

ELECTRONIC TECHNICIAN

Including 16 pages of
Circuit Digests

A J DIGLIO
94 SLEEPING GIANT DR
HAMDEN 18 CONN
TNS-59N AI 7E45B



STEREO!

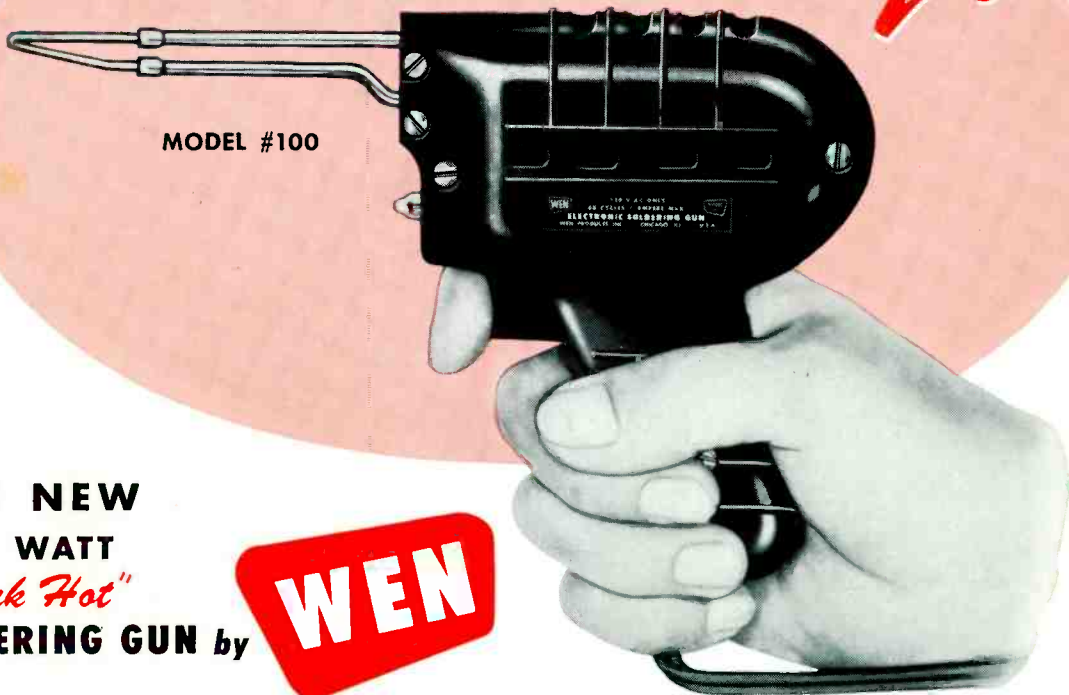
50¢

March • 1958

**SERVICE MAN — SALESMAN — DEALER — JOBBER
HOME WORKSHOPPER — PROFESSIONAL REPAIRMAN**

THEY ALL SAY

It's a Honey!



**THIS NEW
100 WATT
"Quick Hot"
SOLDERING GUN by**



This lowest priced electronic soldering gun on record has other exclusive features that would make it preferred regardless of price.

- It's smaller, slimmer, more compact — beautifully balanced — handy as your hand.
- It's lighter — weighs only 19 ounces. Doesn't tire you.
- Heats in 3 seconds on ordinary 110-120 Volt AC, 60 cycle.
- Cools quickly too when trigger is released.
- Has automatic spotlight that's focused on the tip.
- Has long reach, long life soldering tips that are replaceable and interchangeable with hot-cutting or flat iron finish-repair tips.
- Sturdy, ebony black plastic handle and housing are heat and impact resistant.

**And only
\$5.95
LIST**

IDEAL FOR 90% OF ALL YOUR SOLDERING REQUIREMENTS

OTHER WEN POWER TOOL LEADERS



**\$29.95
LIST**

**2 SPEED
3/8" POWER DRILL**

1000-3000 RPM as needed, on 120 Volt AC/DC. Speed change quick, positive. Provides just the right speeds for different jobs. Geared Jacobs chuck. All you need in an electric drill in this 1 tool. With attachments — it is a whole work shop.



**\$29.95
LIST**

**8 SAWS IN 1
POWER SAW**

Has no equal. Cuts almost anything smoothly, swiftly — 2 x 4's in seconds, 1/2" steel, plastics, conduits. Cuts circles, scrolls, dovetails, straight lines or angles. Makes own starting holes. Blows sawdust off guide lines. 3 blades, coarse, medium, fine. Operates on 110-120 Volt AC/DC.

WEN



PRODUCTS, INC. 5808 NORTHWEST HIGHWAY, CHICAGO 31, ILL.

(Export sales, Scheel International, Inc., Chicago)

ALL WEN PRODUCTS ARE SUPERBLY MADE — U.L. APPROVED — FULLY GUARANTEED

ELECTRONIC TECHNICIAN

Including
Circuit Digests

TELEVISION • ELECTRONIC • RADIO • INDUSTRIAL

AUDIO

March, 1958

ALBERT J. FORMAN *Editor*
ROBERT CORNELL *Technical Editor*
B. V. SPINETTA *Assistant Editor*
C. F. DREYER *Consultant Art Director*
PAT DRUMM *Editorial Assistant*

Address all mail to
480 Lexington Ave., New York 17, N. Y.
Telephone PLaza 9-7880

BUSINESS DEPARTMENT

H. A. REED *General Sales Manager*
Wm. B. ZURKAN *Regional Manager*
N. McALLISTER *Production Manager*
M. RAMSAY *Accounting Supervisor*
M. RUBIN *Circulation Manager*
S. LA MACCHIA *Asst. Circulation Mgr.*
P. H. DEMPERS *Regional Manager*
5010 Howard St., Skokie, Ill.
Telephone ORchard 5-1355

CHRIS DUNKLE & ASSOCIATES
California Representative
740 S. Western Ave., Los Angeles 5, Calif.
Telephone DUmkirk 7-6149

J. KIMBALL *Manager*
420 Market St., San Francisco 11, Calif.
Telephone DOUglas 2-9183

BERNIE EDSTROM *Regional Manager*
2169 Eldred Ave., Cleveland 7, Ohio
Telephone LAkewood 1-7900



ELECTRONIC TECHNICIAN & Circuit Digests, March, 1958. Vol. 67, No. 3. \$5.00 a copy. Published monthly by Electronic Technician, Inc. Publication office, Emmett St., Bristol, Conn. Editorial, advertising and executive offices, 480 Lexington Avenue, New York 17. Telephone PLaza 9-7880.

Entered as second class matter at the Post Office at Bristol, Conn., June 10, 1954. Subscription rates: United States and Canada, \$4.00 for one year; \$6.00 for two years; \$8.00 for three years. Pan-American and foreign countries: \$7.00 for one year; \$10.00 for two years; \$14.00 for three years. Copyright 1958 by Electronic Technician, Inc., New York. M. Clements, Board Chairman; H. Reed, President; A. Forman, Executive Vice-President. Title registered in U. S. Patent Office. Reproduction or reprinting prohibited except by written authorization of publisher. Printed in U.S.A. by Hildreth Press.

FRONT COVER This is the year stereophonic hi-fi will become a commercial reality, offering technicians opportunities for equipment sales and monaural-to-stereo conversions. Cover design shows single needle picking up two channels from single-groove disc. Sound comes through two speakers in background. See article starting on page 28.

FEATURES and ARTICLES

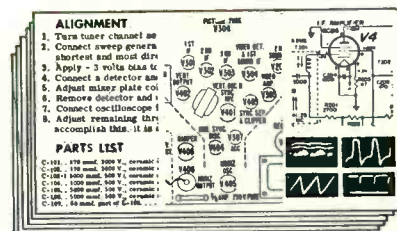
The Swing to Hi-Fi (Editorial)	25
"Tuning in the Picture"	26
Hi-Fi Stereo in Single Groove Discs	N. H. Crowhurst 28
Stereo Sidelights	30
"Tough Dog" Corner	D. Jones, C. R. Maduell, Jr. 31
Debugging TV Alignment with Proper Test Equipment	R. G. Middleton 32
Report on Stereo Cartridges	35
Radio Telemetering for Industry	A. Lytel 36
Current Surge Protection for Silicon Rectifiers	38
Shop Hints	R. Eldridge, J. McRoberts 39
New Audio Products	40
Free Literature	41
Latest Test Equipment	42
New Products for Technicians	43
New Components & Tubes	44
New Antennas & Accessories	46
Measuring the Standard Ampere	52
Pocket-Radio Signaling	W. Strack 64
Characteristics of Printed Circuit Panels	66

DEPARTMENTS

Editor's Memo	4	Catalogs & Bulletins	48
Letters to the Editor	8	Audio Newsletter	50
News of the Industry	17	New Books	55
Reps. & Distrs.	23	New Products	58
Calendar of Coming Events	27	Association News	60

CIRCUIT DIGESTS

73



NOW! Mr. Service Dealer

PHILCO announces

the 1958 Philco power-packed

"PLUS 10"

BATTERY PROGRAM

for Plus Profits for you!



**NOW, MR. DEALER GET UP TO
10% OFF ON EVERY PHILCO
PORTABLE BATTERY YOU BUY!**

Plus

**A BEAUTIFUL
PHILCO BATTERY
COUNTER DISPLAY!**

**Yours free with your
battery order. Make up
your own package with
batteries you use every day.**

This attractive battery counter display is designed to take up minimum counter space. Shows off a wide variety of batteries. Acts as a silent salesman in your store.



FREE

**with your order
of \$75⁰⁰ (or more) in
Philco Batteries**

Plus 11 Sensational Free Offers!

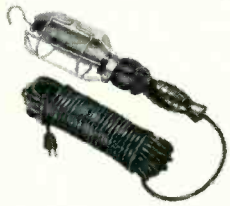
Select the items you want from the sensational
free offers illustrated on the opposite page.
Yours free with your Philco Battery Order!

LOOK AT THESE FREE OFFERS

(These in addition to the special portable battery discount.)

Select any combination of premiums you want!

FREE OFFER NO. **1**



\$3.50 VALUE

50 foot heavy duty extension cord and protected utility light. Yours with every \$35.00 battery purchase.

FREE OFFER NO. **2**



\$3.50 VALUE

Flashing lantern and big powerful searchlight, complete with battery. When you buy \$35.00 worth of batteries.

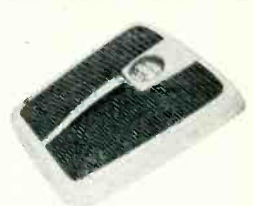
FREE OFFER NO. **3**



\$3.50 VALUE

Six 2-cell prefocused flashlights finished in gleaming chrome. With \$35.00 worth of power packed batteries.

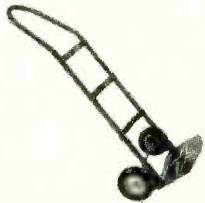
FREE OFFER NO. **4**



\$7.50 VALUE

"Pace" deluxe bathroom scale with magnified dial. When you order \$75.00 worth of Philco batteries.

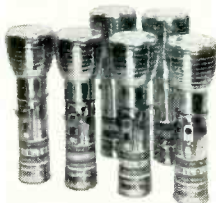
FREE OFFER NO. **5**



\$7.50 VALUE

Heavy duty hand truck . . . A must in every service shop. Holds up to 500 lbs. With \$75.00 worth of batteries.

FREE OFFER NO. **6**



\$7.50 VALUE

Six tri-color beam flashlights for normal use and for safety signalling. Takes only \$75.00 worth of Philco batteries.

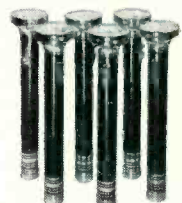
FREE OFFER NO. **7**



\$7.50 VALUE

Rugged "Buckeye" all-steel utility steps. Rubber treads and seat. With your order for \$75.00 in batteries.

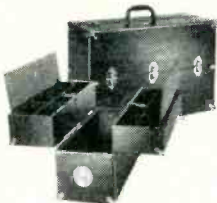
FREE OFFER NO. **8**



\$7.50 VALUE

Six 5-cell powerful flashlights with prefocused spotlight for distances up to 1500'. Yours with \$75.00 worth of batteries.

FREE OFFER NO. **9**



\$19.95 VALUE

Philco deluxe tube caddy that carries up to 250 tubes. When you buy only \$200.00 worth of batteries.

FREE OFFER NO. **10**



\$19.95 VALUE

Stanley executive tool set with selected Stanley highest quality tools. When you buy \$200.00 in batteries.

FREE OFFER NO. **11**



\$19.95 VALUE

"Luxo" lamp. Perfect glare-free illumination. Fully adjustable. Only \$200.00 worth of batteries and it's yours.

See your Philco Distributor or mail this Coupon now!



PHILCO
Accessory Division

WORLD'S LARGEST DISTRIBUTOR OF

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



Philco Corporation
Accessory Division
Attn: Carl Areschoug
Philadelphia 34, Penna.

I would like more information on Philco's Power Packed "Plus 10" Battery Program.

NAME.....

ADDRESS.....

CITY.....ZONE.....STATE.....

In 1958, 60% of all
electronic equipment will
be **TRANSISTORIZED!***



You can't stay in business
without an instrument like **THIS!**

The **NEW** *PRECISION* **MODEL 960**
TRANSISTOR and Crystal Diode TESTER

The new Model 960 has been specifically engineered by **PRECISION** to be the answer to industrial and service-maintenance requirements for a reliable, comprehensive, portable transistor tester at a sensible price.

Designed in accordance with the recommendations of leading transistor manufacturers, the 960 is the only semiconductor tester in its price class which gives you comprehensive tests for I_{cbo} , gain, leakage, shorts, etc., on low, medium and high-power transistors of both the p-n-p and n-p-n types, as well as the new tetrode transistors.

Comprehensive! Complete! Self-contained! \$89⁰⁰
No batteries used or required! . . . and only

MODEL 960 SPECIFICATIONS:

- ▶ **DIRECT I_{cbo} READINGS** in terms of true collector current, on wide-angle $5\frac{1}{2}''$, 100 microampere sensitivity PACE meter.
- ▶ **FIVE I_{cbo} RANGES** cover all types of transistors — low, medium and high power.
- ▶ **WIDE RANGE OF COLLECTOR POTENTIALS:** .5 volts DC to 100 volts DC — 17 selected steps.
- ▶ **DIRECT-READING GAIN RANGES:** Employs five separate injection currents for low, medium and high power types.
- ▶ **LEAKAGE:** Reliable check of emitter collector leakage current provides basis for accurate gain tests.
- ▶ **CRYSTAL DIODE TESTS:** 17 selected DC voltages for reverse current tests. Also provides separate forward tests.
- ▶ **ALL TRANSISTOR TEST SETTINGS** listed on high speed roller chart.
- ▶ **PATCHCORD ELEMENT SELECTOR SYSTEM** provides for accommodation of future semiconductor releases.

MODEL 960: in portable, well-constructed, covered carrying case with accessory compartment; etched, satin-finished, 3 color aluminum panel. Case Dimensions: 18" x 10½" x 6¼".

* CALDWELL-CLEMENTS

PRECISION Apparatus Company, Inc.

70-31 84th Street, Glendale 27, Long Island, New York

Export: Marhan Exporting Corp., 458 Broadway, New York 13, N.Y., U.S.A.
Canada: Atlas Radio Corp., Ltd., 30 Wingold Ave., Toronto 10, Ontario



Available and on display at all leading electronic parts distributors.
Write for new descriptive catalog—it's packed with useful information!

**Editor's
Memo**



It's amazing how much of our lives revolve around personalities. I refer not only to human personalities—that goes without saying—but to business personalities as well.

Market researchers call a firm's business personality the "company image," which is the mental picture conjured up when people think of that particular company.

One firm may be viewed quite differently by one person than another, but definite trends do exist. For example, it's not unusual for the majority of people interviewed to call a certain company generous, lazy or unfriendly—all personality words.

Make no mistake about it: Your own servicing operation has a personality, and it affects your income. The equipment you display, the way you greet customers, even the color your walls are painted help sway a customer's unsupported opinion that you are honest, reliable, friendly or not.

It's no joke about the paint color. Irritating, clashing colors make customers feel uncomfortable, perhaps unconsciously, and they will take it out on you. Coupled with other factors, such a shop might be thought of as: "It's a good place, but something about it annoys me."

Products have personalities, or brand images, too. Look at the ads in this issue. Note how the use of headlines, color, text and art work create the feeling that some are more conservative, others more lively, etc.

Magazines have personalities. There are specific ways of creating the desired personality effects in publishing. In our case, here's what we do. We try to look like the well-dressed man by using original and artistic covers. We try to be generous by publishing more editorial pages than anyone else in the field. We try to be practical by selecting articles and schematics of real use to technicians. We try to be lively and alert by picking up controversial topics when we can be helpful. We try to have a sense of humor with our cartoons, though we shy away from bosom gags in print.

Of course, one man's meat is another man's poison. A few readers (0.01% of the total, to be exact) have let me know that our personality is lousy.

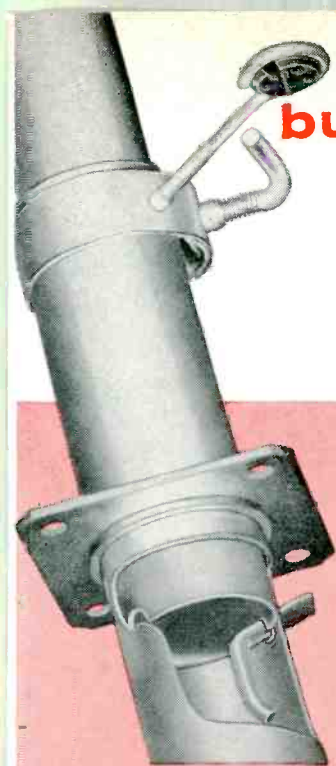
So keep an eye on your business personality. Sometimes you become so close to it that it's hard to see the flaws. Psychoanalysis anybody?

Al Forman

ELECTRONIC TECHNICIAN • March, 1958

build your **PRESTIGE** and **PROFITS** with

CHANNEL MASTER ACCESSORIES



Channel Master masting is made of finest quality high carbon steel

CHANNEL MASTER REDUCES ALL MASTING PRICES!

Only Channel Master can bring you top quality masting at the lowest possible prices . . . because only Channel Master manufactures telescoping masts in its own steel tubing mill.

- Prices for Channel Master telescoping and straight-length masting are the lowest on the market.
- Telescoping masting line now fully assembled — and costs far less than previous non-assembled masts.

Cut your Costs . . . Boost your Profits — Call your Channel Master distributor now.

Cash-In On Channel Master's Consumer Popularity! Feature these top-quality accessories bearing the nationally advertised Channel Master name.



MOUNTS



COUPLERS



**STANDOUT
INSULATORS**



GUY WIRE



Only
**CHANNEL
MASTER**
offers
you this

"SUPERMARKET" VARIETY of TV WIRE

Your choice of 37 models... 14 different types... of VHF, UHF, and Rotor Wires

- NEW! JUMBO TRANSMISSION WIRE — extra heavy-duty 170/18 and 155/20 wire.
- NEW! "SUPER FOAM" TRANSMISSION WIRE — superb-quality foam poly insulation.

When you feature Channel Master you have the widest selection of TV wire . . . plus premium quality for longer life and better performance — at no extra cost. That's why . . .

**"Live Wire" Dealers
use Channel Master Exclusively**

Copyright 1968 Channel Master Corp.

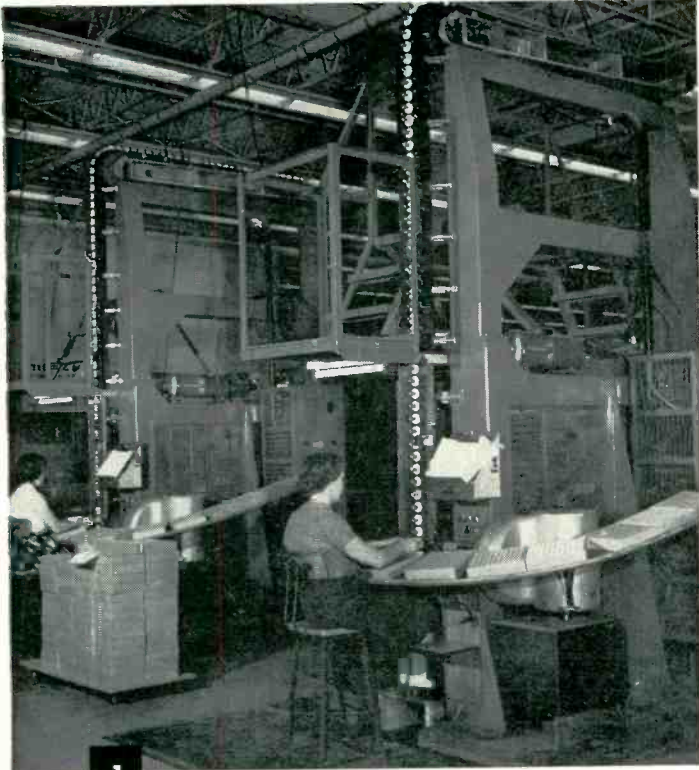


CHANNEL MASTER CORP.

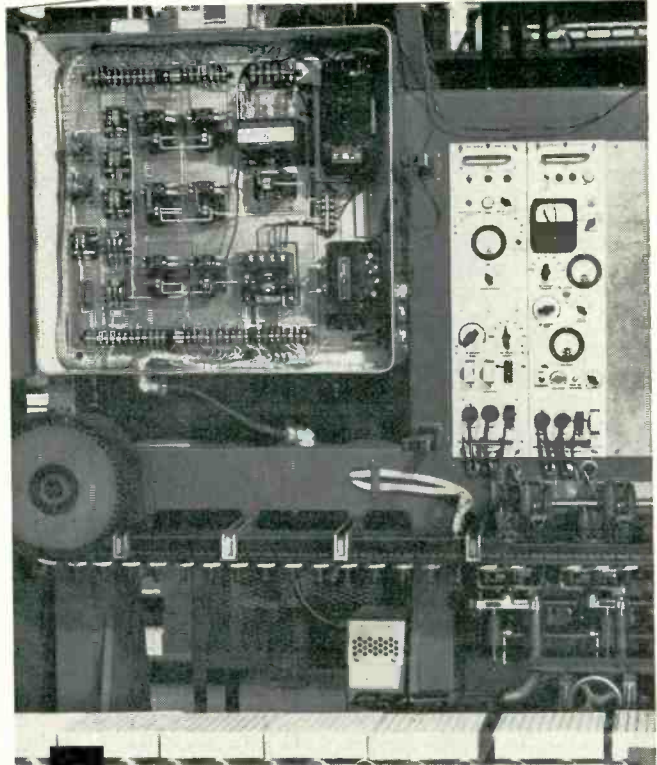
ELLENVILLE, N. Y.
WORLD'S LARGEST MANUFACTURER OF TV ANTENNAS AND ACCESSORIES



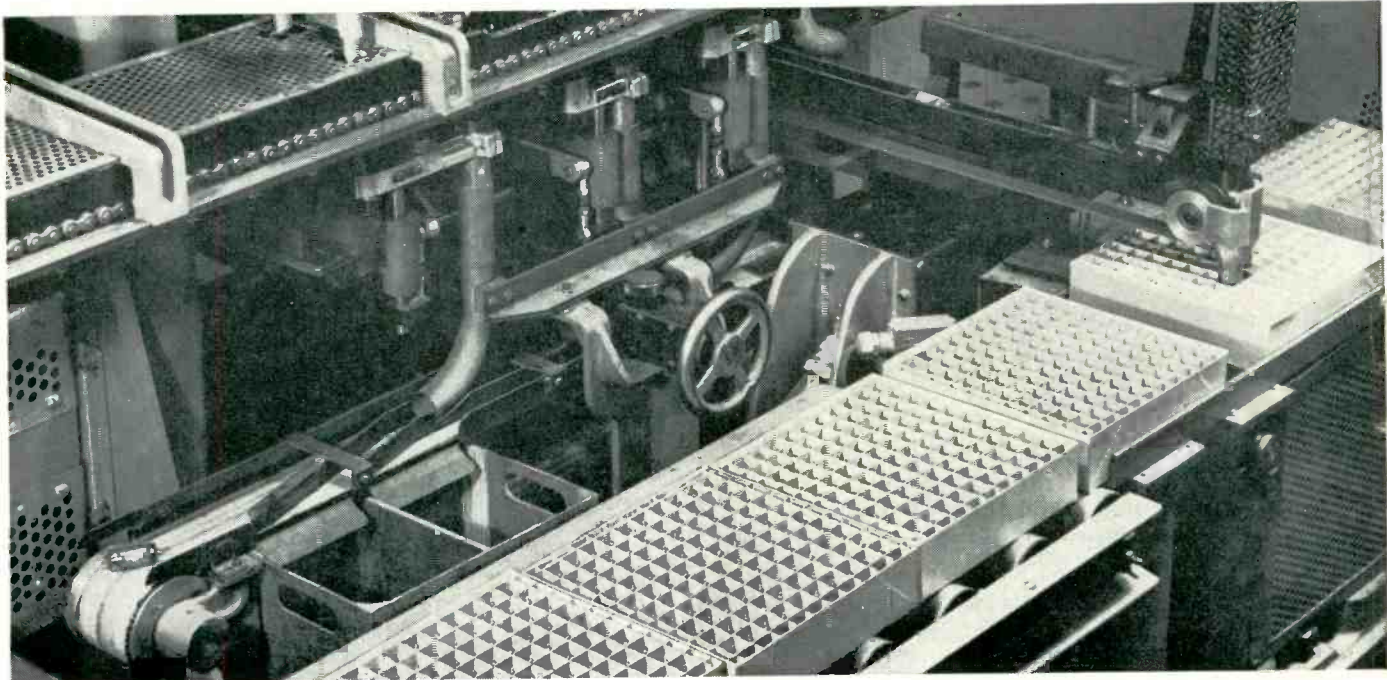
This is



1 Overall view of two automatic testers highlights "chain belt" where tubes are preheated in preparation for tap tests. Operator loading tubes checks pins for straightness.



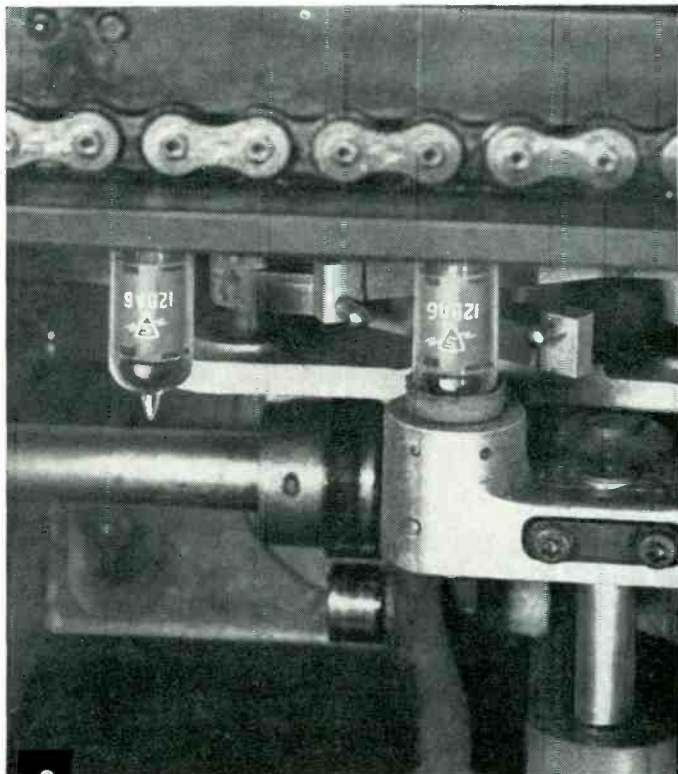
2 Electronic brain of the tester is designed by Sylvania so that any tube type can be tested simply by plugging in its proper adapter (about the size of a pack of cigarettes).



4 —Automatic unloading of "good" tubes into cartons comes after all tests have been made and

"inoperatives" separated. Rejects are dropped to conveyor belt, collected into bins, and scrapped.

Sylvania Williamsport



3 Close-up of tap test position. Here each tube is automatically tapped with 100 g (100 times gravity's force). Tube is tapped in two positions in two planes 90° apart—first for opens; second for shorts.



5 —Testing the tester. As a constant check on the accuracy of the automatic tester—samples from each lot tested, are retested on similar equipment used as a standard. Records are kept of all tests serving as data to feed back to design, manufacturing, and quality-control groups.

— where automation is at work to keep your tube stock free from "inoperatives"



FOR every four thousand tubes tested at Sylvania's plant in Williamsport, Pa., not more than one "inoperative" will escape Sylvania's automatic testing "dragnet" or reach your shelves.

Like Williamsport, all major tube-finishing plants are equipped with automated testers designed and built by Sylvania. Automation makes it possible to test each tube individually and more efficiently for *opens*, *shorts*, *leakage* and *emission*. As a result, Sylvania maintains the industry's lowest percentage of inoperatives. For you this means more efficient and profitable servicing—bothersome, time-consuming returns are kept to an absolute minimum.

Why not try using Sylvania exclusively as many dealers do? You'll find that's the best way to profit from Sylvania's exclusive testing program.



SYLVANIA

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

LIGHTING • TELEVISION • RADIO • ELECTRONICS
PHOTOGRAPHY • ATOMIC ENERGY • CHEMISTRY-METALLURGY



TELECOUPLERS

STOCK & DISPLAY BOTH!

COLORCOUPLERS



let your Customers choose!

Only AMPHENOL provides a *choice* in fine TV set couplers. Color-Couplers and Tele-Couplers are different in design and price range, but alike in superb performance. Stock and display *both* for maximum sales!

TELECOUPLER has an improved distributed line parameter of bifilar coiled transmission lines which isolate the signals and distribute them equally to each set with near perfect impedance matching. Telecouplers are available as 2 set model 114-088 and 3 & 4 set model 114-090; suggested list prices are \$3.75 and \$5.75 respectively.

COLORCOUPLER employs balanced resistive networks to accomplish excellent impedance matching, flat signal response, low loss and effective isolation. Colorcouplers can be mounted vertically or horizontally and have built-in twin lead strain relief. Available as 114-097 (2 set), 114-098 (3 set) and 114-099 (4 set) models; suggested list prices are \$2.95, \$3.95 and \$4.95 respectively.

For sales action over your counter and for assured customer satisfaction through reliable performance, buy *both* of AMPHENOL's couplers—Telecoupler and Colorcoupler!

AMPHENOL ELECTRONICS CORPORATION
chicago 50, illinois

LETTERS

To the Editor

Comments on CU

Editor, ELECTRONIC TECHNICIAN:

Your test report on hi-fi tuners (Jan. 1958) was more intelligent than that of Consumers Union, but I question the attendant publicity given them in doing so. Prior to my entry into the TV business, I was in the quality control department of a large mail-order house which conducted extensive laboratory tests of all products it sold. The results were frequently at variance with CU due to different weighting of various factors. For instance, for a long time CU gave as much weight to vertical interlace as to TV contrast range. CU reports are a disruptive factor in normal trade channels, and we should not dignify their standing by attempting publicly to refute them.

HAROLD N. HOROWITZ
Sombrero Television Co.
Phoenix, Ariz.

... For years I have wanted to see CU's hand called. More power to you.

RALPH PHILLIPS
Williamson, W. Va.

... I have been a Consumers Union subscriber for over a decade. Their reports have been helpful. You are not in a position to say which item is a best buy because of the advertising you accept. CU does not accept any paid ads.

NICK ZAM
Philadelphia, Pa.

● As in the past, we do not hesitate to step on the toes of advertisers or readers when the situation calls for it. With regard to the hi-fi tuners, three of the four companies tested have not advertised in ET; the one that does came off no better in the ratings than the others. Shortcomings and good qualities were equally pointed out for all four.—Ed.

... Your remarks about CU are exactly the same as what I have thought for many years. A few years ago they tested a Motorola TV set, which we sell. This model was built and advertised for "primary signal area." Yet they were comparing it with others built for fringe reception. Their main tests were along these lines. Come to think of it, my opinion of CU is even lower than yours.

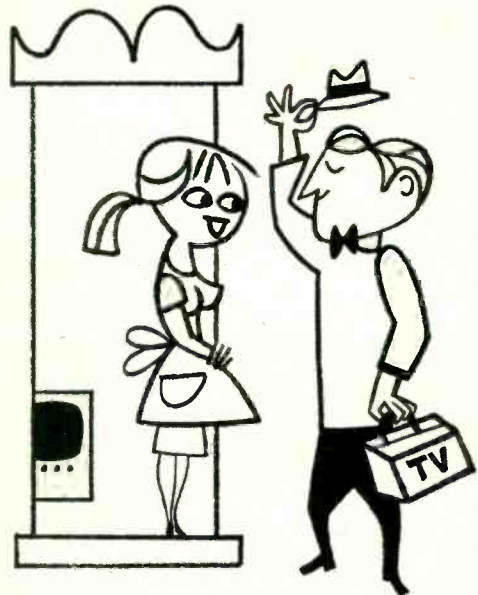
JACK WATT
Watt's Radio Service
Ontonagon, Mich.

(Continued on page 13)

Reputation Builder #4: it pays to wear a smile

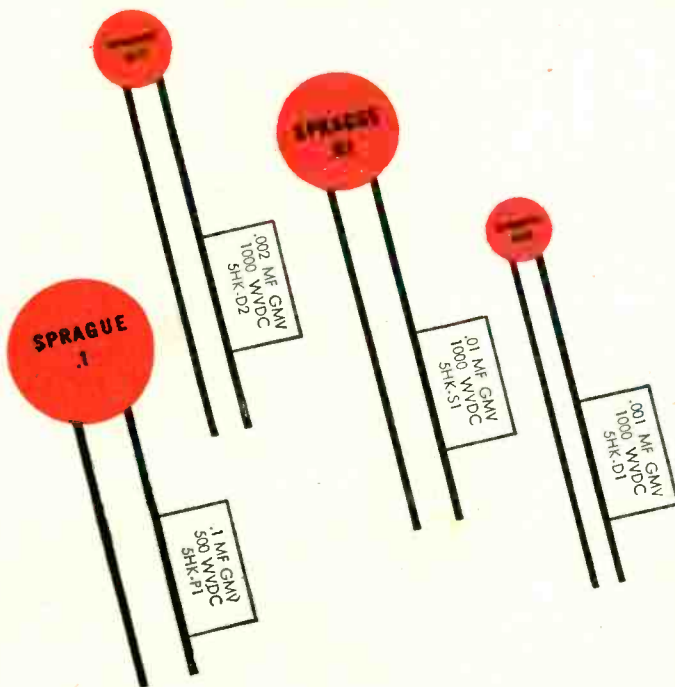


• "Not so courteous servicemen"
get less than 20% repeat business



• BUT... "pleasant and courteous servicemen"
get a healthy 85% repeat business

it pays to replace with Sprague Cera-mite* Ceramic Capacitors



don't be vague... insist on

• Another way to build and hold a reputation is to insist on top quality replacement parts. Callbacks due to replacement failures not only cost you money... they also cost you customers! Replace with less than the best and you place your reputation at stake. In capacitors, the best is Sprague.

• Take Cera-mite Ceramic Capacitors, for example. Their silvered flat-plate design gives Cera-mites low self-inductance... means very high by-pass efficiency in all TV circuits... permits higher self-resonant frequency than tubular ceramic or molded mica capacitors. And they often can replace paper capacitors, too! These capacitors are tough, tiny, and dependable in every application... even under severe humidity and vibration conditions. They fit easily into tight spaces. Designed for continuous operation at 85°C (185°F).

• For the complete list of ratings for all types of Sprague ceramics, get your copy of Sprague's latest radio and TV service catalog, C-456. Write Sprague Products Co., Distributors' Division of Sprague Electric Company, 65 Marshall Street, North Adams, Mass.

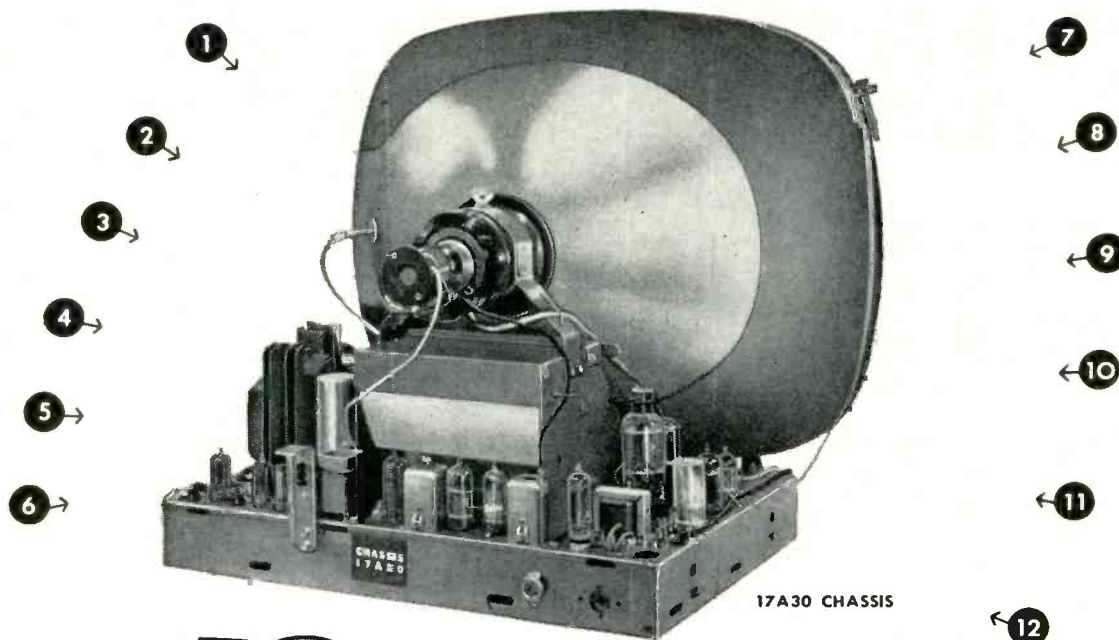
*Trademark

SPRAGUE®

world's largest capacitor manufacturer

SPRAGUE RESEARCH IS CONSTANTLY PRODUCING NEW AND BETTER CAPACITORS FOR YOU

NO SCREWBALL



12 REASONS WHY THE HANDCRAFTED "SERVICE SAVER" HORIZONTAL CHASSIS

in Zenith TV means more satisfied customers for Zenith Dealers and Servicemen

- | | |
|--|---|
| <p>1 21-INCH PICTURE TUBE mounted to chassis.</p> <p>2 SHORT NECK 90° TUBE...no 110° linearity or yoke problems.</p> <p>3 FIN-COOLED POWER TRANSFORMER has 185% more cooling surface.</p> <p>4 TECHNICAL CONTROLS on front of chassis for ease of adjustment... no mirrors required.</p> <p>5 ALL ALIGNMENT adjustments on top of chassis.</p> <p>6 ALL CIRCUIT TUBES accessible for service without removing the chassis.</p> | <p>7 TUBES ARE PLACED in logical circuit sequence.</p> <p>8 NO PAPER ENCASED BYPASS CONDENSERS... all are plastic or ceramic molded.</p> <p>9 NO HIDDEN PARTS... all are easily replaced.</p> <p>10 NO PRINTED CIRCUITS... all connections are hand soldered.</p> <p>11 PRECISION BUILT, rugged horizontal chassis.</p> <p>12 NO SHORTCUTS to impair the reliability.</p> |
|--|---|

OUT OF CONSIDERATION FOR SERVICEMEN WE USE

NO PRINTED CIRCUITRY

IN THE CHASSIS

Every servicing dealer knows that printed circuitry in a television chassis often leads to costly servicing and may also cause service delays. Zenith's handcrafted standard circuitry in television means greater operating dependability and fewer service headaches.

CONSTRUCTION

**...THAT'S WHY
ZENITH TV
NEEDS LESS
SERVICE ...
IS EASIER TO
SERVICE!**

WE THINK IT'S WORTH THE EXTRA COST AND EXTRA CARE OF HANDCRAFTED STANDARD CIRCUITRY TO GET THE BEST PERFORMANCE AND LEAST SERVICE HEADACHES AND SO DO THOUSANDS OF DEALERS WHO WOULD SOONER SELL CUSTOMER SATISFACTION THAN A PRICE TAG!

QUALITY BY

Zenith

the Royalty of Television[®]

The quality goes in before the Zenith name goes on.
Backed by 39 years of leadership in radionics exclusively.
Also makers of Radio, High Fidelity Instruments and fine Hearing Aids.



ZENITH RADIO CORPORATION
Chicago 39, Illinois



**UNIVERSITY AND
FRED WARING
MAKE SOUND HISTORY
...and more sales for you!**



“University speakers were top performers on our *Hi-Fi Holiday** concert tour.

“I had always dreamed of applying hi-fi techniques to our live concerts . . . but I hadn’t thought it could be accomplished to my satisfaction. I presented the problem to University engineers prior to launching our most recent nation-wide tour. Result? University provided the most stirring sound I had ever heard in a concert hall, so dynamically effective that we named our show ‘Hi-Fi Holiday.’

“‘Hi-Fi Holiday’ made sound history . . . it was sound success—and we plan to repeat the tour. University deserves a low bow for their contribution to the success of our show—a top performer most welcome to share the stage with The Pennsylvanians anytime.”

Fred Waring
FRED WARING

*First such live stage presentation in musical and high fidelity history.

CASH IN ON THIS OVERWHELMING TRIBUTE TO UNIVERSITY QUALITY AND PRESTIGE

The acclaim given “Hi-Fi Holiday” and University’s sound reproduction by audiences and critics alike has reflected itself in greatly accelerated interest and sales of University hi-fi equipment for the home—everywhere!

This was the first time that live choral and instrumental stage performances, under the direction of a prominent maestro, demonstrated how even the “real thing”

could benefit from truly genuine high fidelity equipment.

The dramatic role University played in the success of Fred Waring’s “Hi-Fi Holiday” coast-to-coast concert tour brought the wonder of high fidelity to the ears of tens of thousands of Americans—many of them in your area. When **your** customer “talks high fidelity” . . . plan his system with University.

UNIVERSITY LOUDSPEAKERS, INC., 80 SO. KENSICO AVE., WHITE PLAINS, N. Y.

LISTEN

University sounds better



(Letters. Continued from page 8)

8-Tube TV

Editor, ELECTRONIC TECHNICIAN:

An acquaintance of mine swears that he has run across a TV set with only eight tubes. This is an off-brand set, make unknown, and several years old. Is it possible? If so, could I obtain the make and model number? I find it hard to believe.

CLIVE J. REGINA

Melvindale, Mich.

• Except for several experimental transistor TV sets now in the labs, we haven't run into any receivers with so few tubes. Have any of our readers?—Ed.

Reader Writers

Editor, ELECTRONIC TECHNICIAN:

Having read many interesting articles by service technicians in your magazine, I want to know if you still accept any material from repairmen. I have little experience as a writer, but as a technician I have worked in everything from the one man shop to the service department of a major distributor.

ARON GORDON

Tele-Service
Albany, N.Y.

• You bet we accept articles by readers. In addition to buying Shop Hints and Tough Dogs, we pay for feature articles of practical value to professional technicians. If you have any ideas, submit an outline first.—Ed.

Candy from Babies

Editor, ELECTRONIC TECHNICIAN:

We have noticed the increasing number of self-service tube checkers in supermarkets and drug stores. Most technicians are blindly resisting this trend, acting like little children whose candy has been taken away. Then too, there are misguided ones who laugh and say, "I hope they put more of these things around. When people get a shock or put the tubes back in the wrong places, they'll call on us." If they would open their eyes they would see that self-service checkers can help them increase their business. The recent introduction of these checkers in this area has cut into counter tube sales. To protect ourselves, we have decided to "join 'em." We are going to put our own glass in the machines, with a sales pitch on the fact that we do antennas, hi-fi, etc.

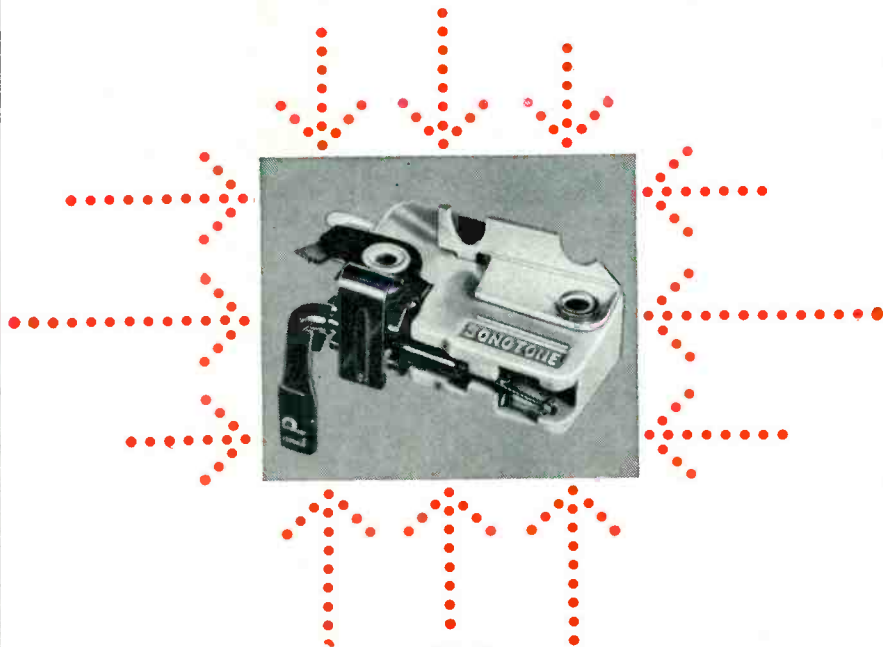
FRED ULLNER

Service Manager

Dexters Hi-Fi—TV—Radio
Larkspur, Calif.

(Continued on page 16)

To fit over 90% of all quality arms, use **SONOTONE** **CERAMIC CARTRIDGES**



**because 50
manufacturers use
them now
as original equipment**

Concentrate your replacement work around the standard cartridge of the phonograph industry. Because Sonotone Ceramics fill the bill in so many cases, you have less cartridge lines to inventory and stock. You also cut down custom fitting and tedious adjustment ... actually save time and money.

Best of all, you give your customers better sound than they bargained for. Sonotone Ceramics give out full range—20 to 20,000 cps—flat, without pre-amp or equalizer. You're all ways ahead when you stock Sonotone Ceramic Cartridges.

Order today from your parts dealer. Write for replacement chart and further information about Ceramic Cartridges to:

Sonotone[®] CORP.

Electronic Applications Division, Dept. CT-38

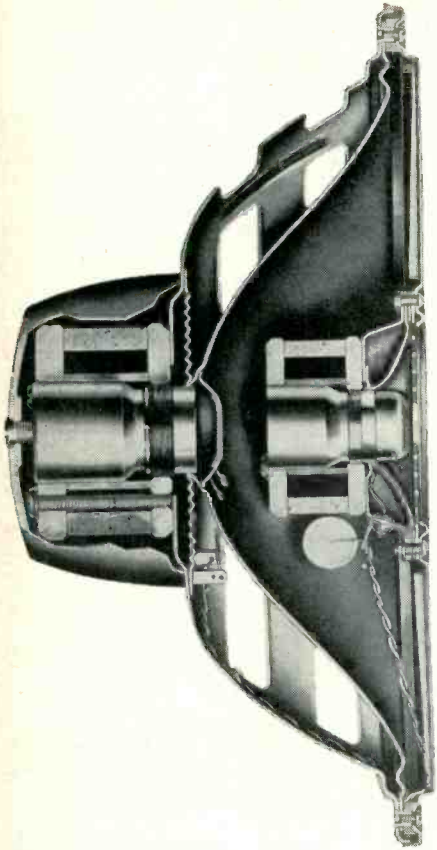
ELMSFORD, NEW YORK



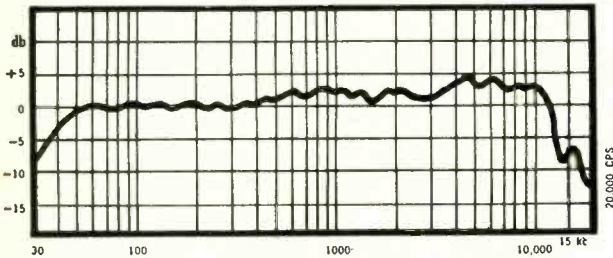
The sound will delight your customers

-and so will the price!

General Electric 12" Golden Coax



G-E Golden Coax Speaker,
Model A1-401.



Relative frequency response in infinite wall baffle—critical damping at resonance.

Full-dimensional realism, true brilliance, outstanding clarity—these make the Golden Coax the finest speaker ever built by General Electric. And only General Electric's unsurpassed research and manufacturing facilities could bring you this superb speaker at such a remarkably moderate price.

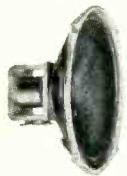
The G-E Golden Coax provides complete audio frequency response from 40 to 15,000 cycles, with a dispersion angle of 100 degrees and power handling ability of 25 watts. It combines a 12 $\frac{3}{8}$ -inch woofer, 2 $\frac{3}{4}$ -inch tweeter and built-in electromechanical crossover network. Mail the coupon for complete specifications.

Check these quality features:

Woofer Unit—Response range from 40 to 1500 cycles. Specially treated, deep-convolution cone edge, linearized air gap and suspension system result in extremely low distortion at high output power.

Tweeter Unit—Mounted on front baffle plate for direct high frequency sound radiation. Response range smooth from 1500 to 15,000 cycles. Built-in pressure equalizer cancels out secondary sound reflection, improves transient response and eliminates harsh peaks or cavity effects.

Slotted Baffle Plate—Serves as baffle for tweeter and low-pass filter to reduce interference between tweeter and woofer. Improves operation of crossover system by "braking" tweeter waves which might otherwise be reflected by woofer cone.



8" Extended Range Speaker, Model 850. Ideal where a hard-working, compact speaker is needed. For best results, mount in matched G-E A1-411 Enclosure.

Add Realism To Existing Systems

A1-404 Tweeter—By adding a G-E Tweeter Speaker to single-cone systems, you obtain wider dispersion at high frequencies and improve response between 1500 and 15,000 cycles.



A1-403 Woofer—General Electric's Woofer Speaker provides undistorted low frequency power output and vastly improves bass reproduction when used in two or three way systems. No external crossover network is needed.

GENERAL  ELECTRIC

ET38

General Electric Company, Specialty Electronic Components Dept.
Section HF, West Genesee Street, Auburn, N. Y.

Please send me the full story on G-E quality High Fidelity speakers and components.

Name _____

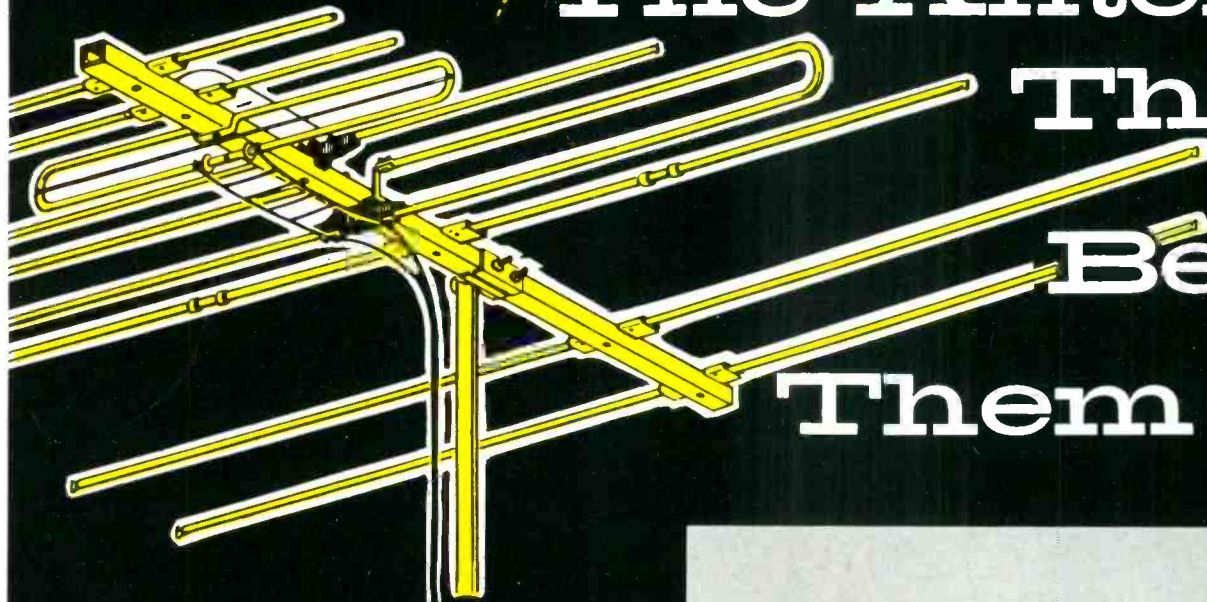
Address _____

City _____ Zone _____ State _____



GOLDEN INVADER

The Antenna That Beats Them All!



TRY TELCO'S NEW GOLDEN INVADER, the powerful antenna for VHF fringe areas and UHF primary areas. Extensive tests prove its uni-plane design can pull in stations from as far as 200 miles away. Ghosts and co-channel interference are eliminated. The GOLDEN INVADER, for color or black-and-white TV, comes pre-assembled with the new Snap-Lock construction that makes it easier to handle, easier to install. Available in single bay (illustrated), two-bay or four-bay models.

- SUPER SHARP DIRECTIVITY
- BEAUTIFUL GOLD ANODIZING
- NEW SNAP-LOCK DESIGN
- RECEPTION UP TO 200 MILES AWAY

No. A-8121 Single Bay..... List \$29.95
A-8122 Two-Bay..... 59.95

VALUABLE BONUS FOR YOU!

Enclosed with each TELCO GOLDEN INVADER is a special Golden Bonus Certificate. Look for these Certificates . . . save them. They're valuable to you!

UNCONDITIONAL GUARANTY...

A Telco Exclusive! TELCO guarantees the GOLDEN INVADER and all Telco Antennas to be free from defects in materials and workmanship. This guarantee on the Golden Invader is for *three* years. All other antennas are guaranteed for one year.

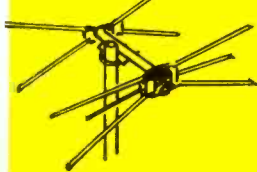


TELCO ELECTRONICS MFG. CO.

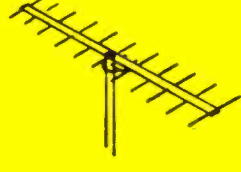
Division of G-C - Textron Inc. • Los Angeles 18, Cal. • Rockford, Ill., U.S.A.

THE COMPLETE LINE OF TELCO POWER PACKED ANTENNAS

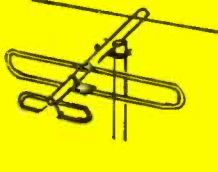
CONICALS



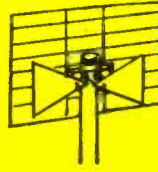
YAGIS



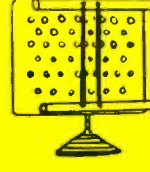
INLINES



BOW TIES



INDOORS



ANTENNA KITS



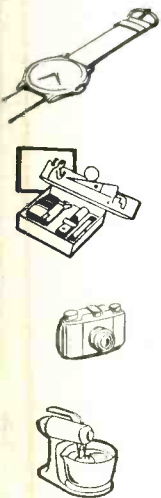
25 WORDS



Tell Why You Like Tobe Service Capacitors

Your 25 words can win the Ford Ranch Wagon

And Here Are the TSC* Features to Help You Win • No substandard materials can possibly enter the manufacture of TOBE SERVICE CAPACITORS, because *everything* is quality-checked beforehand • Highest grade dielectric materials prevent voltage breakdown in service • TSC's are designed for high-temperature operation — will not dry out or deteriorate in service • Copperweld leads soldered directly to foil insure you against opens • Moisture-tight seals guard against shorts • Pigtail leads will not pull out or break off • No danger of hot soldering iron opening internal connection or melting sealing compound • TSC's will maintain specified capacity over entire operating temperature range • TSC's receive 100% quality-control inspection prior to shipment • Continuous production-line testing automatically rejects "duds" • Maintenance of large inventories on complete line means faster delivery to your TOBE DISTRIBUTOR and you.



TOBE
RADIART
CAPACITORS

*Tobe Service Capacitors

**HERE'S YOUR
ENTRY BLANK**

Tobe Deutschmann Corporation, Dept. C
2900 Columbia Avenue, Indianapolis 5, Indiana

"I prefer Tobe Service Capacitors in my work because _____

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

I enclose a Tobe boxtop

(Letters. Continued from page 13)

Sunspots for Customers

Editor, ELECTRONIC TECHNICIAN:

We have used your fine article, "Sun-spot Activity and TV Reception Problems," (Jan. 1958) several times in the short time we have it. It has been valuable in telling our customers about atmospheric conditions, and explaining why their TV does not always perform as it should.

ROBERT S. PENSOCK

S. J. Pensock Radio—TV—Sound
Hazleton, Pa.

Underestimation

Editor, ELECTRONIC TECHNICIAN:

I must admit that for a long time I had underestimated your past editions. Fellow servicemen had often recommended it to me, but I never gave it a second thought until last week when I borrowed a schematic from a friend. It came from your magazine, and my hard-to-find case ended up very simple. How much would schematics cost from 1953 to the present?

IVY ESTILETTE

Ville Platte, La.

• Cost is 50¢ postpaid for the complete 16-page Circuit Digests section, as published in any one issue. Cumulative index of all schematics published to date is published every May.—Ed.

Keep Up the Kicks

Editor, ELECTRONIC TECHNICIAN:

I enjoy the Letters to the Editor column, and I get just as burned about some of the kicks as you do, but I sure like to see you publish them. Keep on publishing the best technical magazine I have ever read, and let the dissenters go buy comic books.

JACK P. GOLDEN
Secretary

Tri-County Electronic
Technicians Assoc.
Portville, N.Y.



"I'm a bit worried—his feet haven't moved for two days."

News of the Industry

ROHN MFG. CO. announces the recent acquisition of 13,750 square feet of floor space to increase their manufacturing facilities. Their expansion plan includes the building of a new and greatly enlarged galvanizing plant to provide approximately 7,000 square feet.

ALLEN B. DU MONT LABORATORIES, INC. has named the following: **WILLIAM CARLIN**, Manager of the Television Tube Division; **ROBERT G. SCOTT**, General Sales Manager for TV tubes, receiving tubes, and replacement parts.

BLONDER-TONGUE LABORATORIES has initiated a new market research unit in the firm's Newark, N. J. sales office. Headed by **ED SHAFER**, the unit is conducting sales analyses and forecasts for the company's standard TV products as well as a number of new items in the preliminary design stage.

GENERAL ELECTRIC CO. will present the firm's annual Edison Radio Amateur Award for 1957 to **JAMES E. HARRINGTON**, a Louisiana radio amateur who, for three days, provided the only communications from a hurricane-devastated town.

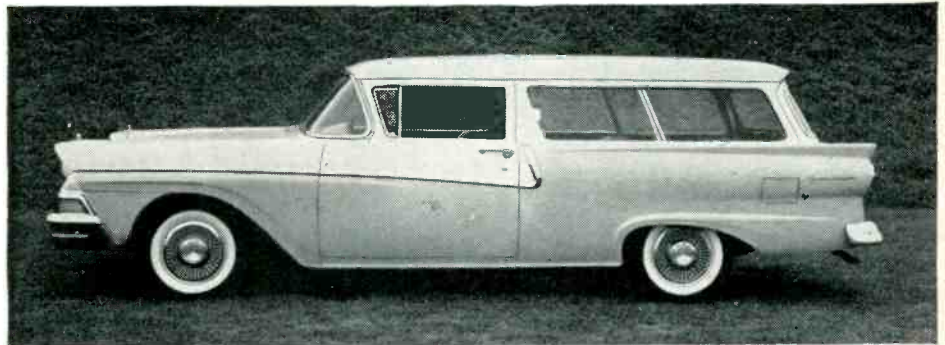
BELDEN MFG. CO. announces the promotion of **LES A. THAYER** to General Sales Manager and **E. K. BUTLER** to Manager of Marketing Services. Both men were Division Sales Managers. Two new District Managers were also announced: **HOYNE HOWE** and **E. V. BLAKE** with headquarters in Chicago and Philadelphia respectively.

WINEGARD CO. has two new antenna floor displays. The Twilight sales booster includes a little house, five hang tags, decal, Gold Bond Guarantee counter card, window signs and newspaper ad mats. The Colorceptor display consists of a 1/3-size scaled antenna, model, two window signs, counter card, decal, check-up sheets and newspaper ad mats.

BRAND NAME SURVEYS has been retained to conduct a nation-wide survey of brand preferences among radio and TV servicemen. This is the fifth such annual survey to be undertaken by this organization. More than 22,000 technicians will be asked for information on their brand preferences for a number of electronic replacement components; and to indicate, where applicable, the reasons for these preferences. Participating manufacturers will use the survey results in product improvement.

(Continued on page 20)

WIN THIS FORD



RANCH WAGON

Or one of 49 other valuable prizes



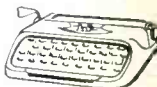
Here's all you do . . . In 25 words or less, tell us why you prefer TOBE SERVICE CAPACITORS.

Then, send your entry to us with the top from any TOBE capacitor carton, or the plastic box some TOBE capacitors are packed in.

That's all there is to it. Enter as many times as you wish, providing each entry is accompanied by a TOBE carton top or the plastic box. Use entry blank below. Additional entry blanks can be obtained from your TOBE DISTRIBUTOR.

Contest Closes May 30

Contest is open to all service-men over 21 years of age residing in the continental United States. Employees of the TOBE DEUTSCHMANN CORPORATION and their advertising agency are excluded. All entries become the property of TOBE DEUTSCHMANN CORPORATION. Decisions of the judges are final. In case of ties, duplicate prizes will be awarded. Contest closes May 30, 1958. Winners will be announced June 30th.



HERE'S YOUR ENTRY BLANK



TOBE
RADIART
CAPACITORS

Tobe Deutschmann Corporation, Dept. C
2900 Columbia Avenue, Indianapolis 5, Indiana

"I prefer Tobe Service Capacitors in my work because _____

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

I enclose a Tobe boxtop

WESTINGHOUSE HELPS TV SERVICEMEN "GET A FAIR SHAKE!"



FREE!

"Build Consumer Confidence" Promotion

Today most people are unaware of the buy they get in TV and radio service. Now, Westinghouse helps you educate them with a program designed to win you friends and influence sales! You get a complete kit *free!* Keystone of the promotion is the mailing piece shown left. It describes how many hundreds of parts there are to check . . . how much knowledge it takes to be a serviceman . . . equipment costs . . . etc. It shows how TV servicemen, like doctors and lawyers, constantly study to keep up with advances. In addition you get window displays, streamers, everything you need — all free! Don't wait, put this promotion to work for you now . . .

CALL YOUR WESTINGHOUSE DISTRIBUTOR

YOU CAN BE SURE...IF IT'S Westinghouse
Electronic Tube Division • Elmira, New York

V-M World Wide Festival of Sound PAYS FOR ITSELF!

You'll Increase Your Sales Volume
With This Terrific Promotion from **V-M**

Here is a self-liquidating promotion designed to pack your store with prospects who are *ready to buy!* You offer an unbeatable combination . . .

- TOP PORTABLE PHONOGRAPH LINE
- A GIVE-AWAY PREMIUM NOBODY CAN BEAT!
- A BARGAIN-PRICED LP RECORD YOU SELL AT A MARGIN
- WHICH CAN PAY FOR YOUR WHOLE PROMOTION!

the PRODUCT

Here is the V-M 'Ultra-Deluxe' Model 557. The unique chrome-plated handle with built-in controls is just one of its many dazzling features! Sensational, too, is the glorious sound from its 8" woofer and 7" oval speaker with amazing coaxial tweeter cone. Plays all four record speeds. \$139.95 List*

the PREMIUM

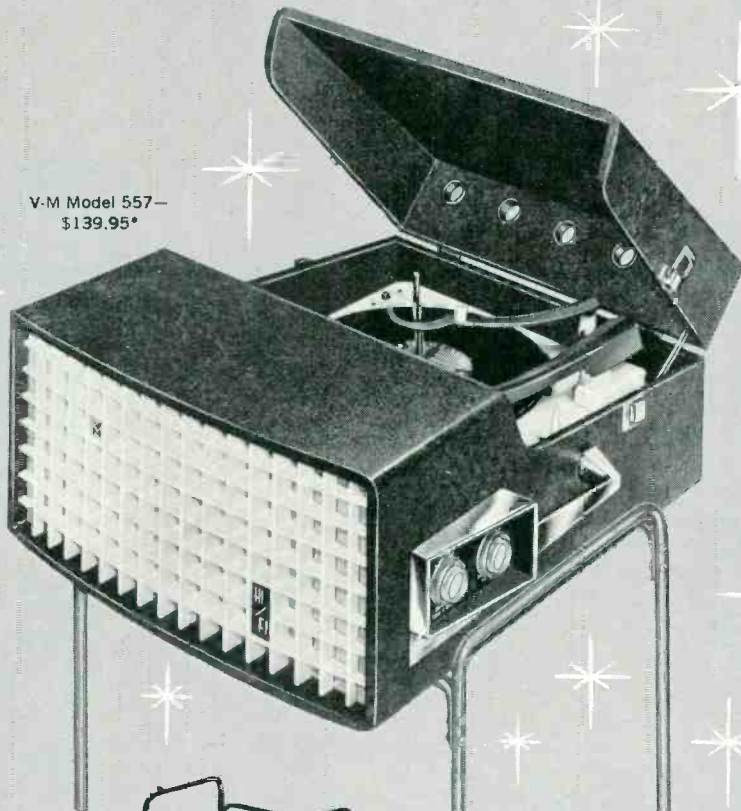
You can GIVE AWAY a smartly-styled phono stand conservatively valued at \$4.95 with every deluxe automatic portable V-M phono you sell. It's light, it's functional, it's beautiful in fashionable copper tone. Constructed of strong, tubular steel, it serves as the perfect at-home stand for portables and table models.

the RECORD offer

You'll create store traffic with an unusual LP recording of music from around the world. Entitled "Hi-Fi Internationale," this record includes BIG NAME talents including Patti Page, Sarah Vaughan, Ralph Marterie and others. It's a smash hit! You'll sell it for \$1.19, MAKE MONEY ON EVERY SALE. And every buyer is a prospect for an equipment sale!

*Slightly higher in the West.

V-M Model 557—
\$139.95*

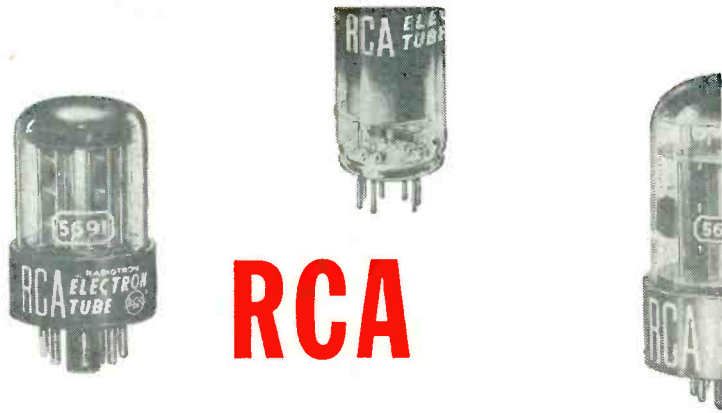


V-M Model 1260—
\$54.95*



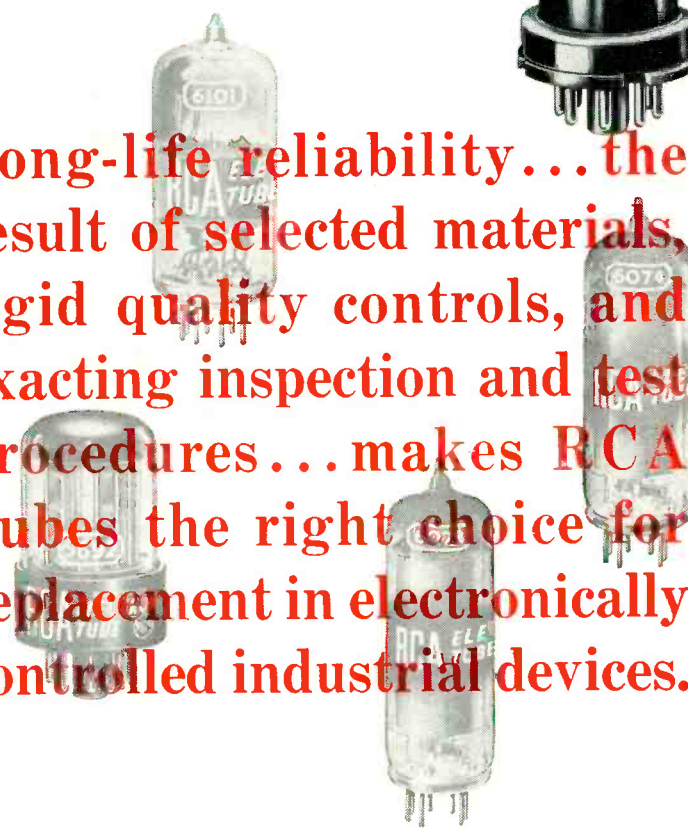
GET PACE-SETTING PROFITS FROM
THE WORLD WIDE FESTIVAL OF SOUND!
Call Your V-M Distributor TODAY!

the **Voice** **M** of Music®
V-M CORPORATION • BENTON HARBOR, MICHIGAN



RCA PREMIUM TUBES

Long-life reliability... the result of selected materials, rigid quality controls, and exacting inspection and test procedures... makes RCA Tubes the right choice for replacement in electronically controlled industrial devices.



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

Send for new booklet RIT-104A. "Receiving-Type Tubes For Industry and Communications". Includes descriptions and basic data on RCA Premium and other special tube types. For your copy, write RCA Commercial Engineering, Section C-46-Z, Harrison, N.J.



CHANNEL MASTER CORP. reports that U.S. Patent No. 2,817,085 has been issued to cover their T-W TV Antenna, an all-channel end-fire array.

ERIE RESISTOR CORP. has promoted LEWIS J. SHIOLENO to General Manager of the Electronics Division, from Superintendent of Manufacturing for the Electro-Mechanical Division. The firm announces the purchase of the assets of HUPP INSTRUMENTATION CO., Los Angeles.

INTERNATIONAL RESISTANCE CO. is offering a new dealer stock on replacement controls. Priced at \$113 the parts package contains a total controls coverage of 4400 parts numbers. The stock enables service technicians to assemble any of 809 different IRC controls.

MERIT COIL & TRANSFORMER CORP. will shortly open its new plant at 2027 Sherman St., Hollywood, Fla., adjacent to the plant of the firm's subsidiary, Florida Merit, Inc. The Chicago plant, damaged by fire on December 29th, will soon be back in operation, according to CHARLES C. KOCH, President. The firm's new transformer catalog 5811 for technicians cost \$45,000, reports Director of Sales, COL. GAIL S. CARTER.

TENNA MFG. CO. reports the following appointments: MORTON MENDES promoted to Executive Vice President from Assistant to the President; HARVEY LUDWIG to Vice President in charge of Sales and Advertising from Sales Manager of the Automotive Division; STANLEY B. GOSS, Electronic Distributors Sales Manager, will also handle manufacturers business; and MAX BAUER has joined the organization as Assistant Sales Manager.

CENTRALAB, DIV. OF GLOBE-UNION, INC. announces the following changes: DOUGLAS THATCHER, Sales Manager of the newly organized Int'l Division; BRUCE VINKEMULDER, Ass't General Sales Manager, was formerly distributor division Sales Manager; GERRY MILLS, Ass't Distributor Sales Manager assumes the responsibilities for distributor sales; JOHN PRUTTON, Sales Manager of the Ceramic Capacitor Division, concentrating in the radio and TV industry. JOHN LEFEBER continues with full responsibility for piezo-electric ceramics and assumes new responsibility for the sale of semiconductor products; JOE FOTHERGILL continues as sales assistant for semiconductor products, and in addition will assist JOHN LEFEBER in sales of piezo electric ceramics and special capacitors.

(Continued on page 22)



The new JFD Satellite-Helix a Giant step in television antenna science

Yesterday we crossed the frontier of the atomic age. Today, we are entering the era of interplanetary space travel. There are no visible limits to the "miracles" to be developed tomorrow.

Great things have been happening at JFD, too. Nineteen months of intensive research into a virtually unknown principle of antenna performance has achieved a major breakthrough in television reception. For the first time, the science of antenna engineering has overcome the two primary barriers to long-distance pick-up — uneven antenna bandpass and reactive impedance components.

These significant improvements are made possible by the development of a spectacular new dipole system. As a result, the *Satellite-Helix* dipole system captures up to 35 per cent more signal and intensifies color reception—has less low band ghost pick-up and less back and side interference, and closer 300 ohm match.



Pioneers in Electronics since 1929

JFD ELECTRONICS CORP.

6101 Sixteenth Avenue Brooklyn 4, New York

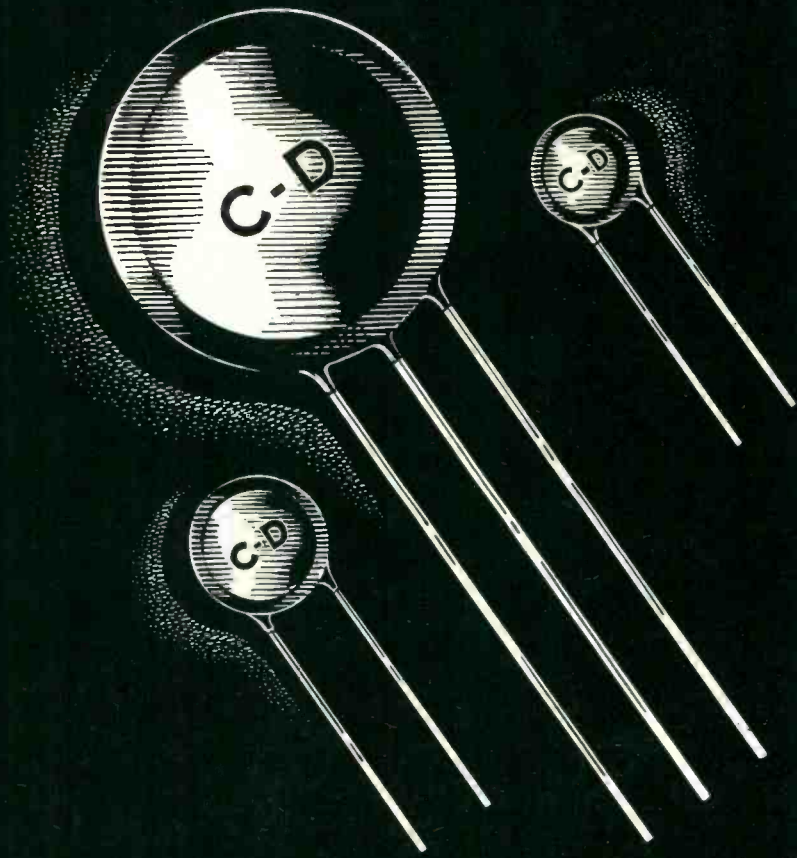
Here are a few of the "extras" the new *Satellite-Helix* configuration will give you over other leading types:

Over Reinforcing Wave Type	Over Focus-Lens Type	Over Bat Dipole Type	Over Dipoles With Phase-Reversing Stubs
*1-2.5 db more gain *sharper low-band pattern *less reactive impedance *higher front-to-back ratio *better side rejection	*flatter bandpass *2-3.5 db more gain *less reactive impedance *higher front-to-back ratio	*flatter bandpass *2-3 db more gain *less reactive impedance *higher front-to-back ratio *better side rejection	*2-4 db more gain *flatter bandpass *higher front-to-back ratio *better side rejection

Take a giant step today into the flawless reception of tomorrow. Install the remarkable *Satellite-Helix* on your next "problem" job with our money-back guarantee. See for yourself its "selling edge" that will keep you out front in TV antenna profits and customer confidence in your area in the competitive years ahead. Priced realistically at a non-inflated level, the *Satellite-Helix* is now on its way to your JFD distributor.

Edward Finkel
General Sales Manager

CORNELL- DUBILIER CAPACITORS



The Ceramics with the "worries" removed

If you want ease of mind, take a second look at C-D Ceramics . . . the Ceramics with the "MILLION DOLLAR BODY." Even if they were costly—which they're not—they would be the most economical replacements you could use. Because C-D Ceramics remain stable, won't melt, and are virtually immune to shorts and opens.

Besides, C-D Ceramics have a quality that can't be matched—because their manufacture, all under one roof, is rigidly supervised from raw materials to finished product.

Next time you need to replace a bypass or blocking capacitor, use a C-D Ceramic. They're available from your local C-D distributor in all the popular values and voltage ratings. Catalog 200D-3 is yours for the asking. Just write Cornell-Dubilier Electric Corporation, South Plainfield, New Jersey, Dept. RT-38B.



CORNELL-DUBILIER CAPACITORS

Old Hands at Dependability

(News. Continued from page 20)

RAYTHEON MFG. CO. names S. A. STANDING as assistant to N. B. KRIM, Vice President and General Manager of receiving tube and semiconductor operations.

MUELLER ELECTRIC CO., in commemoration of the firm's 50th anniversary, as manufacturers of electric clips, will send upon request a gold-plated alligator clip as a souvenir of the firm's Golden Anniversary. It may be used as a tie clip, general purpose desk and paper clip, or just as a handy gadget.

P. R. MALLORY & CO. INC. has appointed FRANK P. VENDELY to the newly created position of Merchandise Manager of the Distributor Div. Also, GEORGE M. ARISMAN, JR. has been named President and General Manager of the **MALLORY BATTERY CO.**, a division of P. R. Mallory & Co. Inc.

CDR-RADIART's nation-wide NAME THE ROTOR Contest is announced. A 1958 Plymouth Station Wagon is the prize offered for the best name submitted. The contest is open to all radio, TV, and electronic servicemen residing in the U. S. No purchases are involved. The 12 new features of the CDR TR-15/16 are listed on the back of the entry blanks as an aid in selecting the winning name. Blanks are available through the firm's distributors. The contest closes midnight, April 30, 1958. Serving as judges are: HARVEY GERNSBACK, Editor of *Radio-Electronics*; ALBERT J. FORMAN, Editor of *Electronic Technician*; and VERNE RAY, Editor of *PF Reporter*.

TOBE DEUTSCHMANN CORP. announces their Special Prize Contest. A 1958 Ford Ranch Wagon is the first of 50 prizes which will be awarded for the best entries. Servicemen will be asked to state, in 25 words or less, why they prefer Tobe Service Capacitors. Entry blanks will list the main features of the new line. Blanks will be available through the firm's distributors. As a condition of entry, each blank must be accompanied by a Tobe box top or envelope sleeve. Judges are the same as for the CDR Contest.

RADIO CORP. OF AMERICA announces the appointment of JAMES M. TONEY as Vice President and General Manager of RCA Victor Television.

TELEVISION HARDWARE MFG. CO. DIV. GENERAL CEMENT announces a new display deal to promote packaged sales. A balanced assortment of products in 150 separate packages contain a total of 26 different hardware accessories. The sturdy display unit is given free with the purchase of the complete hardware. Dealer net is \$78.57.

ELECTRONIC TECHNICIAN • March, 1958

Reps & Distributors

WINEGARD CO. announces the appointment of two factory sales representatives: RICHARD G. BRADBURY, Niagara Falls, N. Y., covering New York state; and VINCENT ALLSTAEDT, Santa Monica, for Calif.

RADIO RECEPTOR CO., INC. has selected DONERT ASSOCIATES, New York, N. Y., as sales representatives to radio, TV and phonograph original equipment manufacturers for its selenium rectifiers and germanium and silicon diodes, in the N. Y. metropolitan area.

INT'L TELEPHONE & TELEGRAPH CORP. COMPONENTS DIV. has named the JACK GOSS CO., Somerville, Mass. as New England sales representative for Federal selenium rectifiers.

ERIE RESISTOR CORP. reports the following distributor appointments for Corning Glass Electronic Components: CAMERADIO CO., Pittsburgh, Pa. and ELECTRONIC PARTS CORP., New Orleans, La. Also, appointed to represent the Distributor Sales Div. of ERIE, in the New England Territory: R. L. GENTRY, Medford, Mass.

ART CERF & CO., Newark, N. J. manufacturers' representatives, announce the winners of their annual awards; First prize of \$250 went to DON SULLIVAN for the biggest increase in volume of business sold in 1957 over 1956. Second prize of \$150 to TOM VAREY for the second best showing; and \$100 to TOM BUCHAN as third prize. In addition to the annual awards, the firm gives a \$100 prize monthly to the man whose territory shows the greatest increase for that month over the corresponding month of the previous year.

ELECTRO-VOICE, INC., INSTRUMENT DIV. announces the following new representatives: ELECTRO-MEC ASSOCIATES, Hazel Park, Mich., for the state of Mich.; ROLAND OLANDER CO., Los Angeles, for Calif., Ore., Wash. and Ariz.; JOHN W. RICHARDT CO., East Orange, N. J., for metropolitan N. Y. and N. J.; ROCKE INT'L CORP., New York, N. Y. for Export business; FRED R. SHARP CO., Cleveland, Ohio, for Ohio, Ky., W. Va., and Western Pa.; SOUTHWEST ELECTRONIC INDUSTRIES, Dallas, Texas, for Texas, Okla., New Mex., La. and Ark.; FRED F. BARTLETT & CO., Bryn Mawr, Pa., for Dela., Md., Va., Washington, D. C., and Eastern Pa.

ELECTRONIC TECHNICIAN • March, 1958

CORNELL-DUBILIER VIBRATORS



Built to last... a type for every radio

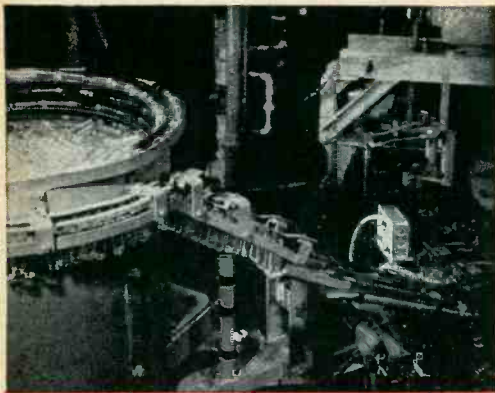
The C-D brand name on a vibrator is your guarantee of dependable performance, long trouble-free service. Because C-D vibrators are built to last, you can use them with full confidence. That's why it pays to reach for a C-D when a replacement is called for.

Remember, too, that there's a C-D vibrator type for every make and model car on the road. And the C-D VIBRATOR REPLACEMENT GUIDE makes it quick and easy for you to select the exact type required. Ask your local C-D distributor for a free copy of VIB-3, or write to Cornell-Dubilier Electric Corp., S. Plainfield, N. J. Dept. RT-38A.

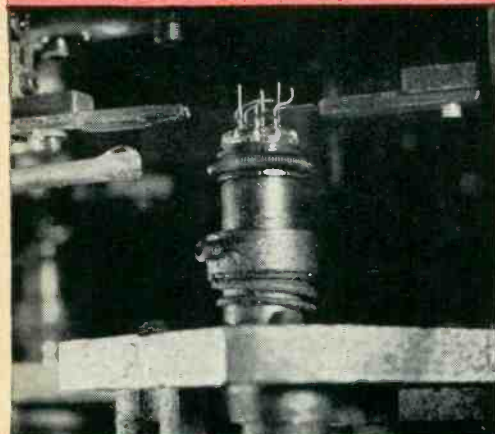


CORNELL-DUBILIER VIBRATORS

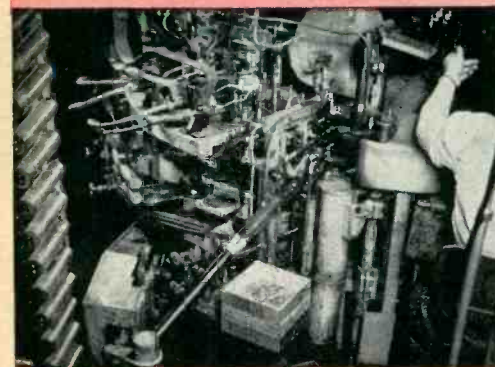
Old Hands at Dependability



Cylindrical machine at left gently vibrates glass tube envelopes, urges them to climb inside track and automatically feed down ramp to tubulating machine. Tubulating machine etches tube type on envelopes, cuts glass to precise tube size, attaches exhaust tube to envelope to allow creation of a perfect vacuum.

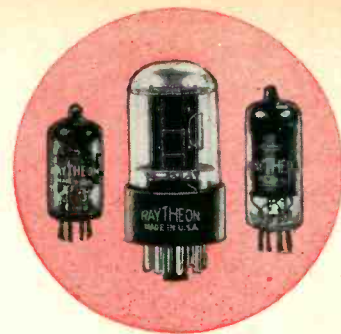


Close up of the button on which tube elements are mounted. Fingers, left and right, move in to swiftly make complicated bends which must be kept extremely precise to insure proper positioning of tube's elements.



This exhaust machine seals the glass envelope to the stem of the mounted tube. Pumps then create a perfect vacuum in the tube, the inside parts are "bombed" (heated white hot) and the getter is then flashed to allow this perfect vacuum to be retained during life. Tubes are automatically discharged after they have been tipped, then slide down a ramp to a conveyor and are carried to the next operation.

IT'S NOT **HUMANLY** POSSIBLE



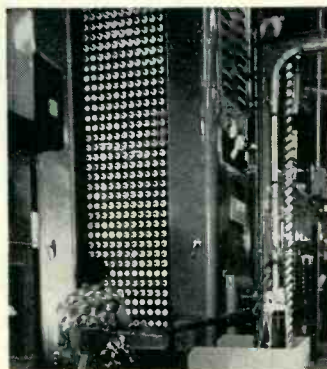
To Make **RAYTHEON TUBES** AS GOOD AS THEY ARE

Here at Raytheon, we think we have the most skillful people in the industry, yet their combined skill alone couldn't make Raytheon TV and Radio Tubes as good as we make them. It takes hundreds of thousands of dollars worth of special instruments and machinery as well.

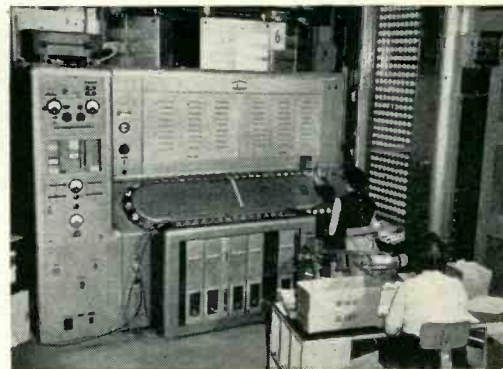
Pictured are but a few of the many automatic precision machines and delicate instruments that are needed to create the matchless quality of Raytheon Tubes; precision machines that build into Raytheon Tubes their superb physical perfection; delicate instruments that test and safeguard not only the quality of the finished tubes but the thousands of components that are part of the whole.

Much of this fine machinery was designed and built by our own skillful people — exists only in the Raytheon plants. That's why Raytheon TV and Radio Tubes receive rigid quality control tests exclusive to Raytheon. That's why Raytheon TV and Radio Tubes are truly **RIGHT . . .** for **SOUND AND SIGHT!**

Buy them from your Raytheon Tube Distributor.



Left: Note the conveyor bringing the finished tubes from the exhaust machine to this rotary aging rack. The aging rack operates the tubes for 1/2 hour to eliminate early tube failure. Voltages are applied to stabilize the characteristics and season the tubes so that uniform results will be obtained through life. High voltages are applied to eliminate any weak tubes.



Right: This Raytheon designed machine performs many complicated tests — tests formerly dependent on human judgment — and automatically eliminates tubes not up to Raytheon standards of quality and performance.



RAYTHEON MANUFACTURING COMPANY

Receiving Tube and Semiconductor Operations

NEWTON 58, MASS.
55 Chapel Street

CHICAGO, ILL.
9501 Grand Ave. (Franklin Park)

ATLANTA 6, GA.
1150 Zonolite Rd. N.E.

LOS ANGELES 7, CALIF.
2419 So. Grand Ave.

Raytheon makes
all these

Receiving and Picture Tubes, Reliable Subminiature and Miniature Tubes, Semiconductor Diodes and Transistors, Nucleonic Tubes, Microwave Tubes.



ELECTRONIC TECHNICIAN

Including
Circuit Digests

The Swing to Hi-Fi

The number of dealer-technicians selling—as well as servicing—high fidelity units is growing rapidly.

Based on a mail survey of 400 of our subscribers in the New York City area, 22.5% replying, we found the following:

Do you make high fidelity installations? Yes 74.4%; No 25.6%.
Are these installations:

- A) Both hi-fi packaged combinations & components? Yes 71.7%
- B) Only components such as speakers, tuners, etc? Yes 22.4%
- C) Only complete or packaged hi-fi combinations? Yes 5.9%

Do you install auxiliary speakers? Yes 73.3%; No 26.7%

A substantial number of sales & service outlets are adding hi-fi to their radio-TV activities. Why? Among the reasons we hear are:

1. Growing demand. The public is really becoming interested in hi-fi.
2. Cost per installation is high, often in the \$200—\$500 range.
3. Audiophiles are interested in technical considerations. Technicians can provide technical explanations.

TV remains the heart of the maintenance industry; it pays the rent and basic salaries. But hi-fi is providing the gravy, that extra margin of profit that turns a fair business year into an excellent one. Electronic technicians are among the best qualified to sell the public on hi-fi right at the local level.

We've run across dealers who were scared off

hi-fi components because these units carry an "audio net" price tag. They incorrectly believe the "one-step" distribution system (manufacturer to retail jobber) eliminates them. This is not so.

In practice, there is a "loose two-step" system (manufacturer to retail jobber to dealer). The sales programs of different manufacturers vary considerably, even from item to item in one manufacturer's lines, but basically here's how it works. The manufacturer, through his representatives, sells to the jobber at discounts that commonly range from 25% to 40% below audio net. A dealer-technician who buys even a moderate amount can frequently buy the hi-fi components from the jobber at about 10% to 25% or more off net, and resell to the consumer for full net. 20% is a typical dealer discount.

Not only do you turn a profit on the sale, but you've gained a customer. In addition, you can earn extra income by making custom installations.

There are some dealers who have built a sufficiently large hi-fi volume, so they can buy directly from the manufacturer! In effect, such a dealer becomes a jobber and gets the full jobber discount.

1958 will go down as the year stereophonic phonographs became a commercial reality. It will mean a gradual obsolescence of existing hi-fi systems. It will also mean a great amount of modification work—right down the technician's alley—converting monaural systems to stereo.

Yes, 1958 is your year of hi-fi opportunity. Take advantage of it!

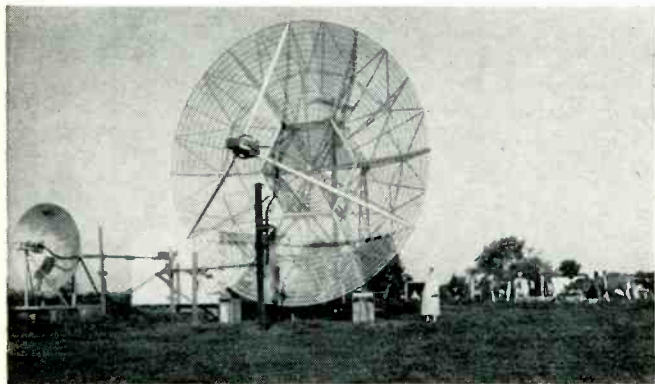
Tuning In the

SERVICE TECHNICIAN SURVEY: The Kansas City, Mo., Conference of Manufacturers, Representatives, Jobbers and Service Dealers is reported to have polled 635 electronic technicians on industry problems. 142 replied (average dollar volume was \$27,835) that the most important thing manufacturers can do to help technicians related to designing sets for ease of service. Included, in order of importance were: Use of standard components, elimination of printed circuits, mounting picture tube on chassis and reduction of tube types. Making service information more readily available was a high point; parts availability and elimination of factory service received prominent mention. The two most important points noted with relation to jobbers were wholesale prices for dealers (elimination of retail sales too), and the need for fast service with complete stocks.

ATOMIC RADIATION is used in an electric eye instead of visible light. The device, developed by Westinghouse, uses strontium-90 to replace the light bulb. It's reported to operate longer without repair than conventional types.

CLOSED CIRCUIT TV is being used by the Berkshire, Eagle, Mass., to bring its newspaper readers the latest news flashes. The Dage camera in the news room is focused on a large revolving drum on which bulletins are placed. The 27-in. receiver is at street level.

CORN, COWS & COMMUNICATIONS



Mrs. Orton Newton of Pharsalia, N.Y., examines 28-ft. dish antenna on her farm pasture. Electric fence keeps dairy herd from microwave gear. Transmitter station is part of Bell Labs research project on over-the-horizon microwave transmission used for commercial telephony, TV relay and military communications. Mrs. Newton uses system to make test calls to the research center 171 miles away.

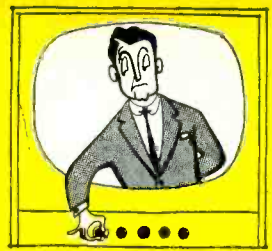


ECONOMIC OUTLOOK: "1957 was spurt then sag; 1958 looks like mild dip then climb . . . The immediate economic situation may not be as rosy as we all want . . . The shower isn't over yet, but the sun shows signs of breaking through the clouds."—Sinclair Weeks, Secretary of Commerce.

MARK TWAIN is credited with saying: "Reports of my death are highly exaggerated." The same may be said about FM radio. 1957 was the first year in almost a decade that the number of operating FM stations increased, bringing the total over the 700 mark, about 85% of them commercial stations. The strong public interest in high fidelity, plus the spread of background music service, may be credited with the recovery.

BI-TRAN. Two TV programs on one channel, described on page 42 of our Oct. 1957 issue, is being demonstrated in the Blonder-Tongue Labs. in Newark, N. J. It is a compatible system of multiplexing TV programs. A second program on the same channel is brought into view as the first program becomes invisible at the flick of a switch. The switch is part of a decoding box, which is for the most part a simple phase inverter. Existing TV broadcast facilities could be used with only slight modification. The sharing of facilities offers an economic advantage for government and commercial applications, and alleviates the need for additional channel space. The multiplexed pictures shown had good definition with an approximate resolution of 350 lines. It was necessary to keep the contrast and brightness down a bit to avoid cross-talk and to maintain a proper contrast range. Further development will probably minimize these problems. It is conceivable that future developments will enable even more than two programs to be sent on the same channel.

Picture



TRANSISTORS became a major industry component in 1957. There were 28,738,000 units produced at an average factory price of \$2.40. This compares with 12,840,000 at \$3.10 in 1956, according to the Electronic Industries Association. Furthermore, 49% of all portable radios were transistorized last year, plus 51% of all auto radios. 1958 will see still greater transistor growth, with very substantial sale of low-priced (\$30 retail) transistorized portable radios. Transistor replacement is becoming an attractive field for technicians; it's expected to climb beyond the 2,000,000-unit mark in 1958.

ELECTRONIC VEHICLE CONTROL offers the ultimate solution to the traffic accident problem which now claims more than 100 lives daily, says RCA Honorary VP Dr. V. K. Zworykin. Such a system was successfully demonstrated on a 300-ft. experimental highway at Lincoln, Nebraska. It consists basically of a series of electronic detector units buried in and along the highway, and a guidance cable buried in the center of a traffic lane along the length of the road. The detector units, in which signals are generated by the passage of vehicles, are used to activate various systems of warning lights and can eventually be combined with simple receivers and automatic equipment in vehicles to control speed and braking. The guidance cable radiates a constant signal which is employed in conjunction with a car receiver and automatic steering equipment to keep a vehicle centered in its traffic lane. A radio tail warning can warn or control following cars.

CALENDAR OF COMING EVENTS

- Mar. 17-21: Atomfair & Nuclear Congress, Int'l Amphitheatre, Chicago, Ill.
- Mar. 24-27: IRE National Convention, The Coliseum, New York, N.Y.
- Mar. 27-29: Ninth Biennial Electric Industry Show, sponsored by Electrical Maintenance Engineers Association of Southern California, Shrine Exposition Hall, Los Angeles.
- Apr. 10-12: Southwest Regional Conference & Electronic Show, Municipal Auditorium, San Antonio, Texas.
- Apr. 18-19: 12th Annual Spring Technical Conference on TV and Transistors, Eng'g Society Bldg., Cincinnati, Ohio
- Apr. 22-24: 1958 Electronic Components Conference, Ambassador Hotel, Los Angeles, Calif.
- Apr. 28- May 2: National Ass'n of Radio & TV Broadcasters Annual Convention, Hotels Baltimore & Statler, Los Angeles, Calif.
- May 7-9: Spring Meeting of The Acoustical Society of America, Washington, D. C.
- May 13-15: Spring Assembly Meeting of The Radio Technical Commission for Marine Service, Benjamin Franklin Hotel, Philadelphia, Pa.
- May 19-21: 1958 Electronic Parts Distributors Show, Conrad Hilton Hotel, Chicago, Ill.
- June 4-6: Armed Forces Communication & Electronics Ass'n., Sheraton Park Hotel, Washington, D. C.

10,000-YEAR LIFE is claimed for Hoffman's new silicon photo-voltaic cells. These units are intended for industrial photoelectric devices where fast response, even lower than 20 microseconds, is desired. They require no external power supply.

55,000 TECHNICIANS, engineers and scientists will attend the Institute of Radio Engineers Convention in New York City's Coliseum, March 24-27. 20,000 items of advanced electronic apparatus will be displayed by 850 exhibitors.

RANDOM NOISE

NEW RCA PHOTO-MULTIPLIER TUBE MEASURES EVENTS THAT HAPPEN IN LESS THAN ONE TEN-BILLIONTH OF A SECOND --- A VALUABLE ABILITY IN NUCLEAR RESEARCH

BY 1975 THE AVERAGE FAMILY INCOME AFTER TAXES WILL BE AT LEAST \$7100-CURRENTLY IT'S \$5300

O MEMO
NATIONAL TV WEEK WILL BE OBSERVED NOV. 16-22, 1958

TOM HIGGINS JR.

Hi-Fi Stereo In

One Cartridge And One Needle, In One Groove Can

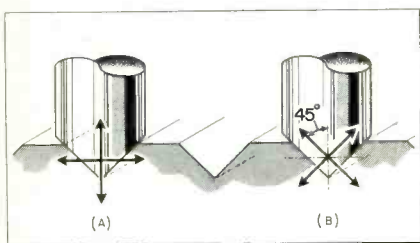
NORMAN H. CROWHURST

• "Do you have the new stereophonic sound on records yet?" Any day now a customer may come in and ask you that question. So it is time to become informed about this market. Of course stereophonic sound has been available for some time, both on tape and in the form of a twin-groove disc requiring two pickups, mounted together in a specially spaced clamp. The new stereophonic discs will be as easy to play as regular records, and will require only one stylus. You don't have it yet, so the next questions from the customer might be "How soon are we likely to see it? Have you heard it yet? Is it any good?"

In the last six months a number of demonstrations have been given by different manufacturers, both of records and equipment, to representatives of the industry. Many of them have been eminently successful. The quality of reproduced sound and the impression of the perspective that the stereophonic presentation gives are far superior to any commercially available records so far. So certainly the new system holds very good promise of being the best form of high fidelity sound on records that has ever been introduced.

"But when is it likely to be available?" That is a very good question and one to which a number of people would like to know the answer. The best that can be done here is to state

Fig. 1—Early single groove stereo discs had a vertical and horizontal axis. The new 45/45 Westrex system, shown on the right, maintains the same relative position between the two axes, but both axes are rotated 45° as a unit, to obtain symmetry of movement.



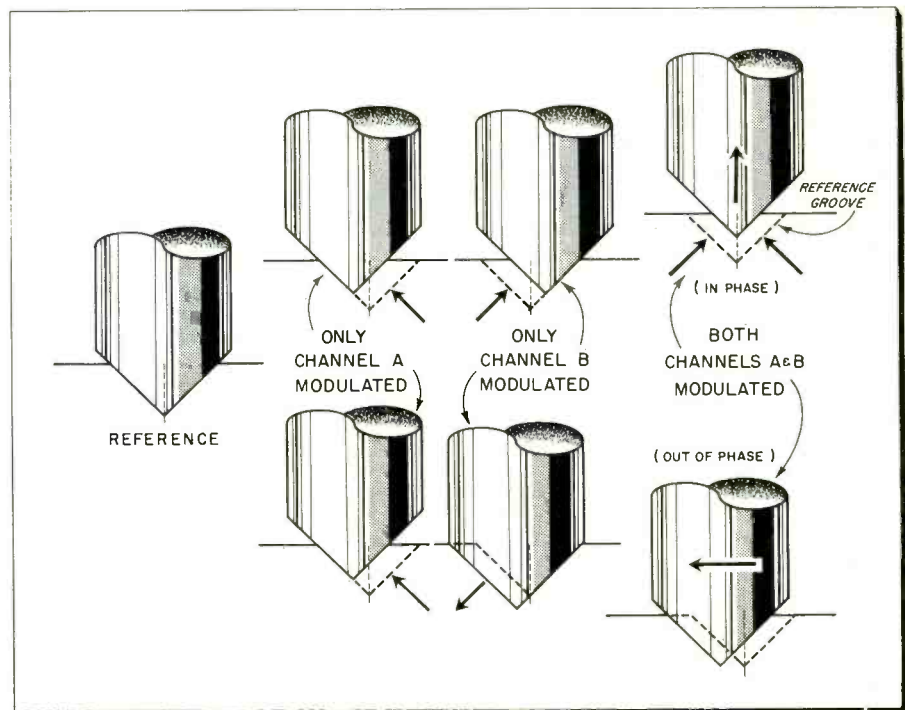
what is involved in having it ready. A new system such as this requires not only a new kind of record, but also a new kind of pickup to play it with. Specimen records have already been made and masters cut for making pressings. In fact, several of the demonstrations have been given from discs pressed on standard machines; which proves it is possible to mass produce stereophonic discs in much the same manner as LPs and other records are pressed. Also, several of the pickup manufacturers are working with the aid of these records on the design of new stereophonic pickups to go with them. The demonstrations with prototype pickups are very promising.

"So what are we waiting for?" Well, both groups need to be sure of what they are doing. The pickup manufacturers need discs of guaranteed quality to test their products on. At the same time the record companies need good stereo pickups of recognized quality to be able to as-

certain that the pressings they produce are up to standard. So we really have a, "Which came first, the chicken or the egg?" kind of story. The record manufacturers have been waiting for a satisfactory pickup to find out how good the discs are, and similarly the pickup manufacturers have been waiting for sample discs to find out if their pickups can do the job. Several manufacturers have produced a number of prototype pickups for use by the record manufacturers and at least one record manufacturer is pressing discs for the pickup manufacturers to use in their development.

As far as recorded programs are concerned, most of the major record companies already have a large library of stereophonically recorded material. The matter of transferring this material to stereophonic discs would be a very speedy operation and a new library of stereophonic records could appear at least as rapidly as the new regular LP discs.

Fig. 2—Position of cutter on discs for various conditions of modulation. The stylus may move up or down, and right or left depending upon the information impressed on each channel. Examination of the record will reveal wider or narrower grooves displaced to one side or another of a reference groove in accordance with the movement of the stylus.



Single Groove Discs



Reproduce High-Fidelity Sound For Two Channels.

From this it appears that when everybody is ready to go we shall suddenly find ourselves with an avalanche of stereophonic disc material descending upon us. The fact that everybody knows everybody else is working on it means that the companies concerned are operating at something like fever pitch and it would seem highly probable that worthwhile stereophonic disc recordings, together with equipment for playing them, will appear within the next six to twelve months at the very most. Once this piece of information is released a whole slew of questions will come from prospective customers.

"What is involved to change over from my present hi-fi rig? Standard LPs are made by having the groove wiggle back and forth sideways. An older form of recording used a groove that went up and down to produce a hill and dale effect. The early monogroove stereo recordings, brought to a workable degree by London Records, used a combination of these two movements. The demands on the cartridge for equally high compliance in both a vertical and horizontal direction presented a rather difficult mechanical problem. Westrex recently introduced the 45/45 system with the advantage of symmetry of movement. The vertical channel was rotated 45°. The horizontal channel's 90° relationship with the vertical channel is maintained and thus also assumes a 45° angle with respect to the vertical plane as shown in Fig. 1.

The resultant position of the groove at any one point may be above or below or to either side, or both of a steady state or reference groove, as shown in Fig. 2. For one channel the movement is at a 45° angle so that it is up toward the left and down toward the right, while the other channel uses a movement which is up toward the right and down toward the left.

This combination of movement produces the necessary output from a two element cartridge using only one stylus. The pickup may have two moving coil elements, two magnetic elements, two crystal elements, or possibly even a combination of dif-

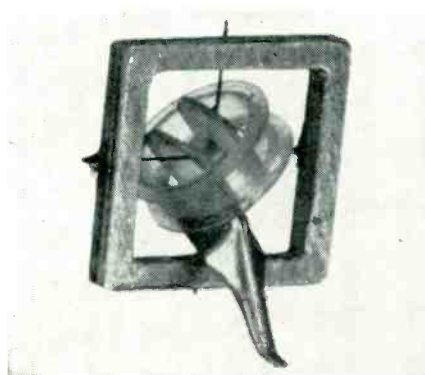


Fig. 3—Elements of a dual coil, single needle, stereo cartridge mounted 45° on each side of the vertical plane and 90° from each other. The coil forms are shown minus the wire.

ferent elements, to get the two outputs; one for each channel. Fig. 3 shows how the elements of a dual coil cartridge are mounted 45° on each side of the vertical plane, and 90° from each other. The coil forms minus the wire are shown. Another stereo cartridge is shown in Fig. 4. To all outward appearances it resembles the conventional monaural pickups. The audiophile net on this unit equipped with a diamond needle is \$19.50. Considering early price predictions, in the neighborhood of \$100.00, this represents very rapid progress. The pickup must be designed for this specific purpose. It is quite possible that existing tonearms may be used with stereophonic pickups plugged into them. A good turntable or record changer is capable of being used for stereophonic reproduction.

So the next question is, "What additional equipment will I need to convert my present hi-fi rig, besides changing the pickup?" From this point forward, a complete extra system, including a preamplifier, basic amplifier and loudspeaker is needed. A number of stereophonic preamplifiers have been designed to incorporate the two-channel preamplifiers into one unit. It will also make the operation of the two units considerably easier. The adjustment of two completely separate preamplifiers

can become quite complicated, with two bass controls, two treble controls, and two volume controls. The combined units will probably come with ganged controls, and a single balance control to adjust both channels for equal loudness to avoid a "heaviness" to the left or to the right.

"What about loudspeakers? Will the existing one do, or shall I have to get two new ones?" This depends to some extent on what kind of loudspeaker the customer already possesses. Whatever he has, it will be possible to get some stereophonic sound that will be an improvement over the monaural system, by adding any speaker to the new channel. But for best results the loudspeakers should be matched. Some have commented that investing in a stereophonic system enables each 50 cents' worth of investment to be as spectacular as a dollar's worth spent for a single channel. At first this seems pretty incredible, because a stereo-

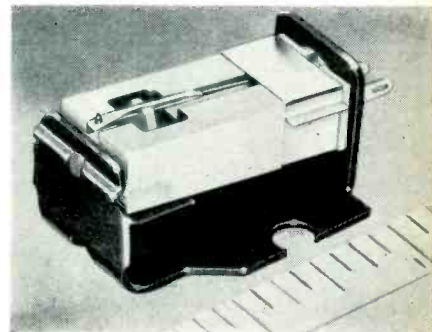


Fig. 4—Stereo cartridge resembles conventional pickup, and will fit into a regular tone arm. It can play standard LP records.

phonic system of fidelity comparable with the single channel must cost almost twice as much. But the point being made is that a relatively low cost stereophonic system sounds so much better than a corresponding quality single channel system. For example, two 10-watt amplifiers in a stereophonic system can be quite as impressive as a 50-watt amplifier in a single channel system, and two low

(Continued on page 30)

cost extended range loudspeakers in quite inexpensive enclosures on stereophonic program can sound quite as impressive as a more expensive loudspeaker system on single channel.

This does not mean to say that the low cost stereophonic system cannot be improved upon. Higher quality amplifiers and higher quality loudspeakers will definitely permit better quality reproduction. On this question of listening quality, several observers have commented on the apparent improvement in frequency range when two loudspeakers are operated on stereophonic program instead of single channel. The low cost speakers, for example, that do not extend very far down in the bass or very high into the treble frequencies, seem to reach much further on both ends when two of them are played on stereophonic program. There is no kidding about this. It really happens. And the reason is fairly simple. It has always been recognized that one method of getting bass is to utilize two smaller loudspeakers instead of one larger one. This extends the range because each of the smaller loudspeakers can still handle the higher frequencies and the two together can reinforce the bass.

"But shouldn't each loudspeaker be capable of handling the full frequency range so as to give the correct directional effect?" For the low frequencies, both channels carry almost identical sound. If the bass comes apparently more from the left, this will mean that the left channel has greater loudness than the right channel. The loudspeaker on the left will be working harder than the speaker on the right, and in spite of the fact that the right hand loudspeaker is helping to push the necessary low frequency sound into the room the sound will still appear to be coming from the left.

High Frequencies

"What about the highs?" The reason for using tweeters to extend the range up to 10,000 cycles and higher is to improve the character of the instrumental quality. One can tell the difference between a flute and a violin much more readily. Stereophonic presentation achieves the same objective in an additional manner. It picks up the sound waves from the same instrument in different locations and on playback reproduces the different intensities and phase which existed at these different locations. This not only helps to distinguish one instrument from an-

other, it helps the listener to obtain a fix on the sound source. Consequently a loudspeaker that begins to fall off after 5000 cycles may seem to sound as good on stereophonic presentation as a loudspeaker, with better high frequency response, played on a single channel.

But one customer may tell you, "I already have a high fidelity system that goes out to 15,000 cycles. So why would I need stereophonic sound? Will it improve my system?" It certainly will. The use of high frequencies for improving the precision of reproduced sound was one of the ways to do it. Stereophonic presentation is another. Not only does it enable the instruments to be distinguished from one another, and enables them to stand out as separate entities, it separates the reverberation from the instruments themselves so each sound is pin-pointed in a manner that was never possible with single channel presentation. By now some customers may be quite enthused and anxious to go as soon as the new system becomes available. Can they start looking for stereophonic discs?

Compatibility

Here a point of warning should be sounded. Several claims have been made for the compatibility of the stereophonic disc system. This compatibility is claimed in two different ways. First that the stereophonic pickup will play all the old LPs as high quality single channel program presented over the two loudspeakers without any change in connection. In this sense the system is compatible. In the second sense, that stereophonic discs can be played with ordinary LP pickups, the compatibility is somewhat limited. It is quite true that any of these new stereophonic discs can be played by any good quality pickup and give reasonably good sound. But the warning is that if you play these discs in this way they will probably be ruined for playing later as true stereophonic discs. This is because the motional impedance of the stylus in a regular pickup is not the same vertically as it is laterally; consequently the groove is liable to be damaged in the vertical direction. A good rule is to use a stereo cartridge for stereophonic discs even though the rest of the system is monaural. •

ILLUSTRATION CREDITS:

Fig. 3. Fairchild Recording Equipment Co.

Fig. 4. Electro-Voice, Inc.

Stereo Sidelights

With formal acceptance imminent, by the executive committee of RIAA, of the Westrex 45/45 stereo system, it means that the technician will be called upon to sell, install, modify and service more audio systems than ever. For technical background purposes it is well to know about some of the other systems capable of reproducing stereophonic program material on a monogroove disc. In addition to straight vertical and horizontal channels which led up to the Westrex approach, there are at least two other systems.

Single-Channel Stereo

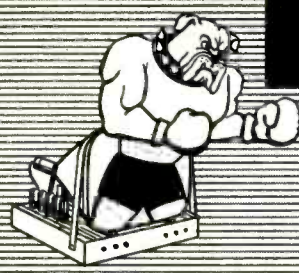
Unlike the other systems this one requires only one channel, one amplifier, and a conventional pickup. It utilizes a number of properly spaced microphones; each feeding through a different narrow-bandpass filter to a mixer and a single-channel recorder. Upon playback, a similar arrangement of filters feeds a series of woofers, tweeters and midrange speakers which are placed in the same relative positions as the microphones. This provides the effect of depth. The sum of all the filter ranges covers the audio spectrum. The more mikes and speakers, the better the stereo effect. For example, if during recording the mike and low pass filter are at stage left, then during replay the woofer fed by its filter or crossover network should also be at stage left.

Another system which does not require a special pickup establishes two channels by a form of multiplexing. The two channels are mixed together in additive phase and recorded, using a range up to 20,000 cycles. At the same time the two channels are mixed together in subtractive phase, which is then used to frequency modulate a 25 kc carrier, with a 5 kc deviation. This is actually on the record, and can be heard if the record is slowed down enough.

On playback, the signal from the pickup is fed to a single preamplifier and then passed on to a fairly simple "decoder" which picks off the FM and separates the two channels. A special elastic type of material is required for these discs to retain their high frequency response.

All things taken into consideration, large number of microphones and speakers in one case and special record material and additional decoders in another seem to indicate that 45/45 Westrex system is the most practical system at this time.

"Tough Dog"



Corner



Difficult Service Jobs Described by Readers

Too Many Rejects

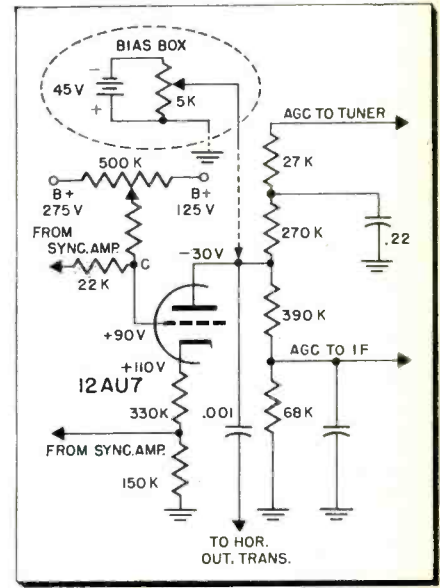
The Raytheon welder Model 225 is a small capacitor-stored energy welder. It was brought into our shop after someone else had tried to fix it. He did succeed in getting a dead welder to work, but one out of four welds had to be rejected, which is much too high. This job was particularly tough because all components and tubes were good. A voltmeter across the capacitor bank C1 showed a gradual voltage drop of 20 volts from the set rating. The rectifier tubes would then fire and bring the voltage up to the specified figure. The voltage would start to drop again and the cycle would repeat itself. If a weld was made while the voltage was on the low side it would have to be rejected. The mercury-rectifier tubes V1 and V2 charge the capacitor bank C1 to a voltage depending upon the setting of R1. When the welding switch is pressed, thyatron, V3, discharges the capaci-

tor bank through the welding transformer. Components R2, R3, C2, C3 form a phasing network which maintains the capacitor bank at a constant voltage.

Because the phasing network is supposed to apply voltage at the proper time to keep C1 fully charged (Continued on page 72)

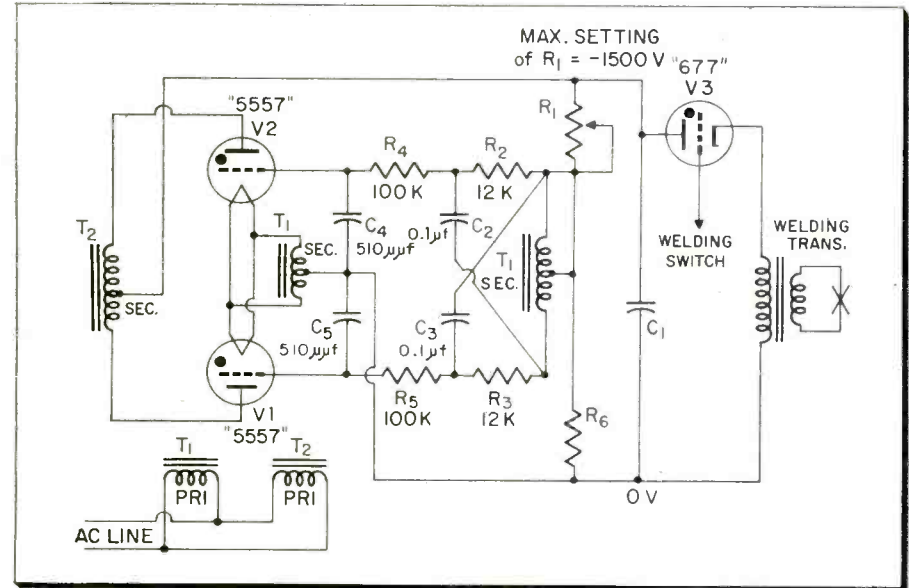
"Sound" AGC

A particularly interesting but disturbing agc problem presented itself in this Stromberg Carlson K-122A Series TV set. This circuit is basically a keyed agc system and the control voltages developed depends upon the amplitude of the sync pulses applied to the grid of the 12AU7 agc tube. Sync pulses of over 7 volts will cause the tube to conduct if pulses from the horizontal



Bias box helps isolate agc trouble originating in the audio section of the receivers.

All parts were good. Transformers wired out of phase caused intermittent welding action.



oscillator are applied to the plate of this tube at the same time.

In this particular case, the -30 volt was absent. However, the 450-volt pulses and the sync pulses were present. The pulses from the sync amplifier were distorted due to the high signal levels. It was apparent that the tube was not conducting and no agc control voltage was produced.

From past experience the 0.001 μ f, 1000-v capacitor coupling the horizontal output transformer to the agc tube was suspected. Replacing this capacitor was a waste of time. At this point it is easy to be misled and start traveling in circles, but an old trick saved the day. Placing a 45-volt battery, positive to ground, and a 5000-ohm potentiometer on the plate of the 12AU7 tube, and disconnecting the coupling capacitor C1, to keep the horizontal pulses from going through the battery, it was determined that at certain settings, (Continued on page 72)

Debugging TV Alignment

End Distortion, Interference, Hum Oscillation & Regeneration.

ROBERT G. MIDDLETON

receiver. The generator's output should be adjusted so that the peak-to-peak voltage at the output of the video detector is in accordance with the TV set manufacturers' alignment instructions. All service scopes have much more gain than is actually required to get full-screen deflection from the output of the video detector. Hence, this type of alignment bug is easily eliminated. As a general rule, keep the generator gain control down, and the scope peak gain up.

Overdrive may also cause the waveform to become flat topped and appear to be an excellent response curve. Whenever the curve looks too good, be on the alert. One simple test is to vary the output from the sweep generator and observe the trace on the scope. As the output is varied, the waveform amplitude will also vary. The shape should remain the same as the instrument's attenuator is rocked back and forth. Maximum signal input can be determined by watching the top of the waveform, it should be below the point where flattening or undershoot or other distortion occurs. See Fig. 3. An external bias

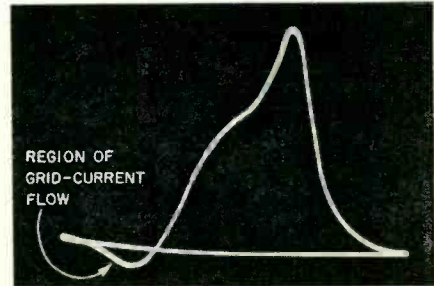


Fig. 2—Undershoot caused by an excessive drive signal to the video amplifier. Unfortunately other defects may also produce this symptom.

supply should be used to fix the operating point of the agc controlled r-f and i-f amplifiers. Too low an output from the signal generator may cause peaking. Stick to the set manufacturer's recommendations.

Cross-talk

Cross-talk or interference from the vertical and horizontal sweep circuits may distort the waveform as shown in Figs. 4 and 5 respectively. The remedy is to remove the interfering signal if possible or to minimize its effects. A quick way is

Basic Alignment Instruments

VTVM

Oscilloscope

Low Capacitance Probe

Demodulator Probe

Sweep Generator

Marker Generator

Bias Box

Marker Adder (optional)

Isolation Transformer (optional)

Balancing & Matching Networks

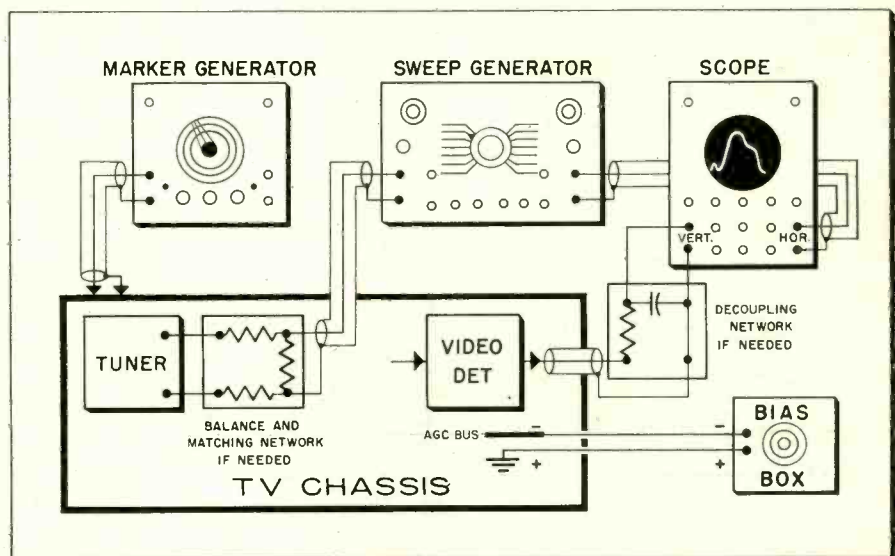
Decoupling Network

• Sweep alignment would be a pleasure if the patterns did not require debugging. Because there are so many different breeds, unless each type is clearly recognized, and properly eliminated, the technician is sure to come to grief. In most cases, cures for one type of phony waveform will have no effect on the other types. A typical test setup is shown in Fig. 1.

Overdrive

One type of difficulty often encountered is caused by too much signal from the signal generators. Picture detectors normally deliver approximately two volts peak-to-peak to the grid of the first video-amplifier tube. Higher outputs can drive the video amplifier into grid current and distort the pattern. The distortion may show up as an undershoot of the curve below the base line as shown in Fig. 2. Sweep generators have enough output in most cases to seriously overdrive the

Fig. 1—Typical test set-up for TV sweep-alignment procedure. This represents minimum equipment requirements. A VTVM, and isolation transformer are also important must items.



With Proper Test Equipment

How To Construct A Balancing, Matching & Decoupling Network.

to disable the oscillators by pulling tubes or bypassing the signal to ground at the grid or plate of the oscillator tubes. Precautionary steps must be taken not to damage the horizontal output tube when the horizontal oscillator is shut down. Either bias the output tube to cutoff with a negative voltage, or remove the tube. In series string circuits a dummy tube could be used to maintain the filament circuit. If boost voltage affects B+ voltages in the stages under test, then it will not be possible to kill the horizontal oscillator and still achieve a proper reading. In that case, a good deal of the hash present in the response curve may be removed by placing a 0.001 to 0.01 μf capacitor across the terminals of the scope, or a 10,000 to 50,000-ohm resistor may be placed in series with the scope's probe. In many cases it is desirable to connect both the capacitor and resistor at the same time in the manner prescribed for each. When using this decoupling filter, as shown in Fig. 6.

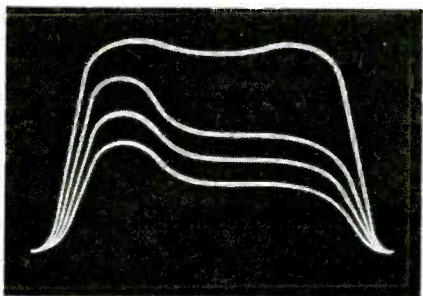


Fig. 3—Flat top can be misleading. When the curve looks too good check for overloading.

check the waveform for distortion, and if necessary try another set of values. A smaller capacitor or resistor or both may cause less distortion. This technique may also be used to sharpen a marker pip and eliminate other undesirable hash.

Hum

Hum is another form of distortion often encountered. Curved and tilted

base lines are one of the prominent clues, inability of the trace and retrace curve to coincide even when properly phased is another. Fig. 7 shows some of the different but typical hum patterns. The particular curvature and tilt observed depends

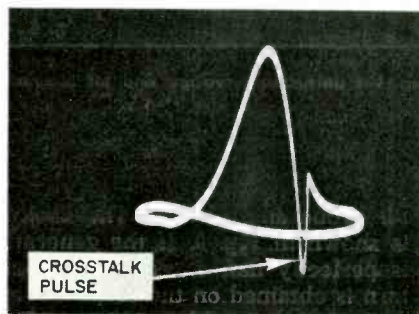


Fig. 4—Interference from the TV vertical sweep circuits may cause undesirable pulses.

upon the value of the hum voltage, and its phase. Hum is usually caused by: exposed test leads, especially when high-impedance circuits are under test; heater-to-cathode leakage in a tube; and poor filtering.

Oscillation

Oscillation and regeneration are pretty much related, and the same medicine may rid both of these pests. Oscillation may take place when two or more stages are tuned to the same frequency in a stagger-tuned receiver, or when the plate and grid circuit are peaked at frequencies which are too close to each other. Defective bypass capacitors, loose or missing tube shields, improper lead dress, and other defective components may contribute to undue oscillation, regeneration, intermittent squelch, and other forms of instability. When oscillation does occur the response curve may collapse completely and an abnormally high d-c voltage will be present at the output of the video detector. It is best to use a VTVM when making this measurement.

Just before oscillation takes place

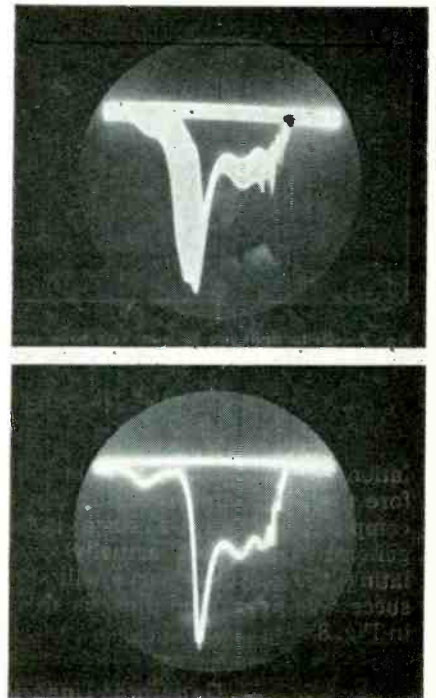
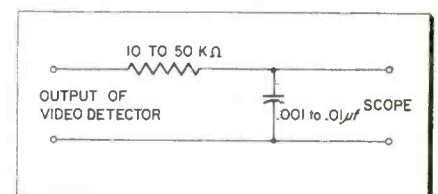


Fig. 5—Horizontal oscillator interference can be eliminated or minimized by disabling the oscillator or using a decoupling network.

the technician may observe an excessive peak in the waveform. No further alignment procedure is possible until this condition is removed. Oscillation may be stopped by reversing the final adjustment made just before the set broke out, or the bias may be increased. It will be necessary to restore the bias to the proper level after the cause of oscillation is removed.

Fig. 6—Decoupling network may be used to sharpen the marker and reduce the amount of hash displayed on the scope. Values are not too critical, but to avoid distortion, use smallest values.



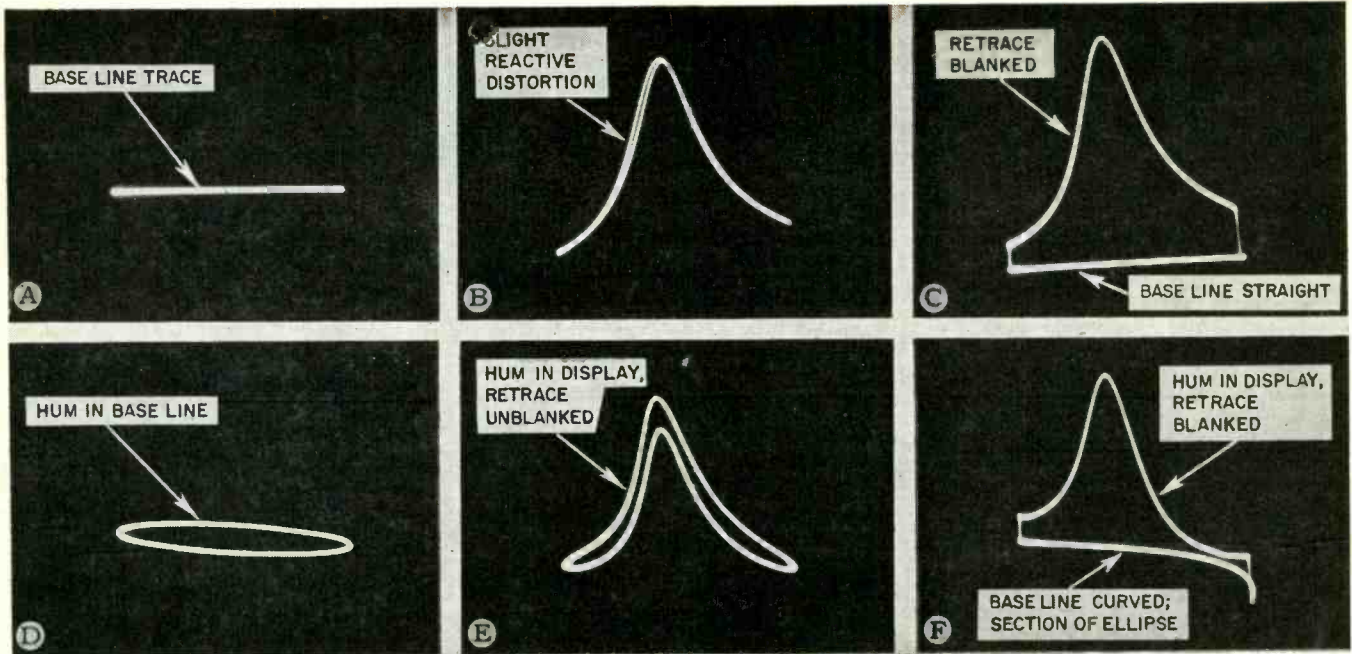


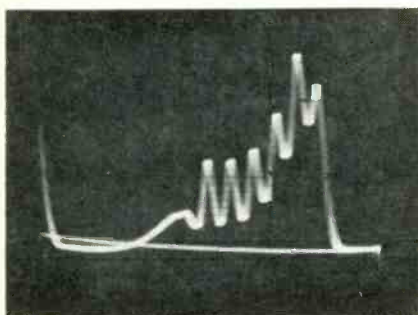
Fig. 7—Distortion due to hum can take many forms. The particular curvature and tilt depend upon the value of the hum voltage and its phase

lation has been eliminated and before the alignment procedure can be completed. If an i-f stage is regenerative, but not actually oscillating, the response curve will show successive peaks and dips, as shown in Fig. 8.

Generator Linearity

After long service, sweep generators require troubleshooting and repair, just as a TV receiver would. One of the most insidious bugs is caused by leaky capacitors, off-value resistors, weak tubes, or similar faults which result in a lack of flatness. This is particularly troublesome because it often passes unsuspected and can result in poor alignment even though the TV set's response curve may seem to be quite satisfactory. It is simple to test a sweep generator for flatness. All that is required is a good demodula-

Fig. 8—Successive peaks and dips are indicative of a regenerative i-f stage.

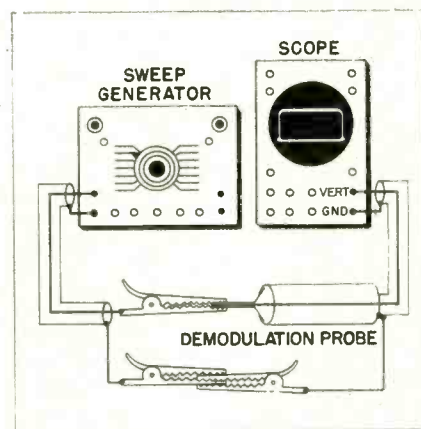


tor probe and a scope. The hookup is shown in Fig. 9. If the generator is perfectly flat, a rectangular pattern is obtained on the scope screen. A generator is seldom 100% perfect. It is generally considered flat if it is within ± 1 db over a swept bandwidth of 10 mc. If a generator shows wide departure from flatness, it should be repaired.

Type Of Signal

It is desirable to obtain proper impedance match, and the correct type of input as well as a signal level that will not overload the receiver. Much has been said about the first and last of the above requirements. However, the distortion introduced

Fig. 9—Sweep generator linearity may be checked for flatness with a scope and demodulator probe.



by not having the proper type of input is often overlooked. It is possible to have correct impedance match and correct input signal amplitude, but not have the correct type of feed. The 300-ohm antenna terminals on a tuner requires a push-pull signal, while a 72-ohm or single-ended input requires an unbalanced signal. If the generator output is 300-ohms and balanced, it

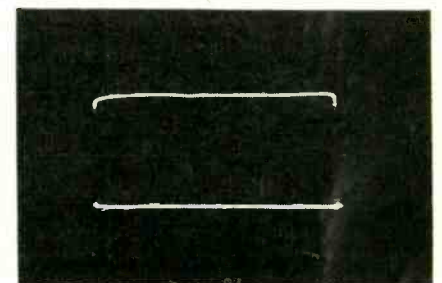
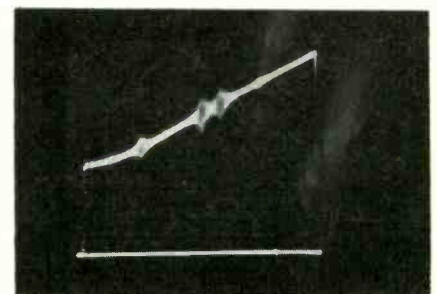


Fig. 9A—Response curve is considered flat if it is within ± 1 db for a bandwidth of 10 mc.

Fig. 9B—Nonlinearity and spurious markers.



Report on

Stereo Cartridges

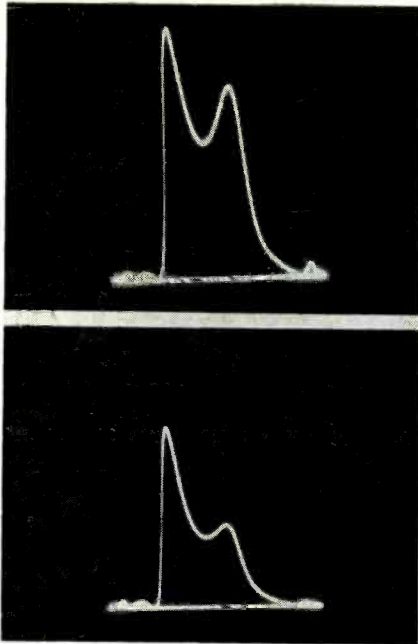
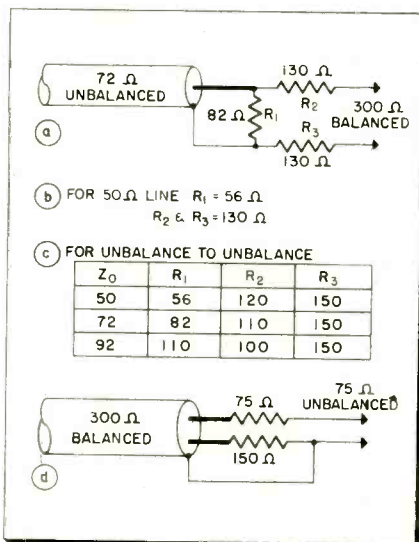


Fig. 10—Distorted signal in bottom photo shows result of feeding an unbalanced signal into a balanced line. Misalignment would be the result if this response curve were brought up by peaking the i-f's.

may be connected directly to the 300-ohm terminals, and by the same token, if the generator's output is 72-ohms and unbalanced, it may be connected directly to a 72-ohm input terminal. Fig. 10 shows the type of distortion likely to occur when an unbalanced signal is fed into a balanced 300-ohm tuner, even though impedance match and other condi-

(Continued on page 56)

Fig. 11—Proper hookup for feeding an unbalanced line to a balanced load, or vice-versa. Impedance match as well as balance is maintained when this network is used.



• Our industry is on the threshold of one of the most significant changes in the history of music reproduction, reports Electro-Voice, Inc., of Buchanan, Mich. The technical developments to reproduce stereophonic recordings on a disc have been completed and within a matter of months the missing links in the chain to accomplish this will be available. Not necessarily in order of importance, here are the significant facts extracted from their releases and conversations with equipment manufacturers, record manufacturers, and engineers.

How Does A Stereophonic Cartridge Differ From A Conventional Cartridge? A cartridge designed for stereo and used to play monaural records will give superior performance to a cartridge designed for monaural record playback only. Several new parameters of performance appear. The most important of these being a separation of sound between tracks, also uniformity of output between the two segments of the cartridge and susceptibility to vertical rumble. Average channel separation in the neighborhood of 15 db is more than adequate. Output variations between sides not exceeding 3 or 4 db are acceptable. Rumble suppression of 20 db or better will permit the use of a stereo cartridge with any type of changer or transcription player. Physically, of course, the design of the cartridge should be interchangeable with existing equipment. The outward identifying characteristic between monaural and stereo cartridges is more than two output terminals or leads.

Are Stereo Discs Compatible With Conventional Cartridges? The answer to this question depends upon the type of cartridge being employed by the individual. Some cartridges now being used for playing monaural records are satisfactory for playing stereo records monaurally, i. e., they will not hurt the stereo record and will reproduce the records monaurally. However, many cartridges in the field are not satisfactory for this and will damage to some extent the stereo record. The customer should

not buy stereo discs when he has a monaural system in anticipation of converting his system to stereo. He should first change his cartridge. On the other hand, once he has converted his cartridge, irrespective of any other conversion he might go through, he can play either stereo discs monaurally, or monaural discs.

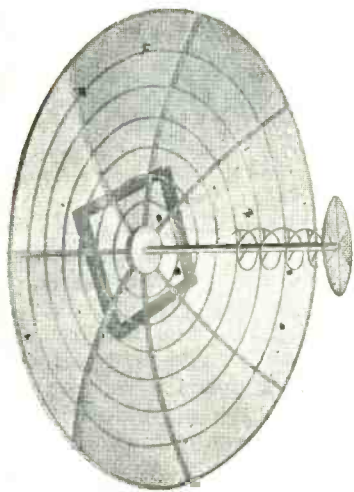
What About The Modification Problem For Existing Equipment? The extent of the modification required will depend upon the type cartridge being employed. Assuming the customer is using a stereo cartridge, which is constructed so that its output is already corrected to the RIAA curve, he does not require a second preamplifier. It will fit virtually any standard tone arm. A stereo cartridge, however, does require a third lead and this lead must be of lightweight wire so as to not impair the tracking of the arm. The addition of a second amplifier and speaker is not complicated. For the technician, the modification is simple.

What About The Stylus Size? And Why Was 0.7 Mil Chosen? There are two tip sizes that are being commonly talked about, 0.7 mil and 0.5 mil. For most applications and for all record changer applications, 0.7 mil or thereabouts will probably be the standard. The reason for this is simple. A 0.5-mil tip must be tracked on a record in the pressure area of 4 grams to avoid excessive tip and record wear. This gives excellent tracking and is very commendable; however, in order to trip a record changer mechanism, you must have tracking pressure between 5 and 10 grams. To track a record at this pressure without hurting the surface of the record, you would require a larger stylus, 0.7 mil being a very satisfactory compromise. This has a further advantage to the consumer in that conventional LP records are actually being cut today so that they will track better with the 0.7-mil tip than with the 1-mil tip.

Will The Stereo Cartridge Be Available As A Conventional Turnover Or As A Single Needle Unit? The stereo cartridge will be available
(Continued on page 56)

Radio Telemetering

Amplitude, Frequency & Pulse Modulation



ALLAN LYTEL

• Telemetering is the reproduction of meter indication, at a location remote from the place where the original measurement was made. This in itself is not new, for current and voltage readings can be transmitted directly over wires. Transmitted signals in this case the voltage and current readings, may also be sent by the carrier current method. This method is a form of wired radio. The signals modulate a low-frequency r-f carrier, usually below 500 kc, and is then coupled to a transmission line which carries the composite signal from one power station to another.

Radio is now widely used for telemetering because of its flexibility, especially in situations where there is no existing wire link between two points. A basic system is shown in Fig. 1. Information from an electrical measurement modulates a transmitter which sends the signal through the atmosphere to a receiver. The signal is demodulated and fed into a remote indicator. More than one channel of information, or several meter readings, can be transmitted by a single carrier or radio link.

An industrial process involving liquids may require control over pressure, rate-of-flow, and temperature. Gauges of various types may be used to obtain indications of these functions. These indications and their variations may be translated

into electrical values. For example: a thermocouple can produce a voltage whose amplitude varies with temperature, this may be indicator A in Fig. 2; indicator B and C may in a similar manner, using proper transducers, show the other two conditions.

A commutator type switch samples each voltage or signal for a period of time depending on the switch's revolutions-per-minute. In this way the indications are read one at a time, in sequence, into the modulator and then transmitted. This

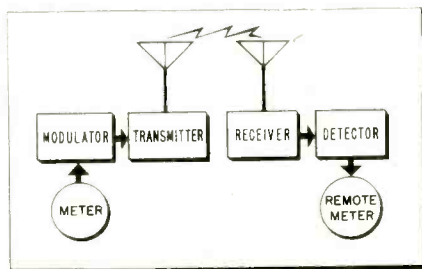


Fig. 1—A meter reading in one place is read on another meter at a distant location. The information is transmitted via radio.

sampling process is one way of sending several readings on a single channel. Because the signals are taken one at a time it is simply called a sequential method of transmission.

AM & FM

If the varying voltage in indicator A is used to modulate a carrier in the conventional manner, the result could readily be an amplitude modulated signal. It is also possible to use frequency modulation. Combinations of AM, FM, carrier and subcarrier signals may be employed on a single channel. It may be interesting to see how a subcarrier and carrier signal is developed. Fig. 3 shows a block diagram of a transmitter. The meter movement or other indicating device may be electrically or

mechanically coupled to Oscillator 1, which is a low r-f frequency, so as to vary its frequency in accordance with the meter movement. (There are a number of ways to accomplish this, one is to have a variable capacitor rotate with the indicator's movement.) This low r-f variable frequency is called the subcarrier and is used to modulate a master oscillator which is a higher r-f frequency, and is then transmitted. It is called the carrier. Because there are many readings to be transmitted several indicators and oscillators may be used to develop these subcarriers which then modulate the carrier. The carriers and subcarriers may be either amplitude or frequency modulated and in different combinations as follows:

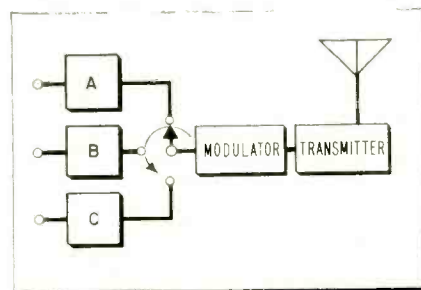
Combination	Subcarrier	Carrier
A	AM	AM
B	AM	FM
C	FM	FM

In combination A, the subcarrier channels are all AM and their modulation of the carrier is also AM but in B they frequency modulate the carrier. In combination C both the subcarrier and carrier are FM. The subcarriers are separated at the receiving end by filters, and fed into the proper meters.

Pulse Modulation

This form of communication lends itself nicely to pulse type signals. Here again many different forms of

Fig. 2—In sequential transmission, a commutator type switch samples different readings one at a time and passes it on to a single-channel transmitter.



for Industry

Relay Information On A Single Channel.

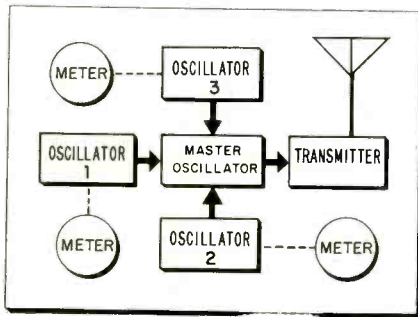


Fig. 3—Carrier and subcarrier transmission may be all AM or FM or combinations of both. Filters at the receiving end separate the different subcarriers.

pulse modulation is possible, some of which are shown in Fig. 4. Part A may be considered as the basic configuration which is a series of equally spaced and equally sized pulses. In B the pulses are amplitude-modulated and as the modulating signal changes so does the relative pulse height. FM is shown in part C. In part D, the pulses are time-modulated. For reference purposes, some of the pulses are master or sync pulses; these are marked M in the diagram. The information in the signal changes the time each pulse occurs after each master pulse. The width of each pulse may also carry information as indicated in part E. The pulses can occur in coded groups, as in part F. Consider the code groupings in part F, if each pulse corresponds to a magnitude of 1 volt, then the pulse group from left to right would correspond to 3, 2, 4, and 1 volt respectively. Here too it is possible, with the various types of pulse modulation, to take many different readings on a single channel.

Multiplexing

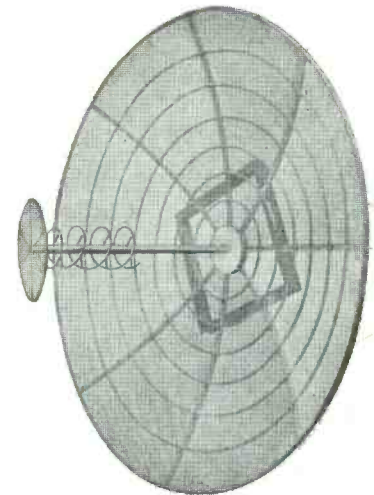
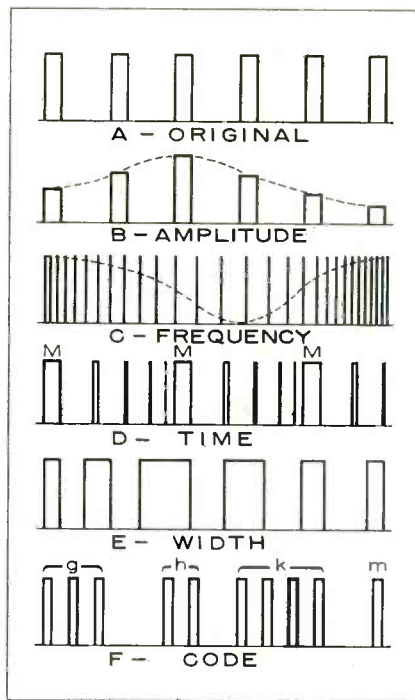
An example of the use of radio telemetering is shown in Fig. 5. A pipe line such as for oil or natural gas, may be installed over a very large expanse of country. This means that the pumping stations, of which two are shown, are usually located in remote areas some distance from

each other. Point-to-point microwave radio voice communication may be used to connect these stations. By multiplexing, it is possible to combine voice and telemetering facilities on a single carrier.

Voice transmissions are picked up and relayed from pumping station to pumping station. At the same time the required meter readings are added to the signal by modulating new subcarriers. This process is repeated at each station. It is thus possible for a central control station to have complete information about the operation of the pipe line at any moment.

An interesting sidelight on remote operation of these distant installations is that in the event of a power failure emergency diesel or gasoline-powered generators which are held

Fig. 4—Pulse modulated signals are also used to transmit intelligence. It is possible to use various types of pulses to indicate many different kinds of information on one channel.

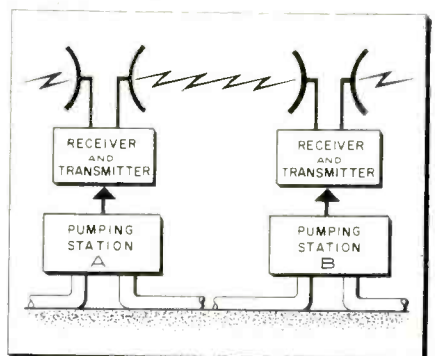


in reserve, will automatically go into operation. Telemetering channels will then relay the generator's fuel level, and thus indicate how long the station can be expected to operate under these conditions. When the regular commercial power is restored, the emergency generator will automatically stop and go into a standby position.

Telemetering is in part responsible for getting space information back to earth, for tracking missiles, and for remote indication of dangerous applications as well as for many industrial applications. •

Photo Credits
Technical Appliance Corp.

Fig. 5—Multiplexing voice and radio telemetering on a single-carrier point-to-point radio relay makes utmost use of existing equipment and conserves space in the electronic spectrum.



Current Surge Protection For

Silicon Rectifiers

• Since the introduction of silicon rectifiers a relatively short time ago, they have made great strides in TV and industrial electronics areas. The number of applications are growing rapidly. More technicians are using these units to perk up old sets and to combat low-line voltage conditions. In addition to their small size, ease of installation and long life expectancy, observable improvements in TV reception can be noted the moment the set is turned on.

Low-voltage drop across the silicon rectifier allows more voltage to be developed for useful purposes. However, low-voltage drop also

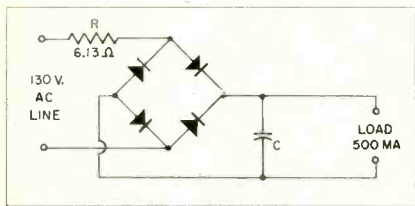


Fig. 1—Type M or N silicon rectifiers in a bridge circuit. Capacitive load requires the use of a series limiting resistor.

means low resistance. Our friend Mr. Ohm tells us to beware of large currents under these circumstances. The proper selection of a rectifier for a given load or TV set is a simple procedure. In most cases enough margin of reserve power is provided for at the time of installation and very little difficulty or breakdown is experienced because of working too close to peak ratings.

However, there does exist a condition that warrants some more attention on the part of the technician who is investigating a failure complaint, or when making a new installation. B+ power supplies using conventional capacitor input filter systems, or any electronic device having a capacitive load presents very low impedance when current is first applied.

Since a capacitor represents almost no resistance for the first few cycles of operation, and since it is across the output circuit, the only limiting

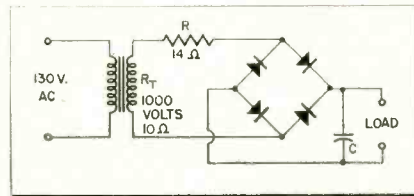


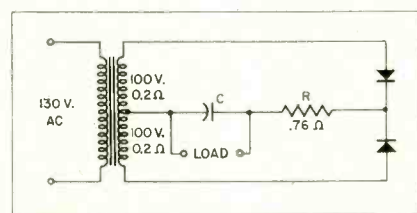
Fig. 2—High voltage bridge using Type L or P rectifiers. Transformer resistance can be deducted from series resistor needs.

resistance is that of the rectifier, plus the resistance of the transformer (if used) and any surge limiting resistance connected in the input circuit. Initial current surges can and do reach sufficiently high values to cause component failure or short life.

Silicon rectifiers have extremely low resistance at high values of current, and in order to provide an adequate safeguard, a series limiting resistor should be used. Fortunately most TV sets and other electronic gear using selenium rectifiers in half-wave circuits with a capacitive load are equipped with these resistors. This design practice has been carried over for silicon applications, and no problem exists in these situations. On the other hand, full-wave circuits have not received proper attention because selenium rectifiers require little or no special precautions in this regard. Selenium rectifiers with relatively low voltage-per-junction ratings and much less sharp conductivity curves have an automatic limiting action in all but half-wave circuits.

Table I shows the maximum peak current ratings for the different types of silicon rectifiers, and the minimum series resistance per 100

Fig. 3—Full-wave arrangement using type Q rectifiers and center-tapped transformer.



volts peak input. Consider the case of the bridge circuit in Fig. 1. The value of R can be readily determined by first finding the value of the peak input voltage. In this case it would be equal to $130\sqrt{2}$ or 184 volts. Divide this figure by 30 which is the maximum allowable peak current for the M type rectifier. R is equal to 6.13 ohms. This resistance can be part of, or completely contained in the transformer winding in the circuits shown in Figs. 2 and 3 which also shows the proper location of a current limiting resistor. The

Type	Max. Peak Current Amps	Min. Series R Per 100 Volts Peak Input
M and N	30	3.33
L and P	60	1.67
Q	150	0.67
R	200	0.5
S	350	0.29
V	1000	0.1
W	1500	0.07
X	2000	0.05

Table 1—Maximum peak current, and series resistance requirements for silicon rectifiers.

resistance of the silicon rectifiers is so low it can be ignored when computing the value of R.

Like other electronic components, silicon rectifiers have maximum current limits. It is at times necessary to use individual rectifiers in parallel to get sufficient output. Because the forward resistance is very low once a silicon rectifier starts to conduct, any unbalance between threshold voltages or internal voltage drop would cause serious unbalance of load distribution and ultimate failure of the overload section. For this reason a small series resistance should be employed with each halfwave section operating in parallel. For proper balancing of individual currents, in the conducting direction, resistance values and wattages for the N, P and Q types are: 2 ohms, 5 watts; 0.5 ohms, 30 watts; and 0.15 ohms, 100 watts respectively. •

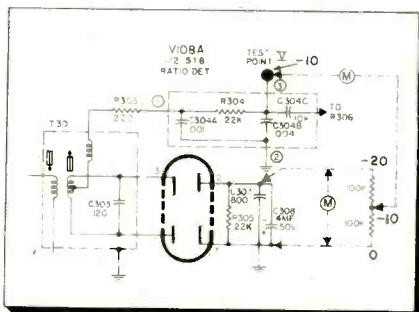
SHOP HINTS



Tips for Home and Bench Service

No Alignment Jig

A convenient alignment jig for the ratio detector in the sound portion of a TV or FM receiver, described on page 46 of the January 1958 issue of *Electronic Technician*, goes a long way to simplify and speed up the procedure. The following method goes one step further, and permits alignment of an unbalanced ratio detector without a jig or other external resistors. When the jig or other pair of equal resistors are placed across the load resistor, the junction point or center of the two resistors is at a potential of half the voltage across the load resistor, as shown by the dotted lines in the diagram. The meter is then con-



FM discriminator can be aligned without the use of jigs or external resistors.

nected between this point and the center tap of the ratio detector transformer circuit, test point V. The transformer secondary is then adjusted for zero volts.

Since the potential difference between test point V and the center point of the two resistors is zero, and since this center point is half the peak voltage (in this example—10 volts with respect to ground) test point V would also be half the total voltage, with respect to ground. Therefore, we can dispense with the jig, and make the alignment with the VTVM only. Attach the positive probe to the chassis and the nega-

tive probe to pin 2 of the tube. Adjust the primary and preceding stages for maximum voltage. Transfer the negative probe to test point V and tune the secondary for one half of the maximum voltage. Recheck the voltage on pin 2 for maximum and readjust if necessary.

Sometimes while adjusting the secondary of the detector transformer the primary becomes detuned. It is good practice to rock the adjustments to make sure that tuning is optimum.—*Bob Eldridge, Vancouver, B. C., Canada.*

To verify the meter reading for exactly half the maximum load voltage at test point V with respect to ground, alternate the position of the positive lead from ground to pin 2 of the 5T8, while the negative lead remains on test point V, the two readings obtained should be exactly equal.—*Ed.*

Record Changer Mounting

Recently, Olympic started to use a new record changer in the Model A588 and initial experience indicates that it is an excellent and trouble free unit. This changer can be recognized by the grey color of its base plate and tone arm. On some of these units the opening in the cabinet motor board was cut improperly and under the weight of a full stack of records can cause part of the changer mechanism to jam against the opening. When this happens the changer will not complete its cycle.

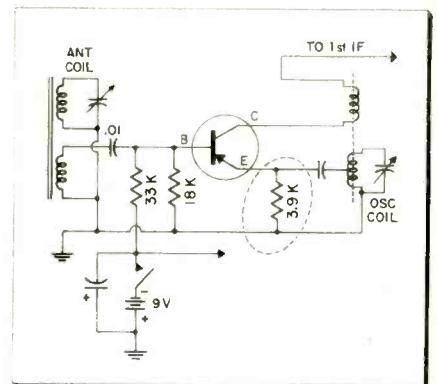
To cure this condition, remove the record changer from the cabinet, remove the 3 changer floating springs and insert washers at least $\frac{1}{8}$ " thick on the stud that holds the changer floating springs. Replace the spring on its original stud and return the changer to the cabinet. Raising the changer from the mounting board in this manner completely elimi-

nates the possibility of the reject spring hitting the motor board.

All future releases of the Model A588, using this changer, will have the cutout on the mounting board re-vamped.—*Olympic Radio & Television, Long Island City, N. Y.*

No Low Stations

The converter-oscillator in this DeWald, Model K-701, all transistor radio failed to operate on frequencies below about 700 kc. A preliminary check revealed that the plates of the tuning capacitors were not shorting in that range, a fairly



Changing bias voltage restored low stations.

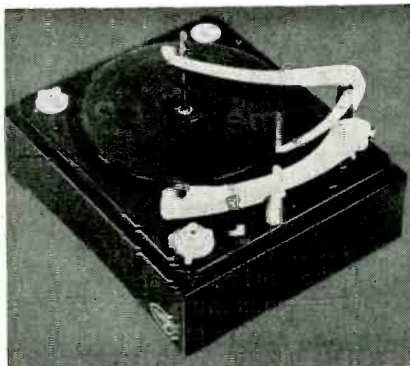
common occurrence. The oscillator section was tested with a VTVM connected from the emitter to ground. A change in voltage indicated that the oscillator would stop functioning at the lower frequency. Because there seemed to be nothing radically wrong, it was decided to alter the bias to see what effect it would have. Changing the 3900-ohm resistor to a 3300-ohm unit (see diagram) corrected this condition.—*James A. McRoberts, Brooklyn 15, N. Y.*

New Audio Products



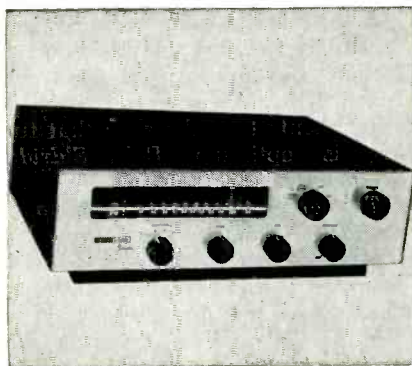
Garrard RECORD CHANGER →

The RC121 changer has now been replaced by a dual purpose record player which converts instantly from an automatic intermix changer to a single play unit, with tone arm completely free. There is no increase in price for the new Model RC121/II. A new spindle prevents double record drop, and affords extra protection against center hole wear. A special stop/pause feature control interrupts performance at any point. Garrard Sales Corp. Dept K38, 80 Shore Rd., Port Washington, N. Y. (ELECTRONIC TECHNICIAN 3-41)



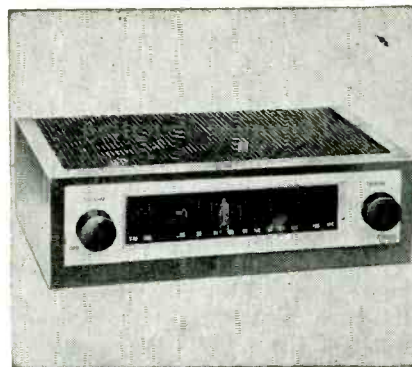
Harman-Kardon GUIDE LINE →

The Guide Line supplements the company's present Standard, Deluxe and Custom Lines. It includes: The Tempo, Model F-10, FM only tuner; The Allegro, Model A-10, power amplifier; and the Sonata, Model FA-10 combination FM only tuner, preamplifier and 10-watt amplifier. The Sonata's features include: broad-band discriminator; limiter; afc; loudness-contour control; and separate bass and treble controls. Harman-Kardon, Inc., 520 Main St., Westbury, N. Y. (ELECTRONIC TECHNICIAN 3-42)



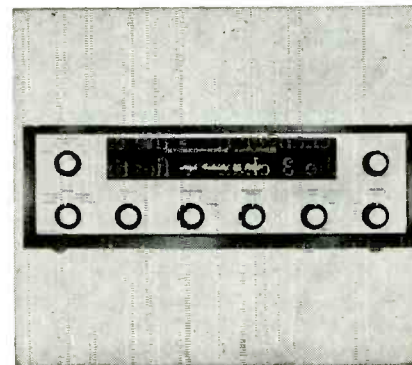
Eico TUNER →

The new FM Tuner in both Kit and Wired Form has a pre-wired, pre-aligned, and drift-free front end. The HFT90 has a traveling neon indicator (Eyetric). Other features include: fly-wheel tuning; agc; stabilized low limiting threshold; broad-band ratio detector; full-wave rectifier; and heavy-filtering. Important construction aids include simplified dial cord arrangement and pre-wired tuning eye assembly. Electronic Instrument Co. Inc., 33-00 Northern Blvd., Long Island City 1, N. Y. (ELECTRONIC TECHNICIAN 3-43)



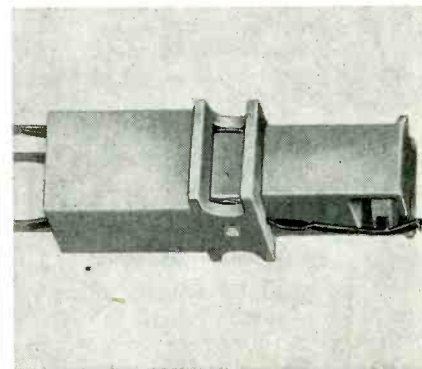
Pilot STEREO AMPLIFIER →

The Model SM-244 consists of two power amplifiers, rated at 14 watts each, with less than 1% distortion. Inputs are provided for stereo FM-AM broadcasts, stereo tape, stereo discs, microphones, and auxiliary. There is a separate output for making stereo tape recordings. A balance control adjusts the relative level of the two channels. It may also be used for monaural high-fidelity listening. Pilot Radio Co., 37-06 36th St., Long Island City 1, N. Y. (ELECTRONIC TECHNICIAN 3-44)



Webster STEREO CARTRIDGE

The small, lightweight stereo-ceramic cartridge is designed to fit any standard record player or changer and can be installed in a matter of minutes. Tests have proved complete compatibility on both regular and stereophonic records. Lightweight elements were developed



for normal tracking pressures between 5 and 9 grams with a one mil sapphire needle. Response is 30 to 15,000 cps. Another advantage, the new cartridge is of the plug-in type and has a replaceable needle. Webster Electric Co., 1900 Clark St., Racine, Wis. (ELECTRONIC TECHNICIAN 3-45)

Soundcraft TAPE

A new extra-long play tape is claimed to be as strong as any conventional long play recording tape manufactured. Du Pont's Mylar Plus 100X, tensilized tape is thin enough to double the playing time of a standard reel (2400 feet on a 7" reel) and strong enough to be used by anyone without fear of breaking or stretching. It also contains a plasticizer-free lifetime oxide. Reeves Soundcraft Corp., 10 E. 52nd St., New York 22, N. Y. (ELECTRONIC TECHNICIAN 3-46)

Knight AMPLIFIER

The medium-duty 35-watt deluxe public address amplifier features: a Volume Unit meter for precise, simplified gain adjustments; six inputs, three for microphone, two for a ceramic or crystal phono cartridge, and one for a magnetic cartridge; volume controls for each input, enables mixing and fading; bass, treble, and master volume control; and a mic/magnetic switch, cuts out one of the microphone inputs when a magnetic phono is used. The Model KN-3035 also has a trumpet protector feature to prevent low-frequency burnout. It will accommodate any speaker system. Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill. (ELECTRONIC TECHNICIAN 3-47)

FREE LITERATURE

Listed below are informative brochures prepared for you by manufacturers. To receive this literature without charge, simply circle the numbers on the coupon corresponding to all items of interest. Cut out and mail to ELECTRONIC TECHNICIAN.

1 Constant Voltage Units: 4-page technical brochure CVS-308 on automatic constant voltage stabilizers gives performance curves and specs, along with application data. Also bulletin VA 195-C details the variable voltage adjustor for TV. (1B3: Acme Electric Corp.)

2 Tube Tester: Bulletin TAD-18 provides technical details and performance information on the new Model 500B Dyna-Quik dynamic mutual conductance tube tester. This unit uses a single test switch, and has tube types listed on socket panel. (2B3: B&K Mfg. Co.)

3 Closed Circuit TV: Informative 16-page booklet, "What Closed Circuit Television Means to You," presents typical camera systems, applications and equipment. It includes school, hospital and industrial installations. (3B3: Blonder-Tongue Labs.)

4 Tools: Revised catalog PA-6 contains 4 pages data on servicing aids, including printed-circuit soldering aids, 395-tube caddy, tube pullers, test adapters, solder dispenser and 4-way screwdriver. 2,500,000 of these tools are now in use. (4B3: CBS-Hytron)

5 Hi-Fi Components: 9 new brochures and spec sheets cover a wide range of hi-fi products. EP-257 is a 10-section full line folder; EP-243 is a 12-pager on styli; EP-235 gives many details of the VR-II 4-gram cartridge; EP-234 discusses tone arms and styli; EP-237, -238, -233 and -232 cover speakers; EP-239 covers speaker enclosures. All brochures offer attractive multi-color presentations and technical data. (5B3: General Electric)

6 Capacitors: 2 literature pieces, 2 pages each, discuss the construction and technical characteristics of epoxy-coated ceramic discs, and the 600-UE mylar dielectric capacitors molded in epoxy resin. Dimensions and ratings are included. (6B3: Good-All Electric Mfg. Co.)

7 Hi-Fi Components: 14-page 1958 catalog goes into considerable detail on the performance of tuners and amplifiers, with discussion of damping factor, equalization, noise gating, etc. In addition, there's a 4-pager on console units, and a bulletin on the economy-priced Guide line. (7B3: Harman-Kardon)

8 Transformers: Impedance matching, output, input and power transformers are described, along with circuits and performance curves, in this 12-page booklet. Typical design problems are given. (8B3: Peerless Electrical Products Div. of Altec Lansing)

9 Hi-Fi Components: 2 compact brochures. One presents ratings and performance data on component tuners and amplifiers. The second presents similar technical data on console units. Sensitivity, frequency response, distortion, etc. are covered. (9B3: Pilot Radio Corp.)

10 Selenium Rectifiers: Special bulletin 257 gives derating curves for operating Petti-Sel power rectifiers at various temperatures and output currents. (10B3: Radio Receptor Co.)

11 Silicon Rectifiers: Service Notes Nos. 1 and 4 explain the circuitry and procedures for replacing selenium rectifiers with silicon rectifier replacement kits. Circuits include voltage doublers, portable radios, console radios, TV, etc. (11B3: Sarkes Tarzian)

12 Test Instruments: Compact 6-pages presents a line of testers for flybacks, capacitors and tubes, including a CRT rejuvenator and punched card tube tester. Uses for each are given. (12B3: TeleTest Instrument Corp.)

13 Armored Open Line: Here's an interesting piece of literature describing open line with armored jacket and polystyrene spacers. Included is a comparison chart showing the low loss characteristics compared to flat and tubular twin lead and cable for various frequencies. (13B3: Tevco Insulated Wire)

14 Hi-Fi Speakers: Informative brochure concisely explains the program of progressive speaker expansion, and pictures and describes some 22 types, plus speaker networks and enclosures. (13B3: University Loudspeakers)

15 Crimping Tool: Catalog T-68 describes Crimcut tool which cuts and strips wire, crimps solderless terminals, and even shears bolts ready for use without deburring. (15B3: Vaco Products Co.)

16 Tools: Colorful folder AL2 illustrates a line of soldering gun from 100 to 250 watts, plus 2-speed drill, totor tool kit, sanders, multi-use power saws and saw table. (16B3: Wen Products)

PLEASE SEND ME FREE LITERATURE AS NOTED BY CIRCLED NUMBERS

ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

This coupon must be used before April 10, 1958

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

Name

Address

Firm My position

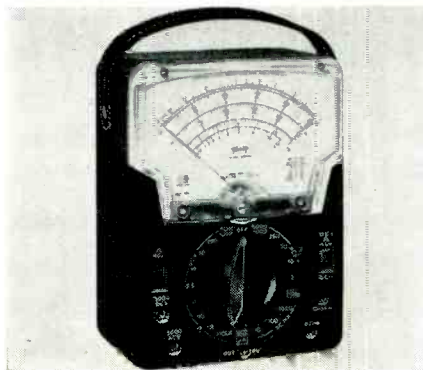
City State

Latest Test Equipment

Triplet VOM



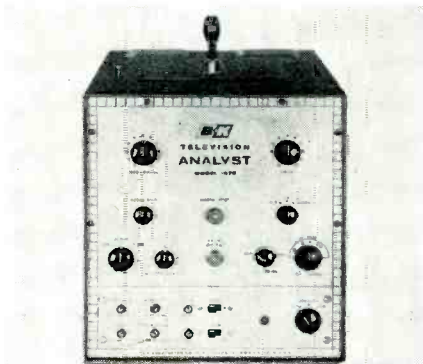
New Models 630-PI (shown) and 630-APL have an unbreakable, front and easier reading scales. Other features include: 5 to 500,000 cps response; continuous resistance reading from 0.1 ohms to 100 megohms; polarity reversing switch; and a single king sized switch to select both function and range, thus minimizing wrong settings and burnouts. The 630-APL has 1/2% resistors and a more accurate movement. Triplet Electrical Instrument Co., Bluffton, Ohio. (ELECTRONIC TECHNICIAN 3-1)



B&K TV ANALYST



The Model 1075 TV Analyst supplies complete r-f and i-f signals to quickly trouble-shoot each stage of a TV set. It produces: complete test pattern, composite signal; positive or negative sync; separate vertical and horizontal driving pulses for trouble-shooting deflection circuits; 4.5 mc sound channel; full color rainbow pattern, to test color sync circuits, range of hue control, align color demodulators, etc. B&K Manufacturing Co., 3726 N. Southport Ave., Chicago 14, Ill. (ELECTRONIC TECHNICIAN 3-2)



Electro POWER SUPPLY



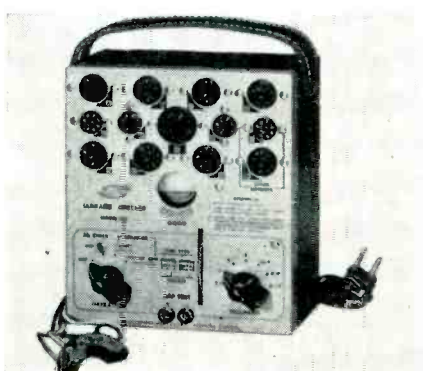
The Model K-612T is a new d-c power supply in kit form which utilizes the same circuit design as in the Model D-612T. It has ample regulation to operate solenoid tuning controls in the newer auto radios. There are two continuously variable voltage ranges, 0-8 volts and 0-16 volts, with 10 amperes continuous duty up to 12 volts. It will supply up to 21 volts for transistor portable radio loads. Electro Products Laboratories, 4500 N. Ravenswood Ave., Chicago 40, Ill. (ELECTRONIC TECHNICIAN 3-3)



Sencore LEAKAGE CHECKER



Tube and capacitor leakage checker's new features are: a filament testing portion; a positive test on heater-to-cathode leakage for series filament TV receivers; CRT socket; and a new replaceable roll chart to speed set-up time. Leakage sensitivity is 100 megohms for tests for control grid to any other tube element. Leakage of 50,000 ohms or lower between cathode and heater is also detected by the Model LC3. Service Instruments Corp., 171 Official Rd., Addison, Ill. (ELECTRONIC TECHNICIAN 3-4)



Paco TUBE CHECKER

A new tube checker in kit form. Model T-60, features: a free-point lever selector system; an extra-large 5" acrylic cased meter; illuminated, high speed, brass-gear, 3-column roll chart; a rugged, ripple-finished steel cabinet; and a two-color panel with contrasting knobs. It tests all new AM-FM-TV tubes, including the series-string types. Net Price is \$36.75. Paco Electronics Co. Inc., 70-31 84th St., Glendale 27, N. Y. (ELECTRONIC TECHNICIAN 3-8)

Kingston PROBE

Simplifies transistor radio checking when used with the Absorption Analyzer. The new probe, which has a needle-sharp tip, and a built-in detector circuit, may be used to pick off the signal from the various stages and feed it into the Analyzer where it may be seen and heard. The high sensitivity of the Analyzer makes it possible to trace the signal all the way through the radio from the antenna to the speaker. Kingston Electronic Corp., Medfield, Mass. (ELECTRONIC TECHNICIAN 3-7)

Superior Instruments VTVM

A new multiple-use VTVM combines sensitivity with ease of operation. The Model 77 is equipped with a six-inch meter and all accessories, including test leads, probe, portable carrying case and full instructions. It is designed for use as a sensitive d-c voltmeter, an RMS and peak-to-peak a-c voltmeter and electronic ohmmeter. The new unit can also be used for db measurement and is equipped for zero center discriminator alignment. It has a new improved printed circuit. It can measure ac from 30 cycles to more than 5 mc without extra accessories. Superior Instruments Co., 2435 White Plains Rd., New York 67, N. Y. (ELECTRONIC TECHNICIAN 3-6)

CE REJUVATUBE

The newest Model RE-2 features a rugged, heavy duty steel carrying case; illuminated meter; new TV interlock power cords; and a new "cube socket" selector and cable as a one-piece assembly. The new "cube socket" and switch assembly enables the testing and rejuvenation of each gun of a color tube; as well as the 110° tubes with miniature or medium bases; and, also the conventional CRTs. A new circuit and an additional direct reading scale on the meter allows the technician to check the gas content of the tubes. Central Electronics, Inc. 1247 W. Belmont Ave., Chicago 13, Ill. (ELECTRONIC TECHNICIAN 3-5)

New Products for Technicians

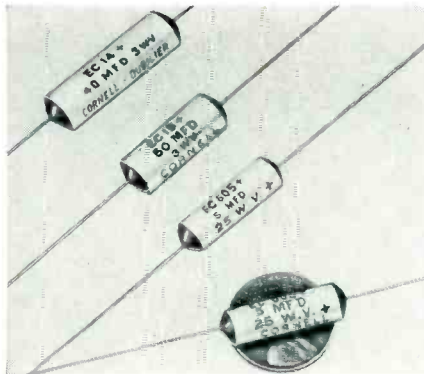
ATR TUBE PROTECTOR →

New display carton holds nine Model 250 and three Model 300 units, which is according to average sales proportion. The Model 250 plugs directly into the wall socket and sells for \$4.95. The Model 300 lists for \$6.95, has rubber mounting feet, and is equipped with a cord set for flexible positioning. These protectors use a thermal cushioned-action principle which also protects other electronic components from initial damaging surge current. American Television & Radio Co., 300 E. 4th St., St. Paul 1, Minn. (ELECTRONIC TECHNICIAN 3-11)



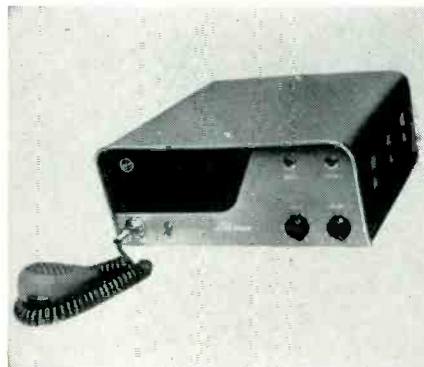
C-D ELECTROLYTICS →

The new Type EC aluminum-foil electrolytic capacitors were specifically designed for transistor and low B+ tube applications, and where compactness is an important design factor. They are available in ratings from 3 to 75 working volts, and 1.0 to 250 μ fd. The capacitors are housed in special tubular ceramic cases which are moisture-tight and heat-resistant. Tinned copper leads are welded to insure low-resistance contacts. Cornell-Dubilier Electric Corp., South Plainfield, N. J. (ELECTRONIC TECHNICIAN 3-12)



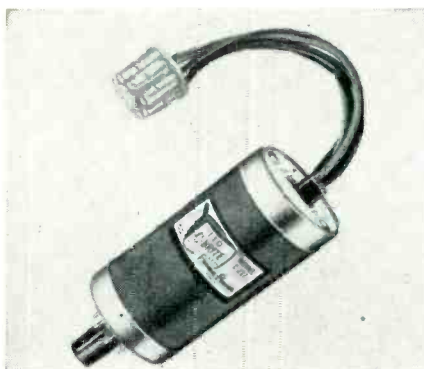
Kaar FM RADIOTELEPHONE →

The TR500FM is a new low-priced FM mobile radiotelephone that can be licensed for use by any U.S. citizen for communicating between vehicles and fixed points. It operates in the 450-460 mc and the 460-470 mc bands. Communication under average conditions is up to a 10-mile radius. Ranges from 50-200 miles can be obtained. The unit may be operated directly from a 12-volt battery or 117-volts a-c line. Kaar Engineering Corp., 2995 Middlefield Rd., Palo Alto, Calif. (ELECTRONIC TECHNICIAN 3-13)



Perma-Power BRITENERS →

The new "C-Brite" Briteners work on series or parallel filament circuits, simply by setting a selector switch. They are auto-former type boosters with a 7.8 v output. The model C-211 is designed for use with the button base (RCA) type 110° CRTs; Model C-221 is designed for use with the shell base (Sylvania-Du Mont) type 110° tubes. Both units have a list price of \$3.75 and are already in distributors stock. Perma-Power Co., 3100 N. Elston Ave., Chicago 18, Ill. (ELECTRONIC TECHNICIAN 3-14)



Utica PLIERS

Twice the cutting ease is featured in the new high leverage lineman's pliers. The new nine-inch pliers weigh only one ounce more than conventional eight-inch pliers, but are specially designed to give tremendous cutting leverage and extra long life. Jaws are electronically hardened and actual tests prove that the hand honed edges are excellent for 100,000 or more cuts. Utica Tool Div., Utica 4, N. Y. (ELECTRONIC TECHNICIAN 3-17)

Hycon MULTIMETER

Rack-mounted digital multimeters are featured in the new improved 1958 line of test instruments. No longer to be considered solely laboratory instruments, these digital multimeters can be used by unskilled personnel to provide a wide range of a-c and d-c voltage, and resistance readings. By slight modification, they can be used to readout or printout temperature, pressure, velocity, or any other data that can be reduced to a form involving electrical resistance, current, or voltage. Hycon Electronics, Inc., 321 S. Arroyo Parkway, Pasadena, Calif. (ELECTRONIC TECHNICIAN 3-15)

Mastra TOTE BOX

The new type box is composed of four different sized sections and a carrying top. Completely interchangeable, the sections can be locked together into one master tote box or tailored to any size convenient for a service call. The Totemaster is extra roomy (over 4000 cu. in.) and can carry a complete inventory of 360 popular size tubes and still have room for tools and accessories. The detachable carrying top features a mirror, built-in 7 and 9-pin straighteners, strap holder for order book or schematics and an adjustable web to hold the cover at any angle. Mastra Co., 2107 Superior Ave., Cleveland 14, Ohio (ELECTRONIC TECHNICIAN 3-18)

Motorola 2-WAY RADIO

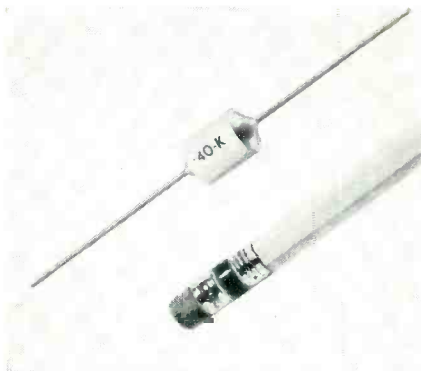
To help fill the growing need for radio circuits to remotely control isolated base station and radio relay equipment, extending range of a mobile radio system or overcoming certain types of interference, this 890 to 960 mc, point-to-point, two-way radio equipment is available. Current FCC Rules permit most services to utilize these facilities. The stations can also be supplied for point-to-point multiple channel communications, providing up to seven multiplexed channels for voice, teletype, telemetering and other uses, as well as one service channel. Motorola Inc., Communications & Industrial Electronics Div., 4501 W. Augusta Blvd., Chicago 51, Ill. (ELECTRONIC TECHNICIAN 3-16)

New Components & Tubes

For more information, fill in coupon, on page 46, mail to ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N.Y.

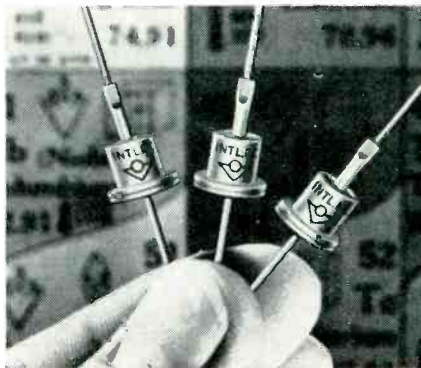
Sarkes Tarzian RECTIFIER →

Type K Silicon Rectifier features: 750 ma up to 55°C, 500 ma up to 100°C, and 250 ma up to 150°C, without a heat sink; axial leads; high efficiency rectification; easy installation; and low cost. This series incorporates a positive environmental seal with a special epoxy resin. Polarity is identified by color coded resin at each end. Peak inverse voltage ratings are 100, 200, 300 and 400 volts. Sarkes Tarzian, Inc., 415 N. College St., Bloomington, Ind. (ELECTRONIC TECHNICIAN 3-21)



Int'l Rect. DIODES →

High current, silicon, pigtail, hermetically sealed diodes featuring excellent forward and reverse characteristics result in high rectification efficiency. Types 1N536 through 1N540 are rated at 750 ma at 50°C, and 250 ma at 150°C ambient, with peak inverse voltage ratings of 50, 100, 200, 300, and 400 volts respectively. The maximum full load average voltage drop of these diodes is 0.5 volts. Maximum leakage current is 0.4 ma. International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif. (ELECTRONIC TECHNICIAN 3-22)



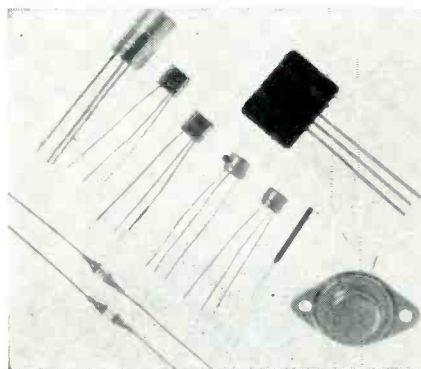
Centralab TUBE-R-CAP →

A new miniature feed-thru Tube-R-Cap incorporates a resistor and a capacitor in a single ceramic tube $\frac{7}{16}$ " long and mounts in a 0.190" hole. It is designed primarily for antenna filter applications in TV tuners. It can also be used as a bypass unit in other medium to high frequency applications. Electrical characteristics of the model 732 are: capacity, 400 μf to 1000 μf ; 1000 VDCW; resistance of 0.3 to 1 megohms. Centralab, A Division of Globe-Union, Inc., 900 East Keefe Ave., Milwaukee 1, Wis. (ELECTRONIC TECHNICIAN 3-23)



Gemco Transistors →

A complete line of transistors and crystal diodes will be marketed exclusively through trade and industrial jobbers, for radio, TV, audio, industrial and micro-wave applications. All items will bear the Gemco tradename. This entire production and marketing program is the culmination of the company's thirty-six years in the electronics components field. Price structures will allow an equitable profit. Great Eastern Mfg. Co., 165 Remsen Ave., Brooklyn 12, N. Y. (ELECTRONIC TECHNICIAN 3-24)



General PHOTOTRANSISTOR

A new-style PNP phototransistor, type 2N469, is a highly improved version of the GT type 2N318, it is smaller, and has a greater optical sensitivity. This new device has a wide variety of industrial and military applications where light is utilized to activate electronic equipment. Applications include smoke density control, automatic machining operations, automobile headlight dimmers, and burglar alarm systems. General Transistor Corp., 91-27 138th Place, Jamaica 35, N. Y. (ELECTRONIC TECHNICIAN 3-25)

RCA TUBES

The new multiplier phototube 7029 is a small, sturdy, dormer-window type designed for use in the detection of low-level light signals in the presence of relatively high background illumination. It is, therefore, especially suited for low-contrast applications.

The 7094 is a high-perveance beam power tube having high power gain. It is designed for use as an r-f power amplifier, oscillator, a-f power amplifier, and modulator in fixed and mobile equipment. In intermittent commercial and amateur service, it can be operated with 500 watts input in cw applications. Radio Corp. of America, Tube Div., Harrison, N. J. (ELECTRONIC TECHNICIAN 3-27)

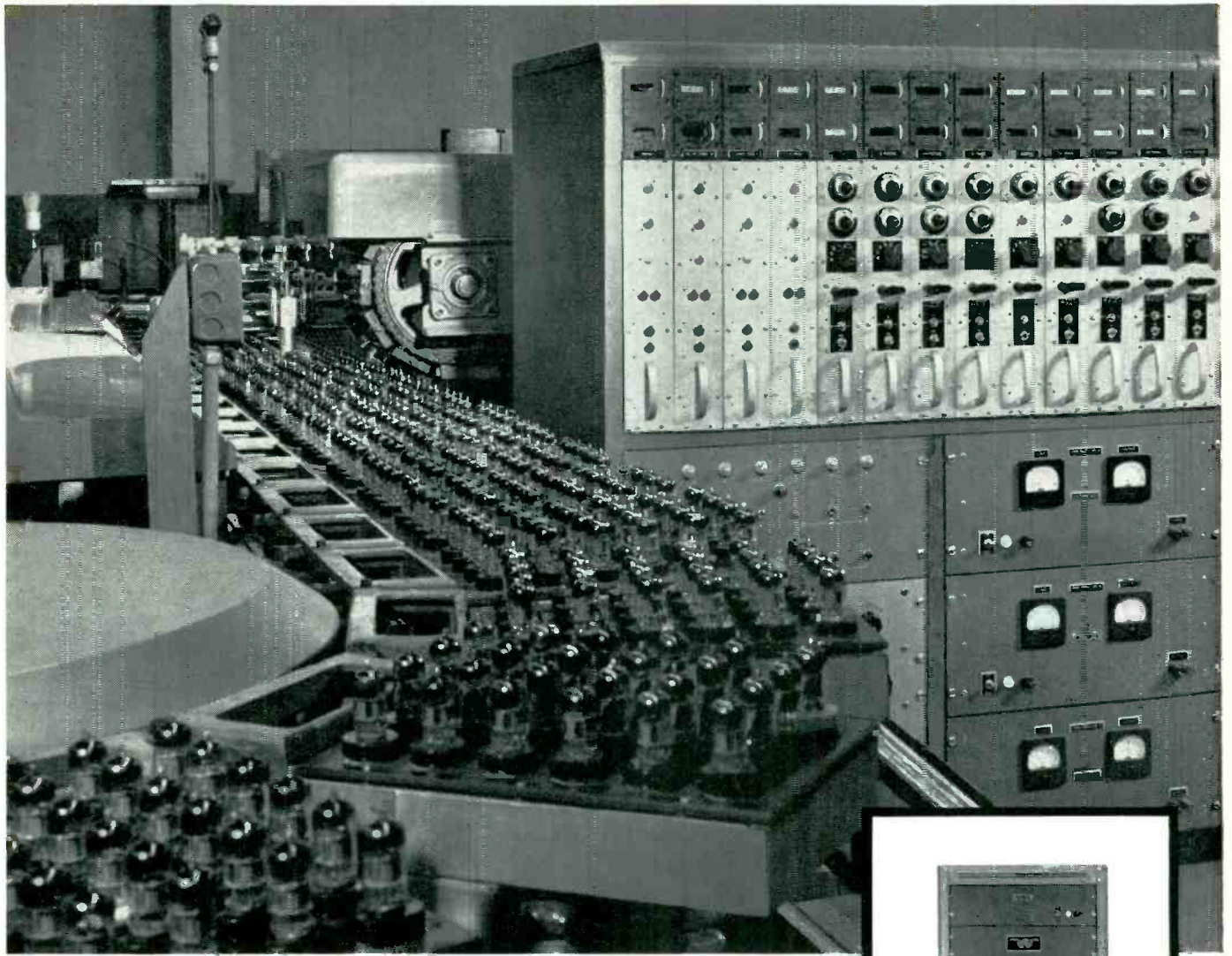
CBS TUBES

The hybrid automobile radio tubes, types 12AL8 and 12DL8, operate directly from a 12.6-volt battery. The 12AL8 includes a triode for detector or voltage amplifier service and a space-charge grid power amplifier to drive the transistor output stage. The 12DL8 offers a duodiode for AM detector and avc service and a space-charge grid power amplifier in one envelope.

Types 3AF4A and 4AU6 have 450-ma CWU heaters and are identical to the 6AF4A and 6AU6 respectively.

The 6CY5, VHF tuner tube combines a high signal-to-noise ratio, transconductance, and input impedance to provide a desirable gain and bandwidth factor for better TV receiver performance.

The 3B2 is designed primarily for use in color TV as a high-voltage rectifier, and features a peak inverse plate voltage of 35 kv and a minimum d-c output of 1.1 ma. It has an octal base and top cap. CBS Hytron, Div. of Columbia Broadcasting System, Inc., Danvers, Mass. (ELECTRONIC TECHNICIAN 3-26)



CBS tubes are mechanically transferred from the aging conveyor (left) to the automated tester (right) where they undergo up to 27 characteristics tests controlled by adjustable plug-in units.

Quality is Automatic with CBS

LET IT CUT YOUR CALL-BACKS AUTOMATICALLY

These automated test stations are part of a plan that makes quality automatic with CBS. They check CBS tubes and semiconductors more precisely, more completely. And they eliminate human error. To you, this advanced engineering means quality you can depend upon to cut your call-backs . . . automatically. Start using CBS tubes and semiconductors. Prove to yourself that automation does make a difference.

*Reliable products
through Advanced-Engineering*



tubes • semiconductors



IN SEMICONDUCTORS, TOO! Matched to CBS mechanized diode production, this meterless test station double-checks automatically the quality built in by CBS automation.

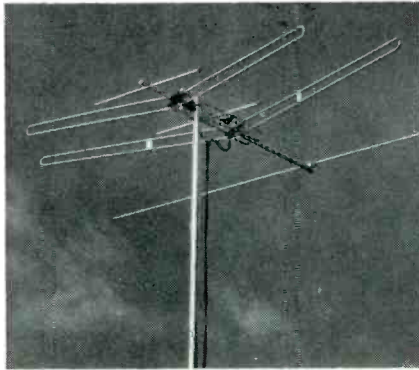
FOR THE BEST IN ENTERTAINMENT TUNE TO CBS

CBS-HYTRON, Danvers, Massachusetts
A Division of Columbia Broadcasting System, Inc.

New Antennas & Accessories

Winegard ANTENNA →

A new line of quality, low-priced, "Scotchman," all-channel TV antennas consists of 4 basic models and 4 attachment kits that can be combined to produce more than 30 antenna combinations. Special attachment kits allow the technician to increase the gain and/or front-to-back ratio of each antenna to meet any reception requirement. Some models include the Electro-Lens director system. All models are completely assembled at the factory. Winegard Co., 3000 Scotten Blvd., Burlington, Iowa. (ELECTRONIC TECHNICIAN 3-31)



TeVco Lead-In →

New merchandising idea for Dura-lead D-80, 300-ohm antenna lead in wire enables the technician to dispense any amount from 50 to 500 feet in one piece, in 50 foot spools. The reels are interconnected and packed, 1,000 feet, in a colorful display carton. The dealer pays \$18.95 for a carton of 20 spools and sells them for \$1.95 each, thus assuring himself a good profit and with minimum handling. TeVco Insulated Wire, 108 Prospect Ave., Burbank, Calif. (ELECTRONIC TECHNICIAN 3-32)



JFD SERVICE-SAVER →

All cartoning of TV accessories will be converted to the Saver Dispenser. The new shipper-merchandise-dispenser will carry 5 Service-Savers, each individually housed in a newly styled 3-color box. Equipped with a tab on the top and easel back, the dispenser unit can be hung from a shelf or wall or stood on a counter or window shelf for maximum display value. It reduces handling, and facilitates stocking and inventory control. JFD Electronics Corp., 6101 16th Ave., Brooklyn 4, N. Y. (ELECTRONIC TECHNICIAN 3-33)



Hi-Lo V KIT

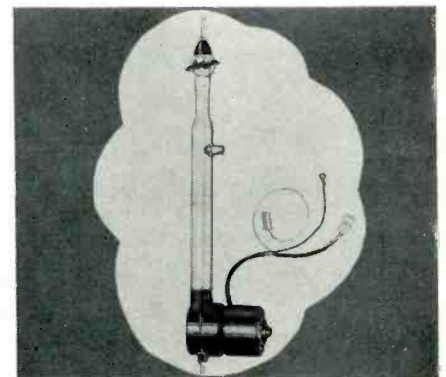
The new Hi-Lo antenna kit, Model #606 utilizes the Spiral-Tenna design, which produces clear reception on channels 2 to 13. The brown plastic base and the gold color on the spiral blends with any room. The antenna is designed to eliminate any pulling or pushing of rods. Retail for \$7.95. Hi-Lo Mfg. Corp., 1122 W. Newport Ave., Chicago 13, Ill. (ELECTRONIC TECHNICIAN 3-35)

Scala ANTENNA HEATERS

The Model GPC-150 ground plane antenna has a 24-v heating system for complete weather proofing and safe year round operation under the most severe icing conditions. Continuously field tested atop Mt. Spokane, Washington, for the past 2 winters and despite 4 to 5 inches of radial ice on the guy wires, the antenna remained free of ice and operated normally. Thermostatically controlled heaters are located in all radial elements as well as in the driven element. Frequency range is 40 to 170 mc. Scala Radio Co., 2814 19th St., San Francisco, Calif. (ELECTRONIC TECHNICIAN 3-36)

Tenna ANTENNA

A new electrically operated, disappearing type auto radio antenna has a universal mounting and is motor-driven. It utilizes a patented thrust-limiting clutch, which prevents motor burnout. The telescoping mast extends or retracts in a maximum of 10 seconds.



The unit's 15-pound thrust assures free action even in zero weather. The motor operates on 12-volts dc and draws a maximum of 10 amperes. Model TM-1 is designed for front mounting, TM-2 for rear mount. The TM-3 is a conversion kit which permits the TM-1 to be rear mounted. The Tenna Mfg. Co., 7580 Garfield Blvd., Cleveland 25, Ohio. (ELECTRONIC TECHNICIAN 3-34)

FOR MORE TECHNICAL INFORMATION ON NEW PRODUCTS OR BULLETINS

use this convenient coupon. Enter below the reference numbers for all items desired.

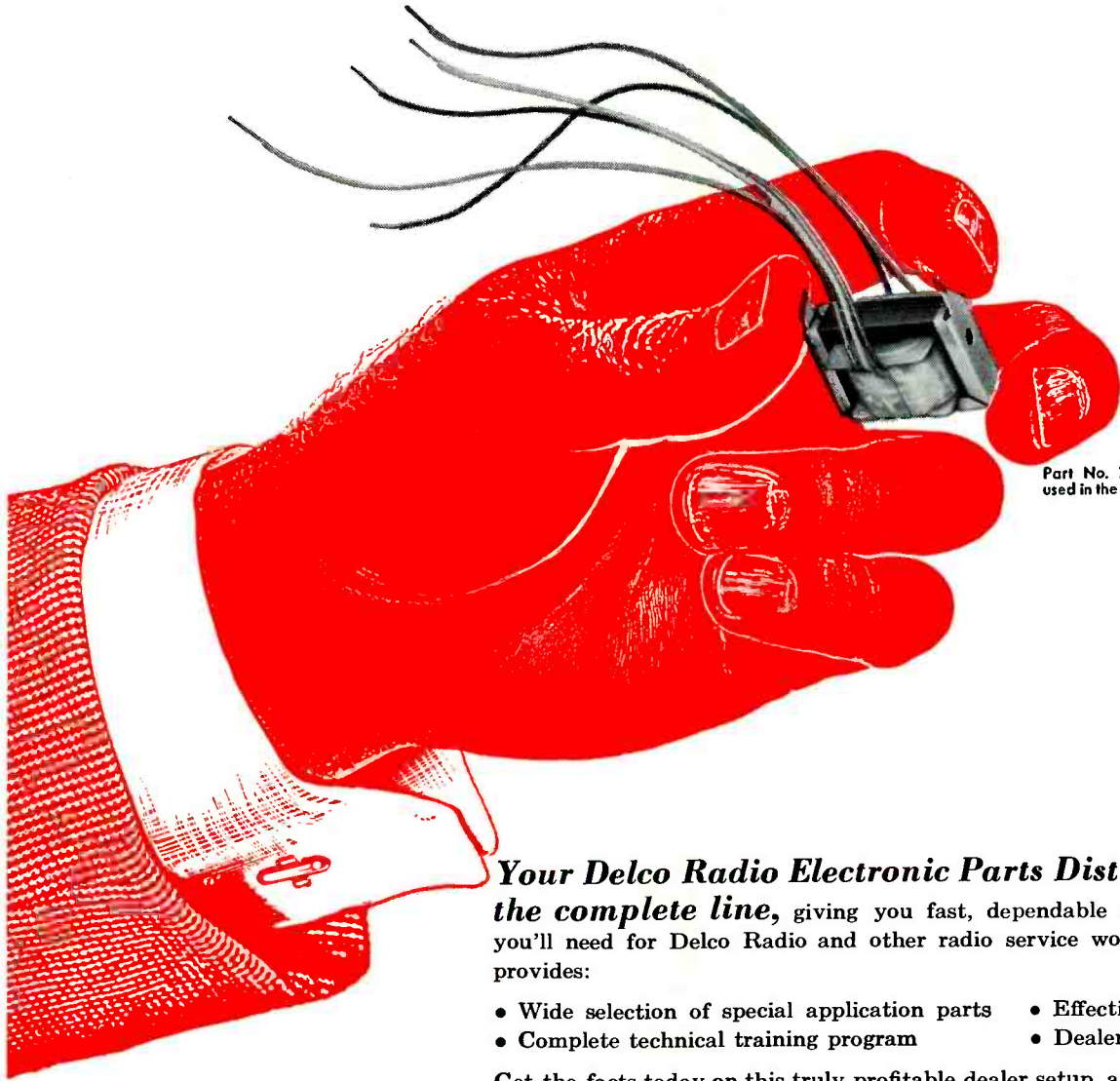
NEW PRODUCTS EDITOR, ELECTRONIC TECHNICIAN
480 Lexington Ave., New York 17, N. Y.

Please send me more information on the following items:

My company letterhead or business card is enclosed.

Name
Address
Firm My position
City State

Use Delco Radio Service Parts!



Part No. 7270804—output transformer used in the new Delco Portable Car Radio.

Your Delco Radio Electronic Parts Distributor carries the complete line, giving you fast, dependable service on the items you'll need for Delco Radio and other radio service work. Delco Radio also provides:

- Wide selection of special application parts
- Complete technical training program
- Effective warranty program
- Dealer identification signs

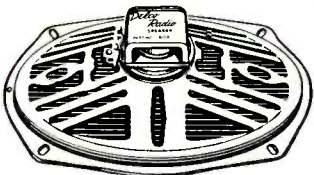
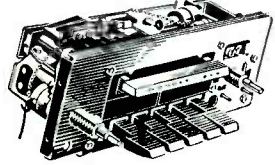



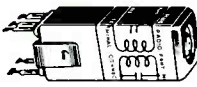




Get the facts today on this truly profitable dealer setup, and grow with General Motors!

Available everywhere through Electronic Distributors associated with . . .

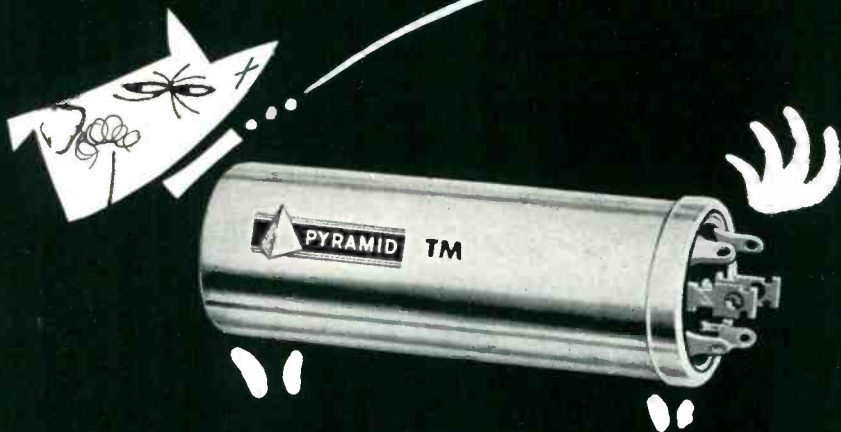


DELCO RADIO

DIVISION OF GENERAL MOTORS, KOKOMO, INDIANA

 <p>SPEAKERS</p>	 <p>TUNER PARTS</p>	 <p>TUBES</p>	 <p>IRON CORES</p>
 <p>TRANSISTORS</p>	 <p>COILS</p>	 <p>CAPACITORS</p>	 <p>RESISTORS</p>
		 <p>VIBRATORS</p>	 <p>CONTROLS</p>

When a Serviceman Needs a Friend



He naturally turns to Pyramid.

For in Pyramid twist-mount electrolytic capacitors he has the advantages of flexibility . . . where one TM type may be safely interchanged with others. The result? You save servicing time and give your customers faster service with a minimum investment.

Write today for Pyramid's new TM Interchangeability Guide and see how you can simplify repairs with Pyramid Twist-mounts.

And remember, a serviceman always has a friend in Pyramid, and his Pyramid distributor.

CAPACITORS—RECTIFIERS
FOR ORIGINAL EQUIPMENT—AND REPLACEMENT

PYRAMID
ELECTRIC COMPANY
North Bergen, New Jersey

Catalogs & Bulletins

DIODES: New 4-page, ready-reference, interchangeability chart lists over 1000 diodes and more than 400 replacements. Available from Raytheon Industrial Tube & Semiconductor Products Distributors. Raytheon Mfg. Co., 55 Chapel St., Newton 58, Mass. (ELECTRONIC TECHNICIAN B3-7)

TRANSISTORS: A new 6-page brochure describes and illustrates transistor performance. Also contains several interesting applications of miniaturized transistors, photo transistors and others. General Transistor Corp., 91-27 138th Place, Jamaica, L. I., N. Y. (ELECTRONIC TECHNICIAN B3-3)

TRANSFORMERS: A series of technical bulletins cover auto and hi-fi transformers, and components. Performance and mechanical characteristics, schematics, descriptive text and illustrations are included. Saratoga Industries, div. Espey Mfg. Co., Saratoga Springs, N. Y. (ELECTRONIC TECHNICIAN B3-8)

INTERCOM SYSTEM: A descriptive circular and a price list cover the Allmaster, in which each station is a master able to call any one or all other stations. Has privacy switch, central plug-in amplifier and is relay controlled. Rayovox Mfg. Co., 902 Albermarle Rd., Brooklyn 18, N. Y. (ELECTRONIC TECHNICIAN B3-6)

TRANSISTORS & DIODES: In a 4-page folder are listed the complete line of transistors, diodes, diode/rectifiers, and rectifiers now being manufactured by Texas Instruments. Arrangement by type numbers. Includes full specifications. Milgray Electronics, Inc., 136 Liberty St., New York 6, N. Y. (ELECTRONIC TECHNICIAN B3-4)

RADIO CONTROLLED GARAGE DOORS: A 4-page, two-color, circular describes the Barcol Doorman, a flush type, garage overdoor with remote control. A touch on the dash button of the car and the door opens; another touch and it closes and locks; a touch while door is in motion and it automatically reverses. Barber-Colman Co., Dept. 8A, Rockford, Ill. (ELECTRONIC TECHNICIAN B3-5)

SLIDE RULE: Thousands of points of information for technicians maintaining 2-way radio systems are provided in a pocket-size slide rule. The Service Detailer gives information on correct tuning, meter types, meter and voltage readings, frequency range, crystal multiplication factors, receiver sensitivity, etc. Weight: less than 3 ounces. Price: \$1.50. General Electric Co., Communication Products Dept., Electronics Park, Syracuse, N. Y. (ELECTRONIC TECHNICIAN B3-2)

Cut testing time in half— DOUBLE TUBE SALES



B&K **DYNA-QUIK**

*Makes Money for
Servicemen Everywhere*

**NEW
MODEL
650**

Fastest, Most Complete, Portable **DYNAMIC MUTUAL CONDUCTANCE TUBE & TRANSISTOR TESTER**

Checks over 99% of the tubes most widely used in television receivers, plus popular home and portable radio tubes. Tests over 500 tube types. Lists over 125 tube types, with settings, on socket panels for maximum operating speed. Complete listing in fast telephone-index type selector. Includes 16 spare sockets and sufficient filament voltages for future new tube types. **Tests each section of multiple tubes separately** for Gm—Shorts—Grid Emission—Gas Content—and Life. Provides instantaneous Heater Continuity check. Shows tube condition on "Good-Bad" scale and in micromhos. Special bridge assures automatic line compensation. No multiple switching—No roll chart. Includes pin straighteners. **Transistor Tester** checks junction, point contact and barrier transistors, germanium and silicon diodes, selenium and silicon rectifiers. Net, **\$169⁹⁵**

- Each Dyna-Quik Tube Tester completely tests each tube in seconds
- Eliminates substitution testing
- Shows customer true condition and life expectancy of tubes
- Sells more tubes right on-the-spot
- Cuts servicing time, wins customer confidence
- Saves costly call-backs, brings more profit

One extra tube sale on each of 5 calls a day pays for the Dyna-Quik in a few weeks.

NEW MODEL 500B *Money-Making Portable* **DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER**

Thousands of the famous B&K Dyna-Quik are in profitable use today by service technicians everywhere. **Servicemen say:** "Best tube tester I've ever owned for speed and dependability!" "Makes money. Really indispensable!" "Have two...one for the shop and one for house calls!"

Now, with more tube sockets, the new Model 500B makes it easy to test more tubes faster and make more money. Accurately quick-checks most of the TV and radio tubes usually encountered in everyday service work. **Tests tubes** for shorts, grid emission, gas content, and leakage. Measures true dynamic mutual conductance with laboratory accuracy in the home or shop. Makes complete tube test in seconds, tests average TV set in a few minutes. Quickly detects weak or inoperative tubes. Shows tube condition on "Good-Bad" scale and in micromhos. Life Test shows customer the tube life expectancy. Makes it easy to sell more tubes right-on-the-spot.

One switch tests everything. No multiple switching. No roll chart. Automatic line voltage compensation. 7-pin and 9-pin straighteners. New tube reference charts are made available by the factory at regular intervals. Net, **\$129⁹⁵**



2 additional tube sales per call on an average of 5 calls a day can increase your income as much as \$50.00 per week

See your B & K Distributor,
or write for Bulletin AP10-T

B&K

B&K MANUFACTURING CO.

3726 N. Southport Ave., Chicago 13, Illinois

Canada: Atlas Radio Corp., 50 Wingold, Toronto 10, Ont.

Export: Empire Exporters, 458 Broadway, New York 13, U.S.A.

... another
MALLORY
 service-engineered
 product

CONVENIENT CARD-PACK
 Buy Discaps on these handy cards
 ... fits standard 3" x 5" file
 drawer ... 5 capacitors per card
 —tabbed for easy identification.



Now available for service use

MALLORY- RMC DISCAPS®

High-quality ceramic capacitors

Long preferred in industrial electronics and by equipment manufacturers, Mallory-RMC Discaps are now ready for you to use on service jobs whenever you need dependable performance in even the most critical applications.

You're sure of tested quality—for Discaps are made under the most rigid quality controls, from basic raw materials to the finished unit. Every capacitor is tested for power factor, capacity, leakage resistance, and dielectric strength.

Discaps ... made by the world's largest manufacturer of ceramic disc capacitors ... are now available in the most popular ratings from your Mallory Distributor. See him today.



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

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



ORRADIO's VP, Nat Welch, states that business is excellent, sales of the firm's IRISH recording tape has hit a record high for three successive months. December was 79% better than the same month a year ago.

PILOT RADIO has introduced the Model SP-215 stereo control, a 2-channel preamp with inputs for broadcast, stereo tapes and discs and mikes. It features 2 VU meters and 2 controls for setting tape recording levels. It retails for \$189.50, and will be available to the trade early this month.

J. W. MILLER COMPANY has announced the Model 560 FM tuner at an audiophile net of \$59.95. It features a tuning indicator and built-in antenna, and is rated at 3 microvolts sensitivity for 20 db quieting.

QUAM-NICHOLS CO's parts division manager, Mel Krumrev, states that they will not require the firm's sales reps to be on duty at their booth during the Electronic Parts Distributors Show. in May. Company executives will be in attendance at the booth and reps will meet their customers there at convenient times.

REEVES SOUNDCRAFT announces a new extra-long play tape, Plus 100X, made with Du Pont's tensilized mylar. A 7" reel carries 2400 ft. Here's a table of comparative strength characteristics:

Type of Base	Break Tensile lbs/in of width
Tensilized mylar	21.7
1/2 mil mylar	10.0
1 mil mylar	20.0
1-1/2 mil mylar	30.0
1 mil acetate	13.0
1-1/2 mil acetate	19.5

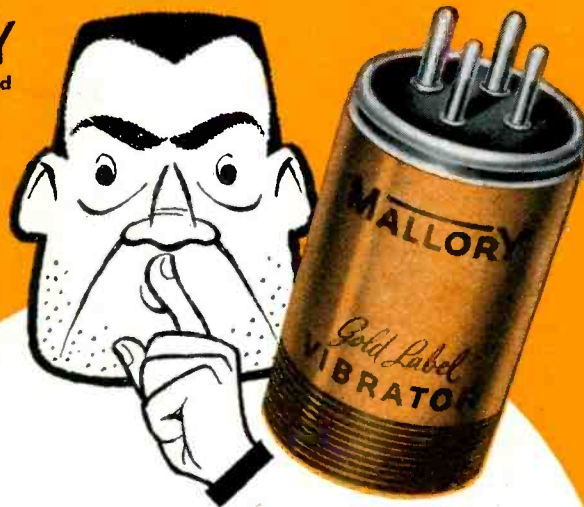
GENERAL ELECTRIC has cut suggested resale prices on replacement diamond styli an average of 18%. This will bring most styli for RPX and VR-11 cartridges down from \$12.95 to \$9.95. Simultaneously, increases averaging 6% were announced for VR-11 cartridge resale prices. The company noted that all seven VR-11 models now bear lower price tags than their RPX-type predecessors did a year ago.

ALTEC LANSING CORP. is displaying, for six weeks, three hi-fi components at the Calif. Design Festival #4, Pasadena Art Museum. They are the 306A AM-FM broadcast tuner, the 344A amplifier and the 833A Verde speaker system. The speaker system has a range of 35 to 22,000 cycles. The Altec components, plus about 2/3 of the exhibit will go on a 1-year nation-wide tour after the Pasadena showing, according to Clifford Nelson of the Museum.

JENSEN INDUSTRIES has appointed the Koether-Cox Co., Denver, as their representative for the Rocky Mountain territory.

JAPANESE AUDIO products show remarkable resemblances to American-made units. Brochures obtained from the Japanese Electronics Exhibition, Inc., 1140 Broadway, New York 1, N. Y., describe cartridges, arms, turntables, microphones, speakers, etc., made by such Tokyo manufacturers as Aiko, Fukuin and Suzuki. From the photos alone, we challenge you to spot the differences between the Japanese arm and a REK-0-KUT 120, the speaker from a UNIVERSITY trumpet, the cartridge from a GENERAL ELECTRIC VR-11, plus mikes and pickups that are stand-ins for SHURE, RONETTE, TURNER and others quite obvious at first glance. A sufficiently large quantity of such products can play havoc with what is already a volatile price structure.

... another
MALLORY
service-engineered
product



THE STRONG SILENT TYPE FOR TOP PERFORMANCE

Mally Gold Label Vibrators set a new standard of quality and performance. They're the quietest, most dependable vibrator you can find anywhere for replacement service. Gold Label Vibrators use the exclusive Mally buttonless contact design that insures quick, positive starting—provides far longer life—keeps output constant.

Let Mally's 27 years of vibrator pioneering and leadership be your standard of quality, to help build your service reputation.



Have you tried the new
Mally Highlander Vibrator?

For economy jobs, get performance second only to the Mally Gold Label. Buy them in the handy 10-pack carton. Write for your copy of the latest edition of the Mally Vibrator Guide.

P. R. MALLORY & CO. Inc.
MALLORY

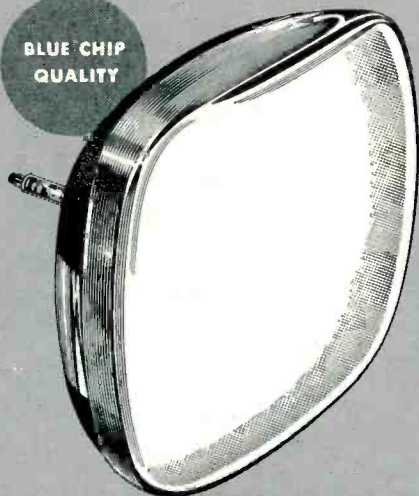
P. R. MALLORY & CO. Inc., INDIANAPOLIS 6, INDIANA

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

LEADING
SET
MAKERS
SPECIFY
TUNG-SOL

HIGH
IN PERFORMANCE

BLUE CHIP
QUALITY



TUNG-SOL[®]
Magic Mirror Aluminized
PICTURE TUBES

ELECTRON TUBE DIVISION  TUNG-SOL ELECTRIC INC.
NEWARK 4, NEW JERSEY

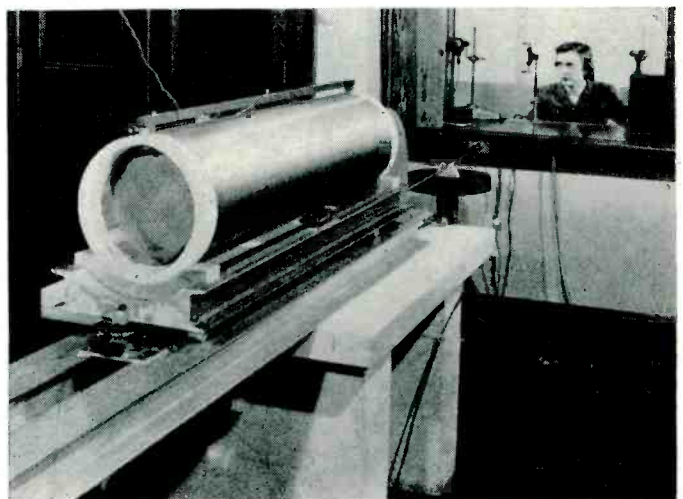
Measuring The Standard Ampere

• A recent experiment at the National Bureau of Standards has shown that the standard ampere maintained by them has drifted no more than a few parts per million in the last 15 years. Such a small apparent change may well be due to slight errors in measurement so that the standard ampere may actually have remained perfectly stable since its original evaluation in 1942.

Because of the importance of precise electrical measurements to modern science and industry, the Bureau maintains permanent primary standards of two basic electrical quantities, voltage and resistance. From these basic electrical standards, other standards are derived for all electrical quantities in use today. One of these, of course, is electric current. Because current is transitory, the primary standard ampere cannot be kept in the form of a material object such as the standard cells that maintain the volt or the standard resistors that maintain the ohm. Each time the standard ampere is required, it must be obtained anew from the standard volt and the standard ohm by use of Ohm's law. However, a gradual change might sometimes occur in the standard cells or the standard resistors. One method of checking the stability of these standards is to compare the standard ampere derived from them with the "absolute" ampere, that is, the ampere obtained experimentally in terms of mechanical units of length, mass, and time.

In the present determination, R. L. Driscoll and R. D. Cutkosky of the Bureau staff measured the standard ampere in absolute amperes using two different sets of apparatus. One was the current balance, shown in Fig. 1, used in the 1942 evaluation; the other was a Pellat type electrodynamicometer, Fig. 2, which was introduced to reduce the possibility of systematic errors. The standard ampere was found to equal 1.000008 absolute amperes by the current balance method and 1.000013 absolute amperes by the Pellat instrument. The weighted

Fig. 2—Pellat Balance is used to determine the absolute value of the ampere. The equipment is operated from another room to avoid air disturbance and dimensional changes produced by heat from the body.



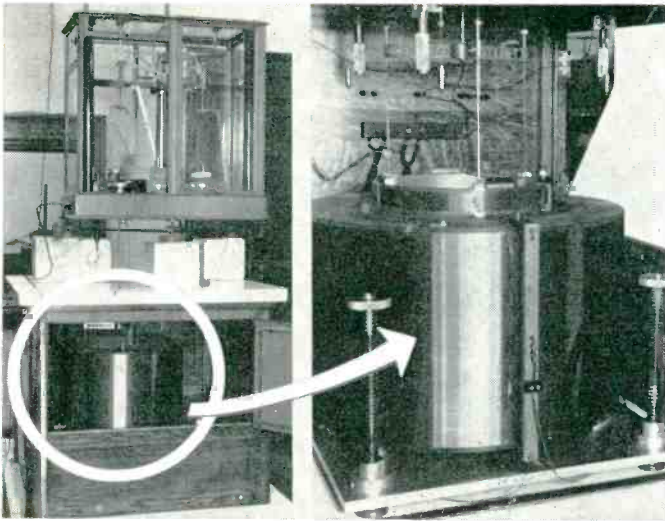


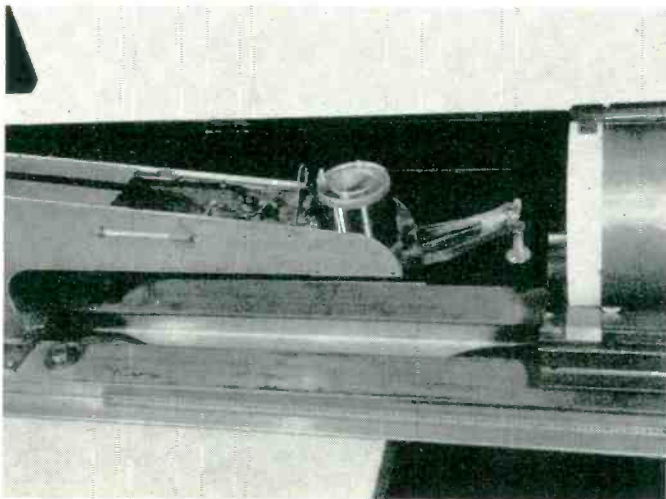
Fig. 1—Helical coil balance. In the center of the large coil is a small movable coil which is attached to the arm of a precision balance. This arrangement measures the change in force on the small current-carrying coil, to determine amount of current.

mean of these two values is 1.000010 absolute amperes, but in this mean there is an uncertainty of 5 parts per million. If no accidental errors were made in either the original or the present evaluation and if all systematic errors remained fixed, then the value of the current yielded by the electrical standards of resistance and voltage has decreased by 6 parts per million. On the other hand, known sources of accidental error in the current balance determinations could easily account for the apparent drift.

The ampere was evaluated with helical coils by determining the mechanical force between the two parts of the circuit through which the current flows. In the center of two large fixed coils, a smaller coil is hung from the arm of a precision balance. The large outer coil has a tap at the center so it is actually two coils. All three coils carry the current to be measured, but the current in the fixed coils can be reversed. The electromagnetic force developed by the current in the coils tends to pull the movable coil downward for one direction of current and

(Continued on page 54)

Fig. 3—Current flowing through the coils produces a torque. The small rotatable coil is connected to a balance. When it tips, equilibrium is restored by adding known weights to the balance arm.




LEADING
INDEPENDENT
SERVICE
DEALERS
CHOOSE
TUNG-SOL

LOW
IN CALLBACKS



BLUE CHIP
QUALITY

TUNG-SOL[®]
RECEIVING TUBES

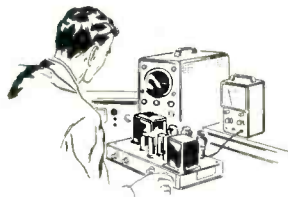
ELECTRON TUBE DIVISION  TUNG-SOL ELECTRIC INC.
NEWARK 4, NEW JERSEY

look what **\$24⁵⁰** buys
in test equipment!



**HEATHKITS
GIVE YOU
TWICE AS MUCH
equipment for
every dollar
invested**

The famous model V-7A Vacuum-Tube-Voltmeter is a perfect example of the high-quality instruments available from Heath at 1/2 the price you would expect to pay! Complete, only **\$24⁵⁰**



Get the most out of your test equipment budget by utilizing HEATHKIT instruments in your laboratory or on your production line. Get high quality equipment, without paying the usual premium price, by dealing directly with the manufacturer, and by letting engineers or technicians assemble Heathkits between rush periods. Comprehensive instructions insure minimum construction time. You'll get more equipment for the same investment, and be able to fill your needs by choosing from the more than 100 different electronic kits by Heath. These are the most popular "do-it-yourself" kits in the world, so why not investigate their possibilities in your particular area of activity! Write for the free Heathkit catalog now!



Contains detailed descriptions of Heathkit models available, including VTVM's, scopes, generators, testers, bridges, power supplies, etc.



Also describes Heathkit ham gear and hi-fi equipment in kit form. 100 interesting and profitable "do-it-yourself" projects!

FREE catalog

Mail coupon below for your copy—Now!

HEATH COMPANY
A SUBSIDIARY OF DAYSTROM, INC.,
BENTON HARBOR 10, MICHIGAN

Name _____

Address _____

City & Zone _____

State _____

upward when this current is reversed. From the change in the force on the balance when the current is reversed and from the measured dimensions of the coils, the value of the current in absolute amperes can be computed. The uncertainty in this method arising from all known sources is estimated to be 6 parts per million.

Electrodynamometer

The modified Pellat electro-dynamometer consists essentially of a long stationary horizontal solenoid, a short solenoid, and a balance. The smaller coil, which is mounted on the balance beam, is inserted into the longer solenoid so that the coil axes are perpendicular, as in Fig. 3. Current in the outer solenoid produces a magnetic field which is essentially constant at its center. When the coils are connected in series an electromagnetic torque on the smaller solenoid is produced. The small coil therefore tends to tip. Since the balance beam rests on a knife edge, the tipping of the coil attached to the beam upsets the balance. The system is restored to equilibrium with a suitable counterweight. When the current in the stationary coil is reversed the coil tips the other way and equilibrium is restored by placing a mass on the end of the balance arm. The mass which counteracted the change in torque was adjusted by trial and later evaluated by comparison with known standards. A calibrated scale on the balance allowed for small corrections to the balancing mass. From the known value of the balance weight, the length of the balance arm, and the geometry of the windings, the value of the current was calculated. The pitch of the stationary coil, the diameter of the rotatable coil, and the length of the balance arm are critical parameters in the current evaluation. The diameters of both coils were also measured with considerable precision. Although the stationary coil diameter did not have to be known accurately for the current evaluation, such a measurement is necessary should the coil be developed into a standard of inductance. The uncertainty in this method is 8 parts per million. The major source of this uncertainty is the limited accuracy with which the radius of the rotatable coil could be measured. The Bureau considers it possible to ultimately reduce uncertainty in the radius measurement by a factor of two so that the electro-dynamometer will be as accurate an instrument as the current balance. •

New Books

IDEAS, INVENTIONS AND PATENTS. By Robert A. Buckles. Published by John Wiley & Sons, 440 Fourth Ave., New York 16, N.Y. 270 pages. Hard cover. \$5.95.

If there are any doubts that electronic technicians are invention-minded, the hundreds of Shop Hint ideas thought up by technicians and published in this magazine should be examined. Yes, servicing sharpshooters often have fertile technical minds. Sometimes it pays to patent an invention. When? How do you protect yourself? What is the filing procedure? These and other pertinent questions are fully answered in this informative volume.

CLOSED CIRCUIT TV SYSTEM PLANNING. By Morris A. Mayers and Rodney D. Chipp, P. E. Published by John F. Rider Publisher, Inc., 116 W. 14th St., New York 11, N. Y. 250 pages. Hard cover. \$10.00.

A complete and authoritative advisory source for all who are contemplating the use of closed circuit TV and especially for those who are faced with the responsibility of planning and evaluating these systems in industry, education, commerce, business, medical institutions and numerous other areas of use. The authors discuss equipment, cost, manpower, advantages and disadvantages, capabilities and limitations. This 8 1/2" x 11" book is easy to read and unusually well illustrated. Since more and more technicians are becoming involved in closed circuit TV, this book is to be recommended.

TV AND RADIO TUBE TROUBLES. By Sol Heller. Published by Gernsback Library, Inc., 154 W. 14 St., New York 11, N.Y. 224 pages. Paper cover, \$2.90; hard cover, \$4.60.

Efficient servicing depends in large measure on your understanding of which component failures cause particular performance troubles. Therefore, if you can analyze different symptoms properly, you're on the road to rapid troubleshooting. And that's what this practical book is all about. Since tube defects account for the majority of failures, the author has concentrated on linking the multitude of video and sound symptoms with their most likely tube sources. Related components and adjustments are also covered. To mention just a few of the symptoms which are nicely discussed and illustrated: Intermittent vertical collapse, horizontal pulling, ghosts, Barkhausen oscillation, spook interference, hum and many many others. This book should be a useful reference for the old pro, and a valuable aid for the less experienced technician.

the best KIT to give you 10 amps. at 12 volts



Finest kit at this low price — K-612T . . . \$44.95 net

new **Electro Kit** deluxe

DC POWER SUPPLY

For improved operation and servicing of . . .

- Transistor, Hybrid and Vacuum Tube Auto Radios •
- Transistor Portable Radios • Marine Radios

Ample regulation for operating NEW solenoid tuning controls in today's auto radios

Now you can handle all those profitable servicing jobs. Thanks to the wide performance range of this new K-612T, you can now service the latest type radios and electronic equipment, plus older sets, too. And to top it off, you not only save money buying it in kit form but you get the most value for your money on the market.

*Two variable DC ranges, 0-8 and 0-16 volts
1/2% ripple up to 5 amperes; 2% at 10 amperes*

Assembly is simple . . . complete step-by-step diagrammed instruction sheets are easy to follow. The K-612T offers the same patented conduction cooling and reliable time-proven design so long accepted by servicemen in the famous D-612T.

At better Parts Jobbers everywhere

✓ CHECK AND MAIL COUPON FOR ALL THE FACTS



Power Supplies
in assembled form

- D-612T 6/12v. 10 amps.
H 6/12v. 20/10 amps.
EFB 16/32v. 8/4 amps.
NFB 0-32v. at 15 amps.
GFA 0-125v. at 10 amps.

8229

ELECTRO PRODUCTS LABORATORIES

4501-T Ravenswood, Chicago 40, Ill.

Canada • Atlas Radio Ltd., Toronto

Send bulletin(s) on model(s) checked

K-612T Electro Kit

Send name of nearest jobber

Name _____

Firm _____

Address _____

City _____ Zone _____ State _____



watch your mike sales go up with

TURNER'S tape recorder mike replacement package



Size: 14" x 22". Fits neatly on your counter or hangs on wall.

YOUR CUSTOMER sees at a glance what he's getting. His choice of five mikes, each in its own super-clear plastic bag; his choice of style; his choice of color. Each package has a mike, cable with standard plug plus plug adapter. These Turner mikes fit any tape recorder.

You sell these mikes right from the board. No need to carry extra stock of mikes. Your jobber's salesman can quickly spot which mikes you've sold. When a mike is sold, the name and model number show on the board. It's a simple matter for him to keep your display up to date.

The Turner display package is available from your jobber. Be sure to ask him about it. It's an easy way to increase your microphone business with a minimum of effort.



950-17th St., N.E.
Cedar Rapids, Iowa

IN CANADA: **CANADIAN MARCONI CO.,**
Toronto, Ontario and Branches
EXPORT: . . . **AD AURIEMA, INC.**
89 Broad St., New York 4, N. Y.

Debugging

(Continued from page 35)
how to connect a balanced output to an unbalanced lead, and vice-versa.

Marker Adder

Attention should be paid to the marker generator to prevent overloading the receiver and distorting the waveform. The marker should be as small as possible. A marker adder is a useful accessory in that it provides a marker pip of relatively large size at the scope input terminals, without having to pass the marker signal through the receiver. Most marker adders have provisions for controlling the size and shape of the marker.

Finally, the subject of proper grounding must be considered. A simple test of adequate grounding, is to vary the position of the leads, or pass the hands over or near the generator and receiver. If the waveform changes check to see that all equipment including the receiver is properly grounded. An isolation transformer for the TV set only will save fuses, test equipment, and human skin, and will enable the entire arrangement of test equipment and receiver to have one common ground. •

Stereo Cartridges

(Continued from page 35)
able in either form. A turnover model is available. It consists of a 0.7-mil stereo and a 3-mil monaural side.

What About Record Availability?
No major record manufacturer has announced the availability of stereo records. There are some problems still to be resolved. Audio Fidelity Records has announced the availability of discs. Records will probably become available in mid 1958.

What About Playing Time On An LP Record? In virtually every case, a standard recording can be reproduced in stereo with the identical material on a single disc. In a few instances this may not be possible. As a rule of thumb, stereo material occupies 7 to 10 percent more space on a disc and in most instances, this space is available on the record by

compressing the available material or cutting further into the center of the record.

What About Cost? Stereo cartridges will cost somewhat more than monaural cartridges, but the difference will be modest. A stereo cartridge is available at a net selling price of \$19.50 with a 0.7-mil diamond needle.

What Effect Will Stereophonic Cartridges And Records Have On The Equipment And Record Market? It is safe to say that all responsible manufacturers are working toward the common objective of supplying equipment as rapidly and as economically as possible to the distributors and dealers for the public. In the component high fidelity field, the problem of obsolescence is almost limited exclusively to the phonograph cartridge. Good speaker systems continue to be a requirement for good music reproduction; amplifiers and preamplifiers continue to be part of the system. While it is more convenient to have a stereo amplifier and preamplifier with the controls ganged, this is certainly not an essential requirement and anybody who buys monaural equipment can add the additional units at their convenience. For some time to come record companies will probably press both monaural and stereophonic discs. In time, there may be a single library where the discs are completely compatible; presently, this is not the case. An individual who is planning on buying high fidelity equipment will make no mistake proceeding exactly as before with the exception that, if possible, he should use a stereo cartridge initially. •



"THANK TO V. DEBIAK"

"I think you're gonna need a new picture tube."

Where PERFORMANCE counts most!



you can depend on AEROVOX CAPACITORS

Set owners today expect and demand top quality service and repairs . . . they won't take less! So, don't gamble with your customers goodwill . . . replace those defective or inferior capacitors with AEROVOX units of known and preferred quality. You give your customers the best when you use Aerovox Capacitors.

DURAMIC CERAMIC-CASED TUBULARS . . . Type P84CM paper capacitors are encased in dense steatite for performance above that of conventional paper units. New thermo-setting end seals for exceptional humidity protection. Firmly imbedded leads will not work loose or pull out.

DURANITE MOLDED TUBULARS . . . Type P88N units are molded in a blue permanent rock-hard casing that does not dry out or develop cracks or fissures. Moisture proof operation from sub-zero to 212°F.

VERTICAL MOUNTING TUBULARS . . . Type P151N capacitors are specifically designed for use in printed-wiring chassis. Assembled in molded phenolic case, Aerolene impregnated, thermosetting end-fill, sturdy wire leads for firm mounting.

Ask your local Aerovox Distributor for your copy of the latest Aerovox Catalog.

AEROVOX CORPORATION

DISTRIBUTOR DIVISION

NEW BEDFORD, MASS.

SPECIAL! FIVE TOOLS FOR THE PRICE OF TWO

in the

Walsco

COLOR TV REPAIR KIT

This kit contains the five tools you must have to service any color TV set . . . at the price you would normally pay for just two of them! In the kit are



KIT #2599

You get the complete kit for \$21.90 Dealer Net . . . the regular cost of the Degaussing Coil and Grid Grounding Box alone! The Interlock Cheater, Color Viewer and Alignment Tool **FREE!**

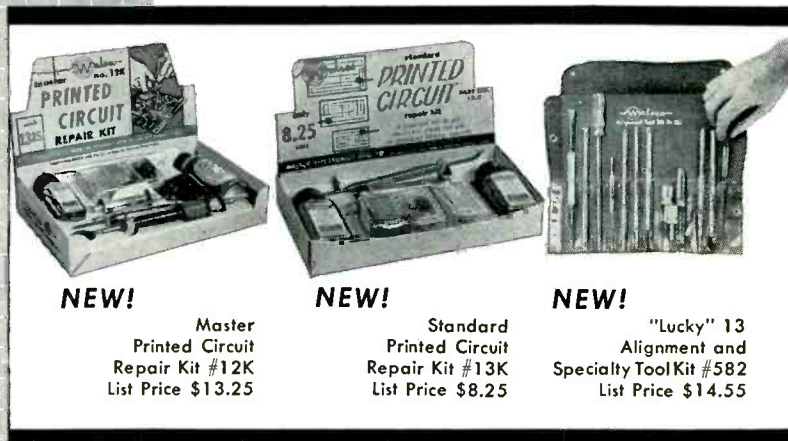
- Color TV Degaussing Coil #2590 to eliminate stray fields prior to purity adjustments. With momentary switch to de-energize coil without pulling plug.

- Color TV Interlock Cheater #2548 with special design that permits safe insertion of high voltage probe.

- Color TV Grid Grounding Box #2595 for convergence and matrix adjustments with special "insulation piercing" terminals.

- Color TV Color Viewer #2596 with balanced optical filters that permit accurate color phase and matrix adjustments . . . without using an oscilloscope.

- Color TV Alignment Tool #2589 for making simultaneous, separate adjustment of concentric controls.



NEW!
Master
Printed Circuit
Repair Kit #12K
List Price \$13.25

NEW!
Standard
Printed Circuit
Repair Kit #13K
List Price \$8.25

NEW!
"Lucky" 13
Alignment and
Specialty Tool Kit #582
List Price \$14.55

WALSCO ELECTRONICS MFG. CO.

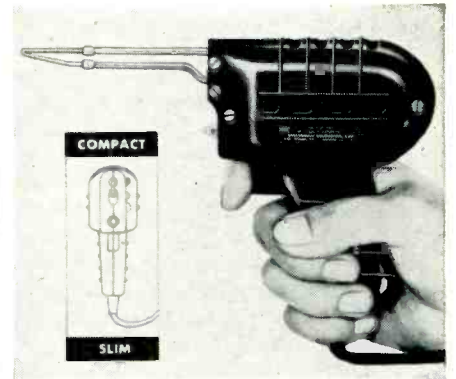
A Division of Textron Inc.

106 WEST GREEN STREET, ROCKFORD, ILLINOIS, U.S.A.
WEST COAST PLANT: LOS ANGELES 18, CALIFORNIA
In Canada: Atlas Radio Corporation, Toronto 10, Ontario

New Products

Wen SOLDERING GUN

The new 100-watt soldering gun Model #100 embodies many features of interest. The extra-thin gun is 1 11/16" diameter and weighs 19 oz. Heats in 2 to 3 seconds on 110-120 v, 60-cycle ac. Cools quickly, too. Has a built-in spotlight, angled to focus on the work; a 6



ft. cord; and replaceable extra-long steel-nosed long-life tips which are interchangeable with hot-cutting or flat-iron tips. \$5.95 list. Wen Products, Inc., 5808 Northwest Highway, Chicago, Ill. (ELECTRONIC TECHNICIAN 3-19)

Raytheon TUBES

1G3GT-filament type, diode designed for use as a high-voltage rectifier in TV receivers and r-f power supplies of electronic equipment, is a direct replacement for the 1B3GT.

3DK6 - heater - cathode, miniature type, sharp-cutoff pentode, designed for use in wide-band high frequency amplifiers. It is identical to the 4DK6 except that it has a 600 ma CWU heater.

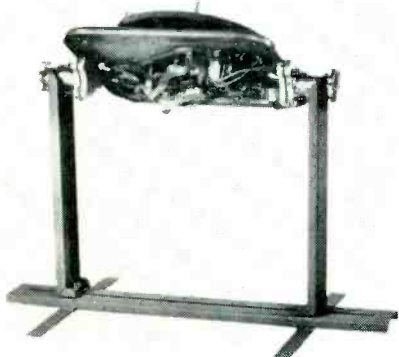
5BT8-heater-cathode, miniature type, dual diode and sharp cutoff pentode. The pentode section may be used as an i-f, video, and agc amplifier and the diode section being symmetrical may be used in afc and detector circuits. It is identical to the 6BT8 except that it has a 600 ma CWU heater.

5CZ5 heater-cathode, miniature type, high perveance beam power amplifier designed for use in vertical-deflection circuits and audio output stages. It is identical to the 6CZ5 except that it has a 600 ma CWU heater.

6CM8-heater cathode, miniature type, high-mu triode, and sharp cutoff pentode. The pentode section may be used as an i-f, video and agc amplifier. It is identical to the 5CM8 except that it has a 450 ma heater. Raytheon Mfg. Co., 55 Chapel St., Newton 58, Mass. (ELECTRONIC TECHNICIAN 3-28)

GC CHASSIS CRADLE

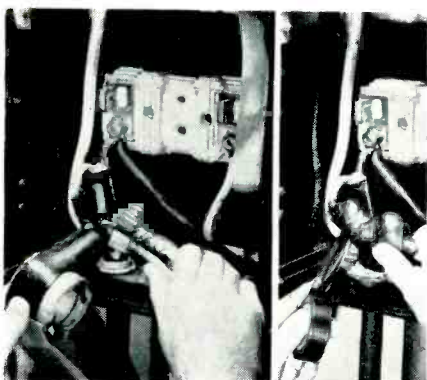
This new tool is a Chassis Cradle that rotates equipment 360° and holds it, to simplify repairs. It can accommodate record changers, radio and amplifier chassis. A rubber cushion is built into the vise grips to protect the finish. The holders are designed to clear record



changer mechanisms even during its cycling operation. Speed clamps allow a chassis to be quickly mounted or removed. Catalog No. 5212. List price is \$12.95. General Cement Mfg. Co., 400 S. Wyman St., Rockford, Ill. (ELECTRONIC TECHNICIAN 3-29)

Volseal COMPOUND

Electrical insulating compound to cushion irregular shapes is an easy-to-handle, high dielectric insulating material used primarily to seal and build-up cable splices. It conforms to irregular shapes, and acts as an excellent padding-insulator to round out sharp corners around terminals, connections, bus bars and motor lead junctions. Packaged in individual metal containers, each roll is 1½ inches wide, 5 feet long and ⅛ inch in thickness. This ribbon

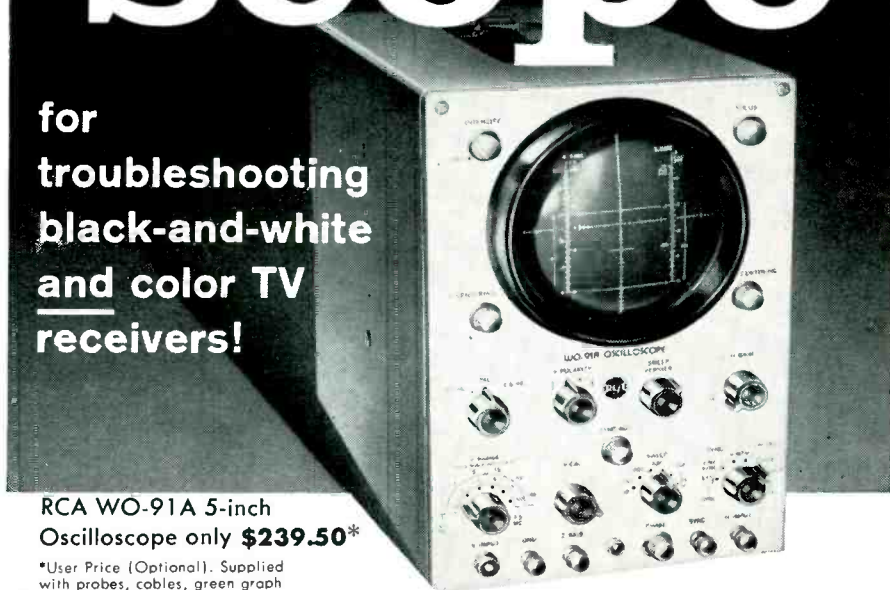


form putty-like substance needs only to be wrapped and shaped into place, to fill and seal every hollow or contour. Once applied, it forms a smooth working surface that's ready to be wrapped by plastic electrical tape. Permanently plastic, it will not dry out, become brittle or excessively hard. It resists acids and alkalis, including brine solutions, soaps and detergents. Johns-Manville Dutch Brand Division, 7800 S. Woodawn Ave., Chicago 19, Ill. (ELECTRONIC TECHNICIAN 3-30)

ELECTRONIC TECHNICIAN • March, 1958

RCA 'scope

for
troubleshooting
black-and-white
and color TV
receivers!



RCA WO-91A 5-inch
Oscilloscope only \$239.50*

*User Price (Optional). Supplied with probes, cables, green graph screen, instruction booklet.

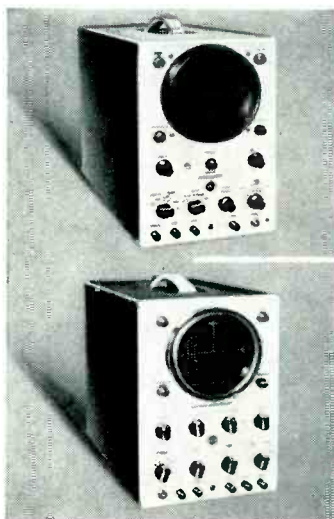
Don't sell yourself short on one of the most important shop instruments you can own—get the best from RCA! Here's a 'scope that will help you make money, now and in the years of increased color servicing to come.

You get full 4.5-Mc bandwidth with high sensitivity—18 millivolt—for checking low-level stages of any TV receiver, color or black-and-white. Three short, simple steps and the WO-91A is calibrated, ready for voltage measurements at all settings of the "V" range and band-width control. Unlike 'scopes with the usual 10:1 step attenuators, there is never a need to disturb calibration because the WO-91A's unique 3:1 step attenuator permits selection of the trace height best suited for analysis.

Plus these important WO-91A features: vertical polarity-reversal switch for "upright" or "inverted" trace display • sturdy single-unit low capacitance/direct probe minimizes circuit loading • shielded vertical-input coaxial connector and shielded cable minimizes hum and stray-field pickup • Z-axis input facilities permit direct modulation of the control grid of the cathode-ray tube • "plus" or "minus" internal-sync selector • positive-lock internal sync.

Choose from RCA's famous family of high-quality 'scopes

RCA WO-78B 5-inch Oscilloscope—laboratory-type 'scope with high 3.5-millivolt sensitivity. Designed with all the features necessary for photographing screen patterns—flat-faced CRT, 2.7Kv high voltage on CRT to obtain bright patterns, fine focus. Excellent roll-off characteristics, a feature usually available only in higher-priced 'scopes. \$475.00*



RCA WO-88A 5-inch DC Oscilloscope—low cost; has all basic features for general service applications. Features 25-millivolt sensitivity, input impedance of 10 megohms to minimize loading of test circuits; built-in voltage-calibrating facilities permit simultaneous waveshape display and peak-to-peak voltage measurements. Supplied with switch-type low-capacitance probe. \$179.50*

Available from Your Local RCA Distributor's!



RADIO CORPORATION OF AMERICA
Electron Tube Division

Harrison, N. J.

Association News

ETG Appoints

The Electronic Technicians Guild of Mass. appointed Albert C. W. Saunders, Director of Education. He is also Educational Director of NATESA. He called upon all the members to assist him in compiling a list of practical servicing problems and answers. It will be used for a national plan of technical classifica-

tion; enabling examinations of those in the service industry wishing to elevate their standing and be recognized for their engineering abilities. The plan approved by several university officials calls for three classes or categories of technical maintenance personnel: Technician, Engineering Technician and Engineer.

RTG Electronics Fair

The Electronics Fair of Long Island which had been scheduled for January 17th, 18th and 19th at the Hempstead Armory, in Hempstead,

New York has been postponed for six months. This action was taken by the Radio and Television Guild, sponsors of the trade show, after the majority of exhibitors requested additional time to prepare and ship their 1958 displays. It has been rescheduled for May 30th, 31st and June 1st.

TESA Elects

TESA-Chicago elected: Pres., John Cahill; 1st. V.P., Elmer Frohardt; 2nd V.P., Walter Schafer; 3rd V.P., Clarence Wilhelm; Secy., Angelo Chrysogelos; Treas. & NATESA Alternate, Joseph Issak; Sgt-at-arms, Harry Miklasz; and NATESA Director, Joseph Blink.

ETA Elects

The Electronic Technicians Association of Lancaster County, Inc., in Ephrata, Penna. (formerly the Northern Lancaster County Electronics Servicemens Association) elected: Pres., Harold Snader; V.P., Thomas Horst; Secy., George Styer; Recrdg. Secy., Ralph Strickler; and Treas., A. J. Yundt.



The Capacitor Package that means Quality

1 year service guarantee

When you see this package in the familiar red and black box, you know it contains "trouble-free" Planet capacitors—mechanically and electrically tested throughout manufacture. This

rigid system of quality control makes our unconditional one-year guarantee possible. But making Planet capacitors correctly from the start means reasonable prices too!

PLANET SALES CORPORATION

225 BELLEVILLE AVENUE
BLOOMFIELD, N. J.

Write for Catalog listing specifications on stock items.

RADIO AND TV SERVICEMEN

Troubleshoot TV Deflection
Circuits fast . . . with the



SECO

Model FB-4

FLYBACK CIRCUIT and INDUCTANCE ANALYZER

Checks complete horizontal coil circuit
. . . not just individual components!

Nothing faster! 100% accuracy! Just connect one test lead to plate of the horizontal output tube, ground the other—then without disconnecting anything, rotate control knob and electron-eye tube instantly tells you whether or not flyback transformer and yoke are all right. Resonant frequency and "Q" meter principle used for testing—will not be obsolete due to variables in engineering design of circuits to be checked.

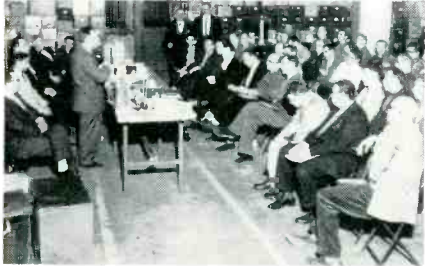
With self-contained power supply, matched 18" leads. **\$38⁹⁵**_{net}

SECO

Write today for free literature
MANUFACTURING CO.
5015 Penn Ave. So., Mpls., Minn.

CETA Visits JFD Plants

Over 100 technicians belonging to the Certified Electronic Technicians Association were guests of the JFD Electronics Corp., in Brooklyn, N. Y. They were conducted on a tour of plants No. 1 and 2, engineering laboratories, aluminum fabricating mill, production lines and other operations. Immediately following the

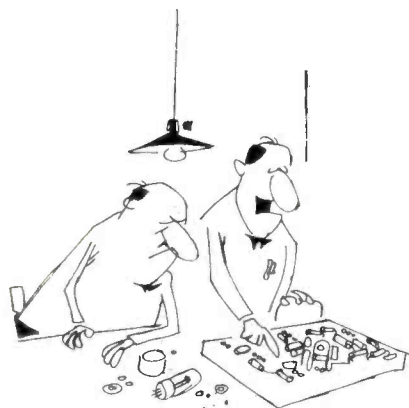


CETA's President Bob Cornell introduces JFD department heads who conducted a business and technical panel discussion at the factory.

tour, the technicians were addressed by engineering, sales, advertising, and credit departmental heads who discussed new approaches in antenna installation, servicing and merchandising. A lively question and answer session followed the meeting during which time the company's speakers recommended specific solutions to daily problems.

RTA Meeting

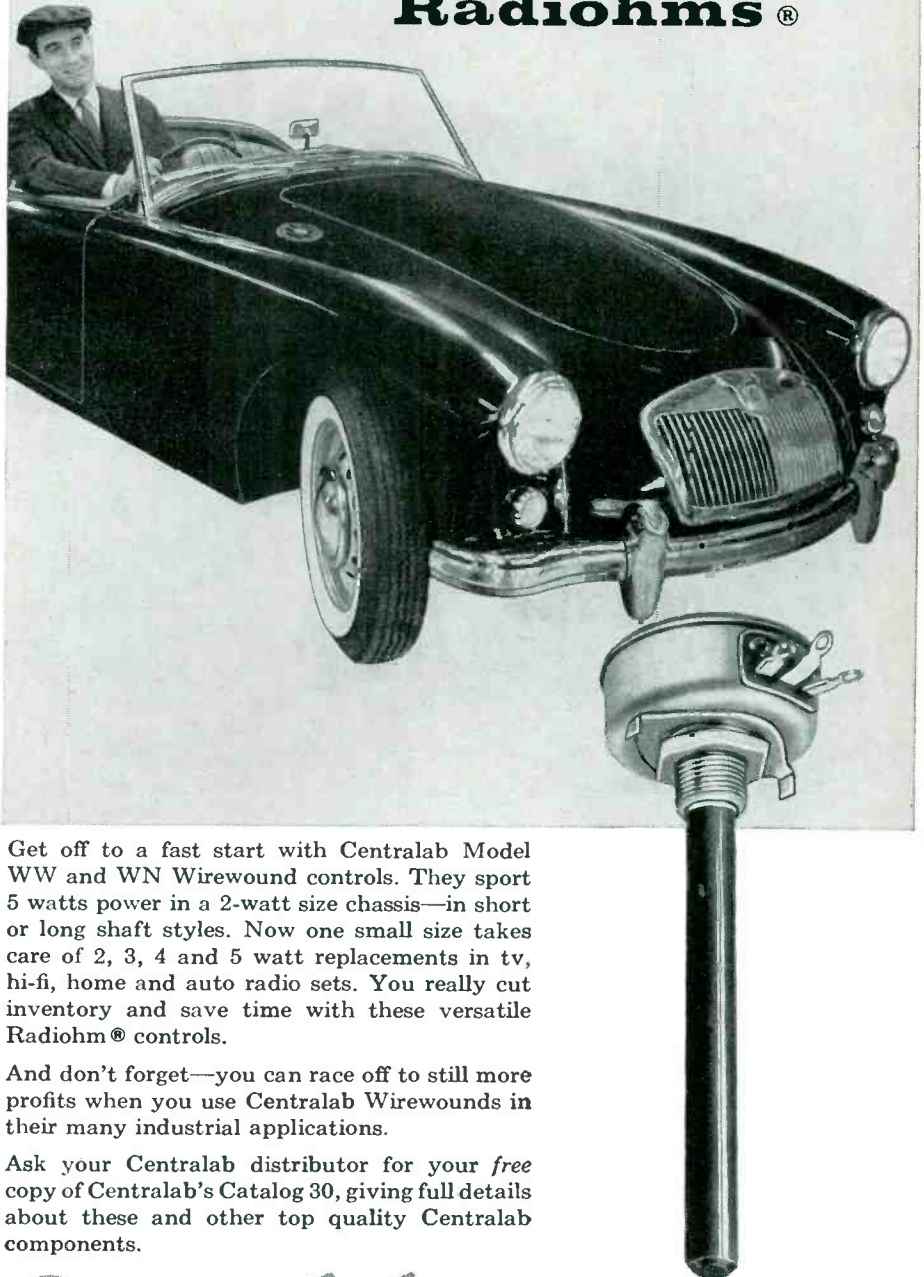
B. J. Castro, Sylvania sales and service representative, presented a talk on "Transistors—Theory and Application," to the RTA of Pasadena, Calif. The technical program was arranged by Cecil Parker, and included refreshments for all and door prizes to three lucky winners. Door prizes are awarded at every meeting; two tickets go to all who arrive before 7:45 P.M., and one to those who arrive late.



"You go down past this 5U4, turn left between these condensers and here's my house."

Big power in a small model

Centralab Wirewound Radiohms®



Get off to a fast start with Centralab Model WW and WN Wirewound controls. They sport 5 watts power in a 2-watt size chassis—in short or long shaft styles. Now one small size takes care of 2, 3, 4 and 5 watt replacements in tv, hi-fi, home and auto radio sets. You really cut inventory and save time with these versatile Radiohm® controls.

And don't forget—you can race off to still more profits when you use Centralab Wirewounds in their many industrial applications.

Ask your Centralab distributor for your free copy of Centralab's Catalog 30, giving full details about these and other top quality Centralab components.

Centralab

B-5823

A DIVISION OF GLOBE-UNION, INC.
902C E. KEEFE AVE. • MILWAUKEE 1, WIS.
In Canada: 804 Mt. Pleasant Rd. • Toronto, Ontario

SWITCHES • PACKAGED ELECTRONIC CIRCUITS • CERAMIC CAPACITORS
CONTROLS • ENGINEERED CERAMICS • SEMI-CONDUCTOR PRODUCTS

News of the Industry

ALLIANCE MFG. CO. reports that their plans for promoting Sessions Clocks will be the most intensive in the 144-year history of the latter company. Alliance has recently assumed exclusive distribution and merchandising in the U. S. for Sessions Clocks. A kit of dealer aids is being prepared.

RADIO CORP. OF AMERICA has awarded, to three graduates of the RCA Institutes, 4-year scholarships in engineering and physics with annual grants of \$800 each. In addition, a contribution of \$500 is given each privately-endowed school attended by an RCA scholar. 83 students are being helped this year by RCA's scholarship and fellowship program. Recipients of the RCA awards are: **FREDERICK B. SMITH, JR.**, Oceanside, N. Y.; **FLOYD W. GARRETT**, Austin, Texas; and **CHARLES ATZENBECK**, Bronx, N. Y.

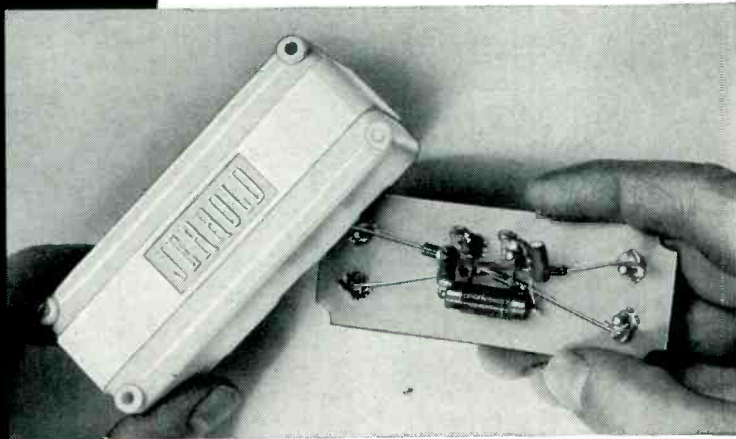
EDWARDS ASSOCIATES, a newly organized manufacturers' representatives firm, with offices at 249-39 60th Ave., Little Neck 62, N. Y., is headed by **BARNEY EDWARDS**, recently resigned Sales Manager of the Recoton Corp. Territory: metropolitan N.Y. and northern N.J.

BERNARD L. CAHN CO., San Francisco manufacturers' representatives, announces that in expanding the firm's Industrial Sales Div., **WILLARD G. SCHIPPER** has been appointed as sales engineer.

ARROW SALES, INC., electronic distributors of North Hollywood, Calif., announces their removal to expanded quarters in their new building at 7035 Laurel Canyon Blvd.

BAUME-MILLER ASSOCIATES, INC., manufacturers' representatives, is a consolidation of Baume Electronic Sales Co. and Gilbert E. Miller Associates. Their new offices are in the Meadowbrook Bank Bldg., 20 Jerusalem Ave., Hicksville, N. Y.

JERROLD MF-2: THE 2-SET COUPLER WITH GUTS!

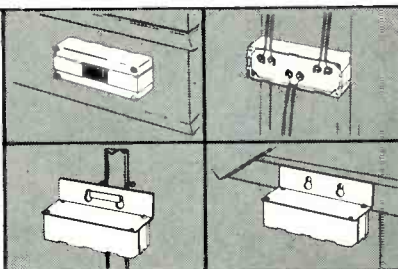


The MF-2 Doesn't Care Where It's Used!

Even though the impedance of most TV sets varies greatly from 300 ohms, the low-loss MF-2 doesn't care. Its special electronic circuit consisting of a resonated auto transformer with stabilizing resistors will produce positive results—prevent interference between sets—will not introduce ghosts!

USE FOR TV and/or FM

The MF-2 has quickly become the leading coupler in the industry. Attractively packaged . . . universal mounting for easy installation. **\$4.50 LIST**



Order the MF-2 From Your Jerrold Distributor Today, or Write:

JERROLD
ELECTRONICS CORPORATION
Dept. PD43, Philadelphia 3, Pa.

NEW! IMPROVED!

SENCORE TRC4 TRANSISTOR CHECKER

Another Sencore Time-Saver

America's newest, most popular test instruments

NOW CHECKS:

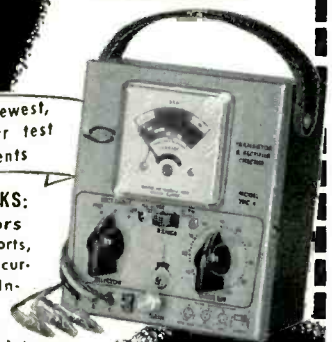
- ★ **Transistors** for opens, shorts, leakage and current gain. Includes new gain test on power transistors.
- ★ **Crystal Diodes** checks forward to reverse current ratio on all diodes.
- ★ **Selenium Rectifiers** checks forward and reverse currents.

Controls are accurately set for each transistor by referring to replaceable set-up chart on rear. Test leads or socket provides for fast hook-up. See your parts distributor.

SENCORE Mfg. by **SERVICE INSTRUMENTS CORP.**
171 OFFICIAL RD., ADDISON, ILL.

Cut out this ad now for further information

ONLY \$17.95
Dealer Net
SIMPLE TO OPERATE
Cannot become obsolete.
Approved by leading manufacturers



Audio News Letter

AUDAX has a new 12-unit display case and plastic packaging for its promotion of \$3.95 stylus balances.

AMPLIFIER CORP. OF AMERICA has designed a new, self-contained stereophonic tape recorder. The "Stereo-Magnemite" measures 8-1/2 x 11 x 10 inches; weighs 17 pounds; and is available in three single-speed models operating at tape speeds of 3-3/4, 7-1/2, or 15 ips.

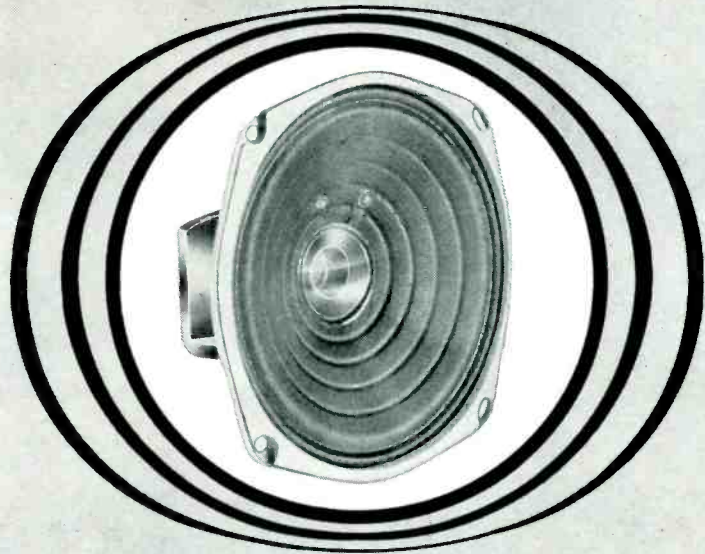
PILOT RADIO announces the appointment of Allan C. Davey as district sales representative for Ill. and eastern Wis. with headquarters at 4733 Wallbank, Downers Grove, Ill. Formerly district sales rep of American Motor's Kelvinator Div., and divisional sales manager for McGraw Electric.

HOFFMAN RADIO has introduced their new line of 11 basic TV receivers, and a full line of hi-fi instruments. A "Floating Sound" speaker chamber, which isolates the speakers from the other components to eliminate distortion: a four-speed Garrard record changer, and a 25-watt amplifier are some of the features in the firm's hi-fi sets.

ROCKBAR has appointed Thomas B. Aldrich as industrial sales manager. He will be responsible for selling Collaro changers and Goodmans speakers and vibration generators to manufacturers.

WALCO has released a 6-phase sales program, including promotion literature, microscope display, data sheets, bonus book, and needle accessory department in 2 x 4 ft. space.

**For protection against heat, humidity or dust—
wherever operating conditions are severe—**



the installation is safe with QUAM SPEAKERS featuring the exclusive HUMI-GARD CONE

This new Quam exclusive, the Humi-Gard Cone, is a plastic-impregnated synthetic fiber fabric cone that has the response characteristics of an untreated paper cone—yet will outlast treated paper cones at least three to one! Not only is it weather-resistant but abrasion-resistant as well! Whenever a TV set or communications system is subject to extreme conditions of humidity, dust or similar situations harmful to speakers, a Quam speaker with a Humi-Gard Cone is the perfect solution. The Humi-Gard Cone is available in speakers up to 6 1/2".

Only in Quam speakers do you get the famous patented Adjust-a-Cone Suspension and U-Shaped Pot, and the new exclusive Humi-Gard Cone.

Write for your free copy of Catalog S-757, describing the complete line of Quam Public Address, Outdoor and Intercom speakers.

QUAM, the quality line for all your speaker needs

QUAM-NICHOLS COMPANY

226 EAST MARQUETTE AVENUE • CHICAGO 37, ILLINOIS

In Canada: A. T. R. Armstrong, Ltd., 700 Weston Road, Toronto 9, Ontario
D. Eldon McLennan, Ltd., 1624 W. Third Avenue, Vancouver 9, B.C.



SERVICE MEN KNOW THERE IS JUST ONE

HUSH

Reg. U. S. Pat. Off.

*Chemically engineered for tuners and
switching mechanism*

Hush comes in a 6 oz. pressure can with sufficient pressure to reach all contacts to wash-away that dirt, leaving clean and positive contacts, protected with a lasting lubricant film. Hush also available in 2 oz., 8 oz. and 32 oz. containers. **\$2.25 net**

EVER-QUIET

Reg. U. S. Pat. Off.®

*Since 1949 the Original Volume Control
and Contact Restorer*

EVER-QUIET is a free-flowing liquid that leaves no powder residue. Scientifically designed to seep around the shaft and penetrate the control or potentiometer, cleaning and contacts and leaving a safe protecting film. Harmless to metals, wire or carbon. Will not affect inductance, capacitance or resistance.

2 oz. bottle with handy dispenser
(32 oz. size available)

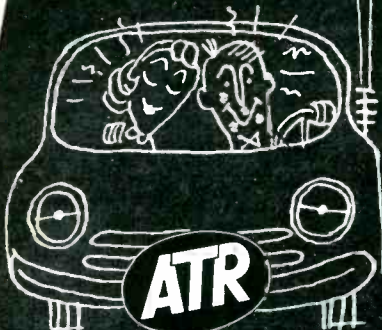
79¢ net

See your distributor or write to



CHEMICAL ELECTRONIC ENGINEERING, INC. Matawan, New Jersey

by
every
test



is BEST!



ATR AUTO
RADIO
VIBRATORS

Have Ceramic Stack Spacers

**A COMPLETE LINE
OF VIBRATORS**

Designed for Use in Standard Vibrator-Operated Auto Radio Receivers. Built with Precision Construction, featuring Ceramic Stack Spacers for Longer Lasting Life. Backed by more than 22 years of experience in Vibrator Design, Development, and Manufacturing.

Free

"A" Battery Eliminators, DC-AC Inverters, Auto Radio Vibrators



NEW MODELS NEW DESIGNS NEW LITERATURE

See your jobber or write factory

AMERICAN TELEVISION & RADIO CO.
Quality Products Since 1931
SAINT PAUL 1, MINNESOTA—U. S. A.

Pocket-Radio Signaling

W. STRACK

BELL TELEPHONE LABS

• City-wide personal radio signaling is a potential new service now being tested in the Allentown-Bethlehem area of Pennsylvania. Basically, the system serves to indicate to a particular customer—perhaps a doctor or a salesman—that his secretary or some other party is trying to reach him. The customer carries a small radio receiver slightly larger than a kingsize package of cigarettes in his pocket or clipped on his belt. On receiving a radio signal with the proper code, the radio will emit an audible tone of sufficient loudness to inform the user that he is being called. He then goes to a telephone and calls his office or other pre-designated number where he is given the message. Fundamentally, personal radio signaling is thus an extension of the telephone bell.

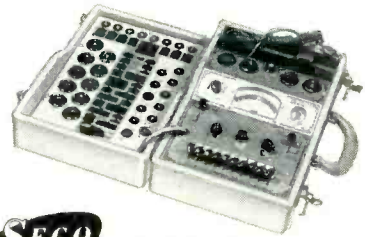
One of the primary purposes of the Allentown installation is to answer various operational and technical questions. Operationally, the trial is providing valuable information on the reaction of the public to the service and is also establishing the requirements of various groups of users. In addition, tests are under way to obtain technical data, particularly with regard to the attenuation or loss which takes place when a radio signal travels from a fixed-station transmitter to a pocket-carried radio receiver.

To call a customer located somewhere within the coverage area, a person dials a particular telephone number and is connected with a personal-signaling operator. The operator responds with "signaling-service—number please." The calling party gives the operator a 4-digit number which corresponds to the code associated with the radio receiver assigned to the called party. With present equipment, the operator then places this number into the system by setting a series of four rotary switches. A total of 24 such codes may be set up at any one time.

The codes are scanned at a rate of about 16 per minute and are translated into combinations of four out of nine audio frequencies. A total of about 3,500 codes can be assigned on a single radio channel. Each number in the code corresponds to a particular audio frequency—No. 1 is a frequency of about 160 cycles, No. 2 about 170 cycles, and so on up to

**RADIO AND TV
SERVICEMEN**

make more money with this



SECO Model 107
TUBE TESTER

3 complete tests in one handy instrument

Here's the tube tester every serviceman has been asking for! Designed for outstanding performance and accuracy—provides 3 important tests: Dynamic Mutual Conductance Test of all popular radio and TV amplifier tubes—Cathode Emission Test for all tubes by free point selector system—nationally accepted Grid Circuit Test developed and patented by Seco. Saves you valuable time—quickly pays for itself by justifiably culling and selling more tubes for you!

Completely self-contained in compact portable carrying case. Furnished with handy flip-chart for fast, easy tube set-up data. **\$13950** net

Write today for free literature
SECO MANUFACTURING CO.
5015 Penn Ave. So., Mpls., Minn.

**ALL
SERVICE DEALERS
LOOK
TO**



SELECT-O-SWITCH
4-Way Selector Switch

Use as antenna switch or as a hi-fi speaker switch. Permits channeling one input to any one of 4 outputs.

model SS4
LIST \$3.25



Switch-in-Base
DUO-JUVENATOR

Parallel and Series TV tube booster. Cures 95% of all CRT failures. One-piece construction.
model RPS2 LIST \$2.95

TELE-LINK

Two Set TV & FM Coupler

Matched transformers for peak performance. On 2 TV or FM sets from one antenna.

model TL2
LIST \$2.95



134 NASSAU ROAD, ROOSEVELT, N. Y.

No. 9 which is a frequency of about 300 cycles.

These audio frequencies sequentially modulate a 250-watt AM transmitter which operates on one of the common-carrier mobile telephone frequencies at about 35 mc. Each tone is sent for about four-tenths of a second—four tones (one code) requiring a total of 1.6 seconds. The spacing between code transmissions is approximately 2 seconds. Thus the total time per signal is about 3.6 seconds.

When the RF signal is picked up by the receiver, it is demodulated and the audio tones are recovered. These tones are amplified and used to energize a group of four highly selective vibrating reeds which will respond only if the proper frequencies are applied. If, during any coding interval, all reeds in a particular receiver are energized in the proper sequence, an audio oscillator is triggered, and an alerting tone informs the customer that he is being called. By depressing a small push button, the user can silence the oscillator and ready the receiver for the next call. •

Newman CABLE WRAP

The Heli-Tube is a spirally-cut, smooth-surfaced, polyethylene tubing and is ideal for binding electrical wires into cables with full flexibility for wire lead-offs at any point. Newest version, Heli-Tube 275°F, has a softening point of 275°F with no sacrifice of its spring-like quality which makes it tend to return to its original shape to hold wires in a vise-like grip. Available in three diameters: 1/8", 1/4", and 1/2" for bundles of wire ranging in size up to 3 1/2" diameter. M. M. Newman Co., Marblehead, Mass. (ELECTRONIC TECHNICIAN 3-20)



"You named a speaker after me—how thrilling—I can hardly wait to see it."

ALL OVER THE U.S.
utah STANDS for
UNSURPASSED SERVICE

Yes . . .
ALL OVER THE U.S.
UTAH STANDS for UNSURPASSED SERVICE

Yes, all over the U. S.—Utah stands for Unsurpassed Service.

US—Utah and the Service Man—because Utah stands behind you—the Service Man.

Utah stands behind you—with a speaker name that for over 30 years has signified the finest in quality, design, engineering and production.

Utah stands behind you with a speaker that gives installation performance. You can sell customer satisfaction with a Utah—because Utah gives performance satisfaction.

Utah stands behind you—with a secure source of supply. Leading jobbers all over the U. S. handle Utah—because Utah has the finest and widest line of replacement speakers available to the trade.

Utah your one complete speaker source auto * Rear Deck Kits * Standard Replacement * Television * Public Address * High Fidelity * Outdoor * Inter-Com * Wood & Metal Baffles

Utah is your one, complete satisfactory speaker source. When you order speakers today — **THINK**—then order Utah.

Get your **FREE** copy of the latest Utah Catalog S-157 listing over 100 replacement speakers. Available at your distributors or write direct.

RADIO PRODUCTS CORPORATION
HUNTINGTON • INDIANA

Export Dept. Fidevox International, Chicago, Illinois

YOUR BEST BUY!

FUSE RESISTORS

FROM THE ORIGINATOR

Your jobber has them or can get them for you.

MILWAUKEE RESISTOR CO.
700 W. Virginia Street • Milwaukee 4, Wis.

WRIGHT WIRE STRAND PERFORMS LIKE A KING AND IS NON-SNARLING



Wright TV Guy Wire Strand is your guard against irritating snarls. Each concentric coil measures two feet.

You save money in guying antennas. Greater flexibility, heavily galvanized continuous connected coils. Prompt delivery from stocks in Worcester, Chicago, New Orleans, Houston, Dallas and Los Angeles.

Non-Snarling Pre-Measured Wire Strand Sold only through Wholesale Distributors.

G. F. WRIGHT STEEL & WIRE CO.
250 Stafford St. • Worcester, Mass.

Characteristics of Printed Circuit Panels

• The National Bureau of Standards has been investigating the electrical characteristics of several types of copper-clad laminates for printed circuit applications as part of its program for determining the properties of materials. These laminated panels consist of a central core of insulating material with thin sheet copper-bonded to one or both sides. Under a program sponsored by the Navy Bureau of Ships, D. S. Hoynes of the Bureau's electronic engineering laboratory has studied their current-carrying capacity, electrical resistivity, and dielectric properties.

Designers of military and industrial electronic equipment are making increased use of printed circuits because of their simplicity, economy, and adaptability to mass-production methods. Design and application of printed circuit panels is, in most cases, a straightforward matter since the conductors can usually carry more current than is encountered in most electronic circuits. Occasionally, however, because of space limitations, narrow or closely-spaced conductors must be used. It then becomes necessary to know with some degree of certainty whether a particular conductor can fulfill its current-carrying requirements. Because information of this type has not been generally available, the Bureau undertook a study of the characteristics of printed circuit panels under various conditions of use.

Temperature Rise Measurements

To obtain a general temperature behavior pattern for the current-carrying capacity of printed circuit conductors, a large number of measurements were made, under different conditions of use, on various lengths and widths of conductors bonded to a variety of materials. The curves derived from the measurements showed that cross-sectional area is a dominant factor in the ability of a conductor to carry a given current for a particular temperature rise, especially for the usual copper thickness of 0.00135 in. (1 oz) and 0.0027 in. (2 oz). As might be expected, heavier coppers (0.004 in.) appear capable of carrying somewhat less current, and thinner coppers (0.00067 in.) somewhat higher

NEW
IMPROVED
SENCORE
LC3
Leakage Checker

Another Sencore Time-Saver

Check these outstanding New Features
Now — For the first time...

- Checks 130 different tube types — more than any other "grid circuit" type checker. Includes UHF and latest type tubes.
- Checks picture tubes without removing tube from cabinet or chassis.
- New Roll Chart prevents obsolence — just dial the tube type and save time. Chart is easily replaced at no extra cost.
- Dynamic Filament checks including heater to cathode leakage & shorts — no need for a second filament tester.
- Two spare preheating sockets to cut down testing time.
- Capacitor checks simplified.

The LC3 provides all these new improved features in addition to those employed in earlier leakage or "grid circuit" testers. A must for any TV service technician.

\$28.95
DEALER NET
Really Whips Tough Dogs

SERVICE
INSTRUMENTS CORP.
171 Official Rd • Addison, Ill.

In stock at your local parts distributor

Cut out this ad now for further information

all EYES are on MERIT

...watch for new catalog No. 5811 it's terrific!

"COMPARE IT WITH MERIT"

MERIT COIL & TRANSFORMER CORP.
MERIT PLAZA, HOLLYWOOD, FLA.

current, for a given cross-sectional area than do medium-weight coppers.

Another factor affecting the temperature-current relationship is the thickness of the laminate core material. Core materials about 1/32 in. thick showed some reduction in current-carrying capacity compared with heavier cores. When a solid copper backing was used, the same type of material showed a higher current-carrying capacity. For the usual 1/16-in. core thickness, only small differences could be noticed between single-clad and double-clad laminate panels. Variations in ambient temperature also appear to have little effect on the temperature rise above ambient due to a given current.

A reduction in current-carrying capacity of about 15 to 20 per cent for a given temperature rise was noted for samples coated with a protective plastic material. Such samples were less able to dissipate the heat generated in the copper conductor. Although in most samples the resistance of a particular conductor is actually decreased by dip soldering, an additional reduction in current-carrying capacity up to about 30 per cent was noted in many dip-soldered samples. This has been attributed to changes in the bond characteristics of the materials.

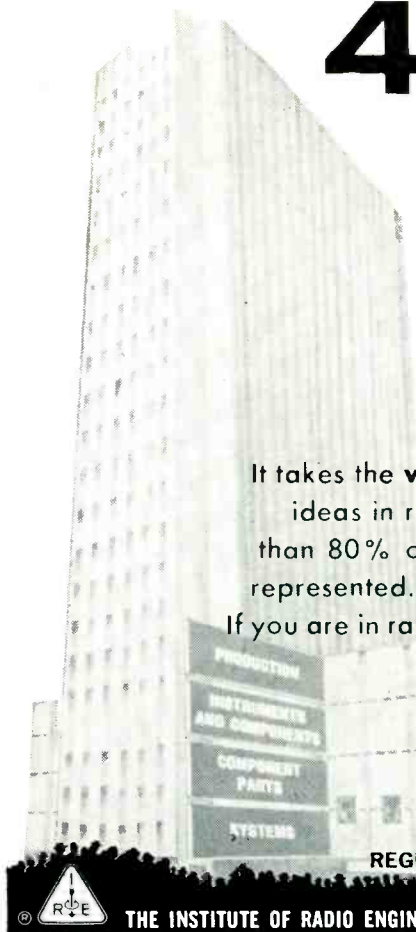
Surface Resistivity

Test samples of metal-clad laminates were subjected to a temperature of 70°C and 95 per cent relative humidity for a period of 2000 hr to determine the effects of various protective coatings on the surface electrical resistivity of the core material. Seven groups of XXXP-composition phenolic laminates and one of the epoxy glass-mat type were included in this test. The coatings included various epoxy resins, microwax, varnish and silicone compounds. The variation in surface resistivity for the coated samples was generally much higher than for uncoated control samples.

Little variation was found between dip-soldered and nondip-soldered samples. Although no set pattern has been established that could not be ascribed to normal variations in the samples, a slight trend toward higher surface resistivities was detected for the dip-soldered samples. In comparing the surface resistivity curves for the coated samples with those for the uncoated controls, little or no improvement was seen in most instances for the six coating materials. Considerable variation in

4 FLOORS

4 MINUTES FROM TIMES SQUARE!



It takes the **whole** Coliseum to show you 800 new ideas in radio-electronics — here you find more than 80% of your industry's productive capacity represented. Attend the Convention. See the Show. If you are in radio-electronics, your year begins here!

MARCH 24-27
THE IRE NATIONAL CONVENTION
Waldorf-Astoria Hotel
and The Radio Engineering Show
Coliseum, New York City

REGISTRATION: IRE Members \$1.00
Non-members \$3.00



THE INSTITUTE OF RADIO ENGINEERS • 1 East 79th Street, New York 21, N. Y.

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 3/32", 1/16", 3/64", 1/32" and others.



Printed Circuit Soldering
On Copper-etched boards use 60% Tin - 40% Lead Alloy . . . for those that are Silver-surfaced use 3% Silver-61 1/2% Tin-35 1/2% Lead

KESTER SOLDER COMPANY

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

"OUTPERFORMS THEM ALL"



I. J. Saltzman, Globe Sound Service, Jamaica, N. Y., experienced commercial sound engineer, says: "On side by side comparison test, the CJ-44 outperforms them all."

NEW!
ATLAS "King Cobra-Jector"
CJ-44



Shown with GB-1 Universal Mounting Bracket

Complete with "Acousti-Match" Built-in Driver Unit

List \$72.50
NET \$43.50

A wide-angle, all-purpose, all-weather Public Address Speaker, complete with integral high-power super-efficient "Acousti-Matched" driver unit. "Acoustic-Matched" means "Controlled Response" within the frequency limits most useful in P. A. and high level music reproduction. "Controlled Response" offers conversion efficiency never before obtainable in high-powered speakers. "Controlled Response" results in smooth reproduction — free from peaks which so often create and sustain acoustic feedback.

The CJ-44 conserves costly amplifier output power — fewer speakers do a complete job. The speaker horn is easily rotated for horizontal or vertical dispersion patterns.

The CJ-44 is the only high-powered P. A. speaker that can be equipped with the new Atlas Universal Mounting Bracket, permitting quick and secure directional adjustment on both planes. Simple to make a horizontal or vertical adjustment as a final "touch-up" to the installation.

The CJ-44 is designed for the "tough jobs." No gimmicks, no fluffs, no wild claims — just a reliable super-efficient speaker for all applications.

Input Power: 30 watts constant
50 watts peak
Input Impedance: 16 ohms
Response: 150-9,000 cps
Dimensions: Bell 23" x 13",
Over-all length 19"
Net Weight: 16 lbs.

Write for free Catalog 57.



ATLAS SOUND CORP.

1445-39 St., Brooklyn 18, N. Y.
Atlas Radio Ltd., Toronto, Canada

the resultant surface resistivity beyond that recorded for the control samples was the rule rather than the exception. Additional variations were noted in the behavior of a particular coating material on different core materials.

Dissipation Factor

Measurements were made over a frequency range of 10^2 to 10^7 cps on the dielectric properties of a group of 16 metal-clad laminates. Individual families of curves for each laminate were developed for dissipation factor and dielectric constant at -30°C , $+23^\circ\text{C}$, and $+100^\circ\text{C}$. Additional measurements were made at 150°C and 200°C on materials that might be expected to be useful at these higher temperatures.

With the exception of one sample, all of the phenolic-base materials showed a general reduction in dissipation factor with an increase in temperature at a frequency of 10^6 cycles. However, considerable variation in dissipation factor was observed for the entire phenolic group at the lower frequencies, particularly at the 100°C temperature level.

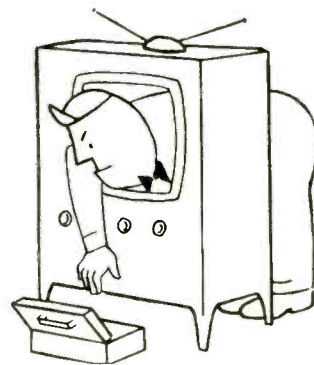
Two samples of the epoxy-glass mat type laminates also showed a variation in characteristics similar to the phenolics. However, at temperatures of 100°C or less, both samples showed less change in dissipation factor than those of the phenolic group over the entire frequency range.

Considerable differences in behavior were exhibited by the two glass-melamine G-5 samples tested. In one sample, the dissipation factor was influenced to an extreme degree by the test temperature. At 100°C , the dissipation factor was so high that it was impractical to make a determination with the existing equipment. The second sample showed characteristics similar to those of the phenolics with respect to temperature, but had a dissipation factor of less than 0.02 at 10^6 cycles. This value compares well with the epoxy samples tested.

For one sample of silicone G-7 material, the dissipation factor at 10^6 cycles was 0.02 or less at temperatures up to 100°C but was influenced to a marked degree at lower frequencies.

The polytetrafluoroethylene-glass mat sample had the lowest dissipation factor of any of those tested in the group. Some variations did occur at the various temperature levels, but they are relatively slight considering the temperature range. At -30°C , the dissipation factor was

repairing TV sets?
for the right part to do
the best job



you'll find it
faster in the

MASTER

new 1958 edition—world's largest
electronic catalog only \$3.50 at
your local parts distributor—now

Free! Write for Panel Lamp Chart.

THE RADIO-ELECTRONIC MASTER
60 MADISON AVE., HEMPSTEAD, N. Y.

**WILL YOUR REPLACEMENT
Fuse Resistor
BURN OUT AGAIN?**

Not if you use—
**The NEW SENCORE
"FUSE-SAFE"
CIRCUIT TESTER**

Save costly call backs
by testing the circuit
before replacing
fuse, fuse resistor or
circuit breaker.



Individual scale for
each value fuse resistor — no interpretation, just read in red or green area.

★ Measures line current and up to 1100 watts of power at 115 volts using line cord and socket.
★ Two convenient current ranges — 0 to 2 amps and 0 to 10 amps. Test leads clip in place of fuse or fuse resistor.
★ 5 ohm, 10 watt resistor prevents TV circuit damage and simulates operating conditions.

As Recommended by Leading Manufacturers



Mfg by **SERVICE INSTRUMENTS CORP.**
171 OFFICIAL RD., ADDISON, ILL.

Cut out this ad now for further information



\$8.95
DEALER NET
MODEL FS-3
AC-DC or both as
needed for Fuse
Resistor Circuits

ELECTRONIC TECHNICIAN

the only magazine to bring you
16 pages of the latest sche-
matics every month, will bring
you the annual

BUYERS DIRECTORY

in the May 1958 issue . . . the
only directory in the electronic
maintenance field!

nearly constant over the entire fre-
quency range.

The nylon-base phenolic N-1 ma-
terial showed good stability at the
lower temperatures. At the higher
temperature of 100°C, the dissipation
factor increased as the frequency
increased.

Dielectric Constant

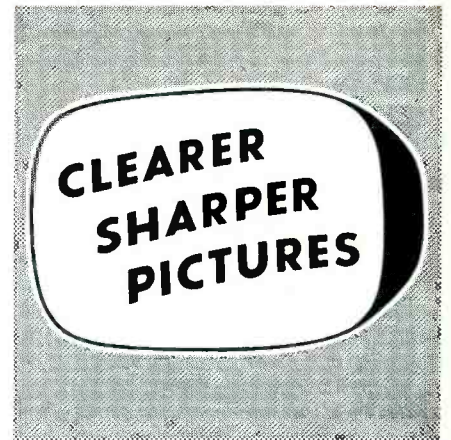
Determinations of the dielectric
constant of the various core mate-
rials showed that this factor in-
creased generally at higher temper-
atures. The outstanding exception
was the polytetrafluoroethylene-
glass mat material, which showed
the opposite trend.

In the phenolic group the dielectric
constant tended to be somewhat
lower for the XXXP materials than
for the XXP and XXX materials. At
10⁶ cycles an over-all average for
the XXXP materials tested was
about 4, while for the XXX and
XXP materials the dielectric con-
stant averaged about 5. Both of the
epoxy-base samples tested had di-
electric constants at 10⁶ cycles rang-
ing between 5 and 6 at temperatures
below 100°C. Above this tempera-
ture both samples showed increases
to a value above 6. •

AV SHOW SET. The Dept. of
Audio-Visual Instruction of
the National Education As-
sociation will hold its 1958
National Convention April
21-25 at Minneapolis' Leam-
ington Hotel. Expected at-
tendance is over 1500.

RACON ELECTRIC announces
the release of an 18" woofer,
Model 18-HW. It is reported
to utilize a patented float-
ing cone design which re-
sults in a low fundamental
resonance of 18 cps. Its
plastic foam surround pro-
vides pneumatic self-damp-
ing. Power is 25 watts, fre-
quency response 10 to 1500
cps, weight 38 lbs. Audio-
phile net is \$150.

WESTINGHOUSE 1958 hi-fi
line contains 4 units. Low
end of line is a vertical
phono console with 3
speakers and 6-8 watt ampli-
fier listing at \$159.50 in
mahogany. High end is a
horizontal console phono
with AM/FM radio, 4 speakers
and 16-8 watt amplifier
listing at \$298.50 in fruit-
wood.

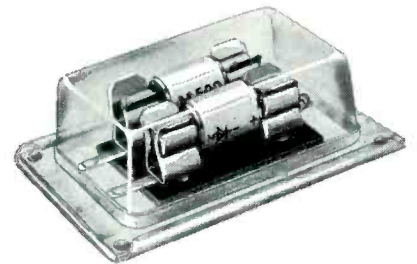


at LESS cost !

Now
Tarzian

**M-500
SILICON
RECTIFIERS**

Will Cost You LESS Than
SELENIUM RECTIFIERS
rated at 200 Milliamperes or higher



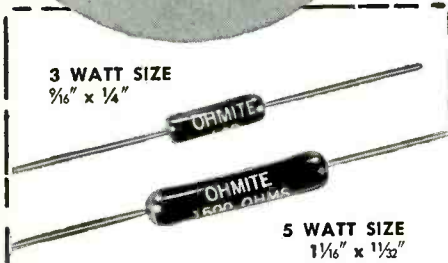
. . . and, as an extra bonus, Tarzian
M-500 Silicons rated at 500 milliamperes
give you wider safety margin. Send for your
copy of the latest Service Information.

**Sarkes
Tarzian, INC.**

Rectifier Division
DEPT. T-1, 415 N. COLLEGE AVE.
BLOOMINGTON, INDIANA

In Canada: 700 Weston Rd., Toronto 9, Tel. Rogers 2-7535
Export: Ad Aurlima, Inc., New York City

Eliminate call backs...
use dependable,
industry-preferred...



AXIAL-LEAD RESISTORS

Vitreous-enameled, power-type, axial-lead units designed to withstand high temperatures.



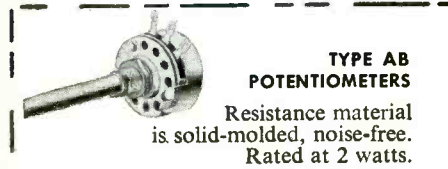
LITTLE DEVIL® COMPOSITION RESISTORS

Meet all MIL-R-11A requirements. Available in 1/2, 1, and 2-watt sizes in all standard RETMA values.



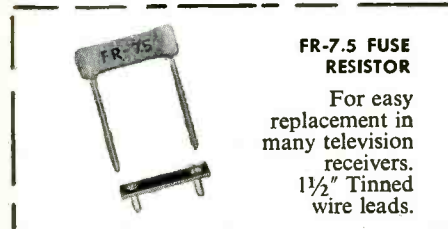
BROWN DEVIL® RESISTORS

Vitreous-enameled. In 5, 10, and 20-watt sizes.



TYPE AB POTENTIOMETERS

Resistance material is solid-molded, noise-free. Rated at 2 watts.



FR-7.5 FUSE RESISTOR

For easy replacement in many television receivers. 1 1/2" Tinned wire leads.

WRITE FOR STOCK CATALOG



OHMITE MANUFACTURING COMPANY
3687 Howard Street • Skokie, Illinois

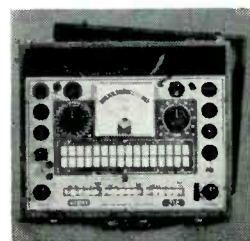
BOGEN announces its one millionth amplifier, a DB-130, rolled off the production line last week. Pres. Lester Bogen noted that sales are expected to be 40% ahead of last year.

HOFFMAN RADIO has named Tom E. Mumford sales manager for hi-fi and radio products. He was previously general manager of Hoffman Sales div. of San Francisco, which was recently discontinued when the territory was awarded to Thompson & Holmes, Ltd.

FAIRCHILD RECORDING Sales Manager Robert E. Bach reports sales of single-speed electronic drive turntables are running 5 to 1 over the 4-speed model. Ratio was originally anticipated to run 10 to 1 since single-speed is \$99.50, while 4-speed has been raised to \$229.50.

FCC REVIEW of frequency allocations in the 25-895 mc range is being followed with interest by the Institute of High Fidelity Manufacturers, which has engaged the Washington, D. C., firm of Koteen & Burt to prepare a petition so the industry view may be presented at any projected hearings. The Institute does not believe the FM band is in immediate danger. Lester Bogen is Chairman of the Ad Hoc Committee dealing with this question.

AMERICAN GELOSO ELECTRONIC's sales manager Myles S. Spector announces the appointment of two regional salesmen for the firm's Hi-Tone miniature tape recorder. Myron Rosenthal for Manhattan, Bronx and Westchester County; Charles Bernstein for Brooklyn and Long Island. The unit with case, tape, take-up reel and microphone sells for \$179.95.



SAVE 4 WAYS

WITH A
JACKSON 648A
DYNAMIC® TUBE TESTER

SAVE ON TIME

Jackson 648A, with fingertouch sequence switching is the world's fastest fully-flexible tube tester.

SAVE ON CALL BACKS

Jackson 648A features famous Jackson Dynamic® circuit, for reliable tests on all radio, tv and most industrial tubes.

SAVE ON INVESTMENT

Jackson 648A is one of the lowest cost, fully-reliable, fully-wired testers on the market.

SAVE ON UPKEEP

Jackson 648A is fully flexible, provides for almost any new development in tube design. No cards to lose. No sea of sockets to confuse you. 23 Separate heater voltages—more than any other tester. Latest test data published monthly on page 65, PF Reporter.



Famous "Service-Engineered" Test Equipment

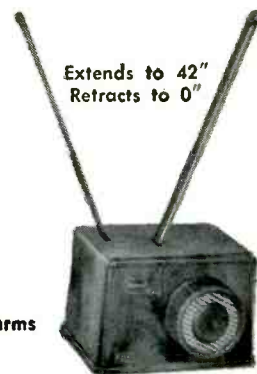
JACKSON ELECTRICAL INSTRUMENT COMPANY
16-18 S. Patterson Boulevard • Dayton 2, Ohio

Channel King® INDOOR TV ANTENNA

THE TRULY UNIQUE AND ADVANCED INDOOR ANTENNA

HIGH PROFIT SALES

- Ⓚ Hands NEVER touch Antenna arms
- Ⓚ SINGLE DIAL adjusts arms and signal
- Ⓚ FAST, positive wider range tuning
- Ⓚ UNBREAKABLE, flexible stainless steel arms
- Ⓚ COMPACT, attractive appearance
- Ⓚ 6 Rich Color Choices



Extends to 42"
Retracts to 0"

See your Distributor or write for Literature and Specification Sheets
MARJO TECHNICAL PRODUCTS CO. 1146 E. Henry St., Linden, N. J.

ELECTRONIC DICTIONARY

(Illustrated)

English—Spanish

French—German

Size: 9" x 12"—over 3,000 definitions and 600 illustrations covering 21 electronic fields including Circuit Symbols

Compiled by

Walter J. Duschinsky, Dr. Sc.

Copyright 1956 by

Caldwell-Clements

SPECIAL PRICE: \$3 Postpaid

Send order & remittance to:

Box 97—ELECTRONIC TECHNICIAN
480 Lexington Avenue
New York 17, N. Y.

INDEX TO ADVERTISERS

March, 1958

Aerovox Corp.	57
American Television and Radio Co. . .	64
Amphenol Electronics Corp.	8
Atlas Sound Corp.	68
B & K Manufacturing Co.	49
Bogen Co., David	Cover III
CBS-Hytron	45
Centralab Div., Globe-Union, Inc. . . .	61
Channel Master Corp.	5
Chemical Electronic Engineering, Inc. .	63
Cisin, H. G.	71
Cornell-Dubilier Electric Corp.	22, 23
Delco Radio Div. of General Motors	47
De Ro Electronics	64
Deutschmann Corp., Tobe	16, 17
Electronic Technician	69, 71
Electro Products Laboratories	55
General Electric Co.	14
Heath Co.	54
Institute of Radio Engineers	67
Jackson Electrical Instrument Co.	70
Jensen Industries	72
Jerrold Electronics Corp.	62
JFD Electronics Corp.	21
Kester Solder Co.	67
Mallory & Co., Inc., P. R.	50, 51
Marjo Technical Products Co.	70
Merit Coil & Transformer Corp.	66
Milwaukee Resistor Co.	65
Ohmite Manufacturing Co.	70
Philco Corporation	2, 3
Planet Sales Corp.	60
Precision Apparatus Co., Inc.	4
Pyramid Electric Co.	48
Quam-Nichols Co.	63
Radio Corporation of America	20, 59, Cover IV
Raytheon Manufacturing Co.	24
Seco Manufacturing Co.	60, 64, 72
Service Instruments Corp.	62, 66, 68
Sonotone Corp.	13
South River Metal Products Co.	71
Sprague Products Co.	9
Sylvania Electric Products, Inc.	6, 7
Tarzian, Inc., Sarkes	69
Telco Electronics Mfg. Co.	15
TungSol Electric, Inc.	52, 53
Turner Co.	56
United Catalog Publishers	68
University Loudspeakers, Inc.	12
Utah Radio Products Co.	65
V-M Corp.	19
Walsco Electronics Manufacturing Co. .	58
Wen Products, Inc.	Cover II
Westinghouse Electric Corp.	18
Wright Steel & Wire Co.	66
Zenith Radio Corp.	10, 11

While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.

NEW SPEED TV SERVICING SYSTEM

FIND TUBE—CURE TROUBLE

With H. G. Cisin's NEW

TV TUBE LOCATOR

Just off the press, Vol. 2 has copyrighted Trouble Indicating Tube Location Guides for over 5000 TV models of 45 leading makes Admiral to Zenith. 1957, 1956, 1955 Models. Vol. 2. Only \$1.50 Postpaid

TV TUBE LOCATOR—Vol. 1 contains similar Location Guides for over 3000 TV models from 1947 to 1954.

Vol. 1. Only \$1 Postpaid

These two volumes are a "Must" for every TV service bench. A storehouse of TV tube servicing information.

Each TV TUBE LOCATION volume shows not only location and type of all tubes, but also actually indicates the exact location of the particular tube or tubes which must be replaced. Picture tube types are given on all guides and where series string heaters are used, this fact is noted.

SPECIAL FEATURE: 135 common TV troubles listed, with explicit directions for locating defective tubes causing each fault.

Guaranteed Money Back in 5 Days if Not Satisfied!

ABSOLUTELY FREE with each order for both LOCATOR volumes: H. G. Cisin's "TV & RADIO TUBE SUBSTITUTION GUIDE." Gives direct replacements of set and picture tubes. Most valuable servicing aid! **ACT NOW**—send \$2.50, get all three books postpaid at cost of only two.

RUSH COUPON NOW!

H. G. CISIN, CONSULTING ENGINEER
Amagansett, L. I., N. Y. Dept. T-1

Enclosed find \$..... RUSH following:
 Vol. 1 Vol. 2 Both Vols.
Include **FREE** book with both volumes.

Name


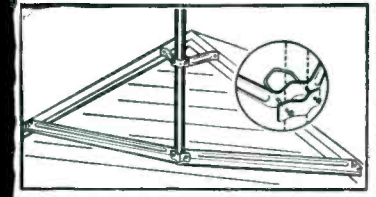
Address

City

Zone.. State.....

ask the
"Man-on-the-Roof"
why he prefers

South River

EAVE MOUNT Model EM-48

One piece construction of heavy gauge, embossed steel. Hot-Dip galvanized to prevent corrosion. Unique design of lower bracket gives extra strength and rigidity. Extended lip supports mast during installation. 48" spread permits generous spacing between brackets for excellent mechanical mast support. Both 3" embossed steel upper bracket and lower bracket have new "reverse" U bolt and clamp feature for Spintite fastening.

Also available with 60" spreads: EM-60.

SOUTH RIVER pioneer & outstanding producer of finest line of antenna mounts
METAL PRODUCTS CO., INC.
South River, New Jersey

RADIO AND TV
SERVICEMEN

Here's the perfect companion
to any tester!

Model GCT-8
**GRID
CIRCUIT
TUBE
TESTER**

(U.S. Pat. No. 2,784,372)



Quickly spots grid errors and leakage

Here's the perfect accessory for every serviceman! Checks critical "Control-Grid" condition of vacuum tubes faster, more accurately than any other tester! As many as eleven simultaneous checks—automatically! Stops guessing, substitution checking, and costly re-checks. Electron-eye tube indicates following faults at a glance: Control Grid Emission Excl., Grid-to-Cathode Shorts, Gaseous Condition, Cathode-to-Heater Shorts, Grid-to-Heater Shorts, Grid-to-Plate Shorts, Plate-to-Heater Shorts, Grid-to-Screen Shorts, Screen-to-Heater Shorts, Heater-to-Suppressor Shorts, Grid-to-Suppressor Shorts.

Truly portable—may be stored and carried anywhere. Complete, easy-to-assemble kit

\$19.95

net
Wired and factory tested.. **\$29.95** net



Write today for free literature
MANUFACTURING CO.
5015 Penn Ave. So., Mpls., Minn.

Tough Dogs

(AGC. Continued from pg. 31)

from 20-30 volts, the set behaved normally. See diagram. This led to the conclusion that all was well in the front end and i-f sections.

This gimmick or bias box can be used to show if the tube is operating properly. Connect the battery between the grid and cathode of the 12AU7, and adjust the pot so that -10 volts appears on the grid with respect to the cathode. Once again, the set worked normally.

The voltages at the cathode, as measured with a VTVM, was 110 volts and the grid 90 volts; but the agc control, a 500,000 ohm potentiometer between the 275-volt and the 125-volt lines, had little or no effect. What should have been 125 volts was found to be 145 volts. This voltage is produced, in part, from the drop across the 12L6 audio amplifier output tube. This tube checked good—in fact, it checked too good. With an emission tester, the tube showed no reason to be replaced. A GM tester, however, showed this tube to have about 25% more gain than a new tube. Replacing the 12L6 with one from stock proved that with a proper GM figure the 125 volts was restored, so was the agc, and so was the set.

Here's another proof that troubles in a TV set are not always associated with the circuit acting abnormally.—*Charles R. Maduell, Jr., New Orleans, La.*

Too Many Rejects

(Continued from page 31)

and because all components were already checked, it was decided to further check the phasing aspects. By reversing the leads of the primary windings on either transformer, the trouble was eliminated.

Apparently during the first service call a check was made of the transformer and the primary windings were inadvertently reversed. When dealing with a phase-shifting network involving two transformers, it is necessary to place all transformer leads in their proper place.—*Donald Jones, Brookfield, Illinois.*

WIN \$10.00!

ELECTRONIC TECHNICIAN will pay \$10.00 for acceptable Tough Dogs. Unacceptable items will be returned. A rough sketch will do. Send to "Tough Dog" Editor, ELECTRONIC TECHNICIAN, 480 Lexington Ave., N. Y. 17, N. Y.



Ridiculous, you say.
Delay can't kill anyone.
It isn't a disease.

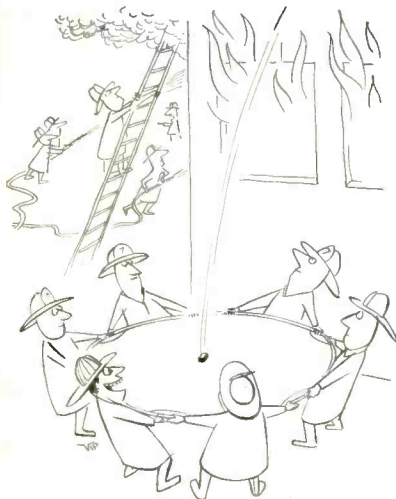
Yet last year, of the 250,000 Americans who were cancer's victims, 75,000 died needlessly. 75,000!... the populations of cities like Charleston, Santa Monica, or Racine. They might have been saved... but they put off seeing their doctors until it was too late. Their story is told in our dramatic film "The Other City"... a film which can save thousands of lives. Perhaps your own.

It teaches you the seven danger signals by which early cancer often reveals itself, and emphasizes your need for an annual health checkup as your best insurance against cancer.

"The Other City" is available, without charge, for showing at your church, your club, your community center, plant or office.

To arrange to see this and other life-saving films, made possible by your contributions, call the Unit of the American Cancer Society in your community or write to "Cancer" in care of your local post office.

**AMERICAN
CANCER
SOCIETY**



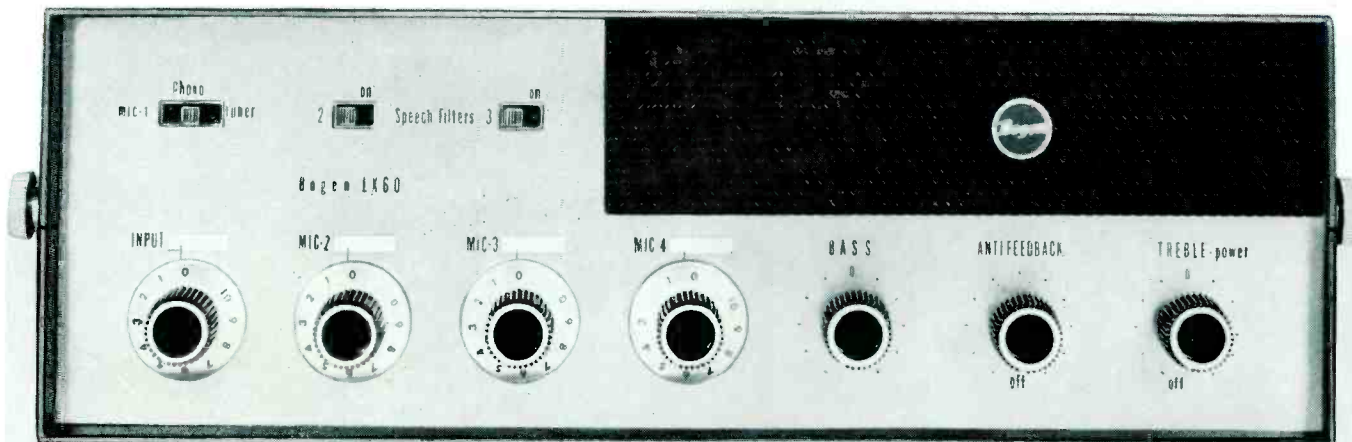
"It's a JENSEN NEEDLE"

portable . . . or permanent



BOGEN FLEX-PAK®

MAKES EVERY PA JOB AN EASY ONE



pre-engineered to serve 90% of your sound installations



Deluxe LX30 30-Watt Amplifier

4 Microphone Inputs (panel switch converts one microphone channel for phono or tuner); Built-In Remote Gain-Control Circuit; Exclusive Anti-Feedback Control; Speech Filters; Separate Bass and Treble Tone Controls.

H. 5 3/4", W. 16 1/4", D. 13". Wgt.: 25 lbs.



Superb LX30 30-Watt Amplifier

3 Microphone Inputs (panel switch converts one microphone channel for phono or tuner); Speech Filters; Separate Bass and Treble Tone Controls.

H. 5 3/4", W. 14 1/4", D. 13". Wgt.: 24 lbs.

BOGEN'S FLEX-PAK LINE has the flexibility you need to meet virtually every PA installation problem. Flex-Pak units are light, compact, portable, and can be used separately or grouped together. The amplifiers are available in every popular price range and power output . . . 13 models in all. That's why, with Flex-Pak, you can tailor the sound system to fit the job, with none of the fuss and bother of custom installations.

And remember—you can look to Bogen for *all* your sound equipment needs . . . speakers, microphones, turntables, tuners, and accessories. See your Bogen distributor today.

EASY SERVICE . . . EASY INSTALLATION



Loosen 4 thumbscrews and the lid's off for fast, easy servicing.



Folds back when not in use in easy-sliding wall-mount bracket.



4 thumbscrews attach accessory record player mount.



Easily erased write-in's on gain controls mark level settings.

Bogen EVERYTHING IN SOUND

A Division of The Siegler Corporation

David Bogen Company, Paramus, N. J., Dept. P-3
Gentlemen: Please send me descriptive catalog on your BOGEN FLEX-PAK Public Address Equipment and 24-page, illustrated brochure, "What You Should Know About Sound Systems."

NAME _____

FIRM _____
Check one dealer distributor sound specialist

CITY _____ ZONE _____ STATE _____

MAIL COUPON TODAY

You're in the spotlight for the
BIGGEST SHOW
OF ALL TIME!

RCA offers every TV service-dealer a "front-row-center" ticket to a service-selling program! You are the "star" in this big performance:

☆ National Television Servicemen's Week—
 and you can win valuable prizes in the exciting
 RCA "Mystery Shopper" contest!



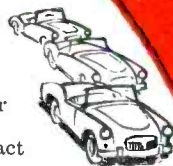
4th Annual NTSW
March 24-29, 1958!

"National Television Servicemen's Week"—
 "showing" for the 4th
 consecutive year in national
 magazines such as Life and TV
 Guide, television and radio
 commercials, nation-wide
 publicity... local newspaper
 advertising and special attention-
 getting displays and promotion
 kits—gives you the "star" billing.



Valuable Prizes Offered!

See the "RCA MYSTERY-SHOPPER CONTEST" ad appearing in other trade magazines this month. You can win one of 192 big awards. Every service-dealer who enters receives a gift, just for entering. Contact your RCA tube distributor for full details.



Attention Getters! Traffic Stoppers!
Business Builders!

A dazzling "cast" of NTSW stickers, streamers, cards, displays, premiums, mailers, broadsides, signs of all kinds—all available through your **RCA TUBE DISTRIBUTOR**. See him now!



Never before in the history of the TV service-industry has there been such a tremendous "cast" of featured "players" to back up a "star" performer—you, the *independent TV service-dealer*.

Yes, RCA is putting you in the spotlight to help you • gain greater public recognition than ever before • build customer good-will • promote your skill and experience • merchandise your sales and service business.

Take a bow! You're the "star"! Contact your **RCA TUBE DISTRIBUTOR** now for full details!



RADIO CORPORATION OF AMERICA

Electron Tube Division

Harrison, N. J.