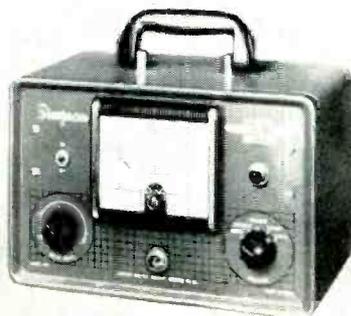
## Heath AUDIO VTVM →

New AC VTVM emphasizes stability, broad frequency response, and sensitivity. Designed especially for audio, and low-level AC measurements. Employs a cascode amplifier circuit with cathode-follower isolation. Response of the AV-3 is essentially flat from 10 cps to 200 kc, and is usable for tests even beyond these frequency limits. Extremely wide AC (rms) voltage ranges are 0-.01, .03, .1, .3, 1, 3, 10, 30, 100, and 300 v. Decibel ranges cover -52 db to +52 db. Heath Co., Benton Harbor, Mich. (ELECTRONIC TECHNICIAN No. 11-51)



## Simpson FLYBACKER →

A new TV tester combines both an in-circuit horizontal system analyzer and a capacitor checker in one unit, and will check an entire horizontal deflection system, in-circuit, test flyback transformers for opens and shorts, check deflection yokes for opens and shorts, and measure capacitance from 10 $\mu$ f to 1 $\mu$ f by direct reading. It registers with better than 10% accuracy. Operates on 110-125 v 60 cycle AC. A special test cable is included in the \$69.95 price. Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill. (ELECTRONIC TECHNICIAN No. 11-25)



## New Books

**INTRODUCTION TO PRINTED CIRCUITS.** By Robert L. Swiggett. Published by John F. Rider Publisher, Inc., 116 W. 14 St., New York 11, N.Y. 112 pages. Paper cover. \$2.70.

Printed circuits have become one of the most important developments incorporated in electronic equipment in recent years. Their significance in the trend toward automation and miniaturization is apparent. This excellent little book on the subject provides all the basic knowledge an electronic technician needs for a solid fundamental understanding. Ceramic based, etched and plated types are covered, as well as components for printed circuits and assembly systems. Servicing, which presents several unique problems, is covered, though more than one chapter would be welcome. Nicely illustrated and clearly explained, this book is well recommended.

**HOW TO MAKE GOOD TAPE RECORDINGS.** By C. J. LeBel. Published by Audio Devices, Inc., 444 Madison Ave., New York 22, N.Y. 159 pages. Hard cover, \$2.50; paper cover, \$1.50.

Subtitled "The Complete Handbook of Tape Recording," this information packed volume keeps technical language to a minimum. Subjects covered are recorder operation, recording techniques, acoustically treating the studio, tape properties, tape editing, binaural recording and glossary of terms. Emphasis is almost exclusively on the practical side.

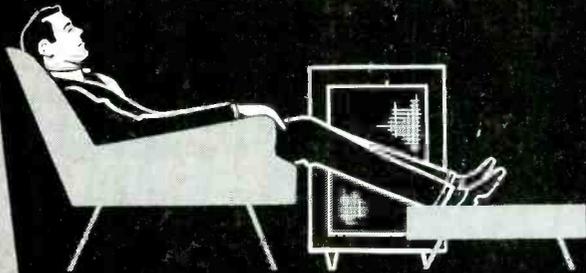
**HANDBOOK OF BASIC CIRCUITS.** By Matthew Mandl. Published by the Macmillan Co., 60 Fifth Ave., New York 11, N.Y. 365 pages. Hard cover. \$7.50.

Simply written and easy to understand this basic guide to circuitry combines comprehensive coverage of the major circuits with detailed information. Characteristics, functions, and schematics of 136 circuits, including virtually every standard in the TV, FM, and AM field. An extensive index enables the reader to refer to any point of interest in the quickest possible time.

**BASIC ELECTRONICS (91 pages).** **BASIC RADIO AND RADIO RECEIVER SERVICING (105 pages).** By Paul Zbar and Sid Schildkraut. Published by McGraw-Hill Book Co., Inc., 330 W. 42 St., New York 36, N.Y. Paper cover. \$1.75 each.

These two lab manuals for training electronic technicians are derived from the educational program developed by the Radio-Electronic-Television Manufacturers Association. A section is devoted to each of the major circuits and components, presenting explanatory information, procedure for making actual measurements, and test questions.

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# BEST IN



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The Tung-Sol Magic Mirror Aluminized Picture Tube captures every tone, every detail brilliantly to bring out the best in every set. It's your best insurance for loyal, satisfied customers. Tell your supplier you'd rather have Tung-Sol tubes.

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**PICTURE TUBES**

TUNG-SOL ELECTRIC INC., Newark 4, N. J. Sales Offices: Atlanta, Columbus, Culver City, Dallas, Denver, Detroit, Melrose Park (Ill.), Newark, Seattle.

## News of the Industry

**RAYTHEON'S** 1956-57 bonded dealer advertising, promotion campaign, and new business building program was announced.

**PHILCO** named **RAYMOND B. GEORGE** as V.P. in charge of sales promotion, and **MAX ENELOW** as advertising manager.

**SNYDER** "Sight Savers," magic lens silicone treated tissues to clean eye glasses, is the newest innovation in promotional items, distributed by **SNYDER MFG. CO.** Ben Snyder urged set owners to check their outdoor antennas every 6 months, and to replace every two years.

**STANDARD COIL PRODUCTS** appointed **J. R. JOHNSON** as V.P. in charge of sales and merchandising.

**INTERNATIONAL RESISTANCE CO.** announces the appointment of **ANDREW J. CALLANAN** to sales manager of its deposited carbon and boron resistor plant in Burlington, Iowa, **WALTER CANFIELD** to sales manager, and **KENNETH C. SCHAEFER** to office salesman, at its power resistor & rectifier plant in Boone, North Carolina, **JOHN M. SEARING** to sales manager, and **TERRY A. HALPERN** to office salesman at its Philadelphia plant.

**THOMPSON PRODUCTS, INC.**, will start, this month, the construction of a new \$10,000,000 test facility for the accessories division, on a 1000-acre site near Roanoke, Va.

**SYLVANIA ELECTRIC PRODUCTS INC.**, broke ground for its newest electronic tube manufacturing plant in Altoona, Penn.

**ELECTRO-VOICE** appoints **JAY CARVER** to the position of advertising and sales promotion manager.

**HEATH CO.**, appoints **NEAL W. TURNER** as merchandising manager.

**WESTINGHOUSE'S** tube division announces the appointment of **W. A. HAYES**, **H. G. CHENEY**, and **G. SHERMAN** as district managers of the eastern, midwestern, and pacific sales districts, respectively.

**DU MONT** to add government field service department; **J. A. HATCHWELL** named director.

**CBS-HYTRON** announces the opening of its new Miami warehouse, to service distributors in Southern Florida. Part of their fall premium program is a soldering gun for the man and a 9 pc carving and steak knife set for the lady of the house.

**DAVID BOGEN CO., INC.**, has officially opened its new manufacturing plant in Paramus, New Jersey. **LESTER BOGEN** president of both Bogen and **PRESTO RECORDING CORP.**, announced the appointment of **LAWRENCE LE LASHMAN** as V.P. in charge of sales, and **DAVID PEAR** manager of advertising and sales promotion, for both companies. **LLOYD LORING** to assistant sales manager, and **ALFRED ZRIKE** to manager, customer services, for Presto.

**MAGNECORD, INC.**, has named **ROCKE INTERNATIONAL CORP.**, of NYC, to handle export sales.

**WINEGARD** will promote, this fall, their gold anodized TV antennas with the new "Umbrella-Ease" installation features. The largest advertising campaign in his company's history, **JOHN WINEGARD**, president, hopes to gain more consumer preference.

**SENTINEL RADIO CO.**, names **HENRY N. MULLER JR.**, assistant service manager in Ft. Wayne.

**AEROVOX CORP.**, appoints G. EMERSON PRAY as general manager of the special products division.

**SPRAGUE ELECTRIC** purchases controlling interest in Italian manufacturer. No imports to the United States are contemplated.

**JERROLD ELECTRONICS CORP.**, appointed L. F. WAELTERMAN regional manager of the midwest region. The company has engineered a portable closed-circuit system, and is putting it on the road for demonstration.

**CORNELL-DUBILIER** names BILL ASHBY as director of service engineering.

**FAIRCHILD RECORDING EQUIPMENT CO.**, announced that ROBERT G. BACH has rejoined them as sales manager.

**AMPHENOL** names RICHARD P. THORNTON as marketing manager for the aircraft and guided missile industries.

**JOHN F. RIDER PUBLISHER, INC.**, will be located at a new address, 116 W. 14th Street, New York 11, N.Y. Need for larger quarters, and shipping facilities made this move necessary. They have instituted a new service called S-D-O (single diagram only) aimed at satisfying the needs of the servicing industry.

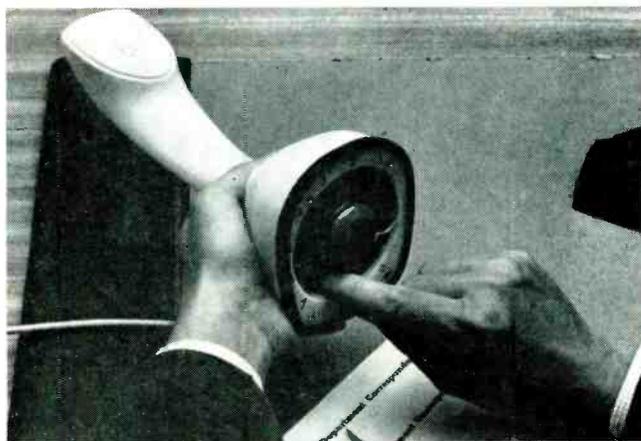
**ALLEN B. DU MONT**, and **CHROMATIC TELEVISION LABS.**, have reached an agreement whereby Du Mont will undertake immediately a program aimed to get the Chromatic single gun color tube and the color TV set using the Chromatron into mass production.

**SAUNDERS ELECTRONICS CORRESPONDENCE SCHOOL** has prepared and published a seven lesson color TV home study course now available, and is designed especially for electronics lab and working TV technicians. Also in the works is a practical transistor home study course which may be marketed soon.

**AMPHENOL'S** new five color counter display is now available to dealers and servicemen. The display holds six antenna couplers.

**NATIONAL SCHOOLS** of California graduates, who can qualify, will be awarded the RETMA TV servicing certificate. The highly prized certificate is regarded as an industry-wide symbol of excellence.

## RADICAL PHONE DESIGN



New concept in telephone design is a one-piece unit with the dial located in the underside of the base. Line connection is made when the unit is lifted. The base is  $4\frac{1}{2} \times 3\frac{7}{8}$  in., less than half the size of a standard phone, and the receiver is at the top, transmitter located in the base front. Called the Ericofon, this Swedish-designed product is made by North Electric.

# BEST IN



# SOUND

Made to the highest requirements of leading set manufacturers, Tung-Sol Tubes are perfect replacements for all sets. Bank on Tung-Sol's brand of quality—tops in the industry. It's the sure way to avoid callbacks that eat into profits. Tell your supplier you'd rather have Tung-Sol tubes.

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**RECEIVING TUBES**

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# Scope Traces Horizontal Sync Failure

H. P. MANLY

• The answer is "Yes" to the question, "Could the scope be used as a signal tracer for locating horizontal sync failure after warmup?" Preliminary reasoning would be as follows.

First, the horizontal sweep oscillator is changing its free running frequency more than can be corrected by the automatic frequency control, or else the afc system is failing to

correct a normal variation. Therefore, we should suspect the horizontal oscillator or the afc section.

Second, if vertical sync becomes critical when horizontal sync fails, trouble doubtless is ahead of the afc section. Probably the fault is in the sync section or the video amplifier, from which sync pulses go to both the vertical and horizontal systems. If vertical sync remains unaffected the trouble is beyond the output of the sync section. It is in the hori-

zontal afc or oscillator section.

Third, it would be routine to try replacing the horizontal oscillator and afc tube or tubes. The trouble might be due to a cathode-heater leak in the oscillator occurring after warmup. The afc tube might develop weakness. If new tubes are of no help we turn to the oscilloscope.

## Types of Sweep Circuits

In a group of 100 chassis models of 50 odd makes selected from receivers marketed in 1955 and 1956 it was found that 58 have a phase detector for afc and a multivibrator horizontal oscillator. Another 36 employ the variable pulse width system and 6 have a reactance tube for automatic frequency control.

Since no one set can have more than one type of horizontal afc and oscillator we shall select, for an illustrative case, a phase detector and multivibrator. There are four principal classes of phase detectors.

1. Two diodes with the plate of one tied to the cathode of the other. The remaining cathode and plate are fed from a phase splitter with sync pulses of opposite polarity.

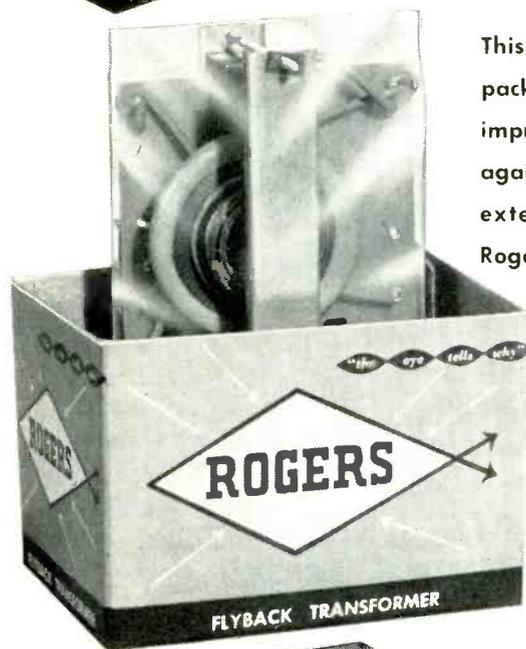
2. Two diodes with their cathodes tied together or with a single cathode. Sync pulses are fed in single polarity to the cathodes in most cases, but sometimes to one plate.

3. A triode to whose cathode and

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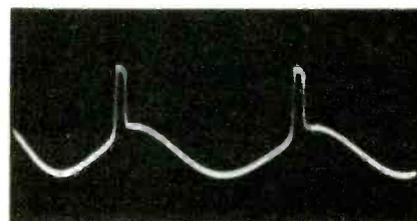


This exclusive moisture-free, dirt-free packaging . . . in addition to built-in impregnation and sealing . . . protects against failure, reduces callbacks and extends shelf-life indefinitely. It's Rogers for the complete line of high quality TV replacements!

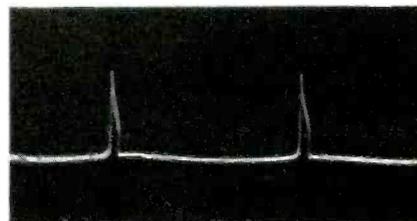
Often called the "Bible for TV Replacements," the giant Rogers Exact Replacement Manual cross references over 11,000 sets and 7,000 parts! 71 pages, with supplemental inserts issued periodically to keep it up to date. It's free to TV Service Technicians from Rogers jobbers, or 75¢ from the manufacturer.



Write for name of your Rogers jobber

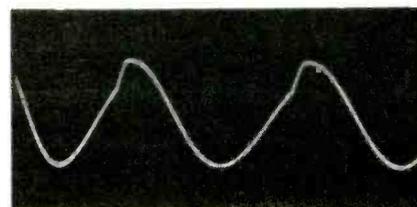


Multivibrator plate input & grid output



Joined cathodes of the multivibrator

High side of multivibrator freq. control



**ROGERS**  **ROGERS ELECTRONIC CORP.** 43-49 Bleeker Street  
New York 12, N. Y.

grid are fed sync pulses of opposite polarity from a phase splitter.

4. A triode to whose cathode are fed sync pulses of one polarity.

Again it is true that no one receiver can embody all possible designs, this time with respect to phase detectors. To show how the oscilloscope may be used we shall select the fourth class of phase detector, consisting of a triode fed with sync pulses of one polarity from a pentagrid or triode sync tube. This class takes in 16 of the 100 classes with which we began this analysis. The other three classes of phase detectors would be handled with only minor differences in procedure.

### Oscilloscope Observations

While working with the oscilloscope especial attention should be given to capacitors mentioned in following tests. This is because horizontal sync fails only after a warmup period, and capacitors sometimes change their values materially with rise of temperature. Resistors seldom change unless overheated, after which the resistance usually remains high rather than varying. Now make the following tests.

1. Set the scope internal sweep to display two or three cycles at horizontal line frequency. Connect the vertical input to ground and the high side first to the plate of the input section of the multivibrator, then to the grid of the output section. Waveforms at both points should be approximate sine waves with narrow positive peaks on every cycle and with only slightly less amplitude at the grid than at the plate.

If the waveform is satisfactory or nearly so at the plate, but faulty at the grid, replace the capacitor between plate and grid. If this does not good, check or replace the resistor in

(Continued on page 54)

## Power Transformer

(Continued from page 35)

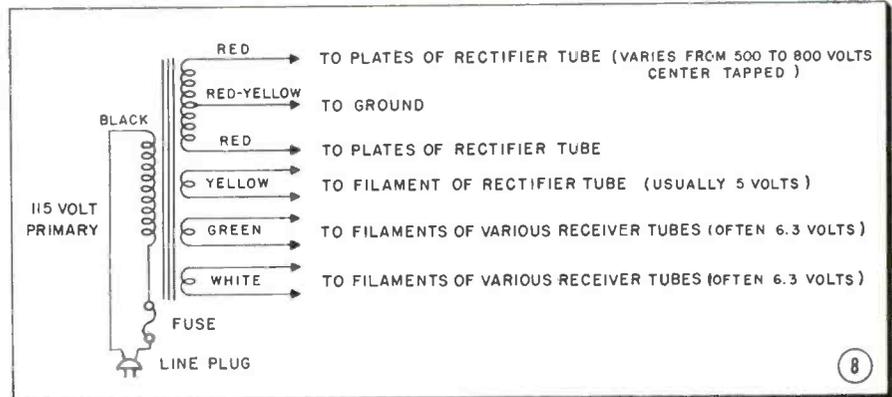
be checked with it. While there is little or no reading on this good transformer, a power drop would have indicated a defect.

Fig. 7: A check of a filament winding correctly shows slightly over 6 volts for a 6.3-volt winding.

Fig. 8: As an additional aid in making checks and for future reference, a diagram can now be drawn up from the data already obtained. In addition to the wire colors, as

shown, the diagram may also include such data as the resistance

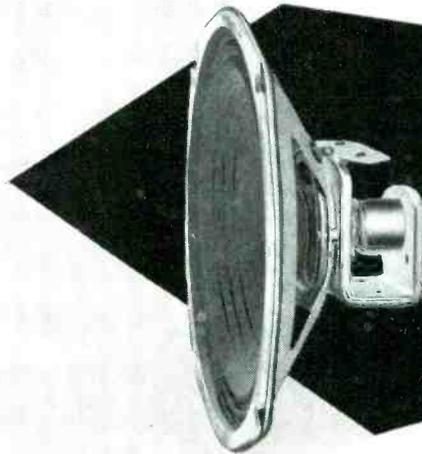
measurements of the various windings and the normal voltages.



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**COST LESS**

They cost less because they fit right . . . the first time . . . and they work right . . . the first time.

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## Horizontal Sync

(Continued from page 53)

series with the horizontal hold control and possibly the control itself.

2. Observe the waveform at the joined cathodes of the multivibrator. There should be sharp positive pulses. If pulses are weak or irregular check the condition of the cathode resistor. Remember, the multivibrator tube is supposed to have been replaced.

3. Observe the waveform at the multivibrator frequency control, which is a paralleled coil and capacitor in the plate lead to the first or input section. This may be called a stabilizer, a locking control, a ringing coil, or something else. On the side of the coil toward the multivibrator plate should appear an approximate sine wave. Try adjusting the slug in the coil to stabilize the horizontal sync. If adjustment is ineffective check the capacitor which is across the coil. Check the resistor between tube and coil for value, often about 5.6K ohms.

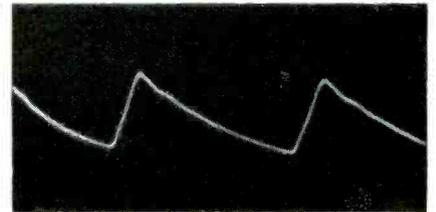


Plate of triode phase detector

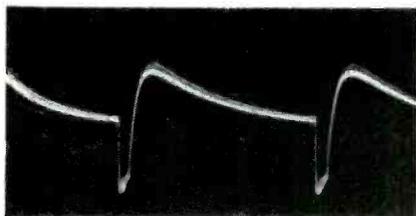
4. At the plate of the triode phase detector should appear a sawtooth waveform which usually originates as high-voltage pulses from the horizontal output transformer secondary or from a small extra winding then goes through resistors and capacitors which change the waveform to a sawtooth. In some sets the feedback is from the output of the multivibrator.

No matter what the origin, a weak, fluttery or otherwise faulty sawtooth calls for checking of series capacitors and resistors, also of capacitors and resistors to ground along the feedback line.

5. Now go to the cathode of the phase detector triode. Here should be negative pulses, often riding on a rather weak sawtooth. If these pulses appear faulty shift the scope to the output of the sync tube which feeds the phase detector. The output may be at plate or cathode. If pulses are good at the sync tube but faulty at the phase detector check any ca-

pacitors in series between these tubes, also check resistors to ground along this line.

As mentioned before, faulty output from a sync tube which feeds both sweep systems usually will cause trouble with both vertical and horizontal sync. Because our difficulty is with horizontal sync there



Cathode of phase detector triode

should be no need to go back farther than the sync pulses going to the horizontal phase detector.

The procedure may sound time consuming as you read it. This is partly because so many remedies are mentioned along with the tests. Even though you have to hunt for the test points, each check with the scope should take no more than three to four minutes. Where waveforms are satisfactory you will apply no remedies, but simply pass to the next test point. •

**STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF TECHNICAL (title change pending to ELECTRONIC TECHNICIAN) published monthly at Bristol, Conn., for October 1, 1956.**

1. The names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, M. Clements, 114 Ludlow Ave., Spring Lake, N. J. Editor, Albert J. Forman, Woodbrook Dr., Springdale, Stamford, Conn. Consulting Editor, Orestes H. Caldwell, Catrock Road and Bible St., Cos Cob, Conn. Business Manager, Howard A. Reel, 174 Waverly Rd., Scarsdale, N. Y.

2. The owner is (if owned by a corporation its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given.) M. Clements, 114 Ludlow Ave., Spring Lake, N. J.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

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(Signed) M. CLEMENTS

Sworn to and subscribed before me this 1st day of October, 1956.

ALICE H. POND, Notary Public  
State of New York, No. 03-8406175  
Qualified in Bronx County  
Commission expires March 30, 1958

**Complete Circuit Digest  
Index begins on p. 60**

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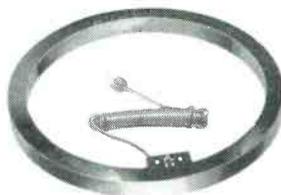
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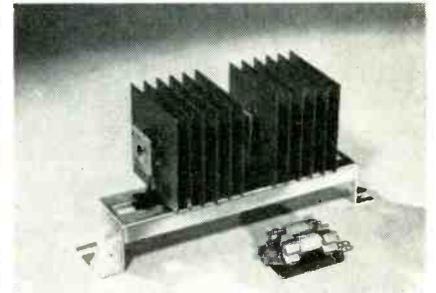
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# SOLDER

## Focus on Silicon and Selenium Rectifiers

• The newest and most promising addition to the rectification field, silicon offers many worthwhile properties. It opens a dimension in temperature operating range, peak inverse voltage ratings, forward to reverse resistance ratios, power handling capabilities and miniaturization compared to other solid state rectifiers. Some TV set makers have ordered quantities and are contemplating the mass use of these rectifying devices.

Silicon junctions mounted on a stack of fins size 2"x2"x1" can deliver about 1250 ma of dc as compared to about 500 ma of dc for the conventional seleniums. A 500 ma silicon



Comparative size of selenium and silicon rectifiers. Both types are rated 500 ma.

rectifier, now available, resembles an ordinary cartridge fuse. A polarized holder simplifies installation, and makes replacement a snap. Another advantage is the lower voltage drop developed across this new rectifier. An average of ten tests by Sarkes-Tarzian show that in a given circuit the silicon model 40N1 delivered 139.4 volts and a selenium model 300 developed 128.3 volts. This gain of 11.1 volts can be a boon to the industry, as well as to the serviceman in the field. The added B+ may mean wider pictures, better overall set operation, and reduced susceptibility to low line voltage problems. Fewer breakdowns are reportedly encountered due to heat. The ambient temperature ranges from -55°C to 100°C. Some silicones are already rated by International Rectifier Co., up to 150°C, and more developments in this direction are predicted. Pricewise both silicon and selenium will be about the same, reports Sarkes-Tarzian.

However, selenium is here to stay. Many new techniques are being developed to improve and enhance this proven product which is already per-



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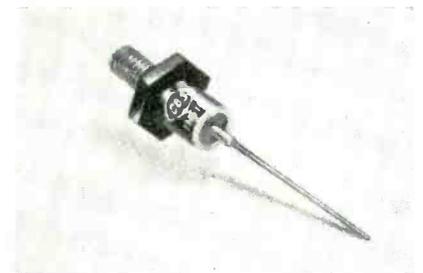
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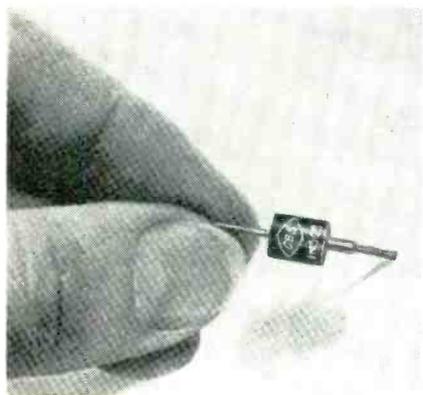
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**BATTERY GUIDE:** Cross-reference battery index lists 28 brand names, 1063 numbers, and interchangeability data with 133 standardized NEDA numbers. Write for quantity prices. Nat'l Electronic Distributors Assn., 4704 W. Irving Park Rd., Chicago 41, Ill.

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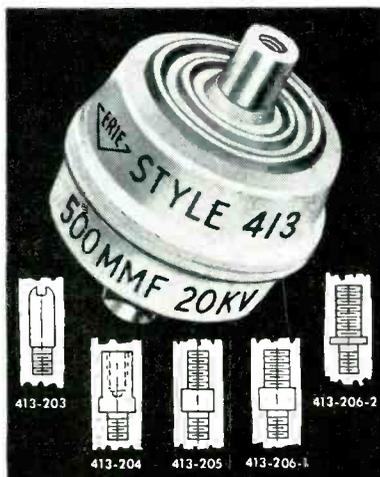
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Table 2—Nomenclature Guide

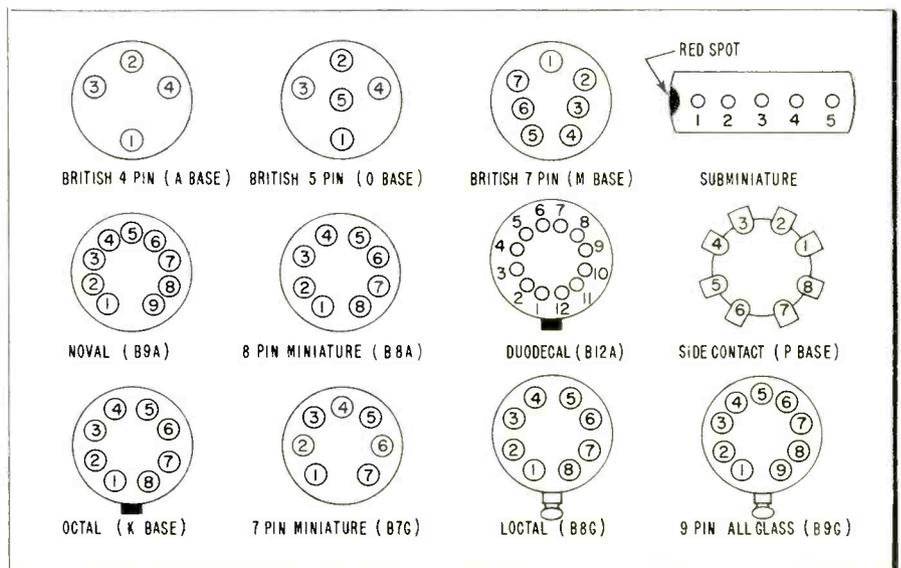
1st Letter	2nd, 3rd & 4th Letters	1st Figure	2nd & 3rd Figures
Heater or Filament Voltage or Current	Tube Type*	Tube Base	Design or Development Serial Number
A 4.0 V	A Single Diode	2 B8G	Design or Development Serial Number
C 200 ma	B Double Diode	3 Octal	
D .5 V to 1.5 V	C Triode	4 B8A	
E 6.3 V	F Voltage amplifying Pentode	5 B9G and special bases	
G 5.0 V	H Hexode	6 Sub-miniature	
H 150 ma	K Heptode or Octode	7 Sub-miniature	
K 2.0 V	L Output Pentode	8 B9A	
P 300 ma	M Tuning indicator	9 B7G	
U 100 ma	N Thyatron		
	Q Nonode		
	Y Half-wave rectifier		
	Z Full-wave rectifier		

\*Note—2 or 3 letters may be combined, e.g. BC—Double diode triode.

The European "valves" are usually quality tubes, and in many cases design features are incorporated to improve performance. Mullard Products of Great Britain, have a line of high fidelity tubes, designed specifically for this purpose. The ECC81, ECC82, and ECC83, are exact replacements for the 12AT7, 12AU7 and 12AX7, and have special mica supports and internal structure which make these tubes superior to regular types, especially in Hi-Fi circuits that require the lowest levels of hum, noise and microphonics.

Telefunken reports higher transconductance and greater stability for some types. British Industries KT66 is said to have higher power capabilities than the 6L6. Amperex's affiliate Philips of the Netherlands also has tubes specifically designed for use in high quality audio equipment. And so on down the line. If tubes are substituted and difficulty is encountered such as unstable oscillators, inherent tube noise, microphonics, distortion, and other subtle discrepancies, then the most logical procedure would be to use an original replacement.

Tube Bases



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(Continued from page 58)

While the job of upgrading or improving a piece of equipment normally belongs in the engineering laboratory, the technician in the field can often accomplish this task by a judicious substitution of both American and European types. Many times we can take advantage of those service types normally found in the premium and industrial categories. Such tubes as reliable or improved types, matched pairs and matched sections in multipurpose tubes are well worth the extra expense, time and effort. •

## Coffee Pot

(Continued from page 47)

put tube(s) sockets. Leave the tubes in place while spraying to form a mask and prevent the spray from causing a defective contact in the socket.

Service may be facilitated by series connecting the voice coils of the several speaker "microphones." A small screw type connector strip is handy for keeping the "pairs" in order. A defective station can be shorted out, temporarily allowing the rest of the system to operate normally. A jumper is useful for the short test.

Be wary of an all inclusive service contract. Rather take on a periodical inspection at a fixed fee. And allow enough for the cleaning operations! Discuss with the owner the advisability of "writing off" the microphones; if a speaker-mike unit is used, the cones may be badly warped after one year. Despite this disadvantage, the speaker-mike sometimes will withstand the abuse better than other types of microphones in this service. •

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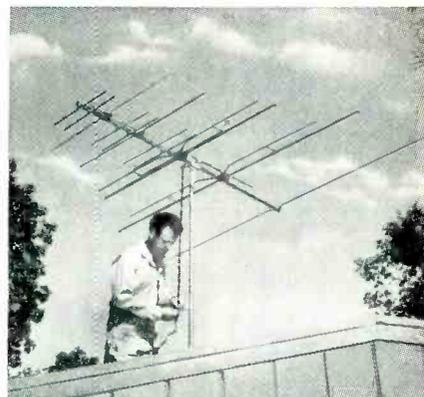
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**All Units Are TV Receivers Unless Otherwise Noted**

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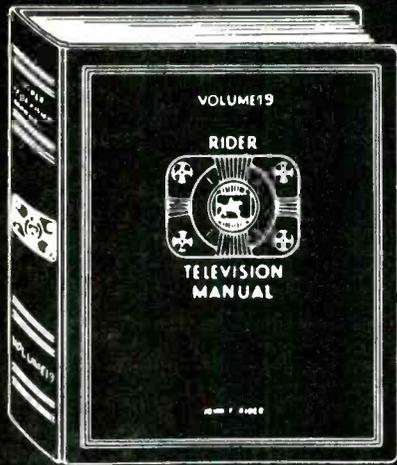
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	Apr. 1953
	May 1953
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Note: Months prior to September, 1953, refer to issues of Television Retailing; prior to Nov. 1956, refer to Technician.

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## Square Wave Patterns

(Continued from page 32)

may be combined with a loss (attenuation) or a boost (gain) at the low frequencies. A bowing down of the sloping 'flat top' will indicate a loss regardless of the direction of the slope indicated by Fig. 10. A bowing or concavity upwards indicates a gain at low frequencies. These cases are illustrated by Fig. 11.

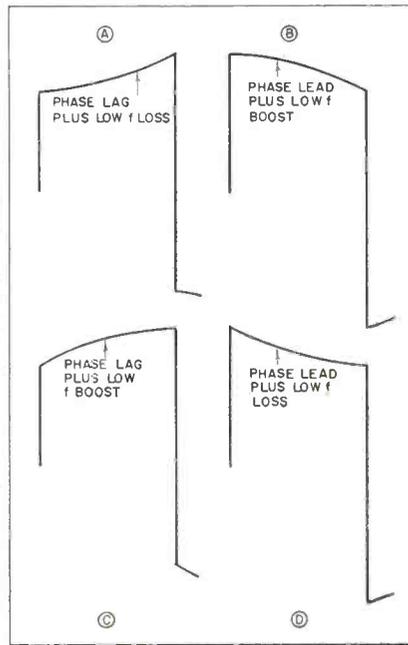


Fig. 11—Some of the possible combinations of distortion of frequency and shift of phase.

A rounded corner in any waveform will indicate a loss of high frequency regardless of the slope.

In all the foregoing discussion, use of the terms low and high frequency are strictly relative. Low means frequencies at or below the applied fundamental frequency of the square wave. High means higher than this applied square-wave fundamental frequency.

In practical work, a low-frequency square wave is usually sent through a video or audio amplifier. Thus at 400 cps, the low frequencies would be 400 and less while highs would be to about 3-4000 cycles. With a test frequency of 2000 cycles, low frequencies are below this number of cycles and at it, while high frequencies are above it to about the 10th harmonic, say 20,000 cycles or 20 kc. •

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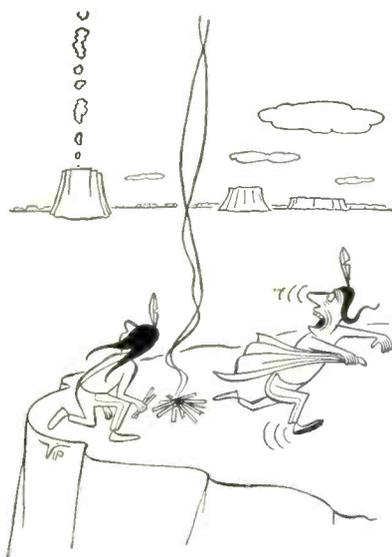
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Chassis 17Z21, 17Z22: Models Z2222C, E, R, Y; Z2247E, H, R; Z2258E, H, R; Z2282E, R; Z3000E, R; Z3004E, R; Z3006E, R; Z3008E, R 303

BASIC ALIGNMENT DATA

8

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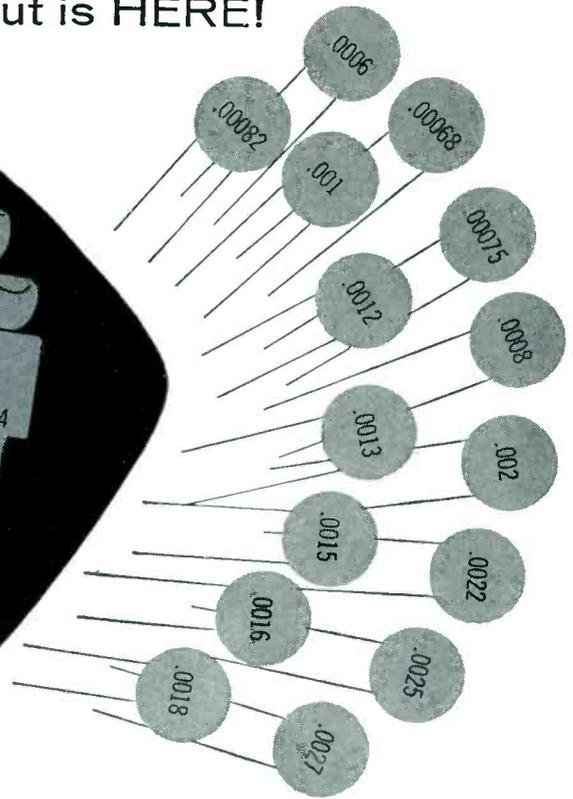
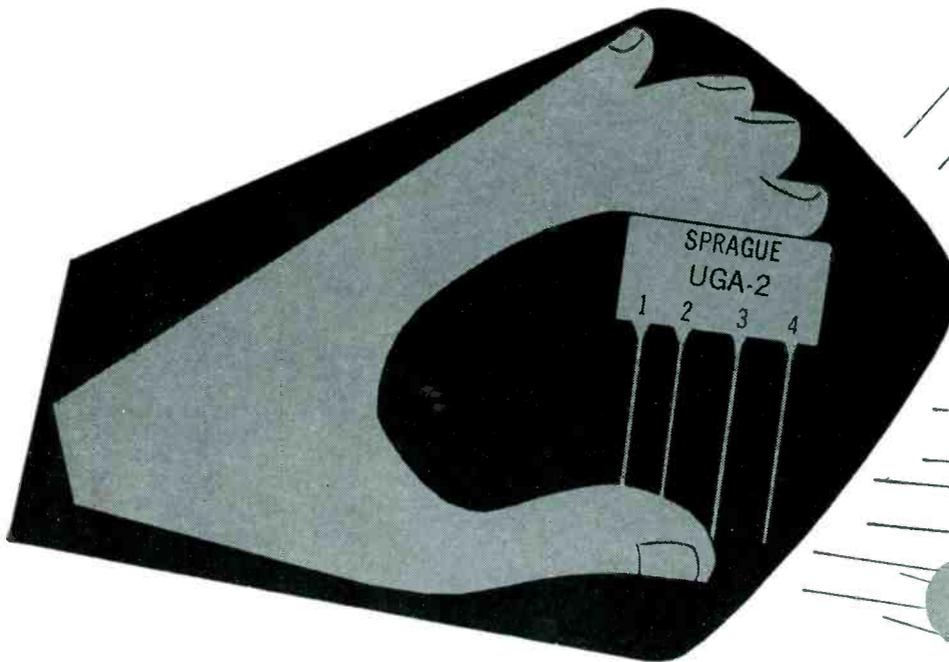
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For .0004  $\mu\text{F}$

Cut leads 2 and 3 from a UGA-1 "Universal". Use leads 1 and 4 as terminals.

For .005  $\mu\text{F}$

Cut leads 2 and 4 from a UGA-1 "Universal". Use leads 1 and 3 as terminals.

For .001  $\mu\text{F}$

Cut lead 2 from a UGA-2 "Universal". Solder lead 3 to lead 4. Use leads 1 and 4 as terminals.

For .002  $\mu\text{F}$

Cut lead 4 from a UGA-2 "Universal". Solder lead 2 to lead 1. Use leads 1 and 3 as terminals.

For .0033  $\mu\text{F}$

Cut lead 4 from a UHK-1 "Universal". Solder lead 3 to lead 1. Use leads 1 and 2 as terminals.

For .01  $\mu\text{F}$

Cut lead 1 from a UHK-2 "Universal". Solder lead 4 to lead 2. Use leads 2 and 3 as terminals.

For .015  $\mu\text{F}$

Solder lead 3 to lead 1 on a UHK-2 "Universal". Solder lead 4 to lead 2. Use leads 1 and 2 as terminals.



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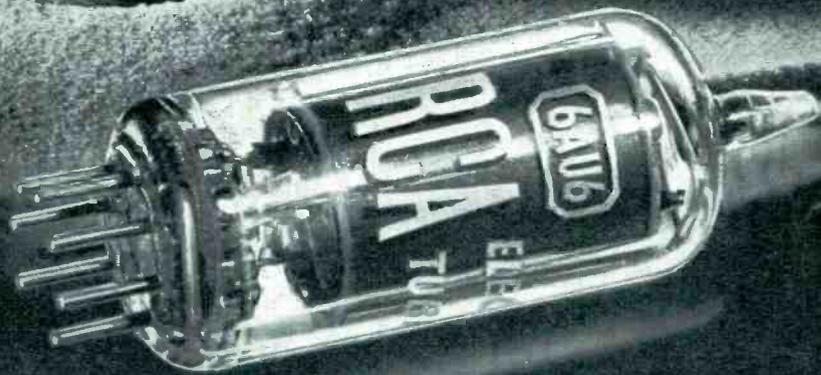
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