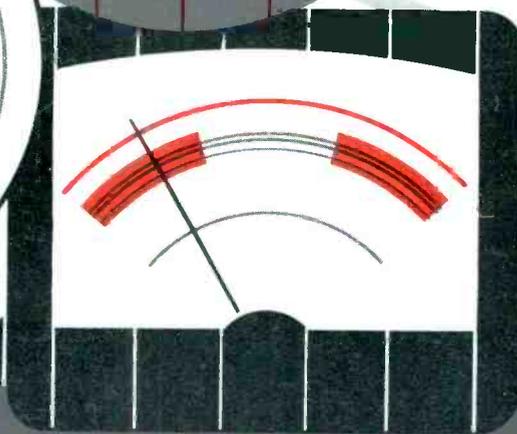
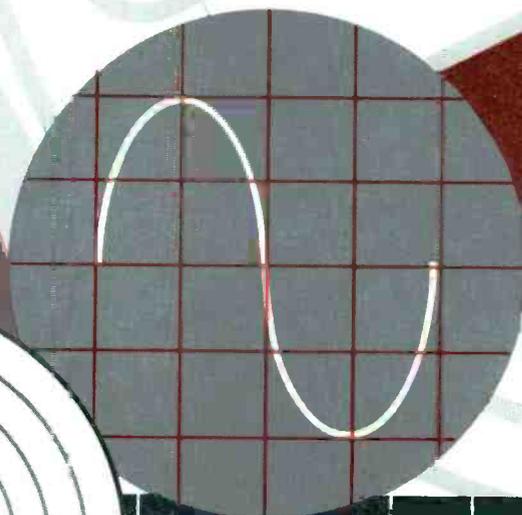


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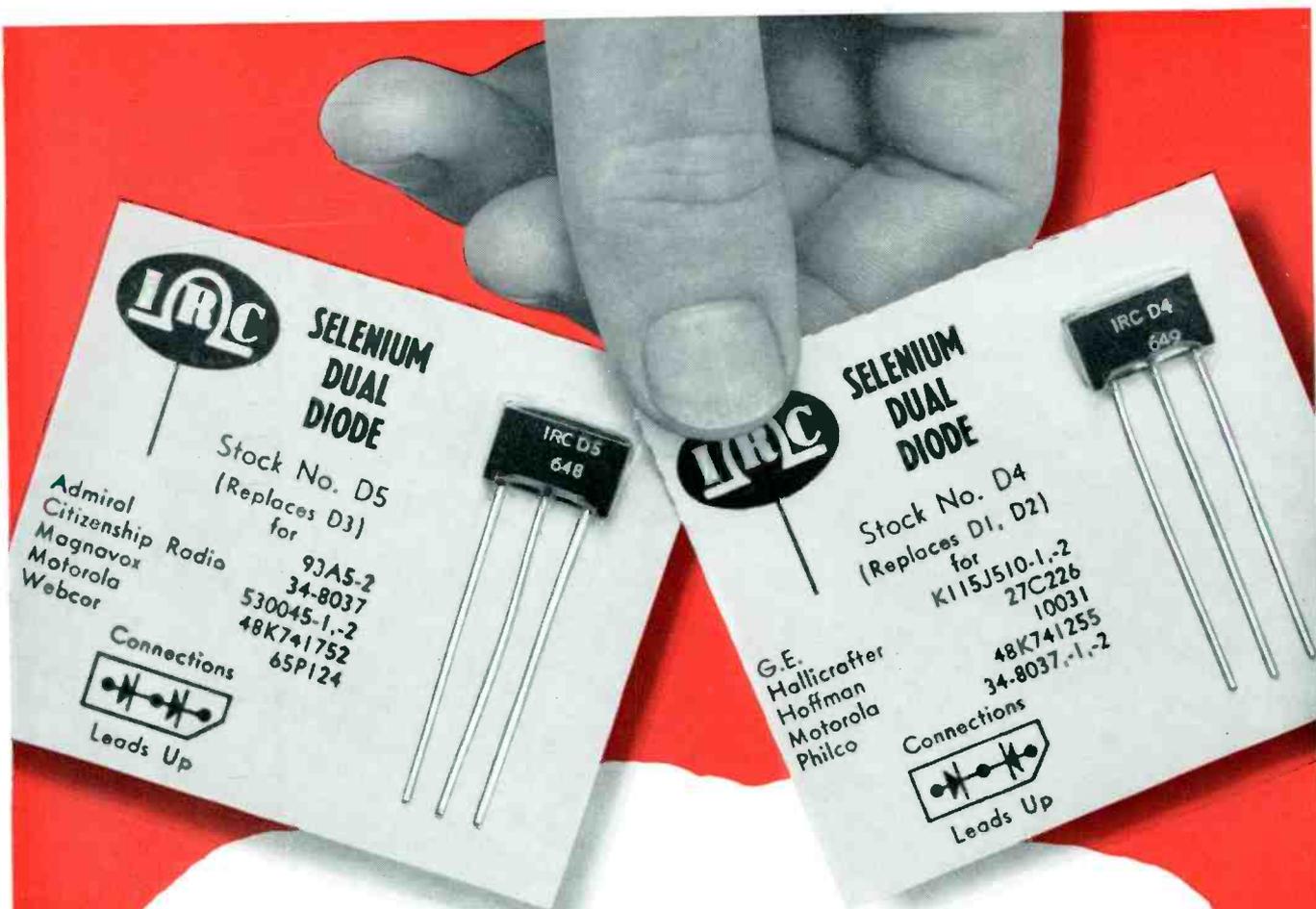
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FRONT COVER

Audio servicing is becoming big business, as detailed in this month's editorial, page 25. The test equipment representation superimposed on a record, tape reel and speaker points up the use of proper instruments for hi-fi troubleshooting. See article starting on page 28.

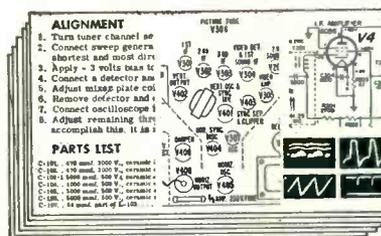
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CIRCUIT DIGESTS





Unidyne? OR Slendyne?

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HOW TO CHOOSE THE RIGHT MICROPHONE FOR YOUR APPLICATION

SHURE engineers recommend Unidynes for best performance and Slendynes where versatility is essential.

In selecting a microphone, you must be careful to analyze your needs very carefully. Microphones are highly specialized equipment, and for full satisfaction it is important that you consider, in advance, the uses to which your microphone will be put. Otherwise, you may be paying for features you don't need, and losing advantages your microphone should have.

Wherever feedback is a problem, the choice of a directional microphone is virtually automatic. Only the directional pickup pattern can effectively reduce or eliminate feedback. Furthermore this pickup pattern greatly reduces the pickup of distracting random noises. For floor stand usage, the directional microphone, with its ultra-cardioid pickup pattern, provides far greater freedom for the performer. In the moderate price range, the UNIDYNE is the perfect microphone choice among directional microphones. It is a uni-directional dynamic microphone, and it reduces the pickup of random noise energy by 67%. It is the ideal selection for use with fine-quality public address systems, and its high output permits its use even with low gain public address systems and tape recorders. It has a smooth frequency response from 50 to 15,000 cps.

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LETTERS

To the Editor

Sleep Teaching

Editor, ELECTRONIC TECHNICIAN:

In your June issue "Random Noise" panel, page 23, you mention a recorder that teaches while you sleep. It's called Dormiphonics. Where can I get more information on this?

ROBERT STUBBLEFIELD

Joplin, Mo.

• Write to Modernophone, Inc., 30 Rockefeller Plaza, New York 20, N.Y.—Ed.

Canadian Association

Editor, ELECTRONIC TECHNICIAN:

A number of technicians in Quebec are interested in forming an association for the protection of the public, and also of the electronic technician. I have read about such associations being formed in the States, and would be interested to know if all these associations have been successful. What respected group can we ask for advice?

OMER GIRARD

Magog, Quebec, Canada

• A dynamic program and active members have produced many successful associations; others have not fared so well. For information on forming an association, contact NATESA, 5906 S. Troy St., Chicago 29, Ill.

Tube Layouts

Editor, ELECTRONIC TECHNICIAN:

I am interested in finding a small book which shows tube layouts and functions for leading sets during the past few years. With tube types changing in different sets today, it's hard to recall which type is used in a particular stage. By the way, I enjoy ELECTRONIC TECHNICIAN very much, and use it on house calls.

HOMER SCHOENING

McAllen, Texas

• There are several tube layout compilations on the market. A series of these is available from John F. Rider Publisher, Inc., 116 W. 14 St., New York 11, N.Y.—Ed.

Literature Request

Editor, ELECTRONIC TECHNICIAN:

Enclosed is a list of literature I would like to receive, as described in ELECTRONIC TECHNICIAN. I want you to know how much we in the electronics service industry appreciate your interest in our success. Keep up the good work.

F. J. WINSHIP

Winship Radio & TV
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(Continued on page 6)



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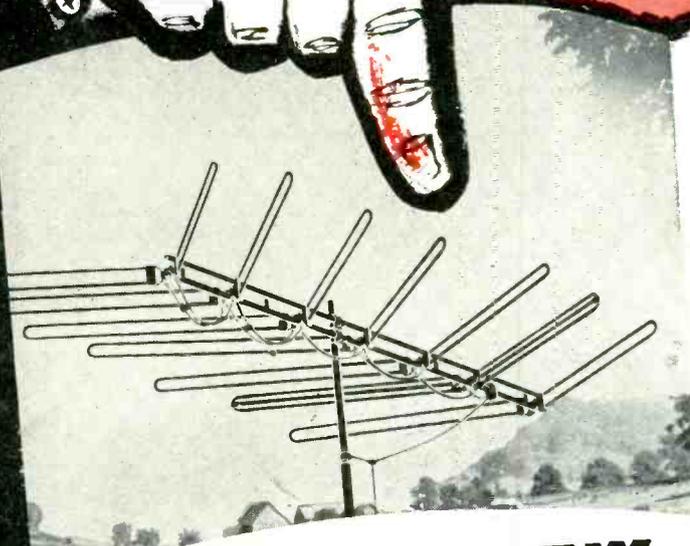
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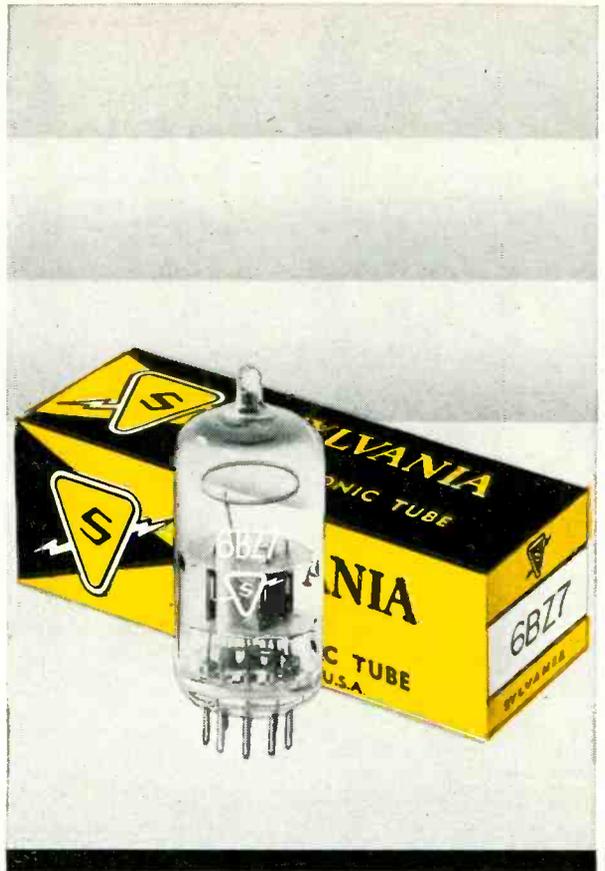
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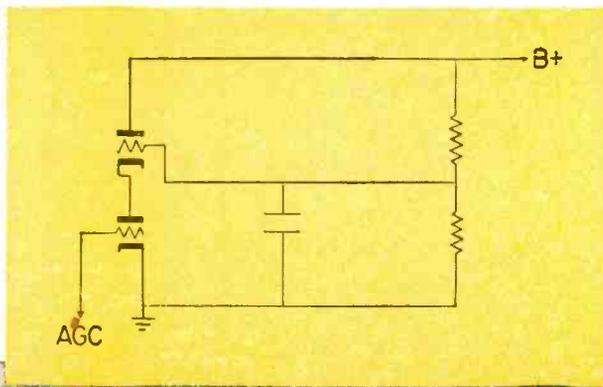
Sylvania

TV Tuner

Tubes



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Simplified schematic is a typical cascode circuit in which double-triode amplifiers are tested for transconductance and plate current under actual operating conditions. In this way, Sylvania offers you maximum assurance of proper circuit performance when you repair TV tuners. Regardless of make or model TV, Sylvania tuner tubes mean dependability backed by industry's most exhaustive dynamic testing program.

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specific number of sections in the receiver. In effect, the presentation is like a spiral—first an overall view of the whole, and then the detailed explanation of each part. The most perfect modern teaching technique. The result—maximum understanding.

Valuable to both the professional technician and the beginner because it is so comprehensive, so accurate and so easy to read and understand. However, it is specifically directed towards those technicians who are in the early stages of their career—and to beginners. Ideal for apprentice training in every service organization which is conducting an on-the-job training program. Perfect to keep handy in the shop for reference. The entire story of black and white television receiver theory will be at your fingertips with this new Rider 5-volume course. There is no similar television course like it anywhere in the free world. Reserve your copies today at your local jobber or bookstore or by ordering direct. Your \$10 investment can easily be the most important you ever made in your entire technical career. #198—soft cover, 5 vols. 590 pages (approx.) \$10.00 per set. 198-H all 5 volumes in a single cloth covered binding, \$11.50.

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(Continued from page 2)

Address Wanted

Editor, ELECTRONIC TECHNICIAN:

Do you have the location of Fada Radio in your files? I need parts for their radios, and am unable to locate them at their old address in Long Island City, N.Y. Thank you for your kind help.

HAROLD T. WOLFE

Wolfe's Radio & TV Service
Salem, Ohio

• Fada Radio & Electric Co. is located at 525 Main St., Belleville, N.J.—Ed.

Jitter Mystery

Editor, ELECTRONIC TECHNICIAN:

Several technicians have been unable to fix this 1953 Model 17 C125 Stratopower GE receiver. On one of our local stations, channel 6, the reception is fine on network programs. However, as soon as a program starts which originates in the local studio, horizontal jitter begins in the upper portion of the picture, and it continues until the next network telecast. This trouble does not occur on any other channel. Why?

BRUCE L. MEADOR

Waco, Texas

• Reader Meador builds a case against the local station, but we suspect the home installation. All sync signals, regardless of program source, originate in the local station. It is possible that a difference in the composite video signal is causing sync-pulse clipping in the set, and the station's chief engineer should be notified of the possibility. However, FCC requirements are strict and tolerances small. Have you tried the set at a different location with a different antenna? If the culprit is the set, and not the antenna or station, check these components: C301, 357; R301, 302, 359; V113, 118.—Ed.

Personal Responsibility

Editor, ELECTRONIC TECHNICIAN:

Congratulations on your splendid editorial in the May issue. The key to the part time problem is, as you state, personal responsibility. There is no room for fly-by-nights in TV service. Nor should the incompetent be given the green light to practice on an unwary public. The widespread demand today for licensing is symptomatic of how the majority of competent technicians feel. As for new blood in TV service, I'm all for it; but let the newcomers realize that the public has some rights too. Their shiny diplomas are no substitute for experience. Until they have sufficient experience working with journeymen technicians, they are not ready to serve the public as bonafide technicians.

HARRY M. LAYDEN

Judd-Bennett Co.
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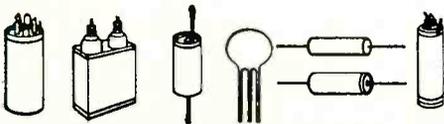
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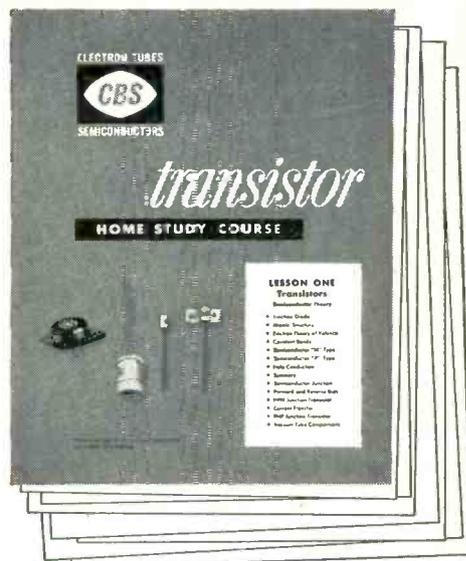
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Editor's Memo

A certain jargon, or trade double-talk, has developed in writing technical articles. High-sounding expressions are often used, at times masking the real meaning. Rare is the writer or editor who hasn't at one time or another fallen into this pitfall.

A recent issue of *Metal Progress* is credited with collecting some of these terms, and giving them a humorous, yet pointed, meaning to interpret what the writer really had in mind. Here are some of the better ones:

"It has long been known . . ."—*I haven't bothered to look up the original reference.*

"Of great theoretical and practical importance . . ."—*Interesting to me.*

"While it has not been possible to provide definite answers to these questions . . ."—*The experiments didn't work out, but I figured I could at least get publication out of it.*

"Extremely high purity, super-purity . . ."—*Composition unknown except for the exaggerated claims of the supplier.*

"Three of the samples were chosen for detailed study . . ."—*The results on the others didn't make sense and were ignored.*

"Accidentally strained during mounting . . ."—*Dropped on the floor.*

"Handled with extreme care throughout the experiments . . ."—*Not dropped on the floor.*

"Typical results are shown . . ."—*The best results are shown.*

"Presumably at longer times . . ."—*I didn't take time to find out.*

"These results will be reported at a later date . . ."—*I might possibly get around to this sometime.*

"The most reliable values are those of Jones . . ."—*He was a student of mine.*

"It is believed that . . ."—*I think.*
"It is generally believed that . . ."—*A couple of other guys think so too.*

"It might be argued that . . ."—*I have such a good answer to this objection that I shall now raise it.*

"It is clear that much additional work will be required before a complete understanding . . ."—*I don't understand it.*

"Correct within an order of magnitude . . ."—*Wrong.*

"It is to be hoped that this work will stimulate further work in the field . . ."—*This paper isn't very good, but neither are any of the others in this miserable subject.*

"Thanks are due to Joe Glotz for assistance with the experiments and to John Doe for valuable discussions . . ."—*Glotz did the work and Doe explained what it meant.*

Al Forman



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At leading electronic parts distributors everywhere.

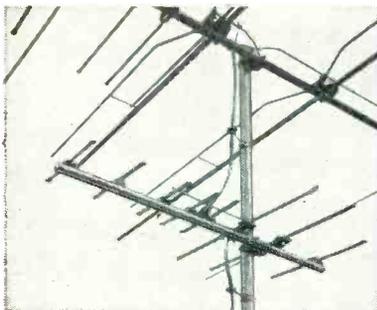
TRIPLETT Model 630 VOM—the proof of 53 years' experience in test instruments.

Triplet Electrical Instrument Company
Bluffton, Ohio



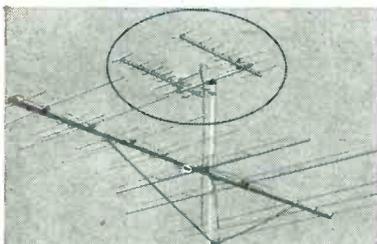
WHAT'S **NEW** FROM

Now...2 Ways to Add UHF to Your Fringe Area Color'ceptor



Here's something really new!

A UHF antenna (Winegard Mod. GG-1) that connects in series with the same lead used for the VHF Color'ceptor. No couplers... no loss... no interaction. Perfect results every time! Can be oriented independently from CL-4 or CL-4X. Same general features as on GG-2 shown below. Completely gold anodized. Only \$7.95.



New UHF Colinear Yagis Model GG-2 mounted with CL-4X Color'ceptor

High gain UHF antenna has 4 col. driven elements, 10 directors, 6 reflectors. Pin point directivity. No minor lobes. Flat frequency response. Can be stacked up to 16 bays for up to 21 db gain. Completely gold anodized. Can be ordered factory peaked to favor your channels. Only \$14.95.

NEWS NOTE: Color'ceptor, the favorite fringe area antenna of professional installers everywhere, is now even better! —NEW TDM insulators. Low loss, unbreakable—NEW special alloy plus extra reinforcing used in reflectors. Four times more durable—NEW sunfast gold finish. Permanently anodized.

... NEW ... SUPER *twilight** TV AREA

FOR THE TWILIGHT* Biggest Advance Yet In Antenna Design!

Something new and wonderful has happened to antennas! Now you get the "whole ball of wax"... mast, lead-in, Antenna, mount... everything factory-assembled—factory-engineered into one simple, integral unit!

- NO loose parts to assemble
- NO wires to strip

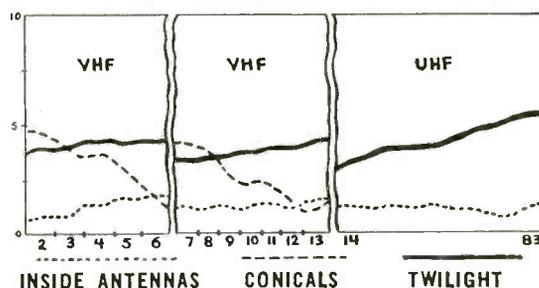
Just take your Twilight out of the box... pop it open... put it up as easy as driving 3 nails... it's as simple as that!

Now you can make a complete installation (in most cases without even getting on the roof) in no more time than it takes to pull a TV chassis for repair! Twilight is so easy... it's a breeze to install.

Engineered for results... styled to sell... as new and modern as today!

SENSITIVITY COMPARISON CHART

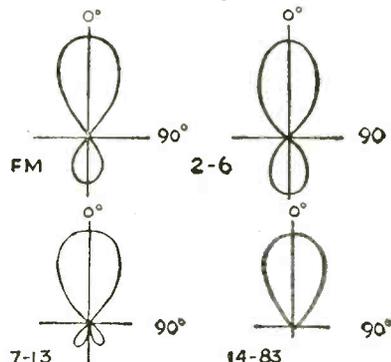
Note extremely linear frequency response of Twilight



LOOK AT THESE ALL NEW EXCLUSIVE ENGINEERING INNOVATIONS

- 1 **UNIVERSAL MOUNT*** goes up in minutes... super-sturdy... eliminates ugly guy wires, chimney brackets... fits all surfaces, flat, sloping and vertical.
- 2 **SPECIAL DRIVE FASTENERS** go in like nails, hold like screws... special gaskets seal roof automatically.
- 3 **SNAP-OUT MAST CLAMP**... automatic, self-aligning. No tools.
- 4 **SERIES-FED UHF** new intermixed design. No loss, no interaction, one lead-in. Can't become obsolete. And at no extra cost!
- 5 **ELECTRO-LENS HIGH GAIN DIRECTOR SYSTEM** for ultra linear frequency response and no ghost-catching minor lobes on any channel.
- 6 **DUAL "T" MATCHED DRIVEN ELEMENTS**... end-fire phased. Accurate 300 ohm impedance match.
- 7 **PERMANENT NON-CORROSIVE ANODIZED FINISH** in Sunfast Gold, Twilight Blue or Starbrite Silver... looks better, sells faster... makes all other antennas look as old-fashioned and out-of-date as they really are.

Horizontal Directivity Patterns



*Patent Pending



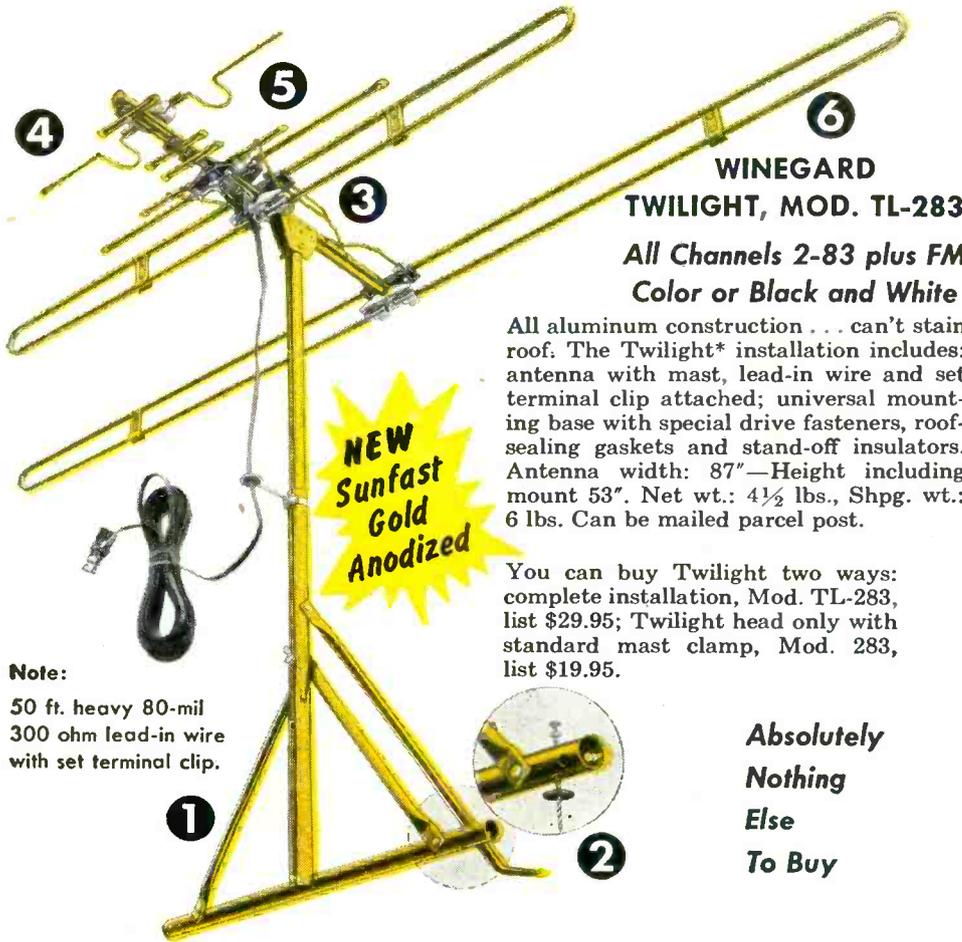
Winegard Co.

NEW PEEK-A-BOO PACKAGE

Makes beautiful display... lets customer see merchandise without opening carton... has complete sales story pitched to your customers on back of carton.

Winegard

COMPACT... POWERFUL!



**WINEGARD
TWILIGHT, MOD. TL-283**
All Channels 2-83 plus FM
Color or Black and White

All aluminum construction... can't stain roof. The Twilight* installation includes: antenna with mast, lead-in wire and set terminal clip attached; universal mounting base with special drive fasteners, roof-sealing gaskets and stand-off insulators. Antenna width: 87"—Height including mount 53". Net wt.: 4½ lbs., Shpg. wt.: 6 lbs. Can be mailed parcel post.

You can buy Twilight two ways: complete installation, Mod. TL-283, list \$29.95; Twilight head only with standard mast clamp, Mod. 283, list \$19.95.

Note:
50 ft. heavy 80-mil
300 ohm lead-in wire
with set terminal clip.

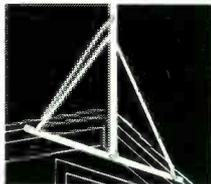
**NEW
Sunfast
Gold
Anodized**

**Absolutely
Nothing
Else
To Buy**

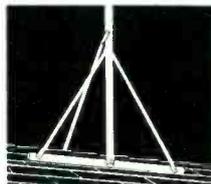
Twilight Mounts on ANY Surface—Sloping, Flat, Vertical



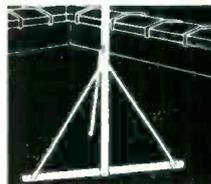
Side of roof



End of roof

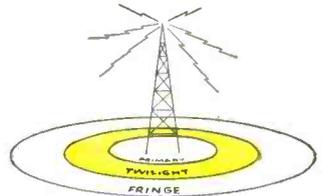


Peak of roof



Flat or trailer

**THIS IS THE
TWILIGHT AREA**



The "in-between" Twilight area (5 to 35 miles) presents reception problems all its own. Most set owners living within its boundaries have been enjoying neither the finest TV reception nor the poorest.

Because the Twilight area has many of the reception difficulties of both the fringe and primary areas, almost every type of antenna from rabbit ears to large arrays is used here. None of which were actually designed with the Twilight area's actual requirements in mind.

An extensive survey made by the Winegard Company in the Twilight areas of some of our larger cities brought to light these amazing facts:

- 42% of the TV owners were not really satisfied with their reception
- 72% of these dissatisfied TV viewers were using set-top antennas
- 53% didn't like antennas on top of their set
- 34% said set-top antennas were too difficult to adjust
- 49% thought outside antennas were too big and unsightly
- 34% thought outside antennas were too susceptible to corrosion-stained roofs... and were ruined by weather
- 49% of all set owners questioned were willing to spend up to \$30.00 for a TV antenna that would overcome all these objections. 7% would spend up to \$60.00

With the above information, Winegard engineers went to work to produce the first antenna designed specifically for the needs and wants of TV set owners in the Twilight area.

We call this new electronic masterpiece... appropriately enough... the Twilight!

SELL THE LINE THAT HELPS YOU SELL!

As
Advised
in
LIFE
The Saturday Evening
POST
Better Homes
& Gardens

List price established nationally in Life magazine at \$29.95. Extra long discount structure so you can allow trade-ins or free installation if you wish... and still make your normal profit.

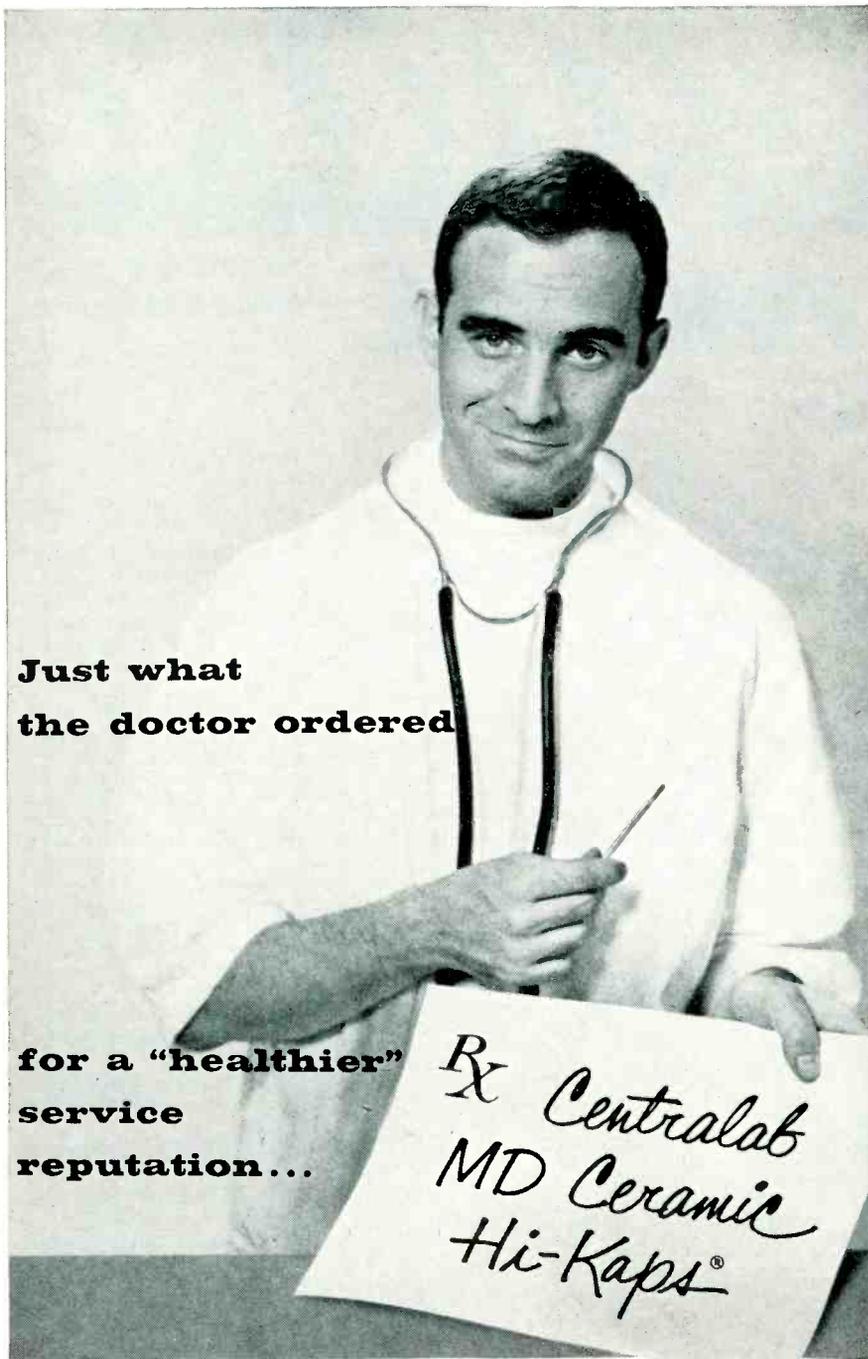
Mr. Dealer:
See Your
Winegard
Distributor
and

Mail Coupon
Today!

WINEGARD CO., Dept. ET-8
3000 Scotten Blvd., Burlington, Iowa

- Complete information on Twilight plus sales aids.
- Other Winegard Do-It-Yourself antennas and kits as low as \$14.95.
- Complete information on high powered Color'ceptor.

Dealer Firm Name.....
Address.....
City..... State.....



**Just what
the doctor ordered**

**for a "healthier"
service
reputation...**

Check these "undoctored" facts yourself to learn why CRL MD (molded disc) ceramic capacitors outlast and outperform conventional "mud" discs—yet cost the same.

You'll find that CRL molded discs give you:

1. *Three times* the voltage breakdown — 3000 V.D.C. breakdown to ground.
2. *Eight times* the lead strength—greater than the breaking strength of the No. 22 tinned-copper wire itself.
3. *Ten times* the humidity resistance — .005% or less moisture absorption by the molded casing.
4. *Many times* the resistance of ordinary discs to physical shock and vibration.

The results: more satisfied customers . . . more business for you . . . and a self-assurance that you gave the best.

Pick them up at your CRL distributor who handles these and thousands of other quality components described in Centralab Catalog 30, which is available on request.



0-1750

Centralab

© Centralab Trademark

A DIVISION OF GLOBE-UNION INC.
902H EAST KEEFE AVENUE • MILWAUKEE 1, WISCONSIN
IN CANADA: 804 MT. PLEASANT ROAD • TORONTO, ONTARIO

EMPLOYMENT OPPORTUNITIES

For further information about employment openings, write directly to address noted in advertisement, or list companies of interest and mail to:

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

Positions Wanted

TV-RADIO TECHNICIAN, 8 years bench experience, graduate Electronic Radio TV Institute of Omaha, Nebr. 2 years army radar school and repair. Now taking United TV Labs. correspondence course. Age 29, married. Will relocate, prefer town under 15,000 population. Lloyd Hoffart, Plainview, Nebr.

SELF-EMPLOYED technician with 28 years full-time radio-TV sales and service experience. Have complete shop, late model station wagon and truck. Wishes to relocate on West Coast of Florida with partner or salary. Age 48, married. C. L. Doerr, 3415 Overton Crossing Rd., Memphis, Tenn.

TV-RADIOMAN, 27 years in electronics, 6 years military communications. Graduate ASC electrical engineering, NRI 3 courses. Operating own shop past 7 years. Locate Texas, N.M., Okla., Southwest. Age 46, married. Salary \$435. Leonard L. Williams, Box 364, Dalhart, Texas.

TECHNICIAN, 4 years bench and house calls, 2 years army radio communications. Correspondence school graduate. Prefer to locate Midwest. Age 25, single. Box E801, ELECTRONIC TECHNICIAN.

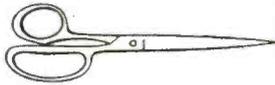
Business For Sale

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

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

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

CLIP THESE NOW,
FOR REFERENCE



NEW 1958 HOTPOINT TV TUBE LOCATION CHARTS

Hotpoint's new 1958 TV line is now in the stores—featuring 110° Picture Tubes in every model.

Note that two 21" models (21S405 and 21S505) use the M3 chassis.

All tubes and fuses are conveniently located at the back of the chassis and can be easily replaced by removing the cabinet back. Single printed circuit board further simplifies servicing. Test points accessible from rear of chassis for quick checks.

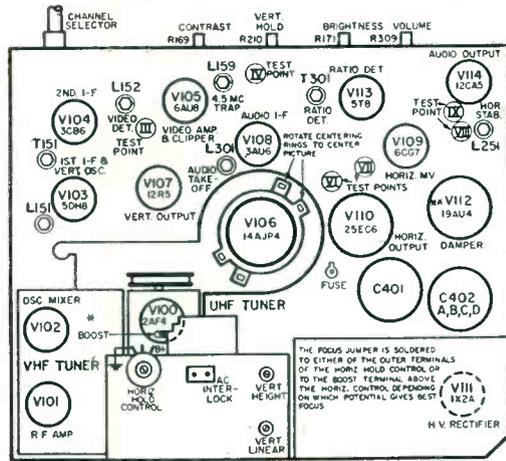
Complete service information on this new line is now available from your Hotpoint Distributor, and you are invited to contact him and order Hotpoint TV Service Data today.

Published as a service
to servicemen by

Hotpoint

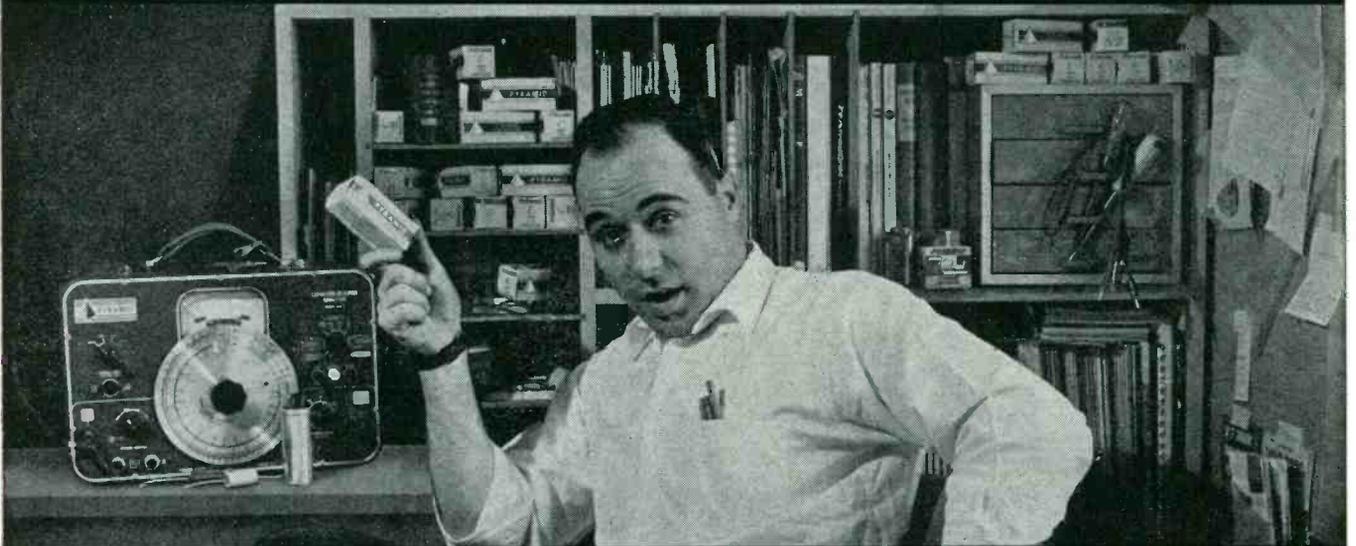
(A Division of General Electric Company)

5600 West Taylor Street
Chicago 44, Illinois



BURTON BROWNE/New York

**FOR
RELIABILITY...
WHICH
CAPACITOR
DO YOU
PREFER?**



**PYRAMID...
SAID
4.6
OUT OF
EVERY 6
SERVICEMEN**

CAPACITORS—RECTIFIERS
FOR ORIGINAL EQUIPMENT—FOR REPLACEMENT



PYRAMID ELECTRIC COMPANY

1445 HUDSON BLVD., NORTH BERGEN, NEW JERSEY

**Only one
Manufacturer
Specializes
in TV
Replacement
Tuners
...that is
STANDARD
COIL**

See the ultimate in TV tuners
Standard Coil's new line of APPROVED
NEUTRODE REPLACEMENT TUNERS
Booth 691—Room 2405-6 Conrad Hilton
May Parts Show

Overseas:

Scheel
International, Inc.
Chicago, Ill.

Standard

Coil Products Co., Inc.
2085 North Hawthorne Avenue • Melrose Park, Ill.
In Canada: Standard Coil Products Co. Limited, Toronto

Burton Browne Advertising



FOR RESTAURANTS, NIGHT CLUBS
Neat, trim, unobtrusive, the MLC is a superb little performer too. Delivers clean, sweet music and voice reinforcement that overcomes noise and dead spots.



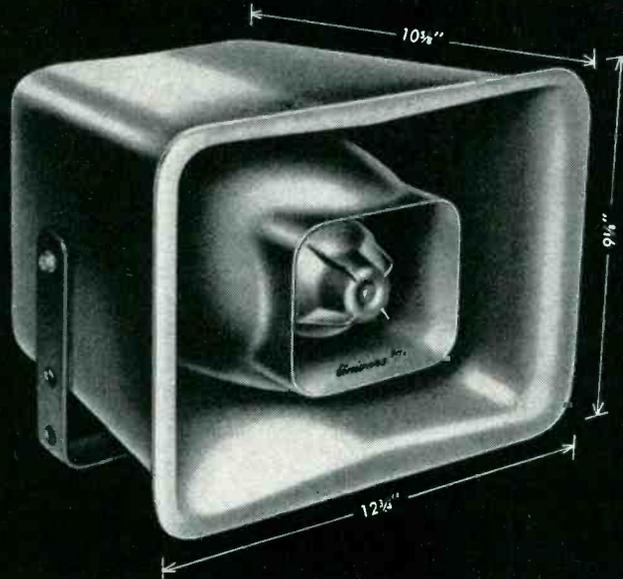
SOUND AND AMUSEMENT TRUCKS
The versatile, dependable MLC efficiently handles all types of program material without harsh, annoying blare prohibited by many town ordinances.



PATIOS, SWIMMING POOLS, LAWNS
Here's weatherproof high fidelity that is also low in price. With the MLC, you can economically extend a music system outdoors and retain hi-fi quality.



TO ADD HI-FI TO P.A. SYSTEMS
In paging applications, the MLC penetrates high noise levels... its wide frequency range adds deep richness to music reproduction. Here's double duty, double value!



NEW...UNIVERSITY DUAL-RANGE MLC

Weatherproof Super-Compact Speaker System for Voice and Music

Now...real high fidelity never before available in a rugged, small size, weatherproof speaker system. Unusual wide-angle, dual folded horn design with separate low and high frequency drivers. Dependable, easy to install, low in cost, the MLC offers these outstanding features:

BETTER LOWS: Balanced "compression" folded horn, starting with 8" throat and energized by top quality woofer driver provides *more* lows than other designs.

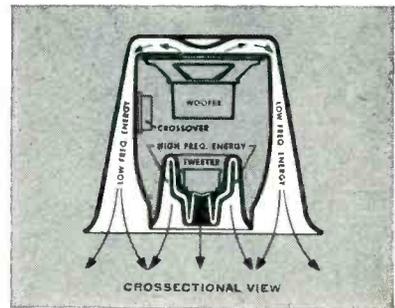
BETTER HIGHS: Driver unit tweeter with wide angle horn transmits more highs with greater uniformity... high frequency response that you can hear!

BETTER EFFICIENCY: Dual range theater type system permits uncompromising design of the woofer and tweeter sections for greatest efficiency. Penetrates noise with remarkable fidelity and intelligibility.

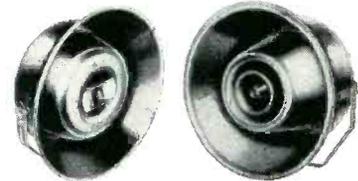
LESS DISTORTION: *Separate* low and high frequency driver systems reduce intermodulation and acoustic phase distortion found in other systems which use two different horns on a single diaphragm.

MORE DEPENDABLE: Experienced mechanical engineering and careful electrical design meet the challenge of diversified application and environmental hazards. Rugged and conservatively rated—you can *rely* on the MLC.

SPECIFICATIONS: Power Capacity, 15 watts; Frequency Response, 150-15,000 cps; Impedance, 8 ohms; Dispersion, 120°; Sound Pressure Level, 117 db taken at 4 ft., 750-1250 cps with 1 cps sweep; Dimensions, Bell Mouth 12 3/4" W x 9 1/4" H, Overall Depth 10 3/4"; Shipping Weight, 10 lbs.; \$54.50 List.



FOR HEAVY DUTY APPLICATION...



MODEL BLC

MODEL WLC

MODEL BLC employs same design principles as the MLC except for heavy duty 8" woofer with uniform response from 70 cps, exclusive "reciprocating flare" wide-angle tweeter and has 25 watt power capacity. Exceptionally shallow depth, only 9", ideal for close quarters. **\$86.00 List.**

MODEL WLC, largest of the series, has 30 watt power capacity, 12" super-efficient woofer with response from 50 cycles, heavy duty radial tweeter... and a decade of successful performance in concert halls, rinks, auditoriums, stadiums and outdoor theaters throughout the world. **\$250.00 List.**

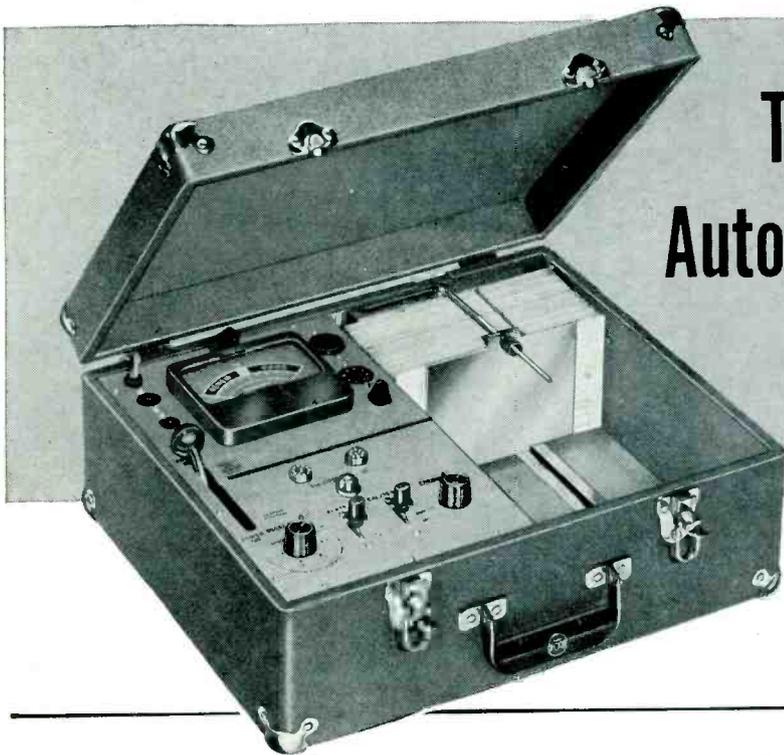
LISTEN

University sounds better



UNIVERSITY LOUDSPEAKERS, INC., 80 SOUTH KENSICO AVENUE, WHITE PLAINS, N. Y.

an announcement of utmost importance to the service industry...



The RCA WT-110A Automatic Electron Tube Tester

smashing the price barrier
at . . . **\$199⁵⁰***!

. . . automated to provide simplicity,
accuracy and speed never before achieved in a comparable service type tester!

Here—from RCA—is a modern tube tester geared for modern servicing requirements . . . and at a price you can afford. In fact—you can't afford to be without it!

Here is tube testing with no wasted motion—no time-consuming searching and setup of old-fashioned roll charts or socket panels, no dial twisting, no fumbling. It's truly *automatic testing* with speed and simplicity that will amaze you!

Here is virtually an obsolescent-proof design—no roll charts to constantly maintain or replace. All data and setup are supplied on the 241 pre-punched cards provided with the instrument. These cards cover 95% of the currently active TV tube types. In addition, accessory cards and punch are available for punching your own cards, enabling you to keep your instrument current as new tube types are released.

See it . . . test it for yourself . . . at your local RCA Distributor's!

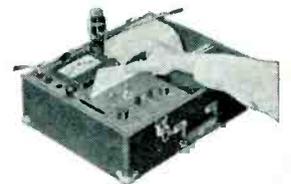
ACCURATE AUTOMATIC ANALYSIS!

- automatically sets up, not only socket connections, but all operating voltages such as filament, signal, plate and screen voltages, and bias (both fixed and cathode).
- checks tubes for transconductance, gas, and shorts between elements.
- provides 220 combinations of heater voltage, 10 bias voltages, 11 values of cathode resistors, and 50 quality sensitivity ranges.
- tubes tested under heavy load currents, such as rectifiers, at 140 ma per plate.
- leakage test with high and low sensitivity ranges.
- 12-volt plate and screen supply for testing new automobile tubes.
- meter protected against burnout.
- calibration card provided for checking instrument.
- active card magazine capacity—350; storage capacity—350 . . . a total capacity of 700 cards.

*User Price (Optional)

SIMPLE AS A-B-C!

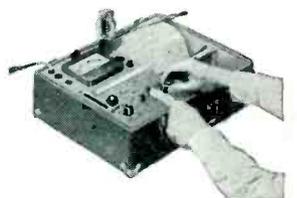
a. merely insert card in matrix



b. flip power lever to "power-on" position



c. press calibrate lever and adjust calibration control



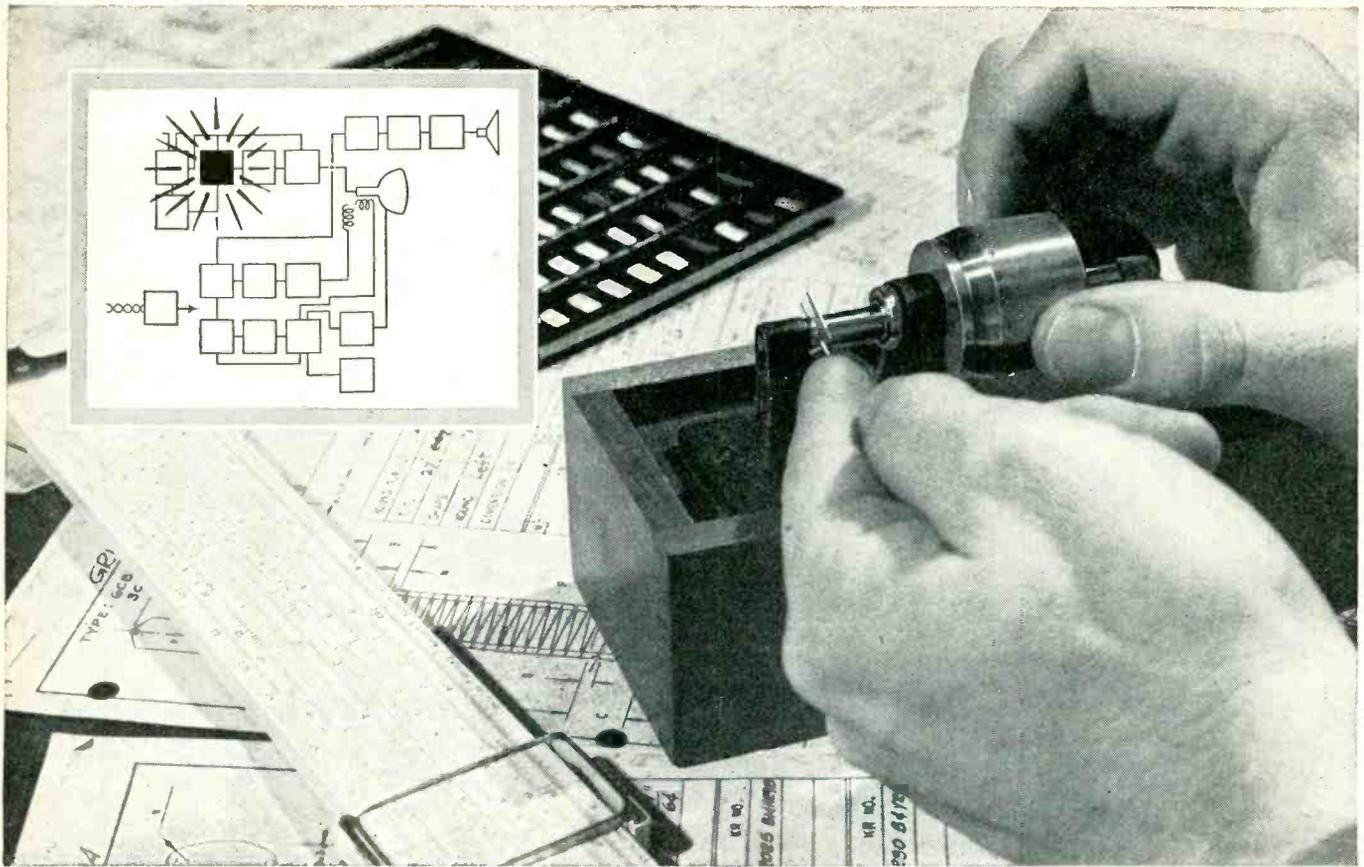
TUBE IS NOW UNDER TEST!



RADIO CORPORATION of AMERICA

COMPONENTS DIVISION

CAMDEN, N. J.



Grid rods gaged to .0005": this quality step helps cut microphonics in General Electric i-f-amplifier tubes!

Grid side rods of General Electric i-f-amplifier tubes and the mica-spacer holes into which they are inserted both are gaged for diameter with .0005 inch the maximum tolerance. The tight grid fit thus achieved damps vibration, and is a major factor in the low microphonics level of General Electric types such as the 6BZ6, 6CB6, 6CF6, and 6DE6.

To the service technician, this feature gives protection against the "busy" TV-picture background that can result from tube microphonics in the i-f stage. Consequently, servicing call-backs are fewer; work stays done.

In addition to reduced microphonics, General Electric i-f-amplifier tubes are rigidly tested under electrical conditions that are selected to match closely the con-

ditions found in actual television application. This is a further safeguard for the serviceman, as is the uniform tube-to-tube performance of General Electric i-f-amplifier types achieved through close control of cut-off and AGC characteristics.

New long life for the 6CB6—a tube often pushed to peak performance in modern sets—comes from a superior screen-grid material that reduces gas and electrical leakage, and minimizes shorts, at high screen dissipation levels. Here General Electric demonstrates once more its policy of constant design improvement. Phone your G-E tube distributor for types that are ever higher in quality! *Distributor Sales, Electronic Components Division, General Electric Company, Schenectady 5, N. Y.*

Progress Is Our Most Important Product

GENERAL  **ELECTRIC**

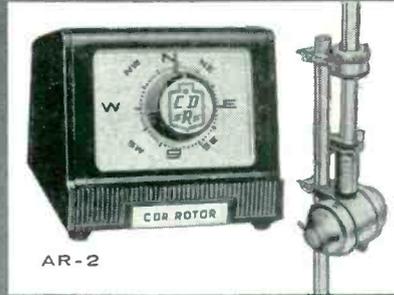
161-1AB

give them



AR-22

what they want...



AR-2

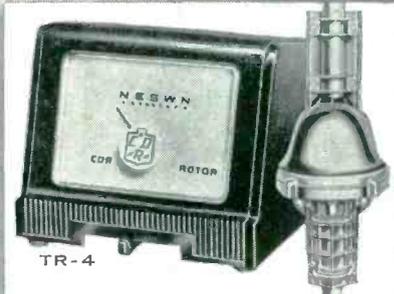
give them -

CDR

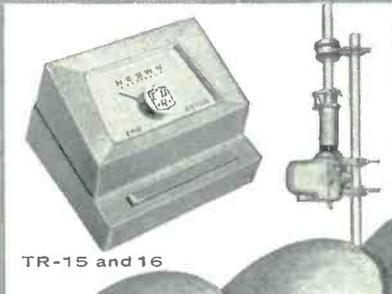
ROTORS



TR-2



TR-4



TR-15 and 16

It's easy for you to give your customers EXACTLY what they want... and at the same time EXACTLY what is BEST for them... because CDR ROTORS are the single answer! The complete line with a model for every need... proven performance and dependability through years of experience. This combination has made CDR ROTORS the favorites everywhere... that is why your customers should have CDR ROTORS!

Especially Important for color TV reception. Critical tuning requirements call for CDR Rotors.



CORNELL-DUBILIER
SOUTH PLAINFIELD, N. J.

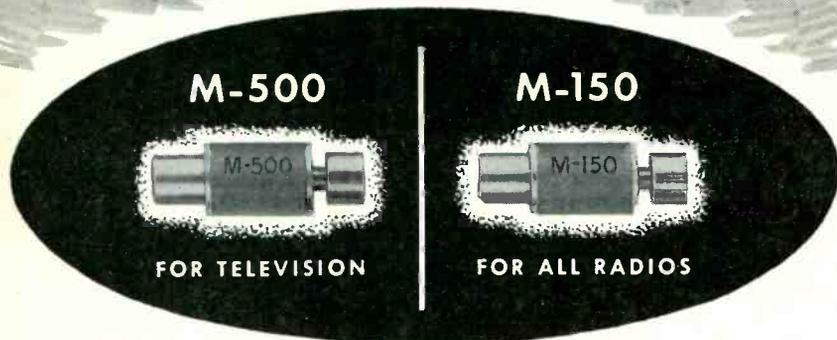
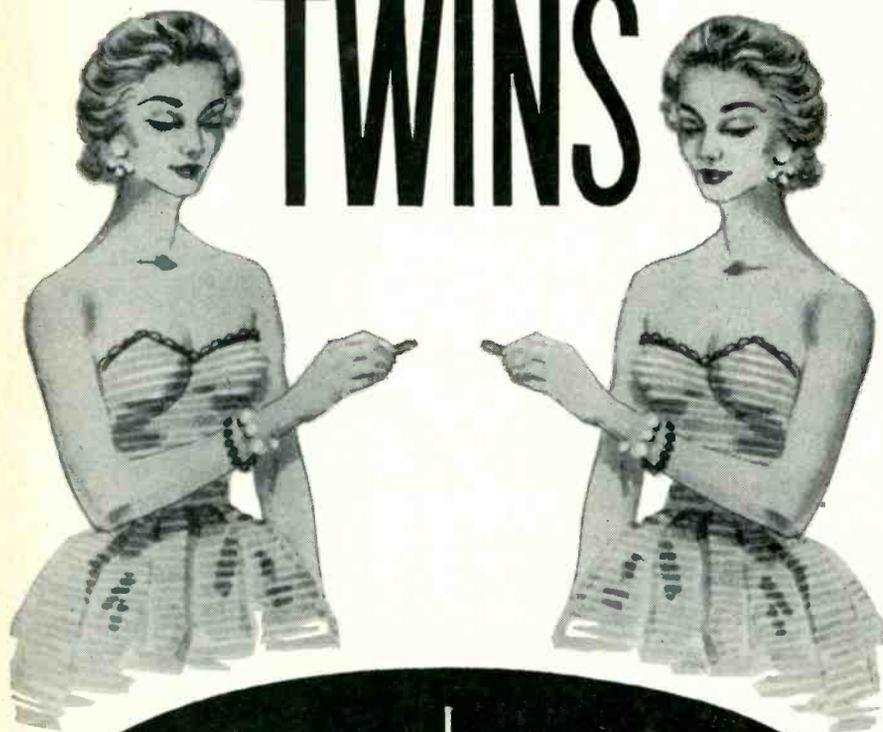


THE RADIART CORP.
CLEVELAND 13, OHIO

THE

Miraculous

TWINS



Rectifier replacement is now further simplified by the "Miraculous Twins"—the M-150 for all radio sets and the M-500 for television and electronic devices. Just two models will fulfill most of your rectifier requirements.

Write for further information on these popular Sarkes Tarzian Silicon Rectifiers.

**Sarkes
Tarzian** INC.

RECTIFIER DIVISION

DEPT. T-1, 415 NORTH COLLEGE AVE., BLOOMINGTON, INDIANA

IN CANADA: 700 WESTON RD., TORONTO 9, TEL. ROGERS 2-7535
EXPORT: AD AURIEMA, INC., NEW YORK CITY

Representatives

BLONDER-TONGUE LABS., INC. announces the appointment of EUGENE L. PARK to cover jobber and industrial sales in Virginia and WILLIAM F. HEMMINGER to handle the Florida area with the exception of Panama City and Pensacola.

ASTRON CORP. reports the appointment of I. R. STERN & CO. as jobber representative in the Southern California and Arizona area.

MOTOROLA INC. announces the appointment of KIERULFF ELECTRONICS of Los Angeles as distributor for its transistors and other devices in the Southern Calif. area.

CHARLES S. POLACHEK ASSOCIATES and **JESS HASKELL ASSOCIATES** have been appointed distributor sales reps for selenium rectifiers and germanium and diodes of the **RADIO RECEPTOR CO.**

MEL FOSTER has been named to represent **WELLER ELECTRIC CORP.** in Minnesota, North and South Dakota and Western Wisconsin.

LEONARD D. ALLEN, INC. has invaded New York State with its 30-foot trailer filled with eye-catching displays of the products as represented by his organization. Constant attendance by his personnel welcomes all and every visitor, 90% of whom are interested members of the engineering staffs of the manufacturers visited.

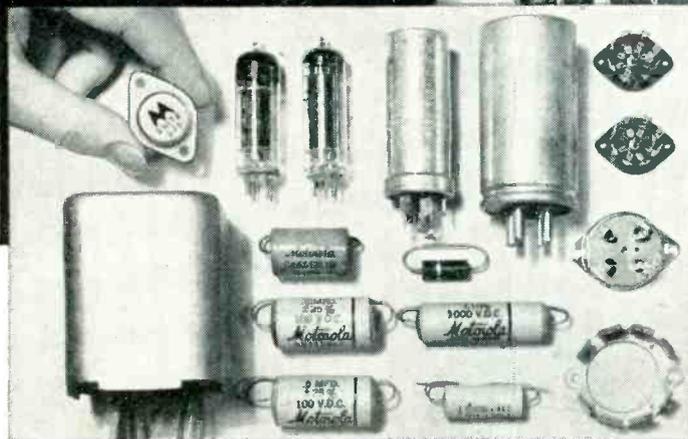
ELECTRONIC PUBLISHING CO. INC. announces the appointments of the **FRED HAIGHT CO.** as its sales reps in Washington, Oregon, Idaho and Western Montana. . . . **I. R. STERN & CO.** will cover Southern Calif. and Arizona. . . . **PAUL W. NIEF ASSOC.** will cover the New England area.

(News continued on page 47)



"Don't worry about me getting a shock—it isn't plugged I-EEY!!!"

NEW Transistor-Powered MOTOROLA® CAR RADIOS



GOLDEN TRANSISTOR HEART . . . replaces 20 parts that wear out in conventional car radios.

Best Car Radio Profit Opportunity in 27 Years

CAR RADIO sales rose 30% last year. And this year—with the most revolutionary car radio improvement in 27 years—Motorola Car Radios are rising even faster!

\$1,040 plus-profits for you. Every fourth car on the road today needs a radio. This means one out of every four people who come into your place of business is a good car radio prospect.

Even if you sell only one Motorola Car Radio a week, your yearly profit will amount to at least \$1,040! And you'll find you can close sales in five minutes or less—just by giving prospects these facts:

Most trouble-free car radio ever built. Motorola transistor-powered car radios replace 20 parts that cause 75% of the trouble in conventional car radios.

Cuts battery drain 50% or more. Transistors use far less power than vacuum tubes . . . play for hours with no appreciable battery drain.

MOTOROLA
World's Largest Exclusive Electronics Manufacturer

Ends all mechanical noise and vibration. Now all the rich tone produced by Motorola's Golden Voice® speaker and exclusive Volumatic® control comes through with no mechanical distortion.

Custom-designed to fit most any dash—like it came with the car. Installation takes as little as 20 minutes and adds extra profit. Or your Motorola installation depot will handle it for you.

And Motorola Car Radios retail at prices your customers are ready to pay—low as \$39.95, with a big profit for you.

So why not get all the facts on your opportunities in this plus-profit business? Just mail this coupon today. No obligation, of course.

Motorola, Inc., T-8
4545 W. Augusta Blvd., Chicago 51, Illinois

Please give me all the facts about the Motorola Car Radio business. Thank you.

Name _____

Firm _____

Street _____ Zone _____ State _____



DOOR BAR

TRUCK DECAL



TV SCREEN POLISHING CLOTH

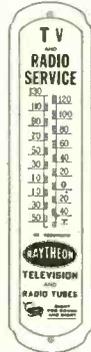


ILLUMINATED CLOCK

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OUTDOOR THERMOMETER



INDEPENDENT SERVICE DEALERS!

These useful Shop and Sales Aids were created specially for You!

ASK YOUR



TUBE DISTRIBUTOR FOR THEM

Pictured are but a few of a most complete line of tested and proven shop, sales and business aids Raytheon has produced for you. All of them are specially designed to help make your work easier and more profitable. Many are free and the rest available to you through your Raytheon Tube Distributor at far below normal cost.

DISPLAYS



OUTDOOR HANGING METAL SIGNS



ALUMINUM Snap-Out-Form POCKET CASE



TRANSPARENT WINDOW STREAMERS



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



ELECTRONIC TECHNICIAN

Including
Circuit Digests

Your Industry—Facts & Figures

Here are the results of our latest business survey. Thousands of questionnaires were sent to our readers.

Servicing Volume

The first question we asked was: *What is your annual dollar volume in SERVICING the following types of products (including labor & parts)?* Here are the four categories listed, together with the average amount reported:

	AVG. TECHNICIAN	AVG. OUTLET
TV-RADIO service	\$15,353.33	\$30,706.66
HOME HI-FI service	\$ 1,192.85	\$ 2,385.70
PUBLIC ADDRESS AUDIO installation & repair	\$ 1,248.09	\$ 2,496.18
INDUSTRIAL ELECTRONICS & COMMUNICATIONS service ..	\$ 1,733.24	\$ 3,466.48

The left column above shows the average reply for those individual technicians answering the questions. The right column is the total average per service outlet, based on two technicians per shop.

The averages do not hold for each of the industry's 62,000 major service outlets. Obviously, a number do not service some of the last three categories; others do a large volume business. Combining our current research with studies done previously on number of technicians engaged in different types of work, we get these results:

	% of Outlets Doing This Work	No. of Outlets (% times 62,000)	Industry \$ Volume (No. times avg. \$)
TV-RADIO service	96 %	59,520	\$1,830,000,000
HOME HI-FI service	56 %	34,720	\$ 82,800,000
PUBLIC ADDRESS AUDIO installation & repair	37.1 %	23,002	\$ 57,400,000
INDUSTRIAL ELECTRONICS & COMMUNICATIONS service	22.8 %	14,136	\$ 59,000,000

Not included in these findings are the millions of dollars technicians spend for their own use, buying such products as test instruments, trucks and store fixtures.

Sales Volume

A second question you answered was worded as follows: *What is your annual dollar volume in SELLING the following types of products (equip-*

ment and sets only)? (\$ shown are averages for those reporting.)

TV-RADIO set sales	\$15,889.90
HOME HI-FI "component" sales	\$ 2,032.08
HOME HI-FI "packaged" sales	\$ 2,610.60
PUBLIC ADDRESS equipment sales	\$ 1,560.27
INDUSTRIAL ELECTRONIC AND COMMUNICATIONS sales	\$ 2,530.77

To determine the industry's total dollar volume in sales by categories, here again we must find out how many technicians these averages apply to, and then multiply by the average dollar volumes shown. Unfortunately, we do not have recent statistical findings applied to sales, as we do to service. So we use the following *minimum* percentages, which are the percentages of readers who answered the questions (others who didn't fill in this part of the questionnaire must certainly include some who sell these products):

	% of Technician Outlets Selling	No. of Technicians (% times 62,000)	Industry \$ Volume (No. times avg. \$)
TV-RADIO set sales	44.44 %	27,553	\$437,000,000
HOME HI-FI "component" sales	18.64 %	11,557	\$ 23,400,000
HOME HI-FI "packaged" sales	16.9 %	10,478	\$ 27,300,000
PUBLIC ADDRESS equipment sales	13.47 %	8,351	\$ 13,000,000
INDUSTRIAL ELECTRONIC & COMMUNICATIONS sales	6.74 %	4,179	\$ 10,600,000

Conclusions

Today's electronic technician is diversifying in two directions. Horizontally, he is going into the allied audio and industrial electronic fields to broaden his income base. Television and radio are by far the dominant sources of business, but very substantial numbers are entering the profitable allied fields, accounting for much of the business done there.

The second direction is vertical. That is, in addition to servicing electronic equipment, technician-dealer outlets are selling complete sets as well as replacement parts. Approximately one fifth of the total income is derived from sales other than replacement parts.

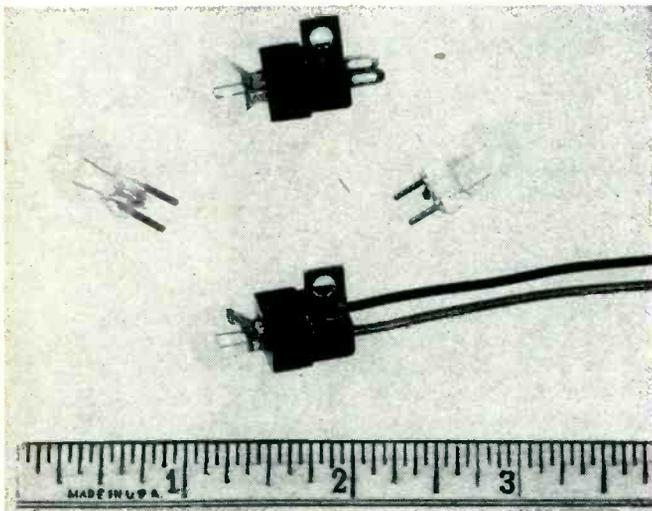
Tuning In the

NATIONAL TELEVISION WEEK, Sept. 8-14, will springboard an autumn promotion program to support greater sales and TV viewing. It is expected that 150 cities in all 48 states will participate in this Television Fall Festival. Among the industry groups sponsoring this week are: National Electronic Distributors Association (NEDA), National Appliance & Radio-TV Dealers Association (NARDA), Radio-Electronics-Television Manufacturers Association (RETMA), and the National Association of Radio and Television Broadcasters (NARTB).

CLOSED CIRCUIT TV has been put to work for sidewalk superintendents. A builder in New York City has installed such a system to enable passersby to get a close-up view of skyscraper construction methods.

TRANSISTOR sales are booming. RETMA figures for Jan.-April 1957 factory sales showed 6,899,300 units worth \$19,492,000 sold, compared to 2,730,000 worth \$7,884,000 sold in the same period of 1956. In 1956, some 12,800,000 transistors were sold, while this year it may go over the 25,000,000 mark. One industry expert expects 1961 industry production of 210,000,000 transistors. A study by **ELECTRONIC TECHNICIAN** showed that the service and replacement market accounted for a current annual rate of 846,000 units, or about 4% of all transistors sold.

NEW LAMPS: PULL, DON'T TWIST



Here's a new design trend. In the coming months you'll be seeing home and commercial electronic equipment with plug-in pin lamps, which feature better contact, less space and easier replacement. Special sockets are made by Webster Electronic Co., 39-16 Tierney Place, Fair Lawn, N.J. General Electric and Tung-Sol are among those unofficially reported to be making such lamps.



"Here's an ad for two experienced bench men."

FLAT TV PICTURE panel to replace the crt is a potential application of Sylvania's experimental "Sylvatron." These panels employ two techniques for producing images. First is electroluminescence, whereby light is produced by exciting a phosphor layer with an electric field. Second, photoconductance is employed, whereby light intensity controls the passage of electric current through a solid. The panels shown by the company were 2 by 4 inches, but they could be made any size. More immediate applications may be expected in radar, information storage systems and similar equipment. TV application is at least four to five years (and several million research dollars) away.

THE "SOLION," an electrochemical device which performs many of the functions heretofore in the exclusive domain of the electron tube or transistor, has been announced by the Naval Ordnance Lab. It depends on the flow of ions between electrodes in an iodine solution, and is very sensitive to changes in temperature, light, pressure, sound and acceleration. The laboratory expects the solion to make possible cheaper and smaller electronic control systems useful in guided missiles, factory regulators and indicators, and burglar alarms.

DIAMOND NEEDLES are reaching into the mass market. Walco reports that over 1,000,000 were sold in 1956, accounting for half of the nation's \$50,000,000 needle sales. In 1957, diamond needles are expected to take an even greater share of the market.

Picture



"LICENSE VALUE" is the title of an article in the St. Paul Pioneer Press (Minn.), called to our attention by TESA secretary Joe Driscoll. It tells about a TV man who applied for a servicing license under the city ordinance, and tendered a \$33 check with the application. As a formality, the license department asked for a police report, which usually brings a statement of "no police record." In this case, there was an 11-year history of 10 arrests and jail sentences for crimes including leaving the scene of an accident, drunkenness, forgery, indecent assault, and more. To add insult to injury, the \$33 check bounced. P.S. License was denied.

FREE SERVICE plan on Philco's 1958 line of radios and phonos carries a 90-day warranty, including labor and parts. The program is designed to enroll 10,000 independent service outlets through the company's distributors. In operation, a radio or phono owner brings his set to the technician, together with his Free Service Guarantee card. The franchised service outlet then submits a repair report to Philco and is reimbursed for his services.

OSCILLOSCOPES are being used in psychological testing at Rutgers University, reports Allen B. DuMont Labs. The tests to determine what man thinks he perceives to what has actually been presented to him operates something like this. A white disc is shown to those being tested. Then it is covered and the subject at the controls of the scope must try to duplicate on the scope face and size of the original disc by expanding or contracting a Lissajous circle.

CALENDAR OF COMING EVENTS

- Aug. 2-4: Texas Electronic Association Clinic and Fair, Hotel Texas, Fort Worth, Texas.
- Aug. 16-18: National TV-Radio-Electronic Service Industry Convention, sponsored by NATESA, Sheraton Hotel, Chicago, Ill.
- Aug. 19: Symposium on Automatic Control, San Francisco, Calif.
- Aug. 20-23: Western Electronic Show & Convention (WESCON), Cow Palace, San Francisco, Cal.
- Sept. 9-13: Instrument Society of America 12th Annual Automation Conference, Cleveland Public Auditorium, Cleveland, Ohio.
- Sept. 24-25: Sixth Annual Industrial Electronics Symposium, Morrison Hotel, Chicago, Ill.
- Oct. 7-9: 1957 National Electronics Conference, Hotel Sherman, Chicago, Ill.
- Oct. 9-11: Fall Assembly Meeting, Radio Technical Commission for Marine Services, Ambassador Hotel, Los Angeles, Calif.
- Oct. 16-18: Institute of Radio Engineers' Canadian Convention, Automotive Bldg., Exhibition Park, Toronto, Ontario.
- Nov. 11-13: Radio Fall Meeting, King Edward Hotel, Toronto, Canada.
- Jan. 6-8: Fourth National Symposium on Reliability & Quality Control, Hotel Statler, Washington, D. C.
- Jan. 17-19: Long Island Guild Electronics Fair, Hempstead Armory, Hempstead, New York.

SUN BATTERIES are receiving increasing attention. International Rectifier Corp., El Segundo, Calif., has developed such a unit, size 18 by 18 inches, for converting solar energy into electrical current. It comprises nine smaller selenium cells. The company's house organ, "Tips for the Serviceman," volume 2, no. 1, offers an interesting collection of cell applications.

RANDOM NOISE

RADIO-CONTROLLED CAMERA FOR AMATEURS AND PROS MAY BE ACTUATED UP TO A MILE AWAY—MOTOR-OPERATED PRAKTINA FX IS MARKETED BY STANDARD CAMERA CORP., N.Y.C.

TOM HIGGINS JR.

AN AUTOMATIC CIRCUIT ANALYZER WHICH TESTS 1200 AIRCRAFT CIRCUITS FOR SHORTS IN LESS THAN A MINUTE HAS BEEN DEVELOPED BY REPUBLIC AVIATION

A FERRITE MATERIAL HAS BEEN USED BY BELL LABS TO AMPLIFY MICROWAVE SIGNALS

MOLECULAR LAYER OF TRANSPARENT PHOSPHOR APPLIED TO SPECIAL CRT'S BY GE IMPROVES LINE RESOLUTION ALMOST TO BEAM DIAMETER, INSTEAD OF 2 TO THREE TIMES AS IN POWDERED PHOSPHORS-

Planning To Develop

Specialized Audio Test Equipment Opens New Horizons To The

NORMAN H. CROWHURST

• Getting into the high fidelity service business can look like quite an impressive step. This is because the accepted methods of testing and checking the performance of amplifiers and other items of high fidelity equipment involve more elaborate tests and test equipment. So the prospect of getting into the business looks as if a considerable investment may be needed. However, as with many other enterprises, there are more ways to tackle this problem. The invest-as-you-earn approach is one possible solution.

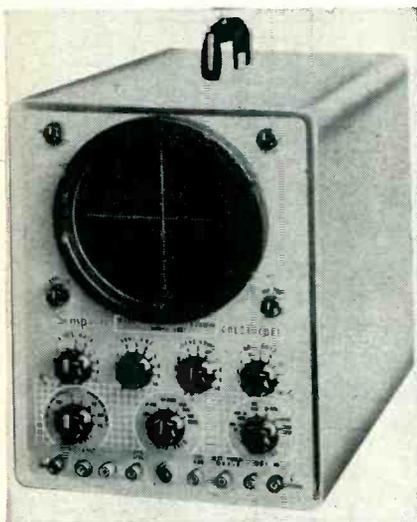
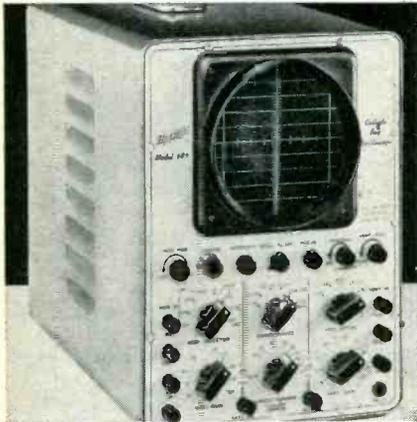
You can start with what you have and plan to add to the audio service center as you go. In this manner the work you do will pay for the additional equipment as the hi-fi business expands. On the other hand a complete test set-up will encourage more of this type of business faster. Another logical approach is to establish different levels of maintenance, and to obtain sufficient equipment to satisfactorily and economically perform all the service work that is called for within the selected level. The military calls it echelons of maintenance. When work is called for which is beyond the scope of the repair equipment on hand, then the defective machine is passed on to the next higher repair level where

more and heavier tools and even specialists are available. In the service business, it is sometimes more economical to send some work out, rather than tie up the shop and delay getting the customer's set returned. However, everytime a job is farmed out there are additional expenses incurred and somehow the information gets out that somebody else had to do the job. It is only a matter of time before the customer establishes direct contact with the technician who actually performed the work and you are minus a customer.

Basic Maintenance

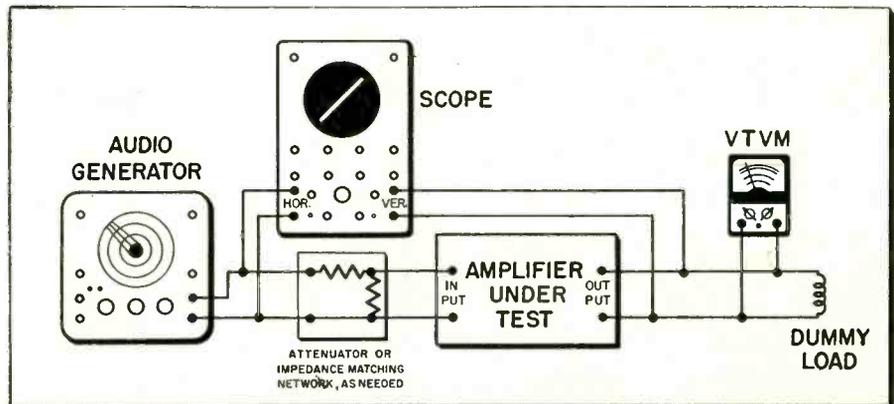
Even without any equipment whatsoever, it is possible to perform some maintenance procedures. A defective tube can usually be found by tube substitution, visual checks can detect broken leads and burned components. Noisy controls, microphonics and other symptoms can be heard. Most of these things the do-it-yourself customer can do. So where does the technician enter the picture? He doesn't unless he has the proper test equipment to do the job.

While all technicians agree that test equipment is essential, not all think alike as to the order of importance of each type of tester. Personal preference, experience, and how much money is available will



An oscilloscope, once a laboratory instrument, has now become a must item for servicing electronic equipment. Hum, distortion, parasitic oscillations and other wave shapes, may be seen on the scope.

Fig. 1—Lissajous figures derived from output and input signals reveals distortion.



A Hi-Fi Service Center

Radio And TV Technician. Use Equipment On Hand To Get Started.

dictate the final choice. Fortunately most radio and TV shops have enough test gear on hand to handle about 70% of the work which falls into the second echelon of maintenance. For our purpose this is really the primary or entry area. A great deal of service work can be performed at this level. Both the oscilloscope and VTVM have become standard equipment and many technicians already possess these items.

They can be put to good use in servicing audio components. The big difference is that, in audio work you have to go further than just using the equipment to check that it plays and if it doesn't, to find the trouble. For this work it is also necessary to check that it comes up to the standard for which it was designed. Among the things to check are: rated power output; distortion level; frequency response; transient response; and hum level. Equipment to make all these measurements, with laboratory precision would require a considerable investment. But it is possible to make most of these same measurements in a satisfactory manner, for small volume high-fidelity business, with a limited investment. However, these tests will take more time to perform because the results are obtained in an indirect manner. As the business grows more equipment can be obtained to enable measurements

which can be made more readily and expeditiously.

This of course would lead us into the upper echelon of maintenance. No definite line of demarcation exists, actually it varies from shop-to-shop. In this upper maintenance area, some technicians, at times, may suffer from a feeling that they are working on an intangible trouble. The customer's complaint is real, and the money he is prepared to spend to have his quality sound reproduction system restored is real too. The complaints of loss of presence, distortion, peaks and a host of other types of trouble familiar to owners of high-fidelity sound systems may not be readily discernible to a stranger's ear. In many instances it is the customer's response rather than the amplifiers that determines how successful the repair job is. Confidence in our own knowledge, workmanship and test equipment will do much to build a profitable business.

Signal Generators

To make satisfactory audio checks of any kind an audio signal generator, having a reasonably good sinusoidal output at frequencies from 20 to 20,000 cycles is required. The audio signal from the average r-f signal generator is usually available only at one frequency, about

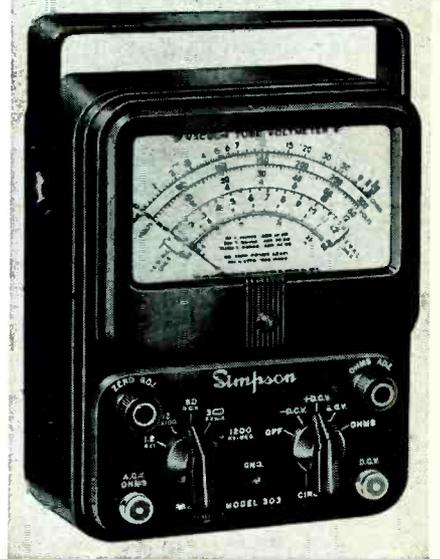
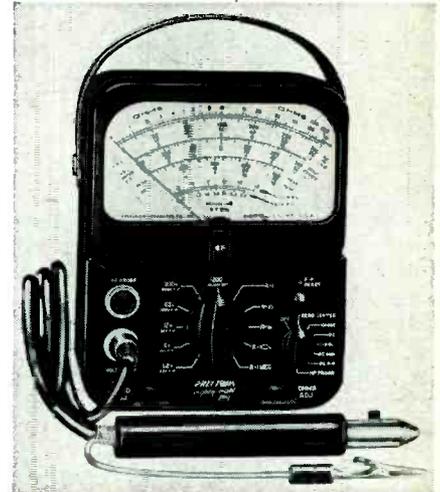
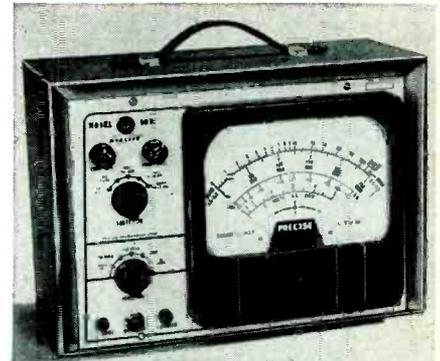
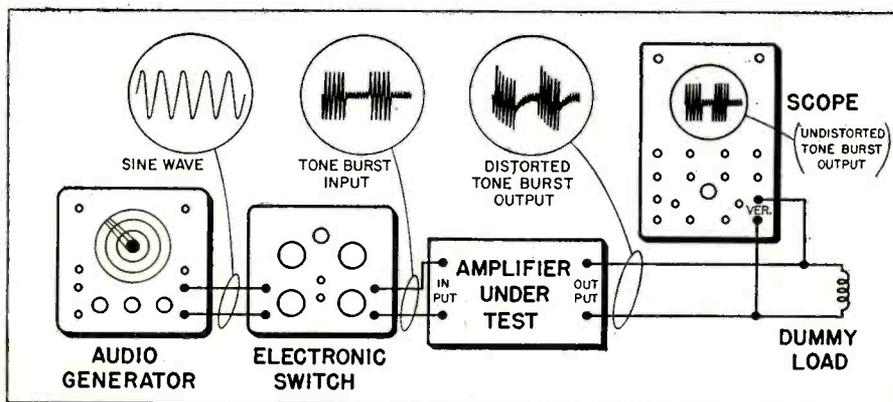
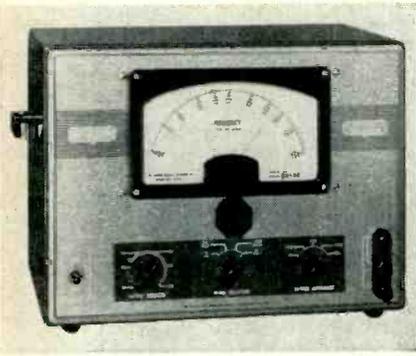


Fig. 2—Electronic switch enables tone-burst test which indicates transient response.



The VTVM, like the oscilloscope, has found its place in the repair shop. In addition to its ability to accurately measure voltage in high-impedance circuits, it can be called upon to handle audio frequencies satisfactorily.



400 cycles, and its waveform may be far from good. A number of low-cost sine and square-wave generators capable of covering the range from 20 to 20,000 cycles and beyond, are available. While these instruments do not always have exceptionally low distortion, they, on the other hand, do have a fairly good-looking waveform. This item is probably the most profitable first investment for audio servicing. With it, in conjunction with the oscilloscope and the VTVM, all the checks just discussed can be made by one method or another.

Comparison Circuit

Several of these tests can be made using the input/output comparison circuit illustrated in Fig. 1. The output from the generator is fed directly into the horizontal input of the scope and the function switch controlling the horizontal input is turned to the external position. If necessary a pad may be inserted between the output of the signal generator and the input to the amplifier to obtain the correct input voltage and impedance match for the amplifier. The output of the amplifier is connected to a dummy load and to the vertical input of the scope. A VTVM may also be attached across the load.

If the amplifier produces a faithful replica of the input, the trace will be a straight sloping line. The amplifier may be set at different levels all the way up to maximum output. With the aid of the VTVM and scope some types of distortion and clipping, if present, may be detected and at the different output-power levels. Frequency response of the amplifier may also be checked quite quickly. A fairly close estimate of the amount of distortion, down to fractions of 1% may be made; even though the generator may have as much as 5%.

A square-wave signal from the audio generator and use of the regular time base on the oscilloscope, instead of input/output comparison, makes possible the use of square-wave techniques for trouble shooting and performance tests. If the VTVM is not sensitive enough, the scope may be used to measure and identify sources of hum and noise. This much equipment will enable the technician to make a handsome start in the high fidelity field.

Specialist Level

If the volume of business increases to the point where more than one test position is desired, or if you wish to have a more direct setup to mea-

sure different characteristics, an intermodulation distortion test set may be the next item to consider. This will give a direct reading of certain types of distortion without having to interpret oscilloscope traces. An IM distortion tester can measure distortion to quite low orders without any other equipment. If the amplifier is not working properly, it may still be necessary to resort to investigation with the scope and VTVM to find out what is wrong.

It is sometimes desirable to check both IM and harmonic distortion. Different manufacturers use one or the other or both types of distortion when specifying the performance of their amplifiers. A distortion meter can indicate the amount of distortion at different audio frequencies and at different power levels. The sine-wave generator used as a signal source must be able to furnish a clean signal, otherwise it will be difficult if not impossible to obtain satisfactorily low readings. If the oscillator's output has 2 or 3% distortion, and the amplifier is rated at 0.5% distortion, it will not be feasible to measure amplifier distortion for the simple reason that the input contains more distortion than would be expected at the output. Assuming the amplifier works satisfactorily, the input and output distortion figure will measure almost identical and there is no way of being sure that the distortion from the amplifier is down where it ought to be.

So it would be well, when buying a distortion meter, to also obtain some filters; one for 1000 cycles, and possibly one each for a lower and higher frequency, if detailed distortion checks are desired at other frequencies. But one at 1000 cycles is necessary to measure distortion at this middle frequency. This is then placed between the oscillator and amplifier to insure a pure input, or at any rate one with less distortion than expected at the output.

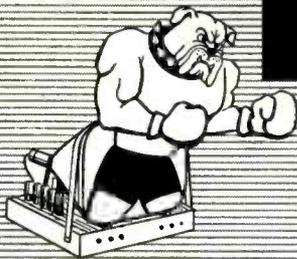
Audio Voltmeter

Next, as an aid in measuring hum and noise, an audio voltmeter is an asset. The regular VTVM gives db readings that are suitable for checking frequency response or power output, but usually is not sufficiently sensitive to read hum and noise levels. This can be done on the scope. The scope is still the best means of tracing hum. However, an audio voltmeter will relieve the burden on the scope and enable more work to be handled. At times the scope may be monitoring some par-

(Continued on page 61)



A variable sine and square-wave generator is perhaps the first specialized test instrument investment in a high-fidelity service center. Distortion-free signals at constant output level over the entire range is one of the important features.



"Tough Dog"

Corner



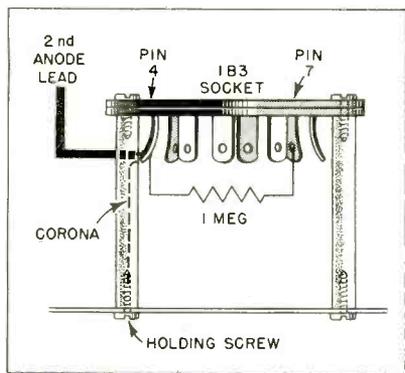
Difficult Service Jobs Described by Readers

Intermittent Arcing

The set was an Emerson Model #120-143B. After clearing the original trouble in the audio section, I could hear a slight, intermittent arcing or corona, which disappeared when the set warmed up.

It seemed to come from a pile of two resistors and two capacitors in the damper circuit beneath the h-v cage. All efforts to locate the hiss with a hollow listening tube were futile. As a last resort I grounded one leg of a neon-light tester, slightly insulated the other leg and tried to see if I could detect an escape path.

Near the bottom mounting screw of the 1B3 socket I got results. Investigation showed that the #4 lug of the 1B3 socket, a tie-point for a 1-meg resistor and the 2nd anode



Hollow porcelain tube hid high-voltage leak.

lead, was touching the porcelain tube, on which the 1B3 socket is mounted, and was now defective.

The high voltage had burned and made a green spot on the porcelain and was jumping to the metal fasten-

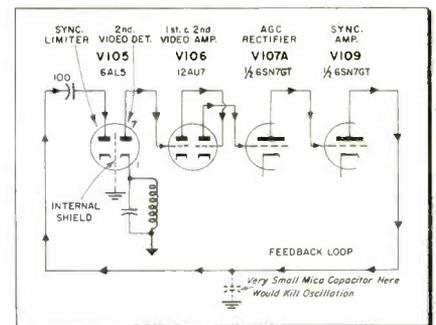
ing screw. I had checked the set in the dark and no corona was visible. Even if I could smell the ozone, which I didn't, I wasn't going to stick my nose under the 1B3.

Bending the #4 lug away and reversing the porcelain tube cleared the trouble. Perhaps if I had followed Lee Scott's suggestion, in the April 1957 issue of *Electronic Technician*, to increase the voltage I might have been able to see the corona; but I do believe it was all inside the porcelain.—*John F. McGroarty, Bronx, N. Y.*

Unusual Feedback

A tough dog item, in a previous issue, called attention to a bad case of feedback which brought on some unusual raster effects in a TV receiver. Replacement of the 6AL5 tube corrected the difficulty. How could this possibly occur? The 6AL5 is a dual diode and doesn't have any gain to promote feedback in itself. Sometime ago I had a similar experience with an RCA receiver of the TI64-5-6-7-8 series and after a couple of hours of headache replaced the 6AL5 tube and cured the trouble. However, to make the lost time worthwhile I checked the schematic to see how this difficulty could come about. In the receiver on the bench at the time there was uncontrollable oscillation at a very high audio frequency which caused the horizontal oscillator to "cogwheel" the raster. The raster had a bad fold-over in the center of the screen as in an exaggerated case of overdrive. In the block diagram below note that the 6AL5 has an internal shield. (Most tube manuals do not show this shield.) If the shield becomes ineffective for some reason there will be

more coupling between the two diode sections. The entire gain of the video amplifier is in between these two diode sections, and only a small amount of coupling is needed to cause oscillation to take place. The signal in the feedback loop may be reduced to eliminate the difficulty by merely placing a very small mica capacitor to ground as shown. However, this is not necessary since a new tube will correct the trouble. The fact that the small capacitor



Feedback loop completed by a defective 6AL5.

would kill the oscillation gave me the clue as to its cause. The arrows show the path of the coupling loop through the video amplifier, agc rectifier, sync amplifier and back to the other section of the 6AL5. Perhaps this will explain why a lowly diode can raise so much fuss.—*M. G. Goldberg, St. Paul, Minn.*

WIN \$10.00!

ELECTRONIC TECHNICIAN will pay \$10.00 for acceptable Tough Dogs. Unacceptable items will be returned. Use drawing to illustrate wherever necessary. A rough sketch will do as long as it can be followed. Send to "Tough Dog" Editor, ELECTRONIC TECHNICIAN, 480 Lexington Ave., N. Y. 17, N. Y.

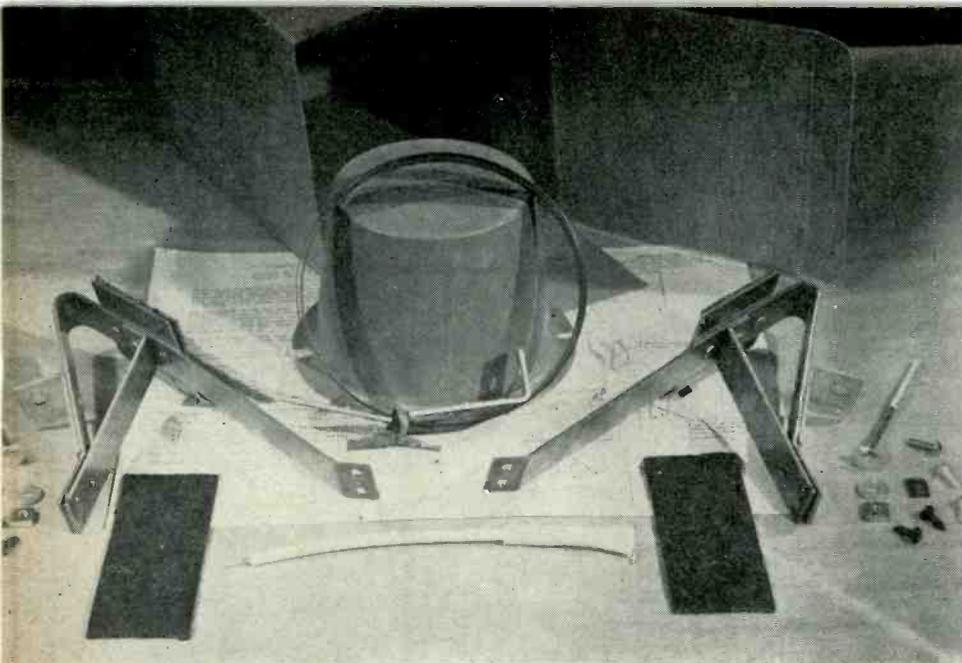


Fig. 1—A typical conversion kit complete with instructions, hardware, and anode lead.

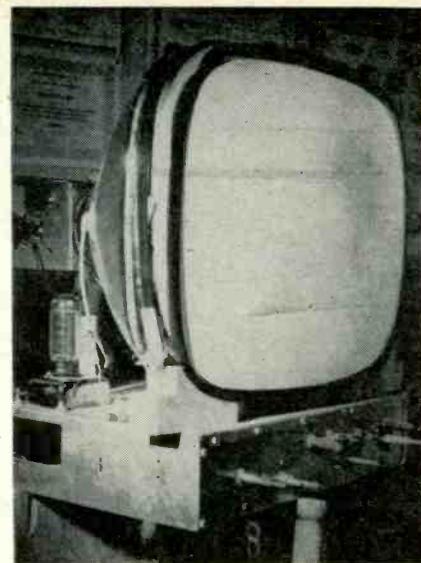


Fig. 2—Pads, harness strap, blocks and anode lead installed on Stewart-Warner chassis.

TV Sets Converted From Metal

Aluminized Tubes Make Possible Brighter & Better Pictures

R. V. PAVEK
M. D. COLMAN

• It isn't often that a technician is able to repair a set so that it will give a better picture and more customer satisfaction than when it was delivered from the factory. One of the few occasions when this is possible is in the conversion of metal-to-glass aluminized CRT's.

The advantages of glass aluminized CRT's are many. The aquadag coating provides additional filtering for the high-voltage supply. The aluminized screen makes it possible to have a brighter picture, a greater contrast range, and more shades of gray between black and white. There is also less danger of damaging the phosphors due to ion burns.

Conversion kits for different sets are currently available and help

simplify the job considerably. The time saved and professional appearance of the work is quite rewarding. Not more than 20 to 40 minutes additional time is required over and above the regular replacement time. A typical type of kit available is shown in Fig. 1.

The usual conversion is accomplished by removing the metal-tube edge guard, metal strap, and mounting brackets. The yoke and yoke-mounting bracket are moved approximately 1" to the rear and new front mounting blocks, or metal brackets, depending on the model being worked on, are installed. The CRT can then be inserted into the yoke and set down on the new mounts. A new harness-strap is then laid over the top and side edges of the CRT. Small rubber pads are placed in the upper corners of the tube under the strap. The ends are then fastened. See Fig. 2. For RCA sets, new U-shaped front brackets

for the side-rods are included, which allows for the slightly greater length of the glass tube, as shown in Fig. 3.

The new anode-lead may be soldered directly to the old wire and the connection should be properly insulated. High dielectric plastic tape or tubing is suitable. In some cases a new anode-connector is supplied which plugs into the same quick-disconnect fitting as the original.

A ground-wire is furnished for installation on the yoke support bracket. If necessary the wire can be easily bent to provide good contact with the external coating of the CRT.

No Cabinet Work

The chassis is now ready to install in the cabinet. This should present no problem if the new tube has the same face-plate curvature as the original tube. It should fit snugly against the mask without the need



Fig. 3—New mounting brackets and glass CRT. Aquadag is grounded to rear bracket.

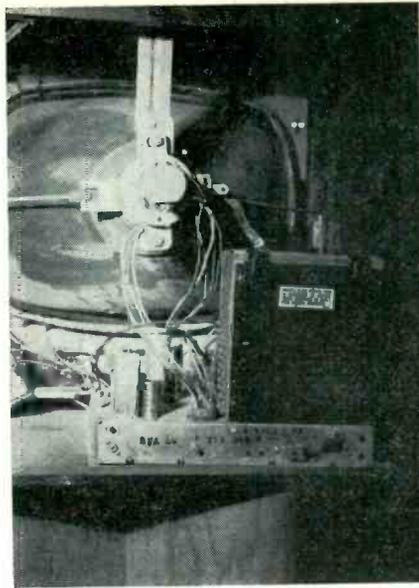


Fig. 4—RCA-TV receiver before conversion. New glass CRT also minimizes shock hazard.

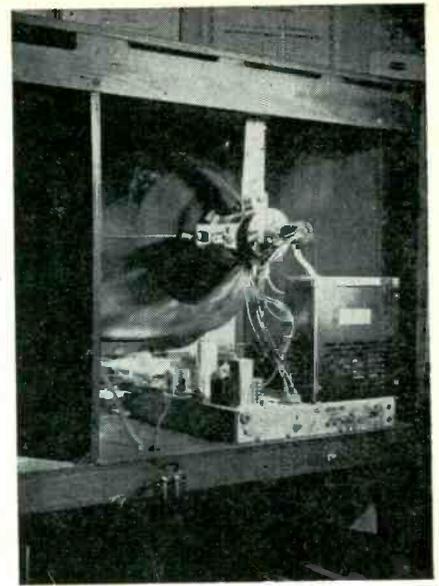


Fig. 5—RCA after conversion. Note ample clearance between CRT and chassis parts.

To Glass CRT'S

and An Additional Source of Income.

for trimming or other alterations. If the electrical characteristics of the new tube are identical with the original, no change in the circuitry is required. In many cases the same ion trap can be used, however it is good practice to ascertain that the proper trap is employed.

Some of the tubes that are directly interchangeable and do not require any mask or electrical modifications are as follows:

<i>Original</i>	<i>New</i>
21MP4	21YP4, 21YP4A
21AP4	21ZP4, 21ZP4A
27MP4	27EP4

Many models of TV sets, made by the following manufacturers, use these tubes and lend themselves to this easy conversion technique: Airline, Arlington, Arvin, CBS-Columbia, Coronado, Crosley, Emerson, Fedway, Firestone, Hallicrafters, Hudson, RCA 21", RCA 27", Silver-tone, Stewart-Warner, Telecraft, Truetone, and Wells-Gardner.

It may be necessary in some sets to change or extend the cup on the back panel to accommodate the slightly longer neck of the new tube. The kit shown in Fig. 1 includes a new cup. If desired, a tinted filter screen may be installed on the rear face of the safety-glass. This completes the conversion.

The cost involved in converting the set is low. The glass aluminized tubes are lower in price than the metal tubes. The total additional cost, adding the price of the kit to the replacement of the metal CRT. In the case of the 27-inch metal tubes, a saving of approximately \$25.00 to \$30.00 can be realized. The result achieved from such a conversion is a great boost to customer relations. In fact, many new customers and conversion jobs are recommended by old customers whose sets have already been converted. •

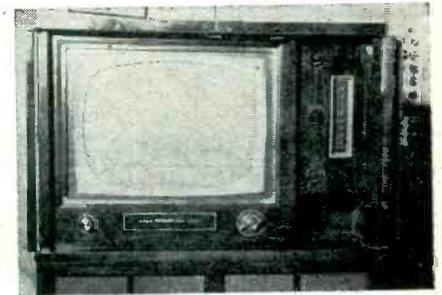
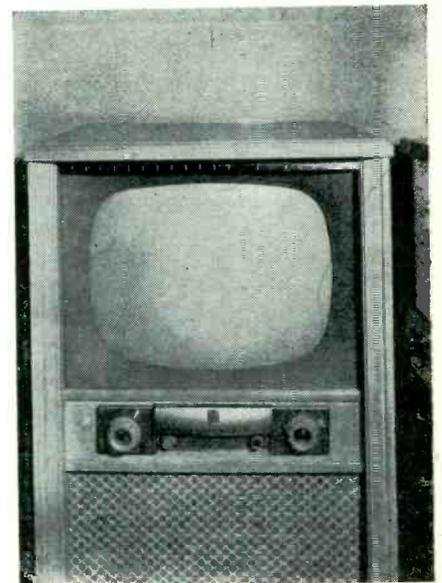


Fig. 6—Mask and tube fit on converted RCA. Conversion does not require cabinet work.

Fig. 7—This Stewart-Warner console shows no change in appearance after conversion.



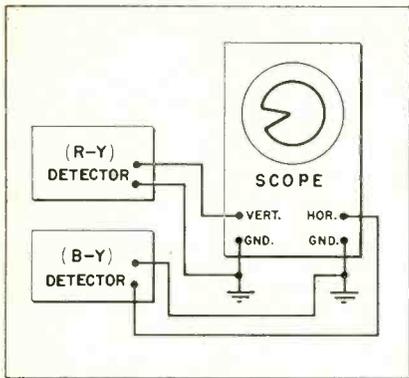


Fig. 1—Typical test set-up for vectorscope.



Fig. 2—Rainbow generator provides 1 to 8 complete vertical rainbows via linear phase sweep. Has facilities for crystal control.

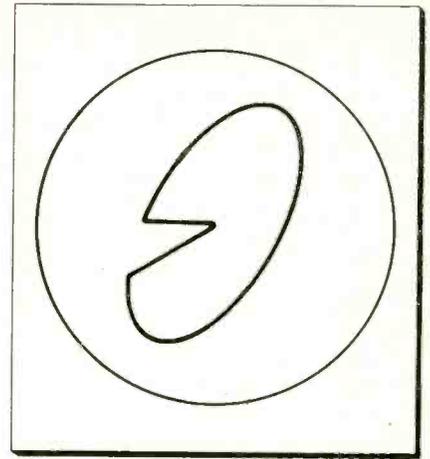


Fig. 3—Diagonal axes of ellipse indicates an improperly adjusted quadrature transformer.

Use Of The Vectorscope

Phase and Quadrature Transformer May Be Aligned With Just One

ROBERT G. MIDDLETON

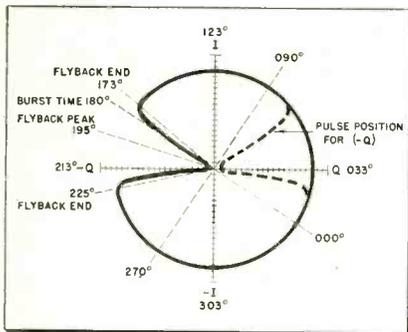
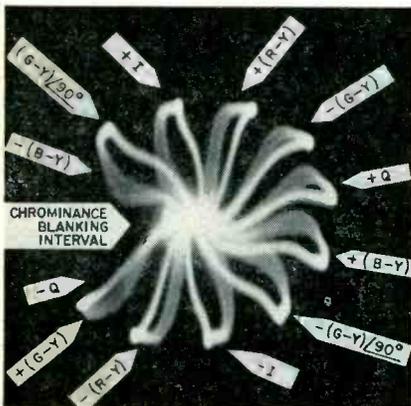


Fig. 7—Note the different positions of the bite when using I & Q demodulators.

Fig. 8—Vectorscope display of keyed rainbow signal shows proper adjustment of quadrature transformer and provides general identification of the principal chrominance phases.



• A vectorscope provides a tremendous amount of practical data concerning color-circuit operation in one easily-read waveform. Any service oscilloscope with vertical and horizontal-amplifier response out to 1 or 2 Mc operates satisfactorily in this application. A typical test set-up is illustrated in Fig. 1. It is advisable to use low-capacitance probes, to minimize circuit loading. Essentially the circle obtained is a Lissajous pattern which is produced by the sine wave outputs of the chroma demodulators when a rainbow generator is connected to the antenna terminals of the receiver.

The vectorscope can be operated from several types of chroma signal. The simplest test signal is a rainbow or sidelock voltage, obtained from an unkeyed rainbow generator, as shown in Fig. 2. This signal generator will produce a pattern of one to eight vivid rainbows (color spectra) on the Kinescope of a properly aligned color TV receiver when connected to the receiver antenna terminals.

Since color reproduction is essentially "Phase" interpretation by the color circuits in a receiver, the prin-

ciple of operation of the Rainbow Generator is the production of a "linear phase sweep" which permits simultaneous viewing on the receiver kinescope of a multiplicity of color phases which in turn enable the technician to ascertain the overall operation and alignment of the receiver.

Rainbow Generator

It may be well to note at this time the similarity of this "linear phase sweep" technique with "Frequency Sweep" Generators which permit viewing of a complete IF or RF response curve at a glance.

The Rainbow Generator does not normally require any initial generator calibration or special connections prior to using it for color receiver work. It provides equally satisfactory results with I/Q and R-Y/B-Y color receiver systems.

It is interesting to see how this arrangement can be used to adjust the quadrature transformer. The procedure is as follows:

1. Apply the rainbow signal to the antenna-input terminals of the receiver, and adjust the receiver controls to obtain a rainbow display on the screen of the color picture tube.

2. Set the color-phasing control

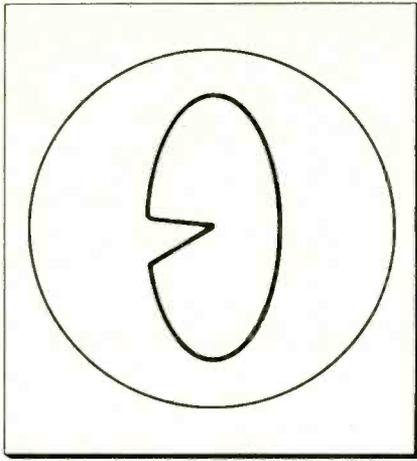


Fig. 4—When the quadrature transformer is properly adjusted, the axes of the ellipse appear vertical and horizontal.

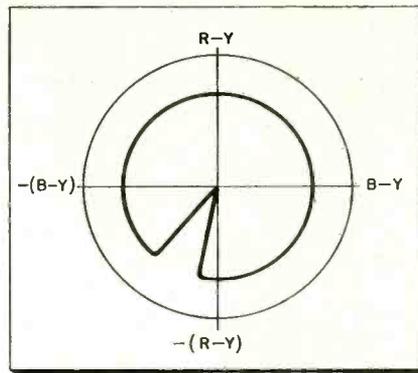


Fig. 5—Incorrect location of bite indicates improper alignment of phase control.

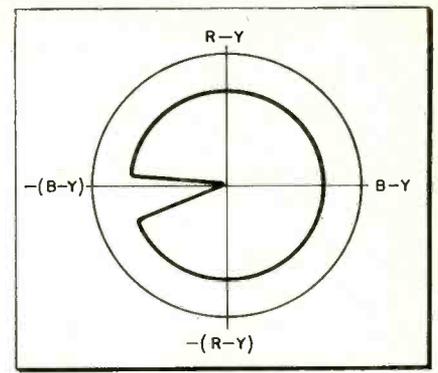


Fig. 6—The ellipse in Fig. 4 can be resolved into a perfect circle by adjusting the scope gain controls. The blanking bite in Fig. 5 can be brought to the correct location by adjusting the master phase control.

Technique To Service Color TV

Curve. Most Oscilloscopes May Be Employed To Display A Vectorgram.

to the mid-point of its range. (The color sequence in the rainbow display will be incorrect in case the quadrature transformer is out of adjustment).

3. Apply the output from the (R-Y) detector to the vertical-input terminals, and the output from the (B-Y) detector to the horizontal-input terminals of the scope. (These outputs can be conveniently obtained from the red and blue grid leads to the picture tube, in most cases).

4. Operate the scope on the "Horizontal Input" function. (The internal horizontal-deflection function of the scope is not used in this procedure).

5. Adjust the vertical and horizontal gain controls of the scope, to obtain a pattern which is as nearly circular as possible. A perfect circle can be obtained only when the quadrature transformer is in correct adjustment.

6. Incorrect adjustment of the quadrature transformer is indicated by an elliptical pattern which cannot be resolved into a circle by adjustment of the scope gain controls. The axes of the ellipse will appear diagonal as shown in Fig. 3.

7. Adjust the slugs in the quadrature transformer to rotate the axes of the ellipse to vertical and horizontal positions, as shown in Fig. 4.

The ellipse can then be resolved into a circle by adjustment of the scope gain controls, showing that the quadrature transformer is in proper adjustment.

8. Note the location of the "bite" in the circle. This is the blanking interval or flyback pulse. Fig. 5 shows incorrect location of flyback pulse due to improper alignment of master phase or hue control. Adjustments should be made to also locate the "bite" approximately as shown in Fig. 6. This enables the color-phasing control to have the intended range.

I and Q Demodulators

The vectorscope technique may also be used on receivers employing I and Q demodulators. The waveform obtained is shown in Fig. 7. Both the master phase and quadrature transformer can be aligned with this one curve. The output of the I demodulator is connected to the vertical, and the Q demodulator is hooked up to the horizontal input of the scope. If -Q is used, the bite will appear on the opposite side of the circle as shown by the dotted line.

Rainbow generators having crystal controlled or VFO side lock oscillators may be used, however the for-

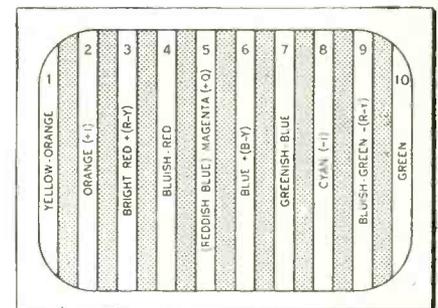
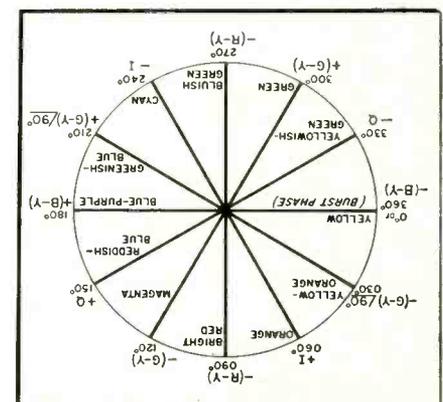


Fig. 9—Keyed rainbow generator provides 10 distinct bars of color on receiver's CRT.

Fig. 10—Chrominance phase diagram corresponds to vectorgram in Fig. 8. The chrominance blanking pulse normally eliminates $-(B-Y)$ and $-Q$.



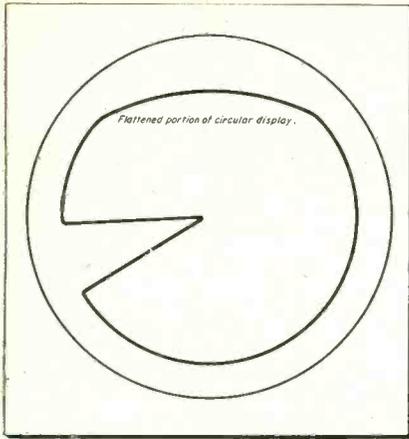


Fig. 11—Overloaded chroma circuit causes a flattening of the circular vectorgram.

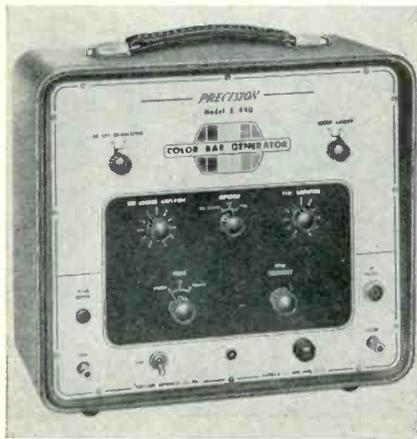


Fig. 12—Crystal controlled color bar generator provides 10 equally spaced color bars across the color receiver's CRT. Included are the color bars corresponding to the R-Y, G-Y, B-Y, I, and Q signals as shown in Fig. 9.

mer is more stable, and the color-phasing control may be set more accurately.

Keyed Rainbow Signal

When a keyed rainbow signal is used in a vectorscope test, a circle is obtained as shown in Fig. 8. The keying signal interrupts the pattern, like the spokes of a wheel. The "spokes" are not well defined as straight lines for two reasons:

1. The phase of the rainbow signal is changing somewhat over the duration of each bar.
2. The transient response of the receiver chroma circuits is somewhat less than perfect.

A keyed rainbow generator customarily displays 10 bars of simulated color on the screen of the picture tube, as depicted in Fig. 9. These bars correspond to chrominance phases in the vectorscope pattern as noted in Fig. 8. The complete chrominance phase diagram corresponding to the vectorgram is shown

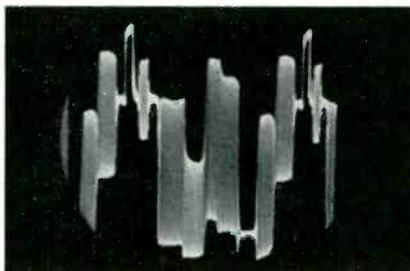
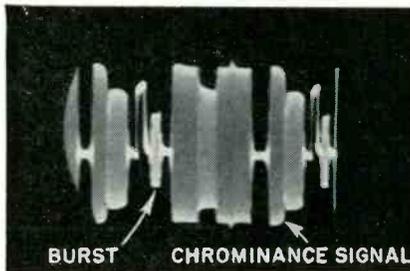
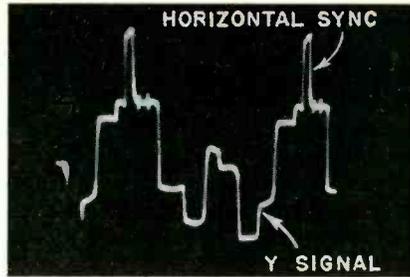


Fig. 13—Top-luminance signal: Center-chrominance information: Bottom—both signals comb.

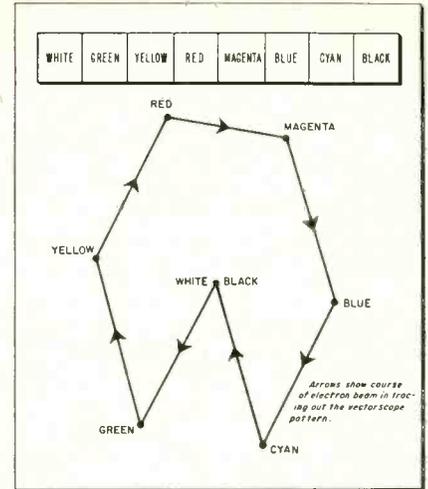


Fig. 14—Vectorgram pattern from NTSC signal using R-Y and B-Y vertical and horizontal axes.

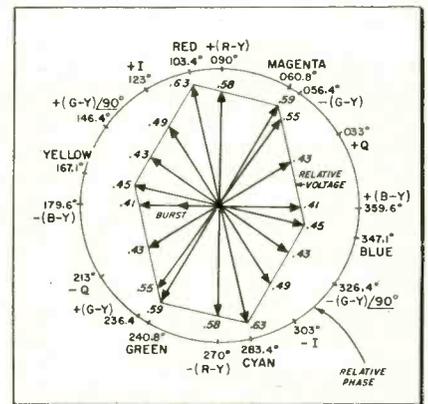


Fig. 15—Relative voltages and phases reproduced in normal operation of a color receiver.

in Fig. 10; from which it is seen that the blanking pulse normally bites out yellow and yellowish-green (-Q and -(B-Y)). As the color-phasing control is turned, the vectorgram rotates like a wheel. As the color-intensity control is advanced or turned down the vectorgram expands or contracts respectively.

If the input signal is excessive, or if the color-intensity control is advanced too far with a normal signal level, a vectorgram display becomes flattened, due to chroma circuit overload. This condition is indicated in Fig. 11 for a simple rainbow signal. The generator shown in Fig. 12 produces color bars on the screen of the picture tube by means of a crystal-controlled oscillator operating at an exact frequency of 3,563.795 Kc, (15,750 cps lower in frequency than the color sub carrier oscillator in the TV receiver). The difference in frequency between this oscillator and the set oscillator produces a signal that is equivalent to a continuous phase variation from 0°

to 360° of the color sub carrier oscillator. This continuous phase shift occurs in the time it takes the 3 electron beams in the picture tube to complete one horizontal scanning line, including retrace. It is repeated for each scanning line. If it is remembered that different hues or colors are produced in the receiver by varying the phase of the sub carrier oscillator with respect to the reference burst of 3.58 Mc then it can be readily seen that the 0° to 360° phase shift will produce a continuous spectrum of colors across the screen of the CRT.

NTSC Generator

When the TV receiver is energized by a standard NTSC colorbar signal, Figs. 13A, B & C., the vectorgram which is obtained in normal operation appears as shown in Fig. 14. This illustration shows the progress of the electron beam from one color signal to the next, but does not show
(Continued on page 59)

TV SOUND ALIGNMENT NOTES

M. G. GOLDBERG

When sound alignment is called for on some of the older models of TV receivers such as the RCA split-sound jobs and others, instructions state that the signal generator is to be set to some frequency such as 21 mc. Due to differences in tolerances on various generators, 21 mc on the shop generator may not conform exactly to that of the factory equipment, and may actually be something like 20.85, 21.1, or even 21.25 mc. If the entire alignment of the receiver were being attempted, this would make very little difference, but if only the sound i-f strip is to be realigned this difference can be serious and cause poor tone, sound in the picture, etc.

When adjusting only the sound i-f's or detector, the sound traps in the video i-f stages would normally not be touched. If the shop generator was not "on the nose" with the factory counterpart, the traps and the discriminator circuits would be set at different frequencies. To circumvent this possibility, it is a good idea when aligning only the sound i-f stages to connect the output of the generator to the input of the tube ahead of the last sound trap in the video i-f amplifier and with the scope at the video detector output, adjust the generator for mini-

mum response, using a modulated signal. Then leave the generator strictly alone for the rest of the alignment procedure. The sound traps and sound i-f adjustments will now be set to exactly the same frequency when alignment is accomplished.

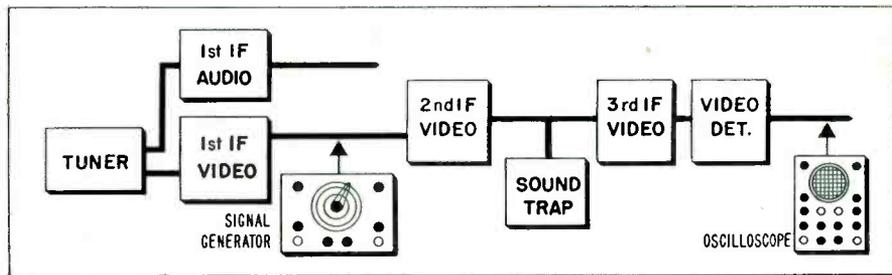
This method of setting up the signal generator may be employed in those situations where alignment data is not available. By going through a range of possible frequencies and watching for the point at which the trap is most effective, the sound i-f frequency may be determined; assuming of course that the trap is properly adjusted, and that the correct trap is selected.

It is often difficult to create factory conditions in the field, due to variations in equipment, stray signal

pickup; differences in bonding and shielding of leads, line voltage, biasing conditions, circuit loading and other factors.

In spite of the most careful procedure after alignment is completed, the technician may find that hair-line adjustments in one direction or another will eliminate a trace of sound bars, minimize the slight amount of hum that may be present, or step up the volume just a bit. There is no harm in attempting these adjustments if proper care is exercised. Several alignment tools are available which enable the technician to index the adjusting screws. Should no improvement be noticed when turning first in one direction, and then in another, the adjusting screw should be judiciously returned to the index point.

Minimum indication indicates when signal generator is tuned to frequency of sound trap.



You're in with Both Feet

F. R. VOORHAAR
SALES PROMOTION MANAGER
TECHNICAL APPLIANCE CORP.

• Door-to-door salesmen consider their sale 90% made if they can get one foot inside the door. Service technicians should remember this because they are privileged to enter the customer's home, and should make the most of their opportunities to serve TV owners. Just a short time ago it was brought home to me rather forcefully that many technicians do not take advantage of these opportunities. Here is the story.

While in a dealer's store telling him about new antennas, one of his outside technicians came in to say that he was boiling mad. Let me tell you his story in censored form.

"Boss, I just drove by Mrs.

Anderson's and thought I'd drive in for we hadn't had a service call for some time. I should have looked up on the roof, and sure wished that I had done so. First of all, I asked her how the TV set was working and she finally told me that Joe's TV Service had been doing her service work. It seems that he sent out some promotional post cards last August, suggesting that the summertime was the best time to replace an antenna. Well she got one of these cards and gave him a call. Not only did he sell her an antenna, but he is also doing all of the radio and TV service that we formerly did, and on top of that sold her a new set. Well I managed to keep a bit cooler than I am now, and asked why she hadn't told us that she wanted an antenna. Well I sure learned a lesson when she said, 'I didn't know that you did anything except repair work, for you never mentioned it to me.' Well, from now on every one of my customers will know that we sell as well as service.

I did put one over on Joe's serviceman. I noticed that he had haw-wired the two sets together and so I installed a two-set coupler which gave her a much better picture. Well we've lost some business there, but I'm pretty certain that we'll get her back as a customer again now that we understand each other."

Well, if there is any lesson to be learned from this experience, it's quite obvious. We should take advantage of the invitation we get every time the customer calls us in to do a service job. Your customer has confidence in you and your ability, and he expects you to make the recommendations for new antennas, set couplers and other replacements about which he has no knowledge. You know and I know that we expect the same thing from our garage mechanic, and we would be very provoked if our gas mileage dropped down 25 to 50% because he didn't tell us we needed one or two new spark plugs. •

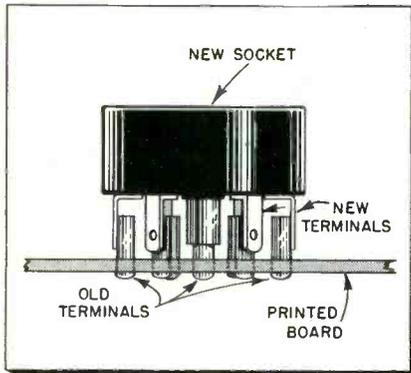
SHOP HINTS

Tips for Home and Bench Service



Socket Replacement

Some late model Emerson TV receivers use a tube socket that is mounted on metal posts on the printed circuit board. The contacts often break between the socket wafers. Since the replacement sockets when available are not better than the original, we replace them with regular molded sockets, result-



ing in a more permanent repair.

Carefully break the formica wafers on the old socket and cut away the metal contacts, leaving the terminal intact on the board. Bend the soldering lugs of the new socket to lineup with the terminals left on the printed board. Slip the center ground contact of the new socket over the similar part of the old socket and solder the lugs to the appropriate terminals.

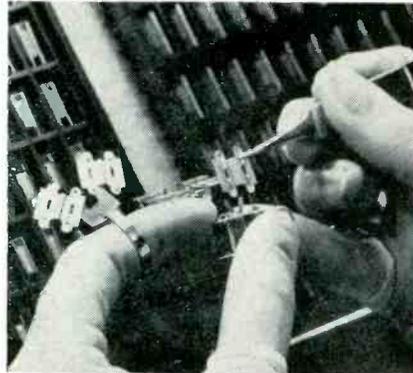
If the new socket has a mounting bracket, remove it before mounting. —Daniel Gross, Richard Riebsamen, Tampa, Fla.

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Magnetic Ring

Magnetic fields not only play an important role in the operation of electronic equipment they also extend into the production area. Here, a small permanent magnet worn as a ring simplifies assembly of tiny parts in precision manufacturing. Motion studies reveal that U-shaped Alnico-5 magnets step up this



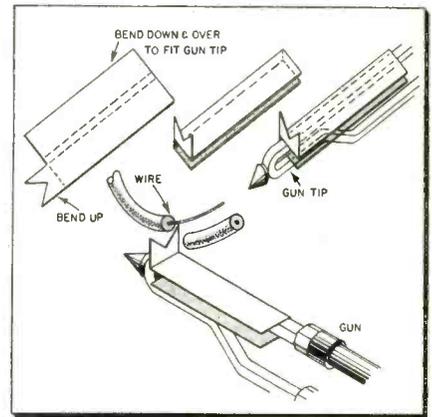
Magnetic ring holds parts for assembly.

"tweezer" operation 12 percent. Formerly, time was lost through extra motions in picking up tiny parts individually from bins.—Metallurgical Products Dept. General Electric Co., Detroit 32, Mich.

• An excellent tool for servicing subminiature electronics. See the June 1957 issue of *Electronic Technician*.—Ed.

Wire Stripper

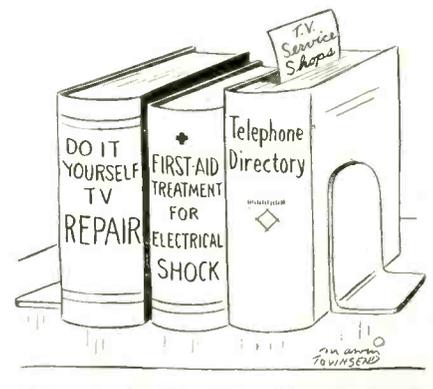
Because the tip of a soldering gun heats and cools quickly, it is quite feasible to have several attachments available which can slip on and off easily and which can often be improvised on the spot. Many different shapes and sizes of tips may be fashioned for close work, heat sensitive areas, and components with many terminals, which have to be



Solder gun attachment strips wire neatly.

unsoldered simultaneously.

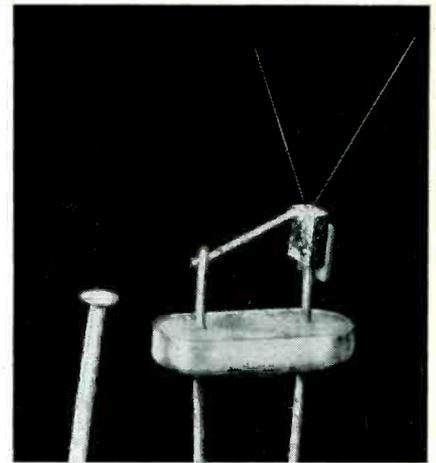
Here is another gismo to remove that tough insulation on plastic-covered hook-up wire. Cut and bend a piece of copper as shown and slip over the tip of the soldering gun. If the V cut is sharpened a bit it can be used to clean the wire after removing the insulation. Apply to insulation, work around a bit and pull—presto, clean, neat stripped wire—ready to solder.—C. Hoffman, Kewaunee, Wisconsin.



A New Component--

The Spacistor

Experimental device combines tube and transistor principles.



Spacistor shows four leads: base (slanty crossbar); collector (lower right); injector (top left whisker); modulator (top right whisker).

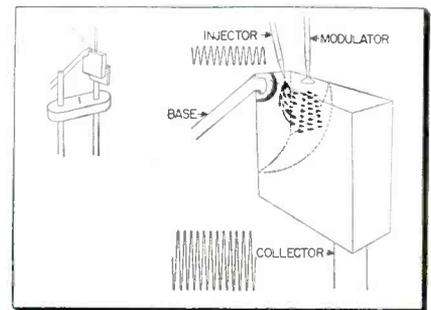
• A radically new semiconductor component capable of amplifying electrical signals has been announced by Raytheon Mfg. Co. Called the spacistor, this still-experimental device combines electron flow in solids (as found in transistors) and electric field action (similar to tubes) to develop the best characteristics of both. Note accompanying anticipated characteristic table and functional drawings.

Physically, the spacistor is similar to a transistor. First models have been made of germanium, but other materials such as silicon carbide, which are not suitable for transistors, may be used to permit operation at a possible 500°C. Today's germanium and silicon transistors will not operate satisfactorily above 200°C. However, several years of research are ahead of the company to bring performance up to maximum expectations.

A comparison analogy of how the charged particles in spacistors and transistors work can be made by dropping a single ink drop into two glasses—one empty, the other filled with water. The drop rapidly reaches the bottom of the empty glass—similar to the rapid action of the spacistor. In the filled glass, the drop slowly diffuses until it finally reaches the bottom—similar to the relatively slow response of a transistor. •

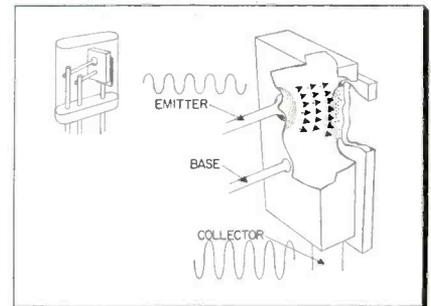
SPACISTOR

A voltage is applied between base and collector in such a direction as to produce a high electric field and virtually no current. A voltage, applied to the injector, causes electrons to enter the region of high field. The electrons flow extremely rapidly to the collector contact. This current (flow of electrons) is modulated by the application of a signal to the modulator as shown. Since the modulator draws only a negligible current while causing the current between injector and collector to fluctuate, amplification results.



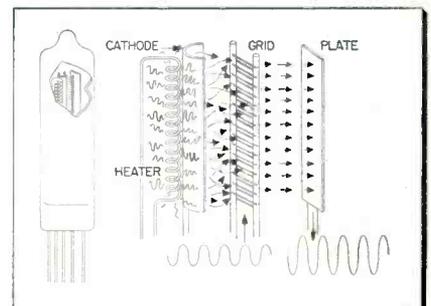
TRANSISTOR

In a typical transistor, a negative voltage is applied between emitter and base. This causes a current (flow of electrons) between the emitter and the positive collector. The small fluctuating signal to be amplified is applied between emitter and base. This causes the negative emitter voltage to fluctuate accordingly. The more negative the emitter, the greater the current (flow of electrons) between emitter and collector. The transistor amplifies because the input resistance is lower than the output resistance while the input current is substantially equal to the output current. The result is a net signal power gain.



VACUUM TUBE

The cathode is heated by a filament heater. A large number of electrons boil off the negative cathode and are attracted to the positive plate. The small fluctuating signal, to be amplified, is applied to the negative grid as shown. This causes the negative grid voltage to fluctuate accordingly. The more negative the grid, the smaller the current (flow of electrons) between cathode and plate. Thus the grid acts as a valve or shutter, a very small signal controlling a relatively large current. The large output signal (shown under plate) is the amplified counterpart of the small input signal.



Comparative Characteristic Table

	VACUUM TUBE	SPACISTOR	TRANSISTOR
FREQUENCY LIMIT	HIGH (1000 Mc.)	HIGH (1000 Mc.)	MEDIUM (100 Mc.)
HEATER POWER	REQUIRED	NONE	NONE
HIGH TEMPERATURE MATERIALS	AVAILABLE	AVAILABLE	NOT AVAILABLE
THEORETICAL LIFE	LIMITED	UNLIMITED	UNLIMITED
VACUUM ENVELOPE	REQUIRED	NONE	NONE
CIRCUIT WEIGHT AND SPACE	HIGH	LOW	LOW
STRATEGIC MATERIALS	REQUIRED	NONE	NONE
COMPLEXITY OF MULTIPLE-STAGE CIRCUITRY	LOW	LOW	HIGH
INPUT AND OUTPUT IMPEDANCES	HIGH	VERY HIGH	LOW

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 Name

 Company

 Address

 City State

Clevite Transistor Products

As described in **ELECTRONIC TECHNICIAN**, send me your free 4-page technical data sheet B211 describing germanium PNP alloy junction power transistors, together with ratings, mechanical specs and various amplifier and converter circuit applications.

 Name

 Company

 Address

 City State

Delco Radio (General Motors)

As described in **ELECTRONIC TECHNICIAN**, send me your free 4-page engineering data sheet on the 2N173 PNP power transistor designed for 12-volt power supply. Literature includes ratings, characteristic curves, dimensions and connections, together with amplifier circuits.

 Name

 Company

 Address

 City State

General Electric

As described in **ELECTRONIC TECHNICIAN**, send me your free 16-page reference ETX-10J, Power Tubes for Industry and Broadcast, covering crt's, ignitrons, rectifiers, transmitting, photo and other tubes. Also your 6-page silicon rectifier brochure ECG-213, and 4-pager ECG-82 on germanium diodes.

 Name

 Company

 Address

 City State

General Instrument

As described in **ELECTRONIC TECHNICIAN**, send me your free brochure of data sheets describing your Automatic Mfg. Div. line of medium power silicon rectifiers, including types for power supplies, magnetic amplifiers, high voltage and replacements for germanium types.

 Name

 Company

 Address

 City State

General Transistor

As described in **ELECTRONIC TECHNICIAN**, please send me your free giant wall chart, 22 x 25 in., describing ratings and characteristics of germanium alloyed junction transistors, plus interchangeability of 153 different transistor types.

 Name

 Company

 Address

 City State

& Semiconductor File

for you. Act before Sept. 20

Minneapolis-Honeywell

As described in ELECTRONIC TECHNICIAN, send me your free 10-page specification brochure on H5, H6 and H7 Weld Seal germanium power transistors, including operating characteristics, dimensions and definitions of performance parameters.

Name

Company

Address

City State

RCA

As described in ELECTRONIC TECHNICIAN, send me your free (regular price 20¢) 16-page interchangeability directory of industrial type electron tubes, listing hundreds of types by manufacturer. Also flyer 4T14 listing transistors and semiconductor diodes.

Name

Company

Address

City State

Radio Receptor

As described in ELECTRONIC TECHNICIAN, send me your free 4-page bulletin G-60 describing the electrical and mechanical specifications of your gold bonded germanium subminiature glass diodes, covering over 50 types, and color coding and polarity data.

Name

Company

Address

City State

Sarkes-Tarzian

As described in ELECTRONIC TECHNICIAN, send me your free (regular price \$1) 36-page Silicon Rectifier Handbook, no. 669A, detailing theory of operation, characteristics, physical structure, plus numerous circuits, applications, performance curves and mounting.

Name

Company

Address

City State

Transitron

As described in ELECTRONIC TECHNICIAN, send me your free 6-page brochures TE1340 describing diodes, rectifiers, transistors and silicon voltage regulators, and TE1342 on the TD series of silicon rectifier stacks giving ratings for different connections.

Name

Company

Address

City State

Westinghouse

As described in ELECTRONIC TECHNICIAN, send me your free 12-page Easy Guide to Reliatron Power Tubes, describing rectifiers, phototubes, pliotrons, ignitrons, thyratrons and similar tube types, including specs, operational ratings, and an interchangeability chart of special tubes.

Name

Company

Address

City State

In addition to the valuable literature described in the coupons here, available to you free for the asking, the following material may be obtained at modest cost by sending payment directly to the manufacturer. Do not send payment to ELECTRONIC TECHNICIAN.

20-page reference data PA-5 on industrial tubes, specs and ratings on all types. Price 10¢ from CBS-Hytron Sales Corp., Danvers, Mass., Att: C. Globe.

64-page Transistor Manual ECG-187 giving applications, circuits and specs. Price 50¢ from General Electric, Semiconductor Products, Electronics Park, Syracuse, N.Y., Att: R. W. Sollinger, Jr.

24-page reference PG101C on power and gas tubes, with descriptions of various types, specs and basing, for industry and communications. Price 20¢ from RCA Tube Div., Harrison, N.J., Att: L. Aurick.

Association News

ITTA Publication & Election

The Indianapolis Television Technicians Association has started a publication for the service trade in Indiana, called, "The Hoosier Test Probe." New officers elected are: George Roberts, Pres.; Oscar Clark, V.P.; Ernest Marthin, Treas.; Harold Joergens, Recording Sec.; Edward T. Carroll, Correspondence Sec.; and Neil Ellwanger, Sgt-at-Arms.

CETA Alumni Night

The Certified Electronic Technicians Association played host to the past graduates, and their guests, of the RETMA Advanced Course in TV Service Techniques given by the N.Y. Trade School, at the Hotel Warwick in New York City. Events of the evening included Hors d'oeuvres, beverages, door prizes, a technical lecture and technical literature. Special guests and speakers included Paul Zbar, Director of the RETMA Training Program and head of the TV Department and Sid Schildkraut a member of the educational staff. They spoke about school activities, progress made, and how as a nonprofit institution, it has helped many of its students to establish a better career. It has one of the best equipped TV laboratories and technical libraries in the country; made possible by many contributions from just about every segment of the industry. The association expressed its desire to help the aims of the school and to help interested technicians apply for enrollment in the next evening class which is scheduled to start on Sept. 15, 1957.

(Continued on page 59)

... another
MALLORY
 service-engineered
 product

New **MALLORY** Dual Controls



**Put an end to
 service delays such
 as awaiting parts—
 and those long
 “shopping tours”
 and “special orders”
 for factory built
 replacements**

Mallory's new dual replacement controls service just about any standard model TV set and home or auto radio. Your Mallory distributor counter man will build a control to your exact specifications—in just 30 seconds. See your Mallory Distributor—TODAY.

P. R. MALLORY & CO. Inc.
MALLORY

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

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



INSTITUTE OF HIGH FIDELITY MANUFACTURERS has moved from Mineola, N. Y., to larger offices at 125 E. 23 St., New York 10, N. Y. Phone is Algonquin 4-3532. Edwin Cornfield, Executive Secretary, and Sanford L. Cahn, Director of Shows, will occupy the new suite.

TALK-A-PHONE has come out with a new all-transistor home intercom-radio system, including door answering device.

SALES MANAGERS CLUB, Eastern Division, is unofficially reported to be changing its name to PACE—Producers of Associated Components for Electronics. It is expected to operate in a more formal trade association fashion.

COLLARO Board Chairman Major Christopher Collaro has arrived in the U. S. from Britain, bringing the first record changer models of a new line reported to contain very substantial design improvements and innovations. The line will be made public on Sept. 1st, accompanied by a major ad campaign.

RECOTON has issued a new needle replacement wall chart, and a new premium booklet of housewares, tools and other products in exchange for profit sharing coupons. The company has also come out with a 100-power stylus inspector, #41, dealer \$13.20, list \$26.40.

TRANSISTORIZED TAPE RECORDER is reported as in production in Japan, weight under 5 lbs., price there over \$300, size about 2 x 6 x 8.

NARDA's annual "Cost of Doing Business Survey" showed TV-appliance-audio dealers had come up with only a 1.2% net profit-sales

ratio for 1956, compared to 3.4% in 1955. Record high of 28% of dealers reported net loss for past year. Year end inventories went up 14.8%; inventories turned over 4.2 times compared to 5.5 times in 1955. Gross margin fell from 34.3% to 32.3%. Operating costs rose from 30.9% of sales in 1955 to 31.1% in 1956. TV-radio-phono sales were up to 31.7% of total from 28.8%. For 1957, 41% of dealers expected sales increase, 13% expected a drop.

GENERAL ELECTRIC's latest line of radios includes the Model T-120, AM-FM set with two speakers, afc, phono and output jack. Price is \$75. It is the only radio in the line that does not have a printed circuit chassis.

TANDBERG corner loud-speaker system features an 8-inch dual-cone speaker with a built-in cross-over network. Frequency response to 16,000 cps. Dimensions are 40" high x 21" wide x 9 1/2" deep and weight is 27 1/2 lbs. The unit may be hung on the wall in a corner.

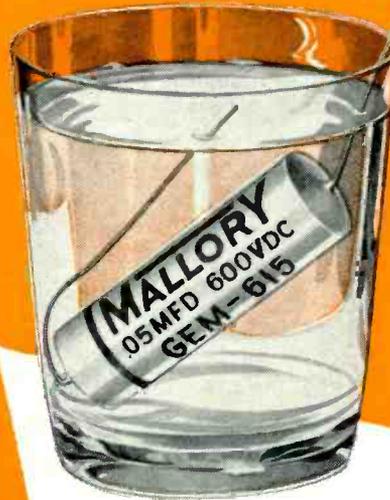
BEAM-ECHO of England is making hi-fi equipment for MAJESTIC INTERNATIONAL. Among items displayed are a 21-watt amplifier-preamp at \$149.95; a stereo amp at \$239.95; AM-FM tuner, \$149.95; stereo tape deck, \$150.95; deck with twin channel amp, \$225.95; 30-watt woofer-tweeter in corner enclosure, \$199.95.



"Good morning—Rapid Service."

... another
MALLORY
 service-engineered
 product

Months under Water...



prove
MALLORY
"GEMS"

moisture proof

To demonstrate how well Mallyory "Gem" tubular capacitors resist moisture, we put some in plastic tubes filled with water. Months later, their internal resistance remains unchanged . . . proving there has been no moisture absorption.

Sure, you don't expect to submerge the capacitors you install. But when you're looking for top performance, even under the toughest humidity—always ask for Mallyory "Gems."

Get your stock today from your Mallyory distributor. He carries them in all popular ratings for by-pass and coupling applications.

P. R. MALLORY & CO. Inc.
MALLORY

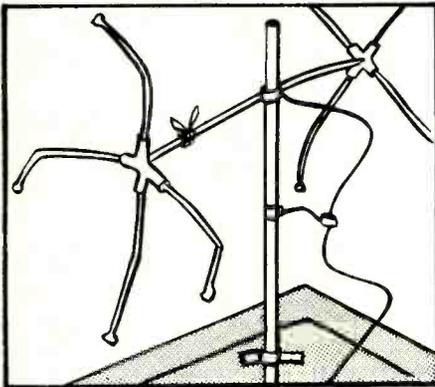
P. R. MALLORY & CO. Inc., INDIANAPOLIS 6, INDIANA

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

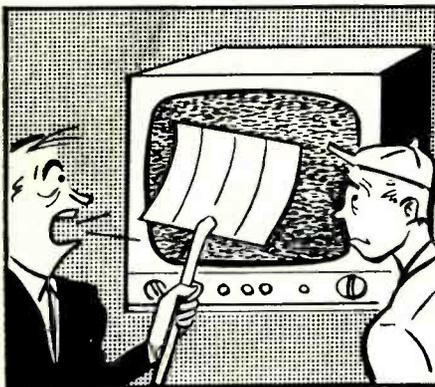
Right Or Wrong In Labor Relations



How's your roof-top "wrestling" with heavy-weight, octopuses?



Discouraged at how fast some "miracle" antennas disintegrate in wind, ice and snow?



How do you stand up under customer tongue lashings about weak, snowy pictures?

had
enough?

then turn to
TACO

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

CAN YOU FIRE AN EMPLOYEE WHO BEATS UP HIS SUPERVISOR OFF COMPANY PREMISES?

What Happened:

The service manager accused benchman Handley of violating a company rule. The technician denied it in colorful and heated language. After work, Handley approached the manager in the company parking lot and asked him to discuss the matter. The manager refused, got into his car and drove home. The technician got into his own car and followed. Outside the manager's house, the benchman landed a haymaker which knocked the manager down. The manager got to his feet and started to swing back but was deterred by a neighbor. Next day, Handley was fired.



Handley objected that the fight was a personal matter, unrelated to work. They had never gotten along well. What's more, the technician maintained, the scrap took place outside of working hours and off company property and was none of the company's business.

The company insisted that the assault on the manager was a direct result of his exercise of his supervisory responsibilities, and that where-and-when it occurred had nothing to do with the case.

Was The Company:
RIGHT WRONG

What Arbitrator Jacob Blair Ruled:
"Careful study of the evidence shows

that Handley did deliberately plan and then carry out an assault upon the manager at the latter's home; second, that this assault arose directly out of the working relationship between two employees, one having supervisory authority over the other; and third, that if such an assault were condoned, it would affect working conditions in the plant. On these grounds, it must be held that the company has established proper cause for discharge."

WHEN CAN'T YOU FIRE AN EMPLOYEE FOR EXCESSIVE CARELESSNESS?

What Happened:

Jack Keen had worked for the company for four years. During his fourth year on the job he made a great many errors, serious enough to mislead the company in some of its decisions. So he was fired for incompetence and carelessness. The company claimed that:

1. Keen made far too many mistakes to be overlooked. His errors damaged our relations with suppliers, and cost us time and money to correct.

2. His careless attitude is clear from his frequent lateness and absence during the past year.

3. Accuracy is vital in that job, and Keen knew this when he took it on.

But Keen objected:

1. My working conditions and the company's methods were such that I didn't have enough control over my own work to do it accurately.

2. My absence and lateness during the past year were due to the fact that my young son was seriously ill, which the company knew. The company even encouraged me to take time off because of it, so they have no right to use that against me now.

Was The Worker:
RIGHT WRONG

What Arbitrator Spencer Pollard Ruled: "It is the conclusion of the arbitrator that there is insufficient evidence to warrant writing 'incompetent and careless' upon Mr. Keen's record, in view of the conditions of work granted him by the company. The mistakes which brought on this case may have been made by Mr. Keen, but we cannot be sure of that in view of the loopholes and informalities in the company's system. Since the burden of proof is on the company, as the party making the

charges, it appears that a reasonable doubt has been established as to Mr. Keen's part in the errors. There is, therefore, insufficient evidence to penalize Mr. Keen for them. There is nothing in the record to show that the company objected to Mr. Keen's tardiness or absences, while they were occurring intermittently over a whole year before his discharge. The evidence is that the company had decided to help him in that way with his family problem. The Arbitrator believes that it is now too late for the company to decide to penalize him for this. Mr. Keen should be reinstated in his job and compensated for lost earnings." •

Making Phono Needles



Electronically controlled fusion chamber receives 3,000 individual diamonds resting in sockets atop 3,000 steel pins. This bonding process which results in joining steel to diamonds is the first step in the automated production of Walco phono needles.

Classified Ads

Editor, ELECTRONIC TECHNICIAN:

I am a full-time, self-employed serviceman. I eat, sleep and work TV and radio, and never seem to tire of it. This makes the fourth year of my subscribing to your very fine magazine—the only servicing magazine I do subscribe to. One section that you should add is classified advertising. Some general radio magazines have such a section, but I don't think many technicians read it. There are several instruments I would like to buy and sell.

ROBERT F. WOLFE

Baltimore, Md.

Thumbs Up on Binders

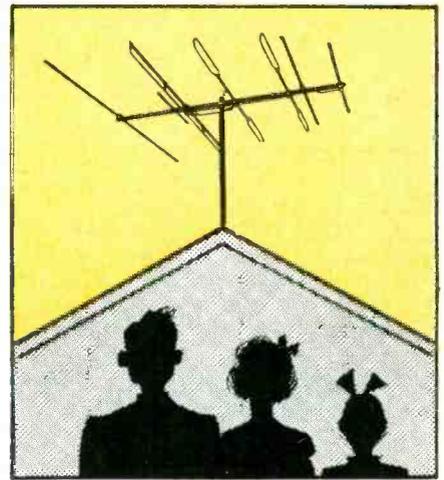
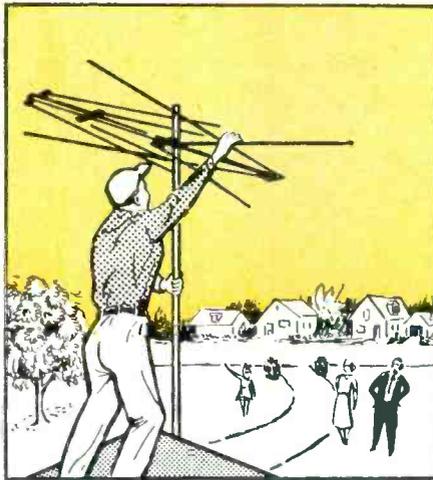
Editor, ELECTRONIC TECHNICIAN:

Your Circuit Digest binders are not only very handy, but very attractive as well. Enclosed is a check for \$2.95 for a second binder.

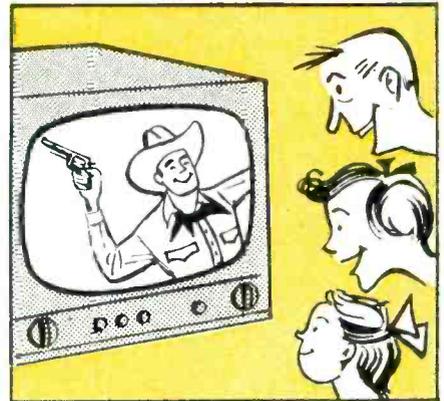
LAWRENCE W. LEVY

New York, N. Y.

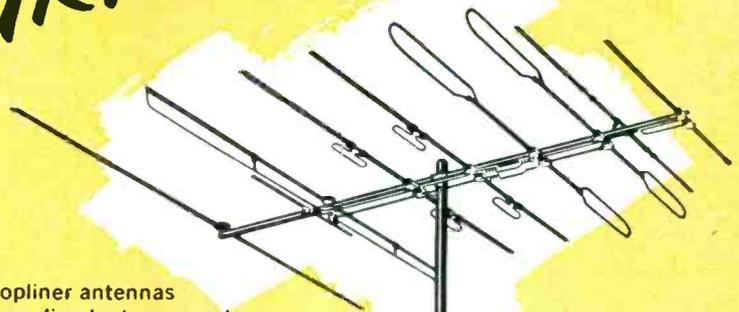
• Our multi-blade binders for 24 complete issues of ELECTRONIC TECHNICIAN are also practical and good looking. They're \$3.25 postpaid.—Ed.



TACO
antennas
work right!



TURN TO TACO...



Taco Topliner antennas are streamlined, strong, and powerful performers. They come out of the carton clean, easy to assemble on the roof, and once installed, they stay up! Customer satisfaction is assured, because no other antenna made provides so much gain pound-for-pound.

Easier installation and customer satisfaction add up to more profit for you. Don't keep putting up with antenna problems—turn to Taco and start making money...

*tops
'em all!*

TACO

TECHNICAL APPLIANCE CORPORATION, SHERBURNE, N. Y.

In Canada: Hackbusch Electronics, Ltd., Toronto 4, Ont

Latest Test Instruments

For more free information, fill in coupons and mail to ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N.Y.

As described in ELECTRONIC TECHNICIAN send me more data on the WINTRONIX Induced Waveform Analyzer, Model 850.

Name _____

Address _____

City _____ State _____



← Wintronix ANALYZER

Induced waveform analyzer, Model 850, localizes troubles in b&w and color TV, radios, amplifiers, etc. Tests are made from above the chassis. The output of the analyzer is fed to an oscilloscope. A detector probe is placed successively over each tube in the circuit under test. It can rapidly localize troubles in r-f, i-f, video sync, and audio circuits. Comes complete with phantom probe and attachments. Winston Electronics Inc., 4312 Main St., Phila. 27, Pa. (ELECTRONIC TECHNICIAN 8-60)

As described in ELECTRONIC TECHNICIAN send me more data on the TRIPLETT Models 100 and 10 clamp-on meter.

Name _____

Address _____

City _____ State _____



← Triplett CLAMP-ON AMMETER

Designed to plug into Model 310 miniature VOM, the Model 10 ac clamp-on ammeter permits current measurements from 6 to 300 amps simply by fitting the split transformer yoke around a conductor. No cutting into wires is required. Price is \$14.50 net. Model 10 can be used with any VOM having a 3-v. ac scale at 5000 ohms/v. by means of no. 611 or 311 lead sets at \$1.90. Complete package Model 100 with VOM and accessories is \$61.90. Triplett Electrical Instrument Co., Bluffton, Ohio. (ELECTRONIC TECHNICIAN 8-41)

As described in ELECTRONIC TECHNICIAN send me more data on the AFFILIATED TV U-Check-Em tester.

Name _____

Address _____

City _____ State _____



← Affiliated TUBE TESTER

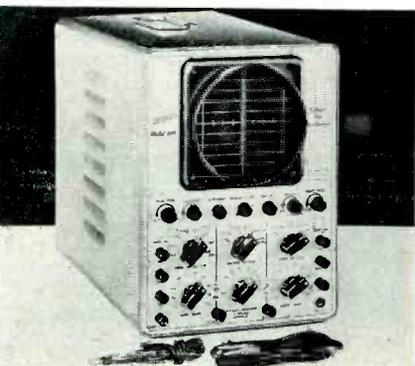
A new 50-v. filament supply is in the U-Check-Em self-service tube tester which are sold only through accredited parts jobbers to service technicians, who in turn set up a route and derive the profits. It is an emission tester under simulated load conditions, has 22 sockets, covers all prevalent types, using 6 bandswitch positions. Cabinet stocks over 300 tubes. New charts issued to keep up-to-date without rewiring. Affiliated Television Labs., 112-07 Francis Lewis Blvd., Queens Village, N.Y. (ELECTRONIC TECHNICIAN 8-42)

As described in ELECTRONIC TECHNICIAN send me more data on the HICKOK Model 685 oscilloscope.

Name _____

Address _____

City _____ State _____



← Hickok OSCILLOSCOPE

Model 685 portable 5" scope has ac and dc amplifiers, response dc to 750 kc, sensitivity 20 mv rms/in. Excellent for interpreting modulation, phase relations, voltage amplitudes, distortion. Gain control provides non-frequency discriminating 10 to 1 gain. V and H attenuators are frequency compensated in decade steps 1:1 through 1000:1. H sweep has 180° phaseable signal available. Hickok Electrical Instrument Co. 10523 Dupont Ave., Cleveland 8, Ohio. (ELECTRONIC TECHNICIAN 8-40)

News of the Industry

CBS-HYTRON SALES CORP. announces the appointment of **JOHN M. BEARSE** as Seattle District Manager.

LOUIS H. COHEN has joined the Components Div. of **INTERNATIONAL TELEPHONE & TELEGRAPH CORP.**

TOBE DEUTSCHMANN CORP. announced the promotions of **JOHN M. GLYNN** and **JOSEPH R. RICHMOND** to the position of Assistants to Sales Manager **TOM CRAWFORD**.

AMPEREX ELECTRONIC CORP. promotes two executives. **JOHN MES-SERSCHMITT** has been made assistant to Vice-Pres. and General Sales Manager and **GEORGE ELLIOT** has been appointed Manager of Export and Tube Industry Sales.

SIMPSON ELECTRIC CO. announced the addition of **JOHN F. SCHIPITZ** and **ROBERT VANDERVOORT** to its sales staff.

BELDEN MFG. CO. reveals the promotion of **DON WALSH** to the position of Sales Service Manager of the Merchandise Sales Division.

MORTON G. SCHERAGE has been appointed Instrument Product Manager of **ALLEN B. DUMONT LABS., INC.**

TRIAD TRANSFORMER reports the appointment of **IRVING TJOMSLAND** as Director of the Television Component Renewal Sales Dept.

WINSTON ELECTRONICS, INC., announces the appointment of **ROBERT M. REED** as Assistant National Sales Manager.

RAYTHEON announces two completely new and comprehensive promotion campaigns. One is a personalized and sales stimulating promotion program for **RAYTHEON Tube Distributors** and the second is a business building program for service dealers.

PERMA-POWER CO. announces that it has just completed a two week move to its own new and larger building at 3100 N. Elston Ave., Chicago, Ill.

(Continued on page 49)

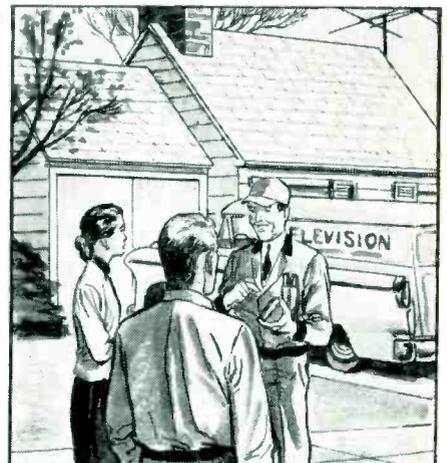


“. . . and let me have a replacement color scanning disk, Al.”

The Case of The Serviceman WHO SAVED A MARRIAGE!



Smith wanted to watch the fights; Mrs. Smith insisted on "This Is Your Wife". Fights they got, since a second set was within their means but there was only one antenna and no multi-set coupler they tried had worked satisfactorily.

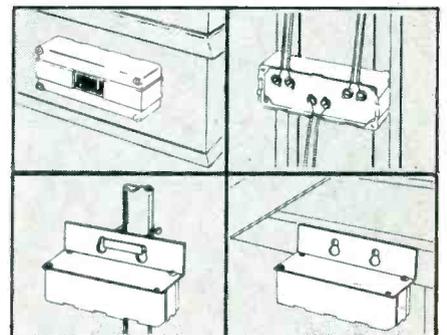


"You won't need another antenna with this 'NEW' Jerrold Multi-set COUPLER", said the TV Serviceman. "Its special design allows for equal distribution of the signal with exceptionally low loss and without smearing or ghosting"



The Jerrold multi-set coupler took only minutes to install . . . now, both the Smiths watch their favorite TV shows.

UNIVERSAL MOUNTING



- On the baseboard. Connectors completely concealed.
- In the attic or basement with terminals exposed for ease of servicing.
- Outdoors, on the antenna mast or on the side of the house.



New! JERROLD LOW LOSS COUPLERS

Available in 3 models

M-2—for strong signal areas . . . list \$3.50

MF-2—for fringe areas list 4.50

MF-4—up to 4 sets—all areas . list 5.75

Engineered for V.H.F., U.H.F., Color reception. See your Jerrold Distributor or write for complete information to Dept. P.D. #11

JERROLD ELECTRONICS CORPORATION

Main Office: 23rd & Chestnut Streets, Philadelphia 3, Pa.

Export Representative: C.B.S. International, New York 22, N.Y.

LOOK TO JERROLD FOR AIDS TO BETTER TELEVIEWING

New Products for Technicians

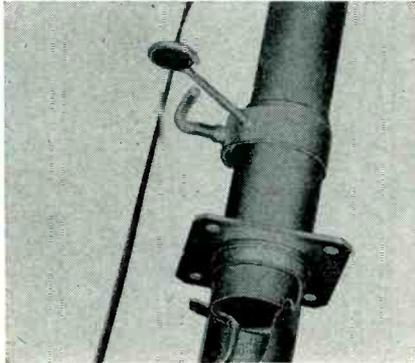
For more free information, fill in coupons and mail to ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N.Y.

As described in ELECTRONIC TECHNICIAN send me more data on the CHANNEL MASTER Super-Mast.

_____ Name _____

_____ Address _____

_____ City _____ State _____



← Channel Master SUPER-MAST

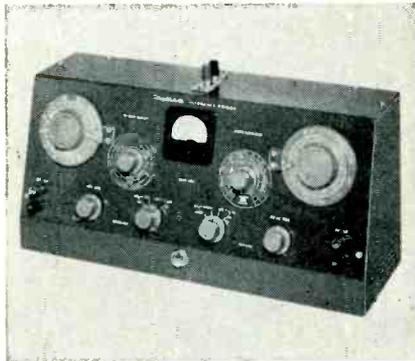
New line of high carbon galvanized steel telescoping TV masting has many time-reducing and cost-saving installation features including a dual T-Nut strap that houses both the insulator and locking bolt for the mast section. Another feature is a free turning guy ring and bearing for each section, which is positioned below the joint, enabling the technician to collapse the mast quickly and without fear of jamming. Channel Master Corp., Ellenville, N.Y. (ELECTRONIC TECHNICIAN 8-28)

As described in ELECTRONIC TECHNICIAN send me more data on the HEATH Model 1B-2A impedance bridge kit.

_____ Name _____

_____ Address _____

_____ City _____ State _____



← Heath IMPEDANCE BRIDGE

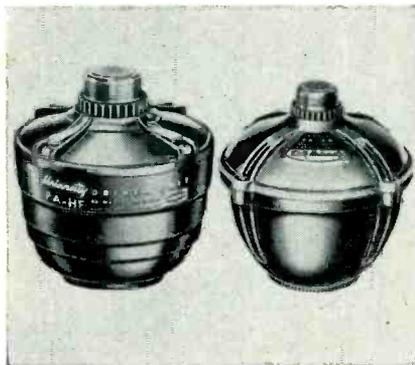
Improved Model 1B-2A impedance bridge kit features more constant filament voltage and more information in the instruction manual. It has a built-in power supply, 1 kc generator, vacuum tube detector and 100-0-100 microamp meter. Resistance measurements are up to 10 megohms, capacitance from 10 μ f to 100 μ f, inductance from 10 mh to 100 h, dissipation factor to 1, and storage factor (Q) from 0.1 to 1000. Price \$59.50. Heath Co., 305 Territorial Rd., Benton Harbor, Mich. (ELECTRONIC TECHNICIAN 8-43)

As described in ELECTRONIC TECHNICIAN send me more data on the UNIVERSITY Super Power Drivers, Model PA-HF and PA-50.

_____ Name _____

_____ Address _____

_____ City _____ State _____



← University DRIVERS

Model PA-HF utilizes a watertight, all die-cast aluminum housing for lifetime resistance to physical abuse. It is recommended for applications requiring 50 to 100-watts input power handling capacity, maximum sensitivity and widest frequency response. (70-10,000 cps.) Model PA-50 employs the same internal mechanism but includes impedance taps from 100 to 2,000 ohms, and 70-v power taps from 2.5 to 50 watts. University Loudspeakers, Inc., 80 S. Kensico Ave., White Plains, N.Y. (ELECTRONIC TECHNICIAN 8-30)

As described in ELECTRONIC TECHNICIAN send me more data on the PERMA-POWER Color Gun Killer, Model T101.

_____ Name _____

_____ Address _____

_____ City _____ State _____



← Perma-Power GUN KILLER

"Color Gun Killer," Model T101, enables each gun of the three-gun color CRT to be operated singly or in combination. It avoids cutting or disconnecting leads to make color purity adjustments. Plugs in, like a booster, between the CRT and its socket. Pre-tested by selected distributors and service technicians; this unit has already received wide acceptance. List price is \$4.95. Special illustrated literature is available. Perma-Power Co., 3100 Elston Ave., Chicago 18, Ill. (ELECTRONIC TECHNICIAN 8-31)

IT&T reports that the electronic instrument manufacturing and distribution activities formerly conducted by the Instrument Div. of FEDERAL TELEPHONE & RADIO, an IT&T div., have been assigned to the recently created Industrial Products Div., INTERNATIONAL TELEPHONE & TELEGRAPH CORP.

PRIZES FOR PYRAMID TWIST-MOUNT CAPACITOR CONTEST. The contest, open to radio & TV servicemen, is based on proper identification of the missing PYRAMID TM capacitor in four TV set schematics. The prizes, which total 147, lead with a weekend at the Waldorf Astoria, New York and other prizes include many electronic products. Every entrant will receive from PYRAMID a kit of 5 bypass and coupling capacitors.

DIRECTORS OF P. R. MALLORY & CO. INC. and RADIO MATERIALS CORP. have agreed on a merger, or pooling of interests, according to a statement released by J. E. CAIN, Pres. of MALLORY and JOSEPH F. RILEY, Chairman of R.M.C.

WELLER ELECTRIC CORP., in order to meet increased demand for its product line and streamline its service organization, will centralize all production, sales and administrative operations in the U. S. at its present general offices at Easton, Penna.

OHMITE MFG. CO. reports that construction of a sizeable addition to its plant begins in July.

SERVICE INSTRUMENTS CORP. has recently purchased H & S MACHINE PRODUCTS CO. of Chicago.

WARD PRODUCTS CORP. announces the sale of its television antenna business to the TELCO ELECTRONIC MFG. CO., a div. of GENERAL CEMENTS CO. The automotive and mobile antenna business stays at WARD PRODUCTS.

TUNG-SOL ELECTRIC INC. has purchased CHATHAM ELECTRONICS Div of GERA CORP.

CBS announces a practical and timely Transistor Home-Study Course especially for electronic service technicians. Technicians may obtain the Transistor Home-Study Course from any CBS Tube distributor.

STANDARD COIL PRODUCTS CO., INC. announces that pursuant to authorization of the board of directors, a litigation has been commenced in U. S. District Court against the GENERAL ELECTRIC CO. The litigation charges GENERAL ELECTRIC with infringement of the STANDARD COIL patent on Cascode tuners, issued by the U. S. Patent Office in December, 1956.

BLONDER-TONGUE LABS., INC. has moved to a larger building at 9-25 Alling St., Newark, N. J.

NEW PRODUCTS

BEGIN ON PAGE 46

MORE TV SIGNAL GAIN AT LOWER COST FOR ALL VHF INSTALLATIONS...



Automatic Broadband VHF BOOSTERS and AMPLIFIERS

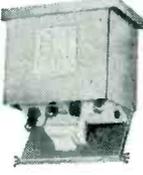
Whether you need signal amplifiers for a 2000-set master TV system or a booster for a single TV receiver, there's a B-T unit that's designed for the job.

Most TV technicians and installers will say 'amen.' They have learned that they can rely on products bearing the B-T Labs symbol. Rigorous factory quality control of construction, gain and match assures dependable and uniform performance of each product that goes out into the field.

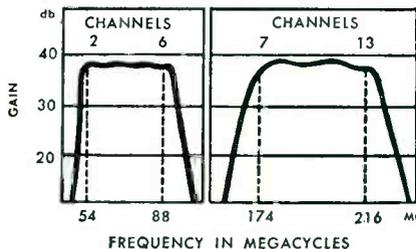
And for positive proof of superior engineering...

Exclusive patents: $\left\{ \begin{array}{l} 2,710,314 \\ 2,710,315 \\ 2,609,466 \end{array} \right\}$ covering automatic broadband circuits and relays have been granted to **Blonder-Tongue.**

Check to see which one of these units will clear up your specific signal gain problem.

	<p>VHF AMPLIFIER Model MLA</p> <p>Powerful all-channel VHF cascode amplifier with more than 37 db gain. Has variable gain controls for equalizing high and low bands. Output on each band: 1.25 volts RMS, flat to within 2 db. Self-powered. Matched input. 75-ohm coax fittings at input and output. When used with MAGC maintains constant output level. \$132.50 list</p>
	<p>COMMERCIAL ANTENSIFIER Model CA-1</p> <p>A popular broad band VHF amplifier for antenna and line applications. Gain: 26 db on low band and 24 db on high band. Low noise circuit. Matched 75 ohm and 300 ohm input. Gain control. Self-powered. \$84.50 list</p>
	<p>ANTENNA BOOSTER Model AB with Remote Control</p> <p>More than 25 db gain. Most popular broadband antenna amplifier in weatherproof housing with mast-mounting bracket. Remote control power supply located near set. Furnishes either 24 or 110 volts to amplifier, as desired. Single line carries power 'up' and signal 'down.' 'On-off' is automatic with TV set. Swing down chassis for easy servicing. \$99.50 list</p>
	<p>HOME BOOSTER Model HA-3</p> <p>Provides more than 16 db gain. Automatic 'on-off' operated by TV set. No tuning. Features low-noise, push-pull, broadband circuits. Self-powered. \$47.00 list</p>

This Typical Response Curve means superior performance - greater gain with lower noise, flatter response, minimum maintenance requirements, and lower initial cost.



Dept. T-8

BLONDER-TONGUE LABS., INC.
9-25 Alling Street, Newark 2, N. J.

Industrial TV Cameras • TV Systems • VHF and UHF Amplifiers and Converters • TV Accessories

New Components

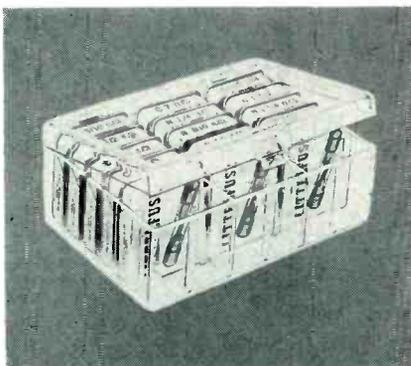
For more free information, fill in coupons and mail to ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N.Y.

As described in ELECTRONIC TECHNICIAN send me more data on the LITTELFUSE Fuse Caddy.

Name

Address

City State



← Littelfuse FUSE CADDY

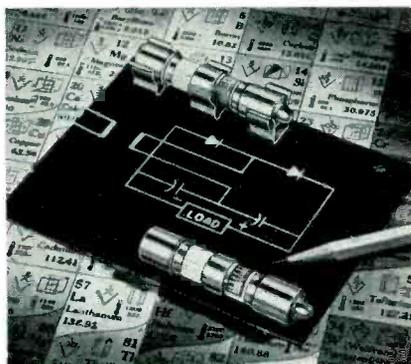
A new plastic-packaged fuse caddy contains an assortment of 15 limited current (LC) fuse types which will cover 94% of all service requirements for this fuse. There are 3 spare compartments for carrying additional fuses. The designation LC refers to the fact that these fuses are specially designed to make it impossible to fuse equipment, particularly TV sets, at a higher rate than the manufacturer originally intended. Littelfuse Inc., Des Plaines, Ill. (ELECTRONIC TECHNICIAN 8-24)

As described in ELECTRONIC TECHNICIAN send me more data on the INTERNATIONAL Silicon Cartridge Voltage Doubler.

Name

Address

City State



← Int'l SILICON RECTIFIER

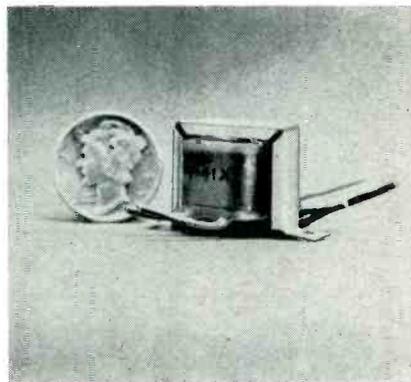
Dual purpose silicon cartridge voltage doubler rectifiers are small in size and light in weight. Each of these voltage doublers have a maximum rating per leg of 3,200 PIV. Two units can be connected as a single-phase, full-wave bridge, capable of delivering 1,900-volts dc at 90 ma. They are available in 2 standard lengths; 2½" and 4¼". The cartridge design permits mounting in standard 30-amp fuse clips. International Rectifier Corp. 1521 E. Grand Ave., El Segundo, Calif. (ELECTRONIC TECHNICIAN 8-25)

As described in ELECTRONIC TECHNICIAN send me more data on the TRIAD Transistor Transformers.

Name

Address

City State



← Triad TRANSFORMERS

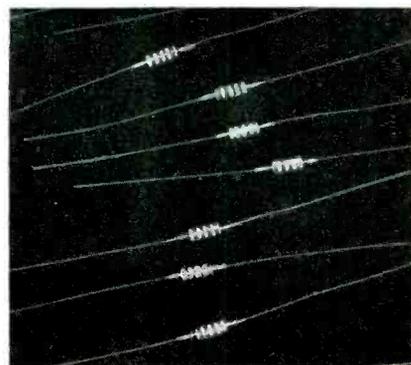
A total of fourteen new items have been added to the line of transistor transformers. They are designed to cover a wide variety of transistor applications. These new transformers, not much larger than the size of a dime, combine optimum performance as well as having minimum size and weight. The complete listing of transistor transformers appears in the general catalog, TR-57, which is now available. Triad Transformer Corp., 4055 Redwood Ave., Venice, Calif. (ELECTRONIC TECHNICIAN 8-26)

As described in ELECTRONIC TECHNICIAN send me more data on the OHMITE Miniature 1/10-watt Resistor.

Name

Address

City State



← Ohmite RESISTORS

Subminiature 1/10-watt moulded composition resistors are only 0.067" in diameter and 0.140" long. They are intended for use in miniaturized assemblies where small size is mandatory. Lead wires are molded solidly into the resistance material. Used within their ratings, these units maintain their resistance values consistently under long use and are available in RETMA values from 100 ohms to 1.0 megohm, ±10% tolerance. Ohmite Mfg. Co., 3631 Howard St., Skokie, Ill. (ELECTRONIC TECHNICIAN 8-27)

New Tubes

Raytheon TUBES

Fourteen new receiving tube types have been added to the replacement line. The 3BN4, 6AQ5A, 6CL8, 6DQ6A, 25CD6GB and 25DQ6 are all equivalent to their respective prototypes except for heater ratings. These tubes all have controlled warmup time (cwu heaters).

12AF6A, pentode for r-f or i-f amplifiers; 12CX6, pentode r-f amplifier and 12EM6 diode, tetrode power amplifier are all miniatures designed for operation where plate and screen potential are obtained directly from an automotive battery.

12CT8 is a triode-pentode miniature. The triode section is designed for service as a sync amplifier, separator or sweep oscillator and the pentode as a video amplifier. It has a 300-ma cwu heater.

12D4 & 17H3 are damping diodes designed for horizontal deflection circuits. They have 600-ma and 300-ma cwu heaters respectively.

The 12R5 is a miniature beam-power vertical-deflection amplifier. It has a 600-ma cwu heater. Raytheon Manufacturing Co., 55 Chapel St., Newton 58, Mass. (ELECTRONIC TECHNICIAN 8-53)

Amperex EL84/6BQ5

The EL84/6BQ5 is a 9-pin miniature power pentode, designed for the output stages of low-distortion amplifiers with relatively low-voltage power supplies. A pair in push-pull will deliver 17 watts at 4% harmonic distortion (without feedback), in Class AB operation, with 300-volts B+ supply. As a single-ended output stage it delivers 5.7 watts at 10% harmonic distortion (without feedback). Plate dissipation is 12 watts. Amperex Electronic Corp., 230 Duffy Ave., Hicksville, N.Y. (ELECTRONIC TECHNICIAN 8-51)

RCA TUBES

3AF4-A is a medium-mu twin triode of the 7-pin miniature type designed especially for use as an oscillator in UHF tuners. It is like the 6AF4-A but utilizes a 3.2-volt, 450-ma cwu heater.

5CQ8 is a multi-unit tube of the 9-pin miniature type containing a medium-mu triode and a sharp-cutoff tetrode, designed for use as a combined VHF oscillator and mixer. It is like the 6CQ8 but utilizes a 4.7-volt 600-ma cwu heater.

6CU8 is a general purpose medium-mu triode and sharp cutoff pentode of the 9-pin miniature type having a 6.3-volt, 450-ma cwu heater. The pentode unite may be used as an i-f, video, or agc amplifier, and reactance tube. The triode section is well suited for use in low-frequency oscillator, sync-separa-

(Continued on page 53)

NEW

at Ward... REAR FIN ANTENNA

Newest, smartest, pace-setting rear fin on the market. Heavy chrome plated—3 sections extend to 27". 15-ft. lead with built-in signal booster.



MODEL NO. TFL-1

Also available as dummy mount.
—Model TFD-1

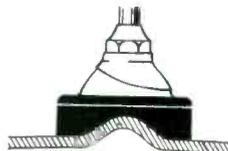
... AND HERE'S MORE!

NEW FENDER PADS

... for 1957 cars

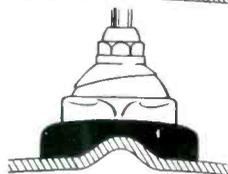
Fender Pads—

For mounting 8-Ball mount antennas on front fenders of 1957 cars. C-61



Fender Pads—

For mounting Tear Drop mounts on front fenders of 1957 cars. C-62



Fast-Selling

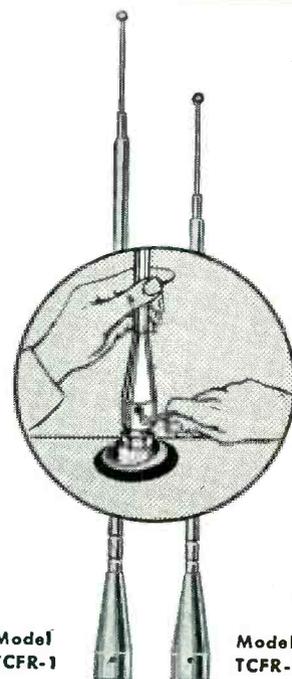
Ward

TEAR DROP MOUNT



The fastest selling style leader of them all ... the replacement antenna with original equipment styling. Mounts completely outside the car ... easily ... quickly. Heavy chrome plate ... 3 sections extend from 22" to 56".

Just a few of Ward's new quality leaders that have joined the famous Ward family—8-Ball, Majorette, and Chrome Fiberglass. Order *TODAY*. For complete information, write: Dept. ETC.



Smart NEW Replacement Masts

No need to disturb the mast. Just slip on and tighten. Easiest, quickest replacement ever developed. Bell-shaped collar on mast fastens to stub of original antenna mast with set screws.

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New Power Supplies

For more free information, fill in coupons and mail to ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N.Y.

As described in ELECTRONIC TECHNICIAN send me more data on the ELECTRO Dual-Range Power Supply Model EFB.

 Name _____
 Address _____
 City _____ State _____



← Electro POWER SUPPLY

A new dual range d-c power supply has less than 10-millivolts ripple at top load. The Model EFB is engineered to meet the requirements necessary for testing transistor circuits and other electronic equipment. It supplies a continuous variable power source from 0 to 16 volts for current loads to 8 amps, and 0 to 32 volts to 4 amps. Accurate current and voltages are indicated on D'Arsonval-type meters. Electro Products Laboratories, 4500 N. Ravenswood Ave., Chicago 40, Ill. (ELECTRONIC TECHNICIAN 8-20)

As described in ELECTRONIC TECHNICIAN send me more data on the EICO Battery Eliminator Accessory Filter Model 1055.

 Name _____
 Address _____
 City _____ State _____

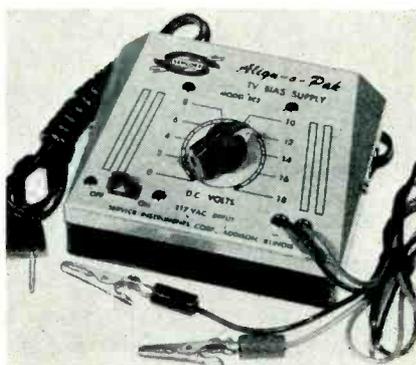


← EICO FILTER

Model 1055 battery eliminator accessory filter provides additional filtering for the Model 1050 6 & 12-volt battery eliminator or similar unit when it is used for powering transistor and hybrid automobile radios. It is an L-C type filter and is adequately rated to remain in use for all functions of the battery eliminator. \$11.95 in kit form, and \$15.95 factory wired. Electronic Instrument Co. Inc., 84 Withers St., Brooklyn 11, N.Y. (ELECTRONIC TECHNICIAN 8-21)

As described in ELECTRONIC TECHNICIAN send me more data on the SENCORE Bias Supply, Align-O-Pak, Model BE3.

 Name _____
 Address _____
 City _____ State _____



← Sencore BIAS SUPPLY

A new improved version of the BE3 Align-O-Pak bias supply is used to replace batteries for alignment and age trouble shooting. It provides any voltage from 0 to 18 volts. Because the supplies are isolated, 2 or more may be used in series to provide higher voltages if needed. Some color sets require 2 supplies for alignment. It has a completely new case. Nets at \$7.85, the same as earlier models. Service Instruments Corp., 171 Official Rd., Addison, Ill. (ELECTRONIC TECHNICIAN 8-22)

As described in ELECTRONIC TECHNICIAN send me more data on the ATR Battery Eliminator Model 610C-ELIF.

 Name _____
 Address _____
 City _____ State _____



← ATR BATTERY ELIMINATORS

The new model battery eliminators are designed especially for use with transistors or vibrator operated auto-radio sets. They provide 6 or 12-volt d-c output operation at negligible ripple current, and feature an 8-position voltage control switch, voltmeter, ammeter, and panel-mounted fuse holder. Sturdy construction and convenient carrying handle contribute to its portability. Model 610C-ELIF is shown. American Television & Radio Co., 300 E. 4th St., St. Paul, Minn. (ELECTRONIC TECHNICIAN 8-23)

tor, synch-clipper, and phase-splitter circuits.

6DQ5 is a new-perveance beam-power tube of the glass-octal type designed especially for use as a horizontal-deflection amplifier. Peak cathode current is 1 amp and plate dissipation is 24 watts.

6DS5 is a new beam-power tube of the 7-pin miniature type designed for use as a class A amplifier in audio output stages. It can deliver a maximum signal power output of approximately 3.6 watts with a peak input a-f signal of 9.2 volts.

14ATP4 is a new aluminized rectangular, 90° CRT designed especially for used in series-connected heater string. It utilizes a 450-ma, 8.4-volt cwu heater. It has a straight type electron gun which does not require an ion-trap.

6198-A is a small camera tube intended primarily for industrial TV applications. Utilizing a photoconductive layer as its light-sensitive element, it has a sensitivity which permits televising scenes with 100 to 200 foot-candles of incident illumination on the scene; a resolution capability of about 600 lines, and a spectral response approaching that of the eye. Measures 1" in diameter and 6¼" long. RCA Tube Division, Harrison, N.J. (ELECTRONIC TECHNICIAN 8-52)

Amperex TUBE

The new E88CC/6922 low-mu miniature twin triode is a premium-quality tube and guaranteed for 10,000 hours. It features, high transconductance, low noise and exceptionally rugged construction. Its principal uses are in cascade circuits, h-f and i-f amplifiers, mixer and phase inverter stages, and as a multivibrator and cathode follower. It has a separate cathode for each section. Amperex Electronic Corp., 230 Duffy Ave., Hicksville, L.I., N.Y. (ELECTRONIC TECHNICIAN 8-70)

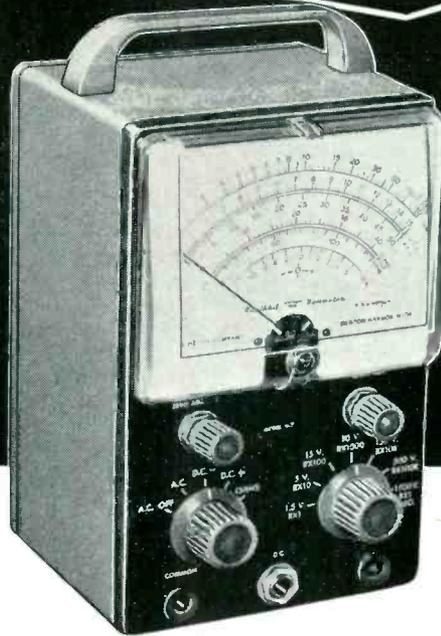
TI TRANSISTORS

Fifteen new silicon transistors in round welded cases are designed and built for use with automatic production techniques in addition to meeting the requirements of military specifications. Highlighting the new silicon products are two switching transistors with total switching times down to 100 millimicroseconds. The other 13 units include three high-frequency tetrodes, five medium power devices, and five small signal transistors. Texas Instruments Inc., 6000 Lemmon Ave., Dallas 9, Texas. (ELECTRONIC TECHNICIAN 8-71)

Hunter MINIATURE TOOL

Starting where normal size nut drivers leave off and going down to the #00 hexagon nut, the approximate overall length of the miniature tool is 2½". They are available in sets containing individual permanent plastic handles and also in replaceable sets having swivel-type jeweler's driver. Hunter Tool, Box 564, Whittier, Calif. (ELECTRONIC TECHNICIAN 8-72)

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New Products

Tenna AUTO ANTENNAS

The "Bullet" with its swivel base permits the antenna to be mounted on top or side as desired. It is available with vertical or angular masts for front or rear mounting. Six models include singles and duals. Extra mounting pad facilitates mounting on varying car surfaces. The Tenna Mfg. Co., 7580 Garfield Blvd., Cleveland 25, Ohio. (ELECTRONIC TECHNICIAN 8-10)

Belden AUDIO CABLES

Numbers 8460 and 8461 are unshielded, 18 gauge, speaker extension lines suitable for 16 to 500 ohms and distances from 200' to 2,000'. Numbers 8470 and 8471 are unshielded, 16 gauge, low loss, extension speaker lines designed for high power installations of 50 to 75 watts and for distances from 300' to 3,000' in length. Numbers 8779 and 8780 are shielded lines for hi-power, low loss, extension speaker. Belden Mfg. Co., Chicago 80, Ill. (ELECTRONIC TECHNICIAN 8-11)

Garrard TONE ARM

Model TPA10 transcription tone arm is adjustable for length, as well as tracking angle, stylus pressure, and mounting height. A special protractor lays out the recommended angle on which to align the cartridge for any arm length being used. The removable head takes virtually any cartridge. Features static balance, spring loading and viscous damping. Dept. K-28, Garrard Sales Corp., Port Washington, N. Y. (ELECTRONIC TECHNICIAN 8-50)

EMC HANDI-TESTER

The Model 108 appliance and auto battery tester uses a D'Arsonval 3½" 0-800 µamp, meter. Measures both ac and dc as follows; 0-300 volts in 3 ranges, 0-15 amps, and 0-1500 watts. Comes complete with test leads and instruction manual. Wired and tested \$15.95; in kit form \$12.95. Electronic Measurements Corp., 625 Broadway, New York 12, N.Y. (ELECTRONIC TECHNICIAN 8-13)

GE TV TUBES

The 14JP4, 17BRP4 and 21CZP4 have 600-ma heaters with controlled warm-up of 11 seconds. They are aluminized, electrostatic-focus and magnetic-deflection types. They feature relatively short over-all length and small neck diameter. An external conductive coating serves as a filter capacitor when grounded. General Electric Co., Schenectady 5, N.Y. (ELECTRONIC TECHNICIAN 8-62)

Century SELENIUM TESTER

An in-circuit selenium rectifier tester, Model SRT-1, can check power rectifiers both in and out of the circuit. Tests can be made for quality (current emission), fading (falling emission after warm-up), shorts, opens, arcing, and life expectancy. The rectifier being tested cannot over heat or be damaged. Priced at \$29.95. Century Electronics Co. Inc., 111 Roosevelt Ave., Mineola, N.Y. (ELECTRONIC TECHNICIAN 8-14)

Wen 2-SPEED DRILL

Speed change is easy and requires no gear shifting. The 115-v Universal ac/dc 2-amp motor delivers maximum torque under load. Design of drill includes a ¾" geared chuck, ball thrust and over-size oilite bearings. Weight 4½ lbs. List price \$29.95. Wen Products Inc., 5808 Northwest Highway, Chicago 31, Ill. (ELECTRONIC TECHNICIAN 8-15)

Colman KNOBS

Four new types of clock-radio knobs fit late model Westinghouse, Zenith, Motorola and Philco, numbers 1109, 1110, 1111, and 1112 respectively. Also fits many other kitchen clocks and kitchen-range timers. Available in 7 stock colors. Colman Tool & Machine Co., Amarillo, Texas. (ELECTRONIC TECHNICIAN 8-16)

Motorola MOBILE RADIOS

Using all-electronic power supplies, a new line of mobile radio units eliminates vibrator replacement problems. The new "T-Power" radiophones incorporate a transistorized switching circuit in place of the conventional vibrator. Rated at 20 and 25-watts power output they are available for operation in the 25-50 mc and the 144-174 mc bands. They operate from a 12-volt supply. Motorola Inc., 4501 W. Augusta Blvd., Chicago 51, Ill. (ELECTRONIC TECHNICIAN 8-17)

Vaco COMBINATION TOOL

Precision-made, combination crimping tool, bolt-cutter, wire-cutter, and insulation stripper is 8" long, chrome-plated, and has plastic covered handles. The front part of the jaws are used for crimping. Located around the rivet of the tool are openings for shearing machine screws or bolts of any of 5 sizes. Screws are automatically deburred upon removal from the tool. Also has a ½" section for cutting and 6 graduated slots for stripping wire. Retail price is \$3.95. Vaco Products Co., 317 East Ontario St., Chicago 11, Ill. (ELECTRONIC TECHNICIAN 8-19)

Precise CUSTOM METERS

Custom meters, PDC, 2½", 3½", and 4½" rectangular, feature interchangeable scale faces, shunting and multiplier resistors which permit coverage of more than 100 voltage and current ac and dc ranges, D'Arsonval moving-coil design, within 2% accuracy, mirror scale, with optional illumination and shadow mask. Precise Development Corp., 2 Neil Court, Oceanside, N.Y. (ELECTRONIC TECHNICIAN 8-18)

DuMont 110° CRT'S

The 17BZP4 and the 21DAP4 are straight-gun tubes which do not require ion traps and have hard lead stems with the pins emerging directly from the glass. Both tubes use the new lightweight glass envelopes and feature 1⅛" neck diameters as opposed to 1⅜" diameters in conventional tube types. Allen B. DuMont Laboratories, Inc., 750 Bloomfield Ave., Clifton, N.J. (ELECTRONIC TECHNICIAN 8-63)

Rogers FLYBACK

New TV flyback transformer, Model EFR 91, is an exact replacement for Scott-Meck part number THC-10021 used in 33 different chassis and models. It is packaged in a hermetically sealed plastic container which reduces shelf deterioration. Rogers Electronic Corp., 49 Bleecker St., New York 12, N. Y. (ELECTRONIC TECHNICIAN 8-12)

Standard Coil CLEANER

Designed specifically to end the common problem of oxidized contacts in TV tuners. The ContaCare Kit consists of a specially developed sulphur free oil which cleans the contacts without leav-



ing a residue, which causes new oxidation to take place. Supplied with the oil are special cleaning cloths. Fits conveniently into the tube caddy. Standard Coil Products Co. Inc., 2085 N. Hawthorne Ave., Melrose Park, Ill. (ELECTRONIC TECHNICIAN 8-29)

Antenna Check List

(The following 10-point check list was prepared by Channel Master as an aid to technicians and dealers. The text is directed toward the consumer, and is presented here as a reference and reminder of the antenna facts you should point up to your customers. It is reprinted from "Spotting Antenna Trouble," one of the pieces of literature in the manufacturer's TV Antenna Check-Up Kit, available to technicians for distribution to the public.)

Reception Quality

1. Check your TV picture. Are all the channels coming in clearly? Or do you have "snow," "ghosts," or "venetian blinds" spoiling your picture? Fuzzy, weak reception usually indicates the need for a newer, better antenna.

2. Compare your antenna type with newer installations put up by your neighbors. They may have newer, more powerful designs, capable of feeding clearer, stronger pictures to your set.

3. Look at your antenna. Is it pointing in the same direction as those on your neighbors roofs? If you use a rotator, can you "aim" the antenna in precisely the right direction for best picture results?

Physical Condition

4. Are any parts of your antenna bent or broken?

5. Check the condition of the transmission wire. If it has been up for more than three years it probably needs replacement, particularly if it looks dried out and brittle. If your picture "flashes" when the wind blows, it may indicate a loose antenna connection.

6. Check the insulating hardware. Look up and see whether the transmission wire is being properly held in a straight line away from the mast. It should not be flopping around loosely, it should not be wrapped around the mast, water pipe, or any other object, and it should not touch any other wires.

7. Check the mast. Is it rusting? Even if the mast looks clean on the outside, check your roof for telltale stains which may indicate that the inside of the mast is rusting. A weakened mast may collapse.

8. Check the guy wires. Do they all have equal tension? Do any of them have too much slack? Do they show any signs of rust or corrosion? Check all guy wire anchor points. The failure of just one guy wire can

result in the failure of the entire installation.

9. Check the condition of mounts and hardware. Are there any signs of rust? Are the mounts rigidly secured to the building, or do they seem to be loosening up?

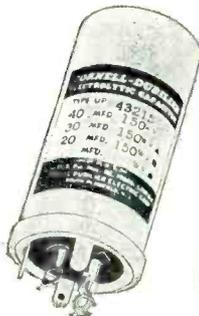
10. Check your installation's lightning protection. Maximum protection from lightning damage is obtained through the use of a lightning arrester. Is the transmission wire properly connected to the lightning

arrester? Is the mast properly grounded?

The 10 points on the checklist are merely for your general guidance. We do not suggest that you climb on your roof to make this inspection. This is a job for your local professional TV serviceman, whose training and experience are at your service, to provide you with the best and safest possible TV antenna installation. •



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*STOP SERVICE CALL BACKS with Cornell-Dubilier's popular "Up" Twist Prong Electrolytics—specified by leading manufacturers as original equipment, adopted by "profit-conscious" technicians and the top choice for wide-coverage replacement service. Call-back-free dependability is the big reason why more C-D Capacitors are in use today than any other make. Complete catalog available. Write to Dept. RT-87 Cornell-Dubilier Electric Corp., South Plainfield, New Jersey. SAVE TIME AND MONEY—INSIST on C-D Twist Prong ELECTROLYTICS.

stop call backs...insist on

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New Books

TRANSISTOR CIRCUIT ENGINEERING. Edited by Richard F. Shea. Published by John Wiley & Sons, 440 Fourth Ave., New York 16, N.Y. 468 pages. Hard cover. \$12.

The book's editor has collected the works of eight transistor specialists to develop this substantial theory-and-application volume. Among the chapter headings are characteristic curves, equivalent circuits, bias, video ampli-

fiers, dc amplifiers, audio amplifiers, oscillators, modulation, pulse circuits and others. It sets forth the tools needed to design proper circuits, and shows how to build various pieces of equipment with available transistors.

RECEIVING TUBE SUBSTITUTION GUIDE BOOK, Third Supplement. By H. A. Middleton. Published by John F. Rider Publisher, Inc., 116 W. 14 St., New York 11, N.Y. 72 pages. Paper cover. \$1.35.

Tube interchangeability has long been an important element of the technician's know-how. This book, which lists over 1200 receiving tube and 200 picture tube substitutions, along with any necessary

wiring changes, is a natural for your technical library. Of special note is inclusion of more than 230 American-to-European tube substitutions, and over 200 European-to-American substitutions. This guide to foreign tubes takes on special significance not only because much imported audio and radio equipment is in use, but American hi-fi producers have been using foreign tubes. Furthermore, at least one TV manufacturer has started to incorporate European tubes in his sets. This volume also includes an index to the basic book and all three supplements.

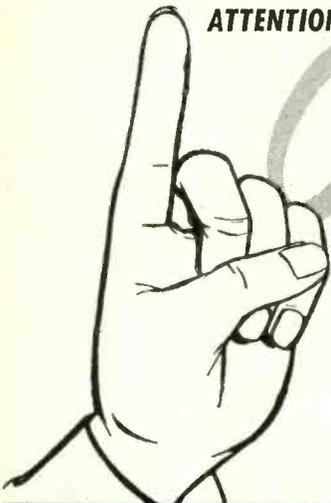
UNDERSTANDING HI-FI CIRCUITS. By Norman H. Crowhurst. Published by Gernsback Library, Inc., 154 W. 14 St., New York 11, N.Y. 224 pages. Paper cover, \$2.90; hard cover, \$5.00.

Clearly written on an intermediate technical level, and of interest to both electronic technicians and advanced audiophiles, this book should prove a most useful reference. The author is an audio authority whose articles have appeared in *ELECTRONIC TECHNICIAN* and other publications. Among the most important subjects covered are output and input stages, feedback, matching, equalization, speaker crossovers, inverters, tone and volume controls. The text is broadly applicable to all makes of equipment, with pictures of specific products not included.

TRANSISTOR APPLICATIONS BOOK, Vol. II. Prepared and published by Raytheon Mfg. Co., 55 Chapel St., Newton 58, Mass. 60 pages. Paper cover. \$50 through Raytheon tube distributors.

This interesting follow-up to the first edition contains new transistor circuits with construction details for receivers, amplifiers, ham gear, service equipment and gadgets. Also included is the helpful Transistor Interchangeability Chart. Sections are devoted to theory, circuit design, installation and wiring. For your own entertainment, and for valuable experience with these semiconductors which have revolutionized electronics, this book should receive a strong welcome from the electronic technician fraternity.

ATTENTION: People who service 2-way Communications



One day!

PROCESSING

F6 Series Crystals

for STANDARD 2-WAY Equipment in Commercial Use



Wire mounted plated crystals for use in commercial equipment where close tolerances must be observed. All units are calibrated for the specific load presented by equipment. HOLDERS: Metal, hermetically sealed. CALIBRATION TOLERANCE:

±.0025% of nominal at 30° C.
TOLERANCE OVER TEMP. RANGE:
±.002% from -30° + 60° C.

CIRCUIT: As specified by customer. Crystals available for all major 2-way equipment. (In most cases the necessary correlation data is on file).

DRIVE LEVEL: Maximum— 10 milliwatts for fundamental, 5 milliwatts for overtone.

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Pin dia. .050 Pin length .238

F-609

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F-612

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HOW TO ORDER:

Specify • Channel Frequency • Holder Type* • Circuit Data (32 mmf load, series resonance, etc.) • End Use (Equipment type and manufacturer, development, etc.)

*Adaptors can be supplied for 3/4" pin spacing.

Orders of 5 Units or Less Air Mailed Within One Working Day!

FREE!

1957 CATALOG

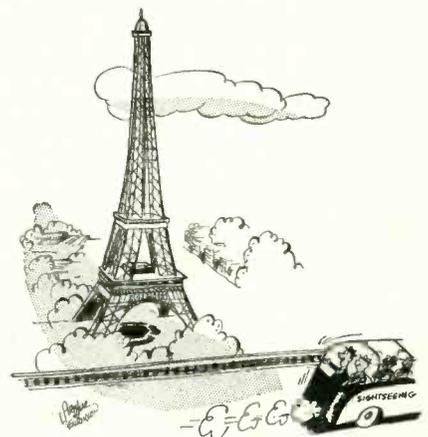
Send for YOUR Copy..Now!
Specify Catalog ET-57!



International

CRYSTAL MFG. CO., Inc.

18 N. LEE OKLAHOMA CITY, OKLA.



"Dig that crazy TV Antenna! Must be in a fringe area!"

AN INTRODUCTION TO SEMICONDUCTORS. By W. Crawford Dunlap Jr. Published by John Wiley & Sons Inc., 440 Fourth Ave., New York 16, N.Y. 417 pages. Hard cover. \$11.75.

Provides a unified elementary survey of the field, covering basic concepts, properties of materials, methods of measurement, and applications. Minimizing formal theory, the theoretical sections stress the presentation of ideas in the same terms that workers in the field use in their own thinking. The chapters deal consecutively with facts about crystals and their structure; theory of the solid state; imperfections in crystals; statistical mechanics for metals and semiconductors; the electron theory of metals and semiconductors; contact and surface properties of semiconductors; properties of p-n junctions; and experimental measurements on semiconductors. Further chapters cover properties, applications and general methods of preparing semiconductor materials.

Catalogs & Bulletins

ELECTRONIC PRODUCTS: No. S-58 is a new product supplement to catalog No. 157. Includes printed circuit repair kits, color TV service aids, tools and service aids, etc. Prices, descriptions, part numbers and illustrations with each item. General Cement Mfg. Co., Rockford, Ill. (ELECTRONIC TECHNICIAN No. B8-6)

KITS: 1957 summer flyer, including 2 handy order blanks, describing and illustrating outside kits for warm weather, ham kits, test equipment for service bench or lab, hi-fi equipment and amplifier kits. Heath Co., Benton Harbor, Mich. (ELECTRONIC TECHNICIAN No. B8-7)

ELECTRONIC SERVICE-DEALER: A new brochure published by CBS-Hytron covering tips on planning for future of independent service, servicing hybrid auto radios, CBS tube tips (a monthly series for service technicians in bulletin form) and other valuable aids. CBS-Hytron, Danvers, Mass. (ELECTRONIC TECHNICIAN No. B8-5)

CAPACITORS: A revised edition of the "Ceramicart" wall chart, measuring 17" x 22", provides a complete background in ceramic capacitors and printed circuits at a glance. Chart M-726 available at Sprague distributors everywhere, or directly from Sprague by sending 10¢, Sprague Products Co., North Adams, Mass. (ELECTRONIC TECHNICIAN No. B8-1)

RECTIFIERS: Flyer giving factory prices in off the shelf quantities of 1-99 for silicon and germanium diodes for many purposes. Texas Instruments Incorporated, 6000 Lemmon Ave., Dallas 9, Texas. (ELECTRONIC TECHNICIAN No. B8-8)

ELECTRONIC COMPONENTS: 1957-58 Electronic Components Guide gives comprehensive data on company's complete line of resistors and other electronic components, including JAN or MIL equivalent, rated wattage, standard tolerance, etc. International Resistance Co., 401 N. Broad St., Philadelphia 8, Penna. (ELECTRONIC TECHNICIAN No. B8-2)

CAPACITORS: GEZ 1912, four pages, describes DC aluminum electrolytic capacitors for radio, television and other communications equipment. General Electric Co., Irmo, South Carolina. (ELECTRONIC TECHNICIAN No. B8-4)

TV REPLACEMENT GUIDE: Catalog TV-57, numbering 108 pages, provides the TV technician or parts distributor with a new indexing system designed to reduce the location of specific replacement recommendations to a matter of seconds. Available at Triad distributors or from Triad Transformer Corp., 4055 Redwood Ave., Venice, Calif. (ELECTRONIC TECHNICIAN No. B8-3)

TUBES FOR HI-FI: Eight-page, two-color illustrated catalog covering the complete series of tubes available for Hi-Fi audio equipment. Available from Amperex Electronic Corp., 230 Duffy Ave., Hicksville, L. I., N. Y. (ELECTRONIC TECHNICIAN No. B8-10)

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PHONO & RECORDER DRIVE KIT

Specially Priced
For A Limited
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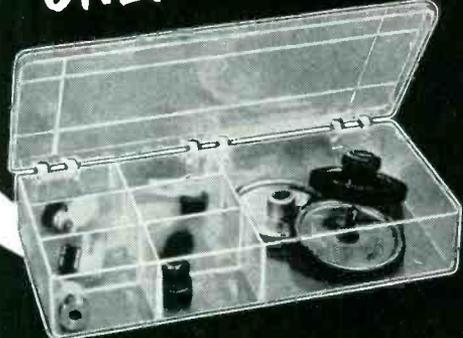
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SPECIAL THIS MONTH

**CONTAINS 9 DRIVES
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Pick up extra work . . . extra sales . . . during the summertime TV lull . . . by repairing your customers' phonographs, record players, tape and wire recorders. Exact factory replacements in clear plastic storage box. Buy now while you save!

P-500 Kit



SEE YOUR G-C JOBBER NOW!

GENERAL CEMENT MFG. CO.

Division of Textron Inc.

400 South Wyman Street

Rockford, Illinois

New Service Award

General Electric has announced the establishment of a new nationwide program of public service awards for television service technicians.

Entitled the "1957 All-American Awards," the program will bring national recognition to eleven television service technicians who have performed outstanding community

service. Each winner will receive a trophy and a \$500 check for use in a public service activity or charity of his preference.

The series of awards will provide what the company feels is "much deserved recognition for an important segment of American public life," said Irvine D. Daniels in announcing the program. Mr. Daniels, general manager of the G-E Receiving Tube Department, is serving as chairman of the company committee administering the award program.

Under the program, eleven top

service technicians will be chosen on the basis of their good citizenship. Nominations for the award may be made by any individual or organization. The winners will be chosen from among the nominees by a panel of distinguished judges who will base their decisions on benefit derived from the winners' public service activities in the two years preceding Sept. 30 of this year.

"From our association with the television service profession, we know that many of these citizens perform outstanding public services in their communities," said Mr. Daniels.

"You may find them repairing TV sets without charge in children's hospitals, teaching disabled veterans, guiding and instructing Boy Scouts and other youth groups, assisting with civil defense activities, and otherwise applying their specialized knowledge to many important fields of public service," he said. "We feel this program will bring much deserved recognition to an important segment of American public life."

The award rules require only that a letter of nomination be addressed to the All-American Awards Committee, General Electric, Owensboro, Ky., containing the name and address of the nominee and a full description of the public service he has performed. To qualify for this first year's All-American Awards, nominations must be mailed before Oct. 19.

Judges who will select the winners are Ed Sullivan, noted columnist and television master of ceremonies; Herman Hickman, television sportscaster; Wendell Barnes, administrator, U.S. Small Business Administration; and Wendell Ford, 1956-57 president, National Junior Chamber of Commerce.

LZX 280SW (shown right)

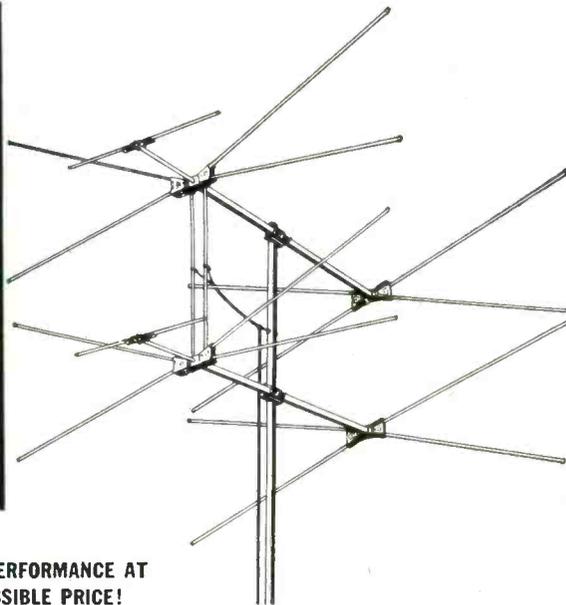
- QUICK-RIG design for speedy one man installation ... Brand NEW!
- Double stacked array PLUS high frequency elements.
- All Aluminum Construction.
- Mounts on any mast up to 1 3/4"
- Complete with stacking bars.

(not shown)

LZX 180SW ... same as 280SW (single stacked)

LZX 180 ... QUICK-RIG 8 element "Mighty-X" Conical.

LZX 280 ... QUICK-RIG double stacked "Mighty-X" Conical.

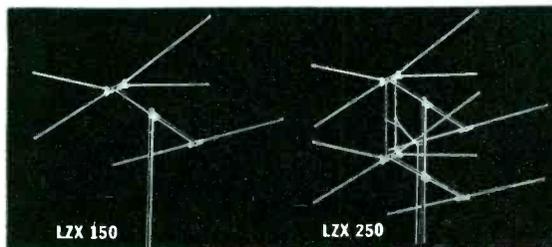
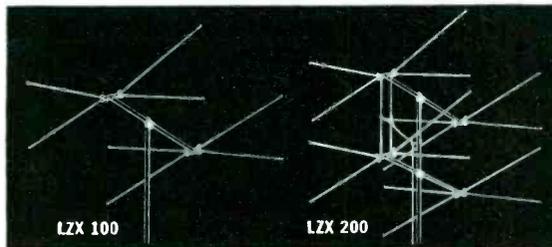


HIGHEST QUALITY PERFORMANCE AT THE LOWEST POSSIBLE PRICE!

12 new C-D TV antennas

Carefully tested under all conditions ... each of these new models is guaranteed to be the best performing at the lowest possible price. QUICK-RIG ... snap! and its up.

- LZX 100** single array
- LZX 101** single array, unassembled
- LZX 200** 8 element conical assembled, stacked array
- LZX 201** 8 element conical unassembled, stacked array
- LZX 150** single array
- LZX 151** single array, unassembled
- LZX 250** 6 element conical assembled, stacked array
- LZX 251** 6 element conical unassembled stacked array



Congressional Action

Transportation legislation battle now going on in Congress can affect distributor and service businesses which operate their own trucks. NEDA points out that Senate bills 1384 and 1677 would establish new interpretations under the Motor Carrier Act of 1935 that would classify you as a common carrier if your truck is used "for compensation." Common and contract motor carriers favor this interpretation which would limit the right of business to operate its own trucks. The present common-sense rule, established in court cases, is that you are not a regulated carrier under the ICC if you operate trucks only as an incident to your own non-transportation enterprise.



CORNELL-DUBILIER

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



Vectorscope

(Continued from page 36)

the "bite" which may appear between green and yellow, if the chroma blanking circuit has not been disabled.

Further details of the vectorscope pattern are shown in Fig. 15, which gives the relative voltages and phases for all of the usual signal outputs of a color-bar generator of the NTSC type. Fig. 16 shows an NTSC Signal type generator. To observe this type of pattern, the vectorscope should be connected at the outputs of the R-Y and B-Y color detectors in the same manner as shown in Fig. 1. The gain of the vertical and horizontal amplifiers should be equalized prior to the test.

Some of the trouble symptoms and their causes are:

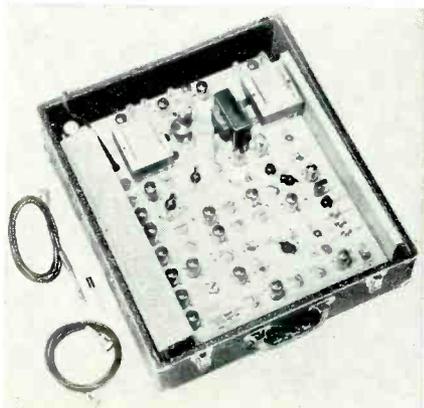
1. Incorrect phases of various colors are caused by mis-adjustment of the quadrature transformer, or by incorrect setting of the color-phasing control.

2. Incorrect voltages of the various signals are caused by overloading in some signal circuit, or by circuit faults such as defective capacitors and off-value resistors.

3. Incorrect voltages and phases which are not caused by the foregoing troubles may be caused by poor alignment of any of the signal circuits. However, we usually assume that alignment is passable, and investigate this possibility last. (Unless, of course, some do-it-yourself bug has been tampering with the chassis).

Some color-bar generators are ad-

Fig. 16—Signal generator capable of reproducing a 100% saturated NTSC signal.



justed at the factory to provide a 100% saturated color-bar output signal. However, since it is standard practice for color-TV stations to transmit a 75% saturated color-bar test pattern, other color-bar generators are adjusted at the factory for 75% saturation.

The saturation of the output signal is not a matter for concern in vectorscope tests. The reason for this is that the chroma circuits respond only to the 3.58-Mc component of the color-bar signal, and the amplitude of the Y signal does not enter into the display of the vectorgram. When the saturation of the color signal is lessened, its relative voltages and phases remain the same, and this is the only thing that we are concerned with in vectorscope tests. •

Association News

(Continued from page 41)

TSA Elects

The Television Service Association of Metropolitan Washington, D.C. has elected new officers. They are: Robb Peters, Pres.; Bernard Bogno-vitz, V.P.; and Carl Johnston, Treas. Robert Trollinger and George B. Sharpe were elected to the Board of Directors. The association has gone on record favoring licensing of TV service contractors and technicians. Such a proposal has been written and will be presented to Congress for adoption in the District of Columbia.

TESA St. Louis New Officers

The following officers were elected: Barney Lewis, Chairman of the Board; Walter Hirschberg, Pres.; Ralph Newberry, Harry Haus, and Ray Wirtel, V.P.'s.; Fred Reichman, Sec.; Chas Luensmann, Sgt-at-Arms; Howard Freiner, Walter Berganti, Vincent Lutz, Tom Knowles, J. G. Alexander, Russ Adelman, and Nick Koclanes, Board of Directors.

ESFETA President Resigns

Recently elected president Gordon Vrooman resigned to take a job on the West Coast. He is leaving the service field. Dan Hurley from Syracuse was unanimously elected President of the Empire State Federation of Electronic Technicians Association Inc. Next meeting is scheduled for September 8th, 1957, in Ithaca, N.Y.

FOR TOP-O'-CHASSIS SERVICING

Locates defective stage in less than 5 minutes for average TV receiver.



NEW FROM Wintronix

MODEL 850

INDUCED WAVEFORM ANALYZER

complete with
"Phantom Probe"
and attachments

ONLY

\$169⁹⁵

Localize troubles in TV, radios, amplifiers, etc., right from the top of the chassis . . . and without making a single direct connection to the circuit! The new Wintronix Model 850 does all this by the modern, easy-to-use Induced Waveform method. Helps you quickly spot those often overlooked tube and circuit defects that mean callbacks or extra troubleshooting.

Simply connect the output of the Model 850 to any scope, then slip the Phantom Detector Probe successively over each tube in the receiver under test. By viewing the waveform of the received signal (from broadcast station or generator) at each stage, you quickly localize troubles to the offending stage. Works equally well for RF, IF, video, sync, and audio circuits. A real time and trouble-saver for portable TV.

See and try the new Wintronix Induced Waveform Analyzer at your local Wintronix dealer or write for free literature.

**WINSTON
ELECTRONICS INC.,**

4312 Main St., Phila. 27, Pa.

MORE ACTIVE! EFFECTIVE!

KESTER "RESIN-FIVE" CORE SOLDER



THE BEST FOR TV-RADIO WORK . . . EVERYTHING ELECTRICAL—Kester "Resin-Five" Core Solder is better and faster than any solder ever developed. It has an activated flux-core that does a perfect job on all metals including zinc and nickel-plate. The flux residue is absolutely non-corrosive and non-conductive.

Available in all practical Tin-Lead Alloys; 40/60, 50/50 and 60/40 in diameters of $\frac{3}{32}$ ", $\frac{1}{16}$ ", $\frac{3}{64}$ ", $\frac{1}{32}$ " and others.



Printed Circuit Soldering
On Copper-etched boards use 60% Tin-40% Lead Alloy . . . for those that are Silver-surfaced use 3% Silver-61½% Tin-35½% Lead

KESTER SOLDER COMPANY

4264 Wrightwood Avenue, Chicago 39, Illinois • Newark 5, New Jersey, Brantford, Canada

RTA Service Charges

The Radio and Television Association of Santa Clara Valley, Calif. has found that the charge for service calls has risen to \$6.50 in many association shops in their area, and bench rates have gone up to \$6.00 an hour. A survey also showed antenna rates slightly higher. Some of the prevailing flat-rate charges are:

Home call, pickup & delivery	\$ 7.50
Basic Technical Fee	12.50
Install resistor	1.00
Install capacitor	1.00
Install a-c interlock	1.50
Install volume control (std)	2.50
Total labor	\$26.00
Parts	2.80
Total bill	\$28.80

NETSDA Reelects

At the last scheduled meeting of the Northeast Television Service Dealers Association in Philadelphia, annual elections were held. The following officers were reelected: Ray Cherrill, Pres.; Charles Settle, V.P.; Harvey Morris, Secy.; Ralph Newby, Treas. Ray Fink was awarded a plaque for being an outstanding serviceman. Earl Fletcher was the recipient of this award last year.

TSA Elects

Elections were held at the last general meeting of the Television Service Association of Metropolitan Washington, which was also the first annual meeting. The new officers elected were: Robb Peters, Pres.; Bernard Bognovitz, V.P.; and Carl Johnston, Treas. In addition, Robert Trollinger and George B. Sharpe were elected to the Board of Directors.



HANDY POCKET NUTDRIVERS

FOR EASY ACCESS TO YOUR



MINIATURE CHASSIS!

With the increasing trend toward miniaturization, we at XCELITE realized that smaller precision tools would be welcomed for servicing those tricky jobs involving printed circuits, transistors and other miniature and sub-miniature parts.

So . . . we were ready for you with our line of compact, convenient Xcelite Pocket Nutdrivers with the handy pocket clip. Xcelite Pocket Nutdrivers are available in the four most-needed sizes: 1/8", 1/4", 5/16" and 3/8" Hex.

You'll want to keep all four of these "just-right-hex-sized" XCELITE Pocket Nutdrivers clipped in your shirt pocket. They're ideal to reach those "hard-to-get-at" places in the new miniature sets.

Fact is, XCELITE Pocket Nutdrivers are just like all the other quality hand tools in the line—XCELITE screwdrivers, pliers, reamers, adjustable wrenches, kits—all the other items precision made especially for professional radio, TV and electronics servicemen. Remember, XCELITE always brings you the finest tools first!

Call or see your dealer today. . . order all four of these handy XCELITE Pocket Nutdrivers. And, while you're at it, check your needs and order all the XCELITE Tools that will help you do your job better, easier, more profitably!

XCELITE, INCORPORATED

Dept. L, Orchard Park, N. Y.
In Canada—Charles W. Pointon, Ltd.
6 Alcina Ave., Toronto, Ont.

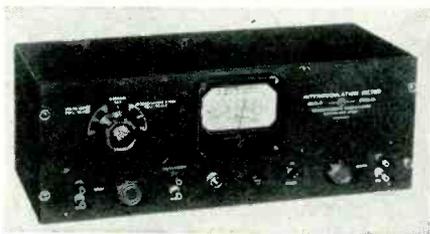


Hi-Fi Service Center

(Continued from page 30)

ticular point in the amplifier and at the same moment other readings may be desired.

This is probably quite as far as most technicians will need to go. It will enable them to handle quite a medium volume of high fidelity quality service business. But for those of us who wish for a top-drawer setup there are further steps that can be taken. A better audio oscillator, with a waveform having less than 1%, and possibly less than 0.1% of harmonic content, will avoid the necessity for using filters to get a pure input, and which will also enable harmonic measurement to be conducted at any audio frequency. It will also help provide for another test position. Another item is a combined electronic switch and square-wave generator. This is useful for making particular kinds of transient-response checks. It enables the tone burst test on amplifiers. (Fig. 2). It can also be used as a square-wave generator, thus liberating the combined sine-wave and square-wave



An intermodulation distortion meter can tell at a glance without the aid of any other instruments whether or not the amplifier is functioning, and can detect certain types of distortion.

The electronic switch may also serve as a square wave generator. See Fig. 2.



A VTVM designed specifically for audio work can measure very small quantities of a-c voltage. Flat frequency response is an important characteristic.

generator for service on another job if needed.

Entirely new and exciting opportunities await the technicians who are alert to the potentialities that exist in the hi-fi field. Custom installation requires a professional approach and affords income possibilities which exceed many other servicing activities. Even when hi-fi systems are purchased as complete units, demand for additional input and output facilities, additional controls, accessories, etc. is most encouraging. •

ILLUSTRATION CREDITS

Electronic Instrument Co. Inc.; Electronic Measurements Corp.; Heath Co.; The Hickok Electrical Instrument Co.; Jackson Electrical Instrument Co.; Measurements Corp.; Precise Development Corp.; Precision Apparatus Co. Inc.; Simpson Electric Co.



"You 'oughta see him on bench repairs."

EXPAND YOUR PORTABLE TV SALES

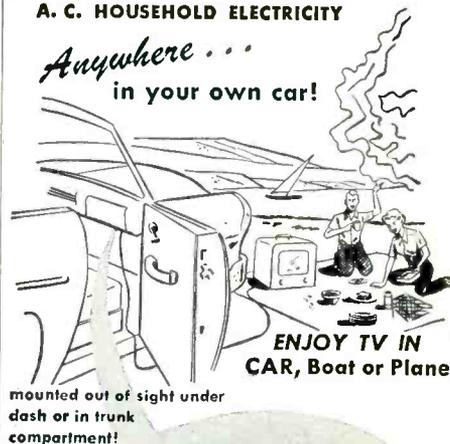
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INVERTERS

for changing your storage battery current to A. C. HOUSEHOLD ELECTRICITY

Anywhere... in your own car!



ENJOY TV IN CAR, Boat or Plane

mounted out of sight under dash or in trunk compartment!



EASY TO INSTALL EASY TO OPERATE

ATR INVERTERS

especially designed for operating standard 110 volt A.C. portable TV sets

also

- TAPE RECORDERS
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for

- EXECUTIVES
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See your jobber or write factory

✓ NEW MODELS ✓ NEW DESIGNS ✓ NEW LITERATURE
"A" Battery Eliminators, DC-AC Inverters, Auto Radio Vibrators



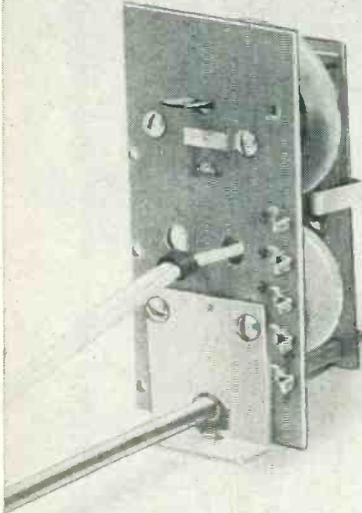
AMERICAN TELEVISION & RADIO CO.

Quality Products Since 1931

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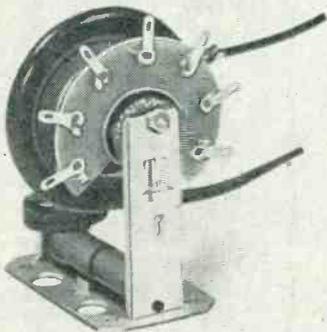
**TRANSFORMER
NEWS**

FROM TRIAD



**12 NEW FLYBACKS
AVAILABLE NOW**

See our TV-57 Replacement Guide!



Note: Triad's Service Aid #2 for the Professional Television Man will contain complete information on the characteristics and use of Triad's New Flybacks. Reserve your free copy now. Ask your distributor, or write to us!



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When ordering change, please INCLUDE IMPRINTED STRIP showing exactly how magazine is now addressed. This will enable us to put the change into effect with a minimum of delay.

**How to Determine Your
Subscription Expiration Date**

To eliminate the risk of missing an issue of ELECTRONIC TECHNICIAN, you can determine the expiration date of your subscription by examining the code on the address stencil. For example:

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The expiration date is shown on the bottom line by the number 1157 after the letters TN. The last two numbers show the year, 1957. The remaining number preceding 57 indicates the 11th month. So John Jones' subscription expires with the November 1957 issue.

Please be sure to send in your renewal order before expiration to Circulation Dept., ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

RCA-6530

The medium-mu twin-triode 9-pin miniature type is designed for use in a wide variety of applications in electronic computers particularly of the high-speed digital type, and in other on-off control equipment. It has separate terminals for each cathode to facilitate flexibility of circuit arrangement, and a mid-tapped heater to permit operation from either a 6.3-volt or a 12.6-volt supply. RCA Tube Div., Harrison, N.J. (ELECTRONIC TECHNICIAN 8-80)

Industrial Electronics

Editor, ELECTRONIC TECHNICIAN:

Congratulations on your recent articles on industrial electronics. The theory is not complicated, but waveforms and voltages are different than radio-TV. How about more?

T. M. BUCHETT

Bethlehem Steel



*"I just go weak all over
when you play those records
with a JENSEN NEEDLE."*

Another Sencore Time-Saver

SENCORE TRANSISTOR CHECKER

Model TDC22

NOW WANTED and NEEDED by EVERY SERVICEMAN

Quickly and accurately checks all transistors and crystal diodes.

Provides these 4 important checks on transistors:
OPEN • SHORT • CURRENT GAIN • LEAKAGE
Checks forward to backward resistance of diodes.

★ Complete set-up chart and instruction booklet attached to back ★ Will never become obsolete, with test leads, replaceable up-to-date set-up chart and gain control to vary battery voltage ★ Accurate and simple to operate — takes less than 30 seconds to test either TRANSISTORS or crystal diodes
★ Uses test leads which eliminates need of completely removing transistor from circuit.

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6 sizes and types.
All impedances
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WEATHERPROOF LINE MATCHING TRANSFORMERS
For constant impedance
or constant voltage systems.
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HIGH-POWERED PUBLIC ADDRESS SPEAKERS
Four sizes from 2 1/2' to 6' air column.
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U-I APPROVED EXPLOSION-PROOF SPEAKERS
For hazardous applications.
Several sizes, all classes.
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For all purposes,
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All sizes and types:
boom stands, desk stands,
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NEW! SWITCHBOARD MIKE SUPPORT
Adjustable 12" goose
neck. Use as desk support,
for dispatcher office,
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#SB-1 ... \$7.80 NET.

New!



NEW! "CHESTY" NECK-SUPPORTED MIKE STAND
Quick, easy 3-way
adjustment. Lightweight.
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NEW! MIKE FOOT SWITCH
Hand, foot or knee
operation—shielded,
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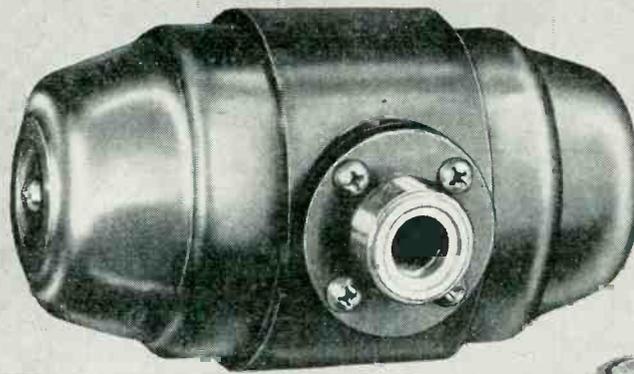


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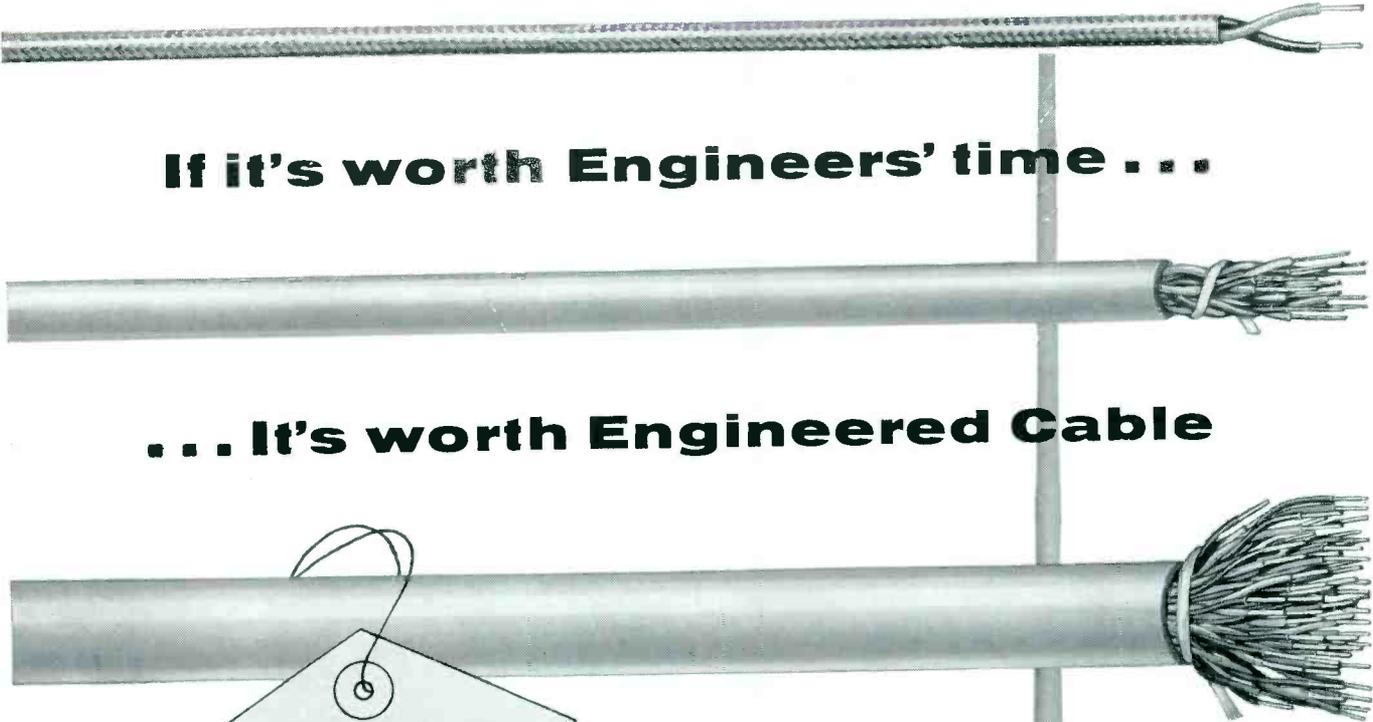
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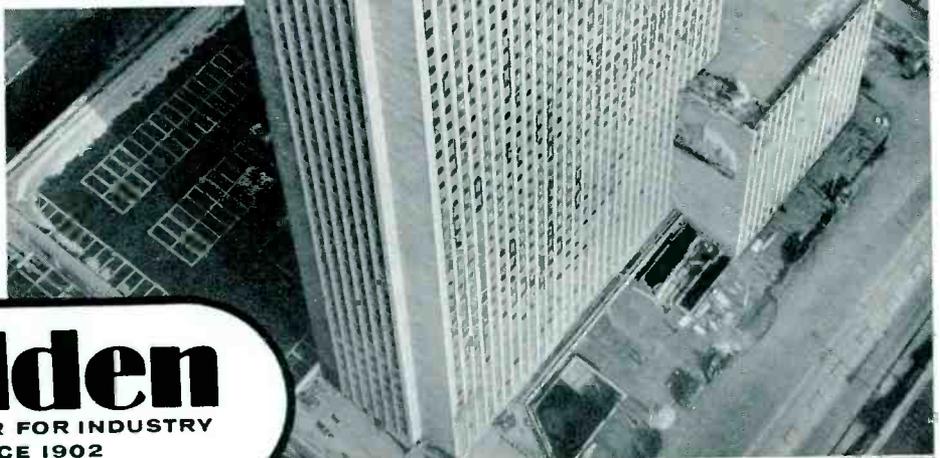
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