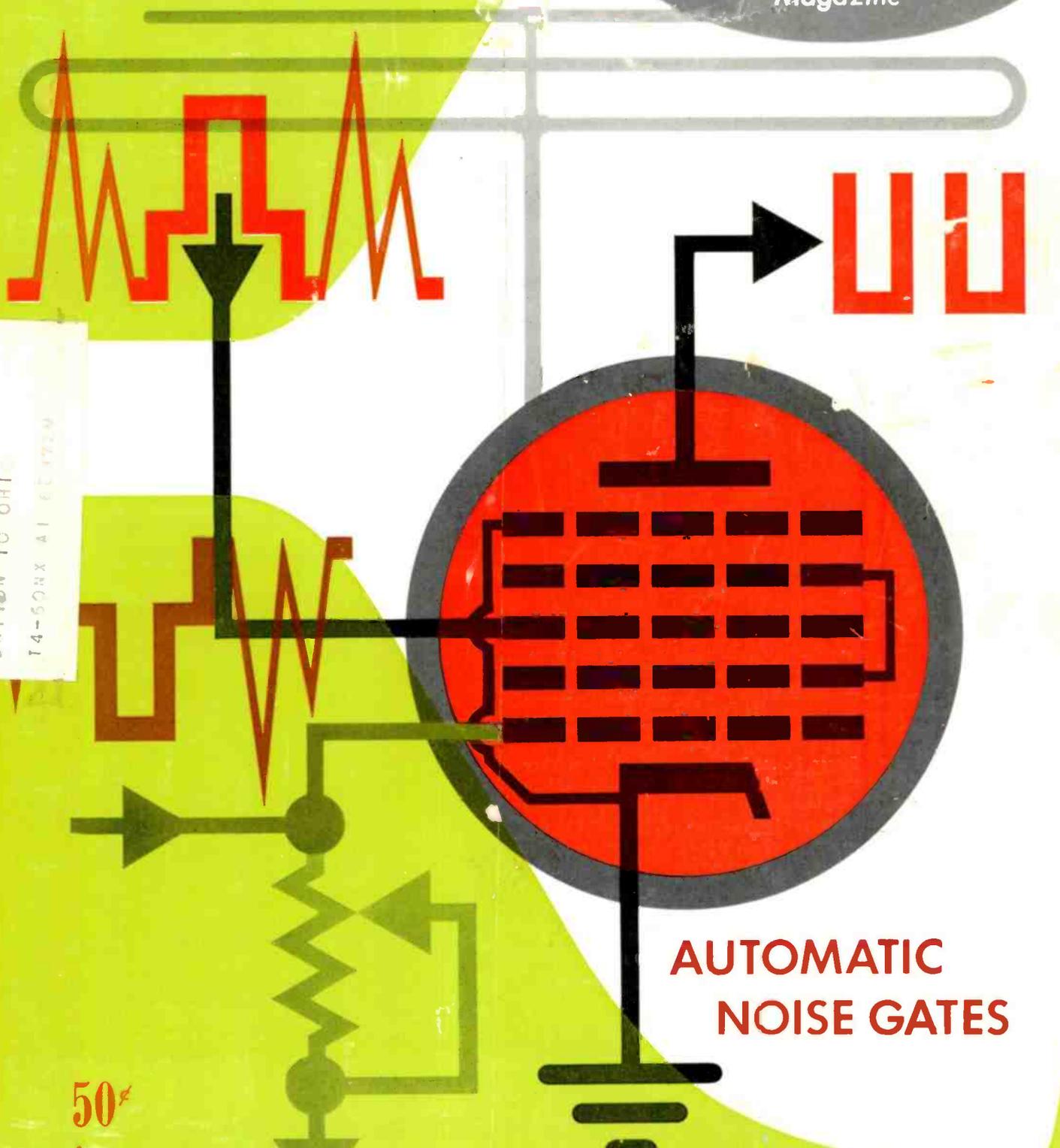


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**FRONT COVER** Eliminating undesirable noise pulses in TV reception—without getting rid of the sync pulse in the process—is the job of the automatic noise gate. This circuit's function is most important in determining what happens to the TV signal during its travels from antenna to pix tube. See article starting on page 36.

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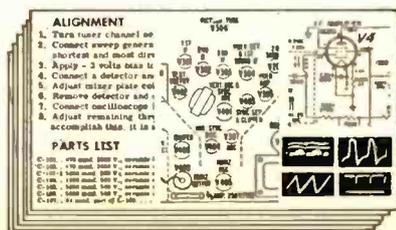
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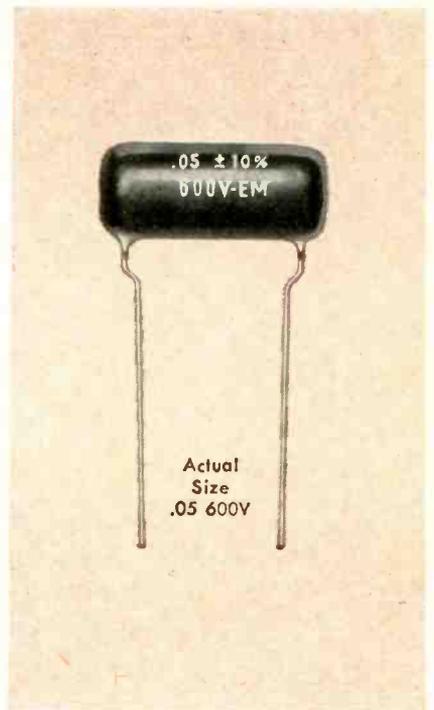


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## Editor's Memo



Modesty has been defined as that optimistic human quality which expects others to recognize your good points.

Carried to extremes, we get false modesty and I do not know whether this is a greater or lesser evil than being a braggart. No doubt there is a happy medium in not hiding your good qualities. In other words, let people know that you take your work seriously and do a good job at a fair price. Shouting too loudly recalls the saying: "Me-thinks he doth protest too much." It's a good thing to slip in your points without too much fanfare.

This whole subject arises because many technicians are more modest than they need be. No apology for living is needed. He possesses a skill that most would envy, and many families depend upon him for his services.

The story is told of a service dealer who did a good job, but after eleven months he had still not collected for his work. Modest hints brought no results. In desperation, he wrote the customer a letter which said: "Dear Sir: I have been examining our books and notice that we have carried you longer than your mother did."

Right now I'm having some construction work done around my house. One subcontractor is the stone mason, a pleasant but terribly immodest fellow. He is the world's finest mason—by his own admission. Yet he admits that he learns something every time he cuts a stone or lays a concrete form. It's a pleasure to watch him work because he is intent on doing a magnificent job to maintain his self-proclaimed reputation.

This is no defense for egotists—those people who brag more than we do. Rather it is hoped that these words will encourage us to be proud of our work, and to get the satisfaction of recognition for skilled accomplishment.

Just keep in mind that people who act terribly modest are not always deserving of the respect that should be due truly modest people with many accomplishments to their credit. After all, it may be as Churchill once said when discussing a political opponent. The venerable prime minister could not bring himself to compliment his opponent. "Well," said the friend talking to him, "you must admit that even if he does not have any other virtues, at least he is modest. To this Winnie replied, "He has much to be modest about!"

*Al Foman*



## notes on the life expectancy of capacitors

*"At half past nine by the meet'n-house clock,—  
Just at the hour of the Earthquake shock!  
What do you think the parson found,  
When he got up and stared around?  
The poor old chaise in a heap or mound,  
As if it had been to the mill and ground!  
You see, of course, if you're not a dunce,  
How it went to pieces all at once,—  
All at once, and nothing first,—  
Just as bubbles do when they burst.  
End of the wonderful one-hoss shay.  
Logic is logic. That's all I say."*

From the "One-Hoss Shay" by  
Oliver Wendell Holmes

The designer and builder of the One-Hoss Shay achieved an interesting objective of some modern-day designers—a product utilizing component materials of great uniformity and well-coordinated life expectancy.

In capacitor design the One-Hoss Shay concept would result in enormously expensive units since materials normally vary in their physical and electrical characteristics. Therefore, the manufacture of capacitors with perfectly uniform characteristics from one to the next would involve a complex process of detailed selection of their component materials, and uniform assembly procedures. Economical and practical capacitors must accordingly be designed with two points in mind:

- 1) They will have a finite, but should have a very low, failure rate.
- 2) They will have a finite, but should have a long, life expectancy.

Exact determination of these levels for any capacitor design is a complex process of analysis and testing. A few of the highlights of these methods will be discussed below.

It has previously been shown (1) that the life expectancy of paper-oil dielectric capacitors is inversely proportional to the fifth power of the applied DC voltage. Further studies (2) indicate that one responsible mechanism for this exponential relationship is gassing of the oil. The life expectancy was also found to be halved for each ten degree Centigrade increase in operating temperature, over the normal range. This effect is probably analogous to the familiar chemical rule concerning the electrolytic action rate of solutions. Thus the actual measured life under a set of test conditions can be translated into expected life under another set of conditions of voltage and temperature, as follows:

$$L_2 = \left( \frac{E_1}{E_2} \right)^5 \cdot T_1 \cdot 2^{-\left( \frac{t_2 - t_1}{10} \right)}$$

where  $L_2$  = expected life in hours  
 $E_1$  = test voltage  
 $E_2$  = actual working voltage  
 $T_1$  = time duration of test in hours  
 $t_1$  = test temperature in degrees Centigrade  
 $t_2$  = actual operating temperature in degrees Centigrade

This relationship applies only to a failure caused by the actual degradation of the paper-oil dielectric brought about by the stresses of voltage and temperature. It would be most misleading to say that each and every failure experienced in any production lot will obey this law—some failures may be the result of manufacturing errors or material flaws.

This basic formula, although evolved for paper-oil capacitors, appears to apply to other types, such as mica and plastic film, but the fifth power law does not hold for these types since their molecular structure is significantly different. A voltage exponent of seven to ten appears to be appropriate for these types. It is also possible that the rule of halving of life expectancy with each ten degree Centigrade rise in temperature may not strictly apply to materials other than paper-oil because of their inherently different sensitivity to temperature, and due to different ranges of operating temperature. These points are the subject of much continuing investigation.

The formula shown has thrown a new light on the use of accelerated conditions as a production evaluation tool. Accelerated tests have, in certain instances, become a processing procedure, offering two major advantages:

- 1) So-called "early" failures can be eliminated to a high degree by proper over-stressing.
- 2) Life expectancy can be better evaluated since measured results are available in a short time.

Thus accelerated, or "screening," tests can serve a highly useful purpose where very high degrees of reliability are required, and must be measured or estimated quickly. This processing and evaluation, of course, involve additional expense, and are therefore not used for run-of-the-mill products. They also do not ensure a good product if the design or manufacturing controls are basically inadequate, and must never be used to sort good units from an inherently bad population.

One additional point should be made before we summarize an example: since, unlike the One-Hoss Shay, we cannot have all production capacitors fail simultaneously, some attention must be paid to the distribution of the failures with regard to time. It is important to know the shape of the failure rate curve.

Some hypothetical numbers can be used to illustrate the previous discussion. Assume that a group of 200 silvered mica button<sup>®</sup> capacitors, designed for 500 WVDC and 125°C., is subjected to an accelerated test of 1000 VDC and 150°C. for 50 hours. At the end of this time, a failure level of one per cent is found, and the failures have occurred at 10 and 40 hours (we assume they are "pure" dielectric failures). Assuming a voltage exponent of 8 to apply, we may use the expected life equation as follows:

$$L_2 = \left( \frac{1000}{500} \right)^8 \cdot T_1 \cdot 2^{-\left( \frac{125 - 150}{10} \right)}$$

therefore,  $L_2 = 1435 T_1$

or, under actual conditions, these failures would have occurred at 14,350 and 57,400 hours of continuous operation. These failures then represent 0.035 and 0.009 per cent failures per 1000 hours, respectively. These times to failure correspond to over 16 and 65 years of normal, intermittent service.

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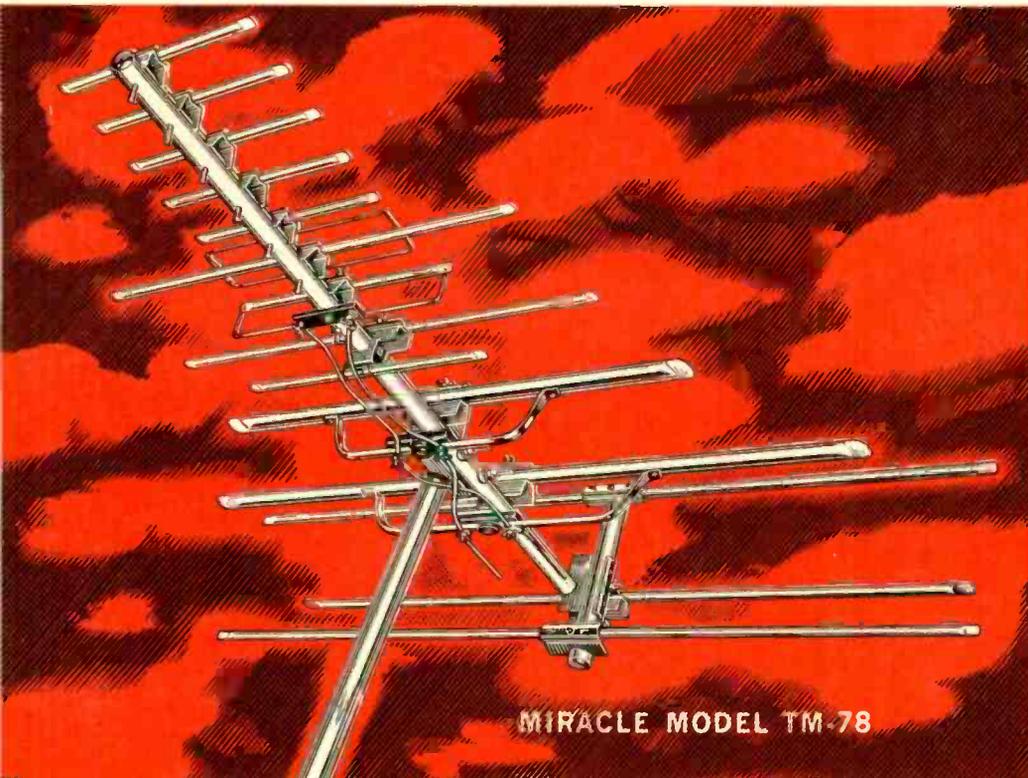
- 1) J. R. Weeks, Capacitor Life Testing, Bell Laboratories Record, Vol. XXIV, No. 8, August, 1946.
- 2) Harold Basseches and Mary W. Barnes, Gassing of Liquid Dielectrics Under Electrical Stress, Industrial and Engineering Chemistry, Vol. 50, No. 6, June, 1958.

SC-59-8

**SANGAMO ELECTRIC COMPANY, Springfield, Illinois**  
 --designing towards the promise of tomorrow

# Proved best in test after test!

**MIRACLE ANTENNA with MIRACLE REFLECTOR SYSTEM  
HAS YET TO MEET ITS PEER IN TV ANTENNAS!**



**HERE'S HOW TESTS WERE MADE...DO THE SAME  
AND CONVINCINGLY PROVE TO YOURSELF THAT  
THERE IS NO ANTENNA THE EQUAL OF MIRACLE**

**TEST  
No. 1**

Select location of tests in any tough reception area. Place any competitive "in-line" Yagi antenna on mast and point directly to desired station. Take reading and lower antenna as quickly as possible so as to assure same signal strength for all three tests.

**TEST  
No. 2**

Add Miracle Reflector to same competitive Yagi, raise on mast, point directly to same station, take reading . . . and you'll be immensely pleased with its improved performance. The Miracle Reflector makes any "in-line" Yagi a better antenna.

**TEST  
No. 3**

Now, lower Yagi and raise Miracle Antenna with Miracle Reflector System on mast. Point directly to same station and again take reading. You'll find that the Miracle with its amazing reflector, plus **tuned elements** gives you a **receiving combination** that has no equal among present day antennas. We invite YOU to make all three tests . . . why not do it at once and forever be convinced of Miracle superiority. Write, wire or phone collect today!

## LETTERS

### To the Editor

#### Giving Away Money

Editor, ELECTRONIC TECHNICIAN:

Regarding your August Editor's Memo about a man who gives away money, I have had a similar policy for several years. For example, when I know that a complaint is unjustified, or when I do a repair which I know, and have so told the client, is insufficient, because of economic limitations imposed by that client, I will remit the labor costs, charging only for the parts used. In addition, where tubes are involved, I offer to return the monies paid for the tubes if they are returned to me in operable condition. Of course, I will not undertake to go after them, and add further labor costs. I have found that, in the majority of cases, the check is returned to me with an apology for their hasty remarks about the quality of the repair.

H. L. MATSINGER

Philadelphia, Pa.

. . . your August memo brought to mind a similar incident. The sum was almost the same, \$17.85. The husband thought that it was a reasonable charge, but the wife violently disagreed. I took as much as I could stand, then told her if the few dollars meant so much to her, I would not charge for the job, and tore up the bill. Unlike your lady, this one was not the crying type. She not only did not pay the bill, but told all who would listen that I must have been trying to cheat, otherwise I would not have torn up the bill. I lost quite a few customers.

ALBERT N. WILLIAMS

Evening TV Service  
Cheltenham, Md.

#### Price for Licensing

Editor, ELECTRONIC TECHNICIAN:

In reply to Mr. O. Dale Burdge's August letter on the high price he is willing to pay for a license bill for TV technicians just to "Get rid of some of the fly-by-nighters and other unethical and unqualified operators," I have this to say. Any person who is confident of his knowledge does not worry about losing his work to some unqualified person. A TV technician who does good work will have customers who continue to give him their sets to fix and recommend him to their neighbors. No matter how many licenses a man has, if he does not please his customers, they will not patronize him. Live and let live.

LOUIS MONTOYA

Los Angeles, Calif.

• See forum on licensing in this issue.  
—Ed.

(Continued on page 10)

# CBS ELECTRONICS

announces its New  
.....

## HARMONY

### Hi-Fi Stereo

#### PORTABLE PHONOGRAPHS

#### The Independent Service-Dealer's Line

Again CBS Electronics opens the way to greater profit for you, the Independent Service-Dealer. You'll find these handsome portables by CBS Electronics easy to sell because they look high priced, sound high priced, yet put the pleasure of Hi-Fi Stereo sound within the reach of all your customers.

#### Get complete details from your local distributor

Everyone wants stereo . . . you know that. Now you can start to profit from *your* new line of Hi-Fi Stereo phonographs priced so everyone can afford one. See your distributor today. Or write us direct for the Harmony Line Folder, RPF-289, the Dealer Helps Booklet, RPF-290 . . . and the name of the distributor nearest you.



## HARMONY

CBS ELECTRONICS

Portable **Hi-Fi Stereo** with Console Sound

**CBS ELECTRONICS**

Danvers, Massachusetts, U.S.A.

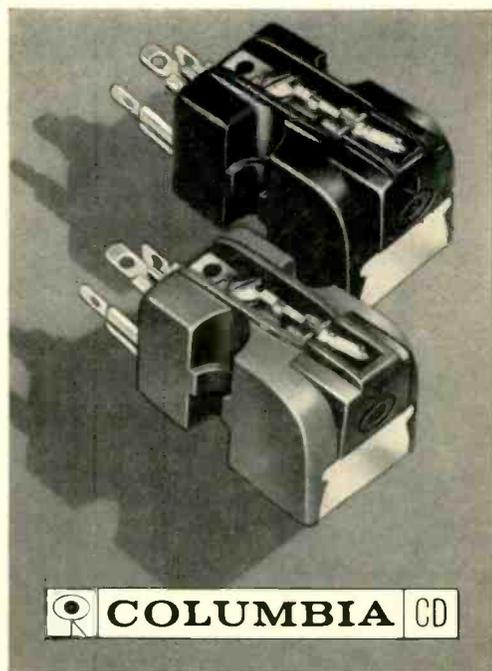
A Division of Columbia Broadcasting System, Inc.

Receiving, industrial and picture tubes • transistors and diodes  
audio components • phonographs

# CBS Electronics adds Ronette to Cartridge Line



CBS-Ronette, the world's most popular cartridge

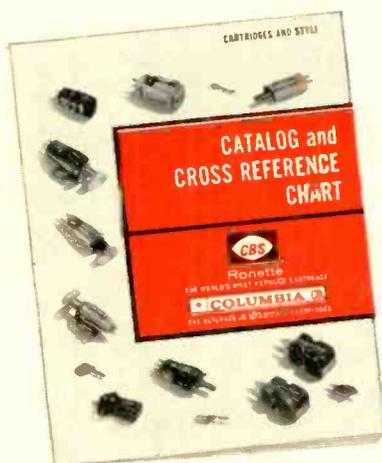


Columbia CD, the ultimate in stereo cartridges

CBS Electronics is proud to announce the addition of CBS-Ronette cartridges to its expanding product line. Independent service-dealers now have the convenience of its local distributors for this quality line of stereo and monaural cartridges widely used by manufacturers of phonographs and changers. Now your distributor offers you one dependable source for CBS-Ronette and Columbia CD cartridges and styli.

## IMPROVE SERVICE... INCREASE PROFITS WITH THESE CBS-RONETTE ADVANTAGES

- Reduced inventory . . . 27 cartridges replace over 500.
- Exact replacements for over 6,000,000 cartridges in U.S.A.
- Made by largest cartridge manufacturer in the world.
- Painsstaking craftsmanship: e.g., clip-on jeweled styli.
- Proven dependability to guarantee satisfied customers.
- Selection made easy by new CBS-Ronette and Columbia CD Catalog and Cross Reference Chart.
- Installation time cut by simplified instruction sheets.



*This 8-page catalog makes cartridge replacement easier, faster, more profitable. It is free from your distributor. Ask for Bulletin PF-285 today.*

## CBS ELECTRONICS

Danvers, Massachusetts, U.S.A.

A Division of Columbia Broadcasting System, Inc.

*Receiving, industrial and picture tubes • transistors and diodes  
audio components • and phonographs*

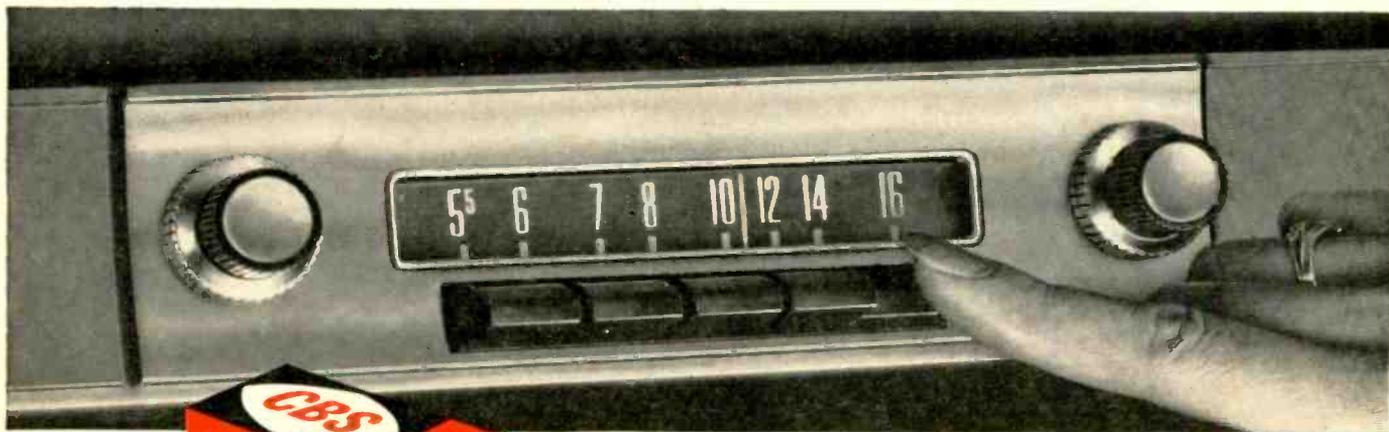
# CBS RADIO SHOWS TOP-RATED BY RATING SERVICES

During the first six months of 1959, an average of 20 of the 25 top-rated popular programs were on CBS Radio . . . over three times as many as on the other three networks combined. A consistent leader is the ARTHUR GODFREY SHOW, a radio favorite for years.



# CBS TUBES TOP-RATED BY LEADING SET MANUFACTURERS

Leading set manufacturers constantly rate and re-rate receiving tubes for quality . . . brand by brand, type by type. We are proud to report that month after month CBS tubes consistently earn top ratings from these manufacturers, and maintain this approval.



**TO YOU,** this is unquestionable proof that when you choose CBS tubes, you choose top-rated quality . . . quality you can depend upon to cut your call-backs to the bone. Always ask for CBS . . . the top-rated name all your customers know and trust.

*Receiving, industrial and picture tubes • transistors and diodes • audio components • and phonographs*

## CBS ELECTRONICS

Danvers, Massachusetts

A Division of Columbia Broadcasting System, Inc.

You can now **guarantee reliability** if you join Pyramid's

# GOLD RUSH



BURTON BROWNE/New York

## Pyramid's New "Gold Standard" $\pm 10\%$ Mylar® Capacitors

resistance. Standard capacity values! Standard voltage ratings! Standard tolerance of  $\pm 10\%$ ! Previously made only on special order and at premium prices, new "Gold Standard" capacitors are now available to servicemen at a price competitive with ordinary paper capacitors.

For reliability assurance, insist on Pyramid "Gold Standard" capacitors from your distributor. Catalog available.



# PYRAMID

Pyramid Electric Company, North Bergen, N. J.

(Continued from page 6)

### Communications Equipment Manufacturers

Editor, ELECTRONIC TECHNICIAN:

Please send me the names and addresses of manufacturers making Citizens Band equipment. I would like to make use of my Second Class Radio-Telephone license that I have been holding for years.

ERNEST JAHODA

Rochester, Minn.

... please send the names of leading manufacturers of communications equipment.

CHAS. G. DAVIS

Davis Radio & TV  
Girard, Ohio

... send the addresses as mentioned on page 29 of your August 1959 issue.

G. B. SMITH

Smith Electronic Service  
Ellwood City, Pa.

... please furnish names of manufacturers.

F. PITRELLI

Valley Stream, L.I., N.Y.

... please send me names and addresses of the most important manufacturers of Citizens Band equipment.

NELSON ORTIZ

Ortiz Radio-Television  
Mayaguez, Puerto Rico

### Missing School

Editor, ELECTRONIC TECHNICIAN:

I am an old Service reader and enjoy ET much more. It is a very informative magazine and that is why I was taken aback when I read the Buyers Directory in the May 1959 issue. I am a graduate of Saunders Electronic School in Boston and I was dismayed to see no Mass. schools listed in the Directory. What's the scoop?

L. A. DEMERS, JR.

Fitchburg, Mass.

• We query all electronic schools for our Directory. Unfortunately, those that do not take the trouble to verify their activities are not listed. No slight meant to Saunders.—Ed.

### Distributor Policies

Editor, ELECTRONIC TECHNICIAN:

Wholesale suppliers should sell only to service shops and not to anyone that walks in. If they are going to do that, why don't they have prices higher than those for the service shop for those people. Auto supply houses have about three different prices. Repair shops get greater discounts than filling stations and it should work the same way in the electronic field. At least, it would give us a better chance.

RICE RADIO & TV

Nocona, Tex.

(Continued on page 12)



(Continued from page 10)

### Subscription Qualifications

Editor, ELECTRONIC TECHNICIAN:

I recently received a letter from your Circulation Manager saying I am not qualified to subscribe to your magazine. My letter is not to convince you that I am something that I am not. I need information for men like myself, and perhaps you can help. I am a maintenance electrician in the largest tide-water steel plant in the world. Our company maintains all its own equipment in the mills, including motor controls, sequence controls, timers, amplidyne, magnetic amplifier controls,

relays and communications.

RAYMOND H. WOCKENFUSS

Baltimore, Md.

• We apologize for our poor communications. Our intent was to keep the magazine in the hands of people who derive their livelihoods from electronic maintenance. From your explanation, it appears that you are qualified. As a matter of fact, a reader who maintains electronic equipment for business or industry may be entitled to receive a special INDUSTRIAL ELECTRONIC MAINTENANCE Edition which we will publish shortly. If you are interested, write for our IEM qualification form.

—Ed.

### Alpha and Beta

Editor, ELECTRONIC TECHNICIAN:

Could you let me know what is the difference between Alpha factor and Beta factor in transistors?

BROTHER GONZALES

Plattsburg, N.Y.

• As shown in the grounded base transistor circuit submitted by Brother Gonzales, Alpha applies and is the ratio of change in collector current to change in emitter current, which is usually less than 1. In circuits where the emitter is grounded and the input signal is applied to the base, Beta applies and is the ratio of change in collector current to change in base current. Beta amplification factor frequently is in the 10 to 50 range.—Ed.

*Mr. Service Dealer...*

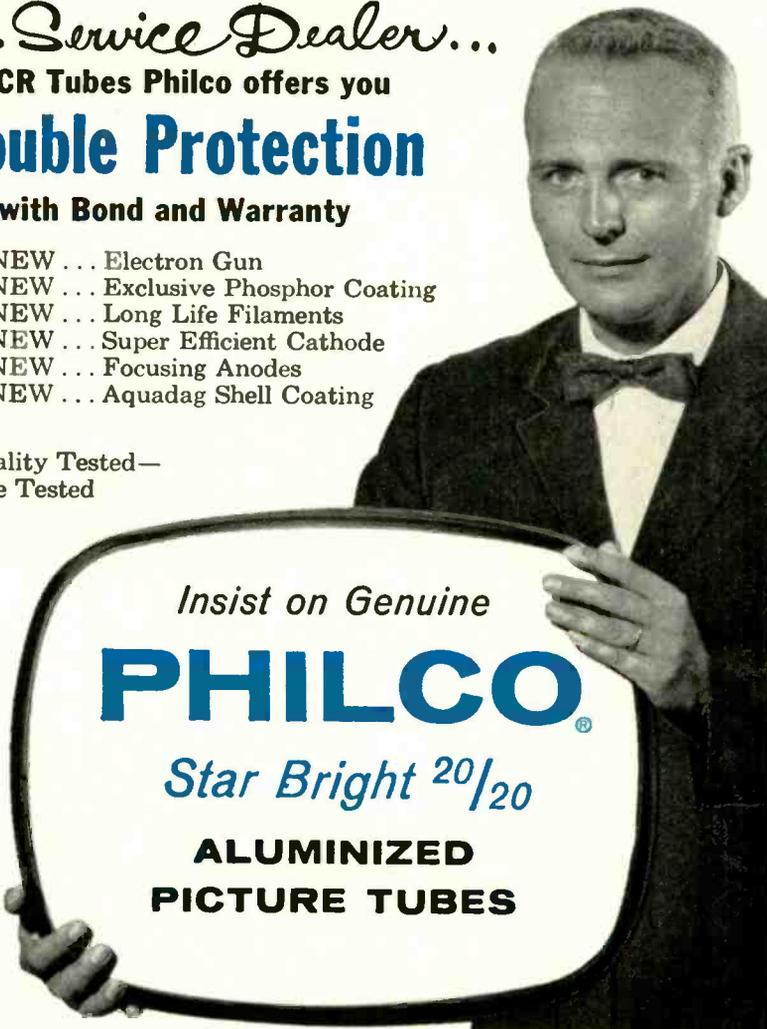
in CR Tubes Philco offers you

## Double Protection

with Bond and Warranty

- ALL NEW ... Electron Gun
- ALL NEW ... Exclusive Phosphor Coating
- ALL NEW ... Long Life Filaments
- ALL NEW ... Super Efficient Cathode
- ALL NEW ... Focusing Anodes
- ALL NEW ... Aquadag Shell Coating

Quality Tested—  
Life Tested



Insist on Genuine

**PHILCO**

Star Bright 20/20

**ALUMINIZED  
PICTURE TUBES**

**SENSATIONAL FREE OFFERS!**

**PHILCO FRONT WHEEL PROGRAM**

**Get All of the Details From Your  
Local Philco Distributor**

**PHILCO** ACCESSORY DIVISION  
WORLD-WIDE DISTRIBUTION

### Automatic Garage Door Problem

Editor, ELECTRONIC TECHNICIAN:

We have a problem concerning the sensitivity of the Automatic Garage Door Operators outlined in ELECTRONIC TECHNICIAN, April 1956 issue. It seems that our customers were once able to open their door at several hundred feet, but now have to be no further than twenty-five feet. We have checked tubes, adjustments, etc., and would certainly appreciate any help you can render.

RICHARD L. NICHOL

Nichol & Schmidt TV-Appliance  
Columbia Falls, Mont.

• Suggest that you check the output voltage and frequency of the transmitter and also the input sensitivity of the receiver. Also inspect antenna connections, motor, limit switches, etc. In addition, don't overlook mechanical difficulties such as door channels, drive chains and other mechanical linkages.

—Ed.

### Reader Dissents

Editor, ELECTRONIC TECHNICIAN:

ET is a rag, praising and calling those gipers professional technicians. Except for a few, they are tinkers and screw driver handymen. I have been in radio repair since 1921 and I'm not a professional. I do not belong to any association. Your magazine is useless. Disgusted.

DAVID WALSH

New York, N.Y.

### Manufacturer's Address

Editor, ELECTRONIC TECHNICIAN:

I cannot find the address of Philco in your magazine or anywhere else. Can you tell me where their headquarters is located?

JAMES R. BALL

Port Arthur, Tex.

• Philco Corp. is located at C & Tioga Sts., Philadelphia 34, Pa. This address, along with those of other manufacturers, are listed in the May 1959 Directory issue of ET.—Ed.

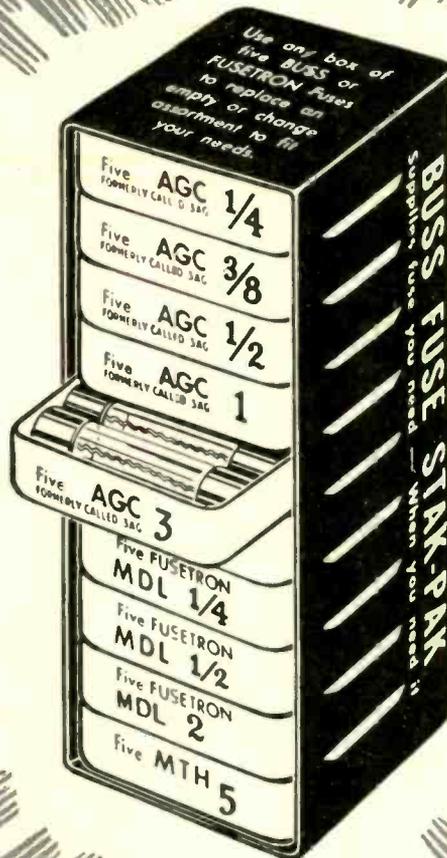
NEAT  
**NEW!**

UNBREAKABLE

PRACTICAL

COMPACT

Picture shows actual size



## BUSS Fuse STAK-PAK

*An On-the-Job Fuse Assortment  
Supplies the Right Fuse When You Need It*

The BUSS Fuse STAK-PAK offers the serviceman a new, convenient way to carry fuses.

It contains fifty of the most popular fuses, in ten different sizes and types. Five fuses to a box, ten boxes in all.

It's **NEAT** — no loose fuses scattered about in the tool box.

It's **COMPACT** — the most fuses in the smallest space — takes less space than any other type of assortment.

It's **UNBREAKABLE** — sturdy metal — not fragile plastic.

It's **PRACTICAL** — to replace fuses or to change assortments just slide in

tray of any BUSS or FUSETRON five-in box.

**Serviceman can make assortment fit his local needs**

The beauty of the STAK-PAK is that empty boxes can be replaced with same fuses — or assortment can be changed to fit the service-man's local needs.

Never any need for the serviceman to carry a lot of "slow-moving" fuses around with him.

If more fuses are needed the serviceman just picks up another STAK-PAK and arranges it to suit himself.

### "PICK A PAIR OF STAK-PAKS"

*Two Assortments Available to Supply Practically All Service Needs.*

*Standard Fuse Assortment* supplies fuses most in use on popular TV sets. Order Number SP-1.

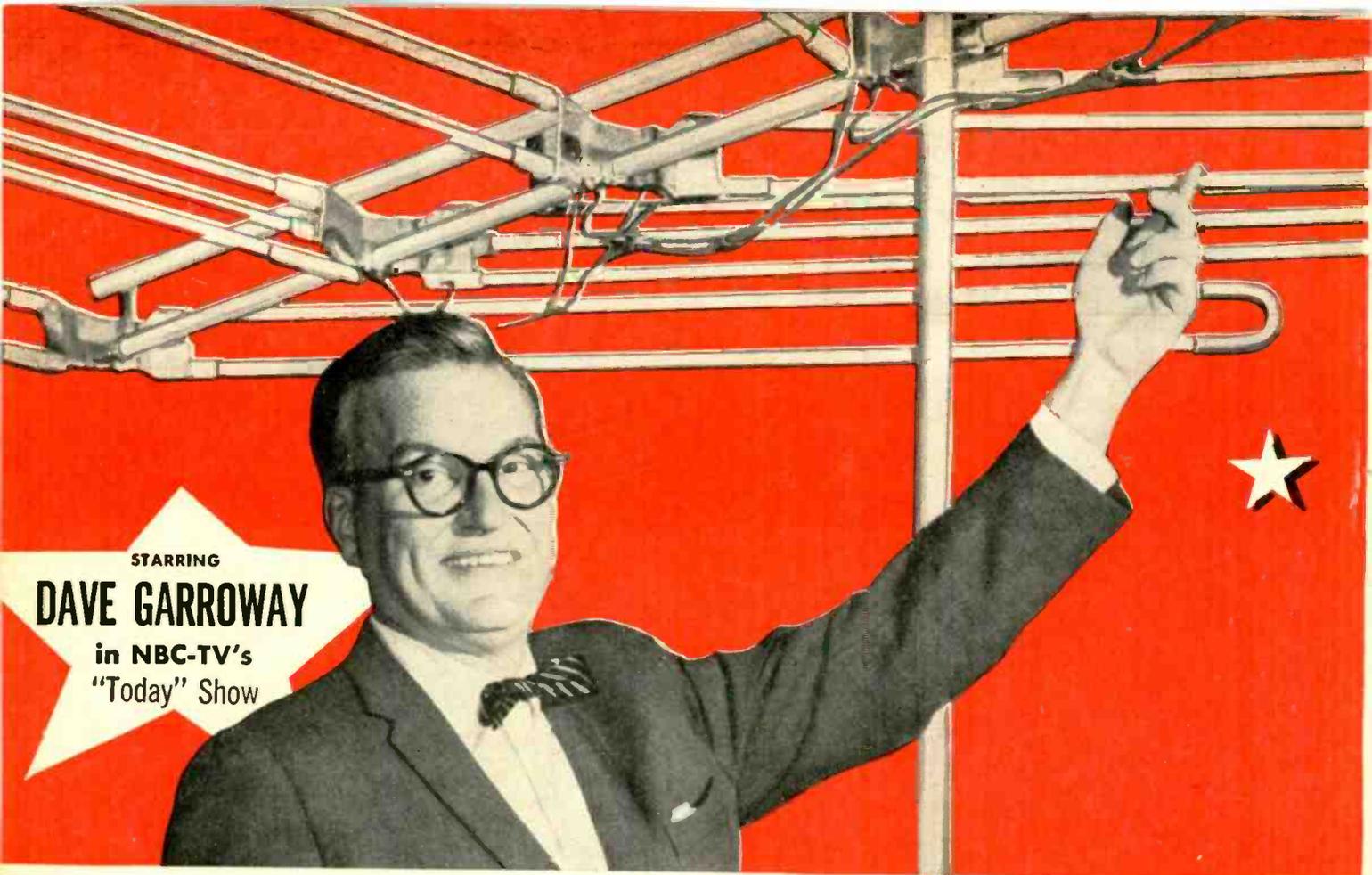
*C & N Fuse Assortment* supplies the popular sizes of these fuses that are especially designed for TV. Order Number SP-2.

While you think of it, make a note to "pick a pair of STAK-PAKS" at your distributor.

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



1059



STARRING  
**DAVE GARROWAY**  
in NBC-TV's  
"Today" Show

# **CHANNEL MASTER<sup>®</sup>**

Channel Master is telling the T-W story to almost every family in the United States with the **MOST SPECTACULAR ANTENNA PROMOTION OF ALL TIME!**



STARRING  
**JOHN PAINE**  
in ABC-TV's  
"The Restless Gun"



STARRING  
**GALE STORM**  
in ABC-TV's  
"The Gale Storm Show"



STARRING  
**BOB CUMMINGS**  
in ABC-TV's  
"Love That Bob"



# the STARS ★ are out FOR THE



THE BEST OF ANTENNAS DELIVERS  
THIS BEST OF PROMOTIONS!

To help you sell more antenna replacements, Channel Master commercials will be broadcast from coast to coast by 4 of America's most popular TV shows over the entire NBC and ABC networks—210 TV stations.

In addition to this full network coverage, 2 powerful national magazine campaigns will put the T-W story into 17 million homes... many of them right in your community.

These ads are aimed at telling consumers that their antenna installations are becoming old, worn out, obsolete, and that for the best possible TV reception they should replace their antennas with the T-W. This campaign has been designed to create new business for you by making the TV family T-W conscious.

ONLY CHANNEL MASTER GIVES THE DEALER  
THIS KIND OF SUPPORT!

**2** NATIONAL  
TELEVISION  
NETWORKS!



**4** TOP-RATED  
TV SHOWS!



**8** WEEKS OF  
STAR-STUDED  
PROMOTION!

**PLUS**

**2** HARD-HITTING  
NATIONAL  
MAGAZINE  
CAMPAIGNS!



## FARM MAGAZINES

To reach the rural market  
... where the big fringe in-  
stallations are sold!

FARM JOURNAL  
SUCCESSFUL FARMING  
PROGRESSIVE FARMER



## GENERAL MAGAZINES

To reach the vast reader-  
ship of these widely-read  
publications... in every city  
and hamlet in the country!

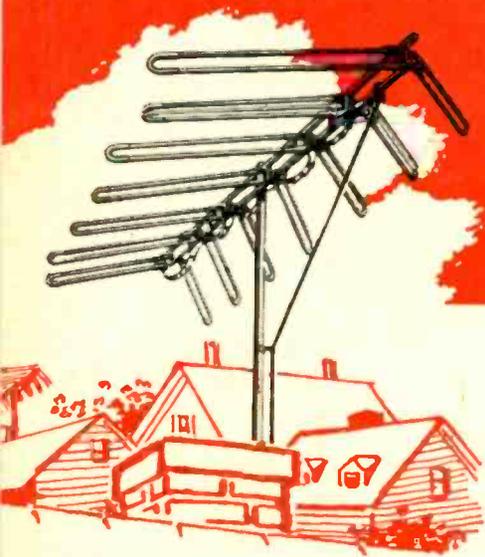


SATURDAY EVENING POST • CORONET

**Now meet the real star of the show...**

# The **CHANNEL MASTER**® **T-W**

## ★ **STAR** ★ of Rooftop America!



Three years ago, Channel Master developed the Traveling Wave antenna. This breakthrough in antenna design was so revolutionary...so far ahead of its time...that modern science has not yet been able to produce a comparable antenna.

**Here's why other antennas simply cannot equal the powerful performance of the Traveling Wave.**

The T-W antenna, featuring the Traveling Wave principle, looks and operates differently from other antennas. All but one of its elements are driven. No conventional dipoles are used—only "hairpin" or "fat" dipoles, and a revolutionary new Controlled Impedance Dipole. The 2-stage phasing harness...the critical lengths and angles of the elements...the folded reflector...all combine to deliver these unique Traveling Wave advantages:

- Ideal phase relationships on all channels
- Optimum impedance on all channels
- Equal flow of current in all dipoles on all channels
- Fullest use of transmitted energy on all channels

**As a result, the T-W brings your set miles closer to the TV transmitter, providing the highest gains and highest front-to-back ratios ever achieved in a broad-band antenna.**

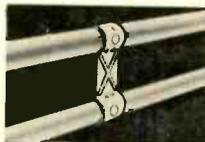


**The T-W is the stand-up-and-take-it antenna!**

The T-W is as rugged as it looks. When you install the T-W, you know this hefty performer is up to stay. It

is, without a doubt, the strongest antenna ever built. Here's why:

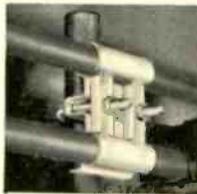
### "TWIN TRUSS" CONSTRUCTION



All elements and crossarm are made with "twin truss" design. The truss is a basic construction form

used in bridges, airplane wings, and wherever high strength and light weight are required. This "twin truss" design makes each T-W element more than 5 times stronger than an ordinary dipole in its ability to withstand the heaviest wind and ice loads.

### RUGGEDIZED MAST BRACKET



Heavy-duty U-bolt grips the antenna to the mast. Twist-proof construction. 4 rivets secure the bracket to the mast.

### RUGGEDIZED ELEMENTS



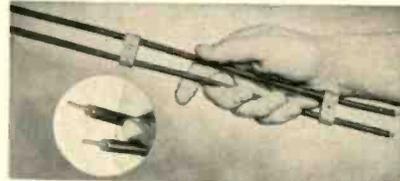
Seamless 1/2" dia. sleeves, seamless 1/2" dia. U-bend...20% heavier wall thickness than regular antenna construction.

### "LINE-LOK"

Absorbs all transmission line tension. Can't tear at terminals.

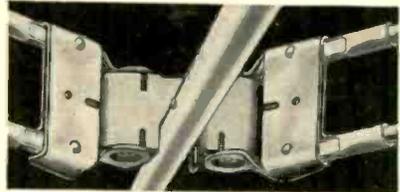


### WEATHERPROOF HARNESS



Extra-thick 1/4" virgin polyethylene insulation protects impedance and electrical efficiency against salt air, rain, and ice.

### MASSIVE, HEAVY DUTY INSULATOR MOLDINGS



**The T-W has consumer recognition and acceptance!**

Millions of consumers, including those in your own area, recognize and ask for the Channel Master brand name. Continuous full-scale advertising campaigns, local advertising, newspaper mats, window displays, streamers, and other advertising aids have made the American consumer T-W conscious. The Channel Master T-W out-sells, out-performs, out-lasts every other all-channel antenna. That's why this premium quality product is still the star of rooftop America...and a most profitable experience on the part of the dealer and the consumer alike.

**Call Your Channel Master Distributor Today!**

**CHANNEL MASTER CORP.** ELLENVILLE, N. Y.

# *CHANNEL MASTER* advertising works 'Round the Clock

...to make friends and customers for the full line of Channel Master products.

Aluminum and Steel Mastings



Indoor and outdoor antennas

2-set couplers



TV Wire



Automatic and compass rotators

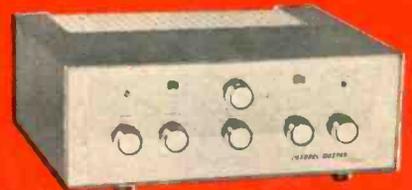
Insulators, mounts, and hardware



AM/FM Tuner



Transistor radios



High Fidelity Amplifiers

Electron Tubes



Stereo turntable



Minstrel Speaker's



Get the profit story. Call your Channel Master distributor today.

*CHANNEL MASTER CORP.* ELLENVILLE, N. Y.

AVAILABLE NOW... THE RCA

Wonderful premiums  
for the family...  
Service aids for  
your business!

**FREE**

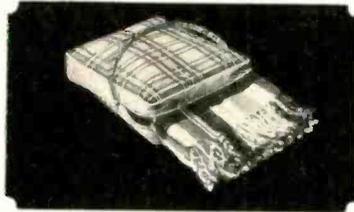
FOR A  
LIMITED  
TIME ONLY

RCA TUBE  
**WALL RACK**



**FREE** when you purchase  
275 RCA  
Tubes\*

BLANKET  
AND BAG SET



**FREE** when you  
purchase 350 RCA Tubes\*

RCA



VoltOhmyst®  
Kit WV-77E(K)

**FREE** when you purchase  
950 RCA Tubes\*

**FIRE  
EXTINGUISHER**



**FREE**  
when you  
purchase  
425  
RCA  
Tubes\*

WEATHERPROOF

**LANTERN**



**FREE** when you purchase  
225  
RCA Tubes\*

\*Suggested Value



12 gorgeous and glorious items to help you have  
more fun...get more done! See them...get them  
now at authorized RCA TUBE DISTRIBUTORS  
participating in this program.



# SPECTACULAR PREMIUM OFFER

## with your purchases of RCA Tubes!

From Authorized RCA Tube Distributors Participating In This Program

**RCA**  
**CLIP LEADS**



**FREE**

when you purchase  
75 RCA Tubes\*

**PICNIC KIT**



**FREE** when you  
purchase 350 RCA Tubes\*

**MAGNIFYING**  
**LAMP**



**FREE**

when you purchase  
900  
RCA Tubes\*

**RCA**  
**Y-O-M KIT**  
WV-38A(K)



**FREE** when  
you purchase  
980 RCA Tubes\*

SUBSCRIPTION TO

**RCA**  
**SERVICE**  
**NOTES**



FOR 1 YEAR

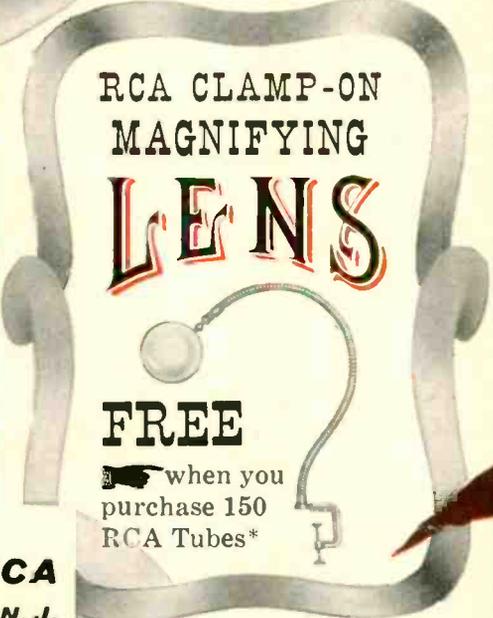
**FREE** when you  
purchase 175 RCA Tubes\*

**RCA PARTS**  
**WALL**  
**RACK**



**FREE** when you  
purchase 125 RCA Tubes\*

**RCA CLAMP-ON**  
**MAGNIFYING**  
**LENS**



**FREE**

when you  
purchase 150  
RCA Tubes\*



**RADIO CORPORATION OF AMERICA**

Electron Tube Division

Harrison, N. J.

## News of the Industry

**HICKOK CO.** named J. W. SIRINGER as Advertising Mgr.

**HEATH CO.** has named ALLAN W. GREENE Pres. of the company.

**HEWLETT-PACKARD CO.** has acquired BOONTON RADIO CORP. as a wholly owned subsidiary.

**BENDIX AVIATION CORP.** reports the appointment of EDWARD A. VOSS as Manufacturing Mgr. of the Cincinnati Div.

**GONSET DIV.** announces they have sold their former Link Mobile Radio Div. to the PLATT SALES CORP., N.Y.C.

**HUGHES AIRCRAFT Products Group** reports that JOSEPH D. BIANCO has been appointed Mgr. of the Vacuum Tube Products Div.

**KESTER SOLDER CO.** has begun manufacture of all their products in the firm's new west coast factory at Anaheim, Calif.

**UNGAR ELECTRIC TOOLS** was granted trademark registration by the U.S. Patent Office for the word, "TIP-LET."

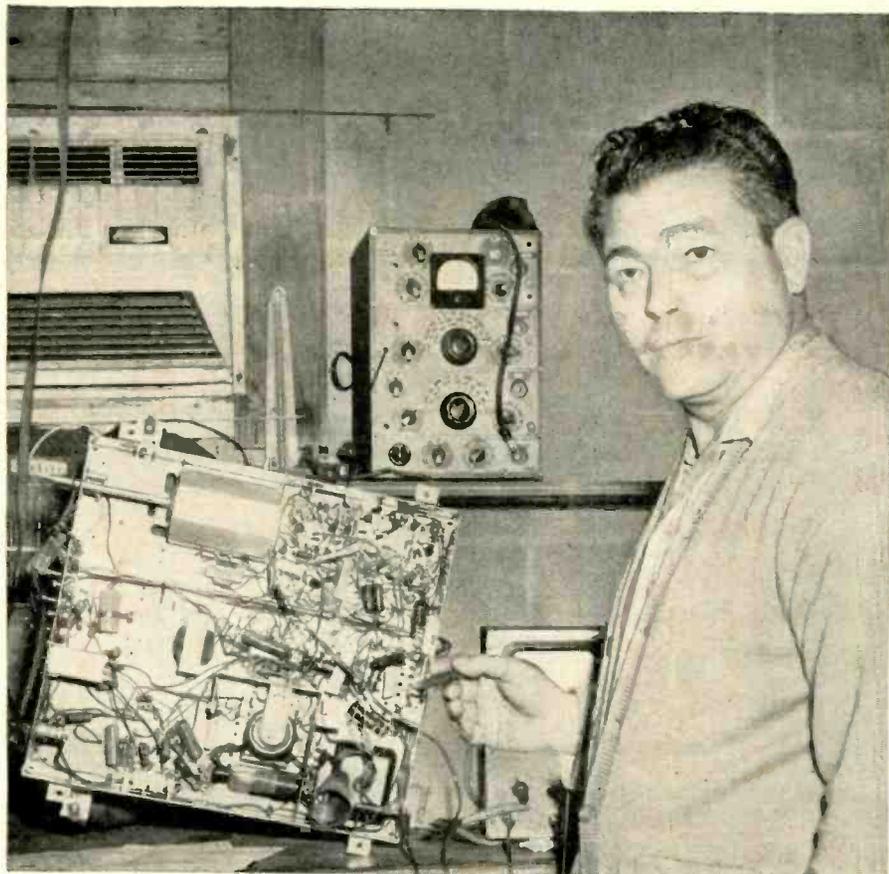
**SONOTONE CORP.** has been appointed exclusive U.S. rep for the Ediswan electronic tubes manufactured by the SIEMENS EDISON SWAN organization in England.

**STROMBERG-CARLSON** has created two new managerial positions in the Special Products Div.; EDWARD R. O'HARA, Mgr. of Manufacturing and MARK E. WOODWORTH, Mgr. of Product Planning & Market Research. The Electronics Div. names DR. DONALD G. WILSON as Asst. Vice Pres. WILLIAM G. ALEXANDER is now Gen. Mgr. at San Diego.

**U.S. TRANSISTOR CORP.**, Syosett, L.I., N.Y., was formed to manufacture electronic components and has acquired the complete sales organization of SUPER ELECTRONIC CORP. Officers & directors are JOSEPH ROSEN, Pres.; BENJAMIN ARFIN, Vice Pres.; SYDNEY SIMON, Vice Pres.; and EDWARD WALDMAN, Dir. WALTER G. REINHAUS will be European Sales Mgr.

**TEXAS INSTRUMENTS Apparatus Div.** makes the following Field Service Engineering Rep. appointments: GRANT A. DOVE, Mgr. of the Div.'s Northeastern Office; MURRAY HENRY will join STAN SORENSEN, Mgr. of the Div.'s activities in Los Angeles; and ROBERT MORRIS will serve the Northwestern U.S. with headquarters in Seattle, Wash.

(Continued on page 22)



## "Where do people look when their TV goes out? In the Yellow Pages!"

says Bill Streiff, Prop., Bill Streiff Television Service, Gulfport, Miss.

"Keeping your telephone number before customers is the most important job you have. You can paint it on trucks, for example, but people may never remember it when they are in need of your services. They don't call often enough so they look in the Classified.

"Besides our Yellow Pages ad we run listings under Zenith and RCA trademark headings. This associates us with names far better known than ours, and helps attract customers looking for service for a particular brand.

"Incidentally, I'm happy with the way the Yellow Pages are promoted on TV. The more people use the directory, the better our chance of getting business."

Tell people *where* to find you *when* they need you through a Yellow Pages **AWHERENESS** program. The Yellow Pages man will gladly build the plan your business needs. Call him now at your local Bell telephone business office.

**RADIO AND TELEVISION**  
SALES AND SERVICE

**RCA VICTOR** *Emerson*

BIG COLOR TELEVISION **Teletalk**  
WE WRITE YOU TO SEE COLOR T.V.  
CALL FOR TIME OF PROGRAMS

Buy Your T.V. Set From a Technician  
90 Days Free Service  
Prompt Service

- CALLS MADE SAME DAY RECEIVED
- WE SERVICE ALL MAKES & MODELS
- ANTENNAS INSTALLED, REPAIRED & MOVED

Open 9:00 A.M. To 9:00 P.M.

Dial UN 3-2692

**Bill Streiff Television Serv.**

118 PAGE 88 HAWTHORNE GULFPORT, MISS.

¼-PAGE DISPLAY AD (shown reduced) in the Yellow Pages sells Bill Streiff's TV service and brand-name products. Firm has been a Yellow Pages advertiser for three years, considers Yellow Pages advertising as well as BRAND-NAME LISTINGS under the Zenith and RCA trade-mark headings a "must" for promoting its service business.

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



**24 HOUR SERVICE...7 DAYS A WEEK...HOLIDAYS TOO!**



**IT'S THERE  
IN HOURS  
...AND  
COSTS  
YOU LESS!**



Your packages go anywhere Greyhound goes... and Greyhound goes over a million miles a day! That means faster, more direct service to more areas, including many, many places not reached by other public transportation.

What's more, Greyhound Package Express offers this service seven days a week... twenty-four hours a day... even on week-

ends and holidays! On Greyhound Package Express packages get the same care and consideration as Greyhound passengers... riding on dependable Greyhound buses on their regular runs. You can send C.O.D., Collect, Prepaid—or open a Charge Account.

Call your nearest Greyhound bus station or write to Greyhound, Dept. H 10, Jarvis Ave., Chicago, Ill.

(Continued from page 20)

**ELECTRO PRODUCTS'** past Pres., ALFRED CROSSLEY, died.

**JACK GILBERT ASSOC.** reports the appointment of ROBERT CORNELL to Dir. of Publicity and Electronic Products Technical Advisor.

**WELLER ELECTRIC CORP.** has assigned JAMES F. COLEMAN as Asst. to the Midwestern Regional Sales Mgr., a new post.

**HOFFMAN ELECTRONICS CORP.** Semiconductor Div. has appointed NORMAN J. REGNIER to a new position, Marketing Dir. for solar products.

**DU MONT LABS.** Electronic Tube Div. names THOMAS C. WELLS and MORGAN P. MEANEY as sales engineers.

**BECKMAN INSTRUMENTS** has appointed MICHAEL YORK Corporate Mgr. of Advertising. DAVID C. MC NEELY was named Mgr. of the HELI-POT DIV.

**DYNAMIC ELECTRONICS** has acquired the CAPEHART CORP. The Capehart line will be manufactured and distributed by the Capehart Div. of Dynamic.

**RCA** has appointed the J. WALTER THOMPSON CO. as its advertising agency, effective Jan. 1, 1960. WILLIAM M. WEBSTER was named Dir., Electronic Research Laboratory, RCA Labs.

**GENERAL ELECTRIC** Communication Products Dept. has named JAMES E. PITMAN as Mgr. of Product Planning for point-to-point communication equipment.

**CORNELL-DUBILIER** has completed negotiations with the TOSHIBA CO. of Japan to form a new, international manufacturing-distribution association to market the Far Eastern firm's transistors in the U.S.

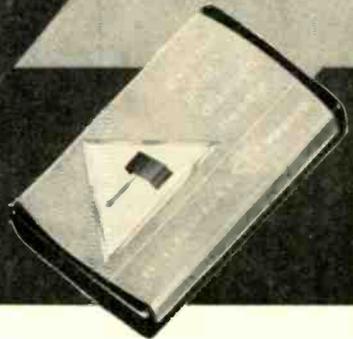
**ELECTRIC SPECIALTY CO.** has made the following promotions: WILLIAM E. H. REARDON, Vice Pres. and Sales Mgr.; JAMES H. PIERSON, Vice Pres. and Personnel Dir.; JOSEPH J. SOUSA, Chief Engr.; and GEORGE C. ZIMMERMAN, Dir. of Manufacturing.

**RAYTHEON CO.** Semiconductor Div. announced the following five appointments: LEO F. LEARY, Mgr. of Manufacturing; HENRY F. SCHUNK, Mgr. of the new Lewiston, Me. plant; RAY T. MIJANOVICH, Mgr. of the Mass. production facilities; DR. WALTER F. LEVERTON, Engineering Mgr.; RAYMOND J. BARBER, Controller. Prices for transistors meeting both military and commercial specifications were lowered by the Div. The Equipment & Systems Div. has been joined by LEONARD G. WALKER as Mgr. of the Communication & Control Systems Dept.

(Continued on page 24)

# NEW PYRAMID POINT<sup>®</sup>

## by Fidelitone



For the first time.. a needle shaped to follow record grooves exactly.. pick up all the sound

### New Pyramid Point Diamond

Traces the centerline of the microgroove with more surface contact. Accurately contacts all frequency areas. Assures minimum distortion, maximum true sound.

### Ordinary Diamond

Does not trace the centerline of the groove. Has less surface contact. Pinches and rides bumpily in high frequency areas — distorts many sound impressions.

Be one of the first to sell the needle shaped to play records as they were recorded. Sell the quality needle — the new Pyramid Point Diamond by Fidelitone. The leader in fine needles for over 30 years. And always the first with the newest in needles. Contact your Fidelitone distributor today.

It's here! The new Pyramid Point Diamond by Fidelitone — the only needle tip scientifically shaped to simulate the original recording stylus. It's designed to pick up all sound information — cleanly reproduces the highest highs — the lowest lows. The exclusive new pyramid shape minimizes pinch effect in the high frequency passages, lowers background noise — and reduces distortions as much as 85%! Now for the first time the full pure tones of the original recorded sound are faithfully reproduced. And the greater surface contact between needle and record prolongs your needle and record life. So hear the amazing difference yourself in sound quality — stereophonic or monophonic with the new Pyramid Point Diamond by Fidelitone.

Over 30 years of quality needles

# Fidelitone

Chicago 26, Illinois  
"Best buy on records"

# DIFILM<sup>®</sup>



## BLACK BEAUTY<sup>®</sup> CAPACITORS BEAT HEAT AND HUMIDITY

New DIFILM Black Beauty Capacitors lead the way in tubulars! The operating temperature range of these new capacitors goes up to 105 C (221 F) *without voltage derating*. **Capacitance tolerance is held to  $\pm 10\%$ .**\*

- The new dual dielectric used in DIFILM Capacitors combines the proven long life of paper capacitors with the effective moisture resistance of polyester plastic film capacitors . . . to give you performance that can't be beat.

- Here's the kind of performance you can expect from DIFILM: very high insulation resistance, low power factor, moderate capacitance change with temperature,

excellent retrace under temperature cycling, and superior long-term stability . . . *all at regular prices!*

- This high performance is fully protected by HCX<sup>®</sup>, an exclusive Sprague hydrocarbon material which impregnates the windings, filling all voids and pinholes before it polymerizes. The result is a solid rock-hard capacitor section. These capacitors are further protected by an outer molding of humidity-resistant, non-flammable phenolic.

*For complete technical information on DIFILM Black Beauty Capacitors, write for Bulletin M-759 to Sprague Products Company, 65 Marshall St., North Adams, Mass.*

\*From .001  $\mu$ F up

The major capacitor improvements come from

# SPRAGUE<sup>®</sup>

*world's largest capacitor manufacturer*

**SPRAGUE RESEARCH IS CONSTANTLY PRODUCING NEW AND BETTER CAPACITORS FOR YOU**

FIRST TIME . . . a versatile

# DUAL

# HEAT SOLDERING GUN

FOR ONLY  
**\$7.95**  
 LIST  
 Model 8200K



...and best of all,  
 it's a new

**Weller**<sup>®</sup>

Here from Weller, long time leader in the soldering field, is the newest and finest soldering gun value on the market.

**WELLER DUAL HEAT FEATURE** saves time, gives greater convenience and greatly increases tip life. A touch of your finger on the Triggermatic control switches heat to high (125 watts) or low (90 watts) as your job requires. It adapts instantly to varying needs, and you use high heat only when necessary.

**HIGH EFFICIENCY WELLERTIP** utilizes copper for superior heat transfer and soldering efficiency, plus iron plating for durability. Flat cross-section design gives added strength and rigidity.

**NEWEST DESIGN** with sturdy plastic housing that resists hard knocks. Compact "feel" and comfortable balance aid precision soldering. Like all other Weller guns, this new model features instant heat, and a spotlight illuminates your work.



## KIT INCLUDED

In addition to the Dual Heat Soldering Gun you get:

- Wire Bristle Cleaning Brush
- Soldering Aid for opening old joints, twisting wires
- All-purpose Solder

On sale now at your  
 Electronic Parts Distributor

**WELLER ELECTRIC CORP. • 601 Stone's Crossing Rd., Easton, Pa.**

(Continued from page 22)

**VOCALINE CO.** has named **THE WEXTON CO.** as their advertising agency.

**DELCO RADIO DIV.** announces the appointment of **D. L. BILLIET** as Regional Mgr. of the Western office, Santa Monica, Calif. and **ROBERT EARLE** as Regional Mgr. of the Eastern office, Newark, N.J.

**GENERAL TRANSISTOR CORP.** made the following two appointments: **A. CHARLES EMANUEL**, Vice Pres., Dir. of Manufacturing; and **FRANK GARBIS**, Vice Pres., Dir. of Engineering.

**PRECISION APPARATUS CO.** will participate in a U.S. Patents Office sponsored exhibition illustrating how the patent system has benefited industry and the public, opening October 20th in Wash. D.C.

**LING-ALTEC ELECTRONICS** has acquired all the outstanding stock of **CONTINENTAL ELECTRONICS MFG. CO.** **JAMES O. WELDON** will continue as Pres. and **LESTER H. CARR** as Vice Pres. of the newly acquired subsidiary.

**MOTOROLA, INC.** has acquired **THE DAHLBERG CO.** of Minneapolis, Minn. **MOTOROLA COMMUNICATIONS & ELECTRONICS, INC.** has named **WILLIS DITMANSON** as National Parts & Service Mgr.

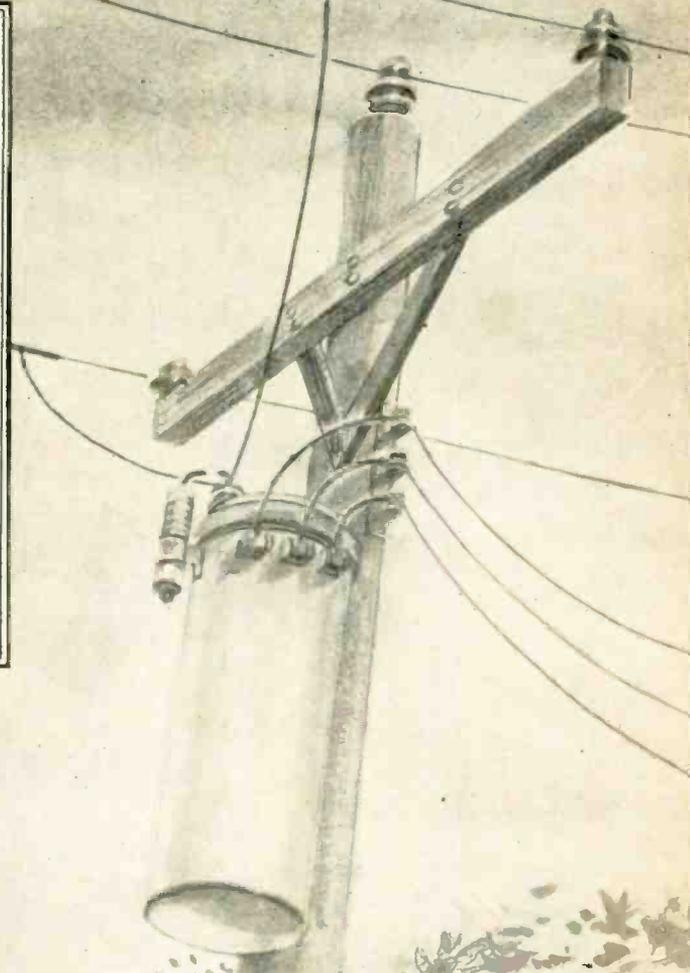
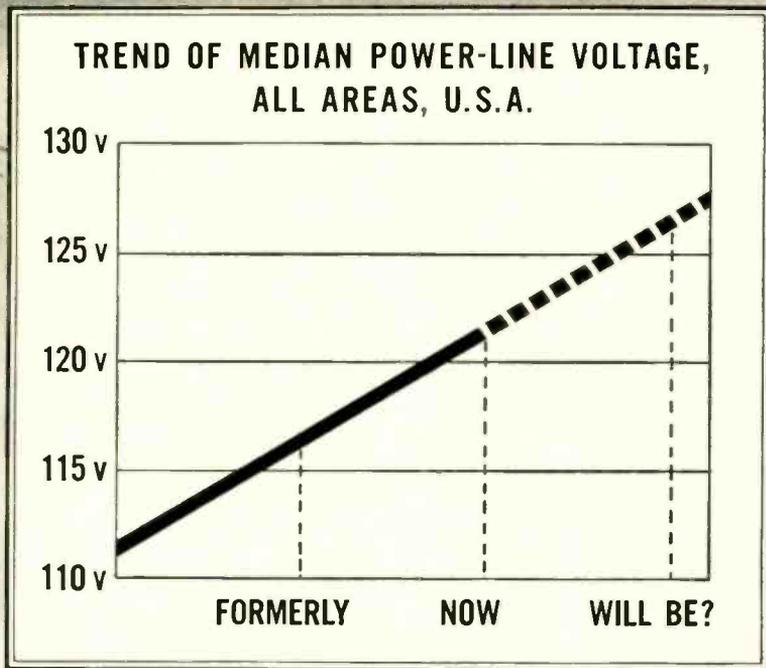
**PHILCO CORP.** was presented a "Service Achievement Award" by **ELECTRIC APPLIANCE SERVICE NEWS** magazine during the Appliance Profession Assoc. Convention. The Parts & Accessory Div. has appointed **T. EDWARD ROGERS** Gen. Sales Mgr.

**PERMA-POWER CO.** announces a fall promotion in which the service man receives a free wind-proof cigarette lighter upon buying twelve Vu-Brite TV tubes at the regular price. Special offer applies to both parallel and series Vu-Brites.

**AMPEX** will market the new British-made Marconi TV camera in the U.S. The following five new Vice Pres. were named by the Bd. of Dirs.: **JOHN JIPP**, **NEAL K. MC NAUGHTEN**, **HERBERT L. BROWN**, **JOHN M. LESLIE, JR.** and **WALTER T. SELSTED.**

**WINEGARD CO.** reports that with the purchase of Colorceptor TV antennas between now and Feb. 1, 1960, dealers will receive a sample kit of store display and mailing material, and a free "Promotion Buck" from his distributor to use for "buying" the dealer's choice of sales aids.

**SERVICE INSTRUMENTS** reports that their brand name, **SENCORE**, will now be used as the company signature in all advertising and promotional activities. They have appointed a new advertising agency, **R. N. JOHNSON ADVERTISING**, which moved into new quarters at 173 W. Madison St., Chicago.



## Built to Withstand Increased Line Voltages!

**G-E Service-Designed 6BQ7-A and 6BZ7 Have Heavy-Duty Cathodes and Heaters That Safeguard TV-Tuner Performance!**

Grid emission from ever-higher line voltages? Not in General Electric's 6BQ7-A and 6BZ7, with their new low-sublimation cathodes that give off far less contaminating material. Heater-cathode shorts? Virtually none, because 6BQ7-A and 6BZ7 heaters, series-connected, have wire which is twice as thick as old-style heaters. The heavy wire holds its shape and does not bend.

Install these Service-Designed twin triodes in sets old and new, without high-line-voltage worries! You'll banish customer complaints of snow, or no picture. And callbacks will be less, because tube life is long. Volume types . . . and profitable. See your G-E tube distributor! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Ky.*

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**

2-111-208

## Reps & Distributors

**ANDREA RADIO CORP.** announces the appointment of the **EASTERN COMPANY'S** Providence, R.I. branch as distributor for TV.

**RICO INDUSTRIES, INC.**, San Juan, Puerto Rico has been established as a full-line parts distributor of radio, TV and industrial electronic products for Puerto Rico. The operation is said to serve a market of 170,000 TV receivers, 200,000 radios and 645 industrial plants.

**SLATE & CO.** names **LEONARD B. KELLERMAN** as field rep. for their component lines.

**AMPEREX ELECTRONIC CORP.** reports the appointment of **VARIETY ELECTRONIC CORP.**, as exclusive distributor of Amperex and Valvo electron tubes for Northern New Jersey area.

**OLYMPIC RADIO & TELEVISION** announces formation of a new, wholly-owned distributing subsidiary, **OLYMPIC MID-STATE, INC.**, located in Newburgh, N.Y. The new Olympic distributor will represent Olympic's line in parts of New York State and Pike County, Pa.

**NATIONAL RADIO CO.**, names **JACK BERMAN CO., INC.**, Los Angeles to represent their line of amateur and shortwave receivers, and components.

**CLEVITE** announces the appointment of **CRAMER ELECTRONICS**, 811 Boylston St., Boston and **GREEN-SHAW CO.**, 341 Watertown St., Newton, Mass. as Boston area distributors for the complete line of semiconductor products.

**CHEMTRONICS, INC.** has named the following two West Coast rep firms: **MARK R. MARKMAN CO., L.A.**, for Ariz., S. Calif., and S. Nev.; and **WILLIAM LOGAN**, Daly City, Calif., for N. Calif.

**ELECTRONIC REPS, INC.** formed by members of the Wolverine Chapter of the **ELECTRONIC REPRESENTATIVES ASSOCIATION**, is sponsoring the Michigan Industrial Electronics Exposition in the Detroit Artillery Armory October 28-29, 1959. National manufacturers will display the latest electronic components, test equipment and industrial equipment.

**BENDIX RADIO** announces **SATTERFIELD ELECTRONICS, INC.**, of Madison, Wis. as an authorized sales and service distributor for their two-way radio equipment. The distributor's statewide dealer organization will provide a complete sales, maintenance, and repair service for the Bendix line of industrial electronics products, consisting mainly of two-way radio communications systems designed for all types of mobile operation. Distributorship covers the state of Wisconsin plus six counties in Northern Illinois.

**ELECTRONIC REPRESENTATIVES ASSOC.** announces plans for holding its first national convention at Chicago in January, 1960. The Board of Governors approved an ERA Business Management Institute for executives of ERA member firms. The Institute will hold a week-long course in September, 1960, and will be conducted by the Bureau of Business Management of the University of Illinois. Also approved was the design and installation of a group retirement income plan for ERA member firms and their employees.

# AVR



the  
**NEW**  
**PERMA-POWER**

Model D-200

## Automatic Voltage Regulator will make you money and save you grief

**It's easy to sell.** There have been units similar to this on the market before—at prices upwards of \$75.00. The new **PERMA-POWER** Automatic Voltage Regulator has a list price of \$9.95—so any TV set owner can afford it . . . and any customer plagued by picture flutter, shrinking, flop-over, loss of brightness, and other similar disturbances will want it.

**It's easy to use.** This new unit insures top performance of TV sets by automatically returning full height and width to pictures when distorted by low line voltage. Whenever the line falls below 110 volts, it automatically boosts line voltage 10 volts—and it automatically feeds the line direct for normal voltages. *You don't have to worry about the customer's forgetting to switch the voltage regulator when the line is normal;* this new **PERMA-POWER** unit switches automatically!

**It's easy to install.** You plug it in, and it's ready to work; goes on and off with TV set. Compact and lightweight, it has no tubes, ballasts, relays, or other moving parts to fail; and it's fully guaranteed for one year. Can be used on any TV set or appliance rated up to 300 watts. See it at your distributor today.

**Perma-Power** COMPANY

3104J N. ELSTON AVENUE  
CHICAGO 18, ILLINOIS



"I think you worked it free that time, Charlie."

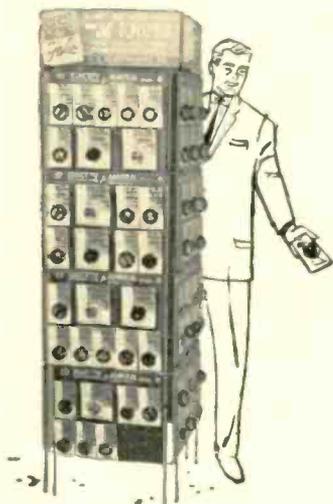
**now...**

**make your customers happy**

**...make more money!**



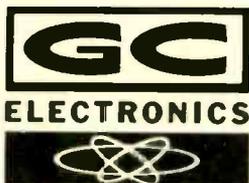
## with NEW G-C **EXACT TV REPLACEMENT KNOBS**



- 97 KNOBS TO CHOOSE FROM
- COVERS ALL 8 POPULAR TV MAKES
- REPLACEMENTS FOR ON-OFF, VOLUME, FINE TUNING, CHANNEL SELECTOR
- MODERN SKIN-PACK—PRICE-MARKED FOR YOUR TRADE

Whenever you run across a broken or missing knob on your TV service calls, you can supply an exact replacement that makes your customer happy, gives you extra money on that call. Your nearby G-C jobber is now showing the complete G-C TV Knob line . . . with each knob skin-packed, clearly identified, and marked with list price for the set owner's information. It's another great service for you from G-C and your G-C jobber.

WRITE today for your free G-C Catalog . . . other literature too.



# G-C ELECTRONICS CO.

Division of Textron Inc.

West Plant: Los Angeles 18, California

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

## Catalogs & Bulletins

**Auto Radio Control Replacement  
is Child's Play**

with new **Centralab**®

**Exact Replacement Controls**



Now one source can fill all your needs for auto radio-replacement controls. CENTRALAB has a new line of exact replacements for every popular radio in use today. This is the first time in history that you have been able to get the auto radio control you need—from a control manufacturer.

It's easy to handle more auto radio repair business—and handle it profitably—when you install exact replacement controls bought from your regular supplier. No need to run all around town looking for the right unit—you can now be sure that your CENTRALAB distributor has it!

Besides controls, the line also includes six exact replacement on-off switches (SP Series) for push-button radios, used in Plymouth, Dodge, DeSoto, Chrysler, Ford, Mercury, Lincoln and Hudson.

A complete and thorough guide listing all auto radio controls in use today, and their CENTRALAB equivalents, is now available. Pick up your free copy from your distributor—or write direct to CENTRALAB.

**Centralab**®  
B-5902

A DIVISION OF GLOBE-UNION INC.  
902 J. E. KEEFE AVE.  
IN CANADA: 669 Bayview Ave. • Toronto 17, Ontario

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

**INDUSTRIAL ELECTRONIC EQUIPMENT:** A 528-page 1960 Electronic Equipment Catalog lists over 40,000 items with special emphasis given to electronic equipment for industry. Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill. (ELECTRONIC TECHNICIAN B10-1)

**SOLDER:** A new technical data sheet covers prevention of silver scavenging; effects of rare metals in soldering; and choosing the right alloy. Alpha Metals, Inc., 56 Water St., Jersey City 4, N.J. (ELECTRONIC TECHNICIAN B10-2)

**RELAYS:** Form A-101MM is a new 2-color specifications catalog sheet on "Dualseal" micro-miniature case relays. The Amerlay Corp., 130 County Court-house Rd., New Hyde Park, N.Y. (ELECTRONIC TECHNICIAN B10-3)

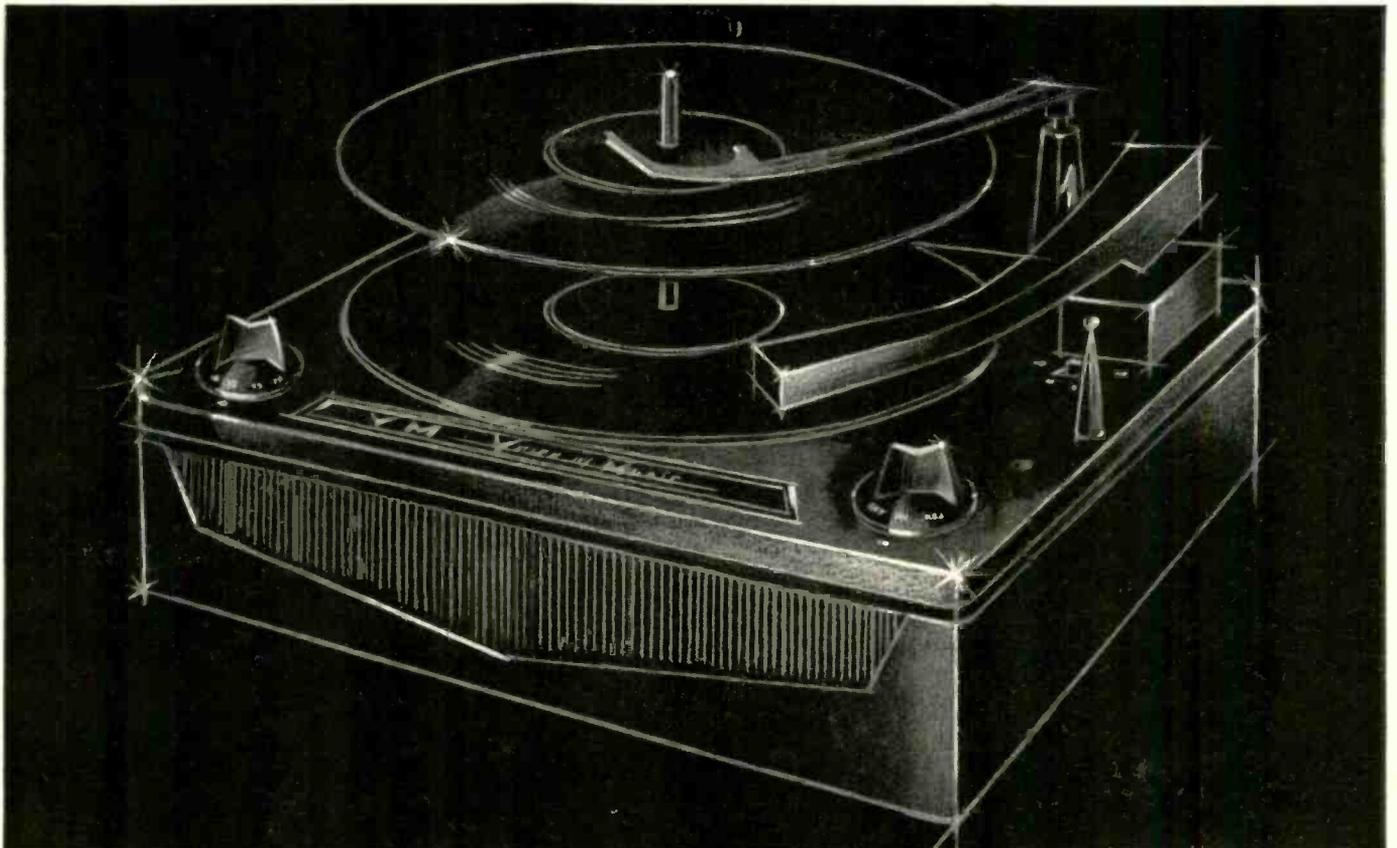
**POWER SUPPLY:** A 2-color, illustrated, brochure covers the firm's Model 21 Isolated Power Supply designed to obtain the isolation of a battery with the convenience, economy and dependability of line operation. Moeller Instrument Co., Electronics Div., 132nd St. & 89th Ave., Richmond Hill 18, N.Y. (ELECTRONIC TECHNICIAN B10-5)

**TRANSISTORS:** "Transistor Dissipation Ratings for Pulse & Switching Service," application note AN-181, helps circuit designers determine peak-dissipation values of 39 RCA transistor types. It includes a special table and two graphs for determining the permissible peak dissipation for any of the types listed in terms of pulse width, duty cycle, and temperature. RCA Semiconductor & Materials Div., Commercial Engineering, Somerville, N.J. (ELECTRONIC TECHNICIAN B10-7)

**ELECTRONIC COMPONENTS:** A new 36-page, 2-color, illustrated catalog of electronic component service replacements describes many new components including IF coils, power and audio transformers and filter chokes. Technical information and service hints are included. Ram Electronics, 600 Industrial Ave., Paramus, N.J. (ELECTRONIC TECHNICIAN B10-8)

**CONDENSERS & DRIVES:** A brochure provides descriptions and illustrations of English-made condensers and drives. M. Swedgal Electronics, 258 Broadway, New York 7, N.Y. (ELECTRONIC TECHNICIAN B10-9)

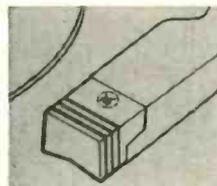
(Continued on page 91)



# THE MASSIVE NEW STEREO REPLACEMENT CHANGER MARKET IS YOURS FOR PROFITS WITH **V-M**

The swing to stereo is creating a growing demand for quality stereo record changers. Plan NOW for your share of volume sales with the world-acclaimed V-M 'Stere-O-Matic'® 4-Speed Changer, the custom-component changer with transcription turntable performance!

You'll sell it for new stereo installations, for replacement, or for use with stereo-play tape recorder systems! It's versatile, it's smartly designed, and best of all it's properly priced for maximum sales to the most customers.



**V-M MODEL 1227**—Plays Stereophonic Records—All Sizes, All Four Speeds—makes Monophonic Records sound better than ever! Stereo Cartridge and Needle, Dual Output, Stereo/Monophonic Switch, Single-Play Manual Operation Too! Mounted on Style-Pleasing

High-Impact Plastic Base. Model 1229 has Four-Pole Motor, Plug-In Head for GE and Other Magnetic Stereophonic and Monophonic Cartridges. Each, \$56 list. †

**BETTER CALL YOUR V-M REPRESENTATIVE TODAY!**

†Slightly higher in the West

the **Voice**  of **Music**\*

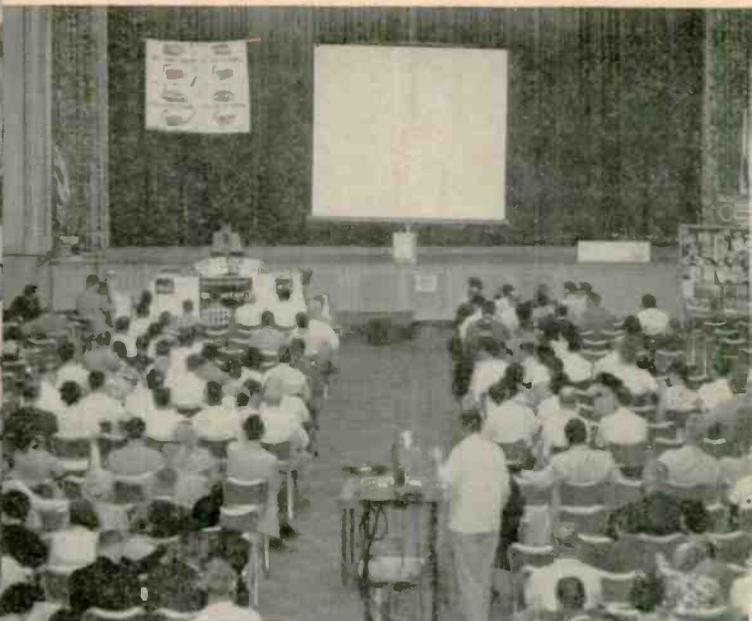
V-M Corporation

Benton Harbor, Michigan

World Famous for the Finest in Record Changers, Phonographs and Tape Recorders



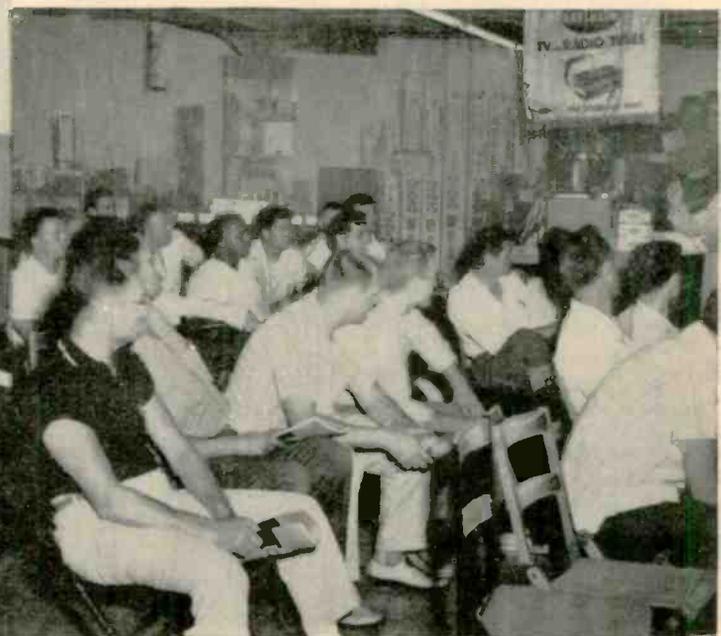
Los Angeles, Cal.



Boston, Mass.



Boise, Idaho



Providence, R. I.



Philadelphia, Penna.



Portland, Ore.

Minneapolis-St. Paul, Minn.

# 10,073

## Leading Independent Service Dealers Attend Raytheon's Closed Circuit Meeting!

*First coast-to-coast sales meeting for industry attended by largest number of dealers ever recorded. Audience gives enthusiastic approval of new Bonded Dealer Program!*

*82-city meeting network hears special NBC MONITOR program. With local Raytheon Distributors acting as host in 82 key cities across the nation, 10,073 top TV-radio service dealers heard the exciting news of the Raytheon Bonded Dealer Program.*

At the same time they saw a preview of Raytheon's saturation announcement program which will be launched on NBC MONITOR by Bob Hope, Ernie Kovacs, Paul Winchell and other stars . . . plus big space ads in LOOK magazine and TV GUIDE with regional listings of local Bonded Dealers. Hundreds of dealers signed up to participate in the program.

*Bonded Dealers backed by the most dynamic program in the industry. Throughout the year Raytheon will tell practically every TV and radio set owning family in the nation that the local Bonded Dealer is the man to see for the finest in service backed by a 90-day Repair Bond.*

To help dealers cash in, Raytheon supplies Bonded Dealers with all necessary advertising and promotional materials. The program has been designed by Raytheon to help the local independent dealer gain his rightful share of the booming service business.

If you missed out, we suggest you contact your local Raytheon Distributor, today.



RAYTHEON COMPANY • DISTRIBUTOR PRODUCTS DIVISION



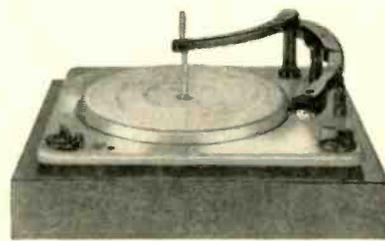
our  
 British  
 cousins  
 at  
 Collaro  
 stress  
 meticulous  
 care and  
 precision  
 engineering  
 in every  
**Collaro**  
 stereo  
 record  
 player!



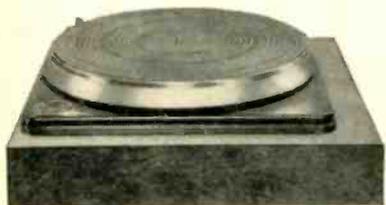
The Constellation, Model TC-99—\$59.50



The Continental II, Model TSC-840—\$49.50



The Coronation II, Model TSC-740—\$42.50  
 \*The Conquest II, Model TSC-640—\$38.50



Transcription Turntable, Model 4TR-200—\$49.50



Manual Player, Model TP-59—\$29.95



Every Collaro stereo record player is built with typical British attention to every detail. They are precision engineered and rigidly tested to give truly professional performance and the ultimate in operating convenience. Here are some of the important features that make Collaro the logical choice for stereo or monophonic records. • Performance specifications exceed NARTB standards for wow, flutter and rumble —with actual performance test reports accompanying each model TC-99. • Extra-heavy, die-cast, non-magnetic turntables (weighing up to 8½ lbs.). Extra-heavy weight is carefully distributed for flywheel effect and smooth, constant rotation. • Shielded four-pole motors are precision balanced, screened with triple interleaved shields to provide extra 25 db reduction in magnetic hum pick-up. • Detachable five-terminal plug-in head shells (on TC-99, TSC-840, TSC-740, TP-59) provide two completely independent circuits, guaranteeing ultimate in noise reduction circuitry. • Transcription-type stereo tonearms are spring-damped and dynamically counterbalanced to permit the last record on a stack to be played with virtually the same low stylus pressure as the first. • All units are handsomely styled, available with optional walnut, blond and mahogany finished bases or unfinished utility base. There's a 4-speed Collaro stereo record player for every need and budget! Prices slightly higher in the West. For free catalog on the Collaro line, write to: Rockbar Corporation, Dept. ET-10, Mamaroneck, N. Y. (\*Not shown. Similar in appearance to The Coronation.)

# ELECTRONIC TECHNICIAN

Now Including  
**SERVICE**  
Magazine

## *The Great Licensing Debate*

Few issues in the electronic service industry have stirred as much debate, as much soul searching, and as much bitterness as the question: To License, Or Not To License.

In some areas represented by more than one association, the main point of contention is whether to support a licensing bill. In the barrage of charges and counter-charges, proponents and opponents push each other to extreme positions, and the voice of moderation is lost. You might never know it to hear the personal accusations thrown about, but licensing is an issue where well intentioned men can honestly disagree.

This disagreement is not limited to association members, among whom those favoring licensing appear in the majority. The many letters we have received from unaffiliated technicians show wide disagreement, with opponents to licensing apparently in the majority.

In several parts of the country, laws regulating TV servicing have been adopted. In a number of other areas, proposed legislation has been defeated. In any case, we do detect more service dealers favoring licensing than did three years ago. It will be of interest to observe how licensing has affected those areas in which it has been in force. There's nothing like experience to learn the pitfalls and benefits of new laws. Once the unvarnished facts are established, we will know whether or not licensing deserves support.

Of course, conditions vary with geography. What's good for one city may be terrible for another town, and vice versa. Nevertheless, the principles behind a favorable or unfavorable attitude toward licensing should be broadly applicable.

Each reader should read this month's feature, "Should TV Servicing Be Licensed?—A Forum." Two outspoken advocates, one pro and one con, explain the reasons for their views.

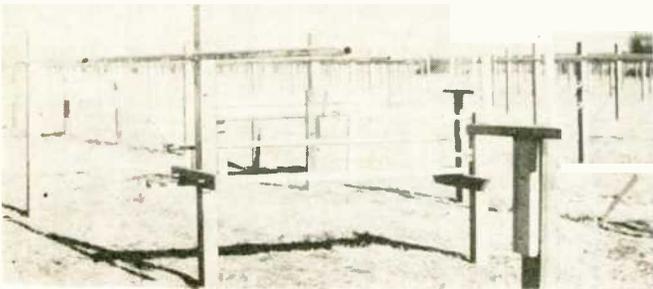
The outcome of The Great Licensing Debate across the country will have an important effect on the lives of all electronic service technicians.

# Tuning In the

**ENEMY AIRCRAFT** "shot down" daily over metropolitan New York. Electronic warfare training uses Nike missiles "launched" from ITT's grounds at Clifton, N. J. The daily drill is made by ITT engineers when checking-out new model 15-D-2 Missile Simulators to be used by the Army for missile team practice. When connected to Nike launching and radar equipment, it provides a realistic method to simulate actual battle and therefore makes it possible to train crews with a minimum of danger and expense. In an exercise, the operator can simulate aircraft at supersonic speeds and countermeasures to obscure the target can be introduced. Missile firing is accomplished whenever the operator desires. If the flight is correct, a blip on the scope will indicate the target is destroyed; if it is a miss due to erratic trajectory, it must be destroyed before falling to the ground. In hundreds of simulated battles, with operations done in seconds, no aircraft has flown past the missile crews to hit New York.

**COLOR TV** will be marketed by Admiral as a separate and limited dealer franchise program. Distributors intend to grant franchises only to dealers that have adequate facilities for demonstrating, selling and servicing. A 56-page merchandising manual has been prepared to assist distributors and dealers in selling color TV. A new series of training schools is planned for independent technicians to study color TV service techniques. Admiral has re-entered the color field with five models, with retail prices \$595.00 to \$905.00.

## ACRES OF ANTENNAS



An antenna array, composed of 1024 half-wave dipoles, 4½ feet above a ground-reflecting screen, covers four acres of land. Used by the National Bureau of Standards to study ionization at all levels of the atmosphere, the new development transmits high frequency waves which are observed through vertically-returned "scatter" or re-radiation. The transmitter, capable of delivering 6 million watts peak-power, sends signals at 41 mc into the antenna.



"All I said was, 'We didn't try to fix it ourselves.'"

**AIRWAVE GOSSIPERS** arouse FCC officials. Random chit-chat is tying up 27 mc Citizens Band transmission. Alleged offenders using the wavelength for extended conversations are non-technical Citizens Band licensees! The FCC says that the Band should be used only to transmit information quickly. It can revoke licenses in the case of persistent violations. Manufacturers of Citizens Band equipment will probably be warned not to advertise that their transmitters may be used for "fun." 55,000 Citizens Band stations have been authorized thus far and the applications are so numerous that a sixty day process period is needed.

**INDUSTRIAL TUBE DISTRIBUTORS** to offer RCA industrial tube products at factory prices. This new policy will enable distributors to supply manufacturers with increased tube availability for short-run production requirements. A new "standing order" program has also been inaugurated permitting distributors to automatically receive a quantity of newly-announced products for distribution to their customers. An RCA spokesman said that the modern program was devised to aid distributors to serve their customers in a more efficient manner and promote future business growth.

**NATIONWIDE TV**, now 13 years old, reaches 44.5 million homes, according to The Television Bureau. These homes are served by 49.3 million TV sets or 86% of the total homes in the US. Representing a substantial public investment of approximately 16 billion dollars for sets, transmissions are made by 513 stations, covering areas that include 98% of the US population.

# Picture .....



**JAPANESE IMPORTS** of electronic equipment has resulted in a group of US electronic manufacturers teaming up to "do something" about it. Industry representatives claim that the increased importation of Japanese products in the past two years have created a serious situation. Union representatives say that thousands of workers in Chicago have lost their jobs because of manufacturers' difficulty in competing with Japanese prices. A Union representative claims that a Japanese manufacturer copied a radio switch—down to an imperfection—that is selling for 21 cents in Chicago. The same switch costs the Chicago manufacturer 30 cents to produce. Japanese employees, it was pointed out, earn as little as 6 cents an hour.

**MICRO-MINIATURE** circuit developed by Melpar is small enough to be hidden under a nickel, despite the fact that it contains 15 electronic components, including transistors, capacitors, diodes and resistors, mounted on a ceramic base 0.625 inches sq. and 0.020 in. thick. Though intended for government use, the development of these tiny circuits is thought to be the forerunner of new designs in communication electronics.

**TV & RADIO PRODUCTION** took a drop in July, compared to the June production level. EIA reports 3,133,075 TV sets produced for the first seven months of 1959. This is in contrast to the same month production in 1958 of 2,442,929 sets. Cumulative radio output during the January-July period this year totaled 7,936,621, compared to last year's seven month production of 5,212,135 radios.

## CALENDAR OF COMING EVENTS

- Oct. 15: Producers of Associated Components For Electronics, Management Seminar, Glen Head Country Club, L. I., N. Y.
- Oct. 15-18: Texas Electronics Assn., Houston Chapter, Rice Hotel, Houston, Texas
- Oct. 26-28: East Coast Aero & Navigation Electronic Conference, Lord Baltimore Hotel, Baltimore, Md.
- Oct. 28-29: Michigan Industrial Electronics Exposition, Detroit Artillery Armory, Oak Park, Mich.
- Oct. 29-31: 1959 Electron Devices Marketing, Shoreham Hotel, Washington, D. C.
- Nov. 3-5: MAECON (Mid-American Electronic Convention), Municipal Auditorium & Hotel Muehlebach, Kansas City, Mo.
- Nov. 4-6: National Automatic Control Conference, Sheraton-Dallas Hotel, Dallas, Texas
- Nov. 8-10: Fourth Annual Electronic Industry Unity Conference, The Concord, Kiamesha Lake, N. Y.
- Nov. 9-11: Radio Fall Meeting, IRE-EIA, Syracuse Hotel, Syracuse, N. Y.
- Nov. 9-11: Fourth IRE Instrumentation Conference and Exhibit, Atlanta Biltmore Hotel, Atlanta, Ga.
- Nov. 17-19: New England Research & Eng. Meeting, Boston Commonwealth Armory, Boston, Mass.
- Dec. 1-3: Eastern Joint Computer Conference, Statler Hotel, Boston, Mass.

**CAMERA FILM** developed by Polaroid Corp. records CRO transients invisible to the human eye. The new film, called Type 47, is rated at ASA daylight exposure index of 3,000 and fits any standard Polaroid Land Camera. It is expected to prove useful in high frequency development work since a single transient pulse can be filmed and analyzed at frequencies of 2,000 to 3,000 mc.

## RANDOM NOISE

**IT&T DEVICES A NEW SONAR TRAINER SIMULATING VARIOUS OBJECTS AT SEA. IT TRAINS NAVY SONAR-MEN TO DISTINGUISH OBJECTS THROUGH ACTUAL AT-SEA TAPE RECORDINGS**

**NEW 400 WATT, 14 LB. AMPLIFIER BY BOGEN-PRESTO CARRIES HUMAN VOICE INTELLIGIBLY OVER A ONE MILE RANGE. DESIGNED FOR EMERGENCY RESCUE OR DISASTER WORK**

*TOM HIGGINS JR.*

**EIA OF JAPAN SAYS, JAPAN IS NOW THE FIRST-RANKING TRANSISTOR RADIO PRODUCER IN THE WORLD. TRAN-SISTOR RADIO PRODUCTION WILL BE PUSHED TO 800,000 SETS A MONTH**

# Understanding And Servicing

## Defective Noise Immunizer Can

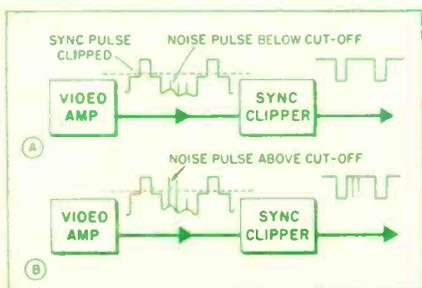
BERNARD GREEN

### Noise Impulses

One of the early criticisms of TV reception concerned occasional loss of sync. When TV spread to fringe areas, with accompanying weaker signals, this problem was intensified. TV manufacturers, heeding these complaints, began incorporating "Noise Gates," "Noise Cancellers," "Fringe Controls," etc. These important circuits counteract noise impulses entering the sync stage. All too often these circuits are ignored by TV technicians when troubleshooting for erratic picture synchronization.

- Interfering noise impulses, though annoying, are usually accurately identified by most technicians. Weird interference patterns on the CRT screen and familiar sound buzzes are easily recognized by visual or aural means. But how familiar are those short duration noise impulses that do not reveal themselves to the technician through interference patterns or buzzing sound?

Fig. 1(A)—Noise pulses below sync clipping level cannot affect the sweep oscillators. (B)—Noise pulses stronger than cut-off can trigger oscillators at wrong time.



Normal noise does not have the opportunity to enter the sync system since the action of the sync clipper removes only the sync pulse tips, as shown in Fig. 1A. However, should the noise impulse have an amplitude above the cut-off portion of the clipper, as shown in Fig. 1B, noise will cause the tube to conduct and consequently inject a pulse at the improper interval to the vertical and horizontal oscillators. This pulse can trigger the oscillators at the wrong time and result in disturbing picture pulling and weaving, vertical roll, jitter or picture tearing.

In an effort to prevent this unstable sync condition, manufacturers are including noise cancellation circuitry in modern TV receivers. The circuit has many names applied to it, depending upon the individual manufacturer. By whatever name they are called, and regardless of minor circuit differences, they all do the same basic job—prevent high amplitude noise impulses from affecting the sync section of the TV set.

### Pentagrid Clipper

Among the most popular noise eliminating circuits designed is the pentagrid clipper type. It uses a 'CS6 or 'BY6 tube, as shown in Fig. 2. In addition to being used as a noise canceller, the pentagrid tube provides greater amplification than a triode tube, and therefore reduces the number of required amplification stages.

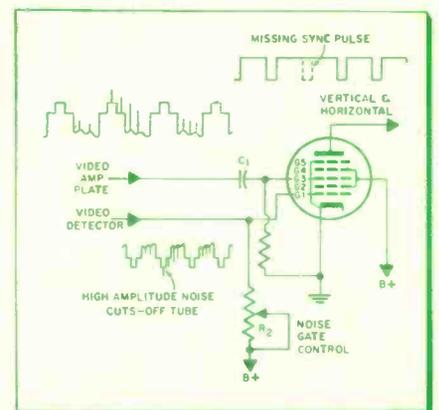
The tube, from grid 3 to plate, operates in the normal sync clipper manner. A large positive composite video signal is applied to grid 3 from the plate of the video amp tube. The signal causes capacitor C1 to charge up so that the bias across grid-leak resistor R1 establishes tube cut-off at approximately the blanking level. Thus, only the sync pulses cause the tube to conduct, thereby reproducing, with an opposite polarity, only the

amplified sync pulses in the plate circuit.

Grid 1 receives a negative-going composite video signal of much lower amplitude from the video detector or video amp grid. Since grid 1 is closest to the cathode and therefore exhibits maximum control of tube current flow, only a small negative voltage can drive the tube to cut-off.

The bias of the tube is adjusted by R2, the noise gate control (sometimes called fringe control or sync stabilizer,) so that tube cut-off occurs near the tip of the sync pulse. Accordingly, current can still flow under normal incoming signals. However, if a noise pulse of unusual amplitude enters grid 1, the high negative amplitude of the noise will cut-off the tube current flow for an instant and prevent the sync pulse going into grid 3 from being reproduced in the plate circuit. Consequently, sync information with accompanying large noise pulses are not transmitted to the sweep oscillators. Since noise pulse duration is usually much shorter than the sync pulse time-interval, the picture is unlikely to be affected by a momentary loss of the sync tip. The momentum generated by the normal train of sync

Fig. 2—When noise gate control is set properly, this pentagrid tube is cut-off by noise pulses higher than sync tips.



# TV Automatic Noise Circuits

## Cause Rolling And Tearing of Picture

pulses to the sweep oscillators is usually sufficient to maintain complete picture stability.

### Servicing

Symptoms of erratic noise circuit operation are very similar to other defects. Picture tearing or vertical rolling or jitter can cause the technician to make an erroneous diagnosis, such as agc trouble or sync, oscillator, video and even i-f defects.

In view of the simplicity of the noise circuit, it might be advisable first to check this circuit when the aforementioned symptoms are indicated. The inspection procedure can be accomplished with great speed. After replacing the pentagrid tube with a known good tube and adjusting the noise gate control for maximum picture stability, the technician's best means for checking-out the circuit is a scope with a low capacitance probe.

Three basic waveforms, as shown in Fig. 3, plate, grid 3 and grid 1, should do the trick before isolating the defect with a VTVM. Clean negative polarity sync pulses, usually around 25 v. to 50 v. P-P, should be obtained at the plate; that is, without video or noise. Grid 3 should produce a large positive polarity composite video signal whose peak-to-peak reading is usually about 50 v. to 70 v. The same signal, reversed in polarity and much smaller, should be seen at the control grid, grid 1. Usual scope voltage reading is about 1/2 v. to 3 v. P-P.

If the improper waveform is produced at the plate, check the two grids to insure that the proper signals are being applied. If they are correct, then the VTVM should quickly isolate the defect in the plate circuit. If the readings are incorrect at the grids, tracing the circuit back to the video amp and detector will speedily locate the point at which the composite video signal is incorrect. When replacing components, adhere to the manufacturer's recommended values.

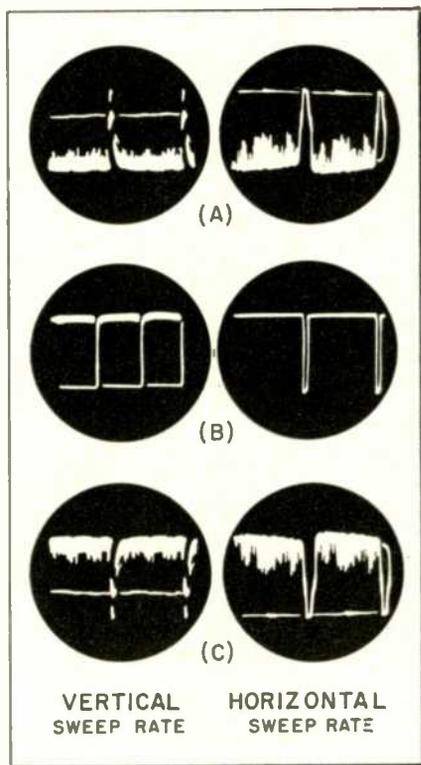
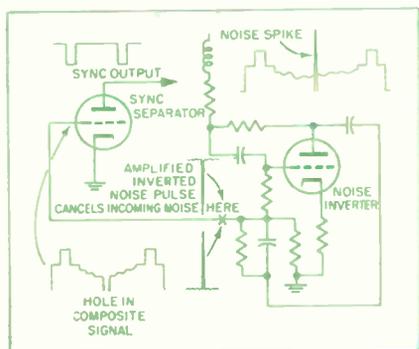


Fig. 3 (A)—Positive going composite video signal at grid 3. (B)—Negative going sync pulses at plate of pentagrid tube. (C)—Negative going composite signal at grid 1.

Of utmost importance to the technician is familiarity with his own scope. All scopes produce slight variations of normal scope readings since the frequency response and varied control settings cause slight differ-

Fig. 4—High noise pulse, inverted and amplified, combines with pulse appearing in grid circuit of sync clipper—cancelling it



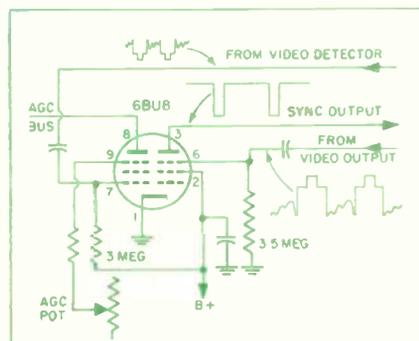
ences in reproduced waveforms. Knowing your scope, and this is possible only through constant use of this all-important troubleshooting instrument, will enable the technician to make minor mental adjustments automatically when comparing published scope traces with those obtained with his own scope. Improper traces caused by defects in the circuit are so numerous, that it is impossible to show all the possible waveform variations of all circuits. Therefore, the technician should familiarize himself with scope traces of individual defective circuits and possibly maintain a record on 3 x 5 cards, together with the set model and the defective component causing the improper trace.

Some circuit variations include the development of agc voltage from the incoming composite video signal to the injector grid (grid 3). If there is a defect in this particular part of the circuit, the picture may be affected by inadequate agc, in addition to improper sync and/or video. Any typical agc trouble symptoms would then be apparent, such as tearing picture, overloading with resultant negative picture, weak picture, etc.

In some instances, the customer complaint is of an intermittent nature.

(Continued on page 60)

Fig. 5—6BU8 combines the functions of agc, sync clipper and noise gate. Large noise pulses, accompanying the signal at the control grid, cuts-off tube and prevents noise reproduction at the plate, pin No. 3.



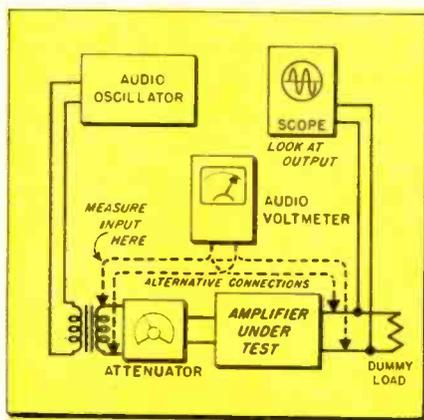


Fig. 1—Test set-up, using a suitable isolating transformer to eliminate spurious effects that invalidate the measurements.

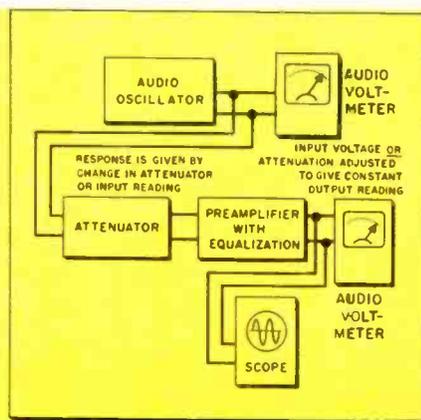


Fig. 2—A preferred method of taking equalization characteristics, at constant output, with fixed or variable attenuator.

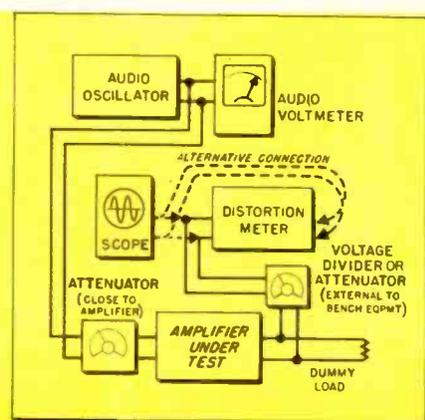


Fig. 3—Test set-up using external attenuation may eliminate difficulties that occur with normal instrument connections.

# Hi-Fi Test Measurements Can Be Wrong!

*Incorrect Readings From Perfect Instruments Often Result In Shelved Test Equipment Or Troubleshooting Difficulties*

NORMAN CROWHURST

• There must be a considerable amount of professional equipment lying idle for want of know-how to use it properly. Its owners have gone into audio servicing determined to "do it right" and bought the best. After a few attempts at using their equipment, in which "answers" were obviously haywire, they quickly turned to more pressing business.

The instructions accompanying this equipment sometimes appears written on the assumption that the user will be the most accomplished engineer, or that everything will go "according to Hoyle." Occasionally it does. But too often it doesn't! And the reason turns out to be something you should know about—except nobody ever bothered to tell you.

Maybe an amplifier sounds bass-deficient, so you decide to measure its frequency response—and it shows up perfectly flat, for as wide a range as your audio generator covers. It

could be that flat, of course, and the apparent bass deficiency could be due to the loudspeaker system, or the amplifier not having the right damping factor for it. But it is also possible that the amplifier isn't as flat as the measurement indicates.

What's that "output" you're measuring? Is it amplified input, hum, or maybe oscillation? Check these possibilities by looking at what the output meter measures on a scope.

Hum can be due to leakage current in the input circuit, which may originate in either the amplifier being tested, the test rig, or to a defective connecting lead (usually a faulty ground return due to bad shield connection.)

## Isolation

If it is a bad connection you will find it in the conventional manner, by wriggling the leads in back of the plugs, and along their length. But if it is due to leakage there may be no need to "cure" it. If the amplifier does not hum in normal operation, all you

have to do is eliminate it from the measurement. This can usually be achieved by isolating the input ground connection with a transformer (Fig. 1).

The transformer will, of course, have its own frequency response, but if you take the input voltage measurement *after* the transformer, the response should be valid. Any convenient transformer of suitable ratio that does not load down the audio oscillator output appreciably will do. Take care though to ground the core or case to the point that produces least hum.

If the "output" proves to be oscillation that does not occur in normal operation of the amplifier, this too can be due to the test set-up. It is particularly likely to happen in an amplifier with a variable damping feature, where some of its internal ground connections carry current associated with current feedback.

Ground isolation with a transformer will usually help here too, but the transformer needs good shielding between primary and secondary, so

Many technicians, spending a substantial amount of money for hi-fi test equipment, soon discover that their investment serves only an ornamental purpose. After elaborate set-ups, the test readings are often misleading and therefore do not result in location and repair of the defect. A few more attempts . . . a few more erroneous indications, and the technician often relegates his new instruments to a dust-collector status.

Much of this waste is due to the lack of hook-up considerations, resulting in misinterpretation of final test readings. Although knowledge and experience are prerequisites to obtaining correct measurements, schools rarely teach adequate audio test techniques, while instruction manuals may assume that purchasers of their instruments are completely familiar with them.

capacitance effects are eliminated. Connect the transformer ground points by trial to eliminate the oscillation.

Another place where frequency response measurements can go wrong is when taking the equalization characteristics. The quick and easy way is to set the input voltage, with appropriate attenuation, to a fixed value; sweep up and down the frequency range and note the readings at different frequencies on the output meter.

The trouble with this method is that you are liable to run into limitations. For example, at the low end the input level may overload some of the input stages, or else the output level will get down in the noise region at the high frequency end. Either will spoil the curve, and will show up if you use a scope to look at the output.

The remedy is to measure equalization the same way it is intended to be used—with constant output, as

shown in Fig. 2. If you have a calibrated attenuator, adjust this so the output remains constant, and read the characteristic from the attenuator settings. If a fixed attenuator is used, adjust the input voltage to it so the amplifier output remains constant, and read the equalization characteristic from the input meter.

### Distortion Meters

The measurement that seems to offer the greatest potential for error is distortion; whether harmonic or IM. However familiar you are with a distortion meter, and however reliable its reputation may be, never take one of these "beasts" for granted.

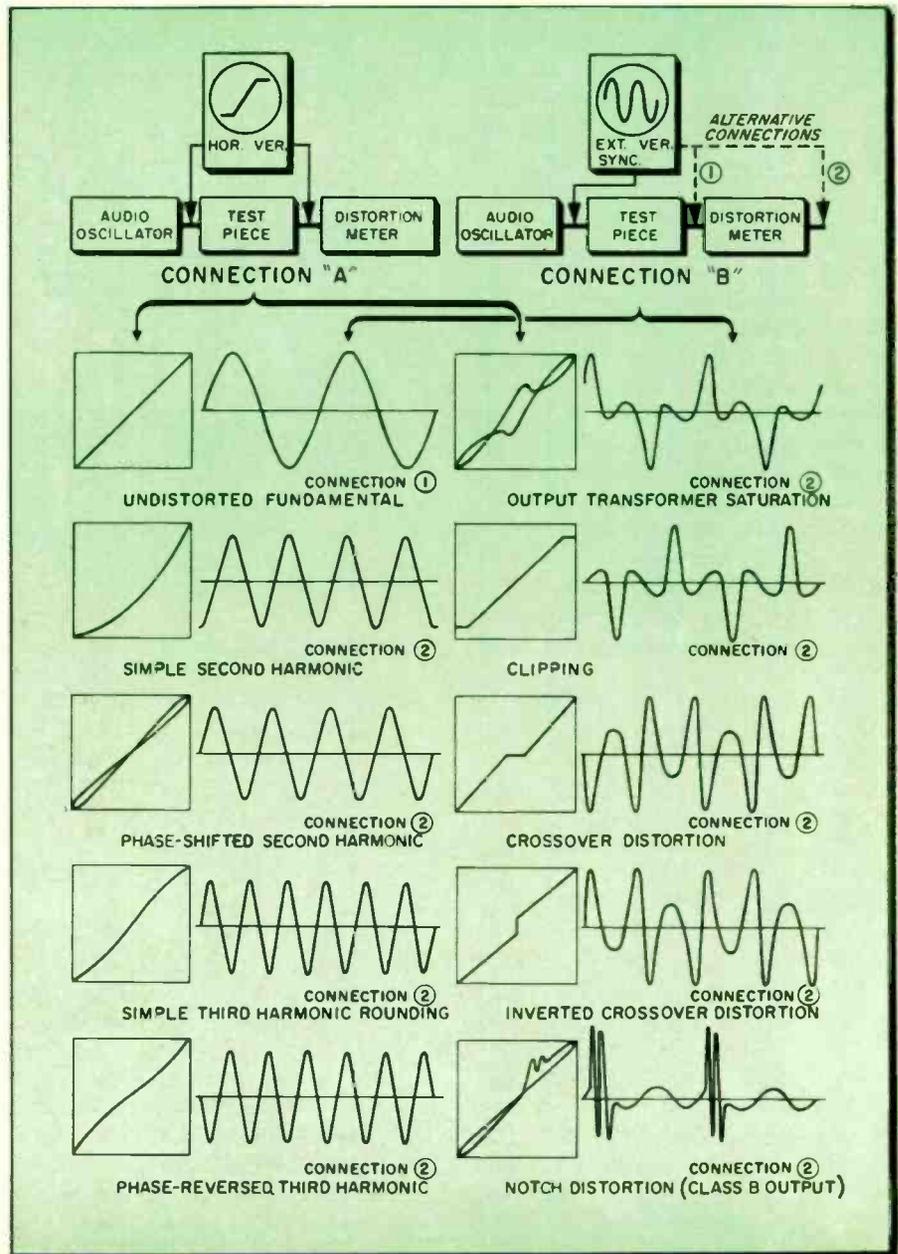
If it is unfamiliar, take time out to check how it works before using it to test your amplifier.

Be certain its built-in audio voltmeter reads correctly and is consistent between ranges by using an external oscillator and, if possible, an external audio voltmeter as a check. This will also make sure you know how the function switch works—or help you find out!

Next, check its reading either on an external audio oscillator, or on its own built-in ones, according to type. Look at the waveform on the scope and measure it with the meter, to see that it is low enough to use for measuring your amplifier.

With an harmonic-type meter,

Fig. 4—Using an audio oscillator, scope and harmonic analyzer, the technician can identify the type of distortion causing imperfect reproduction. Alternate test connections ("A" or "B") may be used as illustrated. Commencing with an undistorted fundamental, exaggerated distortion displays are shown with both methods.



check it at several frequencies, to see that you can tune right through null in the "read harmonic" position, both ways (there is a "frequency" and a "balance" control, each of which should show a margin on both sides of null) to be sure it is null.

In the case of an IM meter with built-in oscillators, the waveform is not quite so critical as harmonic measurement instruments, but it should be reasonably sinusoidal. Therefore, look at both of them with the scope. After following the maker's recommended calibration procedure, check IM reading on its own combined output, without going through an amplifier. The reading should be as low as the indicator will go on its lowest scale.

Doing all this will both check the instrument and make sure you know how to connect it and use it. Now you can "connect-up" with confidence that the meter works. However, this is not a guarantee against the readings going haywire when you finally do hook-up for measurements.

### Measurements

Here again your measurement may be hum or oscillation due to the causes already mentioned in connection with frequency response, but in a lesser degree. Again, the only way to be sure of the reading is to look at it. Place the scope probe on the amplifier output and see whether hum or spurious oscillation starts up when any particular connection is made.

This can be a more difficult bug to eliminate than when it occurs during a frequency response run, because a transformer cannot be used this time. The best approach is to use external attenuation in place of the built-in attenuation, and keep it physically close to the amplifier. Use of an external dummy load, with attenuation of the voltage across it before connecting to the distortion meter, may help further. See Fig. 3.

Having ascertained that the measurement is valid, the next thing is to interpret the results. If we have plenty of distortion, what is it? The patterns of Fig. 4 will aid in recognition of various common forms. In addition to describing the variety or cause, this shows the kind of display (deliberately exaggerated) that will be obtained with a sine wave input connected to the vertical input, together with displays obtained with the scope connected to the appro-

priate terminals (marked "output" or "scope") of the distortion meter.

A question often asked about distortion measurements concerns inconsistencies between results obtained with different meters—the harmonic type and different IM combinations. The answer to this is an interpretive one, as well as giving a reason for the inconsistencies.

The simplest form of distortion is the addition of pure second harmonic; next to this comes the addition of pure third.

Intermodulation distortion, the reproduction of difference frequencies, is considered a prime indicator of discernible distortions in hi-fi equipment. While some harmonic distortions may even appeal to listeners

the third system, only the even order distortion effects can be detected through an asymmetrical waveform. The waveform could have a different amplitude, though being symmetrical, and yet have third order distortion.

Comparing the results of the three different IM methods necessitates maintaining the same swing or peak-to-peak voltage. But how do you know, by measurement, that the swing is the same? Measured values in textbooks are usually based on an assumed rms meter. However, most meters do not measure rms, but an average value, calibrated in rms when the waveform is a sine wave. Therefore, the best way to check for the same peak-to-peak reading is to make a direct comparison of the actual waveforms on a scope. See Fig. 6.

This is how involved it can get with the simpler (and less common) forms of distortion. To look at practical distortions, higher order forms may tend to give larger IM indications, if the amplitude ratio is at least 4:1. But even then, some forms of distortion can be almost "overlooked" by the IM test. Crossover distortion, for example, for a wide range of distortion levels will produce about the same reading for 1:1 or 4:1 test standards, neither of which is indicative of apparent or audible effect.

Some of the much higher order distortions, due to frequency multiplying effects of feedback, can show much lower readings on IM than harmonic, because the test method does not "find" the IM products (they are outside the detection range of the instrument.)

Clipping is minimized by both harmonic and IM meters. Distortion that sounds quite large and looks like about 5% on the scope, may measure only a fractional harmonic percentage, and can measure differently with various tests.

But this is not all. The differences not only depend on the shape the distortion takes, but on the measurement frequencies. Many forms of distortion that occur in an amplifier are different for different frequencies.

Some distortions dominate at low frequencies due to the output transformer loading the output tubes, inductive effects, or just out-of-phase effects in the feedback. The best probability of getting consistent results is between harmonic measurement and an IM measurement using

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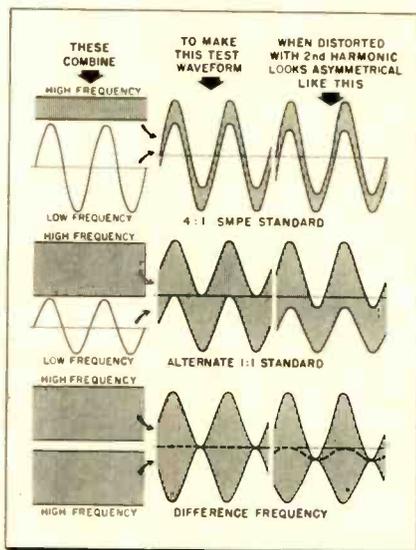


Fig. 5—Three different methods of measuring IM distortion are illustrated here.

and reach substantial percentages before it is annoying, a smaller percentage of IM disturbs the listener.

The measurements are made by using two different signals; one low frequency and one high frequency. Low frequency is usually 60 or 70 cps, while high frequency is usually around 2000 cps; sometimes as high as 7000 cps.

The low frequency signal usually has an amplitude four times the high frequency signal and is referred to as a 4:1 ratio. Another standard uses a 1:1 ratio; that is, high and low frequency amplitudes are equal. These systems have the disadvantage of poor detection of high order distortion. A third standard uses two high frequencies of equal amplitude; for example, 4000 cps and 4100 cps. All three systems are illustrated in Fig. 5. With



# "Tough Dog"

# Corner



## Difficult Service Jobs Described by Readers

### Inoperative New Tube

When I arrived at the customer's home and switched on an RCA model 21T324, chassis KCS82, it had raster, some sound, but no video. In about 3 minutes the sound went off. The problem seemed to have a simple solution. I opened the set and replaced the 6CL6 video output tube with a new tube. No change. I then checked the i-f and tuner tubes to no avail. When I turned up the agc control the sound would come back, but the video wouldn't. After checking the agc tubes I brought the set to the shop. Turning the set on and apply-

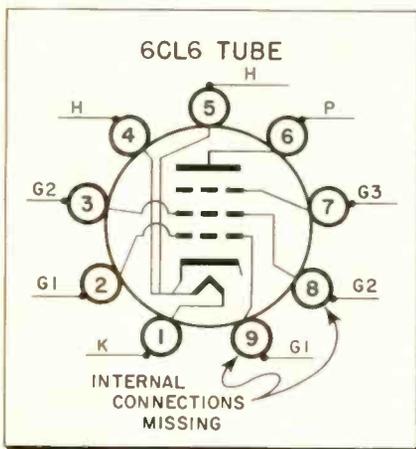


Fig. 1—Failure to internally connect pins 2-9, 3-8, at time of tube manufacture, caused confusing symptoms and loss of time.

ing a scope probe, I found a very good waveform through the i-f's and on the grid of the 6CL6—but nothing on the plate. Replacing the 6CL6 again, this time using a different manufacturer's tube, the set came on and our troubles were over!

Checking the base diagram of the 6CL6 in the tube manual I observed that the control grid is connected to pin 2 and 9 and the screen to pins 3 and 8. In the set the connections used were pin 8 for the screen and pin 9

for the control grid. With a VOM we found that there was no continuity between pins 3 and 8 or 2 and 9 inside the first tube, as shown in Fig. 1. Evidently when the tube was manufactured it was not connected internally. Therefore, if the socket had been wired differently, i.e., pin 3 for the screen, instead of pin 8 and pin 2 for the control grid, instead of pin 9, the first new tube would have worked. In order to prevent this from happening again, we connected pins 3 and 8 and pins 2 and 9 externally on the tube socket. The tube is still in the set and works fine.—*Matthew J. Downs, Pueblo, Colorado.*

### Retrace Hum Bar

A call was made on a Dumont RA-164. Replacing two tubes, restoring the raster, I noticed the picture tube was very weak having, at best, a dull gray picture. The customer was hesitant about investing a large sum of money in the set. After assurances that a new CRT would put the set in top condition, she finally agreed and I returned the following day with a new 21FP4.

Once the new CRT was installed something new turned up that couldn't be seen in the old washed out picture. At full contrast and normal brightness the picture was good and the customer was pleased. As the contrast was gradually reduced a dark hum bar appeared. When I removed the video output tube the hum bar was still present.

After an hour's worth of sweating, all the while noticing a look of increasing worry and regret on the customer's face, I was confronted with a ticklish situation. To leave the set in this condition was impossible; to obtain more money for the shop work it needed was going to be difficult; yet—all my work was already in. So, after a good deal more cajoling and assuring, I finally got the

ok to remove the set to my shop.

On the bench I put the scope to work, but it didn't tell me a thing. I could find no trace of hum on the

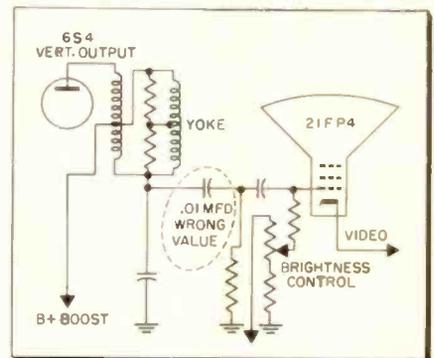


Fig. 2—Incorrect vertical blanking capacitor causes a hum bar in the picture.

scope. Realizing that the picture tube beam could be modulated by an element other than the controlling element (which in this case was the cathode) I checked the wave shapes at the grids with still no sign of hum.

Referring to the schematic, shown in Fig. 2, I discovered that the circuit specified a .01 mfd retrace coupling condenser, whereas the one in the set was .1 mfd. After replacing the condenser with one of correct capacity the trouble was cleared up.

Sometime later, after the set had been returned to a satisfied customer, I learned that a neighbor of the customer, who claimed to "successfully repair" his own set a few times, had tried his hand at this one.—*Frank A. Salerno, Long Island City, N. Y.*

• Many technicians carry a test CRT in their truck to provide a rough check of the results obtained with a new CRT. This often prevents an embarrassing situation if an additional defect is present. A number of service technicians hesitate to replace CRT's in the home just for this reason.—*Ed.*

# Mobile Radio Universal Test Box

## Adapter Eliminates Difficult Job Of Disconnecting Mobile Cables

LARRY CRITCHLOW

• Servicing mobile radios in the field has always had special problems associated with it, due to the location of the installed equipment. Many of these units are mounted in inaccessible places, such as the spare parts compartment of a fire engine, or slung overhead in the cab of a dump truck. The very best a technician can expect to find is the radio installed in the trunk of a taxi or police car. For this reason, the most convenient method of making extensive repairs is to remove it to a better location, where the necessary work can be

done in less cramped quarters.

A typical installation will have the following parts mounted separately in the vehicle: antenna, control box with microphone, loudspeaker, fuse block, and the main transmitter-receiver chassis. These components are interconnected with as many as seven cables. The unit usually requiring attention is the transmitter-receiver chassis. However, this unit can not be operated unless it is connected to all other units.

A master control box with universal cabling, as shown in Fig. 1, enables the technician to make needed repairs and adjustments on the bench without removing the ex-

isting control box. It relieves the technician of the painstaking task of removing the usual intricately routed connector cables.

### Construction

Standard parts have been used in the master control box circuit illustrated in Fig. 2. Only a few cable connectors need be obtained directly from the manufacturer to match its mobile equipment. Tables 1 and 2 list the major parts used in assembling the unit.

The parts noted are not necessarily the only ones which may be employed; rather, they were used by the author in construction of the master control box.

The unit is housed in a 9" x 5" x 6" steel cabinet (ICA #3801) and all parts are mounted on the front panel except the battery terminals. The "hot" terminal is insulated from the cabinet by a two inch square of bakelite. Parts layout is not critical, but in view of the high current that is drawn, some thought should be given to the length and gauge of the wiring to the power jack. Number 12 gauge wire is suggested for leads carrying power to the filaments and power supply. Due to the large amperage being handled by the control box, particular care must be given to soldering, especially to the cables and cable sockets. Cold solder joints could result in erroneous servicing symptoms and even destruction of the wiring and components in the control box from excessive heat.

Adapter cables, about 3 ft. long, must be made up for each type of chassis to be serviced. Fig. 3 and 4 show typical adapter cable wiring diagrams, while table 2 lists the major parts. Additional cables can be made by consulting the manufacturer's service manual. In the case of the Link receiver model 1905, a resistor is added in the cable since this

**Table 1**  
**Control Box Parts List**

J1	Power jack, standard 4 pin tube socket	Amphenol # 77MIP4
J2	Control pack, octal tube socket	Amphenol # 77MIP8
J3	Microphone jack	Amphenol # PC4F
S1	Squelch switch, S.P.S.T. toggle	Arrow H&H # 20994-LH
S2	Transmitter key, D.P.S.T. toggle	Arrow H&H # 20902-CX
R1	Squelch control, 20,000 ohm pot.	IRC # PQ11-119
R2	Volume control, 25 ohm pot.	IRC # 4WS-25
Speaker	4 inch with 3.2 ohm voice coil.	

**Table 2**  
**Adapter Cable Parts List**

Mobile Radio	Control plug	Power plug
Dumont MCA-101 series MCA-301 series	Dumont part No. 09000320	Dumont part No. 09000820
Link 1905 receiver	Amphenol part No. AN-3106A-18-85	not used
Motorola FMTR-41V FMTR-22V T41G series	Motorola part No. 28C802820	not used
Motorola FMTRU-80D series FMTRU-140D series T51G series	Motorola part No. 9A890787	Motorola part No. 28A890788
Motorola FMTRU-5V	Amphenol AN connector with insert # 28-2	not used

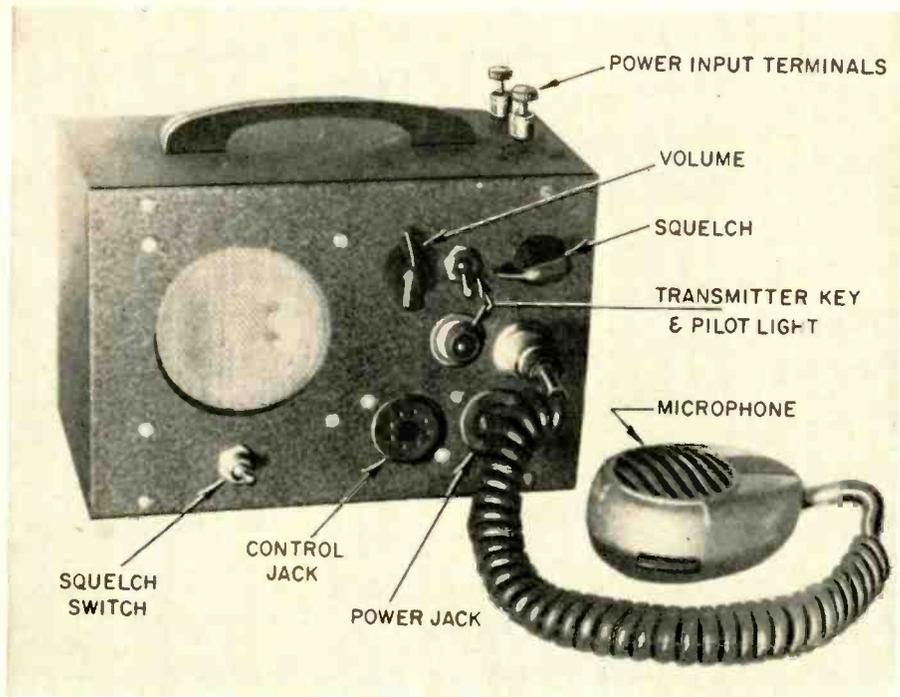


Fig. 1—The compact universal mobile radio control box illustrated above relieves the technician from the troublesome job of removing control units and their connector cables.

unit's control box uses a high impedance volume control.

### Operation

Connect a 6 or 12 volt d-c source, depending on the equipment being tested, to the master control box. Attach the proper adapter cables to the unit under test. A switch is provided to key the transmitter and a standard microphone jack is also included, if modulation is desired. If a "push to talk" mike is used it will key the transmitter directly. Volume and

squelch controls are also provided for operation of the receiver. In addition, a switch in the squelch circuit permits adjustment of older receivers having preset squelch. Before using the master control box for test purposes, a transmitter-receiver chassis, known to be good, should be checked. Consideration should be given to a possible loss of power due to different voltage drops between the master unit and the replaced unit. A mental note of the power loss with a good unit will avoid erroneous diagnosis when testing a defective one. •

Fig. 2—The schematic of an easily constructed universal control adapter is shown below.

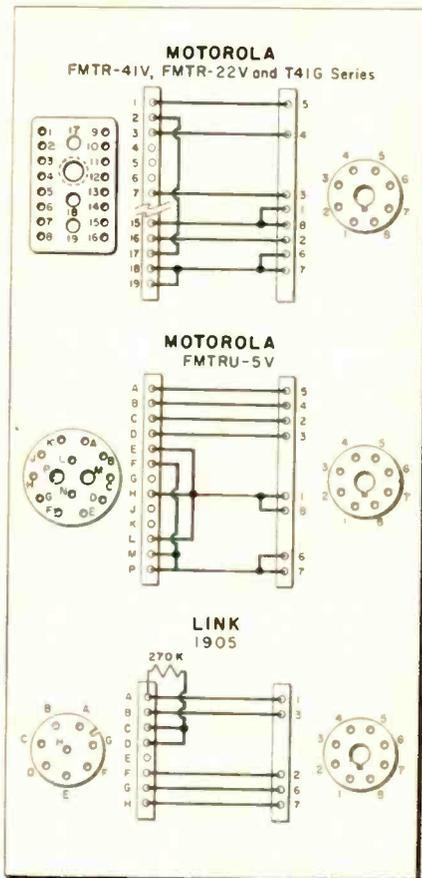
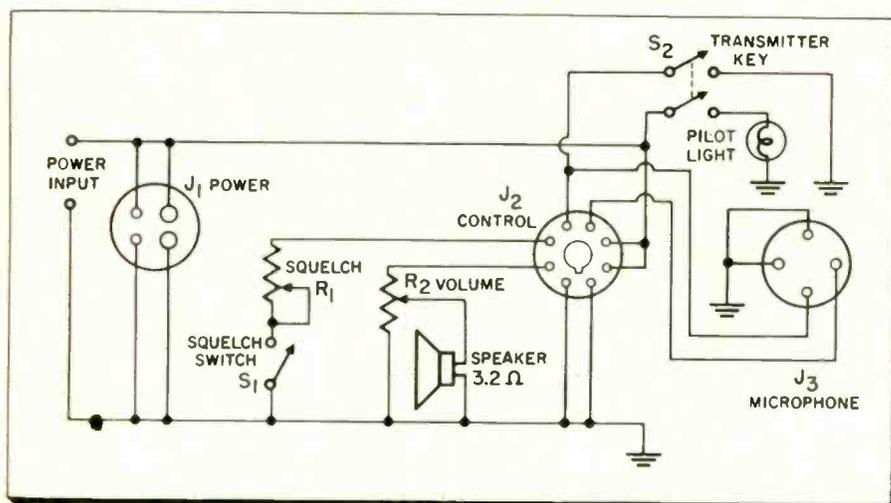
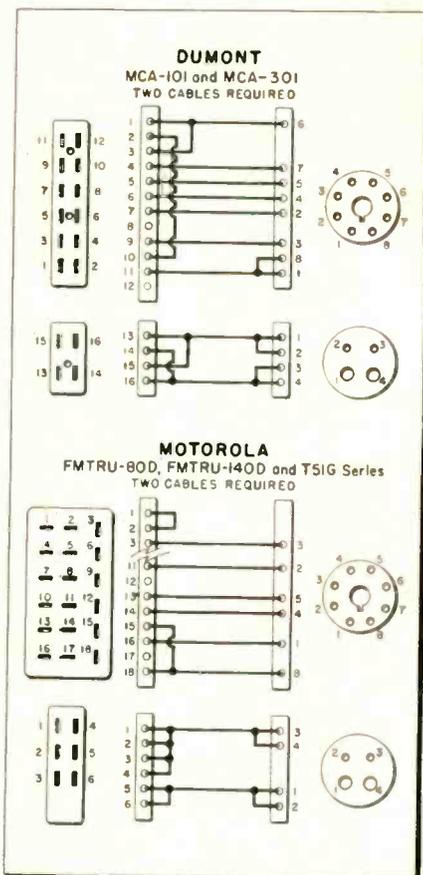


Fig. 3—Adapter wiring diagrams simplify the construction of some popular cables.

Fig. 4—In addition to the cables listed below, manufacturer's service manuals will prove helpful in assembling other cables.



# Transistor Test Circuits

## Diverse Transistor-Checkers

### Compel Technicians To Evaluate Their Needs

R. H. BOWDEN, PRES., SENCORE

• Transistors, no longer unfamiliar objects to the technician, virtually demand inclusion of a transistor-checker in the normal shop's instrument group. The technician considering the purchase of any instrument must base his selection on many factors. Price, of course, is a natural consideration, but going beyond this, practicality is of prime importance. Being practical, the service technician usually does not need a laboratory instrument for radio-TV work. Instead, he must use an instrument that is simple to operate, yet accurate enough for his individual needs.

In order to decide intelligently whether a transistor-checker is accurate enough for an intended application, it is necessary to understand basic transistor characteristics and the circuit design behind the face-plate of the instrument.

Three simple questions are involved when considering the practical aspects of a particular tester: Does it detect faulty transistors? How many types can be tested? Is the test set-up simple?

The technician may chuckle a bit, since *all* transistor testers must obviously include these considerations. They don't. Some testers indicate only a rough quality check for limited transistor types with a fast test set-up, while others are elaborate to the point where lab specs are approached.

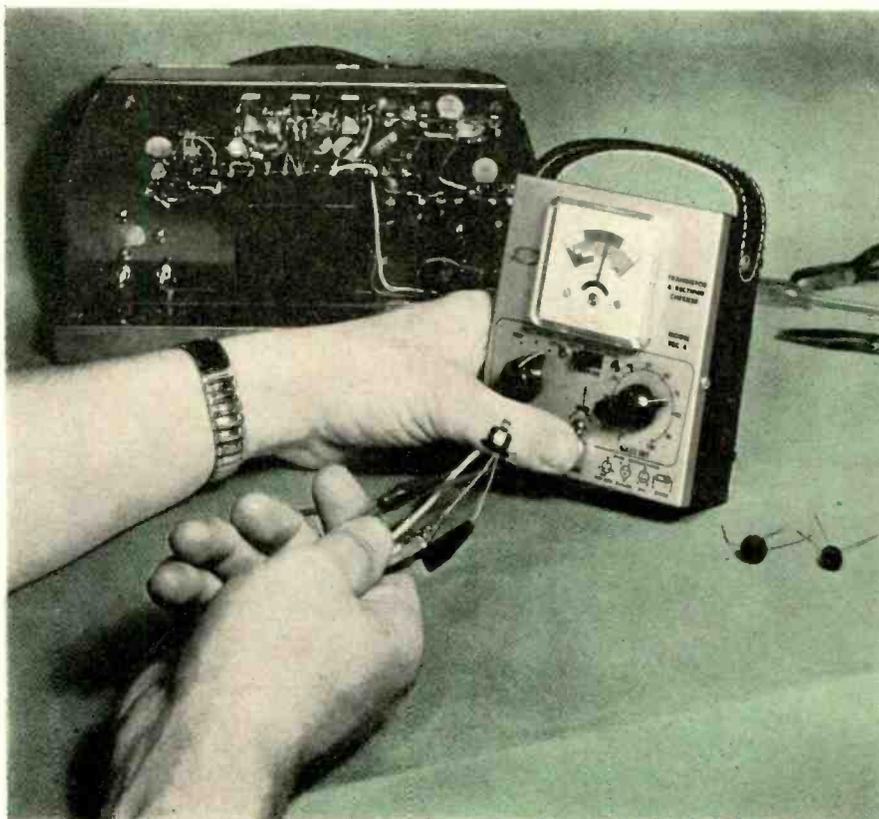
As an example, a particular tester may indicate a faulty transistor only under extreme failure conditions, such as near maximum open or short. Others test transistors as diodes only. But what about triode operation?

The aforementioned types, though, can't be discounted, just as the tube filament checker cannot be ignored for the specific job it serves. If the technician wishes an instrument that is extremely lightweight, simple to operate and provides only a rough indication of the transistor's quality, then this type checker may be adequate. However, its application and limits should be thoroughly understood by the user. Don't confuse, to draw an analogy, between a tube filament checker, emission tester and a mutual conductance tube tester. Most are quite effective within the scope of their intended operation.

#### Circuitry

Various circuit designs have been incorporated into transistor test instruments. One method, shown in Fig. 1, used in a commercial transistor-checker, consists of an oscillator circuit with a detected and metered output. The questionable transistor is inserted to complete the oscillator circuit. Simple and reliable. Furthermore, a reading can be given for each transistor tested for comparison purposes. However, it does not test power transistors.

Fig. 2 indicates another test circuit that balances input signal



If the service technician doesn't already own a transistor-checker, he will surely consider one at some future date. The prospective buyer should carefully consider how the instrument will be used; that is, in-the-home, at the bench or over-the-counter. In order to evaluate his particular requirements, it is necessary for the technician to understand the extent of an instrument's checking capability. Therefore, a knowledge of transistor parameters and test-circuit operation is important.

against output signal using an impedance ratio. The advantage of this circuit is that a set-up chart is not required. This advantage is partially negated by the need to refer to a handbook to determine current gain and other parameters. However, the user is not dependent on the instrument manufacturer for new transistor settings of the tester. This type circuit makes no claim to checking high power transistors.

A third circuit, illustrated in Fig. 3, typifies a rather more complete transistor test instrument. This design includes facilities for testing low and high power transistors. Reviewing its circuit description will provide the service technician with a better understanding of test equipment designed to check transistors.

Fig. 1—Transistors may be checked by this self-contained oscillator circuit.

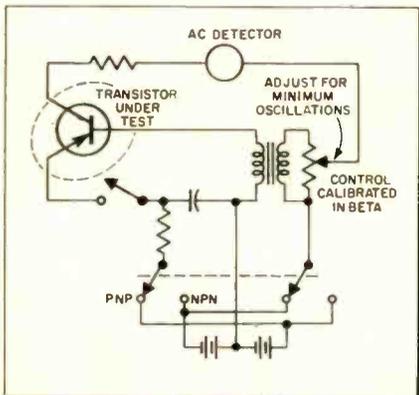


Fig. 2—The checker shown tests transistors by balancing the input and output signals.

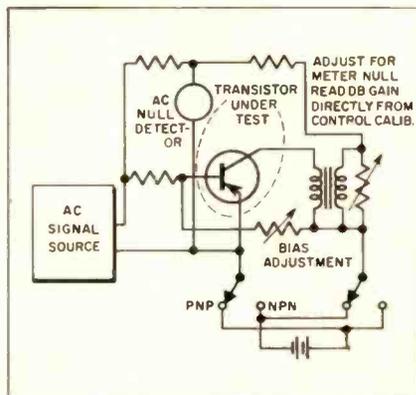


Fig. 4—Simplified transistor leakage test.

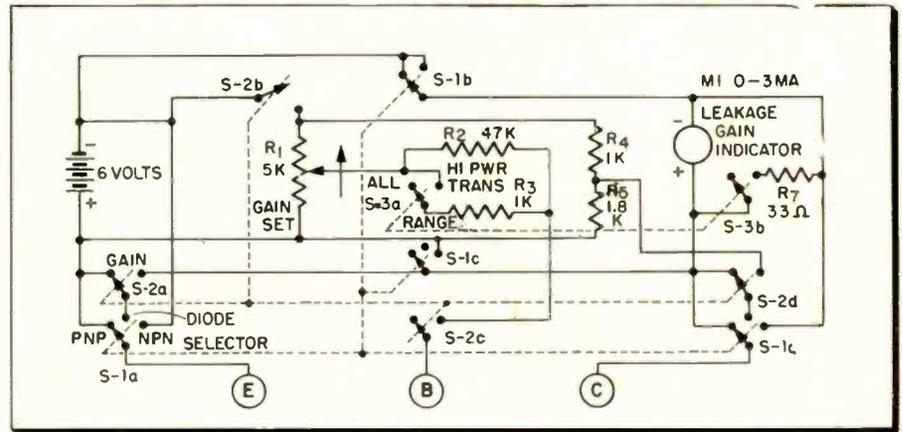
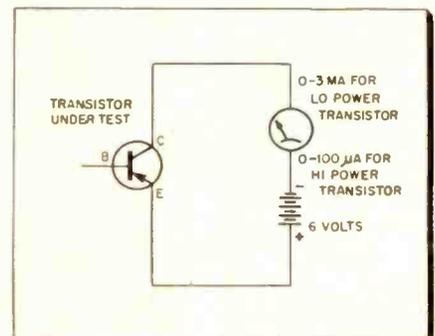


Fig. 3—The transistor tester circuit illustrated uses a 0 to 3 ma meter movement to give visual indication of the questionable transistor's quality. It checks gain and leakage.

### Operation

Test settings for individual transistors or diodes are made through one control (gain) and three switches (selector, range and gain test switch). An indicating scale using a 0 to 3 ma meter movement provides gain and leakage readings. A transistor socket is provided for insertion of transistor leads and, in addition, three test leads provide versatility for "soldered-in" transistors.

The checker in Fig. 3 tests two important characteristics for general transistor quality; leakage and gain, for both high and low power transistors. The beta transistor parameter, that is, the ratio of change in base to collector current in a grounded emitter circuit, is used to check transistor gain. Leakage current is measured by the current flow between collector and emitter—with the base open. See Fig. 4.

### Leakage

When the transistor is connected

with reverse voltage applied between collector and emitter and the base open-circuited, as shown in Fig. 4, different currents will flow, depending on the transistor's collector cut-off current ( $I_{co}$ ) and current gain (beta). Since many transistor's have different characteristics, a number of test ranges must be constructed to accommodate the varied leakage configurations. Four leakage ranges are used in this particular tester for checking low-power transistors; 0 to 100  $\mu$ a, 100 to 200  $\mu$ a, 200 to 600  $\mu$ a and 600 to 1200  $\mu$ a. High power transistors are tested on an additional four ranges; 0 to 3.3 ma, 3.3 to 6.6 ma, 6.6 to 20 ma and 20 to 40 ma. The same scales are used for both meter ranges.

Maximum permissible transistor leakage is not referred to in transistor manufacturers' data. It is approximately the product of the collector cut-off current ( $I_{co}$ ) and the current gain (beta), though some transistors, having a greater allowable leakage tolerance, must be multiplied by an additional factor.

(Continued on page 88)

# Should TV Servicing

*Two leading advocates of pro and con views explain*

FRANK J. MOCH  
EXECUTIVE DIRECTOR  
NATIONAL ALLIANCE OF TV & ELECTRONIC  
SERVICE ASSOCIATIONS  
CHICAGO, ILL.

• Yes, I am a strong advocate of licensing of TV-radio service businesses and technicians, for many good reasons. To lay a groundwork for the case for licensing, let me say that I personally have been in the home electronics service business since 1921 and though today I personally devote my time to the management end of my service business and to association activity, I am fully qualified to service any home electronics device.

I, too, am a rugged individualist who doesn't like anyone to tell me how to run my business, but I do recognize the fact that when I offer my services to the public, it has an inalienable right to be assured that I do possess certain minimum abilities, facilities and equipment necessary to do an acceptable job. The public has a right to assurance that during my service activity and as a result of it, they and their property are not exposed to unnecessary dangers. They have a right to obtain from their investment in the set the greatest possible performance. Last, in buying service and the parts associated with it, in view of the very intangible nature of TV and other home electronic service, they have the right to expect that parts charged for are new and the best obtainable and that the parts are actually installed, and that a sincere effort be made to service the set in the home if possible. These rights cannot be denied the customer, and violations of them are the basis of the nasty articles that have appeared in many consumer publications, indiscriminately condemning the good operators with the bad.

At the same time, service business owners have definite rights. When a man invests in a business, whether it is a one man operation or a big enterprise, and establishes the necessary abilities, facilities and equipment, and maintains the businesslike rates necessary to warrant these business requisites, he has the right to know that

# YES!

he need not face unfair competition from various incompetents and unequipped dabblers who operate after they finish their regular job assignments.

This unfair competition is of several types. One is the result of no investment and thus no need to charge for normal business expenses. Another is the fact that being a spare time operation, supplementing a regular income from another job, their rates are impossible to match by professional service people. The service business operators have the right of freedom of stigma for the sins of the incompetents and racketeers, but unfortunately, the public press at present makes no real distinction. The business operator has the right to charge adequate and fair rates which will permit him to hire and hold employees in competition with other electronic industry employers, but this is not possible as long as he has to compete with non-professional part-timers and bait advertisers.

The employed technician, whether employed by others or himself, has the right to earn a wage commensu-

rate to his training and comparable to other professions and trades. He has a right to job security, decent hours, overtime pay, vacations, pensions and all of the other fringe benefits he can get at any other job. He has a right to expect respect.

The set producers and sellers and the telecasters have the right to expect that sets are so installed and serviced as to assure the greatest satisfaction and the greatest viewing and listening audience. This works to the advantage of the servicer as well, since greater usage means greater incidence of service.

It doesn't take much study to prove conclusively that all of these desirable conditions are far from being achieved under present unrestricted practices. Ethical people through ethical associations have adopted voluntary restraints and codes of ethics at serious cost to themselves. These are ignored by the opportunists, putting the professional service people at greater disadvantage. Today the part-timers exceed the professionals by as much as 20 to 1 and the nasty articles appear at increased pace. Better Business Bureaus report increased complaints. Because of customer doubts, more and more sets are lying around in need of service. Drug store tube testers are getting an increased play. Professional servicers are leaving home service for more lucrative fields. Captive and factory service are growing. The industry as a whole is sick. Electronic manufacturers are losing an increasingly large volume of components which are being "liberated" by their employees who do part-time service work.

The opponents of license have never come up with any alternative solution though they readily admit serious problems exist. They say that licens-

*(Continued on page 66)*

# be Licensed?—A Forum

*their attitude on government regulation of service dealers.*

HOWARD WOLFSON  
CHAIRMAN  
ASSOCIATED RADIO & TELEVISION  
SERVICEMEN  
CHICAGO, ILL.

• On any subject in which there are opposite views, it is my belief that the approach should be made in an objective and constructively critical manner; it is most unfortunate that the controversial issue of servicemen's licensing should create such bitter and acrimonious rifts among servicemen.

Without going into an exhaustive review of all the reasons why I oppose the licensing of servicemen, which position is shared by my member associates, my six years of study of that subject has not caused me to depart from the position that licensing is not needed, workable, or the panacea of servicemen's troubles, as claimed for it by its advocates. That position is further reinforced by long observation of licensing regulations now operating in other fields.

A license law such as the recently defeated measures in Illinois and the City of Chicago, which was modeled along the lines of similar attempts in other states and communities, places in the hands of the political bureaucracy a tool for regimentation, total restriction, and possible ultimate elimination from the business scene for the little businessman. It is small solace, and certainly no guarantee, as voiced by license advocates, that malpractices of the applicable law would never take place. Thirty years of critical observation warns me.

Long experience indicates that every time a regulatory law is passed, ways and means are found to circumvent its fair application, and to water down and vitiate its intent.

Do-gooders, idealists, and luminous eyed liberals always think in terms of theoretical application of prohibitory law; overlooking either deliberately or in their blind ecstatic fervor to right some wrong, that the invariable outcome, almost like a mathematical answer, is that the fix and political clout comes into play

# NO!

for those who know their way around. The only ones who are ever strictured and hurt are the little fellows, who never needed such a law to begin with.

The claims made for licensing that cheating, incompetence, low prices, would be eliminated, and the public weal protected, could never stand the test of time or immediate honest appraisal. No law can set prices, no law can curb covert dishonesty, which would result, and the so-called incompetent can and would bluff his way or buy his way in if it suited his purpose. As for protecting the public, no law can protect a fool from sticking his fingers where he shouldn't.

Claims made that more people are being cheated than ever before are simply not true. There are more sets in operation than ever, and set owners are better informed about TV troubles. Overall claims of cheating the public show a decrease if the records of BBB offices around the country are to be accepted. What is often called a complaint is more often than not a disagreement or mis-

understanding between the set owner and the serviceman as to facts and performance. Many complainants make a charge of dishonesty against the vulnerable serviceman, when more than likely it is the set owner who is being less than honest.

In 1957 a rather revealing experience was gained about TV complaints. In one of the Chicago newspapers a TV set owner wrote a letter to the editor complaining that TV service was a racket and that he had been taken, and all TV servicemen were crooks. The Association of which I am a member offered this aggrieved set owner a full remedy, complete repairs to his set, if his claims were valid. The offer was never accepted. As this newspaper has a circulation in excess of a half million, we held our breath for fear that there might be a deluge of complaints from other TV set owners seeking to take advantage of this single offer.

Much to our surprise over a period of three months, we had about seventeen letters and phone calls. The telephone callers were asked to put their complaints in writing to be considered; few of them did so. The written complaints were carefully gone over and in the final sifting, only one was found to be of real merit. This one case took the time of three men over a period of several weeks, who spent more than fifty hours checking, questioning, and examining all the facts from those involved. The final outcome was a stalemate. It might be fairly said that both sides shared equally in the blame which could be attached.

It should also be noted that if every complaint against a serviceman were to be so carefully handled by a Commission enforcing a license

*(Continued on page 68)*

# Stroboscope Vibration Analyzer

*Development Has Been Found Useful In Determining The Amplitude And Phase Relations of Vibrations Of Any Frequency*

NATIONAL BUREAU OF STANDARDS

*In this instrument, signals from vibration pickups are mixed with a common signal differing slightly from the frequency at which the body is vibrated. The difference signal is then filtered from the combined frequency, and displayed on an oscilloscope. The analyzer can be used to observe vibrations in bodies of any size, and for vibration amplitudes from the submicroscopic to the visible.*

• A time-saving vibration analyzer has been developed by S. Edelman and others of the National Bureau of Standards. This analyzer can be used for determining vibration characteristics of bodies such as aircraft and missile structures and should have industrial applications. The instrument uses the principle of a stroboscope, and enables an operator to quickly explore the vibration patterns in a complex structure. Early in an analysis, therefore, an operator can determine whether his vibration pickups have been located so as to give him the information he needs.

The stroboscope vibration analyzer was developed for use in calibrating vibration pickups, where vibrations other than longitudinal were unwanted. By several small pickups on various parts of the shaker, it was possible to eliminate transverse or flexural vibrations. This work on vibration is part of the Bureau's long-term program aimed at providing additional information on the performance of vibration pick-ups.

A stroboscope is a convenient instrument for determining the reson-

ant frequencies of bodies vibrating at low frequencies. However, when higher frequencies are examined, the duration of the light pulses becomes shorter, putting a limit on the use of a stroboscope for visual inspection for resonant points. There is an additional limit to the usefulness of a stroboscope in that the vibrating body must be observed. For an examination of very small, even microscopic, movements or parts, this examination becomes difficult. When the movement is sub-microscopic, some other method must be used. It is in this area that the vibration analyzer is a useful tool.

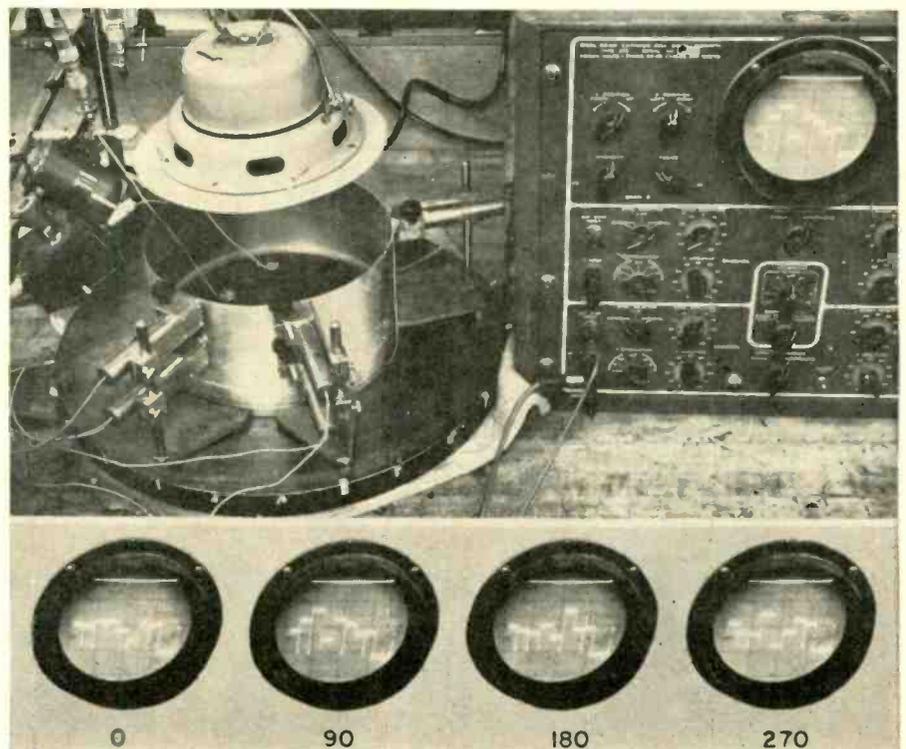
With a stroboscope, the periodic

changes of position of a given body are displayed in apparent slow motion, or are stopped at some desired phase of the vibration cycle. With the stroboscopic vibration analyzer, the same effect is produced by processing signals from transducers or vibration pickups in such a way as to display the pattern of motion on an oscilloscope. Thus the motion of the body itself need not be observed.

In the analyzer, the motions of a body are first converted to electrical impulses by the pickups, and the resulting signals are sent to a mixer which adds a reference signal

*(Continued on page 92)*

Fig. 1—The instrument can be used to determine the amplitude and phase relations of vibrations of any frequency in a complex body. Amplitude and phase changes of vibrations are displayed as traces on the oscilloscope. The bell-shaped object is a loudspeaker, vibrating the cylinder below it. On the displays can be seen horizontal traces showing the relative amplitude of signals from the pickups mounted next to the cylinder wall. For changes in phase of the beat frequency, the patterns vary as shown in the bottom row.



# SHOP HINTS



## Tips for Home and Bench Service

### Determining Open Resistor Values

Occasionally I receive a set in the shop for which I have no schematic. This doesn't pose a great problem as far as locating the trouble, but a problem does arise when the defective part is not marked with its value. I have found this especially true of wirewound resistors which are seldom marked, or have had their markings burned away by the high temperatures at which these units operate.

To determine the original value of an open wirewound resistor, I

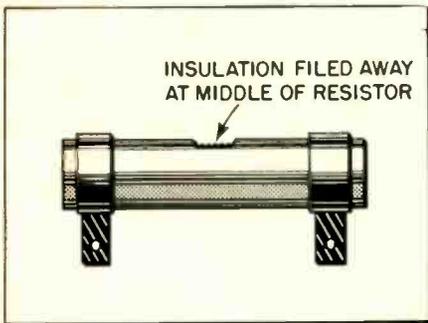


Fig. 1—Exposing center coils of a defective wirewound resistor aids measuring its value.

file away the insulation at the middle of the resistor, as shown in Fig. 1. This exposes a few turns of the winding. Using an ohmmeter I measure the resistance from this midpoint to each end. One of these readings will be infinity, indicating the open half. The reading obtained on the good half when multiplied by two will be approximately equal to the original value of the resistor. A reading will usually be obtained on one half since it is uncommon for more than one turn to open.—*Albert J. Krukowski, West Springfield, Mass.*

### Loose Back Covers

Fiber backs of many radios are secured by tri-mount clips. Repeated removal and reinsertion of these

clips often enlarge the plastic retainer holes, thereby preventing the clips from maintaining the back against the radio.

Invariably, the radio is too old to warrant a new case. To effect a quick and inexpensive repair, I have used the following method successfully: Push an appropriately sized paper clip into all corners and then insert the tri-mount clips. The paper clips enable the tri-mounts to make a positive mechanical hold in the enlarged plastic holes and keep the fiber back firmly in place.—*J. C. Thompson, Valdosta, Ga.*

### Screw Holder

After a few exasperating, not to say painful experiences with a slashed thumb or forefinger, I devised a method for starting wood screws without a starting hole by clamping the screw between the



Fig. 2—Spring-type clothespin saves fingers when starting screws and short nails.

jaws of a spring-type clothespin, as shown in Fig. 2. For a tighter grip, twist a heavy rubber band around

the jaws of the clothespin. When starting screws in soft wood the rubber band is unnecessary. This method is also a finger tip saver if used when driving short nails or brads. They can be started against the wood, in close quarters, above the head without difficulty and with no danger of smashing your finger.—*Glen F. Stillwell, Manhattan Beach, Calif.*

### Component Installation

I've always run into difficulties trying to install some components into their respective holes in a printed circuit board. Attempting to space and thread long flexible leads of tran-

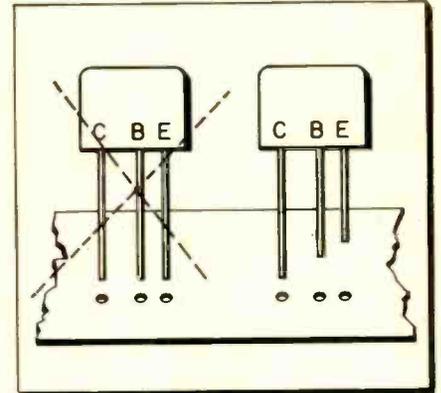


Fig. 3—Ease the job of inserting individual transistor leads into their mountings by cutting the leads to different lengths.

sistors, diodes, etc. was a tedious task until I clipped each lead, as illustrated in Fig. 3, a quarter inch shorter than the previous one. This enabled me to insert the leads one at a time without any difficulty.—*James D. Ducharme, Holyoke, Mass.*

### SHOP HINTS WANTED!

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

# New Tubes & Components

For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 54.

## Pyramid ELECTROLYTIC KIT →

A new radio maintenance assortment kit, No. 515, consists of 15 miniature electrolytic capacitors in the five most popular replacement values used in current models of transistor radios, plus a free plastic container. The electrolytics are rated at 12 volts d-c working and capacitance values are: 6, 12, 25, 50 and 100  $\mu$ f. Suggested technician cost is \$7.50. Pyramid Electric Co. Union City, N. J. (ELECTRONIC TECHNICIAN 10-4)

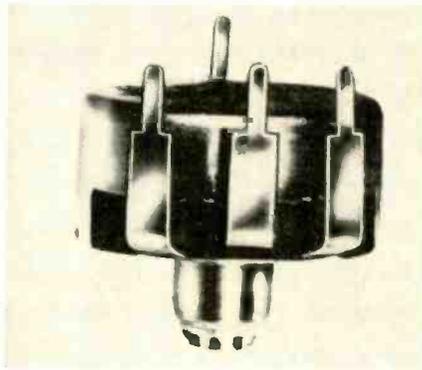


## CBS PULSE TUBE

The 7548, a new secondary emission pulse tube, features ultra-fast rise time, high pulse current and high dissipation. Offering a rise time of less than five millimicro-seconds with a 1 amp pulse, in trigger or free-running pulse generators, the 9 pin miniature combines high transconductance, 25,000 micromhos at 18 ma, and low capacitance. Pulse rates, up to 300 kc, are reported feasible. CBS Electronics, 100 Endicott St., Danvers, Mass. (ELECTRONIC TECHNICIAN 10-6)

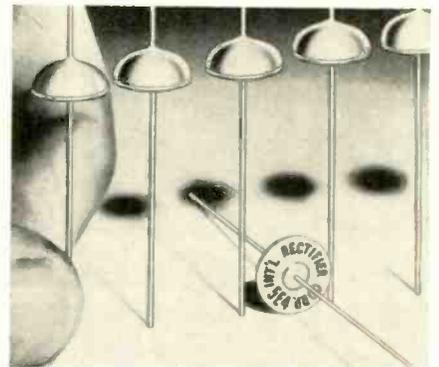
## Clarostat CONTROLS →

Modified terminals adapt standard wire-wound controls to printed-wiring applications for voltage control or other uses requiring up to 2 watts of power. Typical is the modified terminal Series 43, wire wound control  $1\frac{1}{8}$ " diameter, which mounts with terminals ready for dip soldering. The shaft is perpendicular to the mounting position for ready adjustment. Clarostat Mfg. Co., Dover, N. H. (ELECTRONIC TECHNICIAN 10-2)



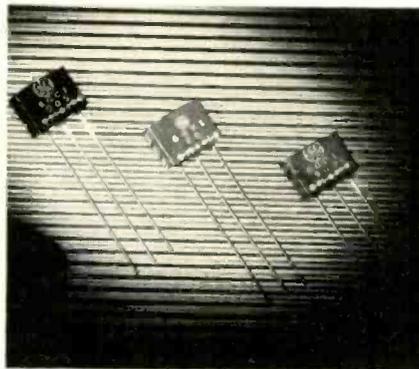
## Int'l Rectifier SILICON DIODES

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## GE DIODE →

This miniature selenium double diode, commonly used as a TV horizontal phase detector universal replacement, is being manufactured in three models: 6GD1, series connected voltage doubler; 6GC1, common cathode center tap and 6GX1, common anode center tap. Forward current rating of 0.5 ma at 2 v d-c. reverse current  $5\mu$ a at  $-20$  v d-c.  $1\frac{1}{8}$ " mounting leads. Price is \$1.40 each. General Electric Co., Semiconductor Products Dept., Liverpool, N. Y. (ELECTRONIC TECHNICIAN 10-3)



PIV. Units are multisealed with layers of insulating resins and sealants, assuring optimum protection against environment. Approximate price range 84¢ to \$1.35. International Rect. Corp., E Grand Ave., El Segundo, Calif. (ELECTRONIC TECHNICIAN 10-5)

## Westinghouse VHF TUBE →

Type 6EV5 tube is a new VHF sharp-cutoff r-f amplifier for TV tuners. High input impedance adapts it to i-f amplifier and other VHF applications. Reported to have lower noise and higher gain than a similarly constructed tube, 6CY5, it functions with high or low B-plus because of low screen voltage requirements for optimum performance. Plate dissipation is 3.25 w. Westinghouse Electric Corp., box 2099, Pittsburgh 30, Pa. (ELECTRONIC TECHNICIAN 10-1)



## Centralab DISC CAPACITORS

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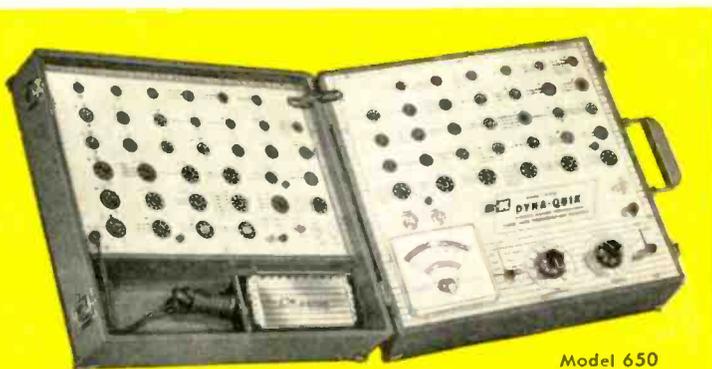
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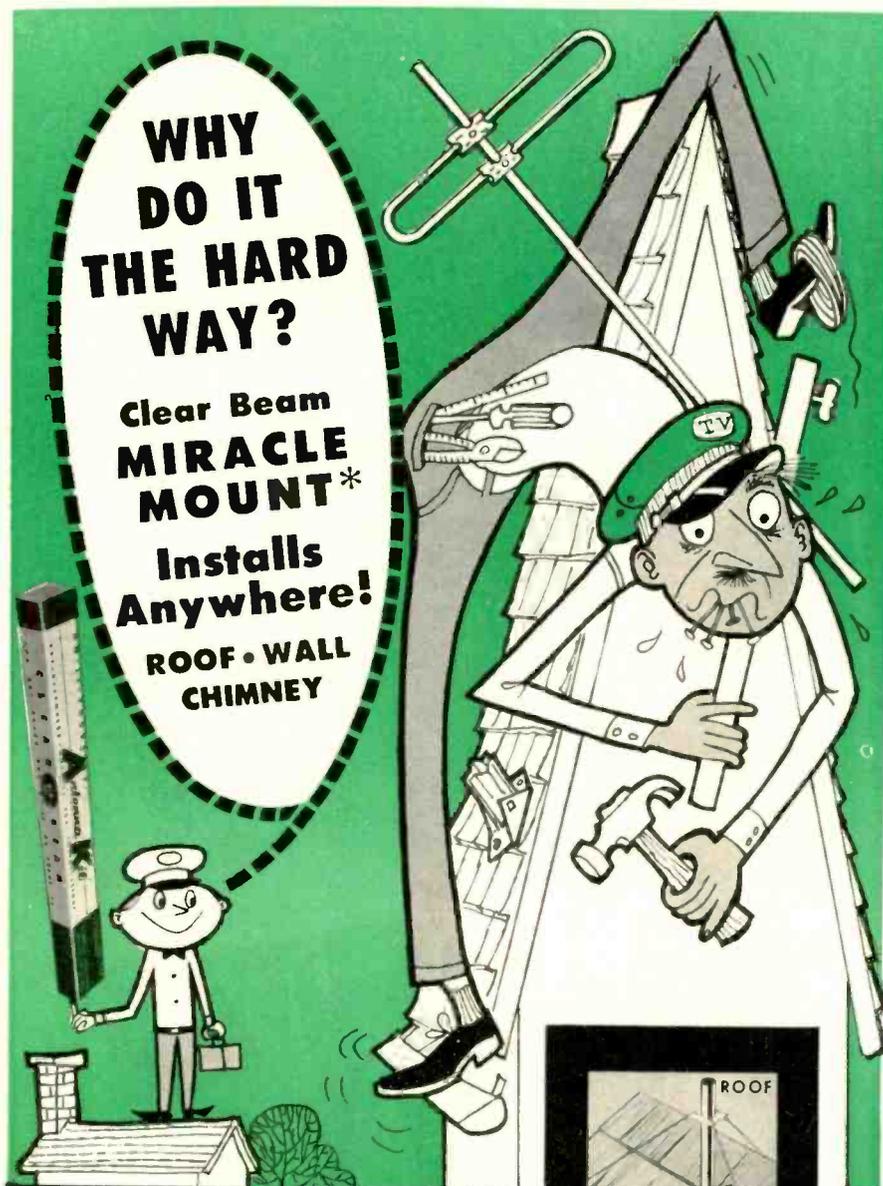
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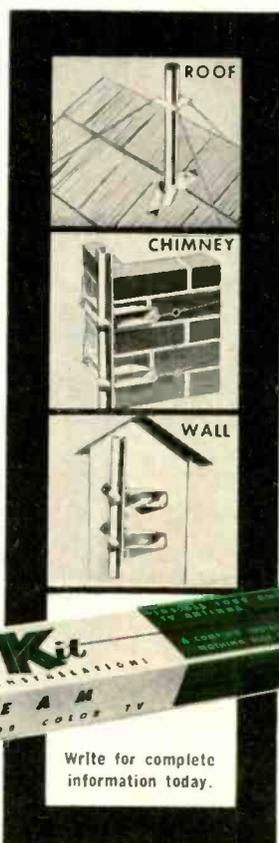
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**Hi-Fi Test Measurements**

(Continued from page 40)

the same low frequency as that used for harmonic measurement, because the IM components are due to distortion of the low frequency wave.

But even then "unexpected" differences may occur. For example, if the low frequency is 40 cycles, the harmonic components will be 80, 120, 200 cycles, with smaller components of higher frequencies; if the higher frequency for the IM test is 2000 cps (the lowest value usually employed), the corresponding components will be 1960 and 2040, 1880 and 2120, 1800 and 2200 cycles.

It often happens that the amplifier has much more feedback to reduce these higher frequency IM components. Thus, the IM reading will be

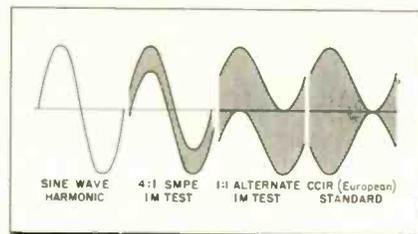


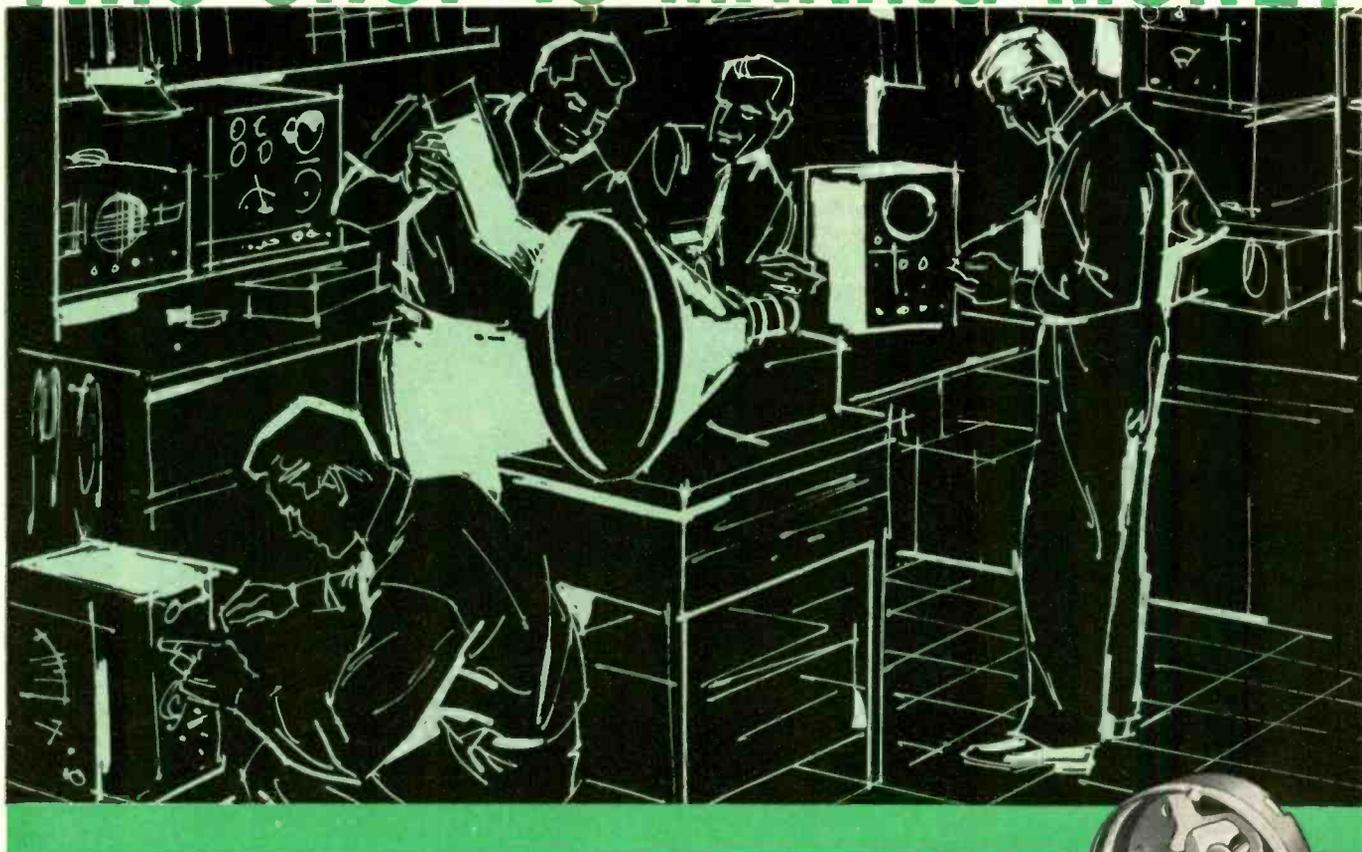
Fig. 6—Method of determining total peak-to-peak reading may be made by direct comparison of actual waveforms on scope.

much better than the harmonic reading on an amplifier with this kind of feedback characteristic. Incidentally, for this case at least, the IM reading is more realistic in representing how the amplifier will sound.

Understanding why all these differences occur, as well as recognizing the significance of the various distortion components, gives a much better idea as to the relationship between the various readings obtained and the expected performance. While, in general, IM measurements are more indicative of how distortion-free the amplifier will sound, all these standard methods still leave something to be desired.

Other forms of distortion can be excited by practical program material that none of these test signals stimulate. One amplifier may perform as well as the test figures imply, while another produces distortions that are not indicated by any of the normal test procedures. Several organizations are presently working on the development of tests that will produce meaningful answers in this direction.

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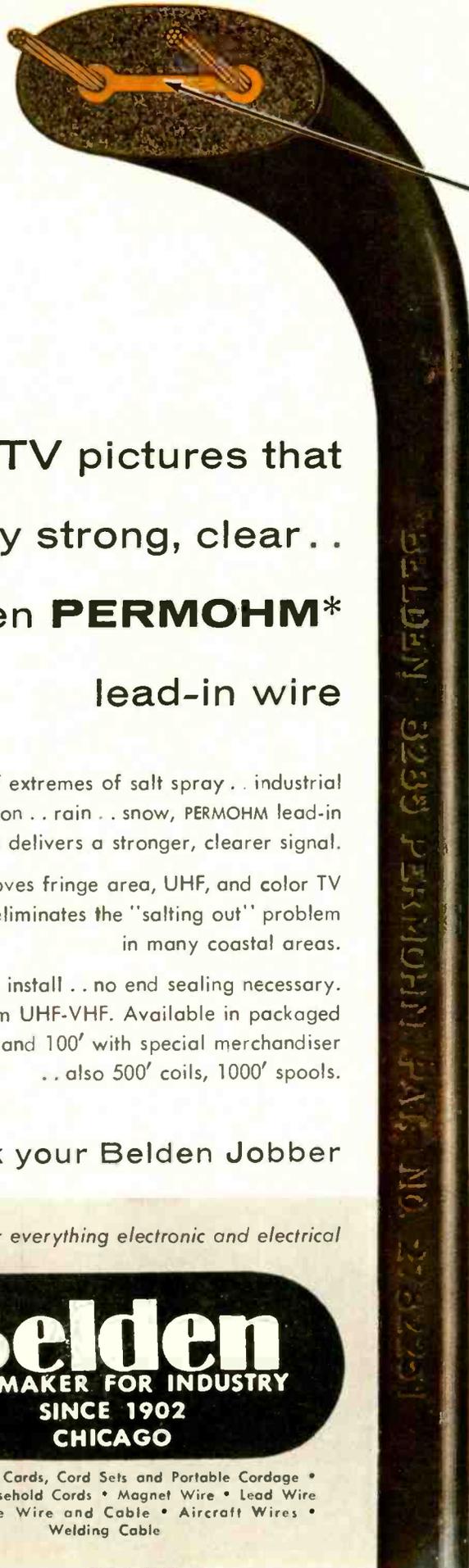


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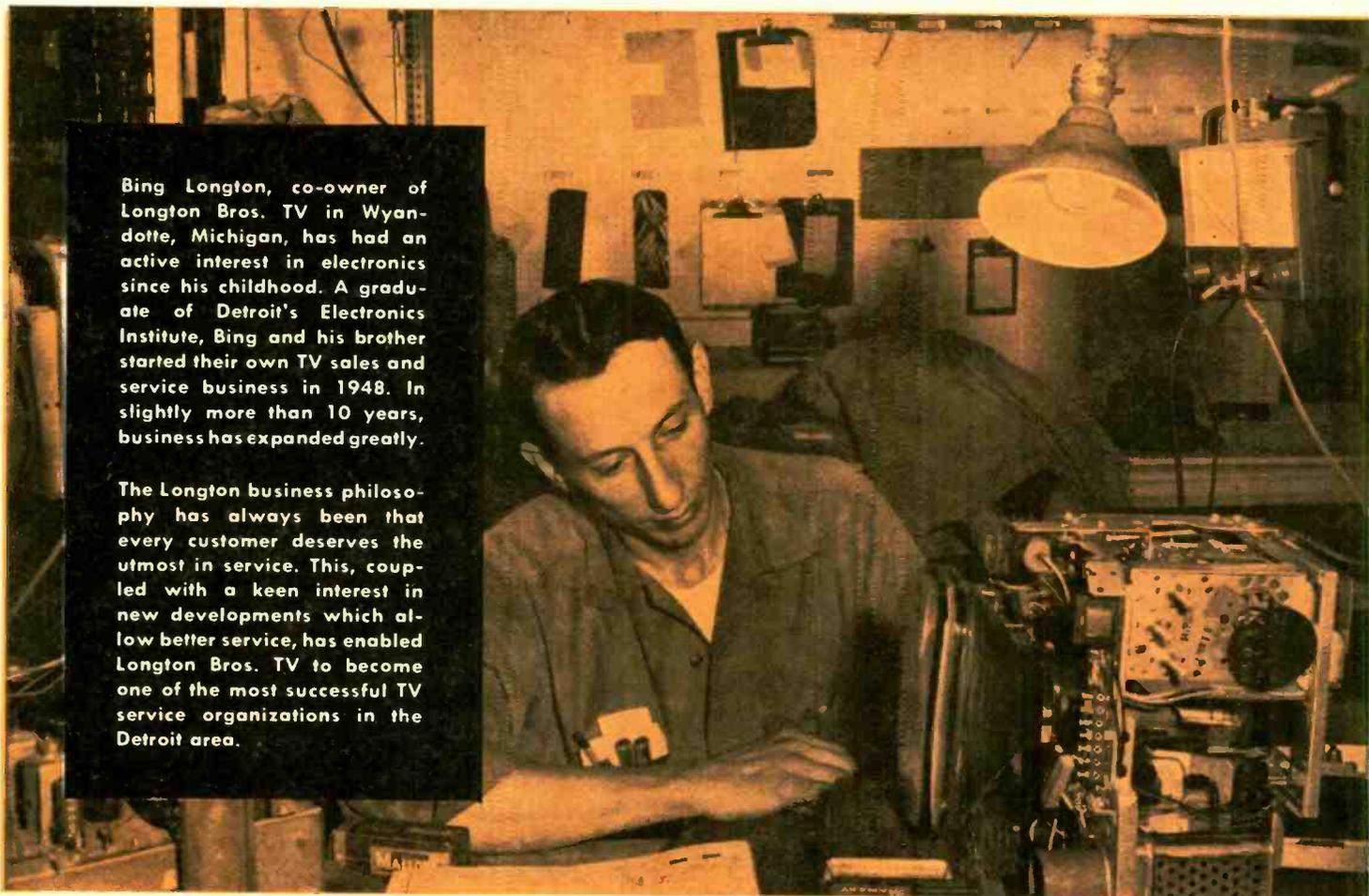
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*TV Technician Bing Longton says . . .*

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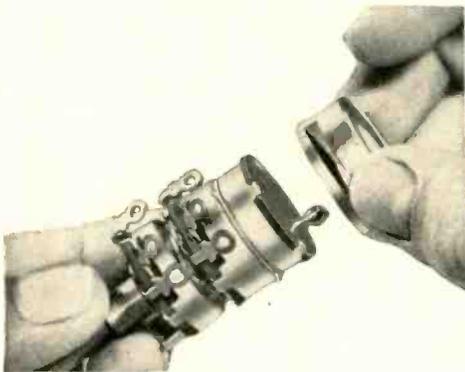
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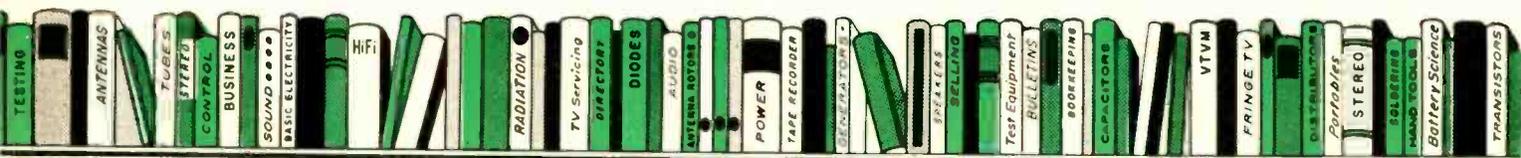


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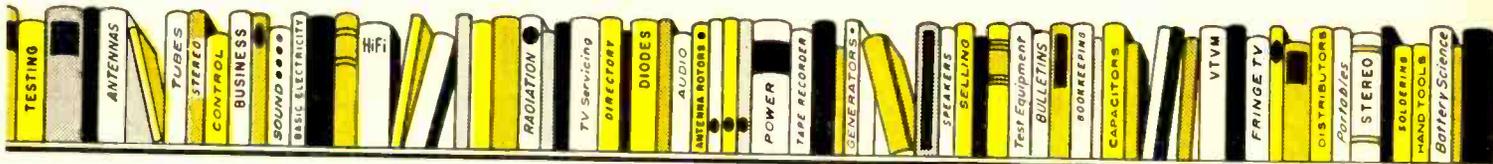
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Also See New Books on Page 86

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## TV Noise Circuits

(Continued from page 37)

If this is the case, the technician shouldn't "sit it out" until a strong electrical disturbance manifests itself. Rather, he should produce his own interference by imposing a strong spark-gap in the vicinity of the tuner or running an electric drill from the same power line as the receiver. Some professional "noise source" devices are available that produce

excess noise with a frequency range of 10 mc to 600 mc. Cost is \$75.00.

### Noise Control

Rotating the noise gate control should change the amplitude of the waveform on the plate, since the tube conduction is either being increased or decreased by the changed bias. Also, the bias voltage on grid 1 should change when the control is rotated.

It is especially important to properly adjust the noise control for

maximum picture stability in fringe areas. The signal is naturally much smaller than in strong signal areas, but the noise pulse is normal size. Therefore, it is more likely that noise pulses will exceed the blanking level.

### Noise Canceller

Another popular and effective TV noise canceller system provides a separate gated path for high amplitude noise impulses. This system uses two triode sections; one as sync separator and the other as a noise inverter. A positive-going composite video signal from the video output stage is applied to the grid of each triode, as shown in Fig. 4. The inverter tube grid is biased well beyond cut-off, so that normal incoming signals do not cause the tube to conduct.

When a heavy noise impulse (positive), appears in the video, the tube conducts, and an amplified negative noise pulse appears in the plate circuit. This amplified noise pulse is fed back to the grid circuit of the sync separator, in opposite phase, cancelling the incoming positive noise pulse.

Should a noise and sync pulse arrive at the same instant, a portion or all of the sync pulse may be canceled out—leaving a gap in the composite picture signal. However, the "fly-wheel" effect of the sweep oscillators normally maintain the picture in sync. Although many circuit deviations exist, the basic concept of a negative pulse cancelling a positive one remains the same.

### BU8 Circuit

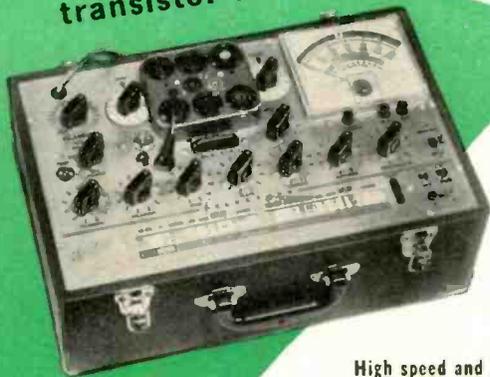
A multipurpose tube, the BU8, type (3BU8, 6BU8, et al) has been widely used in recent years. For all practical purposes the tube is a twin pentode—having two separate 2nd control grids and control grid, screen grid and cathode elements common to both halves. Although manufacturers use a number of circuit configurations, basic functions remain the same.

One half of the tube functions as agc and the other as sync clipper and separator. A strong positive going video signal is coupled from the video output to the 2nd control grid, pin 6, of the sync clipper section, with negative bias held to a level that allows only the sync tips to cause tube current flow. Therefore,

# HICKOK

## tube testers,

## transistor and diode checkers



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MUTUAL  
CONDUCTANCE**

**High speed and  
high quality . . .**

Features the time saving advantages of instantaneous and automatic shorts or leakage identification; constant indication of line voltage; and a new filament continuity test.

The quality-proven HICKOK developed and patented Dynamic Mutual Conductance circuits permit accurate tube, transistor and diode evaluations directly in micromhos . . . plus the important "fringe" tests for grid current (gas) and future tube life (cathode activity).

**\$189.25**

### Lowest Cost Dynamic Mutual Conductance

This tube, transistor and diode tester is the world's most popular portable. Thoroughly engineered and carefully manufactured, the 800 out-performs all other testers in its price range.

**\$159.50**

Model 752 Communication Engineers' Portable

**\$298.00**



800

Ask your distributor for a "Hickok-demonstration" . . .

The world's most complete line of quality tube testers.

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10514 Dupont Ave.  
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GREATEST NAME IN TESTERS

only the sync pulse is amplified.

Noise gating in the agc and sync clipper is generally a single function accomplished by applying a small negative-going composite video signal from the video detector to the control grid, pin 7. See Fig. 5. A resistor connected to the control grid establishes the bias so that any noise burst greater than the composite video signal will cause the tube to cut-off. Also, the increased positive signal on pin 6 enables the grid to attract more electrons, thereby preventing any from reaching the plate. Although occasional strong noise pulses occur at the same time as the sync pulse, cutting off the tube, fly-wheel action of the oscillators normally maintain sync during these brief periods.

In some circuits, agc voltage applied to the r-f section is delayed, allowing application of agc voltage to the i-f stages somewhat sooner than to the tuner. This allows the tuner signal to become stronger, override noise and thus improve fringe area reception.

Since anti-noise circuits are now an integral part of most TV sets, it requires the same careful analysis given to other potential trouble spots. Recognizing the symptom, analyzing the circuit and using test instruments to their best advantage will greatly simplify the technician's troubleshooting job. Before instruments are brought into play, tube substitution and control adjustments (fringe, agc, etc.) should be made.

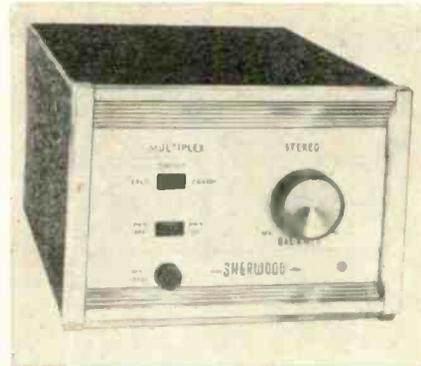
The checkpoints are few and simple and "clearing" this portion of the circuit will speed the servicing procedure. Although sync separator and noise suppression circuits are composed of a relatively small number of components, many customer complaints of improper operation of TV receivers can be traced directly to misadjustments or defective components in this area. •

#### Belden CABLE

A new, three conductor, 32 AWG, shielded stereo phono pick-up arm cable, specifically designed for 3-wire systems, has been announced. With the addition of this new cable, the firm now offers a complete selection of phono pick-up arm cables for 1, 2, 3, and 4 conductor shielded, and 2 and 4 conductor unshielded applications. Belden Mfg. Co., 415 S. Kilpatrick Ave., Chicago 44, Ill. (ELECTRONIC TECHNICIAN 10-48)

#### Sherwood MULTIPLEX ADAPTER

The model SMX Multiplex Adapter enables reception of stereo multiplex FM programs. Circuitry, switching and balance adjustments are included for both the Crosby and Split-Channel systems. It is reported to have a 20 to 20,000 cps  $\pm$  1 db frequency response, detector bandwidth  $\pm$  30 kc linear, subchannel bandpass 22½ kc to 120 kc and 2  $\mu$ v subcarrier sensitivity. The unit is self-powered, with four tubes and a selenium rectifier and can be operated with any FM tuner. Price is \$55.50, less case. Sherwood Electronic Labs., 4300 N. California Ave., Chicago 18, Ill. (ELECTRONIC TECHNICIAN 10-54)



# HICKOK

## tube Caddy-Pal

# 820



Combination...  
TUBE, TRANSISTOR.  
CRT CHECKER  
OHMMETER  
VTVM

An innovation...  
A new idea in test equipment—specifically designed and engineered for the time-conserving needs of television-radio service in the home. The compact, lightweight design is sized to fit your tube caddy. Combines a Tube-Transistor Tester with a sensitive VTVM-Ohmmeter. The tube tester performs the critical "fringe" tests of gas, grid-emission, contact potential, shorts and leakage. Readings are made directly on the meter through a VTVM circuit. There are no relative indicating devices and there is no guess work!  
**\$99.55**

Ask your distributor for a "Hickok-demonstration"...  
The world's most complete line of quality tube testers.  
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## Association News

### California

APA, Los Angeles, gathered members from both So. and No. Calif. to discuss and coordinate mutual problems at their second state convention. During the convention, the following new officers were elected: Pres., Chet Shipley; V.P., Bill Shirley; Sec'y-Treas., Rollie Grinder. Newly elected V.P., Bill Shirley, was

also honored as APA's "Man of the Year" for his accomplishments in building up the No. Calif. region.

RTA, Santa Clara Valley, announces streamlining their sponsored apprenticeship program. The four year course was consolidated to three years, with basic changes involving the first two years of apprenticeship. The first year studies encompass basic electronics and math. Remaining two years include courses in Radio Servicing, Theory, Field Servicing and Bench Servicing. Planners of the program deemed the changes necessary to improve student knowl-

edge of fundamentals, thereby adequately preparing them for later, more difficult courses.

TSA, San Mateo, former Pres. Ed. Hawkins, states Association plans for a TV Owner's Manual is gaining momentum. The booklet is intended for distribution to TV dealers for their customers. Hawkins reveals that the booklet will contain information on receiver operation, guide to service prices and antenna tips.

### Illinois

From Chicago comes a NATESA statement explaining the organization's position in rejecting the Detroit TSA application for membership. This controversy has previously been covered in this column. Exec. Director Frank Moch states: "When the application was finally received, in view of the fact that we had the Michigan State affiliate who already had a Detroit affiliate, the application was submitted to TESA-Michigan. They turned down the application completely in accord with their rights as a state affiliate. For this I have been maligned and libeled." NATESA also released a statement by TESA-Michigan Pres. John Stefanski accusing TSA of not cooperating with other Michigan associations. NATESA elects Mac Metoyer President of NATESA at their Chicago convention.

TESA, Chicago, announced House Bill 1083 for licensed TV-radio service in the State of Illinois was defeated. TESA Pres. Sam Maksimuk, charges that an appeal for fair play and justice was ignored. The Association plans to continue their battle for passage of the service bill.

### Massachusetts

ETG, Boston, planning dinner meetings to discuss mutual problems, including cooperative advertising and customer education campaigns.

### Michigan

TSA, Michigan, plans to solicit funds for campaign to educate the public regarding the reasons why they should check and purchase tubes at their neighborhood radio-TV shops.

### Missouri

TSE, Kansas City, announces the City Council unanimously affirmed ordinance number 23625, regulating service of TV equipment. TSE had vigorously supported this bill.

(Continued on page 87)

# Now Completely SELF-CONTAINED

For Testing & Rejuvenating



BLACK AND WHITE



and COLOR



including 110° TUBES

## NEW CRT 440





**CATHODE REJUVENATOR TESTER**





**TESTS AND REJUVENATES**  
all black & white and color picture tubes at correct filament voltage from 1 to 12 V.

**TESTS AND REJUVENATES**  
110° tubes with 2.34, 2.68, 6.3 and 8.4 volt filaments.

**TESTS AND REJUVENATES**  
color picture tubes. Checks each color gun separately same as black & white tubes.

*Used by Thousands of Professional Servicemen  
MAKES NEW PICTURE TUBE SALES EASIER*

Gives you more value than ever—all-in-one. Quickly checks and corrects most TV picture tube troubles in a few minutes right in the home without removing tube from set. Gives new useful life to weak or inoperative tubes. Checks leakage. Restores emission and brightness. Repairs inter-element shorts and open circuits. Life test checks gas content and predicts remaining useful life of picture tube. Completely self-contained in leatherette-covered carrying case. Net, \$69.95

### ACCESSORIES for USE ONLY with FORMER B & K Models 400 and 350 CRT



**Model C40 Adapter.** For use only with all previous B&K Model 400 and 350 CRT's. Tests and rejuvenates TV color picture tubes and 6.3 volt 110° picture tubes. Net, \$9.95

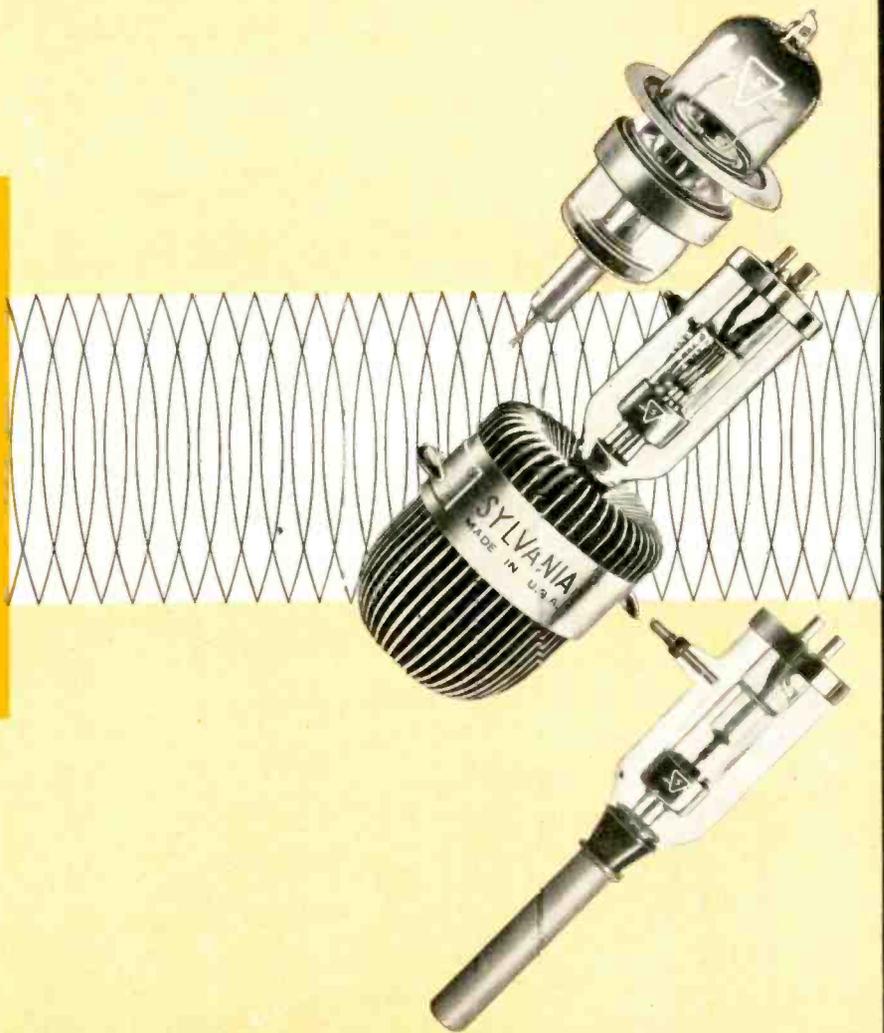
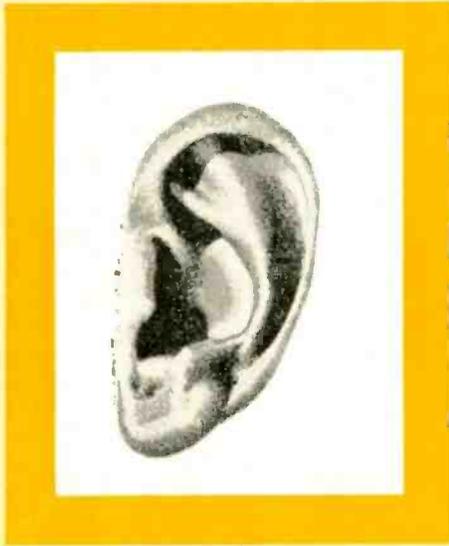
**Model CR48 Adapter.** For use only with all previous B&K Model 400 and 350 CRT's. Tests and rejuvenates 110° picture tubes with 2.34, 2.68, and 8.4 volt filaments. Net, \$4.95

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Sylvania Gold Brand tubes are playing an important role in the continuing progress of communications. They have helped to establish new standards of reliable performance in military, commercial and industrial communications equipment. Now, in keeping with this outstanding record, Sylvania offers a line of transmitting tubes made in the tradition of the famous Gold Brand line.

AM, FM, TV, VHF, UHF—whatever the service, there is a Sylvania transmitting tube to fill the bill. And it will meet your

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Here are some of the more popular classes of Sylvania Communication Tubes:

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- Power Triodes—forced air, convection or water cooled
- Transmitting Beam Amplifiers
- Pilotrons
- Power Tetrodes

Before your next order for power tubes, check out the Sylvania transmitting tube line. Your Sylvania distributor or salesman will be glad to give you the whole story on the complete line.



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THE ANTENNA LINE  
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***Winegard's***

**... the Industry's Greatest**

**SEE** the big-name TV stars such as ★ Ward Bond of "Wagon Train" ★ Walter Brennan of "The Real McCoy's" and other TV stars promoting Winegard Color'Ceptors!

**SEE** Winegard's advertising in a non-stop, big-space schedule in LIFE, Better Homes & Gardens, others, **ALL YEAR LONG!**

**GET FREE PROFIT-MAKING SALES AIDS**

**GET** Winegard's new "PROMOTION BUCKS"! Given to you free with every Color'Ceptor you buy. You use them for getting your own choice of the finest sales promotion aids anyone has ever offered — knock-out sales helps that hitch your business to the giant national sweep of Winegard's **BIG TV SHOW TIME!**



**SEND THIS COUPON TODAY!**

**WINEGARD CO.**  
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- RUSH full color brochure showing Winegard's new antenna dealer sales aids . . . and tell me how I can get them free!
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***Winegard Co.***

3019-10 Scotten, Burlington, Iowa

Sell the Winegard Color'Ceptor, the only antenna that's **GUARANTEED** to give your customers the **BEST** reception — In the rare event, a customer of yours is not satisfied — Winegard will refund the list price of the antenna and **YOU KEEP YOUR FULL PROFIT.**

Talk to your Distributor or send coupon for the whole story.

**FEATURE THE LEADER AND BE ONE!**



# OUT WHERE THE SALES BEGIN

As Advertised in



Color'Ceptor full-color mailing piece and full-color postcards for your direct mail program.



Special window decals.



DEALER'S NAME & ADDRESS GO HERE

Giant 6 foot 3-color metal road sign imprinted with your name.



Year-round big-space national advertising featuring big name TV stars.

Unlimited 50-50 co-op on local newspaper and radio advertising.



For best TV reception Winegard Gold Antennas

Big gold balloons for the kiddies

# BIG TV SHOW TIME!

## All-Out Antenna Profit Drive!

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Colorful window streamers.



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Attractive silk wall banners.



Antenna check-up sheets.



Gold anodized sample to hand out on service calls.



Illuminated plastic window sign.

New Color'Ceptor display with gold anodized mast.



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Eye-catching metal flange sign.



Special truck decals.



Hanging store front sign imprinted with your name.

**ALL THESE SALES AIDS FREE - Ask Your Distributor**

# RCA's Top Three for Electronics Technicians!



## NEW: RCA WO-33A SUPER-PORTABLE OSCILLOSCOPE

only \$129.95\* (complete with Low-Cap Direct Input Probe and Shielded Cable). (Also available as easily assembled kit WO-33A (K) only \$79.95\*, incl. above accessories)

Here is your rugged, compact, super-portable scope for those "in the home" color-TV and black-and-white TV servicing jobs! Enough bandwidth and gain for any "tough dog" service job—FEATURING: cable and power cord storage bracket on carrying handle • combination direct/low-cap probe and shielded input cable assembly • voltage calibrated, frequency-compensated 3-to-1 step attenuator • scaled graph screen and calibrating voltage source for direct reading of peak-to-peak voltages • "plus-minus" internal sync holds sync to 4.5 Mc • weight only 14 pounds!



## NEW RCA WV-38A VOLT-OHM-MILLIAMMETER

only \$43.95\* (complete with batteries, probe and cable with slip-on assembly, and operating instruction). (Also available as easily assembled kit WV-38A (K) only \$29.95\*, including above accessories)

You'll get a world of use from this very essential piece of test equipment—FEATURING: extra 1-volt and 0.25-volt ranges for transistor servicing applications • fuse-protected ohms-divider network • polarity reversal switch • full-wave bridge rectifier circuit with excellent frequency response and low circuit loading on the ac ranges • extra large 5½-inch meter with easy-to-read standard ranges • standard dbm ranges.



## NEW RCA WV-77E VOLT OHMYST

only \$49.95\* (also available as easily assembled kit WV-77E (K) only \$29.95\*)

The latest in the famous RCA VoltOhmyst quality line—FEATURING: fuse-protected ohms-divider network • ultra-slim probes and flexible leads • sleeve attachment on handle stores probes, leads, power cord • separate 1½-volt rms and 4-volt peak-to-peak scales for accuracy on low ac measurements • front panel lettering acid-etched for long life!

\*User Price (Optional)

See the "top three" plus RCA's complete professional Test Equipment line at your Authorized RCA Test Equipment Distributor!



**RADIO CORPORATION OF AMERICA**

Electron Tube Division

Harrison, N. J.

## Should TV Servicing be Licensed?

(Continued from page 46)

ing is unconstitutional, and yet every state has on its books licensing laws governing various professions and trades that have withstood the test of as much as 50 years time. They deny that dangers exist; this in the face of many reports of deaths and injury, and contrary to authoritative Underwriters Lab statements. They disavow responsibility for the public safety and welfare and its fair treatment, wholly in contradiction to commonly recognized business morality. They try to evade the issue by stating that this is an infant industry. Infant at 38 years plus of age? They scream about free enterprise. How free is enterprise to a man who works under virtual slavery at a wage below that of the commonest labor?

What then is the answer? Obviously licensing, which is nothing more or less than the mandatory enforcement of the rules of proper business ethics that are already voluntarily assumed by ethical professional service business people. It is a matter of recorded history that it was only after licensing that such professions as medicine, law, accounting and others, achieved stability.

As a last thought, what will the opponents of licensing do when the 30 hour week comes upon the industrial scene, as is bound to happen sooner than many think, and the vast horde of industrial workers will have an unlimited amount of leisure time on their hands? •



"Sure, I could repair it for half-price, if it was only half a television set!"

# IS ONE OF THESE TYPICAL BLONDER-TONGUE AMPLIFIED INSTALLATIONS THE ANSWER TO BETTER TV RECEPTION IN YOUR AREA?

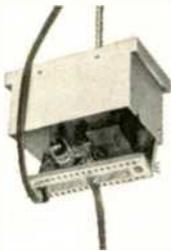
Blonder-Tongue reception improving TV products

## NEW BLONDER-TONGUE B-24 POW-R BOOSTER



Powerful booster or amplified coupler provides sharp, clear pictures on 1, 2 or more TV sets with only one antenna. 10 db gain as 1-set booster, 5 db gain per set as amplified 2-set coupler. No-loss 4-set distribution system with B-T A-104 4-set coupler. New 6DJ8 frame-grid tube for highest signal gain. 24.95 list

## NEW VHF ANTENNA BOOSTER, MODEL AB-2



Brilliant, clear reception in fringe and weak signal areas — more than 10 db gain on all VHF channels. Utilizes advanced RF amplifier circuit with frame-grid tube for maximum signal-to-noise ratio. Can be mounted up to 500 feet from remote control unit. 53.95 list

Model AB-FM for superior FM reception. 53.95 list

## 'NO-STRIP' 2-SET COUPLER, MODEL A-102



300 ohm coupler provides low-loss, matched installation for superior two-set performance. Delivers more signal to each TV or FM set, with greater inter-set isolation than other couplers. No ghosts, no smears. Ideal for outside or indoor mounting, color TV, FM. 3.50 list

Model A-104 — 4 set coupler, list 4.50; Model A-105 high-low antenna list 3.50; A-107 UHF-VHF Mixer, list 3.50; A-100 Outdoor Mounting Kit, list 90¢

## DISTRIBUTION AMPLIFIER, MODEL DA8-B



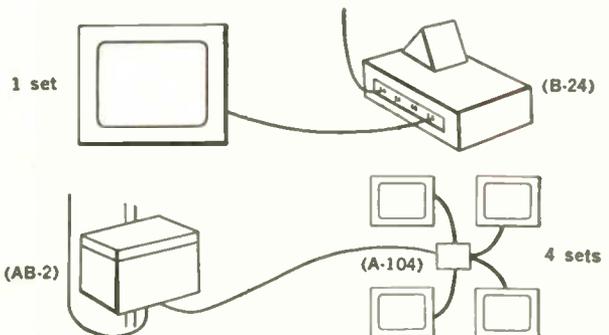
Powerful all-channel amplifier ideal for small TV systems (garden apartments, motels, TV showrooms), provides 8 isolated TV outlets from 75 or 300 ohm input and delivers more than 10 db gain on all VHF channels. Requires no tuning or other special accessories. 94.50 list

for every reception area — primary or fringe. for every type of installation — one set to 100

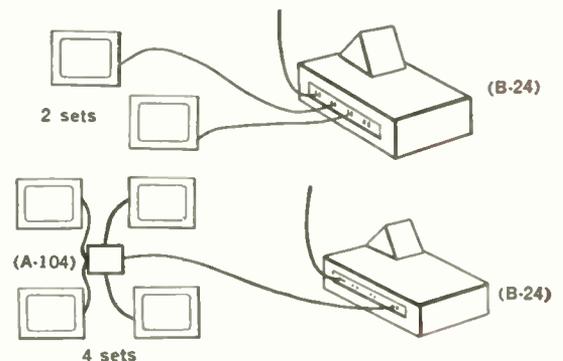
### WEAK SIGNAL AREAS



### INTERMEDIATE SIGNAL AREA

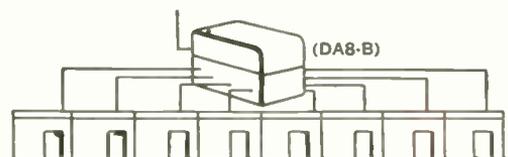


### PRIME SIGNAL AREA



### WEAK, INTERMEDIATE, PRIME SIGNAL AREAS

Small TV System — 8 sets



'NO-STRIP'— these Blonder-Tongue TV products feature exclusive B-T No-Strip terminals for speedy, secure positive installation.

More than 2,000,000 installations provide superior TV reception with B-T products.

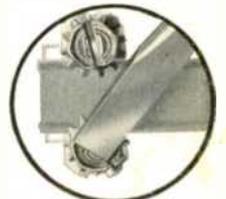
Available at parts distributors. For further information write Dept. ET-10

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## NEW FROM SECO DYNAMIC TRANSISTOR CHECKER



MODEL 100

### DYNAMICALLY CHECKS WIDE RANGE OF TRANSISTOR TYPES EITHER "IN OR OUT" OF CIRCUIT!

This new low-cost checker uses an entirely new approach but a proven DYNAMIC principle for checking transistors. safely tests PNP and NPN transistors either "in or out" of the circuit. Covers wide range of types: small signal including "drift" types, medium power; and power types. Provides positive check for "opens," shorts, and gain—condition indicated by means of a visual indicator plus jacks for meter or scope. Also provides GO-NO-GO test at practical currents—and permits matching of similar transistor types. No set-up required—no further leakage tests necessary. Model 100 is compact, lightweight, complete, and ready-to-use . . . helps you cash-in on the big profits in the fast growing transistorized equipment servicing field!

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## NEW FROM SECO LOW COST, COMPLETE TUBE TESTER



MODEL 78

### GRID CIRCUIT and TUBE MERIT TESTER

Complete test coverage of all modern TV tube types as well as all heater type radio tubes including hybrid types, using only 5 sockets. Incorporates patented Seco GRID CIRCUIT TEST plus a reliable CATHODE EMISSION test using new low impedance low test voltage circuit—also checks filament continuity and provides open element test. One easy-to-read meter indicates results for both Grid Circuit and Tube Merit Tests. Two-stage dc amplifier isolates meter from tube under test to protect meter—and makes it possible to achieve a wide range of load currents and test conditions. Complete with portable carrying case, pin straighteners, and flip-chart for quick set-up data.

MODEL 78—Wired and factory tested . . . . \$69.50 NET



MODEL 107  
TUBE  
TESTER

### outstanding reliability, accuracy

Provides 3 important tests: amplifier types tested for gain by Dynamic Mutual Conductance method—power types tested for cathode current by Cathode Emission method—all types tested for shorts and grid error by Grid Circuit Test developed and patented by Seco. Dynamic Mutual Conductance Test pre-wired to eliminate elaborate set-up. Cathode Emission Test done by free point pin-selector method—will not be obsolete. Completely self-contained in portable carrying case.

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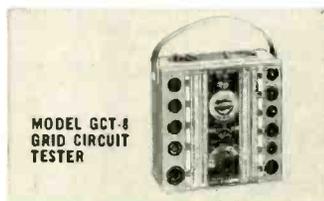


MODEL HC-6  
IN-CIRCUIT  
CURRENT  
CHECKER

### positive, on-the-spot check of horizontal output current!

This new, low-cost current checker provides simple means for making a positive on-the-spot check of TV horizontal circuits. Can be placed into the circuit in seconds—no unsoldering of circuit wiring—immediately indicates whether horizontal tube cathode current is within manufacturer's recommended limits. Valuable as a fast, accurate indicating device when adjusting horizontal drive and linearity. Eliminates one of the most common causes of callbacks. Compact, inexpensive, easy to use—

MODEL HC-6—Wired and factory tested \$12.95 NET



MODEL GCT-8  
GRID CIRCUIT  
TESTER

### fast check of critical "control grid" conditions

Model GCT-8 checks "control grid" condition of vacuum tubes faster, more accurately than any other tester! As many as eleven simultaneous checks—automatically! Quickly spots grid errors and leakage—stops guessing, substitution checking, and costly rechecks. Electron-Eye tube indicates faults at a glance. Truly portable. The perfect companion to any tester that employs only conventional gas and shorts test. Carry it on all calls.

MODEL GCT-8 Complete kit . . . \$19.95 NET

MODEL GCT-8 Wired and tested . . \$29.95 NET

## Should TV Servicing be Licensed?

(Continued from page 47)

law, in order to give all parties a fair and honest review of the circumstances surrounding a complaint, the empowered Commission would become so bogged down in red tape and time consuming fact finding, not to mention the staggering financial expenses of the salaried people involved, that a minimal accomplishment points up to the basic unworkability of a license law to be fairly and scrupulously administered.

More recent and even more telling is our Association experience at the Chicago International Trade Fair where we had a shop exhibit. Our members were exposed to the set owning public for twelve hours a day for seventeen days. The public had every opportunity to unload its gripes, complaints, rending stories of dishonest practices, and to simply vent its spleen on servicemen if they had something to say. This exhibit was viewed by tens of thousands of people every day through the Fair run. After it closed, in summing up our observations and experiences, it would seem that about eighteen people collared our members at one time or another, and took time to make adverse and derogatory statements about TV servicemen.

This actual mass exposure to the public leads me to affirm again that there is no basic need for license control based on the thesis that the public is being cheated and is dissatisfied. That such a law is necessary as a prime control over the ethical business practices of servicemen springs from sterile and barren argument. •

### Kurman RELAY

Introduced is Series 300 Microamp. It is a 2 milliwatt high sensitivity relay, for all low power input circuits where available current is at a premium. Applications include high speed keying, remote control or battery operated devices. Field adjustable to handle currents up to 3 amps at a reduced sensitivity. Mounting: two 196" clearance holes on 2 1/8 x 2 1/8 centers. Kurman Electric Co., 191 Newel St., Brooklyn 22, N. Y. (ELECTRONIC TECHNICIAN 10-55)

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<input type="checkbox"/> Three Tube Testers	<input type="checkbox"/> In-Circuit Current Checker	<b>SECO MANUFACTURING CO.</b> 5015 Penn Ave. So., Minneapolis, Minn.	
<input type="checkbox"/> VTVM	<input type="checkbox"/> 100% Accurate Flyback Checker		
<input type="checkbox"/> Dynamic Transistor Checker	<input type="checkbox"/> Battery Eliminator		
Sold Only Thru Electronics Parts Distributors		NAME _____	ADDRESS _____
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against callbacks**



Just one callback throws your profits for a loss on the next three service calls. But you can tackle any service job and make big gains in profit territory, when you back your line with Tung-Sol Blue Chip quality. Made to industry's top standards, Tung-Sol tubes are best for every replacement — radio, tv or hi-fi. Tung-Sol Electric Inc., Newark 4, N. J.

*Tell your jobber you'd rather have*

**ts TUNG-SOL®**

*Blue Chip Quality*

TUBES • TRANSISTORS • DIODES

# HOW TO MAKE MONEY

## Selling Commercial Sound

Here today and here tomorrow — Commercial Sound is a steady-profit 12-months-a-year business of sales, installation and servicing with lots of customers right in your own neighborhood. Take advantage of the Atlas complete line of speakers — manufactured, advertised and supplied directly by Atlas. Speakers for every application, a mike support for every purpose — plus a wide variety of accessories so necessary for a complete professional installation.

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Write for latest catalog and selling aids to help you get profitable commercial sound business.

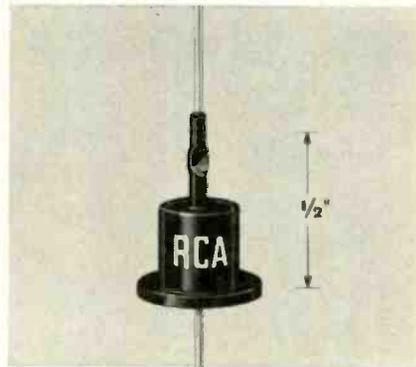
**ATLAS SOUND CORP.**  
Dept. ET-10

1449 — 39th St.,  
Brooklyn 18, N. Y.

In Canada: Atlas Radio Corp.,  
Toronto, Canada

### RCA SILICON RECTIFIERS

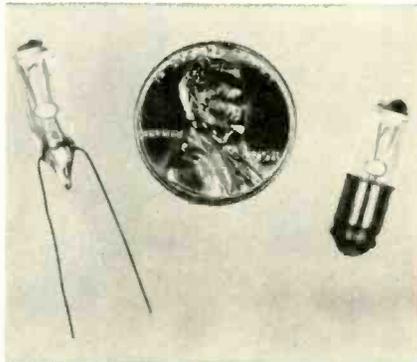
Two groups of 13 diffused-junction type silicon rectifiers are represented in this line: 1N440-B through 1N445-B for magnetic amplifier and other industrial applications and 1N536 through 1N540—plus two others: 1N1095 and



1N547 in the same group—designed for industrial and military applications. Peak inverse voltage ratings range from 100 to 600 volts in the first group and 50 to 600 v in the second group. RCA Semiconductor & Materials Div., Somerville, N. J. (ELECTRONIC TECHNICIAN 10-25)

### Tung-Sol SUBMINIATURE LAMP

This subminiature incandescent designed for computer photoelectric read-out application and direct end-on-view readout indicator, is less than 1/4" in diameter and 13/16" in length (based). Designated #4 lamp, it has a rating of



2.5 volts at 400 ma and is claimed to have a life approaching 10,000 hours. Provided with either a brass snap-in base for direct front replacement or pig-tails for soldering. Tung-Sol Electric Inc., 1 Summer Ave., Newark 4, N.J. (ELECTRONIC TECHNICIAN 10-23)

### EOA PARTS KIT

A new electronic organ parts kit contains coils, chassis, hardware and completely detailed instructions for the assembly of a full size, two-manual organ having 164 independent oscillators. Electronic Organ Arts, 4949 York Blvd., Los Angeles 42, Calif. (ELECTRONIC TECHNICIAN 10-36)

### Frequency of TV Component Replacement

• Electronic components require replacement from time to time. To develop a general inventory guide, and to gain further insight into the operation of the service industry, a study has been made to determine how often various TV parts are replaced on service calls.

The following tabulation is based on a cross-section of actual service records covering various ages of TV receivers. In addition to the actual parts replaced, the number of calls requiring adjustments of one kind or another were also counted.

The percentages shown are the percents of total service calls in which the component noted was replaced. The sum of all the percents listed is greater than 100% since many of the service calls required more than one type of part.

COMPONENT	% OF CALLS REPLACED
Receiving tubes .....	61.0%
Resistors .....	9.1%
Controls .....	6.3%
Fuses .....	5.4%
Capacitors .....	4.8%
HV transformers .....	3.8%
Picture tubes .....	3.0%
IF transformers .....	2.8%
Miscellaneous .....	18.0%
Adjustments .....	37.4%

It should be noted that the above statistics will vary with different service dealers, some having a higher incidence of tube replacement. Nevertheless, the representative sample studied should provide an interesting insight. •

### Philco SILICON TRANSISTORS

Seven NPN silicon transistors include the 2N1199 for high speed, high temperature saturated switching circuits up to 5 mc. The 2N1267, 2N1268 and 2N1269, for 4.3 mc amplifier applications, has typical power gain of 25 db, oscillates at 90 mc and have beta ranges of 6-18, 11-36 and 28-90 respectively. The 2N1270, through 2N1272 for 12.5 mc amplifiers, has 20 db gain, oscillates up to 200 mc with same beta ranges. Philco Corp., Tioga & C Sts., Philadelphia 34, Pa. (ELECTRONIC TECHNICIAN 10-27)

For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 54.

Superior's New Model 80

# 20,000 OHMS PER VOLT ALLMETER

THE ONLY 20,000 OHMS PER VOLT V.O.M. SELLING FOR LESS THAN \$50 WHICH PROVIDES ALL THE FOLLOWING FEATURES:



✓ **6 INCH FULL-VIEW METER** provides large easy-to-read calibrations. No squinting or guessing when you use Model 80.

✓ **MIRRORED SCALE** permits fine accurate measurements where fractional readings are important.

✓ **CAPACITY RANGES** permit you to accurately measure *all* condensers from .00025 MFD. to 30 MFD. in addition to the standard volt, current, resistance and decibel ranges.

✓ **HANDSOME SADDLE-STITCHED CARRYING CASE** included with Model 80 Allmeter at no extra charge enables you to use this fine instrument on outside calls as well as on the bench in your shop.

## Specifications

**7 D.C. VOLTAGE RANGES:**  
(At a sensitivity of 20,000 Ohms per Volt)  
0 to 15/75/150/300/750/1500/7500 Volts.

**6 A.C. VOLTAGE RANGES:**  
(At a sensitivity of 5,000 Ohms per Volt)  
0 to 15/75/150/300/750/1500 Volts.

**3 RESISTANCE RANGES:**  
0 to 2,000/200,000 Ohms. 0-20 Megohms.

**2 CAPACITY RANGES:**  
.00025 Mfd. to .3 Mfd., .05 Mfd. to 30 Mfd.

**5 D.C. CURRENT RANGES:**  
0-75 Microamperes, 0 to 7.5/75/750 Milliampers,  
0 to 15 Amperes.

**3 DECIBEL RANGES:**  
- 6 db to + 18 db. + 14 db to + 38 db  
+ 34 db to + 58 db

Model 80 Allmeter comes complete with operating instructions, test leads and portable carrying case. Only **\$42<sup>50</sup>**

**NOTE:** The line cord is used only for capacity measurements. Resistance ranges operate on self-contained batteries.

## Features:

- A built-in Isolation Transformer automatically isolates the Model 80 from the power line when capacity service is in use.
- Selected, 1% zero temperature coefficient metalized resistors are used as multipliers to assure unchanging accurate readings on all ranges.

# SHIPPED ON APPROVAL NO MONEY WITH ORDER — NO C.O.D.

Try it for 10 days before you buy. If completely satisfied then send \$12.50 and pay balance at rate of \$6.00 per month for 5 months—No interest or Finance Charges Added. If not completely satisfied, return to us, no explanation necessary.

MOSS ELECTRONIC, INC.  
Dept. D-678 3849 Tenth Ave., New York 34, N. Y.

Please rush one Model 80. If satisfactory I agree to pay \$12.50 within 10 days and balance at rate of \$6.00 per month. If not satisfactory, I may return for cancellation of account.

Name .....

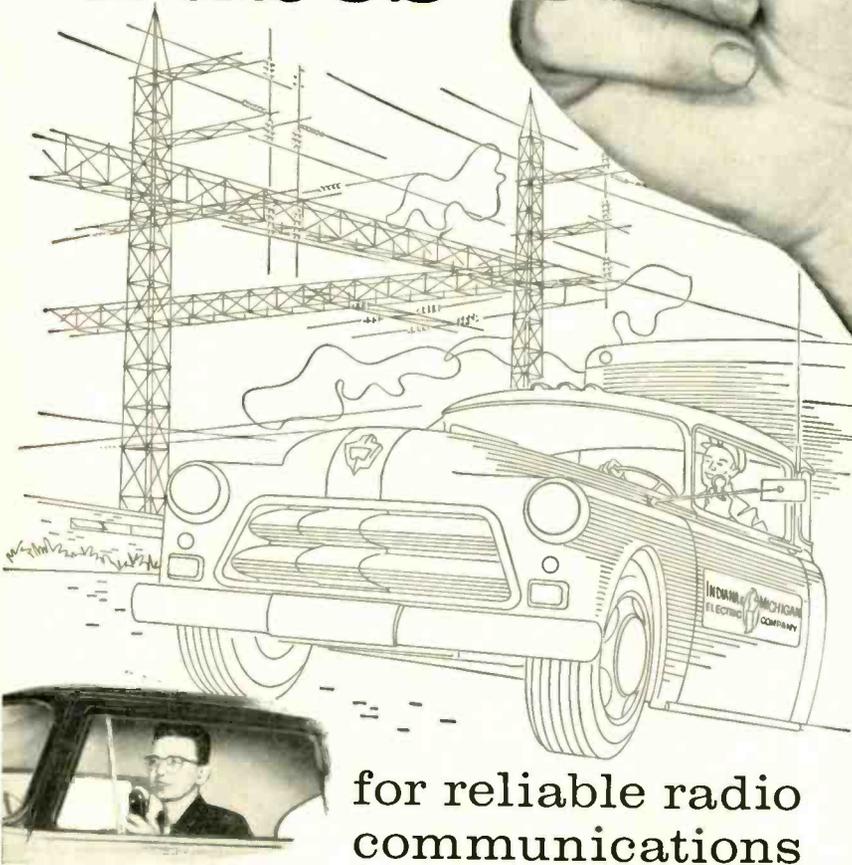
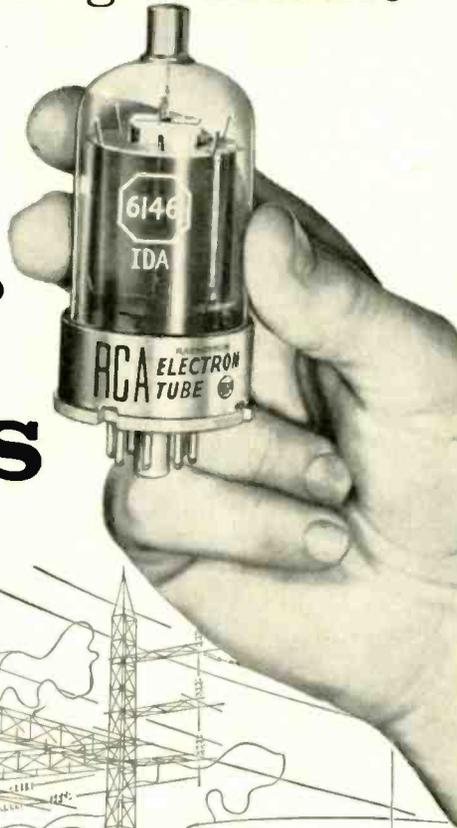
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uses

# RCA Power Tubes



for reliable radio  
communications

RCA Power Tubes play an important part in coordinating the activities of Indiana & Michigan Electric's fleet of 267 maintenance and service vehicles—keeping them on the spot whenever, wherever they're needed over the entire 7,000 sq. mile territory.

To maintain positive, 24-hour-a-day contact with its widespread service and maintenance fleet, Indiana & Michigan Electric uses RCA Power Tubes for its two-way radio equipment. That's because I&ME Co., like so many other fleet operators, has learned by experience that RCA Power Tubes give dependable, high-quality performance at low hourly operating costs.

Your local RCA Industrial Tube Distributor carries a complete line of RCA tubes for mobile and fixed communications. Call him for fast service.



**RADIO CORPORATION OF AMERICA**

Electron Tube Division

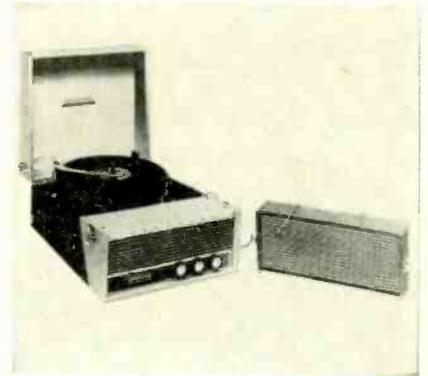
Harrison, N. J.

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



## CBS STEREO PORTABLES

A portable stereo four speed changer, with automatic shut-off, Model 220, is one of the "Harmony" line's three stereo and two monophonic units. Phonograph has twin 5" speakers, one detachable with 12' cord and CBS



Ronette jeweled turnover stereo cartridge. Changer plays 7, 10, and 12 inch records—intermixing 10's and 12's of same speed. Weight 14¾ lbs. \$79.95. Other models in this group range from \$24.95 to \$99.95. CBS Electronics, Danvers, Mass. (ELECTRONIC TECHNICIAN 10-12)

## American LAVALIER MIKE

Combining light weight with miniaturized design, the omnidirectional dynamic microphone, Model D-12, measuring 3<sup>25</sup>/<sub>32</sub>" in length, is said to have wide-range response, excellent sensitivity and a plastic alloy diaphragm



affording maximum protection against wind blast. Frequency response is 70 to 12,000 cycles. Output level —57 db. A necktie clip and lavalier cord are standard equipment. American Microphone Mfg. Co., 412 S. Wyman St., Rockford, Ill. (ELECTRONIC TECHNICIAN 10-11)

For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 54.

### Channel Master ROTOR

A new TV rotor the "Automatic Tenn-A-Liner," model 9524, has few moving parts—no springs, relays or solenoids—and features fully automatic control, high torque and calibrated tuning dial capable of pre-set marking



of desired channel within one degree. Unit operates with two synchronized motors; one in the control box, one in the rotor. Nylon gears. \$49.95 with 90 day replacement warranty. Channel Master Corp., Ellenville, N.Y. (ELECTRONIC TECHNICIAN 10-33)

### Altec STEREO AMPLIFIER

Rated at 25 w rms/channel, the 353A stereo amplifier-preamp has seven inputs for each channel, including dual microphone inputs. Has six outputs. Controls: balance, dual gain, dual bass, dual treble. Switches: stereo two chan-



nel-three-channel, stereo reverse, stereo-mono, rumble filter, loudness and selector. Frequency response 10 to 30,000 cps  $\pm 1$  db at 1 w. \$195.00; w/case \$199.50. Altec Lansing, 1515 S. Manchester, Ave., Anaheim, Calif. (ELECTRONIC TECHNICIAN 10-10)

### Chemtronic INSULATOR

No-Arc is a non-inflammable, fast-drying hi-voltage insulator with more than 20,000 volts dielectric strength. It has been developed to insulate horizontal output transformers and yokes, and to eliminate corona shorts in hi-voltage circuits. 2 oz. bottle with brush applicator, \$.89. Chemtronics, Inc., 122 Montgomery St., Brooklyn 25, N. Y. (ELECTRONIC TECHNICIAN 10-39)

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with precision "eye-tronic"® tuning  
Wired \$65.95\* Kit \$39.95\*  
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\*Less Cover, FET included  
"One of the best buys you can get."  
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#### AM Tuner HFT94

with precision "eye-tronic"® tuning  
Wired \$69.95 Kit \$39.95  
Includes Cover and F.E.T.



#### STEREO Dual Amplifier-Preamplifier HF81

Wired \$109.95 Kit \$69.95  
"Excellent" — SATURDAY REVIEW;  
and HI-FI MUSIC AT HOME.



#### STEREO Dual Preamplifier HF85

Wired \$64.95 Kit \$39.95

#### STEREO Dual Power Amplifier HF86

Wired \$74.95 Kit \$43.95

#### 70W STEREO Dual Power Amplifier Kit

\$74.95 Wired \$114.95

#### Omni-directional Speaker System HFS2

completely factory-built: 36" h, 15 1/4" w, 11 1/2" d.  
Mahogany or Walnut \$139.95. Blonde \$144.95  
"Eminently musical" — HIGH FIDELITY  
"Fine for stereo" — MODERN HI-FI

Also: Bookshelf 2-Way Speaker System HFS1  
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Other 2-Way & 3-Way Speaker System Semi-Kits, from \$47.50

Plus: POWER AMPLIFIERS (14, 22, 30, 35, 50 and 60-watts) from \$23.50.  
INTEGRATED AMPLIFIERS (12, 20, 32 and 50 watts) from \$34.95.



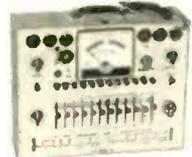
## best buys in test instruments... **EICO**



COLOR & Monochrome DC to 5 MC Lab & TV 5" Oscilloscope #460  
Wired \$129.50  
KIT \$79.95



TV-FM Sweep Generator & Marker #388  
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DYNAMIC CONDUCTANCE Tube & Transistor Tester #666  
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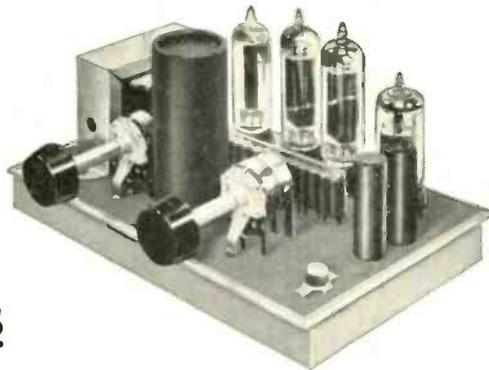
## NEW STEREO CERAMIC CARTRIDGE



This high quality single-element stereophonic cartridge is ideal for converting monaural record players to stereo. Dual stylus—sapphire-sapphire. Frequency response: 20 to 16,000 cps. Tracking force: 5 grams. Output: 0.5V, each channel. Channel separation: 20 DB. **\$8<sup>95</sup>**  
Regular list price . . .

## Plus Audio Amplifier Kit!

A complete-in-one-box ERIE "PAC" kit. Printed circuit board and plug-in components require little assembly time to build this high-quality, four-tube push-pull audio amplifier. Just right for profitable stereo conversions. Regular list price . . .



**\$12<sup>95</sup>**

## *BOTH* FOR ONLY

Here's a special profit-making stereo conversion offer you can't afford to pass up—a full \$21.90 value for only \$14.95. Offer expires November 15, so order from your nearby Erie distributor now and cash in on high-profit conversion business.

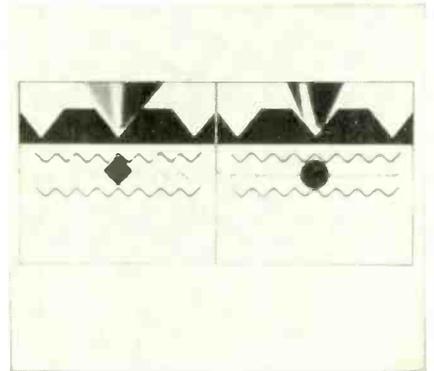
**\$14<sup>95</sup>**  
NET

For name of your nearest Erie Distributor, write to:

**ERIE Electronics Distributor Division**  
**ERIE RESISTOR CORPORATION**  
Erie, Pennsylvania

### Fidelitone *STYLI*

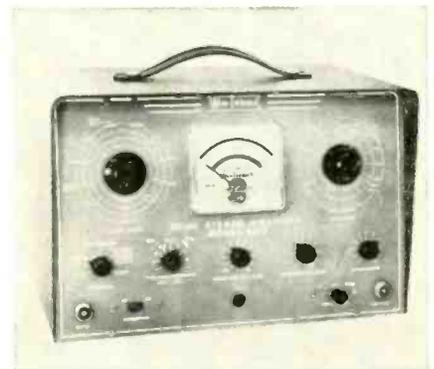
A new "pyramid point" diamond stylus claims to reduce sound distortion from records and reduce "pinch effect." The stylus tip has a pyramid shape, with four sides, instead of the conventional round point, and said to result in more surface contact. It is further



reported that tip shape is always in smooth contact with the sidewalls of the groove and the stylus has a longer playing life than the ball point type. Fidelitone, Inc., 6415 Ravenswood Ave., Chicago 26, Ill. (ELECTRONIC TECHNICIAN 10-8)

### Winston *STEREO ANALYZER*

The Model 800 Hi-Fi Stereo Analyzer provides basic test instruments for audio equipment service. Includes 20 to 30,000 cps signal generator; a-c VTVM ranges .01 to 300 volts rms; audio wattmeter scales 0.15 mw to 150 watts; all full



scale readings. Other features are: IM and harmonic distortion measurement; 4, 8, 16, and 600 ohm terminations; and db meter ranges from -40 to +52 db. Price \$169.95. Winston Electronics, 4000 N.W. 28th St., Miami 42, Fla. (ELECTRONIC TECHNICIAN 10-29)

### Olson *STEREO CONVERSION KIT*

Model KB-70, consisting of 2 shielded tone arm leads, terminal strip, dual 36" audio leads with phono pin plugs and stereo turnover cartridge, is said to convert any record changer to stereo. Cartridge w/dual sapphire styli has response of 40 to 10,000 cps. Mount in 1/2" mounting centers. Available at \$3.88 ea. or three for \$10.00. Olson Radio Warehouse, 260 S. Forge St., Akron, Ohio. (ELECTRONIC TECHNICIAN 10-15)

## Stromberg AM/FM TUNER

Combining the AM-441 and FM-443 tuners into one unit, the SR-445 may be operated either as an AM tuner, FM tuner, or together for stereo. FM frequency response is 20 to 20,000 cps, and sensitivity 2  $\mu$ v for 40 db quieting. Features include afc, tuning eye and



local-distance switch. Multiplex output is provided with chassis space for adapter. AM tuner response is 20 to 7,000 cps. \$129.95. Stromberg-Carlson Div., General Dynamics, 1400 N. Goodman, Rochester 3, N. Y. (ELECTRONIC TECHNICIAN 10-9)

## Alliance TURNTABLE & ARM

A new stereo turntable features single speed belt drive operation; slip clutch for cuing; teflon thrust bearing to provide vertical vibration damping and an 8 lb. anodized aluminum turntable. A companion stereo arm is reported to track properly even when



tilted 45 degrees. Stylus pressure is adjusted by a screw-lock leaf-spring device. Any size cartridge may be accommodated and accurately positioned by an adjustable sub-plate. Turntable, complete with wood base is \$49.95. Arm is \$24.95. Alliance Mfg. Co., Alliance, Ohio (ELECTRONIC TECHNICIAN 10-40)

For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 54.

# MERCURY TUBE TESTERS ARE RATED #1 BY SERVICEMEN EVERYWHERE...

## Model 101 TUBE TESTER SPECIFICATIONS

- Checks emission, inter-element shorts and leakage of over 700 tube types. This includes 0Z4s, series-string TV tubes, gas regulators, auto 12-plate-volt tubes, hi-fi and foreign tubes.
- 3 settings enable a test of any tube in less than 10 seconds.
- Employs dynamic cathode emission test principle.
- 3 1/2" D'Arsonval type meter — most accurate type available... its greater sensitivity means more accuracy... its jewel bearing means longer life.
- 17 long lasting phosphor bronze sockets.
- Combination gas and short jewel indicator.
- 9 filament positions.
- Handy tube chart contained in special back compartment.
- New tube listings furnished periodically at no cost.
- Size: 9" x 8 1/2" x 2 3/4".



Model 101 \$3995  
Dealer Net . . . . .

## PLUS THESE BONUS FEATURES . . . FOUND IN NO OTHER LOW PRICE TUBE TESTER

- ✓ Checks for cathode to heater shorts
- ✓ Checks for gas content
- ✓ Checks all sections of multiple purpose tubes . . . will pickup tubes with one "Bad" section
- ✓ Line isolated — no shock hazard
- ✓ Variable load control enables you to get accurate results on all tubes
- ✓ Positively cannot become obsolete as new tube types are introduced

CRT ADAPTER AVAILABLE FOR MODEL 101 . . . \$3.95 Dealer Net

## Model 201-F SELF SERVICE TUBE TESTER

### COMPARE THESE FEATURES WITH ANY SELF-SERVICE TUBE TESTER MADE BY ANY MANUFACTURER AT ANY PRICE

- Checks quality (emission, shorts and gas) of over 800 tube types, covering over 99% of all TV and radio tubes in use today, including the newest series-string TV tubes, 0Z4s, one volt tubes, magic eye tubes, hi-fi and foreign tubes.
- Cannot become obsolete as circuitry has been engineered to accommodate new tube types as they are introduced.
- Completely self-service . . . just two settings are required to test a tube in less than ten seconds.
- Checks each section of multi-purpose tubes.
- Tests all 6 and 12 volt standard auto radio vibrators.
- 46 long lasting phosphor-bronze beryllium sockets.
- Handy push button fuse can be reset manually — never needs replacement.
- Attractive red and hammer-tone gray durable metal cabinet.
- Tube compartment with own lock holds over 400 tubes.
- Tube storage drawers with tube carton dividers and drawer sheets provide for automatic inventory control.
- Takes only 19" x 19" of floor space. Stands 6'1" high.
- Large seven inch easy-to-read meter is extremely sensitive yet rugged — is fully protected against accidental burn-out.
- Etched aluminum panel always retains its handsome appearance.
- The most complete tube chart in the field lists over 800 tube types.
- New tube listings are furnished periodically at no cost as new tubes are introduced.
- Handy tube substitution guide included with each tester to prevent lost sales due to out of stock tube types.
- Colorful window streamers supplied with each tester to attract customers.
- An illuminated colorful plastic display tops the cabinet — designed to attract attention.
- Shipped in one carton completely assembled.



Model 201-F  
(floor model) \$15850  
Dealer Net . . . . .

ALSO AVAILABLE  
Model 201-C  
(counter model) \$10950  
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Manufacturer  
 of the finest  
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 in kit form



A complete 14-watt hi-fi amplifier-preamplifier combination in one stylish unit . . . and at less than half the price you would expect to pay!  
 Only

**\$29.95**

#### 14-WATT HI-FI ECONOMY AMPLIFIER (EA-3)

From HEATHKIT audio labs comes an exciting new kit . . . New Styling, New Features, Brilliant Performance! Designed to function as the "heart" of your hi-fi system, the EA-3 combines the preamplifier and amplifier into one compact package. Providing a full 14 watts of high fidelity power, more than adequate for operating the average system, the EA-3 provides all the controls necessary for precise blending of musical reproduction to your individual taste. Clearly marked controls give you finger-tip command of bass and treble "boost" and "cut" action, switch selection of three separate inputs, "on-off" and volume control. A hum balance control is also provided.

**NOTE THESE OUTSTANDING SPECIFICATIONS:** HARMONIC DISTORTION, less than 2% (20 cps-20 kc) at 14 watts. I.M. DISTORTION, less than 1% (60 and 6,000 cps, 4:1) at 14 watts. FREQUENCY RESPONSE, 20 cps-20 kc,  $\pm 1$  db at 14 watts. HUM & NOISE, mag. phono input, 47 db below 14 watts, tuner and xtal phono input, 63 db below 14 watts. A truly remarkable buy for the beginning or advanced audiophile.

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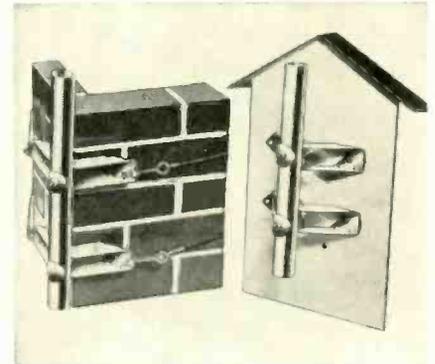
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#### Clear Beam ANTENNA MOUNT

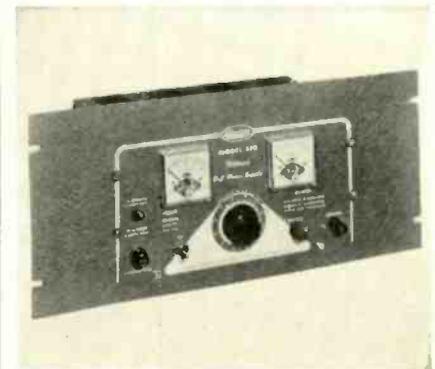
A new "do-it-yourself" universal antenna mounting bracket, the "miracle mount," permits antenna installation on the roof, wall or chimney of any home or building. The patented bracket is the center point for specially designed



hardware components each of which may be used in several different ways. It is available in the full line of do-it-yourself antenna kits. Clear Beam Antenna Corp., 21341 Roscoe Blvd., Canoga Park, Calif. (ELECTRONIC TECHNICIAN 10-19)

#### Electro Products DC SUPPLY

For service and development of transistor and tube circuits, Model EFBR d-c power supply has less than 10 mv ripple at peak load on a 117 v, 60 cycle line. Unit supplies variable d-c from 0-16 volts up to 8 amps and 0-32 v up



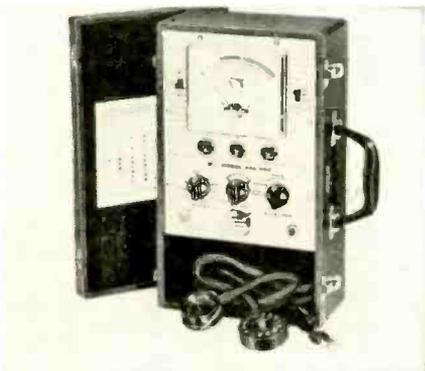
to 4 a. Capable of continuous medium duty on transistor circuits; radios; solenoids and other units. D'Arsenval-type meters indicate voltage and current. Electro Products Labs., 4500 N. Ravenswood Ave., Chicago 40, Ill. (ELECTRONIC TECHNICIAN 10-18)

#### Altec Lansing SPEAKER SYSTEM

The Monterey Jr., 835A, two-way speaker system incorporates one 402A 8" controlled linear excursion speaker and the newly designed 2000A direct-radiator cone tweeter. Frequency range is 45 to 18,000 cps. Power rating 115 watts. Impedance 16 ohms. Enclosure, 11 1/4" x 23" x 11 1/4". \$79.50 Altec Lansing Corp., 1515 S. Manchester Ave., Anaheim, Calif. (ELECTRONIC TECHNICIAN 10-41)

### B&K CRT TESTER

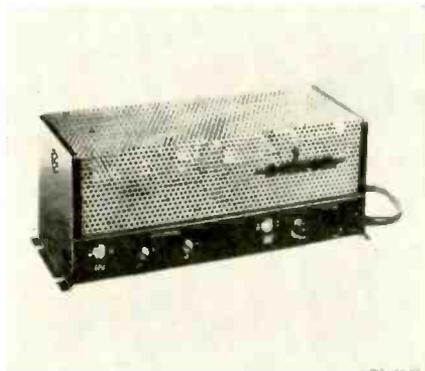
Completely self-contained, the Model 440 tests and rejuvenates b/w and color picture tubes with a heater voltage range from 1 to 12 v., including 110° CRT's with 2.34, 2.68, 6.3 and 8.4 volt filaments. It is reported to check leak-



age, gas content, restore emission, repair inter-element shorts and open circuits in CRT electron guns. Grid cut-off reading indicates picture quality. \$69.95 Net. B&K Mfg. Co., 3726 N. Southport Ave., Chicago 13, Ill. (ELECTRONIC TECHNICIAN 10-32)

### Entron MASTER SYSTEM

Designed for multi-set TV installations, the all-band master amplifier, SA-23, features high output and gain and is provided with antenna filter and filter base for mixing of non-adjacent channels—with excellent isolation. Unit



is equipped with 10,000 hour type 6922 input tubes; gain controls for each band, long life silicon rectifiers and new Tug-Plug quick disconnect fittings. Gain, each band, 38 db. Entron, Inc., Box 287, Bladensburg, Md. (ELECTRONIC TECHNICIAN 10-17)

### Telex BOOM-MIKE HEADSET

Said to be the first Boom-Mike headset to be accepted by the F.A.A., the 3½ ounce dynamic unit is designed for flyers, ham and mobile two-way communications, radio and TV personnel, telephone operators, receptionists and dispatchers. Receivers have a rising response curve at voice range with a uniform frequency response of 50 to 5,000 cps. Carbon, reluctance and crystal microphones are also available. Telex, Inc., Telex Park, St. Paul 1, Minn. (ELECTRONIC TECHNICIAN 10-21)

# THE BIG NEWS FOR 1960

# SYLVANIA 23-INCH TV



•Viewing area 275 square inches. 23-inch picture tube measured diagonally.

Big 23-inch\* picture is the sensation of 1960 that *changes the face of television* . . . and Sylvania scoops the industry with the first complete line.

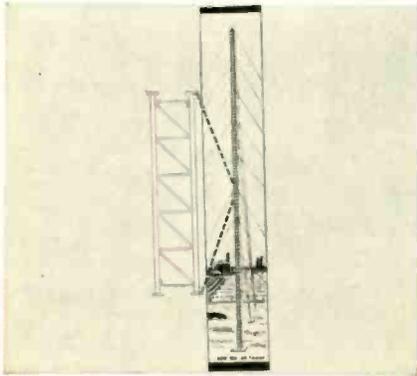
- Square corners of the 23-inch\* bonded shield picture tube pioneered by Sylvania presents more of the TV picture as the camera sees it. New squared shape is closer to the 3 x 4 ratio of the true TV camera raster.
- The 23-inch\* tube flattens the TV screen. "Bonded shield" face-panel eliminates the dust trap, cuts reflections in half, and improves brightness and contrast.
- ◆ New Super HaloLight® is bigger and better than ever. It's a Sylvania exclusive that adds eye comfort to eye appeal.

SYLVANIA 23"\* TV OFFERS THE NEWEST AND  
FINEST FEATURES YOU CAN RECOMMEND

 **SYLVANIA**  
Subsidiary of  
GENERAL TELEPHONE & ELECTRONICS 

### Rohn TOWER

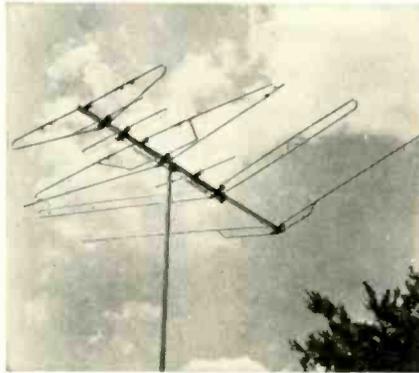
A heavy-duty communication tower, No. 60, utilizes the No. 9 section of another "self-supporting" tower, providing heights up to 630 feet—when properly guyed. For micro-wave radio communications, radio telephone, mili-



tary needs, TV reception and amateur uses, the tower is hot-dipped after fabrication for protection against corrosion. Comes in uniform 10' lengths, facilitating shipping and installation. Rohn Mfg. Co., 116 Limestone, Bellevue, Peoria, Ill. (ELECTRONIC TECHNICIAN 10-20)

### Trio ANTENNA

The all-channel Color Wing TV antenna, Model CW-1, has three active elements, including extended wing dipole, folded dipole and a ratio type high band dipole. It is gold anodized. Other features are: no-strip lead-in connector,



braced reflector elements, quik-lok clamps, dyna-coil phasing and factory assembly. It is said to be accurately phased for highest efficiency on all channels. Trio Mfg. Co., Griggsville, Ill. (ELECTRONIC TECHNICIAN 10-16)

### Heathkit HI-FI AMPLIFIER

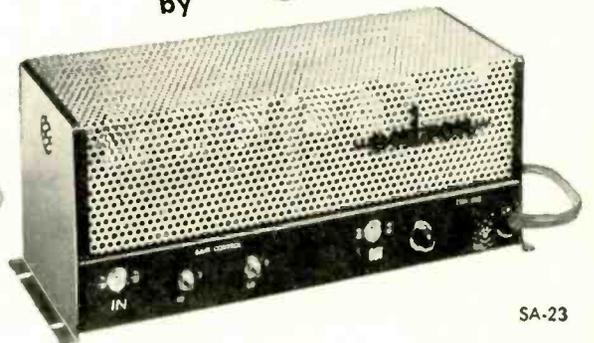
Providing 14 watts of high fidelity power, the EA-3 combines preamplifier and amplifier in one compact unit. Clearly marked controls are as follows: bass "boost," treble "cut," on-off and volume control; switch selection of three separate inputs and knobs with gold inserts. Panel is satin black with brush gold trim strip and cover is black vinyl coated steel. Hum control and neon pilot light are also provided. Price \$29.95. Heath Co., Benton Harbor, Mich. (ELECTRONIC TECHNICIAN 10-13)

### Sonotone CARTRIDGE DISPENSER

Brightly decorated in a gold, white and blue color combination, this cartridge and needle dispenser holds 35 stereo and mono cartridges and 29 jobber-packaged needles. It is designed for stacking for increased capacity, with space for literature or price lists. A supplement to the new handy reference chart, covering all replacement needles, is furnished with the dispenser. The dispenser can stand unsupported on a counter or be fastened to a wall. Sonotone Corp., Elmsford, N.Y. (ELECTRONIC TECHNICIAN 10-22)

# NEW MASTER ANTENNA SYSTEMS EQUIPMENT

FEATURING AN ALL BAND AMPLIFIER



ANTENNA FILTER and FILTER BASE

AF-5



Antenna Filter  
Fixed Tuned Single Channel Design  
Sharp Selectivity

FB-7



Filter Base

Mixes Multiple Antennas  
Designed for Mixing Non-Adjacent Channels in any Combination

SURFACE and FLUSH MOUNTING OUTLETS

OB-700 Series



OP-615



Response Flat from AM thru VHF Bands  
Complete AC Isolation  
Available in 75 and 300 Ohm Plug and 300 Ohm Screw Type

High Power Output • 10,000 Hour Tubes • Long Life Silicon Rectifier • Separate Tilt and Gain Controls for Each Band

The Skill's Built In



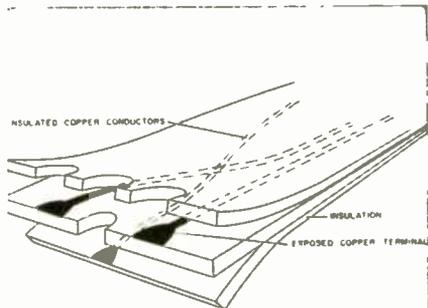
P. O. Box 287 Bladensburg, Maryland  
Appleton 7-9585

For complete information send for Catalog F1102

FREE Send for booklet on Design and Installation of Master Television Antenna Systems

**IRC ETCHED CIRCUITRY**

Custom designed etched circuitry, offers maximum flexibility, less weight and optimum environmental protection. Designed to replace both conventional wiring and rigid printed wiring boards, circuitry is produced in straight cables



or complex wiring patterns. Recommended by the designer for switchboards, computers, aircraft, missiles and other applications. International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa. (ELECTRONIC TECHNICIAN 10-34)

**Semco DIODES**

A new series of small, light weight, high power silicon junction diodes, including 35 w. Zener diodes, provide a high degree of mechanical and electrical stability. Zener voltages range from 8.2 to 100. Rectifier PIV's from 50 to 600



with current ratings to 40 amps. Diodes are reported to have matched coefficients of expansion, preventing separation of internal leads and wafer. U.S. Semiconductor Products, 3540 W. Osborn Road, Phoenix, Ariz. (ELECTRONIC TECHNICIAN 10-24)

**Pickering STYLI**

The Mark 11 "T-Guard" stylus is available in two models: the D3707A for transcription tone arms, 2 to 5 grams tracking force and D3707C for auto-changer arms, 3 to 7 grams tracking force. Respective prices: \$14.40, \$12.00. Both include a 0.7 mil diamond. Both types are said to employ new ruggedized construction and controlled compliance. Models 371 and 196 may be "updated" with this replaceable stylus. Pickering Co., Sunnyside Blvd., Plainview, L.I., N.Y. (ELECTRONIC TECHNICIAN 10-14)

**Polytronics TRANSCEIVER**

The Poly-Comm 4-channel transceiver, for class D operation, offers the choice of 22 newly created 27 mc Citizen Band frequencies. Features include: super sensitive dual conversion 10 tube superhet receiver; rapid acting adjustable vacuum tube squelch circuit; delayed agc; floating series gate type noise limiter; low distortion; communication tailored frequency response and 2 watts of audio output. Choice of 2 dual voltage models. Complete package \$159.50. Polytronics Lab. Inc., 253 Crooks Ave., Clifton, N. J. (ELECTRONIC TECHNICIAN 10-53)



**Transistor Radio Servicing CAN be Highly Profitable**



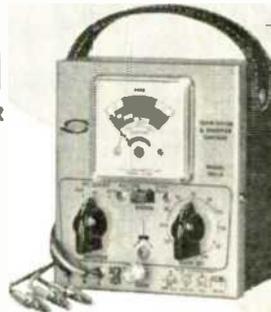
**The ONLY Complete Transistor Radio Service Lab**  
Everything you need for less than \$50



**Check Transistors, Diodes, Rectifiers . . .**

**SENCORE TRC4 TRANSISTOR CHECKER**

Accurately checks all transistors in hearing aids, radios and power transistors in auto radios. Tests for opens, shorts, leakage, current gain. Measures forward-reverse current ratio on all crystal diodes. Measures forward and reverse currents on selenium rectifiers. With set-up chart for accurate checking of each transistor. Size, 5x4 1/2 x 2 1/2". With batteries. DEALER NET..... **17<sup>95</sup>**



**Replace Batteries During Repair . . .**

**SENCORE PS103 BATTERY ELIMINATOR**

All-new "Transi-Pak," twin to TRC4 Checker above. Provides variable DC voltage to 24 volts; 1.5-volt biasing tap (a "must" for servicing Philco and Sylvania radios). Metered current output, to 100 ma. Handles 200-ma peaks. Two 200-mfd electrolytics provide proper filtering and low output impedance. No hum or feedback problems. Ideal for alignment using station signal; adjust 1F slugs for max. current, also ideal for charging nickel-cadmium batteries. Size, 5x4 1/2 x 2 1/2". DEALER NET..... **17<sup>95</sup>**



**Find Defective Stage in a Minute . . .**

**SENCORE HG104 HARMONIC GENERATOR**

New signal generator designed primarily for fast signal-tracing of transistor radio circuits. No need to unsolder all transistors. Provides RF, 1F and audio signals *simultaneously*, drastically cutting service time. Traces from speaker to antenna. Clear 1000 cycle note signal is heard in speaker from all good stages. Signal weakens or stops at defective stage. Equally as effective for testing TV, hi-fi and other audio circuits also. Size, 3 1/2 x 4 1/2 x 1 3/4". With batteries. DEALER NET..... **9<sup>95</sup>**



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ADDISON 2, ILLINOIS



**SHURE** names Robert W. Carr manager of microphone development.

**DUOTONE** packages 24 record cleaning kits in a self-display container.

**PHILCO** franchises MGM record distributors to handle portable phonos and radios.

**SHERWOOD** appoints Anderson Sales, Boston, as New England rep.

**HUDSON PHOTOGRAPHIC INDUSTRIES** introduces a tape splicing kit.

**DYNA-EMPIRE** names Herb Horowitz Director of its Audio Empire division.

**LING-ALTEC** promotes Robert Matrin to vp & general manager, James Ross to vp research, Paul Goodwin to chief engineer.

**SWITCHCRAFT** introduces 7-position multi-speaker selector switch 655 @ \$8.95.

**NATIONAL SONICS** announces the Musicraft Model 120A2 build - it - yourself electronic organ. Prices range from \$661 to \$749.

**ELECTRONIC MEASUREMENTS** announces the EMC Model 214 stereo peramp/amplifier, 14 watts/channel. Kit price is \$68.90; wired \$106.80.

**PRECISION ELECTRONICS** names Buthan Co., Wilmington, N. Carolina, and Al S. Engelman Co., Memphis, as Grommes reps. Also, Bursaw-Cowan as Michigan rep.

**ROBINS INDUSTRIES** announces 4-track tape recorder heads made by **MICHIGAN MAGNETICS**. Model 5Q8 recording head is \$30; 9QE3 erase head is \$14.

**TELECTRO** introduces the TR 555 cartridge tape recorder. It uses 4-track, 1/4" tape, and is transistorized. Measures 11-1/2" x 10" x 6-1/2". Remote control.

**RCA** introduces the Rockland Series 240-KV-77 entertainment center in the \$600-700 range. It features 24" TV plus stereo radio/phono. Also four portable stereo phonos are announced, prices starting at \$39.95.

**HOFFMAN ELECTRONICS** is offering a stereo record changer to convert its Mark 5 TV set to a home sound system. Distributors will get it at a low price. Graybar Electric has been appointed distributor of its TV, radio and hi-fi lines in S. Calif. Location is 720 State St., San Diego.

**GRANCO** reports the results of a survey of 410 radio stations, 237 replying. 59% are broadcasting stereo, 21% plan such broadcasts in the near future. 62% indicated preference for FM/AM simulcast, 36% FM multiplex, and 2% said they would prefer AM multiplex. Public reaction to stereo broadcasts were 24% excellent, 28 good, 48% fair.

# 2X NORMAL OPERATING VOLTAGE +1000

## STANCOR TRANSFORMERS STAND UP!

Every STANCOR iron core transformer gets this breakdown test as a production line operation. To assure you of reliability and safety, each unit is tested for breakdown between windings and to ground—at twice its operating voltage *plus* 1000 volts! STANCOR's thorough testing procedures protect you against failures and call-backs . . . one more reason why experienced technicians everywhere always specify STANCOR.



**CHICAGO STANDARD TRANSFORMER CORPORATION**

3513 ADDISON STREET • CHICAGO 18, ILLINOIS

AMERICAN MICROPHONE announces the D-11 omnidirectional dynamic hand microphone @ \$39.50. Response is 50-11,000 cps, output level -57 db.

CBS ELECTRONICS publishes 8-page phono cartridge cross-reference chart PF-285. It lists 27 CBS-Ronette units which replace over 500 types.

BOZAK publishes 4-page brochure on its new line of equipment cabinets. Brendan C. O'Hara, Philadelphia, has been named Mid-Atlantic rep.

CROSBY ELECTRONICS announces the new Model 360 Madison Fielding stereo control amplifier. It features balancing Aural Zero Null.

ISOPHON SPEAKER div. of Arnhold Ceramics announces a 4-speaker integrated system in 20 and 25 watt ratings. Prices range from \$83 to \$125 with enclosure.

JAMES B. LANSING Pres., William H. Thomas, named 1960 Electronic Industry Show Corp. Pres. Helen Quam, Quam Nichols vp, was named secretary.

ORR INDUSTRIES is showing an original film on the manufacture of recording tape, "Objective: Perfection," in key cities. The documentary, made with Ampex, runs 30 min.

MAGNETIC RECORDING INDUSTRIES announces the Model 10 tape duplicator @ \$4,950. It operates at 30 ips, makes 3 copies simultaneously. Loads 3600' of tape.

PRICE TRENDS, courtesy Audio-File div., United File-O-Matic: GE amplifiers MS-2000, -4000 & -4010 decreased to \$129.95, \$169.95 & \$169.95. ALTEC LANSING enclosures 607A-B & 611B-C, speaker system 710A discontinued. PILOT Model 1240 decreased to \$589.50. LEAK increases Stereo 50 amplifier to \$119. ASTATIC decreases cartridges 91T, 91TX & 93TX to \$2.37, \$5.97 & \$5.97.

NOBLES ENGINEERING, St. PAUL, MINN., introduces transistorized stereo components - preamplifier, 15 watt/channel amplifier and AM-FM multiplex tuner. Components will also be available in package units.

STEREO EXPOSED! "The Great Stereo-Phony Swindle" is the title of a misinformed article in the September issue of that famed guardian of the public welfare, Confidential magazine.

PICKERING announces Sept. 1 price reductions made possible by new manufacturing methods. Model 196 unipoise arm and integrated Fluxvalve pickup is now \$49.50; 371A MK II cartridge \$26.40; 371C MK II for changer arms \$24.

NORELCO announces the Continental 400 4-track stereo tape recorder @ \$399.50. It offers 3 speeds, s/n 55 db, wow & flutter 0.15% @ 7-1/2 ips, crosstalk 55 db.  
(Continued on page 83)

*Servicemen!* **SAVE TIME...SUBSTITUTE THE SENCORE WAY**

**The Fastest, Surest Method Known!**

**Substitute for Capacitors, Resistors**  
**SENCORE H-36—THE "HANDY 36"**  
 36 most-often-needed resistors and capacitors, for fast, easy, direct substitution in all circuits. • Eliminates searching for replacement components for test purposes. • Avoids unnecessary unsoldering and soldering—no more solder mess. • Pays for itself the first month in time saved. • Flick of a switch instantly selects any one of . . .  
 24 RESISTORS from 10 ohms to 5.6 megohms  
 10 CAPACITORS from 100 mmfd to .5 mfd  
 2 ELECTROLYTICS, 10 mfd and 40 mfd  
**DEALER NET..... 12<sup>95</sup>**

**Substitute for Electrolytic Capacitors**  
**SENCORE ES102 ELECTRO-SUB**  
*Usable from 2 to 450 volts, D.C.*  
 Contains 10 electrolytics from 4 to 350 mfd. Select the correct value with the flick of a switch. Features automatic discharge, surge protector circuit. Prevents accidental "healing" of capacitor being bridged. Completely safe—no arc or spark when connecting or disconnecting. **DEALER NET..... 15<sup>95</sup>**

**Substitute for Fuse Resistors During Repair**  
**SENCORE FS3 "FUSE-SAFE" CIRCUIT TESTER**  
 Instantly tells you whether or not it is safe to replace fuse resistors, fuses, or circuit breakers. Separate red and green scale for each commercially available fuse resistor used in radio and TV. Eliminates guesswork and wasted time. Also handy for wattage checks up to 1100 watts. **DEALER NET..... 8<sup>95</sup>**

**Substitute for Bias Batteries During Repair**  
**SENCORE BE3 "ALIGN-O-PAK"**  
 Completely isolated DC supply, with less than 0.1% ripple. Eliminates messy batteries in TV service work. Handy for alignment, AGC trouble-shooting, or checking gated sync circuits. Just dial the voltage you need, 0-18 volts, positive or negative. Covers all voltages recommended by TV set manufacturers. Size, 3 1/2 x 4 1/2 x 1 3/4". For 110-120 volts, 60 cycle AC. **DEALER NET..... 7<sup>85</sup>**

**UNIVERSAL TV JUMPER CORD**  
 Fits any set from back to chassis. Box has male and female plugs for additional power source, soldering, etc. **DEALER NET 1<sup>95</sup>**






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**SENCORE**

ADDISON 2, ILLINOIS

## Channel Master HI-FI

A complete line of five hi-fi components is being offered exclusively on a two-step basis. That is, the manufacturer sells through the distributor to the service dealer, who resells to the public. Distributors do not sell directly to the consumer.

Most recently announced component is the Model 6652 4-speed professional turntable with transcription tone arm @ \$64.95 audiophile net. Model 6653 with wood base and factory wired plugs is \$79.95. Spare plug-in head Model 6654 is \$3.25. Features



Model 6653 turntable

include built-in strobe, shielded 4-pole motor, stylus gauge and arm rest shut-off.

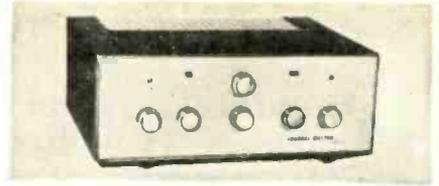
Model 6600 stereo amplifier @ \$99.95 is rated at 16 watts/channel, response 20 to 30,000 cps  $\pm 1$  db @ 1 watt, phono hum and noise 60 db below 10 mv at full output, and distortion less than 1%. Model 6608 wood and 6609 metal cabinets are available.

Model 6610 AM/FM tuner @ \$84.95 features 2  $\mu$ v FM sensitivity for 20 db quieting, 300 kc selectivity, 20 to 20,000 cps response  $\pm 1$  db, hum 60 db below 100% modulation, afc and agc. Walnut and metal cabinets available.

Model 6620 20-watt mono amplifier @ \$79.95 offers 20 to 20,000 cps response  $\pm 0.5$  db at 1 watt, phono hum and noise 55 db below 10 mv at full output, distortion is less than 1%.

Minstrel speaker system 6630 (walnut), 6631 (mahogany) and 6632 (blonde) are priced @ \$29.95. Using a new "acoustic transformer" principle, this compact unit only 9" x 9" x 16" is reported ideal for space saving stereo installations.

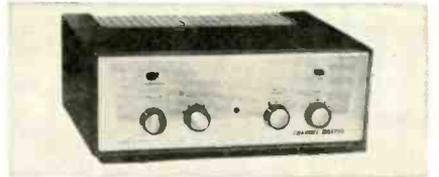
Channel Master Corp., Ellenville, N. Y. (ELECTRONIC TECHNICIAN 10-60)



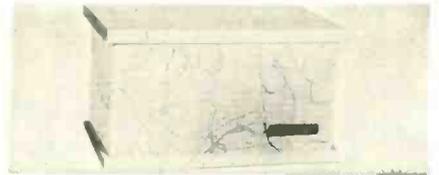
Model 6600 stereo amplifier



Model 6610 FM/AM tuner



Model 6620 mono amplifier



Minstrel speaker system

**CHEMTRONICS' TUN-O-LUBE**  
with MIRACLE ACTIVATED CLEANER TC-3  
cleans and lubricates all tuners and  
provides longer lasting protective film.  
FREE "Spray Aid" and "Wall Mount" with  
every 8 oz. can. See your distributor.  
CHEMTRONICS INC., Brooklyn 25, N. Y.



**Here's a Bargain!**

**SPECIAL OFFER!**

**VACO**

**Nut Driver—  
Voltage Checker & Probe  
Utility Set**

*you get*

Two New Design VACO Nut Drivers (1/4" and 11/32")  
Plus Brand New Voltage  
Checker & Probe

**A \$2.50 Value  
Only \$1.79 Net**



You'll find a hundred uses for this probe. It's a voltage checker, electric tester, etc. Full instructions included.

**GET ACQUAINTED OFFER:** We make this unique offer for a LIMITED time only to acquaint you with VACO'S beautiful new line of Nut Drivers with full polished chrome shafts, colored-for-size handles and extra hard sockets that WON'T round out. Get your set, today!

See Your Parts Jobber or Write

**VACO PRODUCTS COMPANY, 317 E. Ontario St. Chicago 11, Illinois**  
In Canada: Atlas Radio Corp., Toronto 19, Ontario

(Continued from page 81)

THOMPSON RAMO WOOLDRIDGE acquires BEL CANTO STEREO-PHONIC RECORDINGS. TRW is the parent company of BELL SOUND.

ADMIRAL will market a line of phono needles for universal replacement. Wall chart and cross reference lists more than 300 needles.

BELL SOUND appoints new reps: George Fass, metropolitan N.Y., and Hetherington Sales for New England. Company recently entered package-component field.

HARMAN-KARDON. New stereo amplifier The Lute, Model A220 is a 20-watt stereo amplifier with dual preamps and two 10-watt channels on one chassis, complete with cage.

HEATH introduces new hi-fi products. Stereo preamp/amplifier kit SA-2 is rated at 14 watts channel. Similarly rated SA-1 is also announced. The company also states it is the sole kit licensee of ACOUSTIC RESEARCH, and is offering the AS-2 acoustic suspension speaker with prefinished, assembled cabinet.

JAPAN exported to the U.S. 1974 phonos costing \$59,830 in 1958, reports Television Digest. For the first quarter of 1959, the figure has already risen to 1820 phonos costing \$43,209. Total retail value of all our electronic imports from Japan in the first quarter of 1959 is estimated at \$24-\$32 million, most of it transistor radios.

1960 HIGH FIDELITY MUSIC SHOW schedule for the West Coast has been announced by IHFM. In San Francisco it will be held Jan. 26th-Feb. 2nd in 90,000 sq. ft. Brooks Hall. It will be an open show, with large rooms and wide aisles. In Los Angeles it will be the Pan Pacific Auditorium, Feb. 9th-16th. Dates are tentative. These are the only Institute shows in the area.

JENSEN MFG. breaks ground for a new engineering building to provide 10,000 sq. ft. of acoustical lab facilities, including a 33,000 cu. ft. anechoic chamber.

MARANTZ introduces Model 8 dual 30-watt stereo power amplifier, featuring metered adjustment to assure output tube balance without matching tubes. \$237.00.

CONLEY ELECTRONICS, Skokie, Ill., franchises COLLINS RADIO for the use and sale of Fidelipac one-reel tape magazines in the broadcast station field.

BLONDER - TONGUE'S Audio Baton is being used by radio station WNTA, New York. This 9-octave tone control is billed as the "Listening Man's Filter."

# Check TUBES, VIBRATORS THE SENCORE WAY



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

## SENCORE LC3 LEAKAGE CHECKER

Whips those "tough dog" tube troubles . . .

Ask any serviceman who owns one . . . or try one for just one day of servicing in your shop. You'll see for yourself how much time the LC3 can save you. Checks for leakage between all elements, whether caused by gas, grid emission or foreign particles. Also checks leakage on all capacitors with voltage applied—including electrolytics. Provides instant filament checks in "Fil-Check" position—no need for a second filament checker. One spare pre-heating socket and new roll chart prevent obsolescence. New charts provided—no charge. Leakage sensitivity; 100 megohms, control grid to all other elements; 50,000 ohms, heater to cathode. Size, 7x6x3½". Wt., 3 lbs. For 110-120 volts, 60 cycle AC. DEALER NET **28<sup>95</sup>**



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

NEW . . . replaceable Roll Chart prevents obsolescence.

Check Filaments of All Receiving Tubes and Picture Tubes



## FC4 FILAMENT CHECKER

For fast, easy checking of all tube filaments, without pulling chassis. Neon light goes out if tube filament is good. Also acts as continuity and voltage tester. Neon lamp glows when 115 v. AC is applied by cheater cord, providing a check on power to TV set. Size, 3½x4x1". **2<sup>95</sup>** With leads. DEALER NET.....

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



## VB2 "VIBRA-DAPTOR"

Plugs into any tube checker; ideal for use with LC3 above. To check 6-v. vibrators, set for 6AX4 or 6SN7; for 12-v. vibrators, set for 12AX4 or 12SN7. Two No. 51 lamps indicate whether vibrator needs replacing. Instructions on front panel. Steel case. Size, 1½x1½x3". **2<sup>75</sup>** DEALER NET.....

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# SENCORE

ADDISON 2, ILLINOIS

# 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  $\frac{3}{32}$ ",  $\frac{1}{8}$ ",  $\frac{3}{16}$ ",  $\frac{1}{4}$ ",  $\frac{5}{32}$ " 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 • Anaheim, Cal., Newark 5, New Jersey, Brantford, Canada

**"IT TAKES TWO TO STEREO" \***



... the perfect team for stereo!  
For matchless reproduction of stereo recordings

- the Model 196 UNIPOISE Arm  
with integrated Stanton Stereo FLUXVALVE pickup  
and the GYROPOISE 800 airborne Stereotable.

Only the Stanton Stereo FLUXVALVE  
has the exclusive "T-GUARD" stylus assembly  
with the parallel reproducing element so important for stereo . . .  
only the GYROPOISE Stereotable revolves on a bearing-of-air  
— in magnetic suspension . . .

only the Stereo FLUXVALVE is warranted for a lifetime.  
In plain truth, here is more to enjoy —  
from both stereophonic and monophonic records.

Fine quality high fidelity products  
by PICKERING & Co., Inc., Plainview, N. Y.



FOR THOSE WHO CAN HEAR THE DIFFERENCE

# Pickering

FLUXVALVE, GYROPOISE, STEREO TABLE, "T-GUARD", UNIPOISE ©

NEWLY REVISED — "IT TAKES TWO TO STEREO" — Address Dept. M-109 For Your Free Copy

### Aerotron 2-WAY RADIO

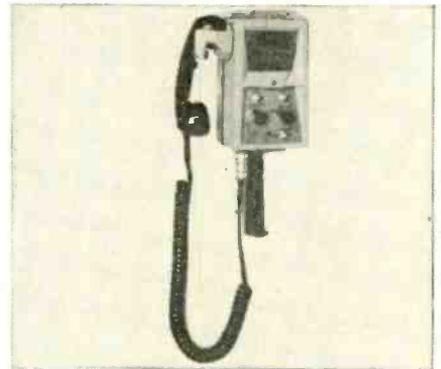
Model 6N15 VHF-FM 2-way radio, designed for either mobile or base station use, has a chassis of only 8½" x 11". It is claimed to utilize tubes and circuits that have been perfected for TV and radar. Features include: a cascode r-f amplifier; push-pull r-f power



amplifier and an exclusive filter to reject off-frequency signals. Operates on 6 v. or 12 v. d-c, or on 115 v. a-c, without modification. Aeronautical Electronics, Inc., Raleigh-Durham Airport, Raleigh, N. C. (ELECTRONIC TECHNICIAN 10-42)

### Bendix CONTROL UNIT

The 8CA mobile control unit, for railroad communications equipment, consists of a 4-position, adjustable stop channel selector switch; an "L" pad volume control; a transmit indicator lamp and a 4-inch speaker. A handset hanger and receptacle are provided to



accommodate a telephone-type handset. Available in models providing automatic channel reverting and/or transistorized tone generator for use with Bendix CRC systems. Bendix Radio Div., Baltimore 4, Md. (ELECTRONIC TECHNICIAN 10-43)

### Gregory AUTO ALARM

A new foolproof police auto alarm can be easily and quickly installed under the hood as a protection against automobile thievery. It can be installed on any automobile with either 6 or 12 volt systems and provides low-cost insurance against theft for technicians repairing car radios. \$14.95. Gregory Sales Co., 316 Marion Bldg., Cleveland 13, Ohio. (ELECTRONIC TECHNICIAN 10-45)



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## New Books

Book marked with an asterisk (\*) may be obtained prepaid from Electronic Marketers, Book Sales Division of Electronic Technician

**\*ELECTRONIC COMPONENTS HANDBOOK, Vol. III.** Prepared by Wright Air Development Center. Published by McGraw-Hill Book Co. 190 pages, hard cover. \$10.00.

Intended primarily for design engineers, this volume contains much data of value to the advanced industrial electronic maintenance technician and field engineer. The six chapters cover transformers, connectors, wire, terminals and hardware. Circuits, cut-away drawings and performance charts detail the technical aspects of the various components. The accent is on reliability and the requirements of military specifications.

**BASIC ELECTRONIC TEST PROCEDURES.** By Rufus P. Turner. Published by Rinehart & Co., Inc., 232 Madison Ave., New York, N.Y. 316 pages, hard cover. \$6.50.

The methods used to test various electronic devices should be as familiar as the alphabet to the technician. Among the topics covered in 18 chapters, are meters; RLC measurements; AF & RF measurements; phase, impedance and power measurements; audio tests; semiconductor tests; receiver and transformer tests; and industrial electronic measurements. In each case, the appropriate test instrument and its required hookup is presented. No doubt all technicians will find helpful data in this book.

**\*101 WAYS TO USE YOUR SIGNAL GENERATOR.** By Robert G. Middleton. Published by Howard W. Sams & Co. 123 pages, soft cover. \$2.00.

Prolific writer-technician Bob Middleton, has come up with a fine collection of brief explanations on how to use the generator for various tests. Twenty-five equipment checks are presented, seven antenna tests, 27 AM-FM receiver tests, 28 TV tests, 10 component tests, and four miscellaneous. Each description briefly lists the required equipment connections, procedure and evaluation of results. No doubt this volume will be useful around the shop.

**UNDERSTANDING TRANSISTORS.** By Milton S. Kiver. Published by Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill. 64 pages, soft cover. 50¢.

This handy little book offers a goodly amount of information on transistor fundamentals. Of particular interest are the explanations of the different types of transistors—PNP, alloy junction, drift, tetrode, etc.—and the circuits in which they operate. A section is devoted to Knight transistor kits and the circuits they employ. With increasing transistorization, this should prove a welcome book.

## COMING IN NOVEMBER MASTER RECEIVING TUBE SUBSTITUTION GUIDEBOOK

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### TV SERVICING

- REPAIRING TELEVISION RECEIVERS** By Cyrus Glickstein, #191.....\$4.40
- HOW TO LOCATE AND ELIMINATE RADIO & TV INTERFERENCE** by Fred D. Rowe, #158.....\$1.80
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By Rider Lab Staff  
Fabulous series of definitive, practical books that teach recognition of faults in TV receivers.
- VOL. 1: HORIZONTAL AFC-OSCILLATOR CIRCUITS**, #168, 80pp.....\$1.35
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- VOL. 7: SOUND CIRCUITS & L-V POWER SUPPLIES**, #168-7, 64pp.....\$1.50
- TV PICTURE TUBE-CHASSIS GUIDE** By Rider Lab Staff, #204.....\$1.35
- HOW TO INSTALL TV ANTENNAS** By Samuel L. Marshall, #172.....\$2.50
- ADVANCED TELEVISION SERVICING TECHNIQUES** By Zbar & Schildkraut  
MAIN TEXT, #161.....\$3.60
- LABORATORY WORKBOOK**, #161-2.....\$ .95
- HOW TO TROUBLESHOOT A TV RECEIVER** By J. Richard Johnson (2nd edition), #152.....\$2.50
- SERVICING TV VERTICAL AND HORIZONTAL OUTPUT SYSTEMS** By Harry Thomas, #150.....\$2.40

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### TEST EQUIPMENT

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- HOW TO USE TEST PROBES** By A. Ghirardi & R. Middleton, #165.....\$2.99
- OBTAINING INTERPRETING TEST SCOPE TRACES** By John F. Rider, #146.....\$2.40
- HOW TO USE SIGNAL & SWEEP GENERATORS** By J. Richard Johnson, #147.....\$2.10

### RADIO SERVICING

- RADIO RECEIVER LABORATORY MANUAL** By Alex W. Levey, #178.....\$2.00

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**\*PHOTOTUBES** By Alexander Schure. Published by John F. Rider Publisher. 96 pages, soft cover. \$1.80.

Photoelectric devices have become increasingly important in electronic control equipment. This well written volume provides an excellent basis for understanding the theory and operation of the photo element. After covering fundamentals and photoemissivity theory, the text goes into photo tubes, both vacuum and gas filled, as well as photo tube amplifiers. Review questions at the end of each chapter are instructive. This book is well recommended.

**\*FREQUENCY RESPONSE FOR PROCESS CONTROL.** Edited by W. Caldwell, G. Coon, L. Zoss. Published by McGraw-Hill Book Co. 395 pages, hard cover. \$11.50.

For the engineer and advanced technician familiar with control systems, this book offers a considerable amount of data. The theory covers such subjects as linear lag, quadratic factor and control loops. Applications include computing, dynamic testing, temperature measurement and control systems. This advanced book is to be recommended for those having a background in the subject matter.

**\*HOW TO INSTALL AND SERVICE AUTO RADIOS** (2nd Ed.). By Jack Darr. Published by John F. Rider Publisher. 160 pages, soft cover. \$3.25.

This 2nd edition of a most practical book offers much information on the techniques for installing and servicing auto radios. The author, a practicing technician, has included many useful tricks of the trade. A considerable amount of data has been added to that included in the first edition. Transistorized and hybrid radios and 6-12 volt conversions are explained. Auto radio repair can be a most profitable operation, and this book gets the highest recommendation for technicians interested in this field.

**\*BASIC AUDIO** (3 Vols.). By Norman Crowhurst. Published by John F. Rider Publisher. 368 pages, soft cover. \$2.90 per volume, \$8.70 per 3-volume set. Hard cover, in single binding, \$9.95.

Much interest has been focused on audio, both high fidelity and commercial sound. This fundamental reference is one of the best published to date, combining the authoritative knowledge of an author who is perhaps the leading audio writer, and the easy-to-understand picture book technique so successfully employed in previous Rider books. Volume I covers acoustics, mikes, speakers, impedance matching and networks. Volume II explains amplification, coupling, distortion, response and circuit performance. Volume III examines feedback, power supplies, shielding, transmission lines, oscillators, recording and, very briefly, stereo. If you want a solid education in audio, and a good basic reference, these are three volumes to get.

FOR

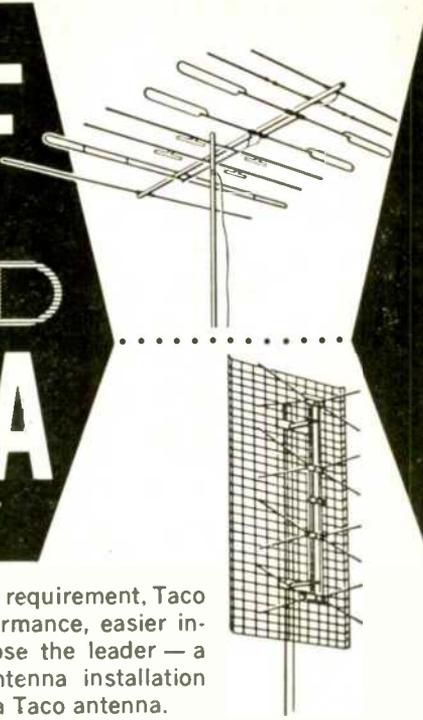
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## Association News

(Continued from page 62)

### New York

ESFETAN, Albany, reports that MVRTTG, New Hartford, is gaining tremendous recognition, public acceptance and a sudden influx of membership applications due to TV station WKTV Channel 2 announcing to viewers at least ten times a day, to call their regular TV man or MVRTTG for TV service.

### Pennsylvania

FRTSA, Harrisburg, is reported to have filed a "demand" to NBC for equal time to answer alleged charges and insults made against the service industry on the Jack Paar TV Show, Aug. 11.

### Texas

TEA, San Antonio, states in SARTA News that the new 3% state tax law, "although intended to bring in additional revenue . . . will do more to 'clean up' the radio-TV business than anything else. . . ." A meeting was held for all TV dealers, technicians and distributors with Albert Brown, Comptroller's office Chief Clerk on hand to explain the new law.

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For faster accurate servicing, the ARKAY VT-10 VTVM has exclusive larger 6-INCH meter, edge-lighted, for easier reading, 400 ua meter movement within 2% accuracy. 1% precision multiplier resistors are used throughout the range switch. There are 7 AC (RMS) and DC ranges, 0 to 1500 volts; also 7 AC (peak-to-peak) ranges, 0 to 2000 volts. Resistance of 0 to 1000 megohms, db and other essential ranges also included. Circuitry features 12AU7 for DC ranges, 6A15 for AC, meter diodes rectifiers, and transformer operated selenium rectifier. Handsome durable plastic case. A sensational quality buy, unmatched at this price!

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## Transistor Test Circuits

(Continued from page 45)

Generally speaking though, the aforementioned constants will detect a defective transistor, since its product will indicate the usual current limit that a good transistor can have. The leakage scale is determined in this instrument by multiplying the average beta by maximum  $I_{co}$  at 6 volts (reversed) @ 25° centigrade. A chart containing the proper instrument settings for individual transistors is included with the instrument.

### Gain

Fig. 5 shows the circuit used to check beta or current gain. The circuit shown is connected for low power PNP transistors. For testing NPN transistors, the battery polarities would merely be reversed. This operation is effected by the selector switch. For testing high power transistors, the range switch is set to the high power position and the circuit constants in the checker are changed for higher current operation.

The circuit is connected for grounded emitter operation. Note, that before the gain button is pushed, it is the same basic circuit for checking leakage shown in Fig. 4. When the gain button is pushed, a base biasing current will flow through the 47K resistor. The magnitude of base current is controlled with the gain potentiometer. It is adjusted to produce a collector current of 1.5 ma for mid-scale readings of low-power transistors. For high-power transistors, the base resistor is switched to a 1K resistor and the meter mid-scale current requirement is then 50 ma. This is necessary, since power transistors require higher current values.

In order to obtain the correct setting for mid-scale readings, the manufacturer must consider the collector current requirements for high and low power transistors, and the beta factor. For example, a low-power transistor with a beta rating of 50 would require 1.5 ma divided by 50 and therefore 30  $\mu$ a. Consequently, the voltage setting of the gain control is the product of 30 $\mu$ a

and the 47K resistor switched into the circuit for low-power transistors. The result, 1.41 volts, is then divided by the 6 volts from the battery to determine the ratio. Since the gain control is calibrated in 100 divisions, multiplying the ratio of 1.41 over six by 100 will fix the setting of the control's indicator as 24. Gain settings for high-power transistors are figured in the same manner, using the 1K base resistor and 50 ma factors.

The beta figure used in determining the gain scale is the average beta as specified by the manufacturer of

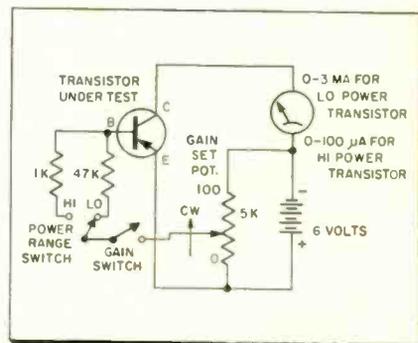


Fig. 5—Hi and lo-power transistors may be tested for gain through using two meter sensitivities and different resistor values. A gain pot determines the correct setting.

the transistor. Since transistor beta variations are quite large the "acceptable" area on the indicating scale has been widened  $\pm 20\%$  to include these variations. The areas to the left and right are labeled low gain and high gain. The test set-up, of course, is taken from the data chart supplied with the instrument.

### Diodes

The checker tests diodes and rectifiers by establishing a ten to one forward-to-back ratio as passable. Anything under this ratio is rejected. The test leads are connected to the emitter and collector leads of the diode and the gain test button is depressed. The meter, reading reverse current, will indicate whether it is good or bad.

Transistors, physically more rugged than vacuum tubes, have some frailties of their own. They are susceptible to damage by surpassing their maximum ratings, and by heat. Although their failure rate is not as great as vacuum tubes, they do have

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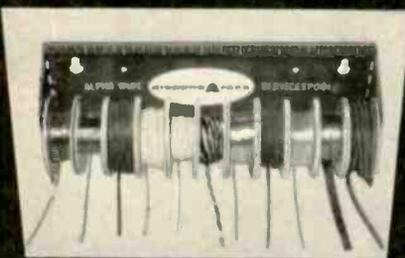
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**STACK 'EM . . .** build them up, back to back, side by side

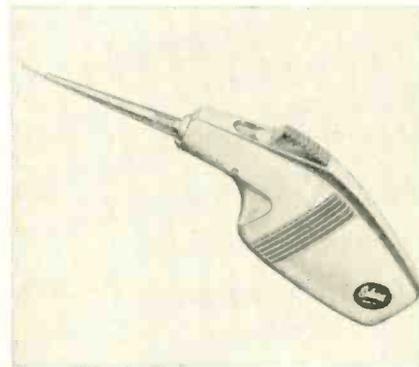
**MOUNT 'EM . . .** on a bench, on a wall, on a peg board, under a bench

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their share of "breakdowns." To locate defective transistors, a technician must have a means of checking them. This need is intensified because most technicians do not maintain an ample replacement stock of transistors and crystal diodes. Therefore, substitutions are rarely possible. Consequently, an accurate, self-contained transistor checker, chosen to fit the individual technician's needs, will be advantageous when checking transistorized portables, auto radios, et al. •

### Int'l Electronic Research TOOL

A new precision-made, metal hand tool for ejector-feeding of wire solder speeds and simplifies soldering applications, particularly in deep chassis and crowded, difficult-to-reach wiring locations. Solder is control-ejected to the proper amount required, by a fingertip



operated, knurled control. Backup pressure for the solder at point of application is provided by a probe tip. The unit contains a supply of wire solder sufficient for several hours, plus all working parts. International Electronic Research Corp., 145 W. Magnolia Blvd., Burbank, Calif. (ELECTRONIC TECHNICIAN 10-37)

### RCA OSCILLOSCOPE

The new portable 3" oscilloscope, model RCA WO-33A, features module-type construction, excellent gain and bandwidth, and graph screen scaled directly in peak-to-peak volts for all ranges. On narrow-band position for the vertical amplifier, it has a sensitivity of 3 mv (rms) per inch and a bandwidth within -3 db of 20 cps to 150 kc. On wide-band position, it has a sensitivity of 100 mv (rms) per inch and a bandwidth within -3 db of 5.5 cps to 5.5 mc. Available in kit or in factory-wired. Radio Corp. of America, Electron Tube Division, Harrison, N. J. (ELECTRONIC TECHNICIAN 10-38)

### TUBE PROBLEM:

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# New Products

For more information, write in ELECTRONIC TECHNICIAN'S new product code number on coupon on page 54.

### Simpson VOM

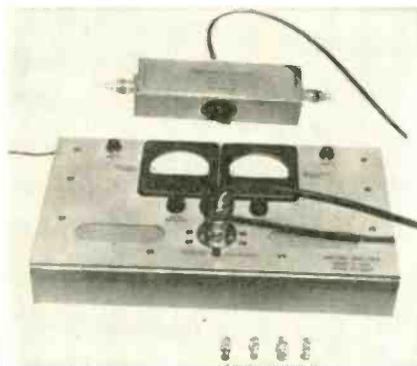
Self powered, Model 270 VOM, includes all the features of its predecessor Model 260, plus a mirror scale, 1/2% resistors, gold bonded diodes, polarity switch and knife edge pointer. It is said to offer a predictable accuracy



over a wide temperature range: 67 to 87° F, with d-c accuracy of 1 1/2% full scale at 77 degrees F. Complete with leads and manual, \$65.95. Simpson Electric Co., 5200 W. Kinzie St., Chicago, Ill. (ELECTRONIC TECHNICIAN 10-31)

### Haydu ANTENNA ANALYZER

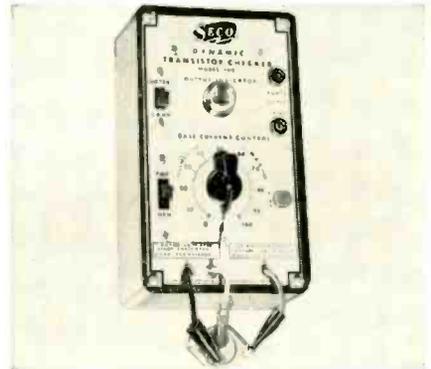
Model B-3-58 consists of a directional coupler, 8" x 2 1/2" x 2", and a double d-c amplifier, 12" x 7" x 2", containing meters that display incident and reflected power directly. It is furnished complete with metering cables, coaxial adapters, spare fuses and spare tubes.



It insures perfect matching of antennas and feeder lines; operates from 3 to 260 mc with powers up to 1 kw, and does not alter the characteristic impedance of the line nor cause major insertion losses. Haydu Industries, Inc., 1426 W. Front St., Plainfield, N. J. (ELECTRONIC TECHNICIAN 10-46)

### Seco TRANSISTOR CHECKER

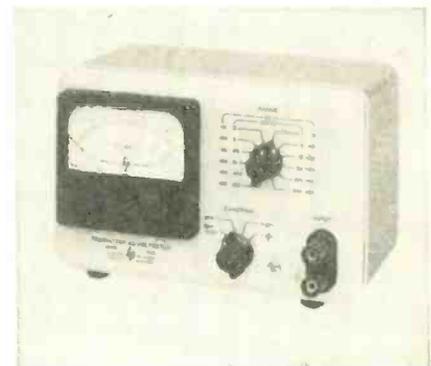
A new self powered, dynamic transistor checker, Model 100, automatically identifies and checks PNP, NPN models; and tests a wide range of other types. Unit is equipped with jacks for an a-c voltmeter, scope, or audio/visual ampli-



fier as output indicators for sensitive noise tests, studying dynamic leakage distribution, or waveform inspection. Battery, leads and clips are included. \$19.95. Seco Mfg. Co., 5015 Penn Ave., South, Minneapolis, Minn. (ELECTRONIC TECHNICIAN 10-30)

### H-P VOLTMETER

Model 403A transistorized a-c voltmeter has a frequency range of 1 cps to 1 mc. It measures a-c voltages from 1 mv to 300 volts with an accuracy of ± 3% 5 cps to 500 kc and ± 5% 1 to 5 cps and 500 kc to 1 mc. The instrument has 12 voltage ranges and also



reads db from -72 to ± 52 db. The low frequency limit of 1 cps make it particularly useful in measuring sub-audio voltages. Battery life is 400 hours, equal to 6 months of average use. Hewlett-Packard Co., 275 Page Mill Rd., Palo Alto, Calif. (ELECTRONIC TECHNICIAN 10-47)

# REPLACEMENT SPEAKERS

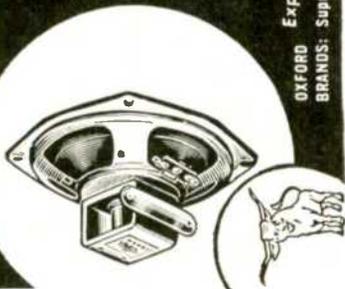
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## Catalogs & Bulletins

(Continued from page 28)

**TEST INSTRUMENTS:** A new 12-page Catalog Digest groups specifications and descriptions under such headings as: spectrum analyzers, tracing systems; single sideband analyzers; RF-VHF-UHF and telemetering spectrum analyzers. Panoramic Radio Products, Inc., 520 S. Fulton Ave., Mt. Vernon, N.Y. (ELECTRONIC TECHNICIAN B10-6)

**STORAGE BATTERIES:** A new, illustrated, pocket-size, 36-page handbook provides technical instructions and engineering data on the care of motive power storage batteries. It covers theory, operation and maintenance. Ask for GB-1896 "Instructions & Maintenance Data." Gould-National Batteries, Inc. Industrial Div., Trenton 7, N.J. (ELECTRONIC TECHNICIAN B10-4)

**AUTOMOTIVE SIGNAL FLASHERS:** The new 1960 Flasher Catalog, AF-20, provides 16 pages of information on all standard and special automotive turn signal flashers, brake light indicators, special flashers and emergency warning units. Application notes, typical circuit diagrams and electrical and mechanical specifications for flashers now in use are included. Installation notes and servicing information aid the service technician. Tung-Sol Electric Inc., 1 Summer Ave., Newark 4, N.J. (ELECTRONIC TECHNICIAN B10-10)

### TI GATED RECTIFIER

A new line of ruggedized controlled P-N-P-N four layer diffused silicon rectifiers is expected to be widely used in regulated power supplies, reversing and light dimming devices, surge voltage suppression, latching relays and other applications. Designated TI Type-130 Series, the device uses a third lead as a "gate" to control current passing through the unit and will "fire" with a current of 5 ma. Texas Instruments, Inc., Box 312, Dallas, Texas. (ELECTRONIC TECHNICIAN 10-28)

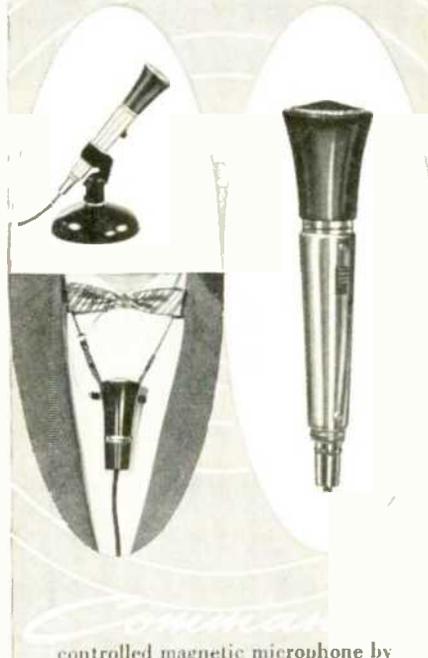
### ITT SILICON RECTIFIERS

Three very high power diffused silicon rectifiers, known as "N", "S" and "M," are rated at 150 amps to 600 v PIV; 250 a 600 v and 400 a 400 v, respectively. For use in motors, magnets, batterychargers and electroplating equipment. Also added to the line are two selenium cells, ITT 45 and ITT 2X, rated at 45 and 26 volts, respectively. These units enable the manufacture of small, light rectifier stacks. International Telephone & Telegraph Corp., Components Div., Clifton, N. J. (ELECTRONIC TECHNICIAN 10-26)

For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 54.

## FOR P. A. OR TAPE

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controlled magnetic microphone by

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Striking, streamlined unit delivers fine voice and music reproduction in dozens of public address and home recording applications. Whether used indoors or out, in-the-hand, or on a desk or floor stand, you'll be impressed by its fine response, high output, ruggedness and beauty of design. The Commando offers you such important features as dual impedance, on-off switch, and cable connector. Patented controlled magnetic construction is unaffected by extremes of temperature and humidity, can be depended on to maintain high level of quality through tough, sustained usage, year after year.

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A high impedance unit with A25 swivel adapter  
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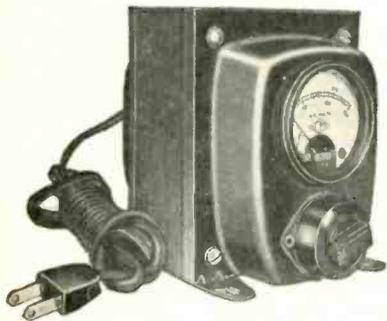
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8810 WATER STREET, CUBA, NEW YORK

**Acme Electric**  
TRANSFORMERS

## Stroboscope

(Continued from page 48)

slightly lower than the frequency at which the body is vibrated. Next, the difference signals are separated by a low-pass filter or a square law detector. When the outputs from this process are displayed on an indicator, such as an oscilloscope, the vibration pattern can be readily seen for a given phase. As the body vibration frequency is changed, the reference signal changes a corresponding amount, so that the difference signal remains at the same frequency.

To make a bar-type trace on the oscilloscope instead of a sine wave, a transistor was used as an emitter follower and d-c rectifier. An output transistor was used to invert the negative signals.

By varying the frequency of the vibration of the body, and the positions of the pickups on the vibrating body, a complete analysis can be made of the vibration characteristics of the body.

Flashing lights can be used for the display, and when properly positioned in space, they can give a three-dimensional representation of vibration. A recorder can be connected to the output channels. When a recorder of limited dynamic response is used, the difference frequency can be chosen to suit the recorder.

A voltmeter can be used to read the absolute value of the motion, if desired. To do this, the signal from a given pickup is fed into the voltmeter from a T-connector at the input to its mixer channel. However, the vibration analyzer is more useful for exploring than for routine measuring.

The analyzer is most useful in helping to visualize the varied motion patterns of a complex structure, or in determining the interactions among the varied motions.

This device should simplify gathering of data from any periodic process in which the amplitude and phase relations of changes are important. The characteristics of the pickups are only limited to the vibration amplitudes that can be studied by this method; and by simply changing the oscillator, frequencies of any range can be analyzed. ●



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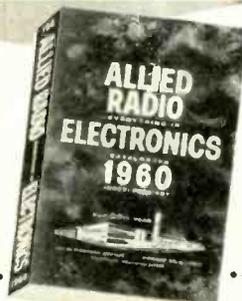
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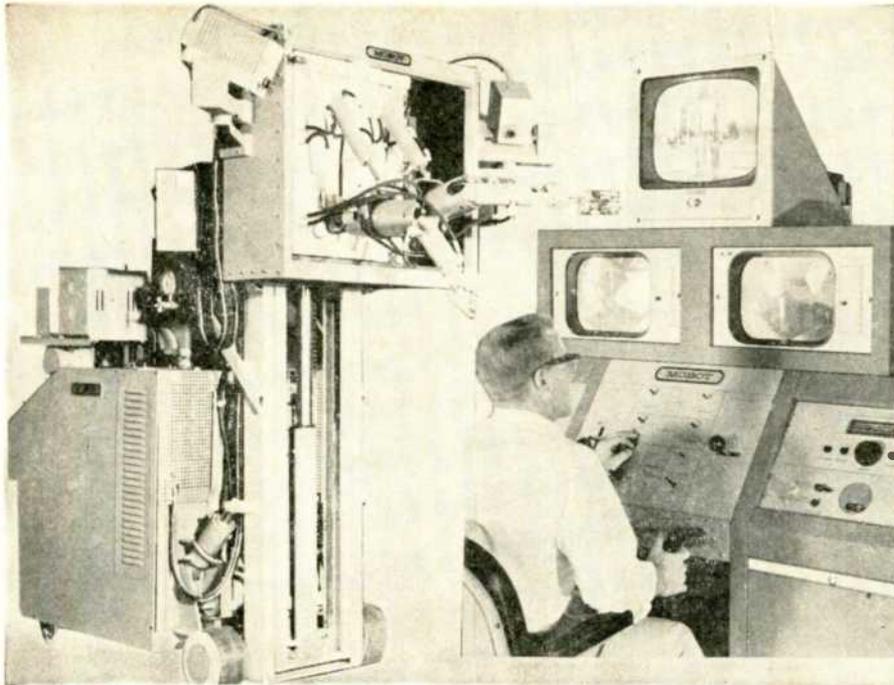


Fig. 1—Mobot Mark 1, humanized robot, does work in atomic lab "hot areas" not possible for human beings. Picks up and places radioactive items in desired position; operates lathes, drills, soldering irons, and sweeps up radioactive debris. Shown also is operator's console used to direct Mobot, including TV monitors for observing its actions.

## Robot-Type Unit Replaces Man

• "Man's replacement for man" has finally emerged from science-fiction and horror stories to become a reality. The substitute, shown in Fig. 1, is called the Mobot Mark I and resembles a tractor rather than a humanized robot.

Developed by Hughes Aircraft Company's nuclear electronics lab, the Mobot will work for its employer, the Sandia Corp., contractor to the Atomic Energy Commission, under circumstances that would endanger a human being's life.

The new employee will work in Sandia's new underground reactor facility, scheduled for 1960 completion. Its prime "responsibilities" will encompass finding, lifting, placing and inverting operations in radiation labs. The Mobot's work area includes a 5,000,000 watts nuclear reactor that is behind dense concrete walls whose entrance door alone weighs half-million pounds.

The Mobot's present capabilities include picking up radioactive items and moving them to a desired spot, using tools such as lathes, drills, soldering irons, electric socket

wrenches, sweeping up radioactive debris, etc.

Mobot Mark I is a remote operated, mobile mechanism that has its own battery and dc-motor, with automatic trickle charging of the battery. A triaxial cable 200 feet long transmits signals and 7.5 kva power from an operator's control console. Two remote-controlled TV "eyes" are provided to enable the human operator to see just what is being done. The TV cameras have separate provision for tilt, focus and 270° pan. In addition, a microphone mounted on the assembly permits the operator to hear. Handling arms are hydraulically operated and capable of lifting 150 pounds. A lifting hook is provided on the lift mechanism to handle weights up to 1500 pounds.

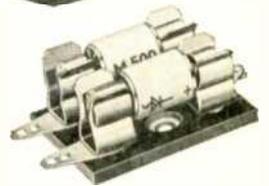
The mobile assembly weighs approximately 4500 pounds and is 84" high, 36" wide and 96" long with arms extended. It is expected that other units will be built according to the specific job they will accomplish. Future possibilities include units that can work in fire, under water, outer space, etc. •

## Tarzian Offers You A Complete Range of Silicon Rectifier Mounting Types

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OR THIS...



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OR THIS...

F4

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## Webster POWER CONVERTERS

Model 2D12, shown, is one of two units in a new line of transistorized power converters for use with receivers and low powered transmitters in mobile equipment. Input, 12.6 v. d-c, 3 amps for max output. Output, 250 v. at 100 ma continuous from -22°F. to 122°F. 50 ma max at 158°F. Regulation, less than 10% at full load. Ripple, less



than 0.1% at full load. Efficiency, 75% full load. Mounting, 3" x 4½" punched base for mounting in any position. Model 2D12 (12 v. to 250 v. d-c) weighs 12 oz. and is 2" deep x 4½" long. Model 2D11 (12 v. to 500 v. d-c) weighs 3½ lbs. and is 4¾" x 4" x 8". Webster Electric Co., 1900 Clark St., Racine, Wis. (ELECTRONIC TECHNICIAN 10-48)

## G-C WIRE STRIPPER

A new precision made tool, the "Strip-Er-Clip", will strip and clip all wire from 14 to 26 gauge. Equipped with a seven-stop gauge that adjusts instantly to the correct wire size and prevents wire damage. The entire unit is made of heat-treated steel with specially treated cutting edges. A heavy insulator grip provides comfort and safety, with the jaws streamlined for use in cramped quarters. \$2.30. General Cement Mfg. Co., 400 S. Wyman St., Rockford, Ill. (ELECTRONIC TECHNICIAN 10-49)

## EMC SIGNAL TRACER

Model 802 is a combination signal tracer and generator. In the absence of a signal, it generates its own signal for audio, i-f or r-f testing. Features include: a noise locator circuit; magic eye tube and a speaker. It can be used as a substitute speaker or amplifier. It is transformer operated. Supplied with r-f crystal demodulator probe and two audio probes. \$38.95 wired. \$24.95 kit. Electronic Measurements Corp., 625 Broadway, New York 12, N. Y. (ELECTRONIC TECHNICIAN 10-50)

For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 54.

## Interference-Free

## Glass Panel

• A new glass lighting panel, manufactured by Corning Glass Works, is said to eliminate high frequency interference radiated by fluorescent lamps. This development should be of particular importance to hospitals and research labs where delicate electronic equipment is adversely affected by high frequency radiation.

Called the "E-C No. 70" Low Brightness Lens Panel, it is specially treated to serve as a grounding shield and is reported to transmit 75% of the light waves. The shield is made by permanently fusing one side of the glass with a thin, transparent electrically-conductive film. The shield coating intercepts the radiated interference which is then grounded

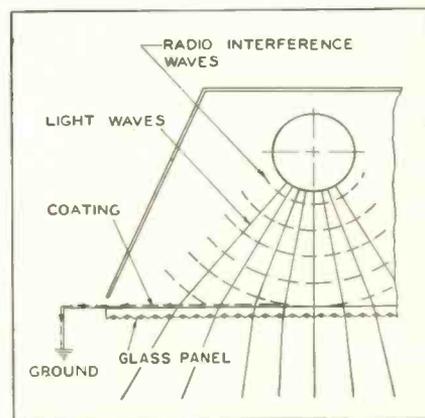


Fig. 1—Radio frequency interference emanating from fluorescent lamps are intercepted by a special coating, allowing only the light waves to pass through the glass panel.

through a ¼ inch wide silver strip around the edge of the glass, as shown in Fig. 1.

The glass face of the panel will not statically attract dust and can be cleaned with a damp cloth. The conductive coating will not rub off since it is permanently fired to the back surface of the glass. Other features are: heat-resistant glass, optically engineered for accurate control of direct and reflected light, and light-weight.

The fixture is further reported to meet military specifications as radio interference free and Underwriters' Lab requirements for a single 24" by 48" panel, permitting 1100 square inches of exposed area. •



# Olson



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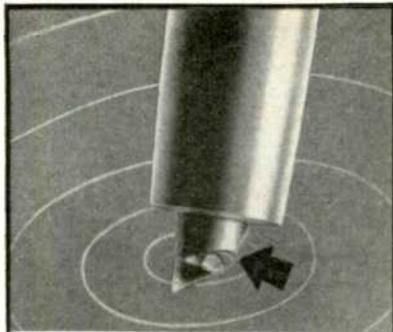
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### FROM ONE WHO LEARNED

This enlargement shows a diamond-chip needle sent us by a disappointed user, who learned all diamond needles are not O.K. Shows what happens if a heat bubble forms when a chip is welded on. Can't happen with a Duotone Needle that uses only the *whole* diamond set deep in the metal shank.



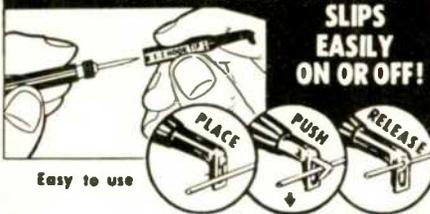
*Insist on Duotone. Be sure. Duotone's whole diamond can't break off.*

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*"that remembers"*  
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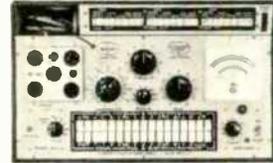
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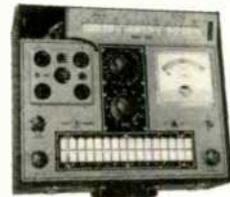
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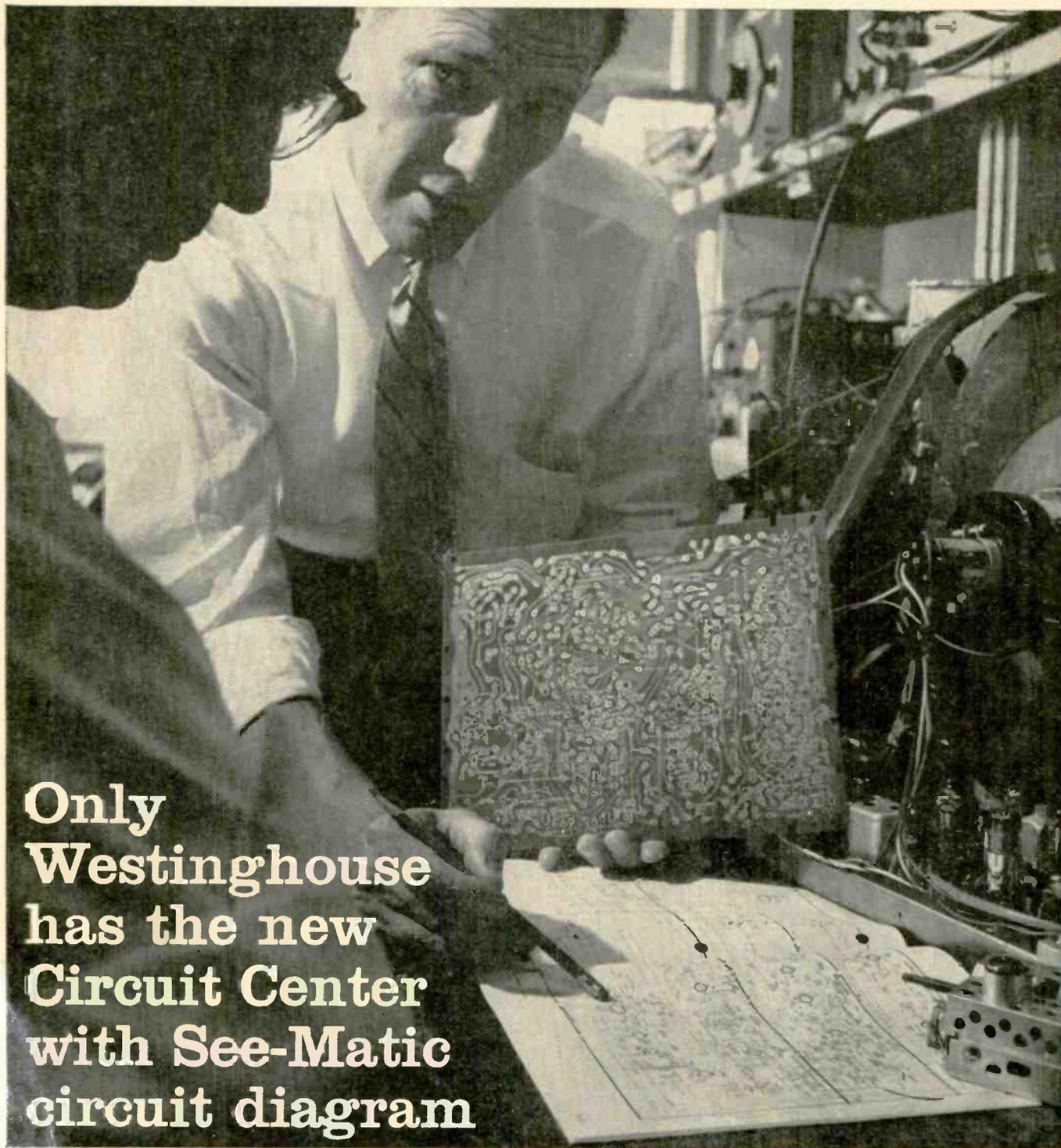


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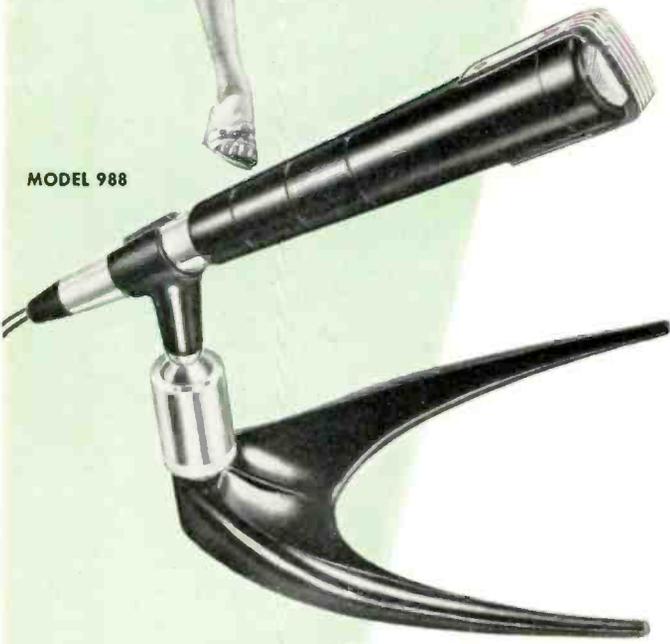
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MODEL 888



MODEL 788



Model No.	Type	Response	Output	Impedance	Finish and Trim	Price
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988	Omni-Directional	40-20,000 cps	-58 DB	50, 150, 250	Black and Gold	150.00

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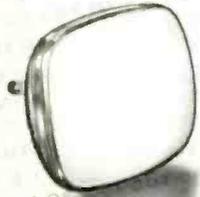
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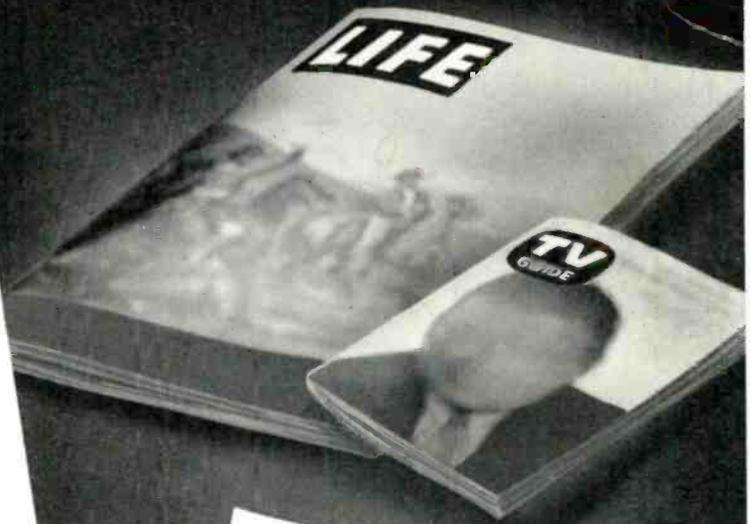
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Let's face it—when you have to replace your TV picture tube, it means a sizeable investment. Doesn't it make sense, then, to be sure that the tube you get is *all-new*? That's why you should bear in mind: of the 3 largest-selling brands of replacement TV picture tubes, only 1...RCA...offers you a line of completely all-new tubes...RCA Silverama!

**With RCA, you know what you're getting!**

RCA guarantees that each and every Silverama picture tube is all-new, totally new...new glass, new phosphor, new gun, new everything...and gives you the added assurance of a full-year warranty.

If your TV picture tube needs replacing, guarantee yourself the clearest, sharpest picture possible—insist on an RCA Silverama. There's one to fit virtually every make and model TV set. Ask your TV technician for complete information and prices.

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