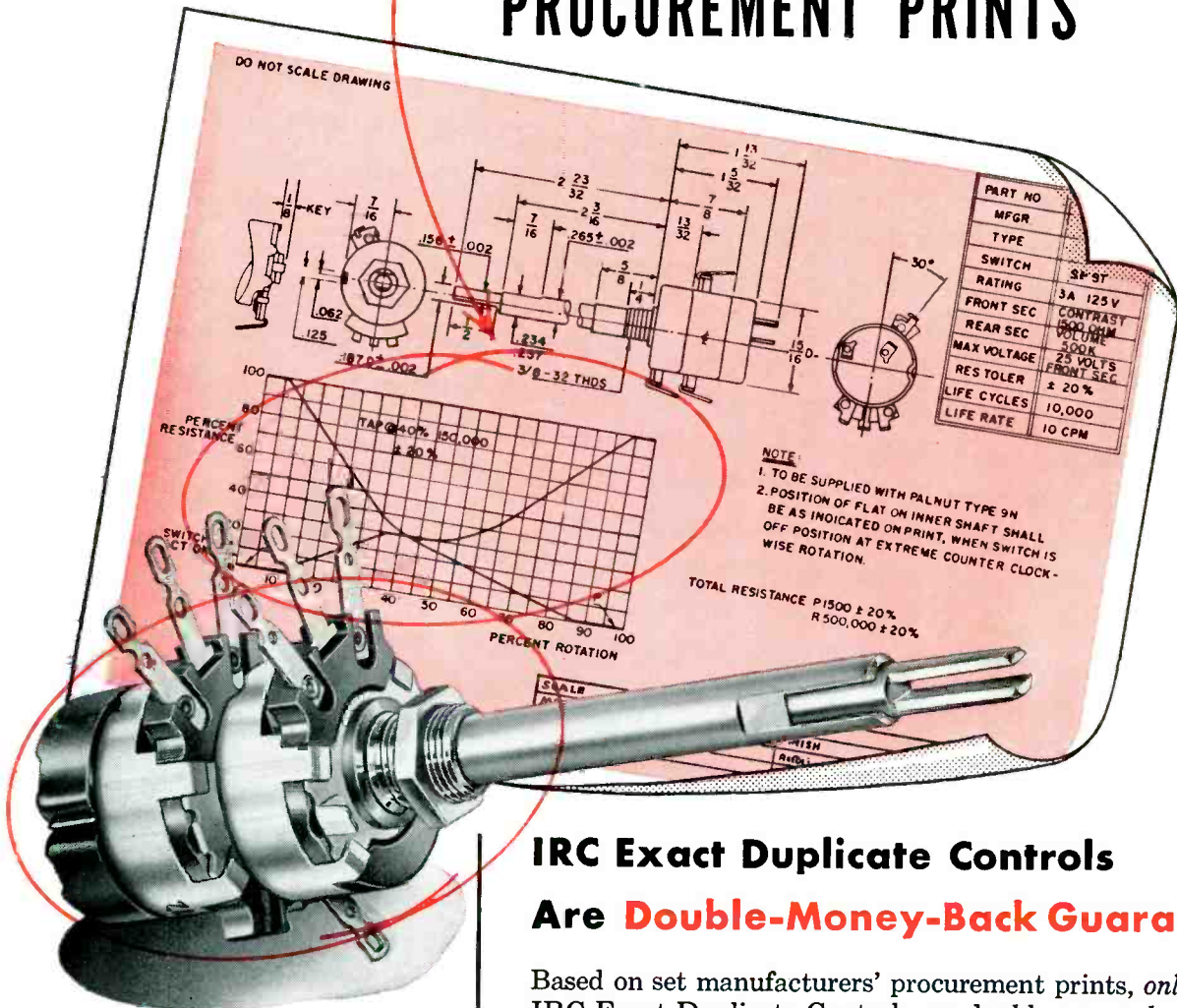




# ASSURED ELECTRICAL ACCURACY BASED ON MANUFACTURERS' PROCUREMENT PRINTS



**ONLY IRC GUARANTEES  
ACCURATE ELECTRICAL OPERATION  
AND SATISFACTORY MECHANICAL FIT  
OR DOUBLE-YOUR-MONEY-BACK**

Electrical specifications of this typical manufacturer's procurement print are exactly duplicated by IRC's QJ-412 control (shown). CONCENTRIKIT assembly includes P1-206 and R1-223 shafts with B17-109 and B13-133X Base Elements and 76-1 Switch.

## IRC Exact Duplicate Controls Are **Double-Money-Back** Guaranteed

Based on set manufacturers' procurement prints, *only* IRC Exact Duplicate Controls are double-money-back guaranteed for accurate electrical operation. This firm guarantee applies to both IRC factory-assembled Exact Duplicates *and* universal CONCENTRIKIT equivalents.

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Wherever the Circuit Says 

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1452 KENHORST BLVD.  
KENHORST, READING, PA.  
Phone 4-3508

AUGUST, 1956

## FRONT COVER

Test equipment—sometimes called the technician's right-hand—is the focus of attention. It is symbolically represented by a scope waveform, meter face and probes against the background of the chart taken from this month's feature, the 4-page directory "Who's Who in Test Equipment." This directory, starting on page 28, lists each manufacturer, address and the number of models of each instrument type available.

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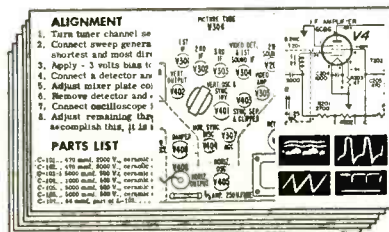
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Chassis RS-158  
ZENITH: Transistor Radio "Royal 500,"  
Chassis 7XT40



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**Together we can give 'em  
the knockout blow!**

# PHILCO

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Last year Philco sponsored the industry's first Tube Racket-Smashing Campaign. The results . . . wonderful cooperation from service dealers and praise from thousands of TV and radio owners who had been "taken over" on replacements.

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ing Campaign. During the month of August, Philco Distributors will credit you with 5c for old, worn out tubes you bring in, toward the purchase of new Philco receiving tubes. *Your old tubes will be smashed right before your eyes.* Join the Tube Racket-Smashing Campaign today . . . for the good of the industry . . . for extra profits for *you*. See your Philco Distributor.



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ACCESSORY DIVISION  
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The completely AUTO-  
MATIC rotor, powerful  
and dependable, with  
a modern design cabi-  
net. Uses 4 wire cable.



## AR-2

Completely AUTOMATIC  
rotor with thrust bear-  
ing. Handsome cabinet,  
uses 4 wire cable.



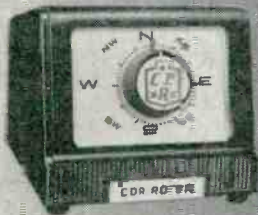
## TR-4

The heavy-duty rotor  
complete with modern  
cabinet with METER  
control dial. Uses 4  
wire cable.



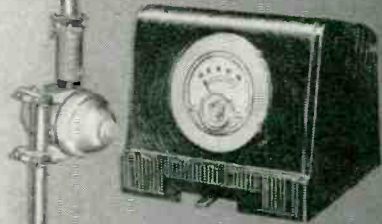
## AR-22

Here is the completely  
AUTOMATIC version of  
the famous TR-2 with all  
the powerful features  
that made it so famous.



## TR-11

The ideal budget all-  
purpose rotor with new,  
modern cabinet featur-  
ing meter control dial.  
Uses 4 wire cable.



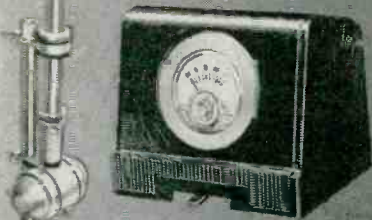
## TR-2

The heavy-duty rotor  
with plastic cabinet fea-  
turing "compass control"  
illuminated perfect pat-  
tern dial. Uses 8 wire  
cable.



## TR-12

A special combination  
value consisting of com-  
plete rotor with thrust  
bearing. Handsome  
modern cabinet with  
meter control dial, uses  
4 wire cable.



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**THE RADIART CORP.**  
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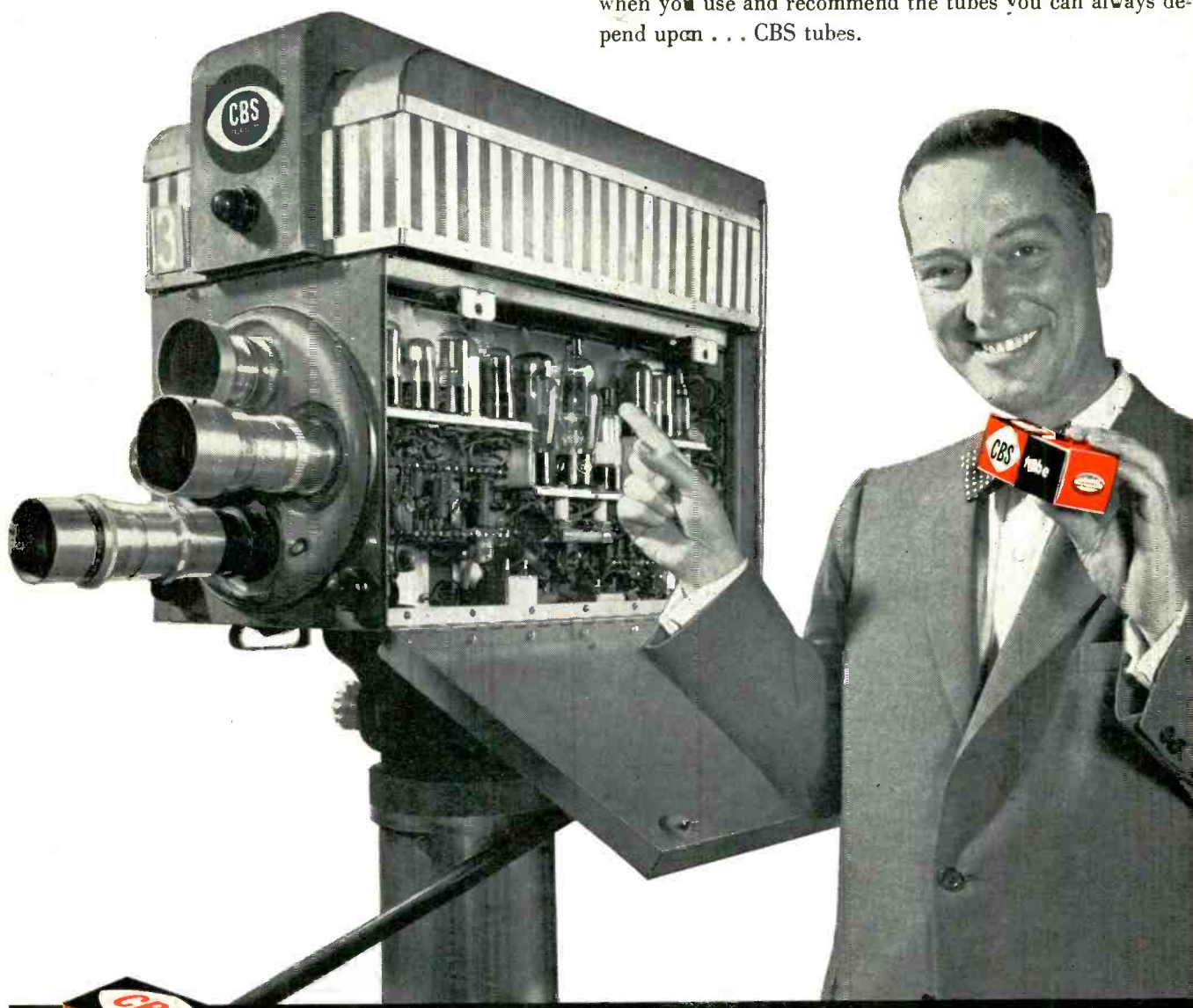
**"A TV network  
 .....  
 can't afford  
 .....  
 to take chances  
 .....  
 on tube quality"**  
 .....

**As Garry Moore tells over five million women on the CBS Television Network...**

"CBS tubes are made by the tube manufacturing division of Columbia Broadcasting System. So we *know* how dependable they are. That's why we use them here in our own cameras and other equipment."

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**A Division of Columbia Broadcasting System, Inc.**



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**DELCO**

**RADIO**

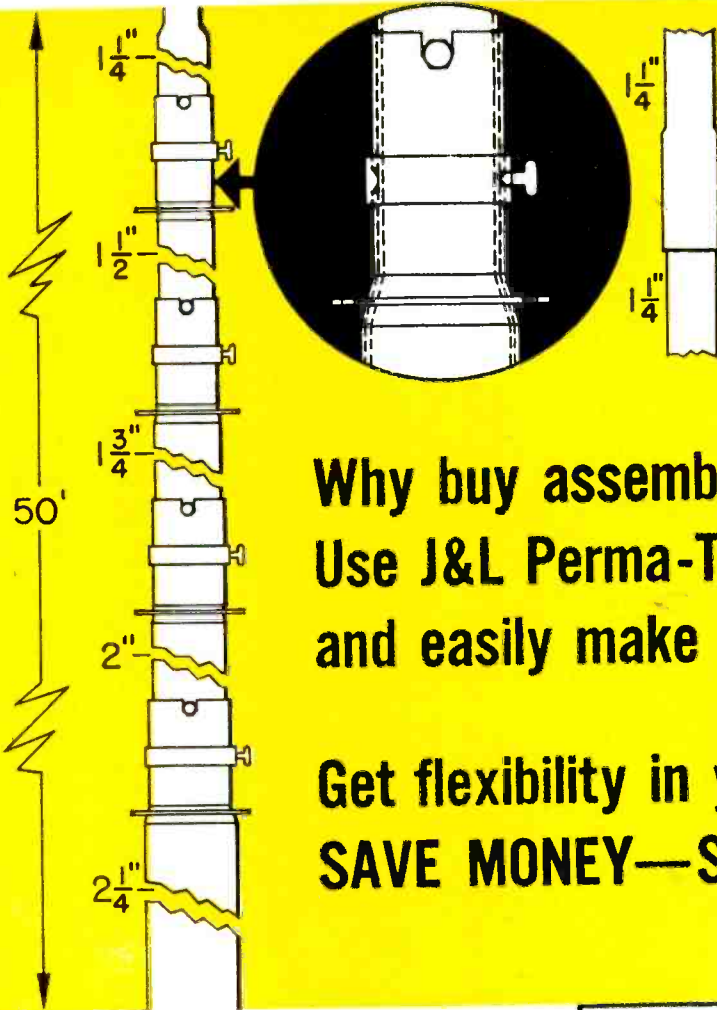
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Use J&L Perma-Tube in 10-foot lengths  
and easily make your own**

**Get flexibility in your stock  
SAVE MONEY—SAVE SPACE**

### Only J&L Perma-Tube offers :

- Joint design which provides instant field assembly.
- Machine-fitted joints that insure close tolerance for high strength and rigidity.
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You can now "tailor-make" your own TV masts up to 50 feet high by using standard 10-foot lengths of 16-gage Perma-Tube—and save money. Five diameters are available in easily-handled cartons from your local distributor. Largest base section OD is 2 1/4 inches and each telescoping section is 1/4-inch smaller, the smallest section having an OD of 1 1/4 inches.

Buy only a carton each of five different sizes of Perma-Tube (1 1/4 to 2 1/4-inch) and make any telescoping TV mast up to 50 feet in height. Hardware—cotter keys or bolts, clamps and guy rings—may also be secured from your distributor.

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service-engineered  
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prevents  
"middle age hum"  
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## LETTERS

To the Editor

### Foreign Receivers

Editor, TECHNICIAN:

Recently we had a German made radio brought in. Three tubes were on one series circuit, and the rectifier tube on another with a burned out glass type resistor. There were no markings. We were losing time on this set, so our wholesaler loaned us a very large tube information book called "Vade-Mecum." It is probably published by Philips of Holland, is printed in several languages including English, and appears to have a complete list of all makes and types of tubes produced up to the time of printing. It uses a somewhat complicated system of identification, but all pertinent data can be found. The pins are not numbered in the basing diagrams; rather they rely on the elements drawn inside the circle.

A. DANN

Dann's  
Cloverdale, B. C., Canada

• To the best of our knowledge, "Vade-Mecum" is published in Belgium by P. H. Brans, and distributed in the U. S. by Editors and Engineers, Summerland, Calif.—Ed.

### To Shield or Not To Shield

Editor, TECHNICIAN:

This is a serious question to which I would appreciate a reply. Should I shield the work bench and instrument shelf with copper or aluminum using grounding cable and isolation transformer, or merely use a wood working bench, grounding only such instruments as are required? Observation of various technicians' shops proves nothing. Some do, some don't. Your opinion?

H. LEE BRIDGES

Lee's Radio Service  
Meridian, Miss.

• The deluxe version, complete shielding, would certainly be desirable, but most techs we've spoken to get along quite nicely without it. Grounding and ac outlet polarity precautions should generally be adequate.—Ed.

### Cut Cut Cut

Editor, TECHNICIAN

I am a tech working for a dealer in a town of about 2000 population. We haven't had any trouble with cut rate merchants until recently. The enclosed ad (Open Sunday—15 to 40% off—etc.) in a Sacramento paper can hurt, since that city is only 30 minutes ride from here.

HENRY L. BUHLERT

Dixon, Calif.

## Color Program Problem

Editor, TECHNICIAN:

Well, I see NBC-RCA is again predicting big things for color TV. Last year, as I recall, they promised us a five-fold increase in color programming. Trouble was, five time nothing is still nothing. Right now, if I were a customer I wouldn't give \$200 for a color receiver because you can't get anything on it. Before sets can move into homes, there will have to be an hour or two of good color programs every night . . . and I don't mean the cooking school or tennis match type of programs. The price is not as much of a deterrent as some in the industry seem to think; it's the programming.

HOWARD RABE

Rabe Electric Shop  
Fremont, Nebraska

● NBC reports that this fall they will carry a daily minimum of one hour in color during prime evening viewing time. This is in addition to color spectaculars and daytime color shows. Also CBS has an extensive color schedule planned.—Ed.

### Home Repairs Net \$10,000-\$15,000

Editor, TECHNICIAN:

I can easily picture Mr. Timmons' quandary (June "Letters") in the matter of replacement parts in home TV repairs. My point was not that every job admits of home repair, but that too many readily discerned easy repairs are not attempted in the home. I have in mind shorted bypass capacitors, open low-wattage resistors, dirty tuner contacts, etc. I know men in this area who make from \$10,000 to \$15,000 a year in home repairs, and most of that income stays with them because they have cut their overhead. Theirs is a personalized service. These men are in the minority, but it certainly is a goal to shoot at for all of us.

H. M. LAYDEN

Judd-Bennett Co.  
New York, N. Y.

### Unbound Circuit Digests

Editor, TECHNICIAN:

I would like to suggest that if possible some way be found to insert the Circuit Digests in the magazine loosely each month instead of stapling them in along with the rest of the magazine. It would be nicer if we could have them come out neat.

H. K. BROWN

Brown Radio & TV Service  
Wheaton, Ill.

● It's less expensive to slip in Circuit Digests instead of binding it in. Matter of fact, when Circuit Digests started it was unbound, but we changed to the more costly procedure when certain problems arose, including that section occasionally slipping out in transit.—Ed.

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**MALLORY**  
service-engineered  
product



## Servicemen's favorites in wire-wound controls

You're sure of giving your customers the best when you use Mallory wire-wound controls. The choice of servicemen and manufacturers everywhere, they have set the standards of the industry for value and performance.

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**They're compact**—fit readily into crowded chassis locations.

**They're long lasting**—give years of stable, dependable service.

**They're uniform**—made to strict specifications to meet or exceed original equipment requirements.

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## Editor's Memo

### WHAT IS A TV TECHNICIAN?

A TV technician is the fellow with the marvelous know-how in his head, a knob and number-filled test instrument in one hand, and a tube caddy in the other. He is found bending over the shop bench, squatting on the customer's living room floor, leaning on the jobber's counter, driving his delivery truck, perched precariously on a rooftop, and puffing his way down stairs with a TV chassis in tow.

His activities include squinting at circuit diagrams, soldering connections, reading meters, pushing probes against now unrecognizably marked components, plugging tubes in testers, scratching his head when he comes across an intermittent, keeping up with new technical developments and cussing (under his breath) the yoke stuck to the picture tube neck.

His vocabulary is filled with horrible-sounding words like choke, ghost, cheater, trap and bleeder; odd-sounding words like yagi, toggle and grommet; complicated-sounding words like electromagnetic deflection and intermodulation; and delicious-sounding words like spaghetti and cone.

His arsenal in the never-ending battle against receiver failure is varied and expensive. Included among his weapons are soldering gun, oscilloscope, vtvm, vom, generators of several types, tube tester, capacitor tester, pliers, screwdrivers and a special little super-dooper device of his own design. His ammunition depot is stockpiled with tubes, capacitors, resistors, transformers, solder, screws, wire, speakers, controls, fuses, antennas, switches, batteries, rectifiers, vibrators (to mention just a few), and a drawer full of junk parts he's been saving (which will get thrown away at the next shop clean-up).

He is many things to many people: symptom detective, psychologist (specializing in pestering children), psychologist (specializing in suspicious adults), salesman, engineer, Doctor Fixit and grass roots spokesman for the entire electronic industry.

His playful moments may be punctuated with such practical jokes as handing someone a charged capacitor, or reverting to his youthful cowboy days with a soldering gun. But usually he is dead serious, working long hours, trying to do a good job and make ends meet.

He's been attacked, slandered and slighted. He's been defended, praised and catered to. But most of all, he's been needed. And when he's made a TV set work again, and Momma, Poppa and Junior Video Viewer express their appreciation, the TV technician is the fellow with the satisfied feeling of a job well done.

*Al Forman*

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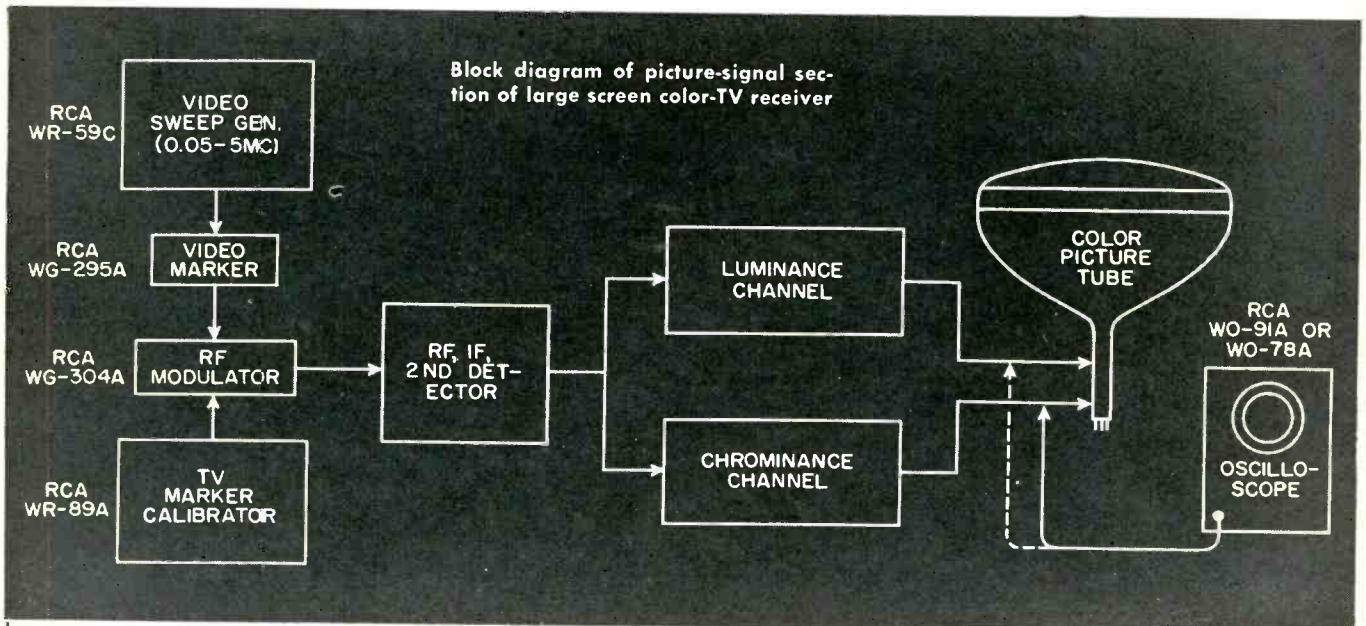
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**ELECTRIC CORP. \* 601 STONE'S CROSSING ROAD EASTON \* PENNSYLVANIA**

RCA ANNOUNCES

# NEW ALIGNMENT TECHNIQUE

*"Must" for COLOR-TV...  
recommended for black-and-white*



**New simplified method essential for the correct alignment of chrominance circuits and for checking overall frequency response of color-TV receivers from antenna to picture tube—rapidly! accurately!**

Techniques considered adequate for checking the overall frequency response of black-and-white receivers are unsatisfactory for checking color-TV receivers. The chrominance circuits and video-amplifier, for example, contain several tunable bandpass stages which must be sweep-aligned to insure good color reproduction.

### The Missing Link

The familiar black-and-white two-step "overall" alignment check from tuner to second detector to picture tube fails to indicate what effects the second detector load circuits have upon overall receiver bandpass. This type of alignment check is inadequate because connection of a video-frequency sweep generator to the second-detector circuits introduces loading, and the resultant detuning alters normal bandpass characteristics. Because this so-called "overall" check does not include the second detector itself, there is a "missing link" in the otherwise complete alignment picture.

For a true indication of overall receiver bandpass and for correct alignment of the chrominance circuits, the response check must indicate the undisturbed, combined performance of the rf, if, second-detector, video-amplifier, and chrominance circuits. It is obvious that

a different alignment technique must be employed for color sets than for black-and-white receivers.

### The RCA Overall Response Check

When an rf sweep signal is fed into the tuner, as is conventional practice, the response curve obtained at the second detector is a rectified 60-cps waveform containing no video-frequency components. Such a sweep signal obviously cannot be used to check the video-frequency characteristics of the second detector, video amplifier, and chrominance circuits. To permit a performance check from the tuner through to the picture tube, the test signal must contain elements of the proper frequencies for all picture-signal sections of the receiver. Such a signal can be obtained simply by the addition of the new RCA WG-304A RF Modulator to your present RCA TV-alignment equipment. The new overall alignment technique utilizing the WG-304A provides a picture-carrier output signal which is amplitude modulated by a video sweep signal of from 0.05 Mc to 5 Mc.

### From Tuner to Picture Tube

With the RCA Alignment System, the sweep modulated signal from the WG-304A is fed into the receiver antenna terminals and the oscilloscope is connected into the picture-tube circuits,

where an immediate indication of true overall frequency response can be obtained. In addition, the response curves are automatically notched at the correct frequencies by the RCA WG-295A or -295B Video MultiMarker with no effort or work on your part.

With the new RCA WG-304A, it is possible, for the first time, to obtain a fast, accurate picture of true overall response in both color and black-and-white receivers...a check which will reveal instantly the need for alignment, should such a need exist anywhere in the receiver!

Write for

### FREE TV-Alignment Booklet

A specially prepared booklet, written by John R. Meagher, nationally known TV-servicing authority, is available free. This authoritative booklet is packed with the very latest information on alignment techniques for both color and black-and-white TV. For your copy write: RCA, Commercial Engineering, Section H-46-W, Harrison, N. J.



**TEST EQUIPMENT**

Radio Corporation of America • Harrison, N. J.

**Snyder**  
PHILADELPHIA

# SOLVES the AUTO ANTENNA PROBLEM

**NEW**

**REPLACEMENT**

**ANTENNA STAFF**

Another  
**Snyder**  
PHILADELPHIA  
Antenn-gineered  
Original

For  
FAST and ECONOMICAL  
REPLACEMENT of BROKEN,  
WEATHERBEATEN or  
STOLEN STAFFS

SLIP ON  
and TIGHTEN!



**RE-8**

**3 95**  
LIST

SOCKET WRENCH  
INCLUDED

97% UNIVERSAL  
GLEAMING CHROME  
60 SECOND INSTALLATION

RE-8 . . . FULL SIZE  
COLLAPSED LENGTH 24"  
EXTENDED LENGTH 56½"

RE-8B . . . MEDIUM SIZE  
COLLAPSED LENGTH 18"  
EXTENDED LENGTH 39"

**SNYDER**

**MANUFACTURING CO.**  
PHILADELPHIA • LOS ANGELES • TORONTO


# What About Color TV?




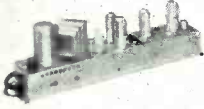


*There has been much talk about Color TV — and about whether or not available TV equipment is suitable for Color TV reception. Whatever other conditions prevail — one thing is certain . . .*

ALL  TV PRODUCTS ARE ENGINEERED for COLOR

Every piece of Blonder-Tongue equipment ever built, sold and in use — or ever to be used — is designed with color in mind . . . with the flat, broad output required for color.

these products include




 DISTRIBUTION AMPLIFIERS	 CONVERTERS	 BOOSTERS
 SIGNAL AMPLIFIERS	 LINE AMPLIFIERS	 MIXER AMPLIFIERS

. . . and all B-T impedance matching devices, equalizers, couplers, attenuators, connectors and tap-offs.

For example:

The  Model TV-42

is the only type approved by engineers for color — with a flat response from 0 to 900 mc.

Every  Master TV System now in operation is designed to meet the exacting demands of Color Television . . . today and tomorrow.

Keep abreast of the Latest Developments. Apply for your FREE subscription to the B-T BULLETIN.



Write today, to Dept. QH-18

**BLONDER-TONGUE LABS., INC.** Westfield, New Jersey

In Canada: Tequipment, London, Ontario

The largest manufacturer of TV Signal Amplifiers, UHF Converters and Master TV Distribution Systems.

## News of the Industry

To JAMES O. SCHOCK goes the post of Industrial Sales Manager at **GENERAL CEMENT MFG. CO.** Following expansion of facilities, this manufacturer plans greater expansion in the industrial field.

Do-it-yourself program for developing engineering-level personnel goes into effect this fall at the **RAYTHEON MFG. CO.** Grants of tuition, fees and book allowances will go to eligible employees for studies in accredited colleges toward engineering positions.

New president of **STANDARD COIL PRODUCTS CO., INC.** is JAMES O. BURKE, succeeding GLEN E. SWANSON. The latter becomes chairman of the board of directors.

Price reductions ranging to 27 percent on 10 transistors used in radios and audio systems have been announced by **GENERAL ELECTRIC.** GE also broadened its national service program on communications equipment so that the factory will take service contracts directly, in addition to those being handled by authorized service stations. This is to assure factory service on more specialized and complex systems.

Electric Products Sales Dept. of **SYLVANIA ELECTRIC PRODUCTS, INC.** now has GEORGE C. ISHAM as gen. merchandising mgr. New Electronics Products advertising mgr. is DONALD J. HUGHES. A nationwide 18,000-mi. private communication network and data processing system, comprising 71 stations, now links plants, laboratories, offices and warehouses of the **SYLVANIA** organization across the continent.

Expansion of its manufacturing facilities for electron tubes at Bath, N. Y., has been announced by **WESTINGHOUSE ELECTRIC CORP.** Newly appointed as plant manager is WILLIAM SAUTER.

25th anniversary celebration for the **SNYDER MFG. CO.** will be held in the Beverly Hilton Hotel in Los Angeles this month. In the coming months this manufacturer will unveil several new developments now under wraps, including a mystery indoor TV antenna.

**P. R. MALLORY & CO., INC.,** has moved its N. Y. district sales office to 545 Cedar Lane, Teaneck, N. J.

After 2 yrs. of design and development and expenditure of over \$35,000, **FINNEY CO.** of Cleveland has completed its Mobile Research Lab Unit. Featuring a 60-ft. telescopic tower and twin antenna circuits for comparison testing, the unit is intended to solve unusual and difficult local TV reception problems. The mfr. invites distributors throughout the country to present such problems to its research dept.





**DOUGLAS H. CARPENTER** announces opening of his own offices at 19 W. 44th St., N. Y. C. He will work on a consulting basis with organizations in the electronic and electromechanical industries.

In existence for 6 yrs., the **ASTRON CORP.** has awarded gold 5-yr. pins to 56 of its employees.

**I. D. E. A., INC.**, mfg. firm of Indianapolis, Ind., has named **WILLIAM F. SHARKEY** as advertising mgr.

**JENSEN MFG. CO.** has been confirmed as a general member of the **INSTITUTE OF HIGH FIDELITY MFRS.** Membership now totals 68.

Vice president and gen. mgr. of the **AEROVOX** West Coast operation is **FRANK L. MARSHALL.** His former position as v-p of mfr. sales will be filled by **ROBERT A. HOAGLAND.** **JAMES LUTHER** receives post of v-p of engineering. **LOUIS KAHN** assumes the role of Technical Assistant to President **W. MYRON OWEN.**

**BURTON BROWNE ADVERTISING** has appointed **JOE SIEFERTH** as client service director. The agency has celebrated the 15th anniversary of its association with **PAUL D. BEZAZIAN**, now a partner in the firm.

**THORDARSON-MEISSNER**, of Mt. Carmel, Ill., has bought for cash the assets and good will of the transformer div. of **MARK ELECTRONICS**, Bloomfield, N. J. Facilities will be consolidated with those of the parent company.

As part of its continuing expansion in electronics, **OLYMPIC RADIO & TV, INC.** of N. Y. has acquired **PRESTO RECORDING CORP.** of Paramus, N. J. This follows the acquisition of the **DAVID BOGEN CO.** earlier this year.

Name change to **ALTEC COMPANIES, INC.**, more accurately reflects the diverse nature of the former **ALTEC SERVICE CORP.** The service company continues as one of several divisions of the combined organization, which include **ALTEC LANSING CORP., PEERLESS ELECTRICAL PRODUCTS CO.,** and **NEWPATHS, INC.**

Establishment of a new engineering and sales office by **AMPHENOL ELECTRONICS CORP.** in Los Angeles, at 5356 West Pico Blvd., is announced with some personnel shifts. Heading up the office will be **JAMES SCHAEFER.** **WALLY WASSON** will now head the Chicago office as district manager, with his former post as manager in Syracuse now going to **GEORGE GLATZ**, formerly of the N. Y. sales engineering staff. The N. Y. post is assigned to **GLENN OMHOLT**, who moves from the main plant.

In its 3 yrs. of operation, **PACE ELECTRICAL INSTR. CO.**, subsidiary of **PRECISION APPARATUS**, has doubled its facilities, as to engineering personnel and physical size.



**LOOKING?**  
for the right dual-control replacement

You'll find it's  
**ALWAYS IN STOCK** at your  
**Centralab Fastatch**  
distributor

- With Centralab's unique Fastatch system, your distributor can afford to carry a complete line of dual-concentric replacements for all popular TV, radio, and auto sets.
- Each Fastatch control unit is factory assembled, tested, and guaranteed.
- Ask your Centralab distributor's salesman or counterman about Fastatch duals. Or send coupon for bulletin 42-218.

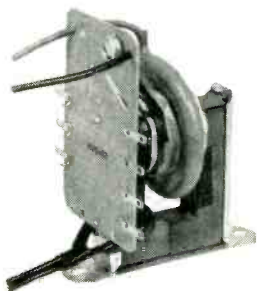
**Centralab**  
A DIVISION OF GLOBE-UNION INC.  
902H East Keefe Avenue, Milwaukee 1, Wisconsin B-5622

Send me Fastatch bulletin 42-218.

Name.....  
Company.....  
Address.....  
City..... Zone..... State.....



MERIT, first in exact and universal replacement transformers, yokes, coils—the only manufacturer of transformers, yokes and coils who has complete production facilities for all parts sold under their brand name.



**HVO-42 FOR EXACT REPLACEMENT IN CBS-COLUMBIA.**  
Another in the complete MERIT line of exact and universal replacements—the only single source for all your transformer and coil requirements.

# Merit

MERIT COIL & TRANSFORMER CORP.  
4427 NORTH CLARK STREET  
CHICAGO 40, ILLINOIS



## New Books

**BLOCKING OSCILLATORS.** By Alexander Schure. Published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y. 72 pages. Paper cover. \$1.25.

The 10th volume in the Electronic Technology Series—and 3rd to appear so far devoted completely to a single type of oscillator—gives it subject a fairly thorough going over. In addition to the popular description of operation, there is a comprehensive elaboration of the less frequently discussed details, peculiarities and variations in blocking oscillators. There is also an extensive treatment of many varied applications for this type of circuit.

**TV REPAIR QUESTIONS AND ANSWERS (SOUND & I-V CIRCUITS).** By Sidney Platt. Published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y. 120 pages. Paper cover. \$2.10.

This fifth and final volume in the "Question and Answer" series follows the earlier format of posing a specific problem, followed by a practical answer and informative discussion. The five sections of the book cover sound servicing, sound i-f and limiters, sound detectors, audio amplifiers and speakers, and low voltage power supplies and filament strings. One question taken from the book will indicate the text's practical servicing slant: "When adjusting the 4.5-mc sound take-off coil, the coil is adjusted to the proper frequency, but the buzz level appears to be unusually high. What is the probable cause of trouble?" There are 111 of such questions, fully answered and many illustrated.

**AMPLITUDE MODULATION.** By Alexander Schure. Published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y. 64 pages. Paper cover \$1.25.

Ninth in the Electronic Technology Series for primary technical-school study as well as for review, this slender text gives organized coverage to such matters as the nature of the modulated signal, the means by which the desired modulation is produced, and practical means of checking and monitoring modulation. Modulation at the plate and other elements of the vacuum tube is discussed.

**TV MANUAL VOL. 18.** Published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N.Y. Looseleaf binder. \$19.80.

This volume presents the complete factory authorized servicing data covering all production runs of over 30 manufacturers. Period covered is Jan. through March 1956, including color and portable TV sets. The manual also lists up-to-date information on private label brands, and has a cumulative index embracing all volumes in the series. Data includes installation, signal waveforms, alignment, pix tube adjustments, voltage charts, tubes, components call-outs and test equipment set-ups.

## Catalogs & Bulletins

**SOLDERLESS PHONO PLUG:** Data sheet describes phono plug that attaches to cable in 1 min. without solder, details method of connection and other information. Workman TV, Inc., 309 Queen Anne Road, Teaneck, N. J. (TECHNICIAN No. B8-8)

**TRANSISTOR COMPONENTS:** Four-page leaflet details capacitors, coils, transformers, etc., with specs, for use in transistorized circuits. Free Thordarson-Meissner, Seventh and Bellmot, Mt. Carmel, Ill. (TECHNICIAN No. B8-9)

**REACTANCE SLIDE RULE:** Again made available due to continuing demand, this time-saver simplifies calculations of resonant frequency, capacitive and inductive reactance, Q, and dissipation factor problems over a range of 5 cps to 100,000 mc. Price \$0.50. Shure Bros., Inc., 222 Hartrey Ave., Evanston, Ill. (TECHNICIAN No. B8-1)

**ANTENNA ACCESSORIES:** Over 40 standard accessories are listed in this 8-page catalog, for regular or special installations. Illustrated with diagrams and photos, including those of actual installations. All types of connectors including wall plates. Cat. #257, available free. Javex, P. O. Box 646, Redlands, Calif. (TECHNICIAN No. B8-2)

**BUSINESS GUIDE:** A Guide to Good Business, 20 pages, is again available free in a second printing. Booklet covers planning, market surveys, location selection, window displays, stock control, insurance, legal aid, accounting, etc., as they apply to service. Sylvania Central Advertising Distrib. Dept., 1100 Main St., Buffalo, N. Y. (TECHNICIAN No. B8-10)

**TEST EQUIPMENT:** Technical Manual 17, 87 pages, describes and illustrates the complete line of Simpson indicating and test instruments with illustrations. Panel meter section covers more than 800 types in 37 pages, with technical and design features. Also included are new additions to line for color service and other fields. Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill. (TECHNICIAN No. B8-3)

**NEUTRODE TUNER:** Technical information available on the new Standard Coil neutralized-triode, high-gain, low-noise TV tuner, using printed circuitry. Oden Jester, asst. gen. mgr., Standard Coil Products Co., Inc., 2085 N. Hawthorne Ave., Melrose Park, Ill. (TECHNICIAN No. B8-4)

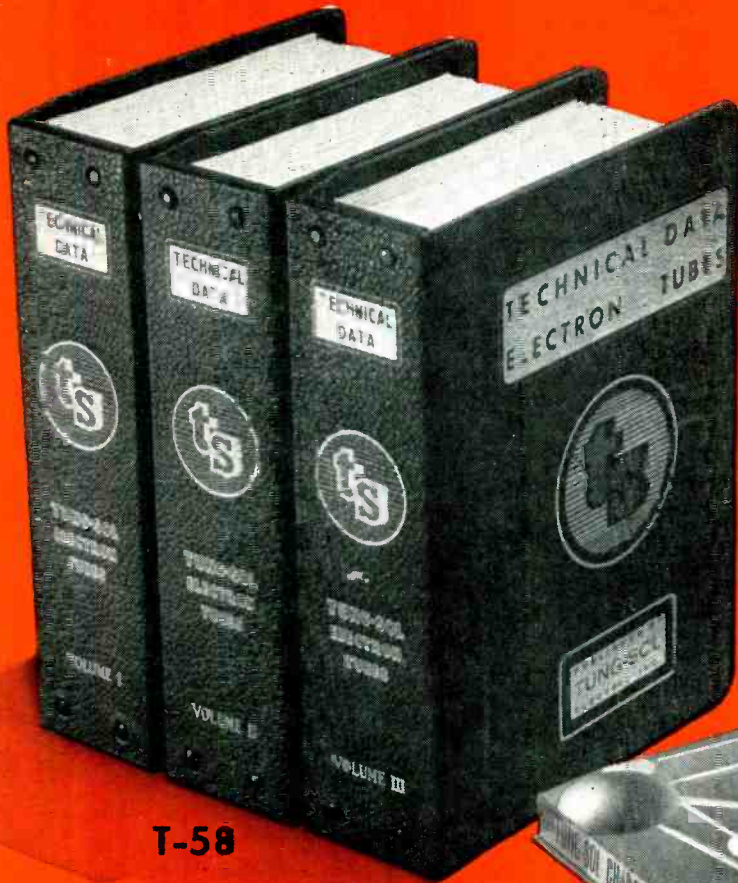
**SERVICE & PROMOTION AIDS:** Over 100 different sales, display, promotion and service aids are described in a 16-page catalog (ETD-589-D), including tube dispensers, caddies, window streamers, signs, ad mats, mailing pieces, etc. GE Tube Dept., Schenectady 5, N. Y. (TECHNICIAN No. B8-6)

# TUNG-SOL 1956 TECHNICAL DATA BOOKS

The new 1956 Tung-Sol Electron Tube Technical Data books are the most practical set of reference books in the entire industry. They contain all the information you need for everyday use. Clearly indexed and streamlined for fast reading, they open flat for rapid on-the-job reference. Ask your Tung-Sol supplier how you can get your set.

**TUNG-SOL ELECTRIC INC.**  
Newark 4, N. J.

Sales Offices: Atlanta, Columbus, Culver City, Dallas, Denver, Detroit, Melrose Park (Ill.), Newark, Seattle.



**T-58**

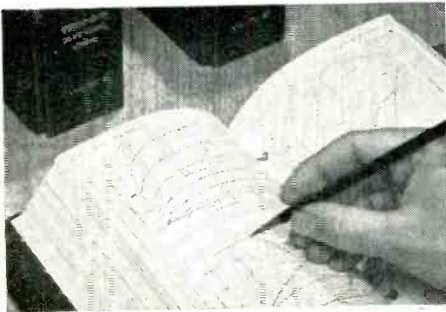


**T-31**

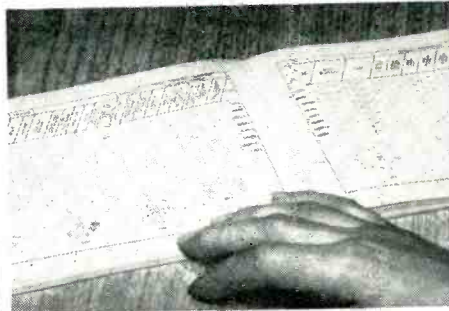


**T-70**

## ALL THE INFORMATION... AT YOUR FINGER TIPS!



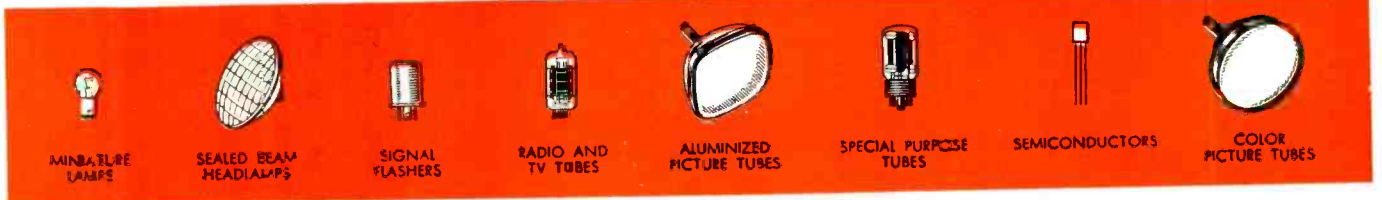
**T-58** 1250 pages—1000 tube types.



**T-70** More than 250 pages of data on CR tubes, receiving and special purpose tubes and dial lamps.



**T-31** Over 350 blueprint base diagrams for 1400 tube types.



**WESTERN UNION "OPERATOR 25"**



Raytheon Bonded Dealers are listed with Western Union "Operator 25". Potential customers needing TV or Radio repairs need only call Western Union by number and ask for "Operator 25". She'll give them the name and phone number of the Raytheon Bonded Dealer nearest the customer. More business for Bonded Dealers.

**NATIONAL ADVERTISING**



10 million readers a month will be urged to use Raytheon Bonded Electronic Technicians for their TV and Radio repairs. A powerful, exclusive advertising campaign designed solely to stimulate service business for Raytheon Bonded Dealers.



**only RAYTHEON BONDDED DEALERS have all these business-building assets**

**RAYTHEON BONDED BACKING**



The Bonded Electronic Technician guarantee on all radio and television repair work and parts is backed by a bond issue through one of America's largest insurance companies. This important support creates customer confidence and results in more customers — more profit and more prestige.

**EXCLUSIVE RAYTHEON BONDED DEALER PROMOTION MATERIAL**



Raytheon Bonded Dealers receive a registered Bond Certificate, Decals, ID Cards, Creed Displays — all designed to bring attention to their Bonded status. Special ads, mailing pieces and countless sales and shop aids are available exclusively to Raytheon Bonded Dealers.

Your sponsoring Raytheon Tube Distributor will be happy to discuss the Raytheon Bonding program with you. Better call him today.

**RAYTHEON MANUFACTURING COMPANY**

Receiving and Cathode Ray Tube Operations

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

Raytheon makes all these } Receiving and Picture Tubes, Reliable Subminiature and Miniature Tubes, Semiconductor Diodes, Power Rectifiers and Transistors, Nucleonic Tubes, Microwave Tubes



Excellence in Electronics



# TECHNICIAN

## & Circuit Digests

CALDWELL-CLEMENTS CO., 480 LEXINGTON AVENUE, NEW YORK 17, N. Y.

### The Reprocessed Tube Racket—One Year Later

The July 1955 issue of **TECHNICIAN & Circuit Digests** contained a five-page article exposing the deceptive practices in selling reprocessed receiving tubes. Briefly, this racket operates as follows: a "junkie" buys the discarded tubes from service shops, sells them to a reprocessor who washes off the name and code, and then rebrands the clean base and shiny envelope. The tubes are then sold to technicians and the public for exceptionally low prices. **TECHNICIAN's** shopping survey found 41.6% of these "bargain" tubes unusable.

To stamp out these unethical practices in the marketing of tubes for radio and TV demands continued effort. No doubt the reprocessors are hoping that in time the revelation of their racket will blow over. We must not let up; techs, manufacturers, publications, jobbers, business and government agencies must continue to maintain pressure on these tube hucksters.

Now that a full year has gone by since the intricate workings of the racket were revealed by **TECHNICIAN**, it is worthwhile to look back on the past 12 months and note in which areas positive results were achieved.

**SERVICE TECHNICIANS:** Most techs, once they became aware of the racket and how it injured their reputations moved in two directions to curb it. First, many refused to buy the so-called bargains. Not only does the high percent of inferior tubes increase the real cost of the remaining good ones, but a weakened tube may mean an unnecessary call-back. Second, techs have put a number of "junkies" out of business by destroying old tubes instead of selling them for 1¢ or 2¢ each. In effect, this tends to dry up a primary source of old tubes for reprocessors.

**MANUFACTURERS:** The tube manufacturers immediately recognized how these reprocessed tubes were hurting their business, as well as the entire industry. They moved quickly to bring it to the attention of the public and their service tech customers. Some of these tube makers reprinted and distributed about 100,000 copies of **TECHNICIAN's** original article. Their publicity departments went to work, and over 100 newspapers and magazines from coast to coast picked up the stories, thereby inform-

ing the public. They dramatized the fight with cash credit on old tubes destroyed, rewards for information leading to conviction, etc. To date, several unscrupulous operators have been arrested.

**PUBLICATIONS:** To cut off the reprocessors' contacts with customers, **TECHNICIAN** reinforced its already strict tube advertising policy. The ad must tell the whole story without misleading. One other magazine in the field followed our move with a similar action, and we tip our hat to them. Other publications, unfortunately, continue to reap the income of misleading tube ads without even trying to police them.

**JOBBERS:** The most reputable jobbers have always refused to handle reprocessed tubes. Some who did were stuck with sizable inventories when techs refused to buy, so they are wary of anything but accepted brands. To prevent bootlegging, even accepted brands are purchased only from reliable sources.

**GOVERNMENT:** To get official action, **TECHNICIAN** filed a formal complaint with the Federal Trade Commission. We turned over evidence in our files to their investigators. Now, about a year later, FTC can only report that "investigations are currently proceeding." A similar complaint to the Better Business Bureau, which has done much to unmask gyps, has not yet resulted in positive action.

**"BARGAIN" TUBES TODAY:** The past year has seen the disappearance of some reprocessors' names from ad promotions. Others continue to sell their questionable bargains with the notice that their tubes are unconditionally guaranteed for one year (knowing full well that very few people ever take advantage of this guarantee). This would indicate that our efforts have been quite effective in stamping out some reprocessors, but only partially successful against others. Judging by performance during the past year, it is up to technicians and manufacturers to shoulder the burden of driving the reprocessor out of the industry. As long as some receiving tube reprocessors flourish, the job is undone.

Remember, destroy worn out tubes; don't sell them. And be alert when you see extraordinary bargains; the \$2 tube being offered for 75¢ may have cost the seller only 1¢.

# Tuning In the

**CANCER CELLS** may be detected by an electronic scanning and computing device called a cytoanalyzer. This system, developed by Airborne Instruments Lab., records more measurements in a few minutes than manual methods could in months. It scans the microscope images of the cells, and automatically classifies them as normal or suspicious.

**HOW DOES YOUR PAY STACK UP** against the average weekly earnings of workers in radio-TV-phono production? They make \$72 per week, which is almost \$7 less than the average of all manufacturing. All told, the industry has about 535,000 employees, of which 380,000 are production workers, reports the Bureau of Labor Statistics.

**MINIATURIZED MICROFARADS.** The requirement for high capacitance in small space has led to the widespread use of electrolytics, whose liquid electrolyte may freeze or evaporate. Bell Labs has now come up with a solid electrolyte using semiconducting manganese dioxide to replace the liquid. Tantalum is preferred as the anode. The resulting temperature-stable component is rated as high as 35 volts, which is excellent for transistor circuits. A 20 uf unit occupies only 0.04 cu. in. That's equivalent to 500 uf per cu. in.

## AUTOMATION SYNCOPATION



"Datatron" computer has composed "Pushbutton Bertha," claimed to be the first song composed by automation. The Burroughs machine can turn out 1000 melodies per hour based on arithmetic note selection. Once the computer is fed the formula or program, which usually follows a fixed pattern of note patterns and cadences, it can produce 10 billion tunes without human aid. Trio includes lyricist Jack Owens (piano), mathematicians D. Bolithe and Dr. M. Klein.



**PIX TUBE DESIGNATIONS** in advertisements have come under fire from the Federal Trade Commission, which thinks a 21-in. set doesn't really have a 21-in. screen. After laying down a restrictive rule about tube size, FTC has relented in part. Set makers can now present screen sizes in square inches, followed by a model number containing 14, 17 or 21, provided these numbers are followed by coding such as T for table or C for console.

**ALONG THE BUSINESS FRONT.** Large retailer in a Southern city is doing a healthy volume selling used, rebuilt TV sets, on time to sub-standard credit risks. Included in the carrying charge is an allowance for service for the life of the contract. He's found that if he charges for service after delivery of the set, the customer may default, failing to make the weekly payments. . . . Along with the recent decline in TV sales, service department managers have noticed a slow-down in making payments of bills even on the part of erstwhile good customers. Result? Many have clamped down on open credit; still others have speeded up their billing methods.

**LARGE DEALER'S SERVICE OPERATION** builds good-will through a unique method it devised in charging its customers for calls where TV sets were found to be in perfect operating condition—for instance, improperly tuned, receiver not plugged in and the like. In such cases the customer is charged \$3.50 for the call, but is given a card entitling him to a partial rebate if and when the servicer is called again for real trouble in the family set.

**BATTERY PORTABLE TV,** which several set makers have been developing, is already available in England. The British receiver sells for close to \$200, has a 9-in. pix tube, and operates from either 12-volt battery or 220-volt line. Since this set weighs between 30 and 40 lbs. without battery, the manufacturer recommends that it be connected to an automobile battery supply.

# Picture .....



**LARGE NEW YORK SERVICE** shop doing a big business in "Bring-'Em-in-Yourself" service on TV sets. The establishment is located in an area where parking facilities exist. The attraction here is that substantial savings are offered along with fast service and a test-while-you-wait policy.

**FUTURE OF 16 RPM ON PHONOS.** Numbers of manufacturers are adding that "4th" speed to current phonographs. Some we've talked with admit that they are not quite sure what's ahead for 16 RPM, but say they are including the new speed "just in case." By just in case they mean that something—talking books—for instance, could strike the public fancy, and if it does they want to be ready. A spokesman for one of the largest firms in the country told a **TECHNICIAN** editor that, although his players have the new speed, he feels that the future for "talking books" lies in the tape recorder field.

**AN ALERT TECH** in New England reports that he has increased his business volume more than \$300 per month with very little extra effort. He simply carries some antennas and a supply of portable radio batteries in his truck. On a call, when he spots a worn antenna or unused portable he finds out if all is well. If not, he usually clinches the sale by doing the job at that very moment.

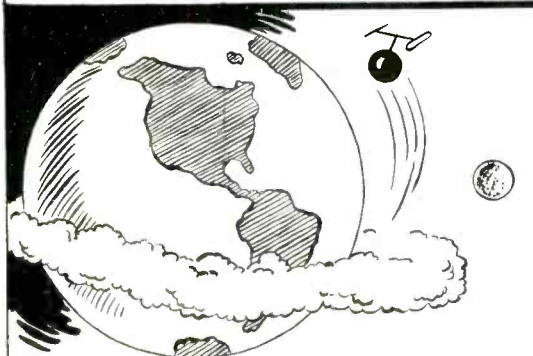
**PRICE OF SILICON** used in diodes and transistors has been reduced \$30 per pound to \$350, reports Du Pont. Despite this high cost, the sliver used in a semiconductor is so small that its value is only 5¢ or 10¢.

## CALENDAR OF COMING EVENTS

- Aug. 21-24: WESCON Show, Pan Pacific Auditorium, Los Angeles, Calif.
- Aug. 22-23rd Annual British National Radio Show, Earls Court, Sept. 1: London, England.
- Aug. 30-3rd Conference, Rocky Mountain Chapter of "The Representatives," Colorado Hotel, Glenwood Springs, Colorado.
- Sept. 11-12: Second RETMA sponsored Conference on "Reliable Electrical Connections," Philadelphia, Pa.
- Sept. 14-16: NATESA TV-Radio-Electronic Service Industry Convention, Sheraton Hotel, Chicago, Ill.
- Sept. 26-30: High Fidelity Show, New York Trade Show Building, New York City, N. Y.
- Oct. 1-3: National Electronics Conference and Exhibition, Hotel Sherman, Chicago, Ill.
- Oct. 1-3: Canadian IRE Convention and Exposition, Automotive Building, Exhibition Park, Toronto, Canada.
- Nov. 2-5: High Fidelity Show, Palmer House, Chicago, Ill.
- Dec. 5-7: Second IRE Instrumentation Conference, Biltmore Hotel, Atlanta, Georgia.
- Dec. 10-12: Eastern Joint Computer Conference, Hotel New Yorker, New York, N. Y.

**TELEVISION PUNDITS** who predicted that better tuners, built-in antennas, higher transmitter power, etc., would cause the disappearance of external antennas have apparently disappeared themselves. One antenna maker alone reports that he sold a few million units last year, and with color TV on the rise better antennas will be in greater demand. Besides, the fringe area never ends; no sooner does one region start to get good pictures, than the next area a bit further away demands a super-super gain antenna.

## RANDOM NOISE



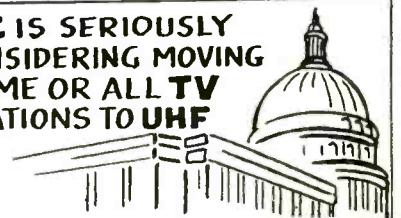
**EARTH SATELLITE** OF TYPE TO BE LAUNCHED DURING INTERNATIONAL GEOPHYSICAL YEAR STARTING JULY '57 MAY EVENTUALLY BE USED TO SEND TV ACROSS ATLANTIC



**RETMA REPORTS** FACTORY RECEIVING TUBE ANNUAL SALES UP 7% TO 483,000,000; PIX TUBES 1% TO 10,900,000; TRANSISTORS UP 177% TO 3,600,000, AND DIODES 5% TO 20,100,000 UNITS

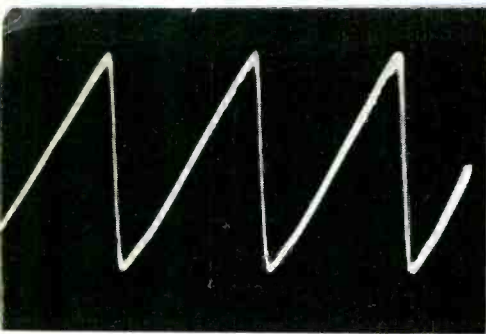
TOM HIGGINS JR

**FCC IS SERIOUSLY CONSIDERING MOVING SOME OR ALL TV STATIONS TO UHF**

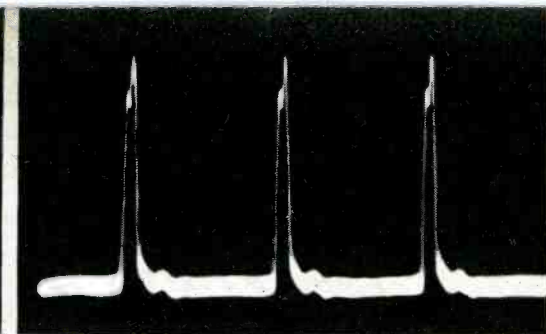


**DID YOU KNOW...? TV-ELECTRONICS PROVIDES EMPLOYMENT FOR 1,750,000 PEOPLE-AND 75% OF JOBS FILLED BY THESE PERSONS DIDN'T EVEN EXIST 10 YEARS AGO**

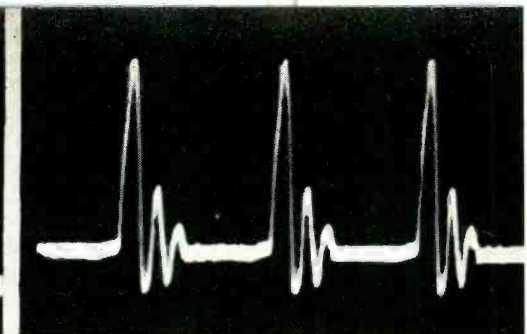




1A—Yoke sawtooth current waveform.



1B—Pulses at damper tube high side.



1C—Pulses at plate of horizontal amplifier.

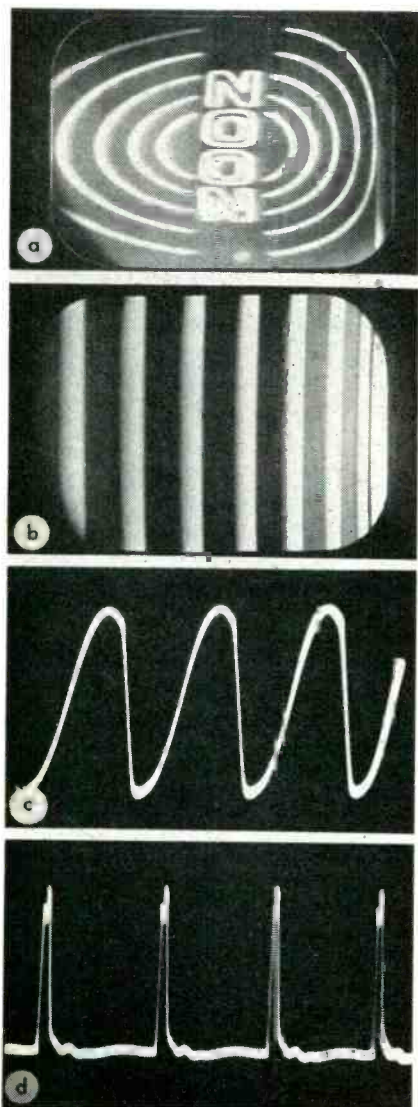
# Troubleshooting in the

## Working from Critical Check Points, Becoming Familiar

H. P. MANLY

- Many television troubles difficult to locate occur in the horizontal

Fig. 2—A blocking capacitor in the yoke circuit was too small, producing these traces.



sweep section, or between the oscillator output and the yoke coils. The difficulty is due partly to the fact that functions of beam deflection and of high voltage production are carried out in the same parts and circuits, and partly because of the relatively great number of capacitors and resistors whose values are somewhat critical.

To check through all these circuit elements for incorrect values and voltages, leakage, opens and shorts is a time-consuming process. Anything which helps localize the probable fault within a fairly small group of components is worthwhile, provided the method itself is fast and is applicable to practically all receivers regardless of differences in circuit.

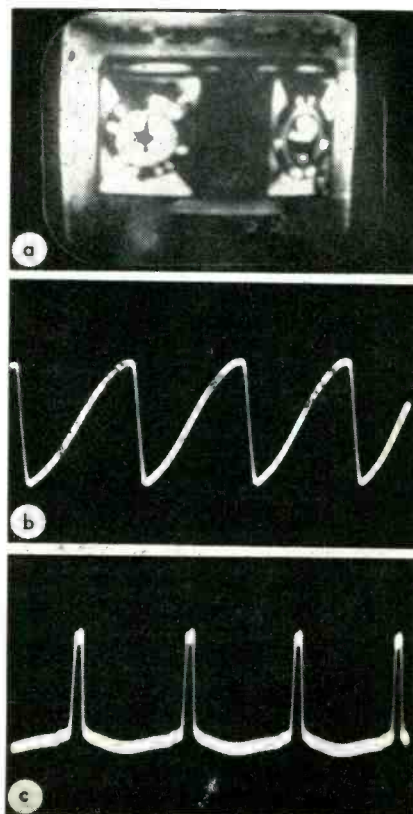
### Scope Checkpoints

One method which satisfies these requirements calls for only four observations with the oscilloscope to divide everything from horizontal oscillator to yoke into three groups of parts, while indicating the group in which a fault is most likely to exist.

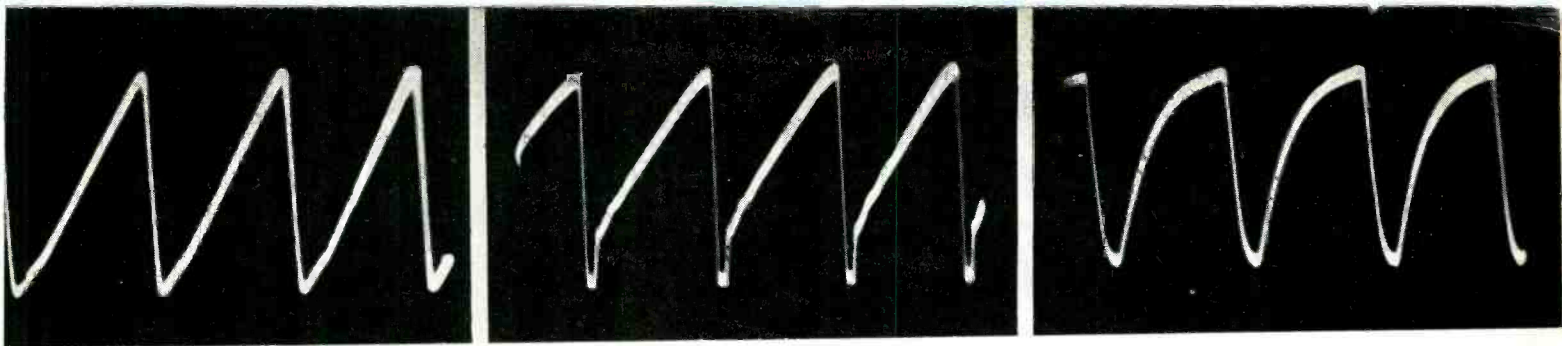
Fig. 1 at the top of this page, shows normal or trouble-free indications for the four tests, as follows: A: Sawtooth current in the horizontal deflection coils, observed with the scope across a small resistor placed in series with a yoke lead. This is the only time a connection need be disturbed. B: Sharp pulses at the high side of the damper tube. The high side is the cathode when there is an autotransformer and is the plate when the flyback transformer has a separate secondary. Pulses will be positive at a damper cathode, negative at a damper plate. C: Sharp positive pulses at the plate of the horizontal output amplifier. Note

that this waveform is similar in appearance to the waveform found at the damper, except that, at the output tube plate, there are conspicuous oscillations, as yet undamped, to the left of the negative portion of each cycle. D: A sawtooth voltage with essentially smooth rise at the output of the oscillator (and sawtooth generator) or at the grid input of the output tube.

E: If the oscillator used in the set is a multivibrator, the negative peak shown here may occur in the sawtooth, instead of the display shown in D. F: If a blocking oscillator is used, the sawtooth rise will







1D—Sawtooth output from oscillator.

1E—Sawtooth output from multivibrator.

1F—Blocking oscillator sawtooth output.

# Horizontal Sweep Section

*with Critical Waveforms, Is Key to the Technique Described*

probably show some curvature, more or less, instead of appearing as in either D or E. Note that the exact shape of the oscillator voltage output waveform does not materially affect the shape of subsequent waveforms observed at the amplifier plate, damper high side, or in the yoke coils.

To illustrate the troubleshooting procedure, we shall examine some actual cases. In Fig. 2A, horizontal stretching is noted at the left of the raster and the center, with crowding on the right. Though the condition is evident with picture content, the vertical bars supplied from a pattern generator confirm it, in Fig. 2B. The yoke current, shown in Fig. 2C, is badly deformed. Note that the too-steep rise, indicating fast travel of the electron beam, accounts for that portion of the picture in which there is stretching. The flattening of the sawtooth toward the top indicates a

slow-down in electron beam travel, corresponding to the crowding at the right of the raster.

In Fig. 2D, the damper waveform is practically normal. This would tend to indicate that the defect is somewhere between the damper and the yoke. Actually a paper capacitor between the low side of the yoke and B-plus turned out to have the wrong value. It should have been 0.25 mf, but was actually 0.025 mf. Replacement with the correct value restored linearity to normal.

## Loss of Width

To take another case, the picture appeared narrow and fuzzy, as in Fig. 3A. When picture content was light, there was a tendency to bloom; when content was dark, the picture contracted. This suggested low voltage on the second anode of the crt, but the trouble might be produced by any of a wide variety of causes in the horizontal and high-voltage system. The yoke current waveform (Fig. 3B) was somewhat deformed, since the rise wasn't sufficiently straight. The damper waveform (Fig. 3C) also showed some irregularity, since the horizontal, negative-going portions of the trace should have been straight, except for some possible indication of oscillation to the left. The waveform at the plate of the horizontal amplifier was of almost normal shape (Fig. 3D), but lacked the sharpness and attendant oscillation in the flyback pulses found with normal performance. Since the output waveform of the oscillator (Fig. 3E) was also of the wrong shape, having a bend half way up, trouble in the oscillator itself or ahead of it was indicated. A leaky coupling capacitor from the oscillator output to the grid of the

horizontal output amplifier turned out to be the cause.

To examine a final case: The picture showed vertical bars or bands (Continued on page 41)

Fig. 3—Leakage in a coupling capacitor produced these raster and waveform symptoms.

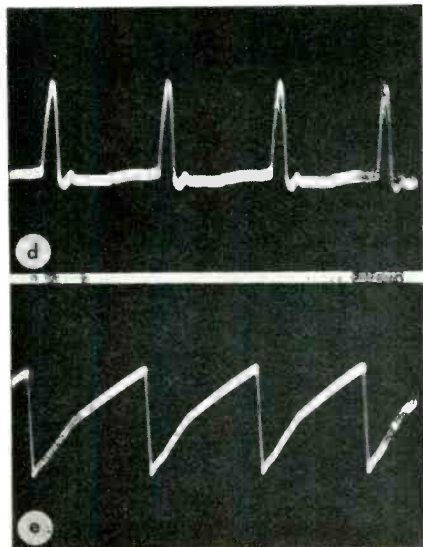
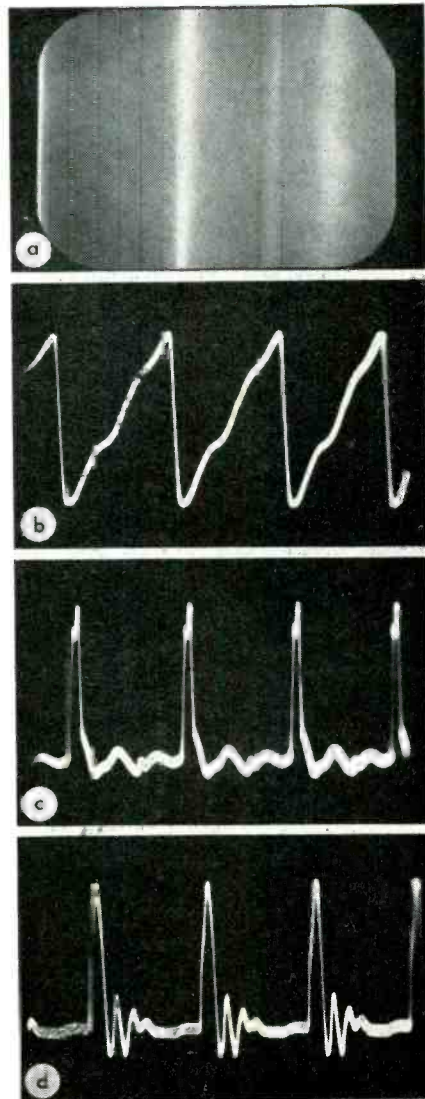


Fig. 4—Trouble in the damper output filter.



# Service Air Conditioning and

## Some Special Types of Meters and Connectors Facilitate

ROBERT G. MIDDLETON,  
SIMPSON ELECTRIC CO.

• In a preceding article, we have seen that volt-ohm-milliammeters and vacuum-tube voltmeters are basic instruments used in testing the electrical systems of refrigeration and air-conditioning units. Tests for insulation resistance and leakage resistance between the wiring and the cabinet, and at other points, were discussed in this connection. In addition to these resistance measurements, it is often necessary to make current and power measurements. Current measurements are often made in checks of compressor-motor operation.

The motor is rated for a specified number of amperes of ac current flow. If measurement shows that the actual current exceeds the rating of the unit by more than 15 per cent, it is indicated that the motor is faulty, or that the compressor is overloading the motor. Current measurements can be made with a v-o-m or vtvm and a 1-ohm power resistor, as illustrated in Fig. 1. The v-o-m is operated on its ac volts ranges, and, as Ohm's Law shows, will indicate a number of volts equal to the current flow in amperes. That is, a 4-volt drop across a 1-ohm resistor will be produced by a current of 4 amps. It is good practice to make the initial test on a high-voltage range, to avoid possible damage to the instrument in case the motor is drawing excessively heavy currents.

Fig. 1—A standard meter, shunted across a 1-ohm resistor, can be used as an ac ammeter.

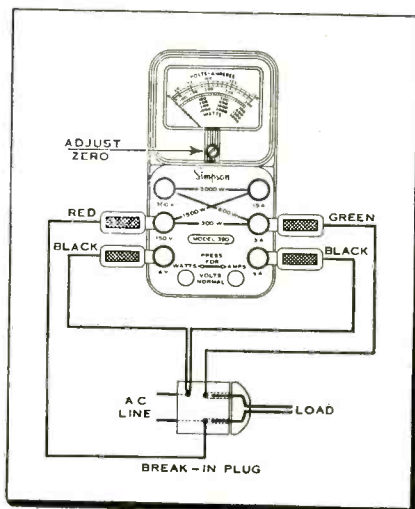
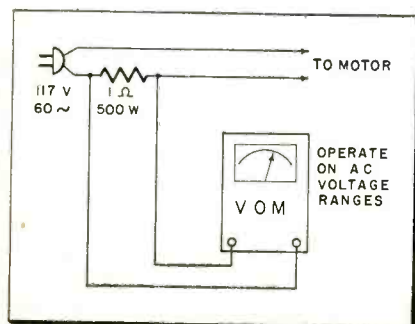


Fig. 2—A "break-in" plug used with a meter avoids inconvenience of changing connections.

Specialized ac ammeters are available for such tests, as illustrated in Fig. 2. This type of instrument is particularly useful in refrigeration and air-conditioner tests, because it provides the technician with an ac voltmeter, ac ammeter, and an ac wattmeter in a single compact case. Fig. 2 also shows the circuit arrangement of a "break-in" plug, which provides operating convenience with this type of instrument. However, conventional test leads can also be used, if desired.

The break-in plug provides both series and shunt connections of the instrument to the line, so that voltage, current, and power measurements can be made rapidly by merely pressing buttons on the front-panel of the instrument. Such break-in plugs, which can be excellent time-savers, are available as standard accessories.

### Slow Motor Starting

When there is no fault in the motor or compressor, slow or erratic starting is sometimes caused by low line voltage at the motor terminals. Hence, the technician will frequently wish to make ac voltage checks at this point. Low terminal voltage is sometimes due to poor electrical

contacts in the external wiring, or to a faulty power cord. If it is found that the motor terminal voltage is less than 105 volts, the cause should be investigated.

The power consumed by the motor is another key indication of trouble. The watts taken by the motor during a test run are usually measured at pressure-gauge readings of 0, 50, 100, 150, and 200 lbs. (More will be said on the matter of these pressure readings later.) Typical refrigerator motors take from 90 to 150 watts in normal operation, but defects in the motor-compressor system result in abnormally high power consumption. Charts are available which indicate the power which should be consumed at each pressure-gauge reading.

The heaviest power consumption (approximately ten times normal), occurs when the motor winding is shorted or when the compressor is jammed. A power consumption approximately five times normal indicates that there may be air in the system, inadequate air circulation about the condenser, or excessive friction in the mechanical system.

### Pre-Installation Check

The ability of a line to deliver the large starting currents that are required can be conveniently checked prior to the installation of a unit by means of a line current-capacity tester, such as illustrated in Fig. 3. The largest currents normally encountered are these starting currents. Always more than the running current, they may be five or more times greater in value. When the load on a motor is increased, so that the motor slows down, the current increases correspondingly. When the rotor or armature is kept from turning at all while power is applied, the current demand is maximum. This current value and the starting current value are approximately the same, and they are referred to as the *locked-rotor current*. Thus, the locked-rotor current is considered to be the maximum current value which flows in the circuit as the motor is started and

# Refrigeration Units, Part II

## Tests; Starting Currents; Power vs. Pressure Readings

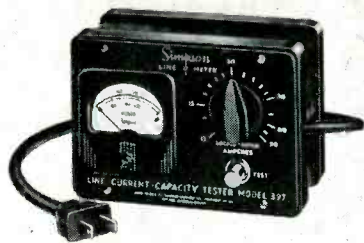


Fig. 3—Typical line current-capacity meter.

also the current demand when the motor is stalled, with power applied.

When current flows through a line, there is always some voltage drop between the power source and the load. The line through which the current passes has resistance and reactance. Hence, some of the source voltage is dropped in supplying current to the load. When more current flows in the line, more voltage is dropped, and less is available to the load.

There are practical limits for permissible drops in voltage. For a 117-volt 60-cycle line, it is generally accepted that a 20-volt drop is tolerable. However, in refrigeration and air-conditioning work, especially with lighter types of equipment, a 12-volt drop is often taken as the tolerable maximum.

### Line Capacity Testers

A line-current capacity tester like the one in Fig. 3 shows the relation between line voltage and load. This instrument measures the maximum current in amperes which a power line can deliver for a 20-volt drop. The power-line voltage is indicated by the meter, over a range of 90 to 130 volts. A knob is provided for checks of the line capacity at various current values; the current value chosen is indicated by the pointer on the knob, and tests can be made for the current values from 13 to 50 amperes.

The meter indication is observed while the *Test* switch is pressed down momentarily. If the meter in-

dication remains the same, or increases, the power line is adequate for the current indicated by the setting of the control knob. But if the indication decreases, even slightly, it is indicated that the power line is inadequate for the given current value. It should be noted that the test switch button must not be held down for more than a couple of seconds, or the load element will be burned out. The load element of the tester is seen in Fig. 4.

The technician should check to see whether there are other appliances or fixtures connected to the same line which is being tested. If there are other appliances on the line, it is necessary to determine the total maximum current which may

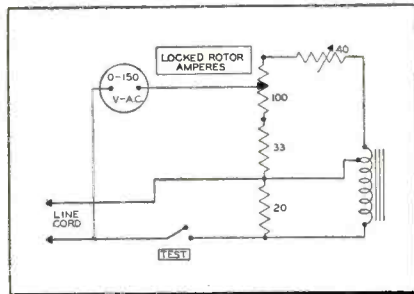


Fig. 4—Line current-capacity meter circuit.

be required, including the starting current for the motor, while the other units are in operation. There are several alternate methods which may be adopted, if the line is inadequate: the technician may remove the other appliances or fixtures from the desired line and connect them to other lines which will accommodate their loads. Existing wiring may be replaced with heavier wiring. Or, a new line may be run to accommodate the motor load.

To return to the matter of pressure readings, which may be an unfamiliar area, it is desirable for the technician to have some sort of pressure indicating device. The most commonly used is called a Bourdon Gauge. This is introduced at the high-pressure side of the refrigerating system, as shown in Fig. 5. Some manufacturers of cooling equipment provide the convenience of a gauge

port for the application of this instrument, but more often the technician will have to tap into the line. Standard valves, such as Tap-a-Line units, are available for this purpose.

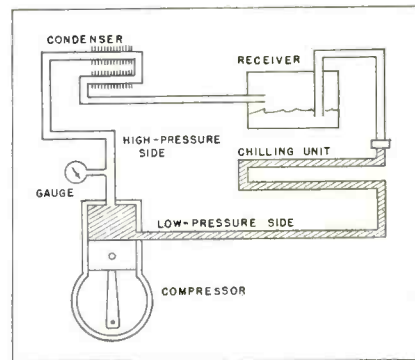
### Pressure vs. Wattage

As already mentioned, either an ac ammeter or ac wattmeter is used in conjunction with the pressure gauge to give a good indication of performance. Various combinations of pressure and wattage readings indicate certain faults. Note that the wattmeter is preferred for this application, as its indication does not tend to be misleading in the event that line voltage is low. When line voltage drops, the iron magnetic circuit in the motor may become supersaturated, with a large drop in output power, a heavy increase in current demand, and a poor power factor.

Under these circumstances, an ac ammeter would lead the observer to believe that the motor was delivering a large value of power to develop a low pressure from the compressor. On the other hand a wattmeter, which indicates the true electrical energy delivered to the motor, would show that the low pressure is accompanied by low power consumption of the motor. The technician would then suspect low line voltage as the cause of inability to develop the rated power consumption and pressure; and line voltage would be measured next.

(Continued on page 40)

Fig. 5—Compression cycle, simplified sketch.



# Phono Fault or TV

WILLIAM THEODORE

This call from a regular customer looked like a cinch. She had a Du Mont 312 in a handsome console cabinet that was in excellent working condition. She had just bought a Webcor 3-speed record changer, equipped with a dual-sapphire-needle Sonotone pickup—and one brand new long-playing record—which she wished to have connected to the TV set. Since the TV receiver already had provisions for connecting a phonograph, she probably could have had her husband do it himself, but preferred to make sure that it was done by a professional technician.

The phono plug was inserted at the rear of the TV set (already provided). The phono ac cord was plugged into an outlet at the rear of the TV chassis, also already there. All that remained was to put on the record, flick the phono-TV switch (already provided, of course, on the front panel), start the changer, and collect a fee. The only difficulty that was at all encountered was in getting the changer into its sliding compartment (naturally, already provided). However, even with this drawer pulled out all the way, there was just barely enough space to get the changer into position. The changer had to be up-ended on one side and juggled into place.

When the record began to play, it showed some pretty nasty distortion, especially on loud peaks. The record was exonerated because it played clean on another player and because other records distorted in the same way on the new changer. This would tend to fix blame on the pickup, stylus or tone arm, especially since TV sound was clear as a bell. Since the changer and all its parts had just been bought under a standard warranty, the customer was advised to take it back.

A few days later she called again to say that the people in the store had got the changer to play beautifully in their place. Would I please come back to hook it up again? Once more the changer was juggled through the narrow opening over the compartment-drawer and set in place. When it was turned on, the distortion was even worse than before, with hardly any of the sound being intelligible and even that was present at very low level. It looked

as though there was a loose connection, poor contact or other trouble in the phono-input or switching set-up, since TV sound was still clean. And I could have sworn that poor tracking was the cause!

Before pulling the chassis, I flicked my finger across the stylus tip lightly. A healthy, loud scraping sound came out of the speaker. If this sound was getting through okay, why would the distorted sounds coming from the record be so low in level that the volume had to be cranked all the way up? A close look



at the stylus-cartridge assembly was in order.

The stylus bar in this ceramic cartridge is a straight cylinder, which is held to the cartridge by a clip. At one end of this bar, the two styli are mounted back to back. When the turnover lever (an extension of the cylindrical bar) is adjusted, it simply rotates the cylinder on its own axis in the clip, reversing the position of the two styli. When the lever was manipulated on this model, it seemed to rock around its axis slightly, rather than rotating on it cleanly. A look at the stylus as it rode on the shiny surface of the disc showed that it was not quite lined up perfectly with its reflection on the record surface. Just a moment to manipulate the cylindrical bar so that it was seated in the retaining clip properly—and the changer worked perfectly!

After it was all over, and I had cautioned the customer to be careful when handling the changeover lever or otherwise handling the stylus assembly, she suddenly remembered that the dealer from whom she had bought the player told her the same thing when she brought it back. (Now she tells me!) Knocking the stylus out of line appeared to be the result of the jarring that was unavoidable every time the player was squeezed back into its narrow quarters.

Techs who have been cashing in on audio sales and installation—as well as service—are looking forward to a profitable fall season. Hi-Fi sales should take a nice jump after the summer doldrums, and those heavily in PA work are signing up local political clubs for the coming election.

Audio manufacturers have been pushing new and improved products into the market thick and fast. HARMAN-KARDON has come up with three units, very attractively designed. The Counterpoint II, Model FM-100 tuner with automatic noise gate nets at \$95. The Trend II amplifier, Model A-1040 is a husky 40-watter with unique speaker selector switch at \$125. HK's Recital II tuner-amplifier, Model TA-120 is a fine unit at \$175.

New RAYVOX packaged intercom, Model AMF-5, uses only a single amplifier, but still allows any station to call any one or all other stations. This amplifier can be turned on by other master stations by remote control.

One of the handiest ideas in record storage is POBINS INDUSTRIES' new "Audio-File," which features 50 transparent plastic containers suspended from slide rods, eliminating the need for record albums.

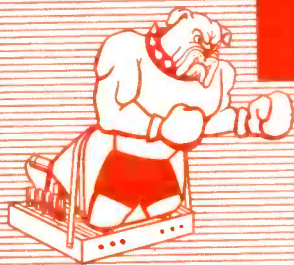
Half-mil stylus is now available for PICKERING "Fluxvalve" phono pickups.

MAGNECORD's high quality tape recorder P-60-ACX simplifies editing and cueing; so they call it the "Editor." Cost is \$765 with carrying case.

AUDIO DEVICES is now making magnetic-coated discs for data recording work.

Techs far removed from metropolitan centers where audio shows are held will be pleased to learn the RIGO ENTERPRISES plans to conduct such shows in seven cities this year: Columbus, O.; Cincinnati; Atlanta; Miami; New Orleans; Dallas; and St. Louis. Eight more cities are planned.

# "Tough Dog"



## Corner



### Difficult Service Jobs Described by Readers

#### Noisy AM Tuning

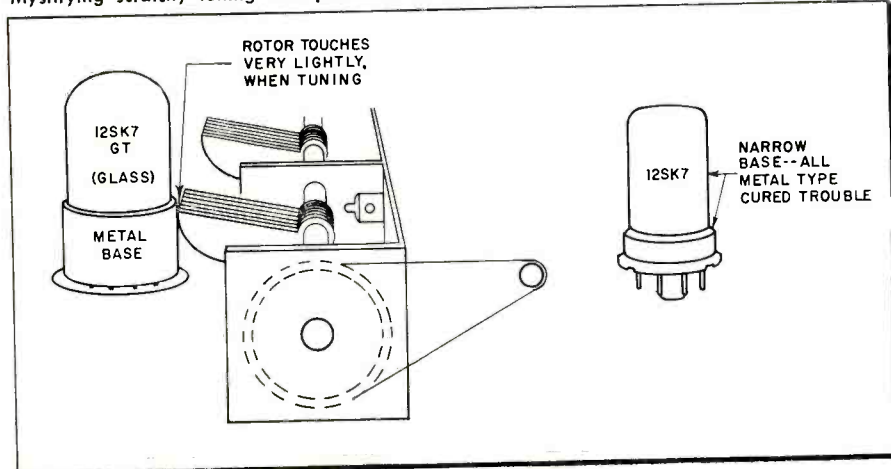
No matter how much studying the radio-TV technician does, every once in a while he will come across a fault involving something not mentioned in "the book." This was one such case.

A customer came in with a very compact Westinghouse model H-127 superhet receiver, complaining of annoying scratchiness while tuning over a portion of the dial. The set had recently been repaired in another shop, the customer reported, and had been restored to normal operation except for the fact that it now tuned noisily. The set was brought back to the first technician with a complaint concerning the tuning, but he had been unable to do anything about it.

First suspicions, of course, were of loose connections on the variable condenser, dirty condenser plates, or contact between the condenser plates. Connections were tightened, the plates were washed, and then they were checked for possible points of contact, which were not evident. Nevertheless, the trouble persisted.

As I studied the crowded layout (see the accompanying illustration),

Mystifying scratchy tuning was produced on this crowded chassis after a tube was replaced.



I noted that the rotor plates came very close to the metal base of the glass GT version of the 12SK7. This tube, obviously a new one, must have been installed recently by the first serviceman who worked on it during the repair that the customer spoke of. Since the all-metal version of the 12SK7 is slightly smaller in diameter at its base, the glass tube was removed and a metal one was put in its place.

Now when the set was tried, all scratch was gone. Light contact between the rotor plates and the base of the 12SK7-GT had been enough to produce the scratch.—Joseph Amorose, Richmond, Virginia.

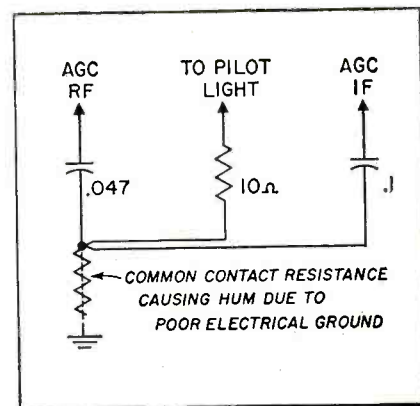
#### Stronger Signal, Worse Pix

On Philco chassis RF 41, model T2151, the complaint was bad vertical sync and a twisted picture. The stronger the signal, the worse the result on the screen. At times, when the trouble was at its worst, about one-third of the screen would be blanked out from top to bottom. Removing the antenna would weaken the picture considerably, as would be expected, but the picture was steady with no appreciable twisting.

#### \$10 For Your "Tough Dog Story"

Have you tangled with a difficult or obscure service problem recently? Write it up, telling us how you licked it. Use drawings to illustrate your explanations wherever necessary. A rough sketch will do as long as it can be followed. Send it to "Tough Dog" Editor, TECHNICIAN, Caldwell-Clements, Inc., 480 Lexington Ave., N. Y. 17, N. Y.

This is usually the symptom of agc troubles, such as a gassy tube, leaky coupling capacitor in the i-f stage, or complete lack of age from the agc source. Since a scope test at the video detector showed a bad 60 cycle hum on the video trace, all tubes in the affected circuit were checked for cathode leak, but without result. Since this set has full-wave rectification, the hum pattern could not be caused by any trouble in the filter circuit as this would



Trouble caused by seemingly good connection.

give rise to 120 cycle pattern instead of the 60 cycle pattern obtained. After some painstaking trouble-shooting, the difficulty was traced to a good mechanical but poor electrical ground at a riveted tie point mount, as shown in the sketch, where the series pilot light resistor is fastened along with two capacitors in the r-f and i-f agc circuit. A good soldered joint at this point completely cured the difficulty.

—M. G. Goldberg, St. Paul, Minn.











# SHOP HINTS

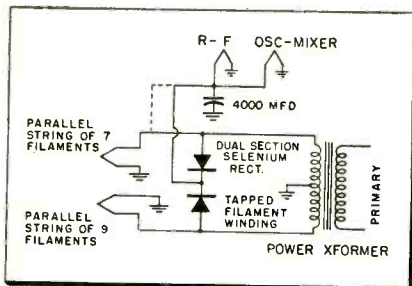
Tips for Home and Bench Service by Readers



## Tuner Filament Trouble

If you ever run into tuner trouble with a GE model 815 TV receiver, perhaps you can save yourself a lot of time by checking filament voltage in the front end. This writer learned the hard way, with intermittently weak reception encountered to varying degrees on different channels, followed by tube substitution of the 6AU6 r-f amplifier and 7F8 oscillator-mixer and other attempts to troubleshoot around these two tubes.

It was finally realized that heater voltages in this tuner can be incorrect in value while all other heater voltages in the set are correct. As a matter of fact, heater voltage for the tuner tubes was down to 4 volts. As the sketch shows, the filament winding of the



Separate dc tuner heater supply gives trouble.

power transformer has a center tap to ground, with each end of the winding supplying a different string of parallel filaments. One side of the winding supplies nine tubes; the other side supplies seven. However the tuner tubes—and only these tubes—are supplied from a dual-selenium rectifier unit and a filter capacitor, which combination in turn connects to the heater winding of the transformer.

It is possible for the selenium unit to start going bad, as it did in this case, thus affecting tuner performance only. Evidently the purpose of this separate dc supply for the front-end heaters is to keep hum out of this portion of the receiver. However, it is possible to connect the tuner tubes directly to the 6.3-volt ac supply without otherwise af-

fecting operation. The original and revised wiring are shown in the illustration, with tuner tubes connected to the side of the winding that was formerly supplying seven tubes. This measure saves the set owner both money and time, as he does not have to wait until the special selenium unit used in the original is ordered and delivered.—*George Stackert, Gary, Indiana.*

## Tight Alignment Cores

On alignment jobs, the service technician is often confronted with threaded alignment cores which just won't be budged by ordinary insulated (plastic or fiber) alignment tools. Sometimes the tool is broken when adjustment is attempted.

If it is possible, remove the core with some tool capable of turning it, and sprinkle a little talcum powder on the core. If it is not possible to remove it, try turning it in a few turns. Then put a little talcum powder inside the coil form. The core can now be backed out until it collects a coat of talc on its threads. This will generally make the core easy to turn with a regular aligning tool.

A word of warning: never use oil or graphite as a substitute for talcum powder in this application. Oil will swell the coil form and may also develop voltage leakage in the coil or associated parts. Graphite will most assuredly develop such leakage. While the measure recommended here is particularly pertinent to cores in i-f coils, it is also useful on other types, including the cores used in auto-radio tuning mechanisms.—*Al Kinckiner, Philadelphia, Pennsylvania.*

## Loose Miniature Tubes

How often have you run into trouble because a miniature tube would not stay seated in its socket securely? This difficulty, which occurs when the receptacles in the socket become worn or loose, can be remedied quickly:

Remove the tube from the defective socket and secure another good socket from your stock. Start inserting the tube into the good socket, but only get it inserted half way. When the tube pins are half way in, give the tube itself a slight twist—just enough so that all of the pins are bent at a slight angle but all in the same direction, so that the spacing of the pins remains the same. Now, when you re-insert the tube in its original socket, you will find that you have a snug fit.—*Theodore Purdy, Washington, D.C.*

## Upside-Down Tube Test

This experience suggests some interesting possibilities for the correct use of tube testers. A Motorola car radio was brought in for repair and restored to perfect playing condition on the bench, then returned to the owner's auto. In a few days, the set was brought back to the store with the complaint that volume would drop when the set was jarred. More jarring would restore the volume.

With the set in normal position on the service bench, nothing could be found wrong with it. All tubes were checked out and found to be in good condition. However, this set happens to mount upside-down when installed in the car, with the tubes pointing downward. Turning the set upside-down in the shop, the intermittent volume could be induced by tapping the chassis. Now, turning the tube checker upside-down enabled a testing of the tubes in the same position they occupied in use in the auto! Sure enough, two tubes showed up as defective in the tube checker when held in this position, although they had checked out in the upright position.—*A. von Zook, Corralitos, California.*

## SHOP HINTS WANTED

TECHNICIAN will pay \$5 for acceptable shop hints. Unacceptable items will be returned. Use drawings to illustrate your explanations wherever necessary. A rough sketch will do as long as it can be followed. Send your hints to "Shop Hints" Editor, TECHNICIAN, Caldwell-Clements Co., 480 Lexington Ave., N. Y. 17, N. Y.

# Inventions For Sale

## Some Suggestions on Handling Your Marketable Ideas

JOSEPH F. VALENTI

(It is not unusual for TECHNICIAN to receive requests for advice from readers who have come up with various service aids and short-cuts which may have some market potential, but who do not know how to go about protecting their ideas or putting them out in salable form. The writer of this article has had some first-hand experience along these lines.)

• A familiar proverb states that Necessity is the Mother of Invention. The practical field technician is often the first man in the radio-TV-electronic industry to come up against the pressure of necessity imposed by new problems in servicing. He gets first crack at solving them and is often in a good position to develop needed instruments.

It is not until after a unit or device has been created that the inventive technician's real problems begin. The experiences of the writer in attempting to promote three of his inventions may be helpful to others also planning such ventures. All three of the writer's inventions are being manufactured. Only two are earning royalties. One of the inventions was lost through carelessness. Of the two earning royalties, one is earning royalties from one manufacturer while other manufacturers marketing similar products have made no arrangement for such payments.

### How Not to Proceed

The three units involved were the Pix-Eye, the Window Feed-Thru model F-2, and a pin guide for seating miniature tubes. The last-mentioned unit, which is the one that went lost, has been manufactured by several companies all holding patent pending claims. The experiences involved in the loss of that device should serve as a good lesson in what not to do.

The pin guide was born out of the necessity that every service technician is confronted with in handling miniature tubes. Since it was simple

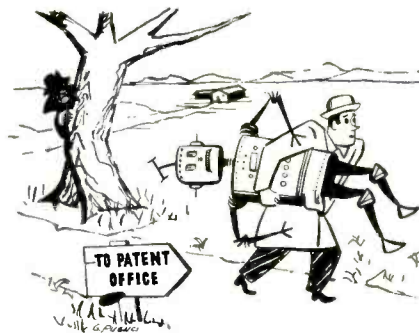
in design and did the job well, it was felt that it could make a good manufacturer's item. Soon after it was conceived, the annual Parts Show was held in Chicago, at which time it was shown to several of the manufacturers exhibiting there. It attracted little interest. About three months later, the item hit the market. Because of its simplicity, anyone who had the chance to see it could have duplicated it easily. It is also interesting to note that the manufacturers to whom the writer took the item were not the ones who began producing it.

### Taking Precautions

Thus, a lesson was learned in protecting ideas. If you have something brewing, do not show it to anyone or tell anyone about it until you have developed it to the point where you are ready to take it to a trustworthy manufacturer in final form. Even then, proceed only after having taken at least some precautionary measures to protect yourself legally. Most manufacturers, incidentally, are genuinely interested in new products with some potential. They have always shown me courtesy, as well as respect for my rights.

There is more than one way to protect an invention. The most expensive and time-consuming is to file for a patent with the U. S. Patent Office. Your chances of getting a patent (after a thorough search of the patent files—which you pay for) depend on how many already protected ideas have some remote resemblance to yours. The writer has spent over a thousand dollars in attempts to patent the three ideas mentioned here, but so far has had no success.

Let us suppose you do manage to receive a patent and then some manufacturer infringes on your claim, making a unit similar to the protected one without paying you royalties. The cost of instituting legal action may very well be more than you can expect to make in royalties, unless your invention is a very unusual one.



There is another less expensive way of gaining some protection, at least until the investment of filing for patent protection becomes feasible. First, of course, you have to have a working model of your brain child in addition to just having it on paper. Then you prepare a document according to the following procedure:

1. Make sure your name and the date the invention was completed appear on it.
2. Include a complete description of the device.
3. Include clear and descriptive diagrams and/or schematics.
4. Include several clear photographs of the completed unit.
5. In the presence of two persons you can trust as witnesses, have the document notarized by a notary public.
6. Seal the document in an envelope and send it to yourself by registered mail.
7. When you receive the envelope, leave it unopened until such time as it may be necessary to use it.

### When to Patent

This document will no longer protect you once your invention is out in the open and headed for the market. However, at that point it will be worthwhile to apply for a patent, and the document will help you to secure a patent in that it will show proof of the date you developed the idea, especially if there are counter-claims.

When you have interested a manufacturer in producing your product, it is good sense to arrange with him to produce as many units as possible at the outset. If he does this when the item first hits the market, it makes it less profitable for other companies to tool up in attempt to make the same item.

When you are ready to bring your idea to a manufacturer, you should be able to present it in complete workable form, not just on paper. Often the working out of a producible model is as important as

(Continued on page 42)

# Proper Uses of Fuses

E. V. SUNDT, CHAIRMAN OF BOARD  
LITTELFUSE, INC.

Table 4. Current ratings of fuses commonly employed for various instrument ranges.

• In electronic circuits, the most common circuit protecting device used is the fuse. The three types of fuses commonly used to protect electronic circuits and associated equipment are the "High Speed," the "Medium Lag," and the "Slo Blo" fuse. Their names describe their blowing characteristics or the speed at which they interrupt current in a circuit. Table 1 lists the types of fuses generally recommended for these blowing characteristics and also includes physical size, range of current ratings, and maximum voltages ratings.

High Speed fuses are used in applications where lag characteristics would be detrimental to the equipment being protected. Examples of this type of equipment are milliammeters and other instruments. The Medium Lag fuse is by far the most widely used in electronic applications. In communications receivers, aircraft electronic equipment, etc., both 3AG and 5AG fuses are used. Slo-Blo fuses are used primarily in conditions where high initial pulses are generated from high capacity circuits or inductive pulses. This type of fuse is also used in circuits having transient pulses which do not damage the equipment. These fuses are designed to withstand transient pulses and to give maximum protection for abnormal conditions.

The electronics industry is somewhat different than most industries

Fuse Rating (amp)	Max. Load (MA)	Voltmeters (Ohms per Volt)	Milliammeters (All Magnetic Type Movements)	Milliammeters (Thermocouple Types)
1/500	2	Over 1000	Galvanometers	0-0.1 to 0-0.5
1/200	5	Over 1000	Galvanometers	Up to 0.1
1/100	10	1000	Up to 0.1	0-5 to 0-10
1/32	25	500-1000	0-1 to 0-10	0-10 to 0-25
1/16	60	100-500	0-10 to 0-25	0-25 to 0-60
1/8	100	20-100	0-25 to 0-75	0-75 to 0-115
1/4	200	10-20	0-75 to 0-150	0-115 to 0-200
3/8	300	5-10	0-150 to 0-250	0-200 to 0-300
1/2	400	3-5	0-250 to 0-350	0-500 to 0-400
3/4	600		0-350 to 0-500	0-400 to 0-600
1	1000		0-500 to 0-750	0-600 to 0-1000
1 1/2	1500		0-750 to 0-1000	0-1000 to 0-1500
2	2000		0-1000 to 0-1500	0-1500 to 0-2000
3	3000		0-1500 to 0-2000	0-2000 to 0-3000
5	5000		0-2000 to 0-4000	0-3000 to 0-5000

in that a great deal of its fusing is for equipment. The other type of fusing does enter the picture occasionally, such as in the automobile radio, TV circuits, battery chargers, etc. Fuse sizes usually used to protect insulated copper wire of different sizes are given in Table 2.

## Power Supply Fuses

Perhaps the greatest number of fuses used in electronic equipment are in the 115v or 230v lines feeding the equipment, usually at the power supply. The power supply rating in watts for 115v and the Medium Lag fuse that would be used are given in Table 3.

The question often arises as to what type of fuse should be used, particularly in view of the fact that the Medium Lag fuses are usually one-half to one-third the cost of the Slo-Blo fuses. The choice is usually dictated by the amount of surges that

will be encountered, especially in circuits subject to switching. This explains the comfortable margin between operating current and rated current of the fuses in Table 3. It is sometimes possible to cut down this margin by the use of Slo-Blo fuses that absorb the surges without blowing, and in this way, by working closer with a means of protection, the equipment can run hotter in normal service, with an appreciable saving in cost. In most cases, however the Slo-Blo fuses are used where high inductive or capacitive surges, which would blow the Medium Lag fuses or induce failure due to cyclic fatigue, are present.

## Intermittent Currents

Cyclic fatigue is also a possibility when fuses are used to protect vibrators or choppers. The intermittent character of the current flow is hard on simple element fuses, and the Slo-Blo fuses, which usually have provision for taking up expansion and contraction within the element of the fuse, give better service.

The fusing of instruments is quite common in the electronic industries. The fuses generally used for various instrument ranges are listed in Table 4. The thermocouple type meters are necessarily fused more closely than meters employing the D'Arsonval type of movement.

Most fusing errors are made because of inadequate information about the characteristics of the fuses. Since the fuse is a heat-operated device, its nature is somewhat similar to that of the incandescent lamp. This is most evident when the fuse

(Continued on page 42)

Table 1. Characteristics of fuses commonly employed in electronic applications.

Blowing Characteristics	Fuse Type	Physical Size	Ampere Ratings	Max. Voltage Rating
High Speed	8AG	1" x 1/4" diam.	1/500-5	32,125,250
Medium Lag	3AG	1 1/4" x 1/4" diam.	1/16-20	32,125,250
	5AG	1 1/2" x 1 3/32" diam.	1-50	32,250
Slo-Blo	3AG	1 1/4" x 1/4" diam.	1/100-5	32V,125V
	5AG	1 1/2" x 1 3/32" diam.	1-30	32V,125V

Table 2. Fuse sizes used to protect various insulated copper wire sizes.

Wire Size (B&S)	Fuse Rating (Amp)
No. 16	10
No. 14	15
No. 12	20-30
No. 10	40
No. 8	50

Table 3. Size of Medium Lag fuse used to protect power supplies for 115v operation.

Power Supply Rating (watts)	Fuse Rating (amp)
40-65	1
65-100	1 1/2
100-150	2
150-250	3
250-350	5
350-450	6

# Latest Test Equipment

## Precision POCKET VOM →

Compact enough to fit into a pocket or tube caddy, a new 20,000 ohms/volt multimeter, Model 110, provides 6 dc and ac voltage ranges plus 5 dc current, 3 resistance and 6 decibel ranges. Extremes of voltage measurement are made possible by low (1.5 v full scale) and high (3,000 v full scale) ranges. Current ranges are available up to 600 ma and broad db ranges from -20 to +70. Only 5 $\frac{1}{8}$  in. high. Available at distributors at \$32.50 net, in vinyl case. Precision Apparatus Co., Inc., Glendale 27, N. Y. (TECHNICIAN No. 8-28)



## Hickok DOT & COLOR GEN.

Substituting for the station signal, Model 660 portable generator provides 3 types of patterns for checking or adjusting monochrome and color TV receivers: white dot, white line cross-hatch, and color bar. All frequencies are stabilized by crystal control. Direct video output available for any pattern, or r-f on Channels 2 through 6 with 60 percent modulation, at an output impedance of 300 ohms. Also features choice of positive or negative black, variable sync-to-video ratio, video output from 0 to 4 v, r-f output variable from 0.001 to 0.05 v. Includes instruction book, crystals and guarantee. Hickok Electrical Instr. Co., 10523 Dupont Ave., Cleveland 8, Ohio. (TECHNICIAN No. 8-34)

## Winston FS METER

Special features test antennas for bandwidth as well as signal level, with special provision for color TV antenna testing, on the Win-Tronix Model 330 wide-band field strength meter. Operates on UHF and VHF. Provides 5 direct-reading ranges from 10 to 100,000 microvolts. Antenna bandwidth and alignment for color reception may be tested in absence of a color signal. Dealer net is \$129.95. Winston Electronics, Inc., 4312 Main St., Philadelphia 27, Penna. (TECHNICIAN No. 8-32)

## Kay SWEPOSCILLATOR

Designed for TV-FM service use, Ligna-Sweep Model C is a low-cost laboratory quality all-electronic sweep generator. Six switched bands and direct-reading dial cover continuously from 30 to 220 mc on fundamentals with 1 v output into 75 ohms. Sweep width is variable to at least 15 mc, up to 20 mc on VHF bands. Also provides sweep output from 100kc to 12 mc for AM and FM alignment, with beat frequency output of 0.25 v into 75 ohms. Kay Electric Co., 14 Maple Ave., Pine Brook, N. J. (TECHNICIAN No. 8-35)

## Precise POWER SUPPLY

Redesigned for greater ruggedness and convenience, the manufacturer's line of supplies provides front-panel control for adjustable voltage output. Models are available with the following ranges: 2,500, 5,000, 10,000, 15,000, and 25,000 volts. Output is well-filtered dc. Also available are regulated models to offer close stabilization against line and load changes. Large 6-in. mirror scales show exact voltage on 1% kilovoltmeters. Precise Measurements Co., 942 Kings Hwy., Brooklyn 33, New York. (TECHNICIAN No. 8-33)

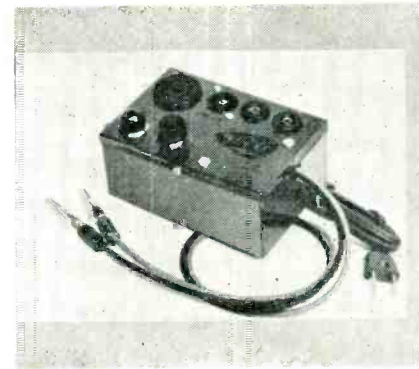
## T-T AUTO. TUBE TESTER →

Applying automation techniques to tube testing, the DynaMatic Model DM456, mutual conductance checker, uses perforated plastic cards to set up socket connections and tube voltages automatically. Technique is reported to enable complete check of tubes in a set in 15 min. No wait for new roll chart to be issued for new tubes. New plastic cards are issued by manufacturer as soon as tubes are announced. Portable. \$125 net. TeleTest Instr. Corp., 121-08 14th Rd., College Point, N. Y. (TECHNICIAN No. 8-29)



## Seco DUAL TESTER →

Twin-purpose service aid functions as a low-resistance filament continuity checker and a 90-volt bias supply pack. Well-filtered and isolated dc useful for alignment work, voltage substitution and as color-killer bias in work on color sets. Continuity checked on all tube types without removal from socket as well as other low-resistance circuits, such as antenna wire and line cords, pilot lamps, switches and contacts, speaker coils, etc. \$12.95 net. Seco Mfg. Co., 5015 Penn Ave. S., Minneapolis 19, Minn. (TECHNICIAN No. 8-31)



## Heath ELECTRONIC SWITCH →

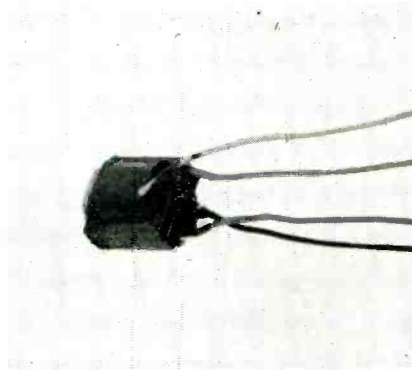
Completely redesigned version of Model S-2, S-3 allows simultaneous oscilloscope observation of 2 input signals by reproducing both signals in rapid alternation at its output. Four switching rates may be selected by a panel switch. Gain is provided for both signals, and may be varied independently. Frequency response is plus or minus 1 db from 0 to 100kc. Sync output provided. For simultaneous observation of input and output of amplifiers, etc. Heath Co., 305 Territorial Rd., Benton Harbor, Mich. (TECHNICIAN No. 8-30)



# New Tubes & Components

## Merit TRANSISTOR XFRMRS →

Series of five tiny transformers for transistor circuits feature efficient nickel alloy cores and flexible coded leads. The A-2700 output type (an exact replacement for Regency TR-1 portable) weighs 1 oz., lists at \$3.60. A-2720 input is \$10; A-2740 interstage is \$9; A-2741 interstage is \$7; and A-2760 output is \$6.50. Latter four weigh only 0.08 oz., measure  $1\frac{1}{2}$ "H x  $\frac{3}{8}$ "W x  $\frac{3}{8}$ "D. All have bobbin windings and open type mountings. Merit Coil Products Co., Inc., 4427 N. Clark St., Chicago, Ill. (TECHNICIAN No. 8-23)



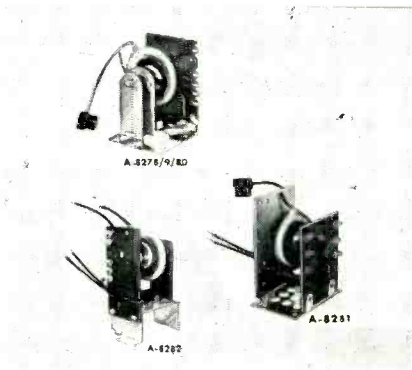
## Mallory CAPACITORS →

"Gem" series plastic tubular capacitors are used for by-pass, coupling and buffer applications. A unique feature is that the case is seamless, and is molded separately, to avoid stressing or deforming of the capacitor cartridge. The case is made of high grade mineral-filled phenolic material, which will not distort, burn or soften when heated. Those rated 600 volts and higher are impregnated with mineral oil. Lower voltage units are impregnated with wax. P. R. Mallory & Co., Box 1558, Indianapolis 6, Ind. (TECHNICIAN No. 8-17)



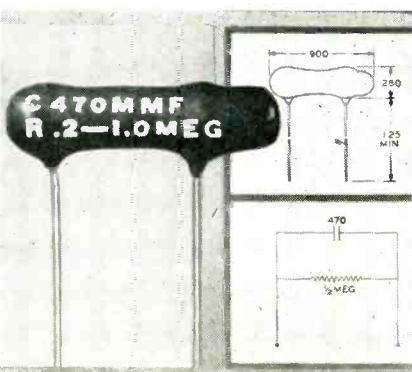
## Stancor FLYBACKS →

Five replacement flybacks for Arvin TV sets are exact duplicates electrically and physically of the Arvin parts they replace. The A-8278 replaces Arvin E-40117; A-8279, replacing Arvin E-41024; A-8280, replacing Arvin E-42721; A-8281, a replacement for Arvin E-24681; and A-8282, replacing Arvin E-41852. The five flybacks provide replacements for 25 chassis and 73 models. Bulletin No. 515 gives full information. Chicago Standard Transformer Corp. 3501 W. Addison St., Chicago 18, Ill. (TECHNICIAN No. 8-16)



## Centralab R-C UNIT →

Single unit resistor-capacitor that requires only the space of a tubular capacitor alone is called "TUBE-R-Cap." It is described as perfect for antenna line applications. Maximum length is 0.900" maximum with an approximate diameter of 0.280". It is rated as 470  $\mu$ f; GMV-1500 volts ac, resistance  $\frac{1}{2}$  megohm nominal,  $\frac{1}{2}$  watt. The TUBE-R-Cap body is of ceramic, impervious to moisture, unaffected by heat, vibration. Centralab, Div. of Globe-Union, Inc., 900 E. Keefe Ave., Milwaukee 1, Wis. (TECHNICIAN No. 8-22)



## RCA RECEIVING TUBES

A multi-unit tube, 6CH8 for b & w and color TV, and a beam power tube, 6CB5-A, especially for color receivers, have been introduced. The 6CH8 contains a sharp-cutoff pentode and a medium- $\mu$  triode in one envelope. Pentode may be used as an i-f amplifier, video amplifier, agc amplifier, and reactance tube. Triode unit is suited for low-frequency oscillator, sync-separator, sync-clipper, and phase-clipper circuits. The 6CB5-A is for horizontal deflection amps. RCA Tube Div., Radio Corp. of America, Harrison, N. J. (TECHNICIAN No. 8-19)

## Workman PHONO PLUG

Phono plug model PP especially designed to eliminate soldering is easily attached in one minute. The solderless phono plug can be used with any coaxial cable or shielded wire commonly used in audio. The curved finger pull allows easy insertion or removal without undue stress. Installation is accomplished by first forcing the center conductor of the cable or wire onto the sharp pin of the solderless phono plug and then tightly crimping the side tab over the exposed braid of the cable. Workman TV Inc., 309 Queen Anne Rd., Teaneck, N. J. (TECHNICIAN No. 8-18)

## Walsco SWITCHES

New switch display is virtually a self-contained department in a few square feet. The compact unit holds an adequate supply of 47 different types of electronic and all-purpose switches, and provides ample room for adding stock. According to the company, its design enables the service tech to quickly spot and select the switches he needs from the samples mounted and identified on the front panel. For further information write to: Walsco Electronics Corp., 3602 Crenshaw Blvd., Los Angeles 16, Calif. (TECHNICIAN No. 8-20)

## Raytheon PIX TUBES

Three additions have been made to the replacement line of TV pix tubes. The 8DP4 electrostatic focus, magnetic deflection type carries a suggested list of \$19.95. The 14QP4 electrostatic focus, magnetic deflection tube lists at \$30. The 20CP4B is a magnetic focus, magnetic deflection aluminized type with a list of \$44.25. All three are designed for use with an external ion trap of the single field type. Raytheon Mfg. Co., Receiving & Cathode Ray Tube Operations, 55 Chapel St., Newton 58, Mass. (TECHNICIAN No. 8-21)

# New Electronic Products

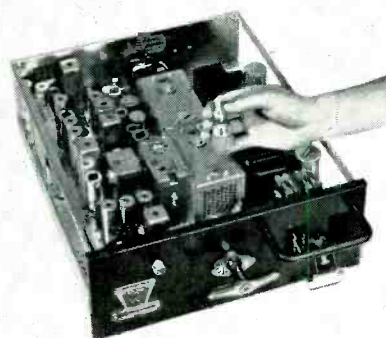
## Eico HI-FI PREAMP →

Hi-Fi preamp features 5 all-feedback low distortion equalizations, high and low end feedback filter circuits on all inputs, and variable turnover feedback tone controls. There are 2 magnetic cartridge inputs, 4 high-level and 3 low-level inputs. Frequency range is  $\pm 1$  db 8-100,000 cps. Model HF61 (with power supply) is \$29.95, kit; factory wired, \$44.95, Model HF61A (without power supply) is \$24.95, kit; factory wired \$37.95. Electronic Instrument Co., Inc., 84 Withers St., Brooklyn 11, N. Y. (TECHNICIAN No. 8-8)



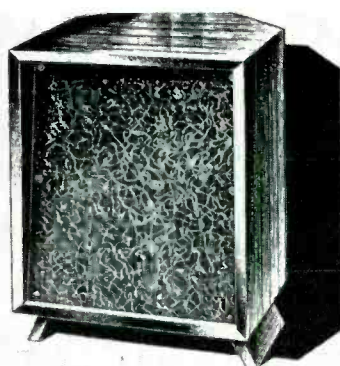
## Motorola 2-WAY RADIO TUBE →

Type ML2C39M r-f power output tube for 450-470 mc transmitters has several times the useful life of previous types. Communications range of mobile radio units is sustained for a proportionally greater time. Introduced in conjunction with other improvements in the new universal 6/12 volt TWIN-V radiophones, the ML2C39M tube is a direct replacement for the type 2C39A tube used in manufacturer's earlier 450-470 mc transmitters. Motorola Inc., 4501 W. Augusta Blvd., Chicago 51, Ill. (TECHNICIAN No. 8-3)



## University ENCLOSURE →

The Tiny-Mite is claimed as the smallest cornerless-corner horn-loaded enclosure for both 12 in. and 8 in. extended-range speakers and multi-speaker systems employing an 8 in. woofer and tweeter combination. Employing the horn-loaded phase-inversion principle, it is completely self-contained and may be placed in room and ceiling corners or along wall. Design permits mounting all speakers from front of enclosure. University Loudspeakers, Inc., 80 S. Kensico Ave., White Plains, N. Y. (TECHNICIAN No. 8-2)



## IR "PAK-FONE" →

A hand carried 2-way portable radio, Model H/M, measuring only 10 x 4½ x 9¾ in. and weighing only 11 lbs. complete with batteries features loud-speaker operation, relay-operated squelch system, volume control and an on-off light. Connector is provided for external power supply. Performance of the H/M Pak-Fone reportedly compares favorably with heavier portables and meets all FCC and FCDA requirements. Industrial Radio Corp., 428 N. Parkside Ave., Chicago 44, Ill. (TECHNICIAN No. 8-1)



## GE TRANSISTOR

A new high frequency transistor for technician-hobbyists is priced under \$2. Designated 2N170, it is an NPN type transistor produced by the rate grown process. The first (2N107) in the series of these transistors was a PNP audio type. Both may be used to build an inexpensive, vest-pocket, super-regenerative broadcast receiver. In a typical common emitter circuit the 2N170 has a power gain of 22 db at 455 kc; alpha is 4 mc; maximum collector to emitter voltage is 6 v.; current is 20 ma. Semiconductor Products, General Electric Co., Syracuse, N. Y. (TECHNICIAN No. 8-5)

## Utah COAX SPEAKER

Model G12P5, 12" coaxial speaker with exceptionally smooth response characteristic is rated at 25 watts audio power. Unit consists of 12" woofer using 21.5 oz. Alnico V magnet. Tweeter is full 5 in. solid back and uses 3.16 oz. Alnico V magnet. New high frequency dispersion screen is standard with this model reproducer. Utah Radio Products Corp., Huntington, Ind. (TECHNICIAN No. 8-4)

## BT CLOSED CIRCUIT TV CAMERA

Model TVC-1 package, including vidicon, F-1.9 lens, cable and control generator is \$1995.00. This closed circuit camera provides one high definition video output and two r-f outputs for direct connection to standard TV receivers. All outputs may be used simultaneously and several cameras and any number of receivers may be connected in one industrial TV system. Control generator operates up to 500 ft. from camera, and output signal carries through 2000 ft. of RG-11/U before amplifiers are inserted. Blonder-Tongue Labs., 526-536 North Ave., Westfield, N. J. (TECHNICIAN No. 8-6)

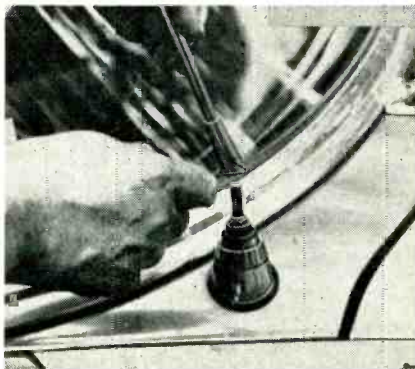
## Webster INTERCOM

A compact and intercom control center called the consollette is particularly suitable for institutional and business needs. It provides intercommunication, music distribution and paging for from one to 48 speaker locations. The dual channel operation permits voice music or alarms to be carried on at the same time. Among the other special features are a built-in AM-FM radio tuner, inputs for a tape recorder, record player and microphone three position telephone-type selector keys, and overload indicator to prevent distortion. Webster Electric Co., Racine, Wis. (TECHNICIAN No. 8-7)

# New Products for Technicians

## Snyder AUTO ANTENNA →

Motorists who face the problem of mischievous persons who break off auto antennas can have the problem solved in 60 seconds. The answer is a chrome plated 3-section replacement auto antenna staff (Model RE-8). The bell-shaped base of the antenna staff merely fits over the old antenna base. A few turns of a special socket wrench, which comes with the replacement model, and the new staff is fixed. Suggested retail cost is \$3.95. Snyder Mfg. Co., 22 & Ontario Sts., Philadelphia, Pa. (TECHNICIAN No. 8-11)



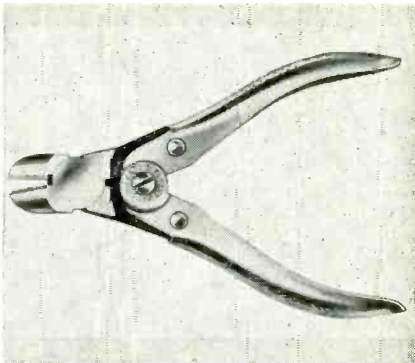
## Electro DC SUPPLY →

Filtered dc power supply, featuring less than 3/4% ripple at top load, is called model "NFA." Unit is a continuously variable source from 0 to 32 volts for loads from 1 to 15 amps, and operates on 115 volt 50/60 cycle input. Circuit breaker, meters and pilot light are included. Excellent for testing and servicing radios, relays, transistors, mobile electronic equipment. Electro Products Labs., 4500 N. Ravenswood Ave., Chicago 40, Ill. Canadian inquiries to Atlas Radio Corp., 50 Wingold Ave., Toronto 10, Canada. (TECHNICIAN No. 8-9)



## Utica PRINTED CIRCUIT PLIERS →

Printed circuit pliers feature compound leverage for easier cutting and one operation cutting and crimping. Formerly a custom tool, the #470-5 pliers is especially useful in the electronic work since it crimps as it cuts to prevent the cut wire from sliding back through the hole of the printed circuit board. The manufacturer has added compound leverage action to this tool to give smooth easy cutting action and reduce operator fatigue. Utica Drop Forge & Tool Corp., Utica 4, New York. (TECHNICIAN No. 8-10)



## Phillips SOLDERING GUN

Heavy-duty performance in a 6-oz. soldering gun is claimed for the model SF-100 Flash. Developing operating temperature in a matter of 4 to 6 seconds, it is ready for operation from any 6 to 12 ac or dc supply, including auto and storage batteries. The pistol-type Flash 100 has no wattage rating as it delivers virtually infinite, trigger controlled, heat limited only by the melting point of the tip and the current capacity of the source. The gun also can be used with 110 volt ac current through the "Flash" HD-520 step-down transformer. Phillips Mfg. Co., Inc., 2816 Aldrich Ave. So., Minneapolis, Minn. (TECHNICIAN No. 8-12)

## Trio GROUND ANTENNA

The "Ground-Master," a ground-installed TV antenna, combines reception of roof-top antenna with a lawn trellis which is an attractive home decoration. It avoids the hazards of a roof-top installation, and removes living room clutter of an indoor antenna. Recommended for metropolitan areas, it has provided reception up to 40 mi. Active elements are treated with a non-conductive covering so characteristics are not affected by moisture or climbing vines. Kit, including mounting stake, lead-in and hardware, lists at \$16.95. Trio Mfg. Co., Griggsville, Ill. (TECHNICIAN No. 8-13)

## Radionic "PIC PROBE"

"Pic-Probe" provides a complete and economical method of checking TV operation without pix tube. It consists of two coils and a network of resistors, capacitors and diodes. Induced into these windings are the yoke H&V currents. A sawtooth is formed from the original pulse, which is then fed to the H&V inputs on the scope, giving a raster. The scope intensity terminal is fed video from the set, producing on the scope face a picture identical to that which would ordinarily appear on the TV set screen. Radionic Industries, 3215 W. North Ave., Chicago 47, Ill. (TECHNICIAN No. 8-14)

## Xcelite REAMERS

New 1/2" capacity hand reamers have both the convenience of handle type reamers and the leverage feature of T-type reamers without the bulk. No. 39 reamers have a 3/16" hole in the shank where a 3/16" screwdriver or pin may be inserted for leverage on extra-heavy work. The new reamers are available in 1" diameter plastic handle or detachable to fit the combination handle in No. 99 driver kits. Xcelite, Inc., Orchard Park, N. Y. (TECHNICIAN No. 8-15)

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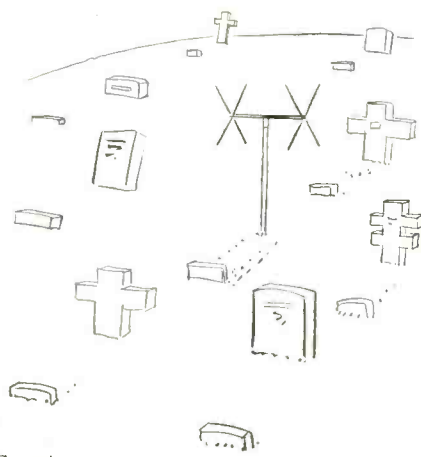
## Refrigeration

(Continued from page 25)

There is also the possibility, however, that a high pressure reading may occur together with a low wattage reading, if the capillary tube is plugged up and a slight over-charge of gas is introduced. In a case like this, the capillary tube is unable to shift gas from the low-pressure side to the high-pressure side, and the compressor is not working against any load. The action involved here may be traced in Fig. 5. The cases just cited are only two examples of how an intelligent assessment of pressure and wattage readings, taken together, can indicate the nature of defects in the system.

It would be helpful if wattage-pressure charts were more generally available to the technician. Where they are not, he must develop a knowledge based on experience with similar units, which comes with time. In any case, good judgment is always required in addition to proper instruments, especially with respect to certain variables.

As examples of the judgment that may be required, ambient temperature and relative humidity will affect the amount of power required by the motor to develop a given pressure under otherwise normal circumstances. At 80 percent relative humidity, most of the power is being expended to reduce the effective humidity. Also, at a high ambient temperature, the heat of the compressed gas cannot be dissipated quite so efficiently. In the case of a refrigerator, the extent to which it is loaded with food is another important factor. Hence, the technician must ask himself whether the load is being handled adequately or not—the wattmeter can only show the amount of work the motor is doing. •



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TYPE	EACH	TYPE	EACH	TYPE	EACH
024	.60	6A56	2.25	7E7	1.20
1AX2	1.15	6A58	1.20	7F7	.90
1B3GT	.95	6A16	.60	7F8	1.20
1H9GT	.80	6A18	1.10	7G7	1.15
1I4	.85	6A4GT	1.10	7H7	.85
1I6	1.10	6A5GT	1.30	7I7	1.20
1IA4	1.00	6A6	.75	7K7	1.20
1IAG	1.00	6A7	.90	7L7	1.15
1I84	1.00	6A5GT	1.25	7M7	.95
1IC5	1.00	6A6	.60	7U7	1.00
1IC6	1.00	6A8	1.20	7R7	1.30
1I95	1.00	6A1GT	.90	7V7	1.30
1IE3	1.00	6A5GT	1.00	7W7	1.30
1IG5	1.00	6BA6	.70	7X7	1.00
1IH4	1.00	6BA7	.90	7Y4	.70
1IAG5	1.00	6BC4	1.60	7Z4	.70
1N5GT	.95	6BC5	1.25	724	.85
1Q5GT	1.15	6BC7	1.40	12A4	.70
1R4	1.00	6BD5	1.70	12A5	.70
1R5	.85	6BD6	1.45	12A6	.65
1S1	.70	6BE6	.75	12A7	1.00
1S5	.75	6BF5	.90	12A8	.70
1I4	.85	6BF6	.70	12A9	.70
1I5GT	1.05	6BG6G	1.85	12AV6	.65
1U5	.80	6BH6	.85	12AV7	1.05
1U5	.75	6BI6	.85	12AV8	1.00
1V	.90	6BK5	1.15	12AV9	1.00
1V2	.75	6BK7A	1.15	12AX7	.90
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2021	1.00	6B6GT	1.15	12A7	.95
2X2	.50	6B7GT	1.30	12BA6	.70
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3A5	.75	6BZ6	.80	12BF6	.75
3AL5	.70	6B7	1.35	12BF6	.70
3AU6	.75	6C4	.60	12B7A	1.00
3AV6	.65	6C5	.80	12B85	1.10
3BA6	.75	6C85	4.50	12B6GT	1.45
3BC5	.80	6C86	.75	12BX7	.90
3BE6	.75	6CG6	1.90	12B7A	1.05
3BN6	1.05	6C7	.90	12B7	1.10
3BY6	.90	6C7	.90	12C5	.80
3BZ6	.80	6CL6	1.20	12C6	1.45
3CB6	.85	6CM6	.85	12L6	.80
3C6	.85	6C6	.85	12A7GT	1.00
3C56	.80	6C6	1.45	12S7	.75
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304	.85	6DE6	.80	12SL7GT	1.00
318GT	1.00	6E5	.85	12M7GT	.95
354	.80	6FG6	.80	12S7GT	.75
3V4	.85	6H6	.75	12V6GT	.80
4B07A	1.30	6J4	3.95	12W6GT	.95
4B7	1.35	6J5	.70	12W6GT	.95
5A78	1.05	6J6	.70	12X7	1.00
5AN8	1.10	6J7	.95	14A5	1.50
5A05	.75	6K6GT	.75	14A7	.85
5A58	1.10	6K8	1.25	14A7	1.00
5A78	1.10	6L6	1.35	14B6	.85
5AY8	1.15	6L6G	1.35	14C5	1.00
5AW4	1.15	6L6A	1.30	14E6	1.20
5AZ4	.60	6L6M	1.75	14E7	1.30
5BK7	1.10	6M7	1.20	14F7	1.00
5I6	.95	6O7	1.00	14F8	1.30
5T4	1.75	6S4	.70	14H7	1.00
5TR	1.10	6SBGT	1.10	14N7	1.00
5U6	.70	6SA7GT	1.00	14O7	.95
5U4GB	.75	6SC7	1.00	14P7	1.30
5U8	1.10	6SF5	.75	14S7	1.25
5V4G	1.00	6SF7	.95	14W7	1.35
5V6GT	.70	6SG7	1.00	19T8	1.20
5W4GT	.70	6SH7	.95	25A5GT	1.30
5X4G	.80	6S17M	.85	25A4GT	1.10
5X8	1.05	6SK7GT	.85	25BK5	1.10
5Y3GT	.60	6SL7GT	1.00	25B6GT	1.45
5Y4G	.65	6SN7GT A/B	.90	25C6GA	1.85
5Z3	.90	6SOT7	.75	25C6	1.45
5Z4	1.25	6SR7	.75	25L6GT	.75
6A7	1.15	6SS7	1.10	25W4GT	.85
6A8M	1.10	6T4	1.30	23Z2	.80
6A8GT	1.10	6T8	1.10	23G6GT	.85
6A11	.70	6U8	1.10	35A5	.75
6AC5GT	1.15	6V6GT	1.50	35B5	.70
6AC7	1.15	6V6	.95	35C5	.75
6AD7G	.55	6V6M	1.35	35L6GT	.65
6AF4	1.35	6W4GT	.80	35W4	.55
6AF6G	1.20	6W6GT	.95	35Y4	.75
6AC5	.80	6X4	1.20	35Z5	.60
6AC7	1.35	6XB	1.20	41	.85
6AH4GT	1.00	6X5GT	.55	42	.75
6AH6V	1.05	6Y6	1.20	43	.85
6A15	1.75	7A5	.95	50A5	.75
6AK5	.80	7A6	.80	50B5	.75
6AK6	.80	7A7	.85	50C5	.75
6AL5	.65	7A8	.80	50L6GT	.75
6AL7GT	1.65	7AC7	1.00	50K6GT	.90
6AN4	1.55	7AH7	1.00	50Y6GT	1.00
6AN8	1.15	7B1	.80	70L7GT	1.55
6AN4	.60	7B5	.70	80	.65
6AN5	3.50	7B6	1.00	117L7GT	2.50
6AN8	1.20	7B7	.80	117N7GT	2.00
6AD5	.75	7B8	.90	117P7GT	2.00
6AG5	.60	7C5	.80	117Z5	.80
6AQ7GT	1.25	7G6	1.00	117Z6GT	1.15
6AR5	.75	7C7	.85	117Z6GT	1.15
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## Horizontal Sweep

(Continued from page 23)

of varying brightness, with darker areas between. Since faults of this nature show up better on a raster without picture content, only the raster is shown with this fault in Fig. 4A. The yoke current waveform (Fig. 4B) shows jogs whose positions correspond to the bright bands on the raster. The first jog on the trace, which is brighter than the rest, corresponds in position to the brighter band on the raster.

Between normal high pulses, the damper waveform (Fig. 4C) shows spurious peaks in the same relative positions as the bright vertical bands in the raster. This points to trouble ahead of the high side of the damper circuit. The amplifier plate waveform is of reasonably normal shape, indicating trouble between amplifier and damper. The capacitor between the damper low side and B-plus was found to have dropped in capacitance value considerably. Replacement restored normal performance.

To observe yoke current waveforms, open the lead going to the low side of the horizontal deflection windings and insert in series a composition resistor of 1 to 3 ohms in value, 1/2-watt or 1-watt. Connect a plain probe from the oscilloscope vertical input across the resistor. Do not ground either scope lead. Exercise care in handling the receiver and test equipment in this operation, as both connections are above ground. Scope sensitivity of 100 millivolts per inch or better should be ample to produce a usable trace from any receiver.

For observations at the damper high side and at the horizontal amplifier plate it is necessary to use a capacitance voltage-divider probe of the style often called a "100-to-1 probe." Pulse voltage at a damper may approach 3,000 volts and at the amplifier plate may reach 6,000, or even more. A resistance divider probe, like that used for measuring high voltage, is useless for waveform observations.

Oscillator output may be observed with a plain probe, but probe capacitance may disturb performance. A low-capacitance isolating probe, the "10-to-1" type, is preferred.

Commence observations with yoke current. Follow back through as many tests as show defective waveforms. When a test shows normal or nearly normal waveform, measure voltages and check circuit elements between that point and the last one

showing a fault. Should yoke current show a good sawtooth while pictures or patterns are deformed, the trouble quite obviously is in the yoke itself.

In analyzing traces, keep in mind the correlation between beam travel across the picture tube and the scope trace. The nearly vertical line of the sawtooth and the sharp, narrow pulse of the rectangular trace correspond to the flyback period. The long diagonal slope of the sawtooth and the horizontal portion of the rectangular trace correspond to the travel of the crt beam from left to right as it traces a single scanning

line. Therefore, defects that appear on these scope traces will appear at corresponding points along the scanning lines of the raster.

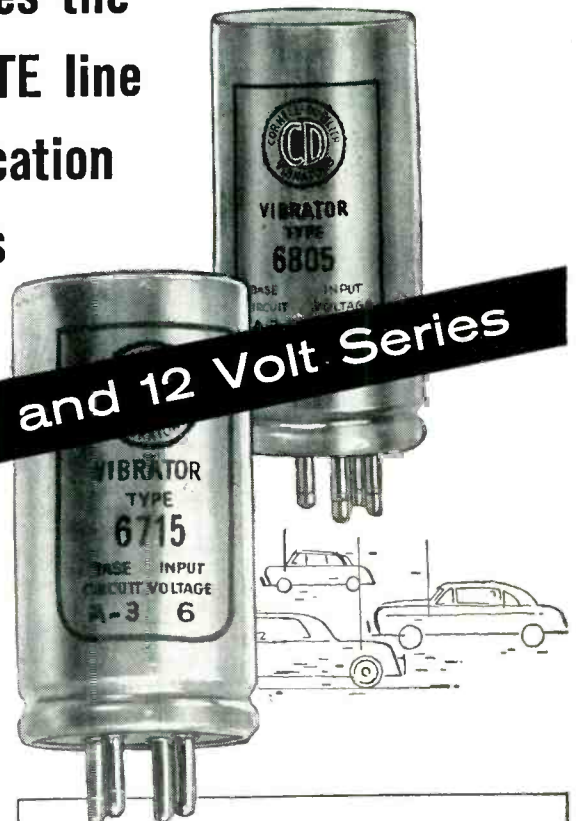
A large percentage of troubles in the horizontal sweep circuits affect flyback action to the extent that high voltage is reduced substantially. When this occurs, nothing can be seen on the viewing screen of the crt, thus eliminating an important potential indication of the trouble. However scope traces taken at the yoke, damper, horizontal amplifier and oscillator continue to show what is happening—or not happening—even though the screen is dark. •

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## Proper Uses of Fuses

(Continued from page 34)

is being worked at its rated load, and even more so when it is operated in the area between its rated load and its blowing point. A rough rule of thumb states that, when a lamp is operated at only 3% higher than the rated current, its life is reduced by 30%. The life of fuses is subject to about the same exponential law, so it is important to avoid operating fuses at their maximum rated load, if possible, because they are weakest there.

One trouble spot is the fuse in TV horizontal sweep applications. One should consider the transient pulses present when applying fuses to protect components of the circuit. In this sort of application, a Slo-Blo fuse having approximately ¼ amp rating is recommended. Use of standard type or Medium Lag fuses results in nuisance blows caused by transient pulses and cyclic fatigue.

Another fusing error is the use of fuses with time current characteristics which do not coordinate with the characteristics of the equipment being protected. An example of this mistake is the use of high speed or even Medium Lag fuses for motor protection, particularly when the motor has high starting surges. It is usually safer to use the Slo-Blo fuse on this type of equipment. •

## Inventions for Sale

(Continued from page 33)

the basic idea. The cost and weight of the materials to be used in final manufacture, the expense of making dies, and the extent to which a product lends itself to convenient fabrication techniques are just some of the factors that play an important role in selling the item to the manufacturer.

Since plastics are so extensively used nowadays, it is well to know that the cost of anything made of these materials depends on the weight of the material used and the expense of the die needed. Two types of dies are in general use: one is for making extruded material, such as tubing and coated wire; the other is for injection molding, used for most irregularly shaped objects and containers. The difference in cost between these two dies is the expense of having them machined. A die for extruded material may cost about \$200, while one for injection molding can run

about \$5,000. Cavities in a die for injection molding represent the number of units that can be produced with a single injection. You can see how important it is, in working out the final design of your device, to work toward the most economical form.

Metals are formed in a similar manner—either by extrusion or by stampings. The cost of dies run about the same as those for plastics. If your unit is to be made up of parts, you have an advantage if you are lucky enough—or ingenious enough—to find standard parts that are already available on the market rather than creating the necessity of making up special parts.

If you wish to market the invention yourself, there are many pitfalls. If you attempt to produce the item without sufficient capital and business experience, you stand a good chance of losing both your invention and your money—even if the invention itself is successful. In the latter case, a larger manufacturer may start to produce it less expensively and in larger quantity. You will also have the problem of setting up distribution of your product as against the established manufacturer with already set up nationwide distribution.

With some insight concerning the problems involved in capitalizing on an invention, you may begin to feel discouraged before you start. This brings up a final point: your success in this type of venture will depend very much on how much faith you have in your idea. •

### Safe CRT Flashing

The venerable custom of reclaiming crt's with interelectrode shorts by flashing out the shorts, using the TV receiver's high voltage, has many years of successes behind it to justify its continued practice. However, there is always the danger of damage to the TV set when this measure is applied.

The heavy instantaneous surge of current drawn by the short has burned out more than one 1B3 or 1X2 h-v rectifier. There are some cases in which the flyback transformer itself is damaged and replacement is required due to the sudden demand put upon it.

New devices now reaching the market, handy and inexpensive, permit flashing to be performed without risk to the flyback circuit, since the latter is not used in the process. These flashers work off the low-voltage power supply. They provide a plug-in arrangement for quick handling of the troublesome shorts.

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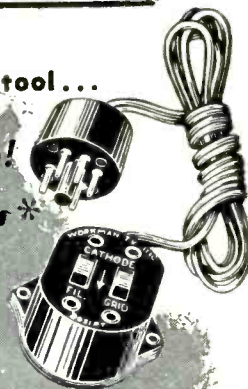


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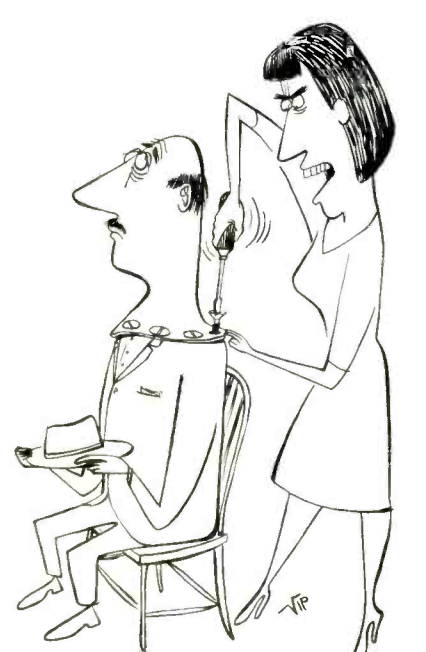


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## Association News

### TESA (St. L.) Boosts Lutz

In its official publication, *TESA News*, Television Electronic Service Assn. of St. Louis, 1724 S. 39th St., St. Louis 10, Mo., reports on a movement to nominate Vincent Lutz, its chairman of the board and present v-p of NATESA, as the next president of NATESA. While the office of national president is presently occupied by Frank Moch, the proposal is not in opposition to him. The move depends on constitutional changes that will detail separate duties for the president and for the executive director, with the latter post going to Moch.

### ARTSD (Columbus) Ads

Associated Radio-TV Service Dealers' Assn., 2552 N. High St., Columbus, O., is publicizing itself and its members with its first ad in the yellow pages of the local telephone directory in which all members are listed along with the association's certified emblem. It's out to make the emblem the mark of dependable service in its area.

### RTGLI Electronics Fair

Brochures have been sent out to manufacturers and other potential exhibitors at the Electronics Fair to be staged December 6-8 by the Radio & TV Guild of L. I., Box 87, Bethpage, L. I., N. Y. The projected show will be held at the Long Island State Agricultural College, where an unobstructed exhibit hall that can accommodate 50 to 75 booths is available. Three lecture halls plus complete technical facilities will be provided.

### WCATT Elections

Election of officers for the ensuing year by the Worcester County Assn. of Television Technicians (13 Austin St., Worcester, Mass.) returned the following to office: Al Stark, pres.; Paul Messier, v-p; Ernest Demers, treas.; Art St. Pierre, secy.; and Edward Cook, bus. agt.

### RTTA (N. C.) Expanding

The High Point Radio & TV Technicians' Assn., 500 Mint St., High Point, N. C., in operation for about 3 yrs., called a meeting in Greensboro to lay the foundation for a group covering the central part of the state. About 30 men from Greensboro and Winston Salem attended. The combined group will

tentatively be known as the Tri-City Technicians' Assn. Temporary officers are Jim Hornaday, pres.; Van Sickles, v-p; Joe Woods, secy.; and C. B. Steele, treas. Address correspondence to Joe Woods, 1708 Spring Garden St., Greensboro, N. C.

## Reps & Distributors

**HEART OF AMERICA CHAPTER** of the Reps have canceled their Sept. 9-12 conference for 1956. They plan to hold a manufacturer-distributor meeting in the fall of 1957.

**NEW ENGLAND CHAPTER** of the Reps has elected **RAY PERRON** a director of the National Board of Governors.

**WCEMA** (West Coast Electronic Manufacturers Assoc.) has elected **L. W. HOWARD** chairman of the Distributor Sales Group.

**MAGNECORD** has appointed **EDWIN CORNFIELD** sales rep for metropolitan N.Y.

**ASTATIC** has named two reps. The upper New York state area will be covered by Paston-Hunter. In Hawaii, Dougherty Enterprises will handle the line.

**PERMA POWER** has named **ALBERT E. MUIR** rep in Washington, Western Montana, Oregon and Western Idaho. **WES ALDERSON CO.** will cover Northern California, Arizona and Las Vegas.

**FANON ELECTRIC** has appointed these new reps: **E. W. BRANDT CO.**, Northern California and Northern Nevada; **SOL LEVIN ASSOC.**, Illinois and Wisconsin; **JACK PERLMUTH ASSOC.**, Southern California and Southern Nevada; **M. K. WIDDEKING CO.**, Washington, Oregon, Idaho and Western Montana.

**ERIE RESISTOR** has named **JACK GOSS CO.** distributor rep in New England.

**OXFORD ELECTRIC** has presented its 1955 rep sales award to **JERRY KOENIG** of Merriam, Kansas.

**BENDIX** has appointed three distributors: **CHASEMARK, DEAN CO.**, Dallas; **SHELL-MUNDAY CO.**, Amarillo; and **RADIO PARTS CO.**, Pittsburgh.

**ROCKBAR** has named **ROGERS ASSOC.** New England rep for **COLLARO** and **GOODMANS, MARSHANK SALES** Southern California rep for **Collaro**, and **APPLESTON & BRERETON** in Northern California for **GOODMANS**.

## New Antennas & Towers

### Channel Master VHF ANTENNAS

The Atlas Super Fan model 314 features elements of seamless 1/2" aluminum tubing. Included is the "Super-Nest" mast assembly which eliminates damaging pressure on cross-arm, and the "Line-Lok," a new device for relieving transmission line tension and protecting terminal connections from straining and tearing. The Atlas is completely "super-sembed" for instant installation without tools or tightening. List price is \$13.89 in single bay and \$29.17 stacked. Another antenna, the Skylark is a completely redesigned version of the Lancer Series. This fringe area line includes a more powerful luxury model, the Super Skylark and an "economy" model, the Challenger Skylark. Challenger Skylark (Model 336) \$14.58 single, \$30.27 stacked; Skylark (Model 337) \$18.20 single, \$37.50 stacked; Super Skylark (Model 338) \$32.50 single, \$65.97 stacked. Channel Master Corp., Ellenville, N. Y. (TECHNICIAN No. 8-24)

### Telco INDOOR ANTENNA

"Switch-O-Matic" is the name of a new indoor TV antenna, a refinement on the basic "rabbit ears" style. Two features that give it power are six-phase tuning and a slide adjustment. The six-phase switch on the front of the antenna's base allows the viewer more opportunity to cancel out standing waves and interference, while the slide adjustment aids in improving antenna circuit resonance. The "Golden Switch-O-Matic Indoor TV Antenna" (Catalog No. A-8140) carries a list price of \$12.95. Telco Electronics Mfg. Co. (Div. of General Cement-Texton American), 919 Taylor Ave., Rockford, Ill. (TECHNICIAN No. 8-25)

### Rohn ROOF TOWERS

The first two in a full line of roof towers are Model TRT60 (5 ft. size) and Model TRT36 (3 ft. size). Hot-dipped galvanized finish and collapsibility for easy shipping and storage are two outstanding features. Designed for sturdiness, these attractive roof towers offer superior type installations where there is no need for great heights. Rohn Mfg., 116 Limestone, Bellevue, Peoria, Ill. (TECHNICIAN No. 8-26)

### Winegard "MINUTE-MOUNT" TOWER

Combination tripod tower and antenna known as the "Minute-Mount" is a factory assembled tripod tower with a high gain antenna for extremely rugged fringe area service, especially terrains with high winds. The package consists of a 10 ft. non-corrosive all aluminum fold-out assembly mast with high gain antenna, attached lead-in, seven insulators, lightning arrester, ground wire and ground rod. It sells for \$37.50 list. Winegard Co., Burlington, Iowa. (TECHNICIAN No. 8-27)

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# Circuit Digest Index Addenda

See complete index in April 1956 issue.

Circuit Digest Nos. 269 to 292 will be found in this issue



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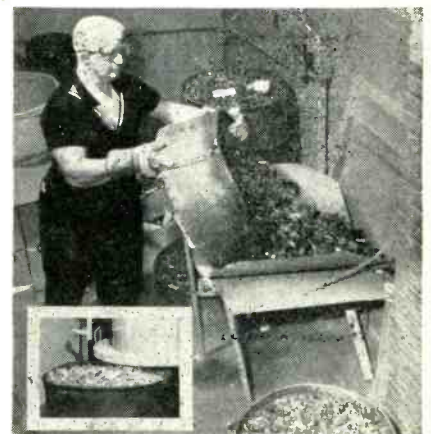
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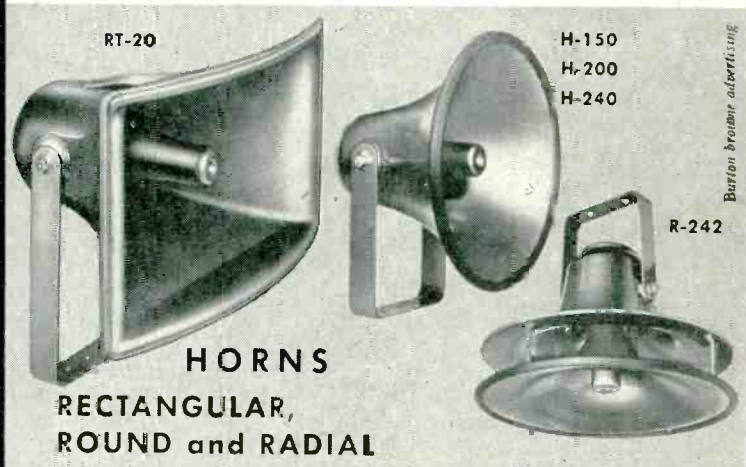
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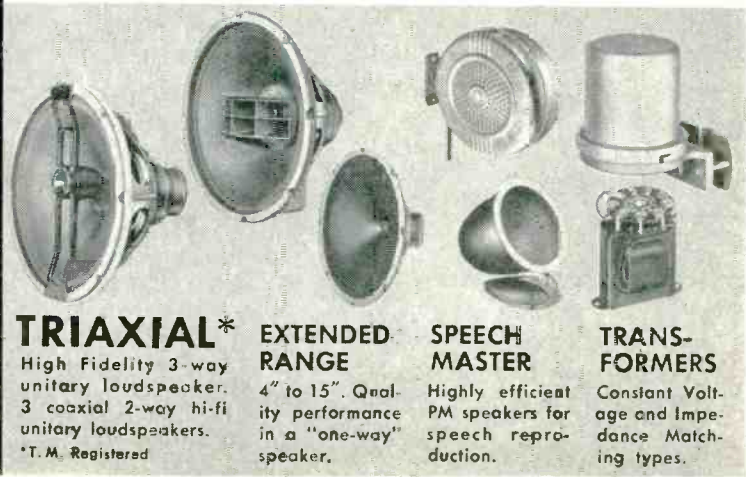
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