

ELECTRONIC TECHNICIAN

Now Including
SERVICE
Magazine

A. J. DIGLIO
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HAMDEN 18 CONN
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RADAR SPEED CONTROL



50¢

March • 1959

ELECTRONIC TECHNICIAN

Now Including
SERVICE
Magazine

World's Largest Electronic Trade Circulation

March, 1959

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ELECTRONIC TECHNICIAN • March, 1959

FRONT COVER

Increasing numbers of police patrols are using radar speed control units to monitor highway traffic. This is expected to open additional maintenance opportunities for electronic technicians. See article starting on page 34.

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CIRCUIT DIGESTS

ALIGNMENT

1. Turn tuner channel on
2. Connect sweep generator shortest and most direct
3. Apply -3 volts bias to
4. Connect a detector and
5. Adjust mixer plate coil
6. Remove detector and
7. Connect oscilloscope
8. Adjust remaining trim

accomplish this in 15 min.

PARTS LIST

- C-101 - 100K 100V 100V ceramic
- C-102 - 100K 100V 100V ceramic
- C-103 - 100K 100V 100V ceramic
- C-104 - 100K 100V 100V ceramic
- C-105 - 100K 100V 100V ceramic
- C-106 - 100K 100V 100V ceramic
- C-107 - 100K 100V 100V ceramic
- C-108 - 100K 100V 100V ceramic
- C-109 - 100K 100V 100V ceramic
- C-110 - 100K 100V 100V ceramic

WHEN CUSTOMERS ASK—IS

RCA provides you

ALL-NEW

RCA Silverama®

SILVERAMA is RCA's premium picture tube—that means *tops* in the industry! Manufactured with all-new glass and parts, it's the finest picture tube made—for the customer who prefers and *expects* the very best.

Command premium price and profits! Sell RCA SILVERAMA with *assurance* that you are delivering a completely all-new picture tube.



A CHOICE OF RCA PICTURE TUBES TO MEET THE DEMAND OF TWO MARKETS

If your customers want the best that money can buy, offer them RCA SILVERAMA...the picture tube that's ALL-NEW through and through. If they want the economy of a rebuilt tube, offer them RCA MONOGRAM...there's no other way, you provide the RCA price for your opportunity for you and selling picture tubes.

FROM YOUR AUTHORIZED RCA DISTRIBUTOR TODAY

IT NEW OR REBUILT?

with a positive answer!

FACTORY-REBUILT

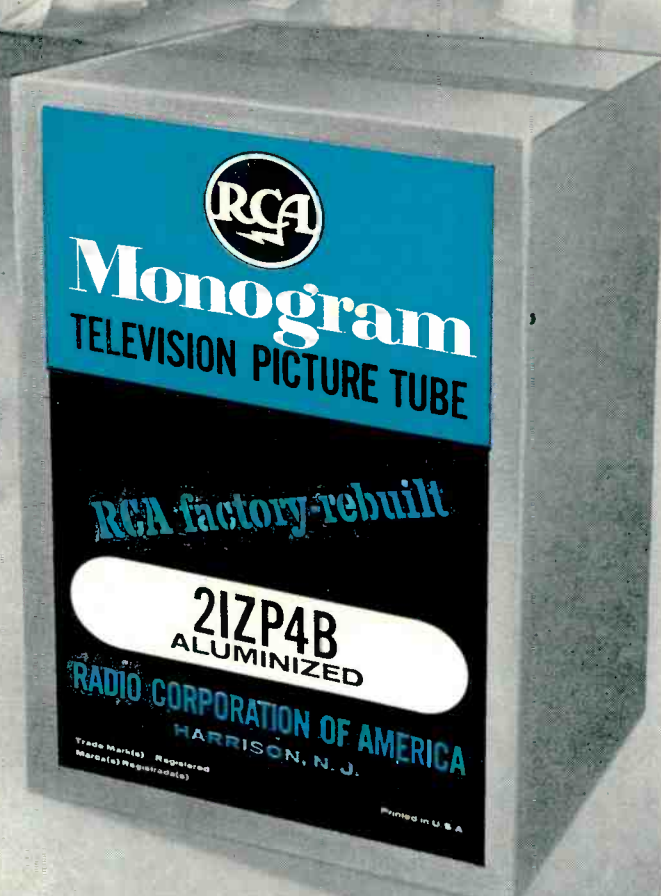
RCA Monogram

RCA MONOGRAM...no finer rebuilt picture tube made. Factory-rebuilt by RCA to quality standards, this tube assures dependable performance and fewer call-backs. It is backed by a brand name *you sell* with confidence—a brand name your customers *buy* with confidence.

Yes, top rebuilt quality at economy prices makes RCA MONOGRAM your best buy for picture tube replacements where price is the primary consideration.

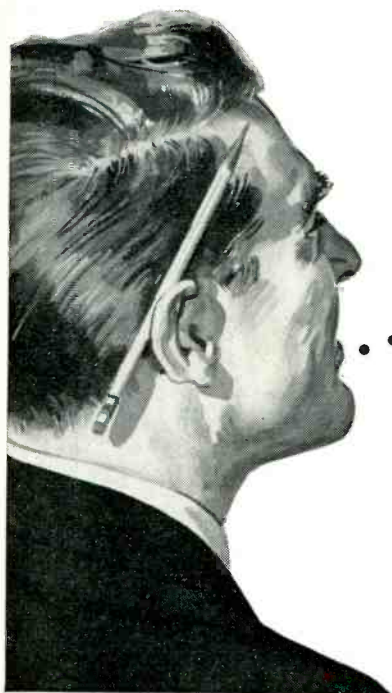
**BACKED BY THE GREATEST
PRE-SELLING CAMPAIGN
IN PICTURE TUBE HISTORY!**

To make sure your customers know the *full story*...and all the advantages of using either RCA SILVERAMA or RCA MONOGRAM for replacement in their TV set, there's a big, big advertising program scheduled by RCA. Hard-hitting ads that pre-sell for *you* are appearing in LIFE, SATURDAY EVENING POST and TV GUIDE. You'll see hard-selling commercials on top TV shows. You'll hear regularly-scheduled radio commercials. And your RCA distributor can supply you with everything you need...from window displays to your own ad mats.

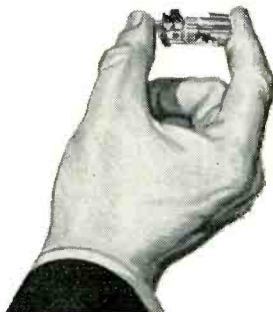


RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

"What do you mean I can take the first step toward stereo at no extra cost?"



"Easy. This Sonotone Stereo Cartridge plays your regular records now...plays stereo when you convert later on."



Sonotone Stereo Cartridges

give brilliant performance on *both* stereo and regular discs...and cost the same as regular cartridges.

Specify Sonotone...here's why you'll hear the difference:

1. Extremely high compliance...also means good tracking, longer record life.
2. Amazingly clean wide-range frequency response.
3. First-quality jewel styli tips—correctly cut and optically ground for minimum record wear.
4. Rumble suppressor greatly reduces vertical turntable noise.

Prices start at \$6.45 (including mounting brackets).

Get details on converting to stereo. Send for free booklet: "Stereo Simplified," Sonotone Corp., Dept. CT-39, Elmsford, N. Y.

Sonotone[®]

Electronic Applications Division, Dept. CT-39

ELMSFORD, NEW YORK

In Canada, contact Atlas Radio Corp., Ltd., Toronto

Leading makers of fine ceramic cartridges, speakers, microphones, tape heads, electron tubes.

Editor's Memo



Thank goodness we live in a country where the citizens have the right to criticize their government legislators and officials—without visiting Siberia as a result of sounding off.

I'm going to take advantage of this freedom to call some Congressmen to account for high pressure tactics in support of people violating the law.

As we know, the Communications Act authorizes the Federal Communications Commission to set up and enforce regulations for the orderly use of the air waves. With an eye toward extending TV broadcast service in low population areas of such states as Montana and Nevada, FCC established rules for operating UHF translators. These translators would pick up VHF broadcasts, and re-broadcast them in their areas at UHF.

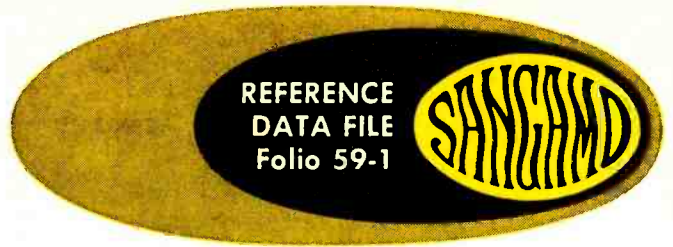
Economically, it was more practical to use VHF boosters to do the job instead of UHF translators... and many boosters sprang up despite the fact that they would have to operate on frequencies not assigned to them. Such violation of the law could have disastrous results. One plane followed a spurious radio beacon transmitted by an improperly functioning booster.

To carry out its duty, after several years of study, FCC ordered the illegal boosters off the air by March 30, 1959. We believe as the FCC does that spreading TV broadcast coverage is desirable, but it must be done in a legal, orderly fashion.

So what did some Congressmen from booster-populated states do? They started to apply the screws to FCC. Unless FCC reversed its decision, one influential senator threatened to "investigate." Other legislators insisted FCC should waive the rules. Still others wanted to legalize the illegal boosters. In effect, Congressmen who had justifiably taken some FCC commissioners to task a short while ago for being influenced by industry had themselves become lobbyists for illegal booster operators.

A clear-cut solution is needed. FCC has been undecisive because of their sensitivity to Congressional comments. Further delay will not make matters better. On the contrary, compromises with illegality will act like the dog owner who had to dock his hound's tail. He pitied the poor beast so much that he decided to cut off only a half inch at a time.

Al Foman



a continuing series on technical topics of specific interest to engineers

What is the true value of high purity aluminum foil in electrolytic capacitors?

Since the word "purity" is relative, the term "high purity" in describing the foil used in electrolytic capacitors has been often misused. Twenty years ago, 99.80% aluminum was the highest purity commercially available. A few years later, 99.85% aluminum anodes became available and for a period of time were considered "high purity" foil.

Today, 99.99% aluminum is readily available for applications where the cost differential between 99.99% and standard purity anodes is justifiable. In some technical circles, purities of 99.85% to 99.87% aluminum are still referred to as "high purity". At Sangamo Electric Company high purity means 99.99% aluminum or better anode foil.

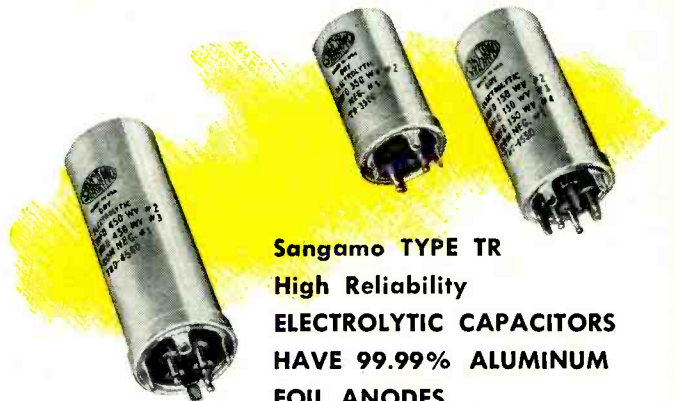
From the engineer's viewpoint, the advantage of 99.99% aluminum over 99.87% aluminum in electrolytic capacitors is both tangible and intangible. Most of the benefits are derived from the fact that there are fewer crystals of metal impurities on the surface of the higher purity foil. Crystal impurities such as iron do not form an insulating dielectric oxide and produce points of high electrical leakage. In a circuit, where capacitors of lower anode aluminum purity are used, voltages are set up between the dissimilar metals and deformation, or point corrosions, slowly takes place. This action decreases the shelf life of the capacitor.

Other benefits provided from the use of 99.99% aluminum foil include longer life, better high temperature operation and lower dissipation factor. When variable factors are equal, the summary advantages of 99.99% anodes versus 99.87% anodes can be shown as follows:

	99.87% Anodes	99.99% Anodes
DC leakage	Per Mil-C-62A or EIA-RS-154	EIA-TR-140 or about 1/2 leakage for 99.87% anodes
Shelf life	2 years	2 1/2—3 years
Estimated life expectancy	4—7 years	7—12 years

Where extremely low leakage is important, where temperature of operation is between 65°C and 85°C, or where exceptional long life is required and something better than standard electrolytic capacitors is desired, 99.99% aluminum anodes are well worth the additional cost.

Capacitor manufacturers, like Sangamo, pay a premium of approximately 60% more for 99.99% aluminum foil. To obtain this near-perfect purity, the aluminum ingots used to produce 99.99% anodes must be reprocessed from a good supply of bauxite and a well run electro-chemical process.



**Sangamo TYPE TR
High Reliability
ELECTROLYTIC CAPACITORS
HAVE 99.99% ALUMINUM
FOIL ANODES**

The use of 99.99% high purity aluminum anodes in Sangamo Type TR Twist-Tab Electrolytics, surgically clean papers, and a highly effective end seal gives these capacitors excellent operating life and superior electrical characteristics. They are designed to operate in a temperature range from -20°C to 85°C and are available in ratings from 3 to 450 volts D.C.

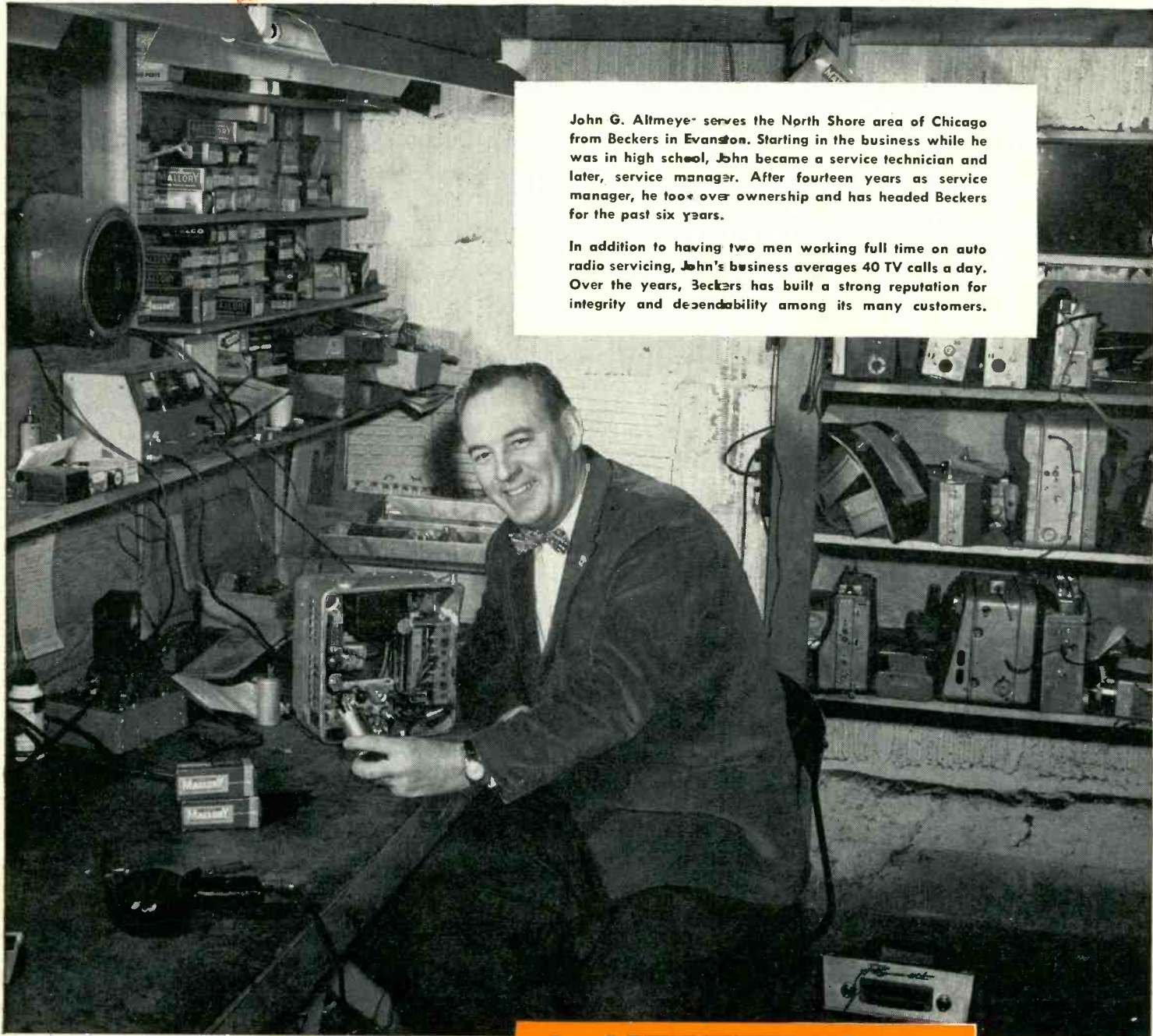
Engineering Catalog Number 2227 gives full information and is available upon request for your files.

SC59-1

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

Dealer JOHN G. ALTMeyer Says...

"Mallory Components are Best



John G. Altmeyer serves the North Shore area of Chicago from Beckers in Evanston. Starting in the business while he was in high school, John became a service technician and later, service manager. After fourteen years as service manager, he took over ownership and has headed Beckers for the past six years.

In addition to having two men working full time on auto radio servicing, John's business averages 40 TV calls a day. Over the years, Beckers has built a strong reputation for integrity and dependability among its many customers.

P. R. MALLORY & CO. Inc.
MALLORY

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

for Modern Equipment 'Trouble Spots'”

“Modern car radios—for example—need quiet vibrators . . . that’s why we replace with Mallory.

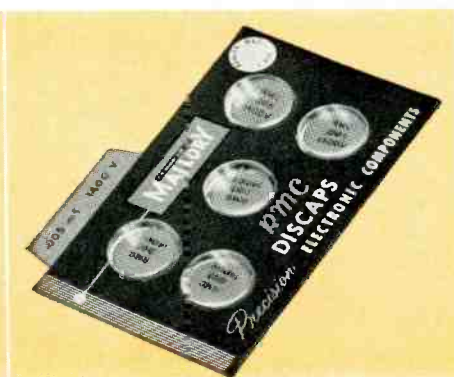
Today’s automobiles are engineered for a quieter, more pleasurable ride. A noisy vibrator in a car radio stands out immediately. Our servicemen use Mallory Vibrators for all replacements. We’ve found that they’re quieter and more dependable. The Mallory buttonless contact design adds to their longer, trouble-free life.”

Whatever component you need for servicing—capacitors, controls, resistors, silicon rectifiers or batteries—you get the highest quality at sensible prices from Mallory. It’s the widest line of parts in the industry . . . and every model is service-engineered to assure you that each job is right the first time, every time.

Stop Callbacks with These Quality Mallory Products...



Gems—5 rugged, moistureproof, Mallory “Gem” tubular capacitors in an easy-to-use dispenser that keeps your stock fresh and clean—easy to find—no more kinks in lead wires. They’re your best bet for outstanding service in buffer, bypass or coupling applications.

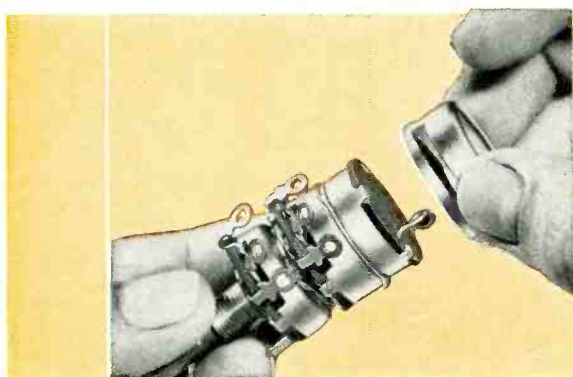


RMC Discaps®—are a product of the world’s largest producer of ceramic disc capacitors. Long the original equipment standard, Mallory RMC Discaps are now available for replacement. They come in a handy 3” x 5” file card package . . . easy to stock, simple to use.

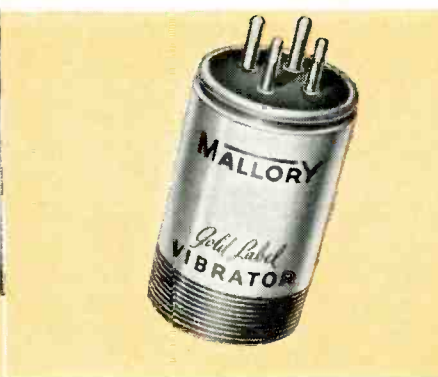
®Trade Mark of Radio Materials Company, a division of P. R. Mallory & Co. Inc.



FP Electrolytics—The Mallory FP—the original 85°C capacitor—now has improved shock-resistant construction and leakproof seal. Its etched cathode construction—standard in all FP’s—assures hum-free performance. High ripple current ratings fit the toughest filter circuits.

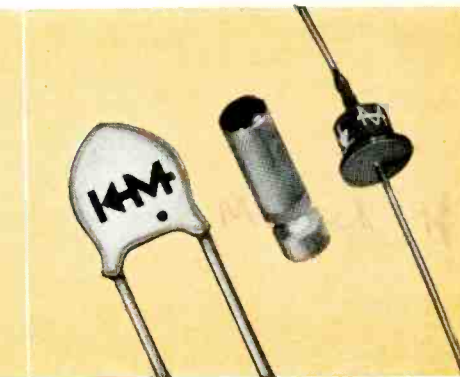


Sta-Loc* Controls—New Sta-Loc design enables your distributor to custom build, in just 30 seconds, over 38,000 combinations—eliminates waiting for out-of-stock controls. You can replace the line switch by itself, without unsoldering control connections.



Gold Label* Vibrators—On critical auto radio servicing, use the Mallory Gold Label Vibrator. It gives longer, trouble-free service life. Mallory Gold Label Vibrators feature Mallory exclusive buttonless contact design.

*Trade Mark



Silicon Rectifiers—New Mallory design gives far longer life, lower forward voltage drop, and reverse leakage current than conventional types . . . exceed the requirements of military humidity tests. In convenient kits for replacement of selenium rectifiers in radio and TV.



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the
BEST
in
SERVICE

USE AEROVOX CERAMIC CAPACITORS!

If you're particular about your service... be particular about the capacitors you use. Aerovox offers you a complete line of rugged, dependable and versatile ceramic capacitors in every case style for every replacement application. Choose from a wide selection of disk types in bypass-coupling, general purpose, hi-voltage and temperature compensating. Three tubular types are available from general purpose to temperature compensating to hi-voltage units. For those special applications you have cartwheels, standoffs and feedthrus in all sizes and values. Your local Aerovox Distributor is your one-stop source of supply. Call on him today for any and all your capacitor needs. Ask him for your personal copy of the latest Aerovox Servicemen's Catalog.

BUY 'EM BY THE KIT...
two disk ceramic kits (AK-200 and AK-201HS) of popular replacement types in special 3 x 5 metal file drawers now available at your Aerovox Distributor. Pay for only the capacitors and get the file cabinet FREE.

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DISTRIBUTOR DIVISION

NEW BEDFORD, MASSACHUSETTS

LETTERS To the Editor

Tough Dog Correction

Editor, **ELECTRONIC TECHNICIAN**:

On page 37 of the January 1959 issue, Mr. Samodell explained his dynamic voltage divider "Tough Dog" quite thoroughly, with two exceptions. One, in the fifth paragraph he states that the plate and screen voltages on the 6W6 were normal; then he says they were greater than normal. Second, according to the schematic diagram—which any professional technician could spot—the screen is not connected to the B+ circuit, and also the suppressor is connected to the 30 μ f side of the output transformer. Another thing, how do you explain the 330 v that is printed under the ground symbol of the 680 ohm resistor?

PAUL J. ROSA

Stamford, Conn.

• The ground symbol was accidentally used instead of a ball to indicate a 330-v B+ point. The 150-v point should have been connected to the 6W6 screen. The excessive voltage drop does occur, but it's across the 6W6 external circuit, not the tube itself. It's possible to obtain normal voltage readings, even though voltage distribution is abnormal—which has the makings of a Tough Dog.—Ed.

Radar Reader

Editor, **ELECTRONIC TECHNICIAN**:

Our company has always tried to keep up with the latest electronic advances, so we are investigating the principles embodied in radar speed analyzers used by police patrol vehicles. Some of the manufacturers are reluctant to supply information. Could **ELECTRONIC TECHNICIAN** look into this?

WILLIAM R. BURGESS

Bill's Radio & TV Service
Cedar Falls, Iowa

• No sooner said than done. See article starting on page 34.—Ed.

Vertical Tracking Angle

Editor, **ELECTRONIC TECHNICIAN**:

Proper vertical tracking angle in stereo disc reproduction is so important that I thought a brief account of this neglected subject would be interesting. Distortion caused by tracking angle error on lateral-cut records is an old story. When a stereo master disc is cut,

(Continued on page 10)

Silicon Rectifier... **1N2078**

NEW Tung-Sol 1N2078 designed and made for simple, speedy TV replacement!

Tung-Sol's new 1N2078 diffused junction silicon rectifier possesses distinct advantages the service industry will welcome. Optimum physical and electrical characteristics combine to make 1N2078 convenient to handle and install, and assure your TV and radio service customers the high-grade performance they want and appreciate.

Small size, easy to install. Tung-Sol's 1N2078 is smaller than most semiconductor devices, at no sacrifice in efficiency. Long

flexible leads can be quickly soldered to existing connections with no additional hardware. This is especially suited to printed circuitry.

Long life. Negligible voltage drop that remains stable over lengthy operation promotes long life. 1N2078 virtually unaffected by high current surges . . . maintains high B+ over full-length operation.

Special Insulated case. Special case insulates against chassis shorts to further ease replacement. Also, 1N2078 dissipates its own heat . . . needs no heat sink . . . yet never requires derating. Only leads get hot.

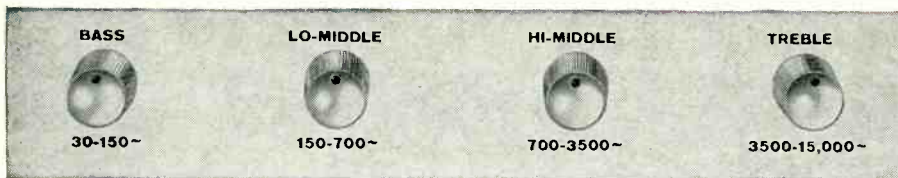
You can replace any other device and, in some cases, rectifier tubes, with the new, high-quality Tung-Sol 1N2078. For complete information . . . to stock up, contact your distributor or: Tung-Sol Electric Inc., Newark 4, New Jersey.

1N2078 Maximum ratings (100°C) capacitive load:

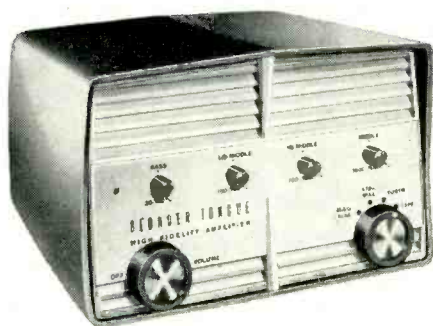
(Similar types available with Peak Inverse Voltages ranging from 60 up to 500)

Peak Inverse Voltage	400 Volts
Continuous D. C. Reverse Working Voltage . . .	400 Volts
Average D. C. Output Current	500 mAdc
Peak Recurrent Forward Current	5 Amps.
½ Cycle Surge Current	30 Amps.
Full Load Voltage Drop @ 25°C	1.1 Volts
RMS Input Voltage	130 Volts
Minimum Series Resistance (for capacitive filter)	5 ohms, 10 watt





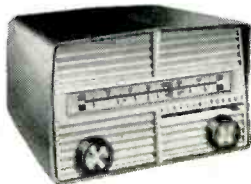
this exclusive
B-T
 LABS feature spells
 hi-fi profits for you



NEW BLONDER-TONGUE MODEL A-1 HIGH FIDELITY AMPLIFIER

A unique B-T development — a deluxe audio amplifier with 4 separate tone controls, provides unlimited control of frequency response. These controls divide the audible spectrum into its four significant segments (BASS, LO-MIDDLE, HI-MIDDLE, TREBLE) and permit the user to boost or attenuate any frequency ranges, tune out feedback and improve speaker and equipment performance. The result — a degree of tonal selectivity unobtainable anywhere . . . at any price in the hi-fi amplifier field. The A-1 also offers full function selectivity, uniform frequency response within ½ db. from 30-15,000 cps, harmonic distortion below 1% at 10 watts. The exclusive control feature is just one reason why the A-1 and other B-T high fidelity components will rack up big sales for you during 1959. List 77.50

**YOU CAN SELL A COMPLETE B-T SYSTEM — FM-AM TUNER,
 TWIN SPEAKERS & A-1 AMPLIFIER — FOR LESS THAN \$160**



Model T-88 DELUXE FM-AM TUNER — Amazing sensitivity on FM and AM. Frequency response 20-20,000 cps; built-in FM and AM antennas, with provision for external FM antenna. Accurate, stable, slide-rule tuning. List 64.50

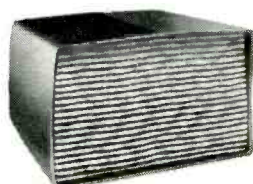
**FOR YOUR CUSTOMERS WHO PREFER
 A DELUXE FM-AM RADIO**

Model R-98 — Complete FM-AM radio with unexcelled quality on both FM and AM in even the most difficult reception areas. List 64.50

Get details on the powerful two-step sales plan at your B-T hi-fi distributor, or write Dept. ET-3



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 hi-fi components • UHF converters • master TV systems • industrial TV cameras • FM-AM radios



Model SS-2 TWIN SPEAKER SYSTEM — Two carefully matched 4" speakers with overlapping frequency ranges in an acoustically matched enclosure. Ideal multiple speaker system for stereo. 16 ohm impedance 15.95

Tuner, amplifier and speaker are styled in matched two-tone grey and white cabinets. They occupy 30" of display space and can be carried along on service calls for home demonstration.

(Letters, Continued from page 8)

the vertical components of the cutting stylus motion are close to straight up and down. If the vertical motion of the playback stylus is along some different line, distortion will be introduced exactly as it is by lateral tracking angle error. We have examined other cartridge makes in which there was an angle of 30, even 45 degrees between the record surface and the line from stylus tip to effective pivot of the stylus assembly. This seems to us a serious retrogression in pickup design, measured against the 3 or 4 degrees long considered the maximum lateral tracking angle error for top-quality reproduction. A series of record wear tests just completed in our Quality Control Dept. have demonstrated that a substantial vertical tracking angle, in addition to adding distortion, also heavily increases record wear. Evidently the forward and back motion that occurs when an angled stylus is forced up and down by the record is destructive to the stereo disc groove.

WALTER O. STANTON
 President

Pickering and Co.
 Plainview, N. Y.

A Technician Taken to Task

Editor, ELECTRONIC TECHNICIAN:

After reading the January "Letters to the Editor," I can't help but feel sorry for Mr. C. B. Ward ["Anyone who has the privilege to watch me . . . will know me to be the genius I am."] He is not a technician, or he would realize that he has only reached the point which eventually comes to technicians. That is, he thinks that he is better than anybody in electronics. My experience has been over the past 37 years that the technician who reaches this point needs to take stock of himself. He is really doing himself and his fellow service men an injustice by his thinking. Perhaps Mr. Ward will realize that his letter was written in haste. Thank you for a first rate magazine, and for your fight for the rights of electronic technicians.

GUY BROOKS

Brooks Radio-TV Service
 Gadsden, Ala.

Radiation Article

Editor, ELECTRONIC TECHNICIAN:

This much belated comment on your radiation article in the Sept. 1958 issue was caused by an addressing mixup. However, better late than never. I do want you to know that I think the piece was top notch in every respect. The background material and specific information have much value for anyone who works with cathode ray devices.

JAMES E. WEDDLE

Home Electronics Service Co.
 Maysville, Ky.

(Continued on page 13)

USE **ZENITH**

QUALITY CIRCUIT TUBES FOR
Maximum Performance

AND

Zenith Dependability

*Zenith's quality reputation
with your customers is an asset to you when you
use Zenith parts to service Zenith TV*

HERE'S WHY:

At Zenith, *quality* is the keynote . . . in circuit tubes, this means uniform, long-life performance!

To insure the highest standard of performance, Zenith circuit tubes are tested under all operating conditions, using the most modern laboratory equipment and techniques.

Rigid manufacturing specifications, production quality controls and performance tests *insure* dependability and customer satisfaction. That's why you should—

**USE ZENITH QUALITY CIRCUIT TUBES
FOR ALL YOUR SERVICE WORK**

SEE YOUR ZENITH DISTRIBUTOR

You can safely guarantee
Zenith repairs when you
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**Buy circuit tubes
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(Letters, Continued from page 10)

Report from Miami

Editor, ELECTRONIC TECHNICIAN:

Most of the editorials and comments on TV business practices sound like college professors touching the subject with a ten foot pole. Some situations may not prevail in New York, but they appear to be widespread. In the Miami area, there are large numbers of retired people trying their hand in small businesses for the first time. Hence, there are a large number of failures or reselling. Secondly, those service shops which try to become too big on just radio-TV sales and service alone, do not last after a few slack summer seasons. Those who stay in business and make money are actually in the part-time radio-TV service business, although they keep a shop open eight hours a day. The more successful radio-TV men operate a multi-business such as hardware-TV, gas station-radio, grocery store & radio-TV service, etc. Most of them are butchers when it comes to service. Big multi-business outfits simply swap one chassis for another if the set is still in warranty. After 25 to 50 chassis pile up, they take them to a skilled technician in a small shop. They advertise as experts, but are actually part time. Behind some of the business evils are the manufacturers. Some of the dog designs show little engineering skills. For instance, high heat tubes are placed along the bottom of portable vertical chassis. The technician facing the public has to take the blame for cheap assembly.

J. PERKINSON, JR.

Miami, Fla.

TV Projector

Editor, ELECTRONIC TECHNICIAN:

You have a picture of a compact TV projector on page 30 of your January 1959 issue. I have never heard of the manufacturer, Giant View. What is their address?

AL ANDERL

Salt Lake City, Utah

. . . I would like further information on the TV projector.

GORDON OLINGER

Polar TV Service
Chicago, Ill.

. . . Price and layout information on the projector.

B. G. WILMER

Radio TV Laboratories
San Francisco, Calif.

• For more information, contact Giant View Electronics, Div. of Meilink Steel Safe Co., 901 Livernois, Ferndale 20, Mich.—Ed.



The Greater Vibrator

Radiart Vibrators are unaffected by bounce, jounce, heat, cold, moisture. There's a replacement type for every 6- and 12-volt application. Ask your Radiart Distributor for a free Radiart Vibrator Replacement Guide or write The Radiart Corporation, 2900 Columbia Avenue, Indianapolis 5, Indiana.



RADIART TOBE Vibrators

G-C CEMENT SAMPLER KIT
Contains 14 different cements for every application.
No. 345..... List \$9.95



G-C ELECTRONIC OIL KIT
Complete assortment of 6 special oils in vial dispensers.
No. 9400
List \$3.50



G-C KLIPZON CRYSTAL PROD
Completely insulated prop snaps on and holds.
No. 5638—Red..... List \$3.06
No. 5639—Black..... List \$3.06



G-C DIAL CABLE
Nylon with fiberglass core treated to prevent slipping and stretching.



G-C AMO MINIATURE TUBE PULLER
A tube puller that prevents burnt fingers and tube breakage.
No. 5093—7-Pin Tubes..... List \$1.80
No. 8106—9-Pin Tubes..... \$1.80



G-C UNIVERSAL TYPE TEST LEADS
Interchangeable tips and 50" leads. Complete set of tips.
No. 8463..... List \$3.00

G-C SPRA-KLEEN
Spray away radio-TV control noises.
6 oz. can.
No. 8666..... List \$1.20



G-C MASTER PRINTED CIRCUIT KIT
Everything for printed circuit repairs, plus instructions.
No. 683
List \$13.25



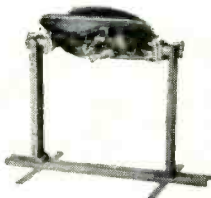
G-C TOP 12 TV ALIGNMENT TOOL KIT
Contains 12 basic tools in plastic fitted container.
No. 5040..... List \$10.95



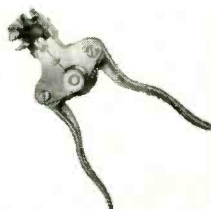
G-C TINNEMAN NUT REMOVER
Removes large or small Tinnermans with simple twist.
No. 9355..... List \$1.47



G-C PHONO TURNABLE STAND
The easy way to make repairs on all turntable sizes and types.
No. 5212
List \$12.50



G-C SPEED-O-MATIC WIRE STRIPPER
No wire crushing with this handy tool. 12 models for all wire sizes.
No. 766 (A to N)
List \$9.50



EVERYTHING UNDER THE SUN!



Electronic Products

The newest and latest items, as well as those you need year after year... the best you can find, as well as the most economically priced—that's what you get in the big G-C ELECTRONIC PRODUCTS line. Your favorite jobber has them. Always look for G-C... the sign of Good-Components!

WRITE TODAY!

for your FREE G-C Catalog. Send postcard.

GENERAL CEMENT MFG. CO.

division of G-C Textron Inc.

Western Plant: Los Angeles 18, Calif.
Main Plant: ROCKFORD, ILLINOIS, U.S.A.

G-C RADIO-TV SERVICE CEMENT
For all kinds of repairs. 2-oz. bottle, brush in cap.
No. 30-2..... List \$0.75



G-C Z-5 SILICONE COMPOUND
Transfers heat from transistors to chassis, prevents damage.
No. 8101..... List \$2.25



G-C DE-OX-ID
Efficient electrical contact cleaner in 6-oz. spray can.
No. 19-6..... List \$3.50



G-C FLEX-SOL SPRAY-CAN EXTENSION
Fits all spray cans, puts spray where you want it.
No. 9344..... List \$1.49



G-C ZERO MIST CIRCUIT COOLER
Circuits cooled instantly. Intermittent components isolated.
No. 8667..... List \$2.17



G-C MINIATURE TUBE PIN STRAIGHTENERS
Precision-constructed steel dies in 2 sizes.
No. 5191 (for 7-pin tubes)..... List \$1.25
No. 8105 (for 9-pin tubes)..... List \$1.25



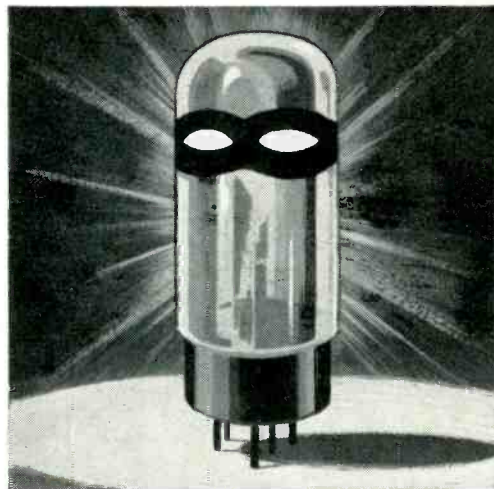
WANTED

DEAD OR ALIVE

This tube is dangerous. He is used and worn. He will burn up your customers.

He could, if you gave him a chance, steal your business from you.

He has been cited as subversive by the entire Electronics Industry.



He has wrecked profits and held up business.

He is unwanted by consumers everywhere.

Your Philco Distributor has been deputized to smash him on sight.

He will go out in a set like a thief in the night.

"TUBE" COUNTERFEITS

5¢ REWARD



You will receive 5c credit toward new Philco receiving tubes for all worn-out tubes you bring in. We'll smash 'em right before your eyes. Join with Philco to smash the racketeers.

SEE YOUR
PHILCO® Distributor

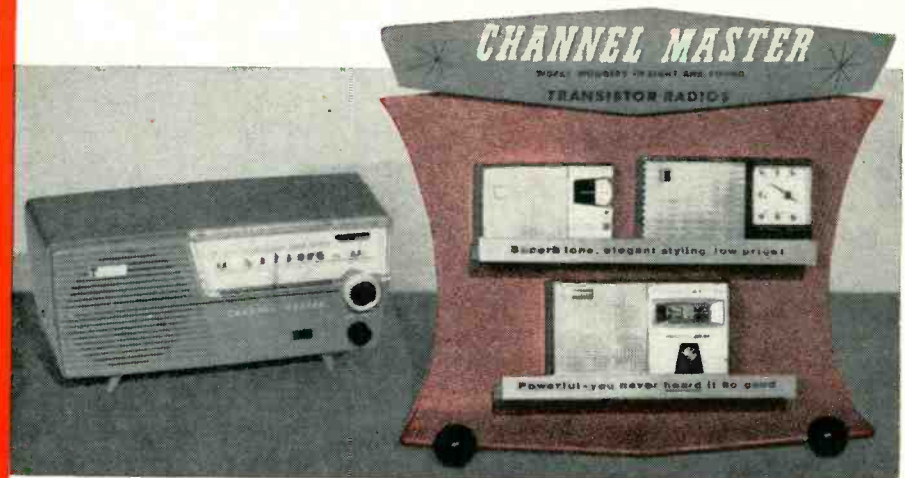
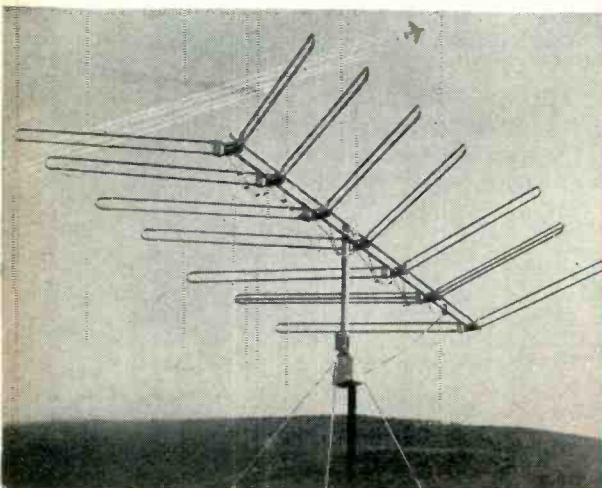


get this great new
TRANSISTOR RADIO DISPLAY

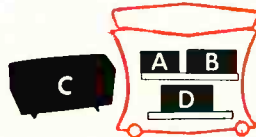
CHANNEL MASTER
TV ANTENNAS

Dealers sell more T-W's than any other fringe-area antenna—by far. The powerful T-W delivers the highest gains and front-to-back ratios of any all-channel VHF antenna. Its rugged construction provides more years of peak performance. And it's nationally advertised on network TV and in leading magazines. Recommend a T-W for your next installation—and help your business grow.

CHANNEL MASTER T-W
The World's Most Powerful TV Antenna



this extra "salesman" really sells radios



- A. model no. 6502 \$39.95 list
 - B. model no. 6506 \$49.95 list
 - C. model no. 6511 \$54.95 list
 - D. model no. 6512, Short Wave and Standard Broadcast, \$72.50 list
- also available: model no. 6514, Marine Band and Standard Broadcast \$74.95 list

Channel Master's colorful, pilfer-proof display lets your customers see, touch, and play these outstanding radios—wraps up more sales than ever before. Use it to set up **your own complete transistor radio center** in less than 1 square foot of shelf or counter space. Ask your Channel Master distributor for full details.

Unmatched sensitivity, superb tone, handsome design, and low price have made Channel Master one of the country's largest-selling lines of transistor radios.

CHANNEL MASTER

works wonders in
Sight and Sound

New! CHANNEL MASTER HIGH FIDELITY COMPONENTS

New components with a new idea: the "Practical Approach!" Channel Master's new hi-fi line is designed to eliminate confusion by directing the customer's attention to the 5 basic, practical considerations which apply to the selection of any high fidelity system: Performance, Ease of Operation, Versatility, Styling, and Cost.

The Channel Master line eminently satisfies each of these requirements. These are instruments of superb quality and striking appearance, offered at moderate prices. They reproduce with astonishing accuracy the entire audible spectrum with an absolute minimum of manual controls. The result is a true high fidelity system which satisfies the most discriminating audiophile... and yet can be used and enjoyed by virtually everyone.

Available in Eastern Areas only

Tiny Minstrel Speaker System brings concert hall realism to the home

Now, for the first time, full dynamic realism is achieved in a miniature enclosure only 9" x 9" x 16". Through the patented new "Acoustic Transformer" principle the entire air chamber becomes a phase matching air transformer which produces clear, undistorted sound from 50 to 15,000 cycles. The big sound and small size of Channel Master Minstrels make them ideal for flexible, space-saving, low-cost stereo installations.

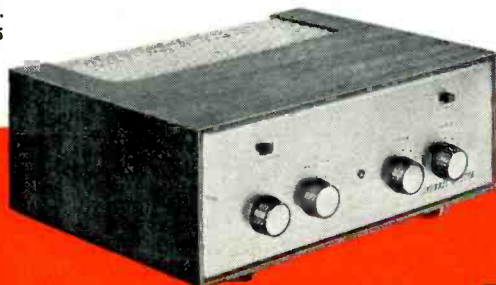
audiophile net \$2995



Monaural Amplifier Model No. 6620

audiophile net \$7995 without cabinet

This superb 20 watt (40 watt peak) amplifier faithfully reproduces every sound audible to the human ear. Modern feed-back circuitry assures minimum distortion and full-frequency range. Special adapter jacks make conversion to a stereo system simple and economical. Solid brass face panel.



Stereophonic Amplifier

Model No. 6600

audiophile net \$11995 without cabinet

The Channel Master 6600 stereophonic amplifier is an instrument of flawless electronic craftsmanship, embodying every advanced technical feature for full-range stereophonic sound reproduction. 16 watts on each channel (32 watt peak). Solid brass face panel.

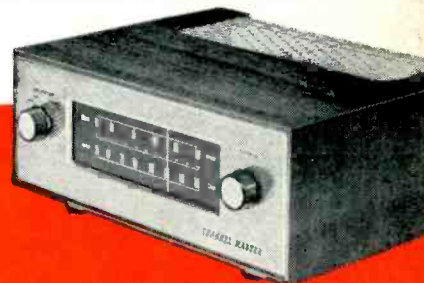


Cabinets available
in wood or metal.

AM/FM Tuner Model No. 6100

audiophile net \$8495 without cabinet

This outstanding tuner provides fine performance, pinpoint station selectivity and effortless flywheel tuning. Automatic Gain and Volume Controls on FM and AM prevent overloading by strong signals and maintain constant sound levels. Special multiplex output permits tuner to be adapted for stereophonic FM broadcasting. Solid brass face panel.



for product literature contact your CM Distributor or write to

CHANNEL MASTER CORP.

THERE'S GOLD IN THIS
**C-D
 TREASURE
 CHEST**



The modern way to stock and sell the world's most wanted capacitors. This efficient shop-chest tells you what's in stock and exactly where it is. No more digging for misplaced units. You get an assortment of the most popular C-D "Preferred" type twist-prongs, "Blue Beavers," and Mylar Tubulars—in handsome metal cabinets. Makes you look more efficient...makes work efficient! Best of all they're FREE with your purchase of capacitors.

See the "Treasure Chest" at your C-D distributor or write for Bulletins to Cornell-Dubilier Electric Corporation, South Plainfield, N. J.



Consistently Dependable
CORNELL-DUBILIER
 SERVICE CAPACITORS

News of the Industry

CANNON ELECTRIC CO. has appointed RALPH J. HIPPERT as Adv. Mgr.

NATIONAL CO. has appointed R. H. ROGERS, Advertising & Sales Promotion Mgr.

PHILCO CORP. has appointed RAYMOND B. GEORGE as Merchandising Mgr., Consumer Products.

PYRAMID ELECTRIC CO., Jobber Div. has moved its offices and warehouse to 507 26th St., Union City, N. J.

ROHN MFG CO. reports a 600 percent increase in capacity as a result of their new galvanizing plant.

GENERAL ELECTRIC CO. is transferring the headquarters of G-E Communication Products Dept. to Lynchburg, Va.

GENERAL INSTRUMENT CORP. announces that J. GERALD MAYER has been named Pres. of subsidiary RADIO RECEPTOR CO. INC.

TUNG-SOL ELECTRIC, INC. reports that BELL LABORATORIES' Chairman DR. MERVIN J. KELLY has been elected a Director of TUNG-SOL ELECTRIC, INC.

PRECISION APPARATUS CO. has appointed: SOL SPARER, Sales Mgr. Distributor Sales Div.; HARRY BRASSEN, Comptroller; and ALAN D. MENTZER, Production Mgr., PACO Div.

CHANNEL MASTER CORP. reports a recent special sales meeting at which their new line of hi-fi components was introduced. A 3-day course in theoretical and applied electronics highlighted the meeting.

AMPHENOL-BORG ELECTRONICS CORP. has announced the formation of the AMPHENOL DISTRIBUTOR DIV., with the following key personnel: R. E. SVOBODA, Gen'l Mgr.; R. F. MEINICKE, Industrial Components Sales Mgr.; and J. W. UPP, Service Products Sales Mgr.

RADIO CORP OF AMERICA announces the following appointments: WENDELL R. SMITH, Dir. Marketing Research & Development; J. M. SPOONER, Plant Mgr., Findlay, Ohio; and C. H. LANE, Plant Mgr., Somerville, N. J. The Findlay operation is being converted from the manufacture of TV components to transistor manufacturing. The Somerville plant is being expanded from 177,000 to 267,000 sq. ft.

(Continued on page 22)

AN OPEN LETTER TO TELEVISION SERVICE DEALERS

By **Gordon E. Burns, Manager, Distributor Sales,
Electronic Components Division, General Electric Company**

Both to you as an independent service dealer, and to General Electric as a TV manufacturer, the goodwill of set owners is a requisite for success. It is the day-in, day-out work of the independent technician which is the cornerstone of owner satisfaction.

The following quotation emphasizes this. It is from a recent announcement by the manager of product service, General Electric Television Receiver Department:

"The independent service industry has filled an important part of our television marketing activity since the introduction of our first television receivers. Our customers have in the past, and certainly will continue in the future, to depend on the independent service dealer for the vast majority of service rendered on G-E television receivers. It is impractical that we provide all these services through our own resources. Consequently, we must develop communications and relationships with independent service organizations so that we may work together for our mutual benefit and for the benefit of the consumer."

On this solid foundation of G-E service policy, independent service dealers may look forward to building a bigger business, a better business... one to which the public will give increased confidence and respect.

General Electric's service policy and plans feature these significant points:

1. General Electric recognizes that television customer satisfaction depends basically on the work of independent servicemen.
2. Cooperative efforts of set dealers, independent service dealers, and various components of the General Electric Company will offer to G-E set owners the most complete and reliable service in the industry.
3. Improved public opinion of the TV service industry can be built on the philosophy quoted above—thus counteracting derogatory publicity servicemen have received.
4. Flexibility to meet local situations is assured as TV set distributors have authority to alter details of service agreements locally within the framework of this philosophy.
5. "Impracticality" of dotting the country with factory-owned service centers is recognized.
6. Technical assistance and flow of service information will be improved by service schools, courses, cooperative forums and meetings in activities encouraged by this policy.

Gordon E. Burns

Progress Is Our Most Important Product

GENERAL  ELECTRIC

2-111-203

Wherever You Go... There are Radio Sales

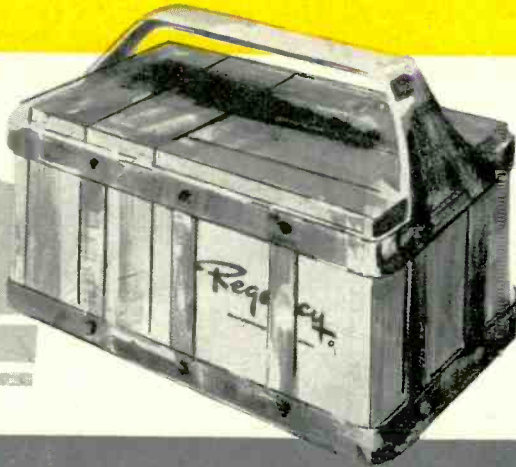


For the first Time

Regency

the first name in transistor radios

makes it easy for you to go to your sales
and take your profits with you



The
New Regency
Radio Caddy

6 Leading Regency Transistor Radios in all price categories from \$14.95 to \$49.95 plus a Regency transistorized portable record player.

On your service calls:

Sell up from a radio repair—more profit less labor.

Pick up sales from the people who already want a transistor

radio but haven't gotten around to a store.

Pick-up impulse sales—from people who have never actually heard a transistor radio at home.

Anything can happen if you have Regency radios with you. The Regency Caddy can be yours at no cost—see your Electronic Parts Distributor—today.

NEW! Model RP-3 \$29.95



Sales Proved Model XR-2A \$14.95



Sales Proved Model TR-7 \$39.95



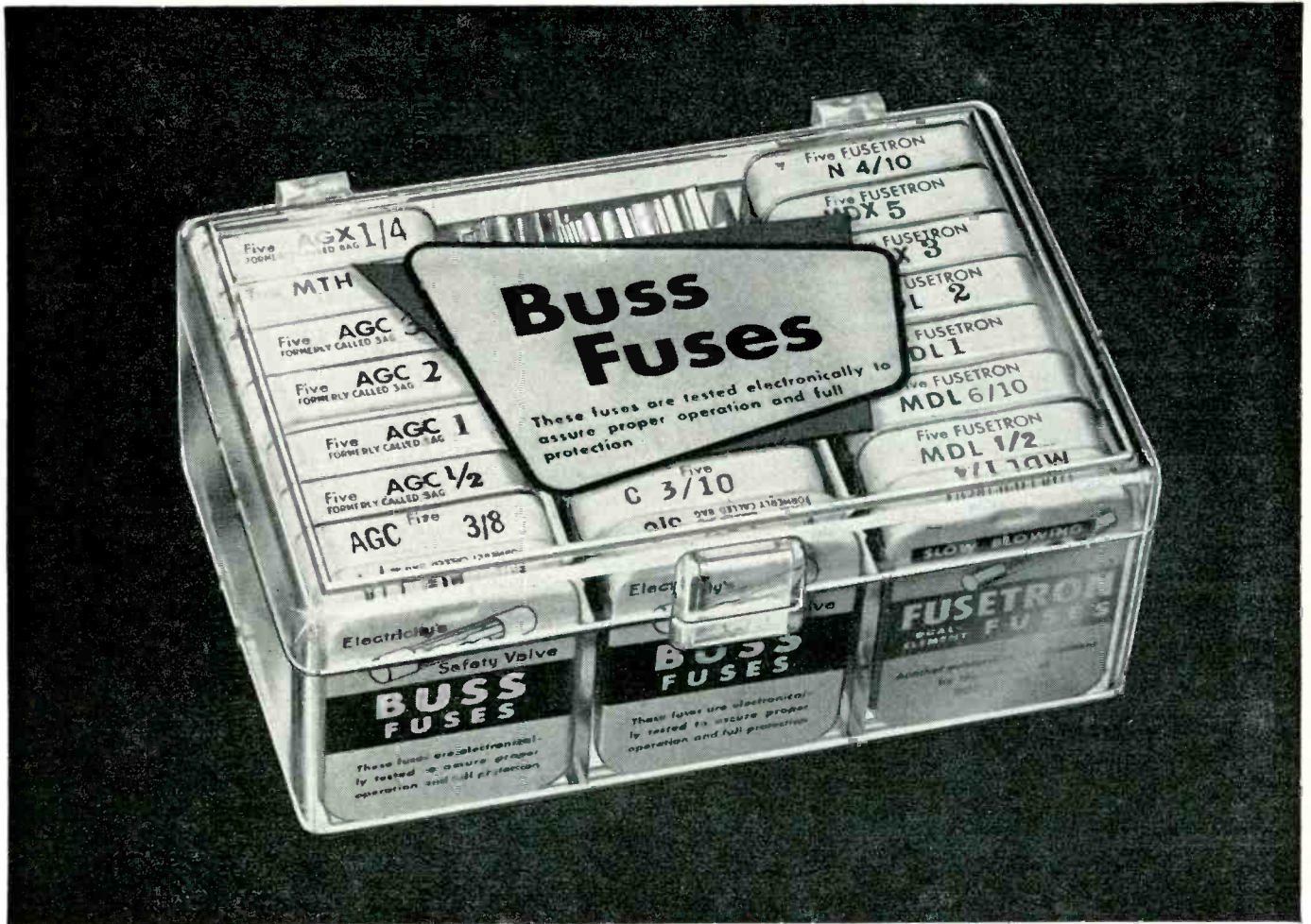
NEW! Model TR-22 \$29.95

Regency

First in Transistor Radios

DIVISION, I.D.E.A., INC.,
INDIANAPOLIS 26, INDIANA

Burton Browne Advertising



A CONVENIENT WAY TO HAVE THE RIGHT FUSE WHEN YOU NEED IT

BUSS fuse TV service kit assortment

Call-backs because you lacked the right fuse are costly — so why not carry an assortment of fuses that will supply the fuse you need.

Fuses are selected for the BUSS Fuse Kit on the basis of popular demand, which practically assures you of having the right fuse for any job.

The fuse boxes will not spill, scatter or be lost, as the kit keeps the boxes neatly arranged.

Your inventory problems are simplified too. One order takes care of your fuse requirements for some time. The clear plastic box enables you to tell at a glance what sizes need to be reordered.

Order the BUSS Fuse TV Service Kit from your distributor today.

BUSS fuses have ready customer acceptance

Over the past 43 years, millions upon millions of BUSS fuses have provided dependable electrical protection in homes, industries and on farms. Using BUSS, the Known brand of fuses, saves you time and helps you build your reputation for service and reliability.

For more information on BUSS and FUSETRON Small Dimension fuses and fuseholders, write for bulletin SFB.

BUSSMANN MFG. DIVISION, McGraw-Edison Co.

University at Jefferson, St. Louis 7, Mo.



359

BUSS makes a complete line of fuses for electronic, commercial, industrial, automotive, farm and home use.

Plus Profits for You...now at your

PHILCO DISTRIBUTOR

Add to your volume and profit...with
Philco's line of universal products for
the Hi-Fi, Stereo and
Tape Recorder
enthusiast



NEEDLES

- DIAMOND
- SAPPHIRE
- OSMIUM



ANTI-STATIC SPRAY

Minimizes surface noise
and insures needle
glide.



45 RPM INSERTS

Custom-built for
long wear.



RECORD BRUSHES

Eliminate harmful dust
from precious
records.



FULL-FIDELITY TAPE

Extra strength and
extra length.

Further evidence of Philco's
PROGRAM OF COMPLETENESS
to America's Service Dealers.



COMPLETE PHILCO NEEDLE CATALOG
Cross references are complete
... Illustrations are big ...
Makes selling easy.



WORLD WIDE DISTRIBUTION: Service Parts • Power
Packed Batteries • Universal Components • Long-Life
Tubes • Heavy Duty Rotors • Star-Bright 20/20 Picture
Tubes • Long-Distance Antennas • Appliance Parts
• Laundry Parts • Universal Parts and Accessories.

News of the Industry

(Continued from page 18)

HERMAN H. SMITH, INC. has appointed SHELDON SACKMAN as Sales Manager.

TRIAD TRANSFORMER CORP. has moved their sales warehouse in Huntington, Ind., to: 305 N. Briant St.

UNGAR ELECTRIC TOOLS, INC. currently celebrated the production of their 10 millionth soldering iron.

WELLER ELECTRIC CORP. has named RAY C. COMPTON as Ass't Sales Manager.

HEATH CO. has appointed: WILLIAM E. JOHNSON, Dealer Sales Mgr., and JOHN T. CAVIEZEL, Dealer Sales Rep.

JERROLD ELECTRONICS CORP. has named KENETH A. SIMONS as Chief Engr. and to head the firm's research and development program.

SERVICE INSTRUMENTS CORP. reports that COLLINS-HAVERCAMP ASSOCIATES received their annual "Rep of the Year" award.

TEXAS INSTRUMENTS, INC. announces that 192,000 sq. ft. will be added to the present 310,000 sq. ft. at the Semiconductor-Components Div. plant, in northeast Dallas.

RAYTHEON MFG. CO. reports that 130 acres will be purchased in Lexington, Mass. for an executive-research park. Also that six regional sales offices will be established to strengthen nation-wide commercial sales.

WEN PRODUCTS CO. INC. announces a new promotion policy for dealers. Material for newspaper co-op advertising, free to dealers with the purchase of \$55.00 worth of tools, is a year-round merchandising kit. Each merchandiser is complete with its own "idea" sheet.

EITEL-MCCULLOUGH, INC. announces these appointments in the Marketing Div.: JOHN H. QUINN, Mgr., Customer Services Dept.; FRED A. SPEAKS, Ass't Dir., Marketing; WILLIAM H. McCAULEY, Ass't Dir. of Marketing for Application Eng'g; GEORGE M. W. BADGER, Mgr. Research & Engineering.

PERMA-POWER CO. announces new promotion. A United Airlines flight bag is given free with an order for 24 Vu-Brite TV Briteners, purchased at the regular price. To the bag is attached an entry blank for participation in the firm's current contest. Contest winners, a service dealer and a jobber salesman, receive an all-expense trip for two to Las Vegas.

(Continued on page 26)

PHILCO® Famous for Quality the World Over



ROHN TOWERS
on the **MARCH** to bring you
NEW, EXPANDED PROFITS!

*** NEW TOWERS**

ROHN engineering presents new, dramatic tower lines for your consideration. Be sure to get complete catalog details on this as they are proving to be *tremendous* profit-makers!

*** MORE DESIGNS**

Outstanding, well-engineered designs of various types are available to suit your *every* requirement.

*** COMPLETE SELECTION**

The ROHN tower line is now one of the *largest* (and growing larger daily) tower lines of its kind in the nation! By selling and servicing the ROHN line you capitalize on *many* fields and markets that others *cannot* possibly fulfill.

*** MORE SALES FEATURES**

ROHN towers and its full line of accessories offer *more* sales features and *sooner* than anyone else! Careful inspection always proves the superiority of ROHN towers. Why settle for less than the best? All ROHN products have the *finest* of finishes too... completely hot-dipped galvanized *after* fabrication!

*** BIGGER PROFITS**

It all adds up to the indisputable fact that ROHN towers make jobber, dealer, serviceman and user *more* money. ROHN has the proof... ask to be shown!

FABULOUS ROHN "SS" TOWER

A Completely Self-Supporting Tower to 130' in a Completely Different Design!

This special self-supporting tower is constructed by using 13 different tower sections of varying weight, size, structural strength and taper. Using all 13 sections gives a heavy-duty self-supporting 130 foot tower. However, the individual sections of this tower can be used in various combinations to build a tower to practically any height from 130' on down, and of *specific* strength in order to handle the *particular* antenna that is to be placed on the tower. This means that you can have a ROHN tower *exactly* to meet *your* requirements. Shipping this tower is convenient and installation is simple.

NO. 50 TOWER

This tower is a special one utilizing sections of the "SS" tower and is suitable for installations of guyed heights up to 450 feet.

NO. 60 TOWER

Special tower using above "SS" tower sections and is suitable in guyed heights up to 600 feet!

ROHN LINE ALSO INCLUDES:

NO. 40 TOWERS—the communications tower having a structural strength so as to be installed in guyed heights up to 300'... thousands are in use today for all types of communication and industrial uses.

NO. 30 TOWER—similar to the above No. 40 tower but utilizing different design.

NO. 6 TOWER—the widely used tower with the "magic triangle" especially suitable for home television reception.

P. T. TOWERS—package towers for easy shipping and storage.

NO. 25 FOLD-OVER TOWER



This general-purpose communication tower with the zig-zag cross-bracing design is now available as a "fold-over" tower. Amateurs and others requiring a "fold-over" tower are invited to inspect this tower to see its superiority and its many advantages that it has to offer you.

ROOF TOWERS—especially designed short height roof installations.

TUBING—complete line.

BASES—for practically every use.

Also, guying and installation accessories of all types to give **complete** television, amateur or communication towers.

See your ROHN representative in your area, your distributor or contact:

ROHN Manufacturing Company

116 Limestone, Bellevue
Peoria, Ill. Phone 4-9156

ROHN MANUFACTURING COMPANY
116 Limestone, Bellevue
Peoria, Illinois

GENTLEMEN: Please send me the catalog and information on the following:

TV Towers Amateur Towers
 Communication Towers Full line of Rohn products

NAME _____
FIRM _____
ADDRESS _____
CITY _____ STATE _____

MAIL THIS COUPON NOW!

THE VOICE OF MUSIC



NATIONAL ADVERTISING MEANS LOCAL BUSINESS FOR YOU!

V-M 'Stere-O-Matic' Record Changer, Model 1201 \$50 list.*
Model 1202 has 4-pole motor and plug-in head for G-E and other magnetic
monaural and stereo cartridges at the same price. Both available on matching
bases as Models 1226 and 1228. *Slightly higher in the West

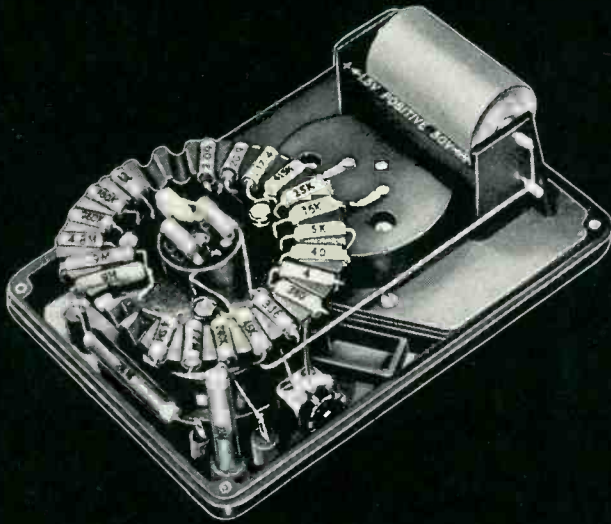
This is the *new* Voice of Music Stere-O-Matic® stereo/high-fidelity automatic record changer your customers will be reading about from now through Spring in an integrated series of hard-hitting advertisements in POPULAR MECHANICS, POPULAR SCIENCE, HI-FI & MUSIC REVIEW and SATURDAY REVIEW.

Cash-in on the demand these national ads will create in *your* market. Feature this newest and finest V-M changer. Stress its nation-wide acceptance by nearly all major phonograph manufacturers. Promote it, display it, *sell* it.

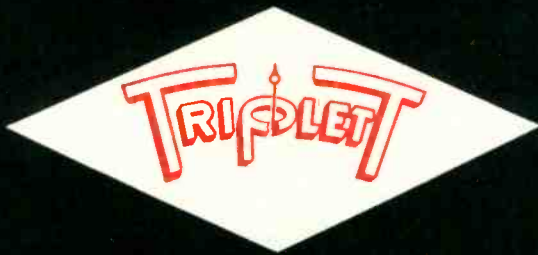
SELL THESE FEATURES: • COMPLETELY WIRED FOR STEREO WITH STEREO CARTRIDGE INSTALLED! • FURNISHED WITH DUAL OUTPUT JACKS AND STEREO-MONAUROUS SWITCH. • RUMBLE: -45 DB. • WOW AND FLUTTER: ¼RMS. • TURNTABLE BALANCED FOR CONSTANT SPEED. • MINIMUM NOISE AND FRICTIONAL DRAG. • CONSTANT, POSITIVE MOTOR SPEED FOR TRUE PITCH. MAXIMUM 2° TRACKING ANGLE VARIATION. • AUTOMATIC SHUT-OFF. • RECORD INTERMIX. • PLAYS ALL SIZES, ALL SPEEDS.

See, hear, order and **SELL** the quality stereo/high-fidelity automatic changer with transcription turntable performance!

V-M CORPORATION • BENTON HARBOR, MICHIGAN • WORLD FAMOUS FOR THE FINEST IN PHONOGRAPHS, TAPE RECORDERS AND RECORD CHANGERS



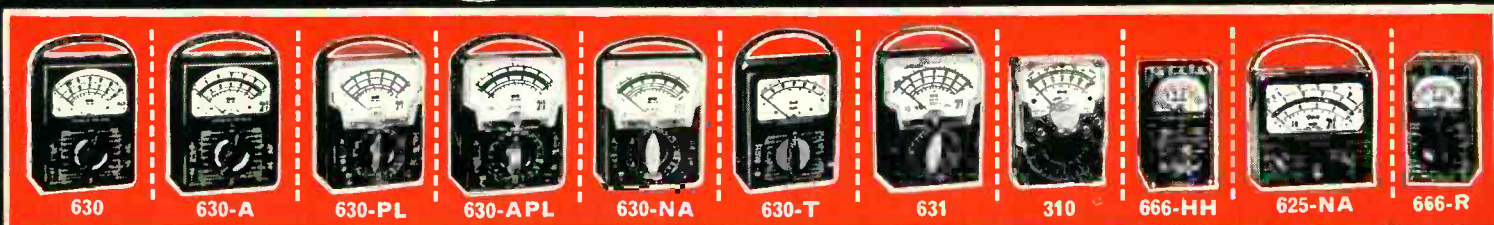
new... most easy to read



- Clear, unbreakable, shadowless front for instant wide vision.
- 5 to 500,000 cps on A.C.
- Continuous resistance reading from 0.1 ohms to 100 megohms.
- Polarity reversing switch.
- Only one (king-sized) switch selects both circuit and range—minimizes wrong settings, burnouts.

Only Triplet affords you such a wide choice of VOMs. Whatever your application—broad or limited—there is a Triplet VOM particularly suited for it.

the mighty nine + two



For Quality of international reputation

Economies that guarantee extra profits

FAMOUS **HITACHI** RECEIVING TUBES

Exclusively through **E.U.C.**



HITACHI, LTD., one of the world's leaders in advanced electronics design and manufacture... *Grand Prix* Award winners, for scientific equipment, at the Brussels World's Fair.

HITACHI TUBES, CHOICE AS ORIGINAL EQUIPMENT BY MANUFACTURERS IN THE U.S. AND ABROAD

SELL—SERVICE—SATISFY—with dependable, EUC-guaranteed Hitachi tubes. Performance-proved around the world, Hitachi tubes are made the quality-controlled American way to fully meet *top American standards*. And, important cost savings assure you of profits not normally obtainable with tubes of this high calibre. Most popular types available.

Behind the EUC symbol... Electronic Utilities Co., a division of The Sampson Company, makes these tubes and other selected electronic components from abroad available to original equipment manufacturers and replacement parts distributors... on a *localized, prompt-delivery* basis. In addition, EUC has its own resident representatives and engineers abroad, maintaining quality of product in strict accordance with U. S. requirements.



ELECTRONIC UTILITIES CO.
DIVISION OF THE SAMPSON COMPANY
2244 S. WESTERN AVE., CHICAGO 8, ILLINOIS

See your EUC Distributor now, or write for CATALOG NO. 558-R



A complete line of Quality Electronic Components:

Capacitors • Miniature Transistor Transformers • Variable Condensers
Carbon Resistors • Tone Arms and Cartridges • Transistor Radio Earphones

(News, Continued from page 22)

KRYLON, INC. has promoted to the position of Vice Pres: **ELMORE E. KAYSER**, charge of Adv. and Promotion.

CORNELL-DUBILIER ELECTRIC CORP. has elected as a Vice Pres. **RAYMOND T. LEARY**, Sales Mgr. of the Distributor Div.

SWITCHCRAFT, INC. reports that a new Distributor Sales Department has been established headed by **THOMAS L. DOWELL**.

HOFFMAN ELECTRONICS CORP. has appointed **RAY B. COX** to the new position of Vice Pres. and Gen'l Mgr. of the Consumer Products Div.

ZENITH RADIO CORP. reports that **L. C. TRUESDELL**, Vice Pres. & Director of Sales, has been elected a member of the Board of Directors.

WENDELL PLASTIC FABRICS CORP. has announced the appointment of **FRANK HANDZEL** to their industrial division, to direct sales in the Chicago area.

Reps & Distributors

JAMES H. PODOLNY CO., Pittsburgh rep firm, has opened a branch in Dayton, Ohio.

FINNEY CO. has named **L. J. McTAGGART**, Buffalo, as rep for upper N. Y. state.

MCKNIGHT ELECTRONICS, INC. is the new name for **LEONARD ELECTRONICS**, Roanoke, Va.

HOFFMAN ELECTRONICS CORP., has named the **CUMBERLAND DISTRIBUTING CO.**, Nashville, Tenn., to handle the firm's home entertainment equipment line.

CENTRALAB, Int'l Div., has appointed **PETER J. HEENAN LTD.**, Toronto, as distributor sales rep in eastern Canada. This is in addition to the rep's previous responsibility for industrial sales.

ERIE RESISTOR CORP. announces the appointment of the following reps for their electronic components: **JULES J. BRESSLER**, Union City, N. J., for metropolitan N. Y.; and **L. J. McTAGGART**, Buffalo, for upper N. Y. state.

VIS-U-ALL PRODUCTS CO. reports the following rep appointments: **EDWIN A. SCHULTZ**, Indianapolis, for Ind. and Ky.; **L. J. McTAGGART**, Buffalo, for upper N. Y. State; and **L. E. BARNHART**, Jacksonville, for Fla., Ala., Ga., N.C., and S.C.

(Continued on page 85)

WINEGARD FM3T

"turnstile" ANTENNA

WITH EXCLUSIVE "offset" MOUNT

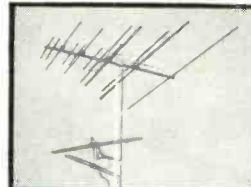
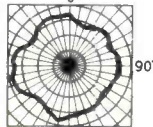
3 BIG ADVANTAGES!

BRIGHT GOLD ANODIZED

Help your customers get maximum results from their FM tuners with this new non-directional Winegard FM3T antenna. A single bay delivers fine reception up to 100 miles or more across the FM band (88-108 mc). Accurate 300 ohm impedance match. Factory assembled and complete with new offset mount. Packed one to full-color display carton. Shpg. wt. 3 lbs.

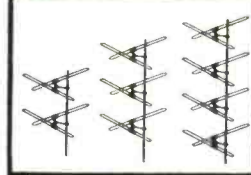
MODEL FM3T WITH OFFSET MOUNT... **\$1195** list

NO ROTOR NEEDED



MOUNTS ON SAME MAST WITH TV ANTENNA

Easiest antenna you ever installed. Factory assembled. Mounts quickly on any mast. No extra mounting parts needed.



STACKS EASILY IN 2, 3 OR 4 BAYS

Unique Winegard offset mount allows you to stack up to 4 bays for greater power and distance, using regular 300 ohm line.



WRAP-AROUND MAST CLAMP CAN'T TILT

New, super-strong "wrap around" mast clamp aligns antenna automatically. Can't crush boom no matter how much you tighten it.

Winegard

Shows you how to cash-in on the FM Market with the

MOST COMPLETE LINE OF FM ANTENNAS

Did you know that high gain TV antennas are worthless for good FM radio reception? This is true because the gain is purposely reduced across the FM radio band on most TV antennas to eliminate possible FM interference on TV.

Thousands of people who own precision FM tuning equipment don't know this and as a result are ruining their reception and pick-

ing up only a few of the stations they should be getting.

A well engineered tuner with a modern Winegard FM antenna can consistently bring in excellent reception on stations from close in, up to 100, even 300 miles away. Add to your profits by displaying and selling Gold Anodized Winegard FM antennas. Choose from 7 different models and kits.

WINEGARD FM ANTENNA KITS

BRIGHT GOLD ANODIZED

	<p>MODEL FM3A Same antenna head as FM3T, but with Winegard's universal tripod mount. Complete with all mounting parts and 50-ft lead-in. Model FM3A, list... \$1795</p>
	<p>MODEL FM3S Same antenna head as FM3T, but includes mast with sleeve mount. Complete with all mounting parts and 50-ft. lead-in. Model FM3S, list \$1695</p>
	<p>MODEL FM3K Same as Model FM3T, but includes 50-ft. lead-in, 2 mast stand-offs and 2 wood screw stand-offs. FM3K, list... \$1495</p>

WINEGARD FM YAGIS

For Long Distance Reception... 200 Miles and More!

Choose from three directional, high gain FM Yagis With Exclusive New TransCoupler

Three new FM yagis, the ultimate in FM antennas. Bright gold anodized heavy-duty aluminum. Flat frequency response across entire FM band. Extremely high gain and sharp directivity.



Winegard's exclusive TransCoupler bars fold down for easiest and most accurate stacking ever devised. Perfect 300 ohm match on single bay or when stacked. No extra bars needed.

<p>Model FMTC2, two element, Gold Anodized</p>
<p>Model FMTC6, six element, Gold Anodized</p>
<p>Model FMTC12, twelve element, Gold Anodized</p>



Winegard Co.

3019-3 Scotten, Burlington, Iowa

Write Today for Technical Bulletins on Winegard FM Antennas

why SYLVANIA TV

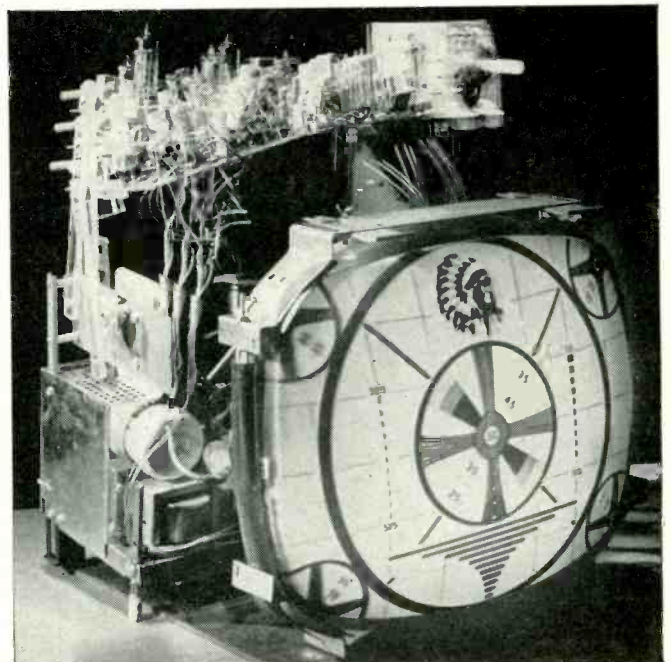
with the new

"LIFETIME ENGRAVED CIRCUIT"

means years of dependable
operation ...
more satisfied customers

1. DEMONSTRATED DURABILITY

One end of the rugged "LIFETIME ENGRAVED CIRCUIT" is being bent continually up and down a distance of over 3 inches. This has now gone on over a million times! Yet, the amazing LIFETIME ENGRAVED CIRCUIT keeps a clear and steady picture on the screen. There have been NO instances of loose or weakened connections, breakage, or failure of any kind!



An actual unretouched photo of one of the toughest tests ever given an operating chassis—note clear picture.

2. LONG TUBE LIFE

Longer tube life is assured in all SYLVANIA sets by a "controlled warm-up" system. All tubes in series have the same warm-up time (approximately 11 seconds) despite varying heater voltages because tube heater resistance is carefully selected and manufactured. There is no danger of harmful surges and overheating damaging the lower voltage tubes.

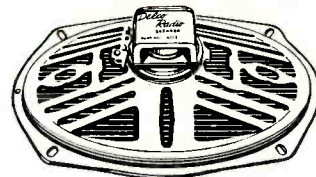
3. COOLER OPERATION

Old-fashioned transformers, with bulky fins to transfer heat to the interior of the cabinet, raise the temperature of the low voltage power supply as much as 60° hotter than the new semiconductors used with the LIFETIME ENGRAVED CIRCUIT. A cooler operating chassis means greater life for all components.

Recommend SYLVANIA TV
—every set has a "LIFETIME ENGRAVED CIRCUIT"

Use Delco Radio Service Parts!

DS501—Highest power transistor used in auto radios.



SPEAKERS



IRON CORES



RESISTORS



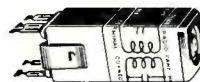
CAPACITORS



CONTROLS



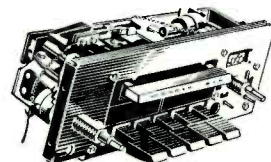
TUBES



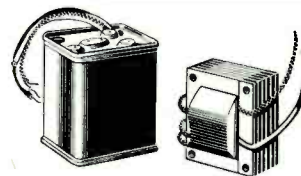
COILS



VIBRATORS



TUNER PARTS



TRANSFORMERS

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

Mr. Service Dealer...

YOUR PHILCO DISTRIBUTOR IS HEADQUARTERS FOR A COMPLETE SELECTION OF GENUINE PARTS

Bendix

Automatic Electric Washers • Automatic Electric Dryers • Duomatic Washer-Dryer Combinations • Automatic Gas Dryers • Gas Duomatic Washer-Dryer Combinations.

CROSLEY

Radio • Television • Refrigerators • Ranges • Freezers • Air Conditioners • Automatic Dishwashers.

PHILCO-Bendix

Automatic Electric Washers • Automatic Electric Dryers • Duomatic Washer-Dryer Combinations • Automatic Gas Dryers • Gas Duomatic Washer-Dryer Combinations.

PHILCO

Radio • High Fidelity • Stereophonic High Fidelity • Television • Refrigerators • Electric Ranges • Freezers • Air Conditioners • Automatic Electric Washers • Automatic Electric Dryers • Duomatic Washer-Dryer Combinations • Automatic Gas Dryers • Gas Duomatic Washer-Dryer Combinations.

Don't Settle for Less than Genuine Replacement Parts



COMPLETE PARTS CATALOGS—All models of all products listed above are completely covered in separate Philco catalogs on Electronics, Appliances and Home Laundry. See your Philco Distributor today for this valuable information.

PHILCO[®]
Accessory Division

WORLD WIDE DISTRIBUTION

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

PHILCO . . . Famous for Quality the World Over

ELECTRONIC TECHNICIAN

Now Including
SERVICE
Magazine

Electronic Maintenance — Still With Us

"The reports of my death are greatly exaggerated."—Samuel Langhorne Clemens (Mark Twain)

Repairing electronic equipment is often a headache to manufacturers, the public, and the technicians who must do the job. The factory man has to put out a set priced to sell. The viewer wants great reliability—at low cost. The servicer copes with consumer irritation, designs without repair in mind, and a massive array of different makes and models.

So it's easy to understand why the newspapers delight in reporting stories of a new thigamajig that will last forever, eliminating the service technician. It's big news. All that's needed is some "interpretive" reporting, or out-of-context quote from some authority.

It's a shame that truly great scientific advances are incorrectly touted as eliminating service technicians. The transistor is an example. Radios with these supposedly everlasting units still require skilled repair and transistor replacement. The same will be true of cold cathode vacuum tubes now entering the limelight.

There are two basic reasons why electronic maintenance will be with us as long as electronic equipment exists. First, the inherent nature of electronic

products makes failures inevitable. Design is complex and construction is critical. Even a slight deviation in one component can cause improper equipment operation.

Second, the progress toward greater reliability gives rise to an opposite compensating trend—complexity. For example, no sooner do we have TV circuitry simplified, when color TV rears its head to introduce additional complexity. No sooner do we reduce phonos to their essentials, than hi-fi becomes the rage. And then stereo.

Yes, electronics will continue to provide entertainment and vital services to the public, industry and commerce. And the electronic technician will have to be there to make sure the equipment keeps working.

So the next time you read that maintenance will not be needed for electronic products, keep in mind that you probably know more about journalism than that reporter does about electronics.

The nation's electronic maintenance bill keeps growing as more devices are put to use. In 1959, it is expected to range between \$2.8 billion and \$3 billion.

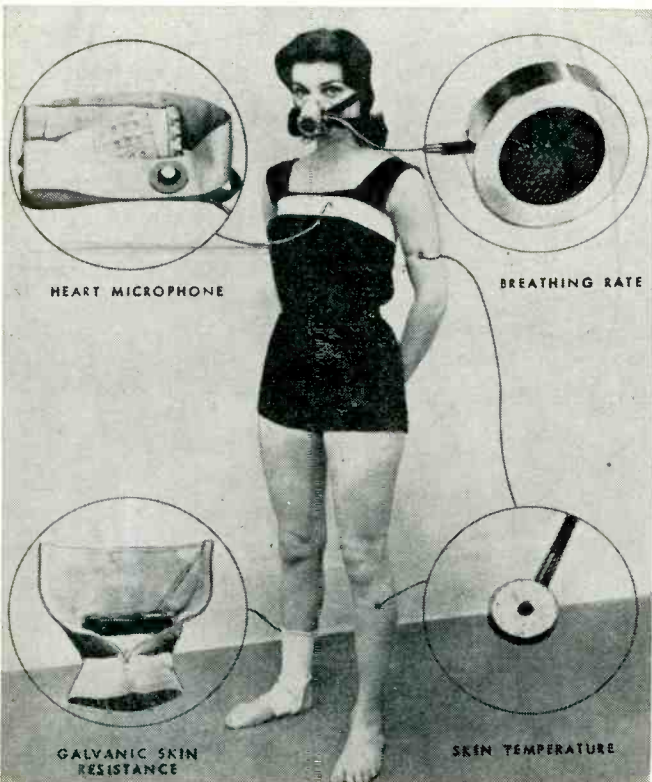
Get rid of technicians? To rephrase a famous cigarette commercial: "They said it couldn't be done—and it wasn't!"

Tuning In the

MERGERS continue to be the order of the day, in electronics as in other industries. Sylvania has merged with General Telephone & Electronics Corp. However, Sylvania will continue to operate as a wholly-owned separate company. Also, Clevite has acquired Electrovox and Walco Products, which will continue to operate with its own staff.

RECTANGULAR PIX TUBES with twin-panel face plates to eliminate the conventional safety glass are set for introduction this fall in the 1960 TV models. Manufacturers have been talking about 23" and 18" sizes, but preference is expected to be given for the larger CRT. They are expected to have 110° deflection. Retail prices of sets using these tubes, possibly top of the line models, are expected to increase at least \$25. A word of caution: The squared corners of the new tubes will improve appearance, but make them more susceptible to implosion when struck accidentally than the more rounded corners of present rectangulars.

WIRED FOR MEDICAL ELECTRONICS



Physiological transducers are what these medical electronic devices by Gulton Industries are called. Designed for pilots in space, they may be forerunners of what MD's will someday use. Ceramic heart mike performs stethoscope function. Strain gage in facemask measures respiration.



"I'd like a resistor—4000 horseshoes . . ."

PRINTED WIRING battle continues, with competing TV manufacturers emphatically pointing up the benefits or drawbacks (depending on which side of the fence you sit) of printed boards. RCA Service Co. Pres. Donald Kunsman states that his branches replaced one board for every 5000 calls. He also reported a survey of 3051 sets of 10 leading brands which showed that the average number of calls per new set in the first 90 days was 0.727. Expressed another way, a customer buying a new set has 3 out of 4 chances that it will require service within 90 days.

FCC has long opposed many applications by manufacturers and broadcasters to set up their own microwave communications systems. The Commission has maintained that common carrier phone companies should provide the service. Now an interesting twist has come about. The FCC has ruled that state agencies such as the police must maintain and install their own radio-phone systems, instead of leasing from common carriers. The ruling follows a U.S. anti-trust suit against AT&T. This action may result in more communication maintenance opportunities for independent electronic technicians.

1959 IRE NATIONAL CONVENTION, March 23-26 will display thousands of the latest commercial and military electronic developments. 850 exhibitors will present their wares on four floors of the New York Coliseum, New York City. In addition, the Institute of Radio Engineers will offer technical papers in 54 sessions, most of them at the Waldorf-Astoria Hotel . . . everything from broadcasting, receivers and vehicular communications to space electronics and nuclear instrumentation. If you can attend, we strongly urge you to do so. It will be a fascinating eye-opener to see this largest of electronic shows.

Picture



WATCH THE I-F. The i-f for Delco radio portable used in 1959 Buicks, Pontiacs and Oldsmobiles is 465 kc. This 10 kc higher than normal frequency is needed because the r-f stage stays in the car with the transistor output stage when the radio is removed for portable use. The lower i-f could cause more images with no r-f stage to block them. The selection of 465 kc is based on a broadcast station survey showing fewer localities with 460-470 kc separation between stations than 450-460 kc. This means fewer whistles while tuning stations

CONFIDENTIAL magazine is one publication about which we've never had any illusions, at least under its former owner. Nevertheless, with over 1,250,000 circulation, it does spread the word around. Happily, in its April 1959 issue, it carries an article favorable to technicians entitled, "Don't Shoot the TV Service Man!" Written by an anonymous Chicago service technician, it puts the blame for costly repairs on the manufacturers "who have designed your set so badly."

TV SET SALES by service dealers are encouraged by an arrangement between the Philadelphia Radio Servicemen's Association and local set distributors. Member dealers may buy receivers at wholesale prices, sell at list price, and allow a fair trade-in allowance.

LEGISLATION has been introduced in New York—which frequently sets the pattern for laws in many other states—which would require used TV, radio and X-ray tubes to be labeled "used." It was stated that reprocessed tubes sold to the medical profession and airlines had endangered human lives.

CALENDAR OF COMING EVENTS

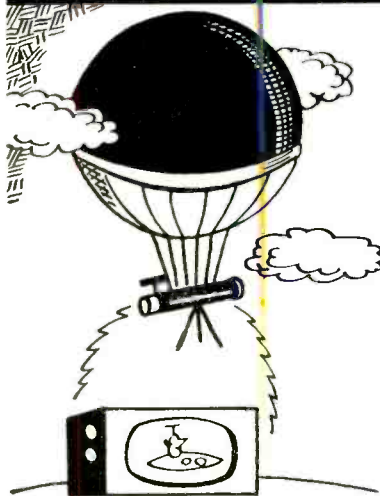
- Mar. 15-18: National Association of Broadcasters Convention, Conrad Hilton Hotel, Chicago, Ill.
- Mar. 23-26: IRE National Convention, Coliseum & Waldorf-Astoria Hotel, New York, N. Y.
- Mar. 24-26: Second Annual NARDA School of Service Management, Northwestern University, Chicago, Ill.
- Apr. 18-19: NATESA Directors' Meeting, Hermitage Hotel, Nashville, Tenn.
- May 6-7: 7th Regional Technical Conference & Trade Show, University of New Mexico, Albuquerque, N. Mex.
- May 6-8: Electronic Components Conference, Ben Franklin Hotel, Philadelphia, Pa.
- May 11-13: Joint Conference on Automatic Techniques, Pick-Congress Hotel, Chicago, Ill.
- May 18-20: 1959 Electronic Parts Distributors Show, Conrad Hilton Hotel, Chicago, Ill.
- Aug. 18-21: Western Electronic Show & Convention (WESCON), San Francisco, Calif.
- Aug. 21-24: NATESA Convention, Congress Hotel, Chicago, Ill.

HI-FI SHOWS

- Feb. 7-10: Biltmore Hotel, Los Angeles, Calif.
- Feb. 16-23: Cow Palace, San Francisco, Calif.

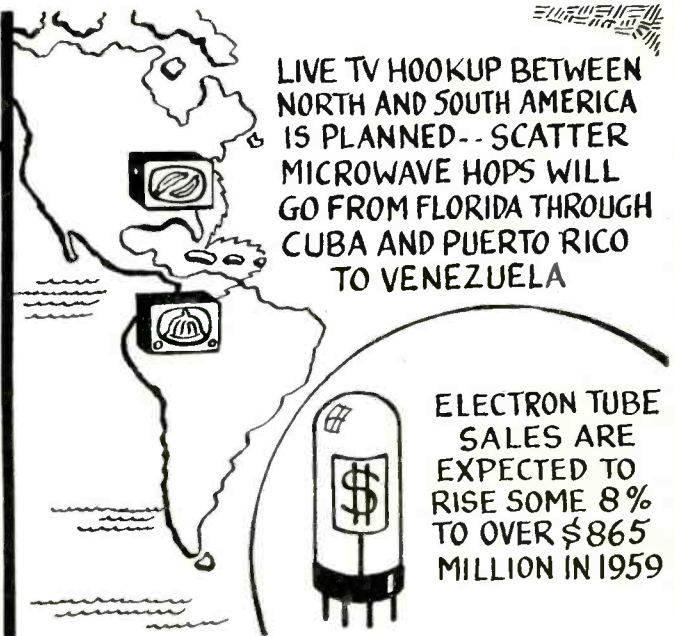
EDITORIALIZING on the air is favored by the National Association of Broadcasters. Such broadcasts should be clearly identified as an expression of opinion.

RANDOM NOISE



AIRBORNE TV CAMERA SYSTEM DEVELOPED BY RCA IS SENT ALOFT TO 80,000' WITH TELESCOPE. 225 MC SIGNAL RELAYS ONE PICTURE/SECOND 150 MILES TO GROUND STATION. -- ASTRONOMERS CAN SCAN SPACE WITHOUT ATMOSPHERIC INTERFERENCE

TOM HIGGINS JR.



LIVE TV HOOKUP BETWEEN NORTH AND SOUTH AMERICA IS PLANNED-- SCATTER MICROWAVE HOPS WILL GO FROM FLORIDA THROUGH CUBA AND PUERTO RICO TO VENEZUELA

ELECTRON TUBE SALES ARE EXPECTED TO RISE SOME 8% TO OVER \$865 MILLION IN 1959



Servicing

Radar Speed

Speed indications are observed on a VTVM, and can be permanently recorded.

Frequency Variations Convert To Miles-Per-Hour Indications By

RADAR SPEED METER

Principles of Operation

Conversion
Detection
Doppler Effect
Special Circuits

Frequencies Used

Calibration
Transmitted

Servicing & Adjustments

Crystals
Expander Circuits
Light-house Tube
Reflex Klystron

Leo G. Sands

• Radar speed meters are essentially microwave transceivers operating in the UHF or SHF band of frequencies and depend upon the Doppler effect for intelligence. Like radar, a microwave beam is transmitted and aimed at a target, in this case it is the moving vehicle. A portion of the sig-

nal striking the target is reflected and picked up by the receiver. The frequency of the signal returned from the moving target is slightly different from the original signal because of a Doppler effect. Differences in frequency vary with the speed of the moving vehicle. The faster the target moves towards the receiver the higher is the frequency of the returned signal. Radar meters using a frequency of 2,455 mc have a Doppler beat note of 7.31 cycles per second per mile per hour. Meters using 10,525 mc develop a beat note of 31.15 cycles per second per mile per hour. Thus a car approaching at 100 miles-per-hour would reflect a signal that is 731 or 3,115 cps higher than the transmitted signal. The speed meter detects the difference in frequency and converts it to a direct-reading indication of the motorist's speed in miles-per-hour.

The block diagram of a radar speed meter using 2,455 mc is shown in Fig. 1. It has a high-frequency cavity-oscillator, 2C40 lighthouse tube,

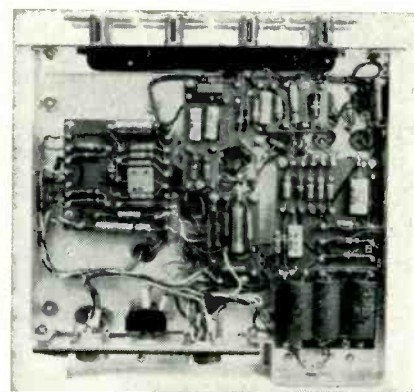
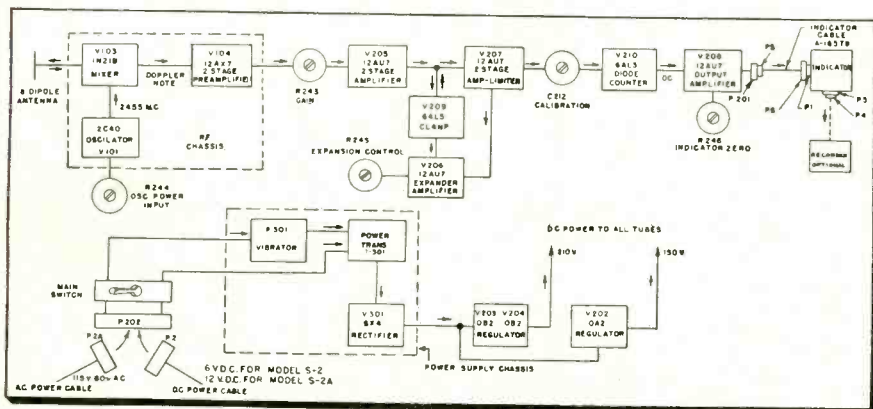


Fig. 2—Eight dipole antennas are mounted on the transceiver for sending and receiving.

which generates approximately 120 milliwatts. The tube serves as the transmitter's source of microwave energy as well as the local oscillator for the receiver. The signal is coupled through a directional mixer to an eight-dipole antenna array, which can be seen in Fig. 2. The reflected signal is picked up by the same antenna and passed back to the directional mixer, where the crystal diode detector beats the reflected signal against a portion of the original signal, as in a conventional super-heterodyne receiver, except that the resulting i-f signal is not fixed, but varies according to the speed of the moving target.

Six stages of wide-band amplification V104, V205 and V207 follow the mixer; of which the last stage also acts as a limiter. The i-f signal frequency is integrated by a diode counter circuit V210 and measured by vacuum tube voltmeter circuit V208 which provides direct readings in miles-per-hour. A schematic of this apparatus, model S12 Electro-Matic Radar Speed Meter is shown

Fig. 1—Transmitted and reflected signals combine at the mixer. The frequency difference is detected and passed on to the meter circuit. A lighthouse tube is used as the oscillator.



Control Meters



Patrol car is positioned as close to the road as possible to avoid parallax error.

Transceivers Operating At 2,445 MC Or 10,525 MC

in Fig. 3. The voltage developed across R226 is proportional to the i-f frequency. The meter measures 0 to 4 d-c mils, is calibrated in miles-per-hour, and at full scale reads 100 mph.

Clean speed readings depend upon proper signal amplitude to the last amplifier and limiter stage in V207. It should operate between full cutoff and limiting. This is accomplished by an automatic expander circuit which operates from the output of tube V207A, through V206 and V209, to control the gain of amplifier stage V205B. In the presence of sufficient signal from a target at V207A, the clamping action is removed and per-

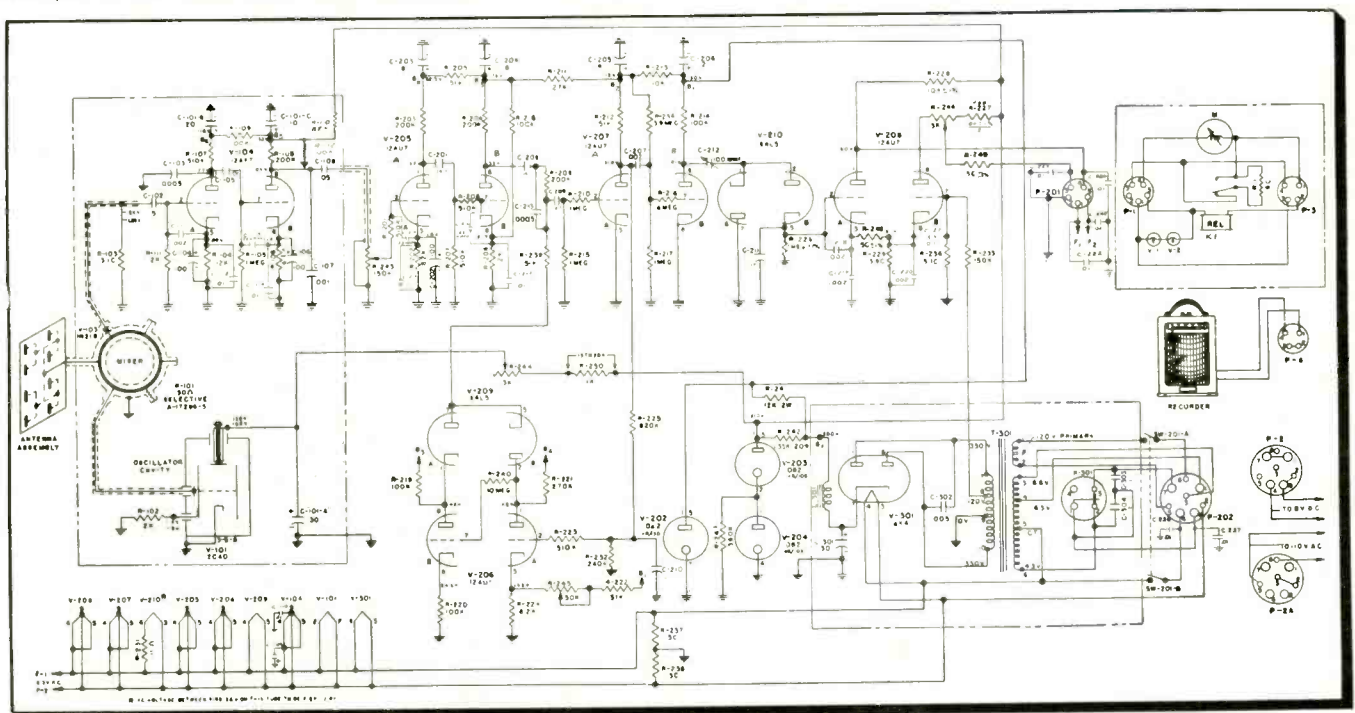
mits the signal to be passed, amplified and read on the meter. Clamping action again takes place when the target is passed. Signals of insufficient amplitude are thus depressed.

Another type of radar meter, the Patrolmaster Model 500 shown in Fig. 4, consists of a transmitter-receiver assembly, amplifier assembly and speedmeter. The transmitter-receiver section contains a klystron oscillator, crystal detector, transmitting and receiving wave guides, and two polystyrene antennas. Power output is approximately 33 to 50 milliwatts, and the beamwidth is approximately 15 degrees. The meter

is a 500 μ a unit calibrated in miles-per-hour, with a maximum indication of 100 mph. The antenna should be located as near the road as possible, and directed to intersect the traffic lane at a point approximately 400 feet from the antenna. As in any high-frequency work, line-of-sight operation prevails, and dips or obstructions in the road should be avoided.

The integral-cavity reflex klystron in the transmitter requires no external tuned circuit, and operates at 10,525 megacycles. The outgoing signal leaves the transmitter by way
(Continued on page 68)

Fig. 3—The I-F signal varies with the speed of the target. The voltage developed in the VTVM circuit V208 is proportional to this signal. An automatic expander circuit assures a clean reading. A tuning fork or audio signal generator may be used to check calibration.



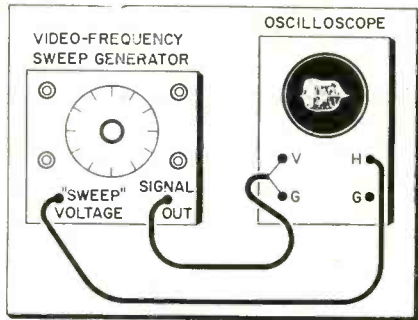


Fig. 1—Output of sweep generator can be displayed linearly if the scope and generator are driven by the same sweep voltage.

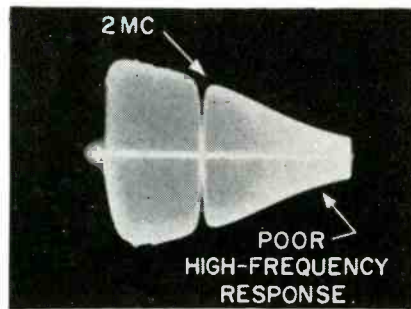


Fig. 3—Absorption type marker sucks out a portion of the signal and is used to accurately identify various portions of the curve.

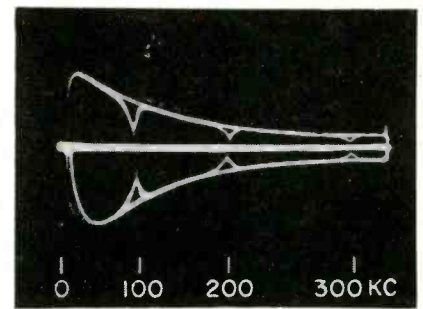


Fig. 4—Non-linearity is indicated by the unequal spacing of markers. Frequency response characteristics can also be determined.

Sinewave Sweep Procedure For Oscilloscopes

"One-Shot" Response Technique

With A Sweep Generator and Scope

For Testing, Evaluating And Alignment Of Electronic Equipment

ROBERT G. MIDDLETON

• One of the chief applications of 60-cycle sinewave deflection in scopes is in tests with the sweep generator. Response curves for alignment purposes, or for quality checks of amplifiers, TV receivers, test equipment and other electronic gear are almost instantaneously developed

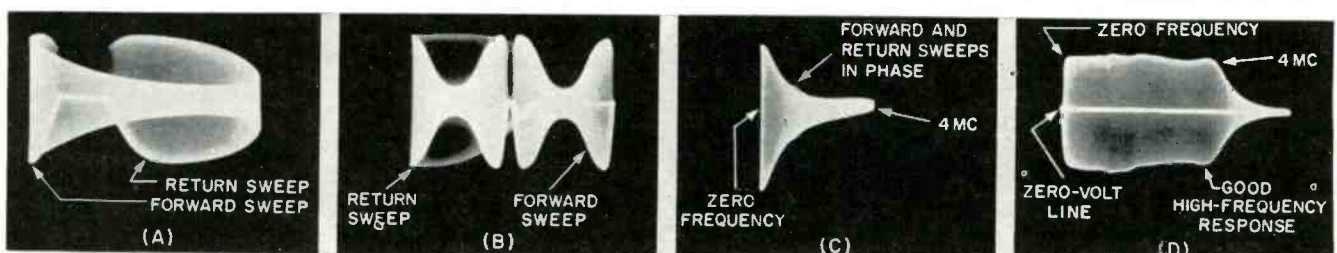
by the use of a sweep generator and oscilloscope. Compare this "one-shot" operation with the process of obtaining a response curve by using an a-m generator and an output meter to plot a reading for each individual frequency. For precision laboratory type of work the plot obtained by checking one frequency at a time is preferred by many engineers, but for service work the speed and facility offered by the sweep techniques are more desirable.

Normal display of a waveform in

scopes, as it is with the presentation of a picture on a CRT in a TV set, is accomplished by a sawtooth sweep voltage. The sawtooth's characteristic linear rise and sharp drop assures a linear trace across the screen. Linear trace is required when it is necessary to view the waveform on a linear time basis. This is another way of saying that if the speed of some of the events in a waveform or picture have not been artificially modified by compression or expansion, sweep voltage must increase at

Fig. 2—When the waveform is first obtained, the chances are the forward and return trace will not coincide, possibly as shown in A and B. Adjust the phase control so that the traces overlap

as in C. This waveform also shows poor high frequency response. Blanking the return trace reduces it to a zero-volt reference line and eliminates layover inaccuracies as in D.



SINEWAVE SWEEP

Test Equipment

Oscilloscope
Marker Generator
Sweep Generator

Functions

Phasing
Blanking
Demodulation

Alignment

Frequency Response

Bandwidth

a steady rate. Sinewaves have a varying rate of voltage change, as evidenced by its familiar curve. If a sinewave sweep voltage was used instead of a required sawtooth sweep voltage, the trace would be compressed at both ends. In the case of a TV picture on a CRT, it might appear as "barreling" accompanied by some foldover on both ends; some loss of sweep width may also be noticed.

Sinewave sweep voltages can present a linear display if the timing of events in a waveform or picture is such as to vary in accordance with the sinewave. For example, most sweep generators vary the frequency, above and below some selected mid frequency, at a 60-cycle sinewave rate; if the scope sweep voltage is set to the same 60-cycle sinewave, the trace will speed up and slow down in step with the generator's changes, and a linear presentation will be seen. Frequency response of the scope may be checked in this manner. The hook-up in Fig. 1 shows how the sweep generator's output is connected to the scope's vertical-input terminals, and the sweep voltage to the horizontal input. If the sweep generator is frequency-modulated at a 60-cycle

sinewave rate which is keyed to the line voltage, and if the scope has provisions for internal 60-cycle sinewave horizontal deflection, the external lead to the horizontal section may be omitted. If there is a choice between using the sweep voltage from the generator, or the scope, it is generally better to work with the voltage from the generator. Phasing controls and in many cases blanking features are usually available on one or both instruments. Select the sweep voltage which can be phased and blanked. Just as nonlinearities develop if a sinewave voltage is used for presentation of linear events, the use of a sawtooth sweep voltage to view the output of the sweep generator, in this case, would also cause distortion.

When using the sweep voltage from the generator to drive the scope's horizontal sweep, it is necessary to switch the scope's sweep function to external sweep. Much time is often lost in the preliminary setup, when the position of this switch is overlooked. Usually the first patterns to appear on the scope are out-of-phase, as shown in Figs. 2A and 2B. Two waveforms plus some overlapping can be observed. This can be corrected by adjusting the phasing control on the generator's front panel, to merge the patterns and to form a single display, as shown in Fig. 2C.

Blanking

Sometimes layover is not quite perfect because of slight inaccuracies in generator operation, presence of even harmonics in the power line, and noise and distortion in the scope's amplifiers. It is therefore desirable to blank one of the waveforms. Another advantage of blanking one of the traces, is that it is converted to a zero-volt reference line, as illustrated in Fig. 2D. Simply turning the generator's blanking switch to the on position will accomplish all this, but it is advisable to first adjust the phasing control before turning on the blanking,

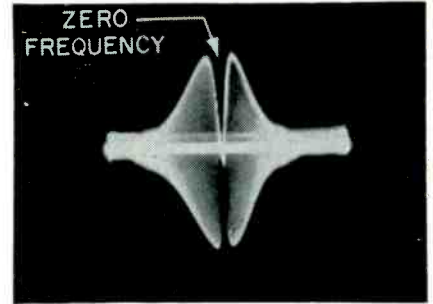


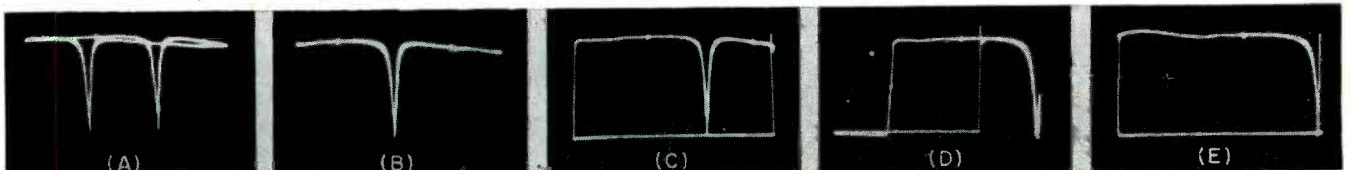
Fig. 5—Normally the sweep generator is adjusted to move zero-frequency response point to one end or the other, as in Fig. 2C.

Whether or not the scope's vertical amplifier is operating properly, its frequency response, etc., can be predicted by looking at the waveform—assuming that the generator's output is known to be good. By the same token, if the scope is in good shape, the generator's signal can also be checked in this manner. The curve in Fig. 2D displays a fairly flat response up to 4 mc. Bandwidth and response such as this would normally be expected in a wide-band scope.

Markers

Generally, the frequencies indicated on a service type sweep generator dial are not relied upon for calibration or accurately identifying various frequency points. In actual practice the sweep generator's dial is set to the approximate position of the desired set of frequencies, and then varied some more to center the response on the curve displayed on the CRT. Markers in the form of pips or dips from other more accurate signal sources are used to identify various points along the response curve. Some sweep generators have built in markers, others do not. Generators used for marking purposes usually have provisions for internal or external calibration, and often provide at least one crystal controlled frequency. An absorption type marker causes a dip to appear in the pattern at its frequency, as in Fig. 3. A 2 mc marker on a waveform which is about 5 mc wide is shown. Poor high-frequency response is also evident in this response curve. If this were a wide-band scope rated for

Fig. 6—Demodulator probe detects the signal, and leaves only half of the envelope. Out-of-phase condition in A is first corrected to appear as in B, then blanking is switched in to obtain C. Blanking is in, phase is out, in D, as indicated by partial loss of zero volt line. Waveform E is properly phased and blanked, zero-frequency point is at end of base line.



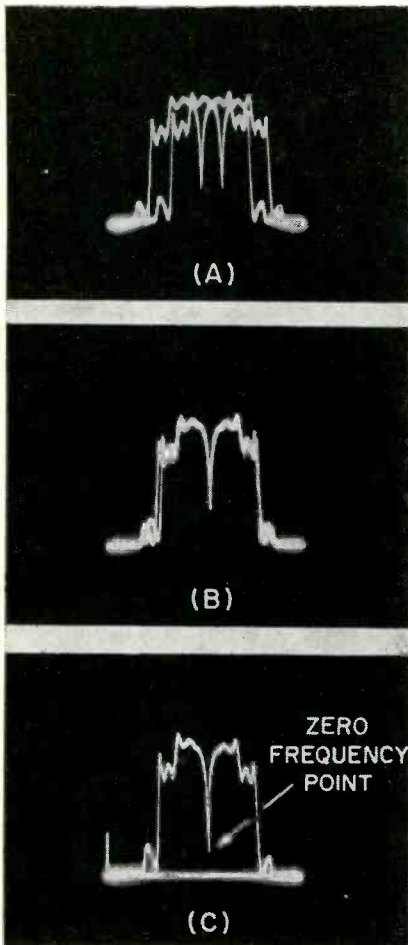


Fig. 7—Jagged lines show unequal response. Out-of-phase signal at A is phased in B, and return trace is blanked in C.

flat response to 4 mc, and if the generator's output were known to be good it would be an indication of trouble with the scope's vertical amplifier.

Linearity

Fig. 4 is a composite of four separate photographs, one for the waveform without markers and one for each of the markers imposed on the waveform. As a matter of interest to some shutter fans, the photos were taken separately, and the four negatives were stacked to make one picture. Of course, it would have been possible to feed three markers in at one time, and make only one negative. Other ideas may suggest themselves, but the important thing here is the story these photos tell.

Three absorption markers placed progressively at 100 kc, 200 kc, and 300 kc show two faults in the scope's response. First, high-frequency response is very poor. Secondly, the 100-kc intervals in the pattern are not uniformly spaced across the screen, because the horizontal am-

plifier is non-linear. Non-linearity may be due to low plate voltage, improper bias, or defective tubes in the horizontal amplifier.

To obtain a frequency response display, that runs from 0 cycles and up as in Fig. 2C, it is necessary to adjust the generator's tuning control to bring the zero-frequency point to the end of the base line. If the generator is mistuned, the zero-frequency point will not appear at the end of the pattern, but somewhere else on the base line. Fig. 5 shows the zero-frequency point in the center.

Demodulation

Frequencies used to check the scope's response were of necessity below 5 mc. To check the output of a sweep generator operating at TV carrier and i-f frequencies requires the use of a demodulator probe between the generator's signal output and the scope's vertical input. The action of the probe is immediately evident in that half the waveform is gone, as is the high frequency component, leaving only the envelope, as shown in Fig. 6. The sharp dip in the waveform, in this case, is due to the generator's frequency variations through zero frequency. Frequency response characteristics of the probe should also be taken into consideration, when performing this type of test. Here again, when the pattern is first obtained the phasing control will probably require adjustment. The display in Fig. 6A is out of phase. An in-phase condition is shown in Fig. 6B. Turning on the blanking control produces a zero-volt reference line, as shown in Fig. 6C. The importance of correct phasing adjustment even when blanking is on, and one wave trace is elimi-

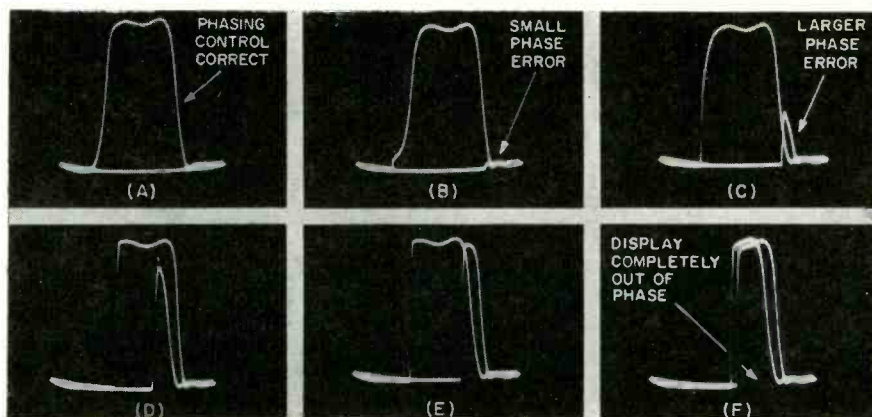
nated, can be seen in Fig. 6D. When the phasing control is correctly set, and the generator's center-frequency control is adjusted to bring the zero-frequency point to the end of the base line, the display will appear as in Fig. 6E. It does not make any difference if the zero-frequency point is tuned to the left-hand or the right-hand end of the base line. A good sweep generator will show a reasonably flat response in this test. The flatness shown in this figure is acceptable.

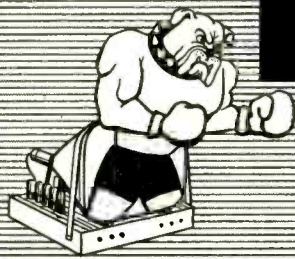
Frequency response is not always flat throughout the bandwidth of many amplifiers. Fig. 7A to 7C shows the response curve obtained from a video amplifier. The sharp dip shown here is also the result of going through zero-frequency, and the generator can be adjusted to bring this point to one end of the line or the other, as in the previous test. To obtain the trace in Fig. 7C, it was necessary to adjust the phasing control, first to change the trace from 7A to 7B, and then turn on the blanking switch to get 7C.

Confusion

The importance of adjusting the phasing control before switching on the blanking circuit to avoid confusion is further emphasized in Fig. 8. Keep in mind that blanking is on, and that the zero-volt reference line is present in all of the photos in this figure. An i-f response curve is shown from 8A to 8F in various out-of-phase conditions going from in-phase and gradually getting worse. Fig. 8F, which is almost completely out-of-phase actually looks like it is almost in-phase. The tell-tale clue is the loss of the zero-volt reference line. •

Fig. 8—Confusion may result if phase is not correct before blanking is switched on. Absence of the base line is the clue. Trace F could be mistaken for an almost in-phase signal.





"Tough Dog"

Corner



Difficult Service Jobs Described by Readers

Vertical Jitter

A Hallicrafter 21" table model, 21T320, was brought in for reconditioning. This set is a close relative to the Crosley "Super V" of a few years ago. After replacing the CRT, selenium rectifiers, filters and several small tubes, we expected the set to perform as good as new. However, the vertical hold was poor and the picture had a pronounced vertical jitter. These symptoms disappeared when the contrast control was set at minimum but then the picture was too washed out to be enjoyed.

This set uses a double triode sync separator and clipper circuit, the first triode is part of the 6AN8 video output and the second is the triode section of the 6U8 sound i-f amplifier. The scope showed no sync compression at the video diode load, nor at the video output, or input to the sync section. When the output of the sync section was viewed, the vertical sync component was seen to disappear as the contrast control was advanced. It appeared that the fault was in the sync section. Voltage checks and tests of component values disclosed nothing. Tube checking by substitution showed that one tube out of the batch available performed slightly better than the others, but it was obvious that I was not getting to the root of the trouble.

Once more I connected the scope to the video diode load resistor, and carefully studied the waveform at the horizontal frequency, a sharp spike riding on top of each horizontal sync pulse and having a peak voltage about equal to the sync-to-blanking amplitude, was seen. It was picked up somehow from the horizontal scan circuitry as its position could be shifted by moving the horizontal hold control. When the horizontal oscillator went out of sync the spike left the horizontal sync pulse and moved around among the video information. I removed the horizontal oscillator tube and the spike disappeared.

The spike was being induced into the signal circuits somewhere ahead of the detector. With the antenna removed and no signal coming in, the spike was still present, but its amplitude was reduced considerably. With the tuner tubes removed from the circuit, it was still there. When the first i-f tube, a 6CB6, was removed, the spike disappeared. The grid coil of this tube is mounted on the tube side of the chassis, not too far from the deflection yoke, and is unshielded. A wire leads from it to the tuner, a distance of four or five inches, and runs by the vertical output transformer. By dressing this wire away from the transformer, and holding my hand between the coil and the yoke, so as to shield one from the other, I found that I could make the spike disappear. A thin piece of aluminum placed around the under part of the yoke, and held in place by the yoke clamping screw, offered sufficient shielding. The set then operated in a normal manner.

Before permanently installing the shield, I made sure that the grid circuit of the tube and the surrounding circuitry were normal, particularly the agc line, and could find no fault anywhere. What surprises me is that the trouble showed up in this individual set, and not in other similar sets which I have serviced.

When the trouble had been run down and corrected, it was not too difficult to explain the peculiar action of the sync circuits. The first triode is applied with a positive-going composite sync and video signal and acts as a separator, accepting the most positive part of the waveform. Normally, it would pass the sync pulses and reject the video signals, but in this case it was passing the spurious spikes and rejecting everything below them, including most of the sync. Little or no vertical information was passed to the sync section. When the contrast control was set at minimum, the peak ampli-

tude of the signal to the sync separator was considerably reduced. The clipping action had less effect and more of the sync signals were passed. —William Welsh, Ottawa, Ontario, Canada.

Shield That Tube!

An Admiral TV chassis 20BY4PS, was recently brought in for repair with the following symptom: A picture could only be obtained on the strongest channel, which is Channel 3 in our area. The picture had both ghosts and halos. Channel 9, the next strongest station, came in with little or no picture. The tuner tubes were checked and found to be good. The agc tube, a 6BH8, was checked and found OK. AGC voltage was checked and found to be a little low. The other tubes in the set were checked and some substitutions were made, but to no avail. Other checks were made, and after an hour, while digging into the B+ circuit, an improperly soldered 1500 ohm resistor, which had also changed its value to 150,000 ohms, was discovered. A new resistor was installed and the set turned on. Now there was no picture at all. The sound would start to come on and then cut out. The 6BH6 agc tube began to glow red after a few minutes. The agc voltage on the i-f control grids was a negative 35 and the 6BH6 plate had minus 300 volts. Many more hours were spent soldering and unsoldering components in the agc circuit, but for naught. Much later I discovered that when my hand passed over the 6AM8, the third video i-f amplifier and video detector, the agc voltage dropped back to normal. A tube shield was installed and the set snapped back to normal. Parasitic oscillations, feedback, and undesirable interstage coupling, all resulted from an unshielded 6AM8. —M. E. West, Lenoir, N. C.

New Hi-Fi Tuner Standards

Meaningful Ratings For Comparison And Evaluation Of Tuners

Are Possible Only When Standard Tests And Methods Prevail

GARY WAYNE

• Modern high fidelity tuners, as in most other types of electronic equipment, vary considerably in their manner of operation. It is difficult to set down a single test procedure for each fundamental characteristic and have the procedure include all the allowances that should be made for peculiarities of different sets. The number of these characteristics and the many methods possible to derive them require some standardization in order to avoid confusion; make it possible to evaluate or compare one tuner with another; and duplicate conditions of test to verify specifications.

Characteristics to be considered for either or both AM and FM tuners are:

- Tuning Range and Frequency Calibration
- Usable Sensitivity
- Volume Sensitivity
- Capture Ratio
- Selectivity
- Amplitude Modulation Suppression
- Frequency Response
- Distortion
 - Variation of Output
 - Variation of Modulation
 - Variation of Input Signal
 - Variation of Modulation Frequency
- Spurious Response
 - Image Response
 - I-F Response
- Hum & Noise
- Frequency Drift
- Radiation
- Automatic Frequency Control
- Squelch Control
- Standard conditions for determination of characteristics have also

been prescribed. Table 1 shows carrier and modulation frequencies to be used as well as the output reference level. Unless otherwise specified all controls are set in their normal position; afc, if present, is set for minimum, squelch for maximum sensitivity, and volume for maximum. In the case of tuners equipped with extra stages of audio amplification, the volume control is set for 20 db attenuation.

Dummy Antenna

For FM, input signals are expressed in terms of input voltage measured in microvolts across a dummy antenna and load as shown in Fig. 1. Intent of this arrangement is to simulate the mean value of the impedance of a typical transmission line connected to an antenna. Where loop antennas are used in AM tuners, field intensities are measured in microvolts per meter. The dummy AM broadcast band antenna for an open single wire, including the lead-in, having an effective height of 4 meters is a 200 μf capacitor.

Usable Sensitivity

Usable sensitivity is determined at the point or level where the output rises 30 db as a result of the standard-test-modulation signal. FM is expressed as: X number of microvolts for 30 db usable sensitivity; for AM, the level is 20 db. This test indicates the relative freedom from objectionable internal noise during pauses in modulation, when receiver noise is least likely to be masked by modulation. This test also serves to indicate the relative freedom from

distortion during periods of maximum modulation. Another way to state this is—it is the lowest standard-modulated r-f test signal that causes a 30 db rise in output signals, in an FM tuner and a 20 db increase in an AM tuner, as a result of the

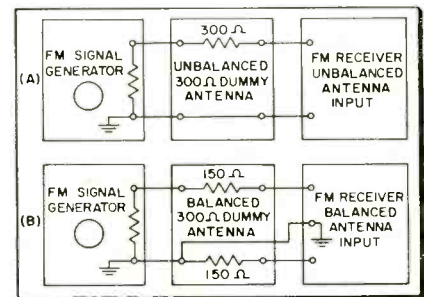


Fig. 1—Standard Dummy Antennas for balanced and unbalanced loads used to simulate the mean value of an antenna line.

modulation. The signal is passed through a 400 cycle null filter, and the output level is measured with the filter in and out of the circuit.

Volume Sensitivity

Volume sensitivity is the ability to maintain a usable audio level over a wide range of signal intensities. A 100,000 μv modulated test signal is fed into the tuner and the output audio voltage is measured in terms of db with respect to 1 volt. The generator's signal is then reduced until the tuner's output signal is down 20 db from this point. The signal strength of the generator in this second position, expressed in microvolts is the volume sensitivity.

Capture Ratio

The capture ratio test is intended to show the effect of an interfering

IHFM Tuner Standards Committee

The following is a list of manufacturers and their chief engineers or executives on the Sub-Committee for Tuner Standards set up by the Institute of High Fidelity Manufacturers, Inc. Among those contributing to the work of this committee were Al Forman, Editor, and Robert Cornell, Technical Editor of *ELECTRONIC TECHNICIAN* Magazine.

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signal of the same frequency as the desired signal in an FM tuner. It shows the inherent effects of the detector, limiter and AVC circuits. This test is probably the most complex in the lot, it requires two signal generators tuned to the same frequency, one of them modulated. Repeated tests are performed with 30% and 100% modulation and at different signal levels in 20 db steps, to ascertain this characteristic for different conditions of operation. To obtain this rating, modulate one generator and adjust its output to obtain 30 db usable sensitivity. Inject just enough unmodulated signal from the second generator to cause a 1 db drop in the audio output. Note the signal amplitude from the second generator, then advance the second generator's until the audio has dropped a total of 30 db, and note this second value. The ratio of these two values are converted to db, and then divided by 2. This last number

is the db capture ratio. It actually gives the ratio of desired to undesired signal required for 30 db suppression of the undesired signal.

Selectivity Test

Tests for selectivity of FM tuners are similar to the capture ratio program, except that instead of using the same carrier frequency for both generators, a separation of 200 kc and 400 kc are used to determine adjacent and second channel interference. For AM tuners, one generator is used. Its signal is adjusted for a 20 db usable sensitivity test input and then detuned 10 kc from the tuner resonance. The generator's output is adjusted until the same audio output is obtained, using standard test modulation. The ratio of the two signal levels is converted to db. Additional tests are performed for 2nd, 3rd, 4th, etc. channels by detuning the generator in progressive

steps of 10 kc on each side of resonance. The tests continue up to 100 kc off resonance, or 80 db selectivity, or 100,000 μ v signal generator output, whichever is the smaller. The rated selectivity is the ratio of the two test signals expressed in db for 100% modulation in FM tuners, and for 30% modulation in AM.

Many of these tests are new, and their significance is not as yet comprehended in all quarters. Still other tests in these standards are old reliables and are self descriptive as to intent and purpose. Much to the credit of the IHFM Standards Committee, the worst figures obtained in these tests, where more than condition is prescribed, are reported. It is also significant that the standard test modulation for FM was selected at the 100% level. It would have been possible for certain types of distortion and other defects to go undetected at lower levels of modulation. Additional material and further discussion of this standard is scheduled for early publication in *Electronic Technician*.

Much work remains to be done by just about all segments of the high fidelity industry. Implementing present advancements, developing new and better techniques simplifying procedures, improving equipment, and dissemination of information, are a few of the recognized tasks that lie ahead. •

Table 1—Standard carrier and modulation frequencies for AM and FM tuners. Output reference level for tuners with excess audio amplification is 20 db below maximum output.

Carrier Frequencies				Modulation Frequency Percent		Output Reference Level
AM	600 KC	1,000 KC*	1,400 KC	400 CPS	30%	1 volt into a 500,000 ohm load shunted by a 500 μ f capacitor
FM	90 MC	98 MC*	106 MC	400 CPS	100%	
Maximum rated deviation = 75 KC						
* Standard mean carrier frequency for use when measurements are to be made at a single frequency only.						

Radio Silence For Small Office Machines

Practical Solution For Sparks, Current Surge, And Other Man-Made Interference Problems Are Possible

INTERFERENCE QUIETING

Spark

Absorber

Surge

Absorbers

Depeakers

Harbors

Line Filters

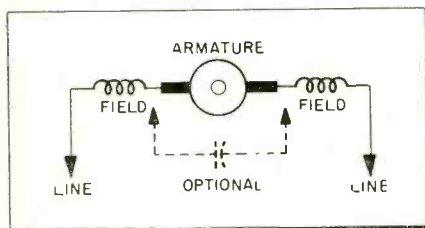
Radiation Shielding

Grounding

RONALD L. IVES

• Radio interference from small office machines and appliances has been a minor problem for many years, but did not become acute until after World War II, when widespread use of TV, plus a great increase in the number of motor-driven office appliances, coincided. This problem is graphically demonstrated many times a day in Joe's Bar and Grill, where the TV program "snows out" every time Joe rings up a sale. Similar interference to raysonde, radar, and other services now constitutes a safety problem in many areas; and the "nervous breakdown's caused in computers by impulse noise from other office equipment increases business costs greatly in some installations.

Fig. 1—Connecting the armature between the field coils reduces commutation noise.



Impulse noise can be eliminated from almost any A-M communications device by simple means, such as a series or shunt diode noise limiter; and in extreme cases by special noise filters. FM receivers are inherently immune to impulse noise from antenna to discriminator, but not in the a-f stages. Some of the better TV receivers are substantially

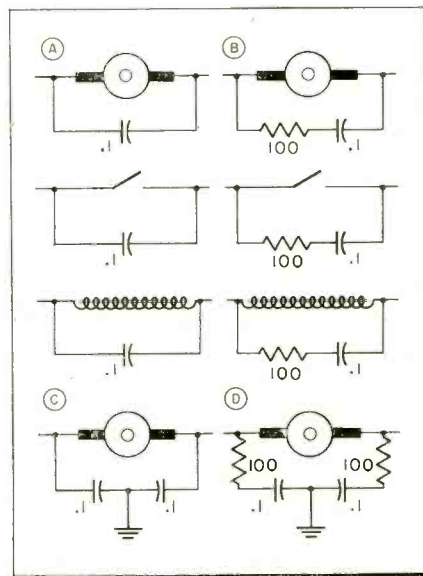


Fig. 2—Typical transients, noise suppression and spark absorber circuits. Resistors increase damping action, and reduce resonant peaks.

immune to most impulse noise, but many are not.

It is true that a considerable amount of the impulse noise present in a given area is transmitted over the power lines, and can be reduced or eliminated, for a single sensitive device, by use of line filters, Faraday-shielded isolation transformers, etc. This requires a filter for each piece of equipment in the installation; worse still, a different filter may be required for each. In contrast, proper corrective measures applied at the source of the impulse

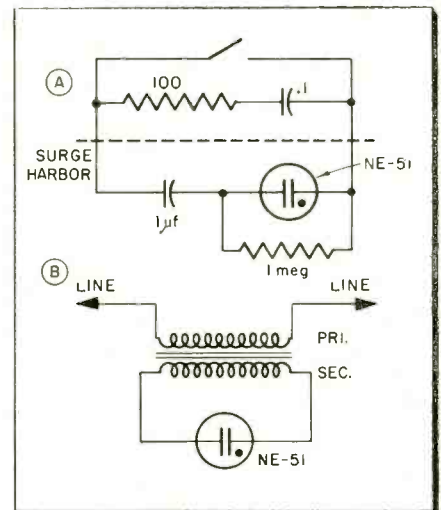


Fig. 3—Voltages in excess of the firing point of the neon lamp are absorbed. Circuits are called harbors, depeakers, surge eaters, etc.

noise will eliminate the trouble for all devices in the vicinity; and will effectively stop complaints of interference from adjacent installations.

A basic step in eliminating r-f noise emission from any small appliance is to ground the frame and case. In many of the older appliances the frame or case is electrically "floating" and serves as an excellent radiator. Many of the new appliances are equipped with a ground wire in the cord, and a three-pronged plug, to permit grounding. This is also an excellent safety measure against shock hazard. Should the power circuit become shorted to the case, the fuse or circuit breaker would usually open. Protection is provided only if the ground wire is actually grounded, and not dead-ended somewhere in the electrical system. Dependable grounds in most areas are the water supply system, or a rod driven into ground which penetrates the dry-season water table. Not all water pipes are suitable grounds.

Commutation noise in small motors

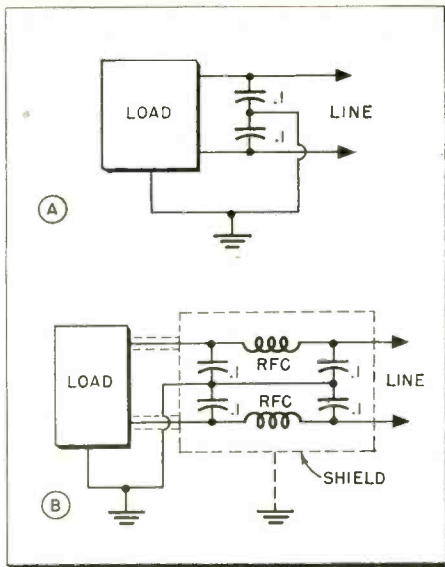


Fig. 4—Supply line filters mounted close to the noise source do much to eliminate the need for individual filters at each electronic device bothered by interference.

can be greatly reduced by connecting the commutator between the two halves of the field coil as shown in Fig. 1. The electrically silent operation of some vacuum cleaners is due to use of this circuit. The field coils act as chokes to suppress commutation surges. This type of trouble is considerably worse than it need be because of the insistence of manufacturers and purchasing agents on using ac-dc motors in office machines, even though, in large areas of North America, dc is not available. Entirely satisfactory induction motors, for most functions can be had.

Further reduction in commutation and switching noise, and virtual elimination of load-change transients, is brought about by use of spark absorbers. These consist of a capacitor connected across the points where a spark would otherwise occur. Some spark absorbers incorporate a resistor, to increase damping and prevent sharp resonances, as in Fig. 2A and B. Nonlinear resistors are used in a few recent designs, with marked success in some cases. When both sides of an inductive circuit are electrically above ground, or where

the ground point cannot be determined by the manufacturer, a symmetrical spark absorber is desirable, as in Fig. 2C and D. An advantage of this circuit is that spark absorption takes place regardless of power line polarity. It should be noted that if the center-tap to ground is omitted, spark-absorption is halved, and the center tap is hot with respect to ground by half of the supply voltage.

More complex spark absorbers are occasionally needed, and take the form of a surge harbor with a bleeder, as in Fig. 3A; or a current transformer and surge eater, as in Fig. 3B. Any surge of higher potential than the striking voltage of the NE-51, which is about 85 volts, charges up the 1 μ f capacitor and is thus de-peaked. The capacitor is gradually discharged through the 1 megohm resistor. However, this circuit is not suitable for surges that repeat rapidly because of the relatively long time constant. For rapid changes the circuit shown in Fig. 3B is more suitable. High voltage peaks, induced in the secondary of the transformer by line surge, is dissipated when the neon bulb conducts. The faster action of the neon lamp-transformer combination is more suitable for equipment having a rapidly varying load, as is the case with electro-magnetic clutches, elliptical gearing, geneva movements, etc. The transformer may be a low-voltage, low-reactance filament type, or even a small output transformer. A high-current gas tube, such as a VR-150 may be used, if necessary, instead of the neon lamp. In a number of special applications, contact protection and spark absorption is accomplished by the use of zener diodes, or back-to-back selenium rectifiers made especially for the purpose. Happily, almost any device which absorbs or suppresses surges, also extends the useful life of the contacts.

It is impractical to fit a spark absorber to each set of contacts, and a surge absorber to each inductance in many complex appliances and office machines. Overall filtering of the ap-



Fig. 5—Power and ground lines are permanently connected to this noise source to avoid compromising the work of the filter, after the technician leaves the job.

pliance supply line is the next best expedient. Line filtering is justifiable not only on a cost and space basis, but also because, in some instances, surges developed in one part of the device cancel those produced in another. Some surges are absorbed internally. Two common supply-line filter circuits are shown in Fig. 4. Because one side of the supply line is commonly grounded, the filter is symmetrical only on paper, but filtering action still takes place. Shielding the chokes in the filters is advisable, as is the line connecting the filter to the appliance. In a few instances, tuned r-f filters can be used, to reject a specific frequency to which adjacent equipment is sensitive. A shunt crystal is too sharp for most uses, but a series-tuned circuit connected across the line, or a pair of shunt traps, one in each side of the line, are usually effective.

A number of good supply-line
(Continued on page 70)

Fig. 6—The wire bond at the lower left mounting bolt completes the ground circuit between the machine and stand.

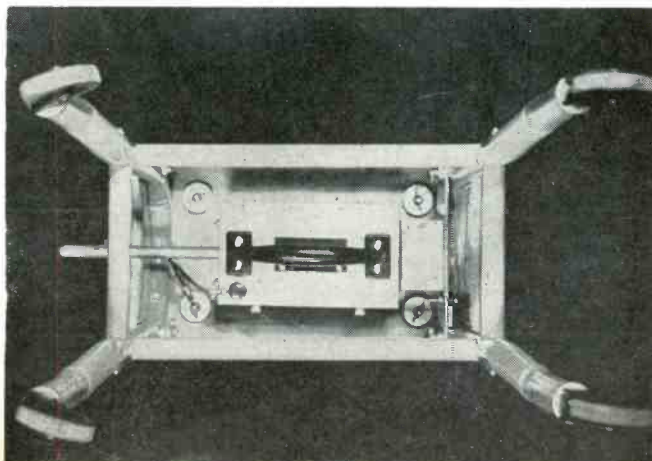
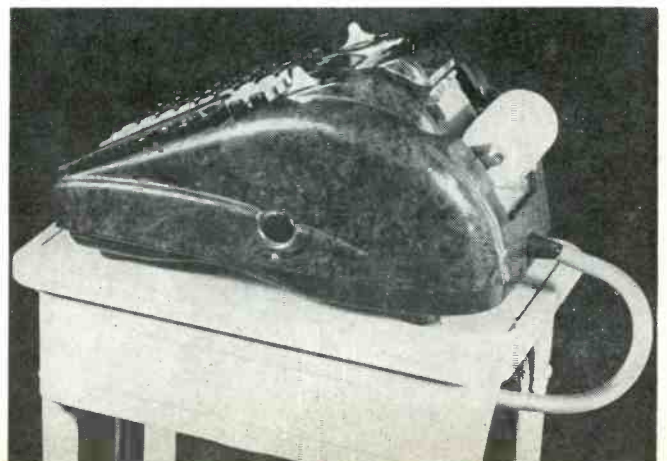


Fig. 7—Radiation from the line cord can be reduced and the cord protected by the use of a screen-door spring.



Legislation Proposed In New York

Would Test And Certify TV Technicians

• This is the time of year when law makers throughout the country are busy. There are several bills being proposed in various states. Most of the technicians associations are clamoring for action either to get a licensing bill started, or if one has already been proposed, to have it passed. Favorable reports from those areas where licensing has been in effect, has further encouraged this activity. On the other side of the fence, some organizations are opposed to legislation of any kind and some complaints of discrimination have been lodged. As yet no definite pattern of TV licensing laws has developed on a nation wide scale. New York State has a couple of bills in the hopper. One of them, is a regular licensing proposal sponsored by Assemblyman Moses M. Weinstein, which would set up minimum standards and other controls, but probably will not be considered favorably in the state Senate and Assembly. The other bill formulated by the State Attorney General and sponsored by Senator Joseph F. Perriconi and Assemblywoman Dorothy Bell Lawrence, has a much better chance of being passed, and is the one examined here in detail.

Because New York State is often looked upon as a precedent maker, and its legislation is sometimes used as a guide by other states, its activities are attracting much attention. The Attorney General, in an effort to establish the need for legislation, appointed the Committee to Promote Fair Practices and Ethical Standards in the TV Supply and Repair Industries. The Committee consists of representatives from manufacturers, distributors, technicians and the public. Present at the last Committee meeting on February 11, 1959 were: (Chairman) Arthur Startz, V.P., Better Business Bureau, Inc. of N. Y.; Robert Cornell, President, Certified Electronic Technicians Association; Samuel E. Ewing, Radio Corp. of America; Philip Fleishman, Metropolitan Electrical Appliance Dealers

Association; Robert Larsen, President, Empire State Federation of Electronic Technicians Association; Robert Powell, President of N. Y. Metropolitan Chapter of National Electronics Distributors Association; W. M. Reynolds, General Counsel, Electronic Industries Association; Donald H. Stover, Electronic Industries Association; and Gerald Sohne, National Tube Testers Association. Also present was Special Assistant Attorney General Joseph Rothman who has done much to facilitate the preparation of the bill, and act as a liaison officer between the Attorney General and the Committee.

Certification Program

The proposed bill, as it stands at this moment, is a voluntary Certification program, and not licensing. In view of the law makers' rejection of licensing in previous years, the Certification Bill is looked upon by most of the technicians Associations as a compromise, but nevertheless a step in the right direction which may eventually lead to licensing. It is significant that certain segments of the industry which have heretofore opposed licensing legislation have not voiced any serious objections. What started out as a noisy hearing, with a battle over the merits of printed wiring and other industry practices, changed its complexion completely once a formal committee was established. The cooperation and desire to do the right thing, which prevailed among the various members of the Committee reached such a high level, that even if nothing else is accomplished, the industry in this area will benefit immeasurably.

The bill provides for an advisory board of examiners of certified TV technicians under the Department of State, subject to the removal by the Secretary of State. The Secretary shall issue a certificate as "Certified Television Technician," to people of good moral character, who are at least 18 years of age, and who have

passed a prescribed written and practical examination. Examinations will be given twice a year for a fee of \$25.00. Should an applicant fail the first exam, subsequent tests will cost him an additional \$10.00 each time.

Before taking an exam an applicant must have completed a satisfactory course of study in the installation, repair, service and maintenance of TV receiving apparatus and have at least 2,000 hours of practical experience. The requirement for a course of study may be dispensed with if the applicant can show an additional 2,000 hours of experience. A man working 48 hours a week could complete the 2,000 hours in about 10 months. The written test may not be waived.

Provisions for revocation or suspension of certificates by the Secretary of State are standard and include such items as fraud, deceit, habitual drunkard, incompetency, etc. Standard procedures for review are also included. An appropriation of up to \$25,000 for expenses to carry out the provisions of this act is asked for. Money derived from this bill will be paid into the general fund.

There is nothing in this proposed act to prohibit non-certified technicians from doing business; nor are there any renewal provisions. Once an applicant is certified, his certificate is good indefinitely. The usual grandfather clause has also been left out, since certification is not compulsory. The experience requirements for eligibility may be deemed to be too easy by some technicians, but this may or may not be offset by the type of examination prescribed. The success of any legislation depends upon able management and administration. While many items are not specifically spelled out, the Secretary of State and the Board of Examiners can adjust or modify regulations and exams, within certain limits, to protect the interest of the public, and to help the TV technician gain a respected niche in the community. •

SHOP HINTS



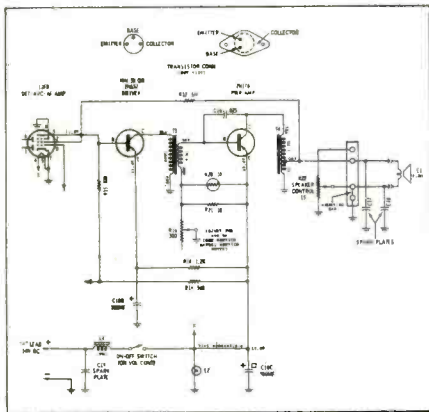
Tips for Home and Bench Service

In-Circuit Transistor Current Check

Adjustment of correct output transistor current is important because incorrect adjustment can:

1. Shorten the life of the transistor.
2. Cause limiting (and distortion) during negative signal peaks.
3. Cause cutoff (and distortion) during positive signal peaks.

Adjustment of output transistor current is relatively simple and must be performed when the transistor is replaced. A convenient method that



An ammeter may be connected from collector to ground to measure the amplifier transistor current without disconnecting any parts.

can be used without having to disconnect any parts or using ohms law to calculate current flow, is to touch a 0 to 2 amp d-c ammeter between the transistor body and the heat sink or ground, as shown. This places the ammeter between ground and collector. Since the ammeter is much less resistant than the output transformer, virtually all the collector current will flow through the ammeter. The transistor current is then adjusted. In the Motorola auto radio

models CTA9X and CTM9X, as shown in the partial schematic, R-19 is adjusted for 360 ma at 12.6 volts d-c input or 440 ma if 14 volts d-c input is used.—*Motorola Inc., Chicago, Ill.*

A Sound Idea

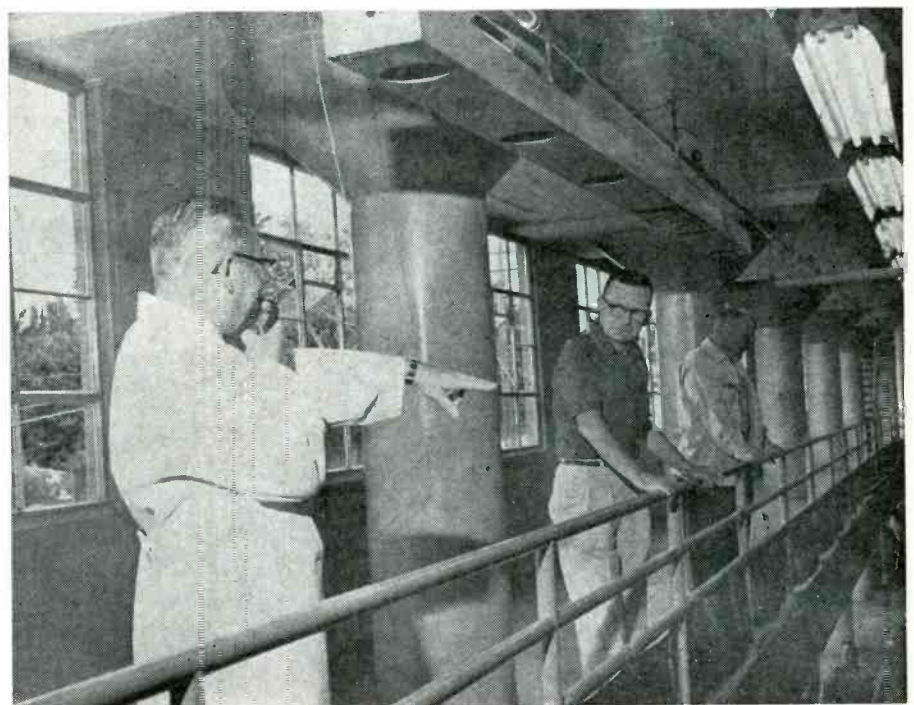
Overhead loudspeakers solved a tough sound coverage problem in the plant of Olympia Brewing Company. This public relations-minded beer manufacturer encourages the public to take a tour of the plant. Many people do visit the modern facilities in Washington's state capitol, Olympia.

A brewery is a noisy place, especially in the bottling department. The genial guide explains what goes on, and without a public address system he cannot be heard. If a high power amplifier were used, the employees would hear the guide's talk several times a day. Even in a noisy

department, stray sounds are distracting, especially where running machinery may sing out a warning that something is wrong by developing a new sound. John Andersen, who heads the company's electrical department, designed a sound reinforcement system which covers the visitors' gallery without interfering with the work area.

Six 7 inch p-m speakers are mounted in a 16 foot long wooden trough-like cabinet, which is 10 inches wide and 4 inches deep. The cabinet is suspended just above head level and the speakers face downward, as shown in the photo. A 10-watt amplifier mounted in the cabinet provides more than ample volume. Tube life averages more than a year and a half in spite of the fact that the amplifier is never turned off. The microphone is pulled down when it is to be used. A 7 inch reel which operates like a window shade stores the cord and keeps the mike out of the way when not in use.—*Leo G. Sands, Ridgewood, N. J.*

Overhead speakers confine sound to visitors gallery in noisy brewery plant, without disturbing workers below. Microphone is suspended from a 7" reel above.



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

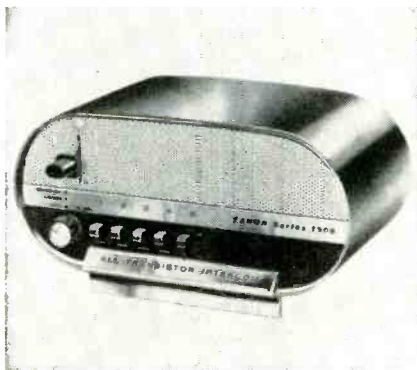
New Audio Products



For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon on page 47.

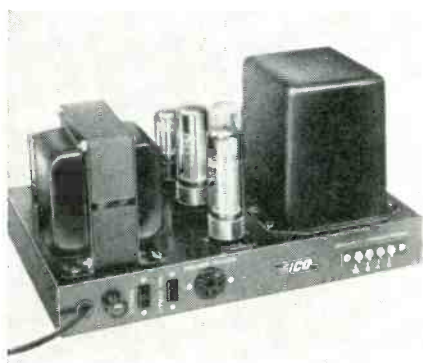
Fannon INTERCOM →

A line of all-transistor intercoms powered by either battery or a-c power, 1500 series, consists of a 6 and 12-station Masters with pushbutton selectors and a Selective Remote model. The equipment can be used in all-master, master-to-remote or intermixed systems. Each unit has four germanium transistors. A two-station all-transistor system is also available. The Master station has volume control and "stand-by-listen-talk" switch. Fannon Electric Co. Inc., 98 Berriman St., Brooklyn 8, N. Y. (ELECTRONIC TECHNICIAN 3-1)



Eico AMPLIFIER →

Model HF35 a 35-watt Ultra-Linear High Fidelity Power Amplifier employs a low-noise EF86 pentode voltage amplifier which is direct-coupled to a 6SN7GTB, a cathode-coupled phase inverter, driving a pair of EL34s in a push-pull, tapped-screen output stage. Harmonic Distortion, Below 1% at any frequency from 20 cps to 20 kc within 1 db of 35 watts; Sensitivity, 0.43 volt for 35 watts output. Kit \$47.95. Wired, \$72.95. Electronic Instrument Co., 33-00 Northern Blvd., Long Island City 1, N. Y. (ELECTRONIC TECHNICIAN 3-2)



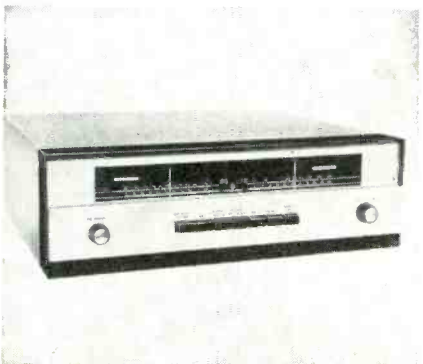
V-M STEREO PHONO →

Three units in one. The central module contains a Stere-O-Matic four-speed record changer with stereo cartridge and diamond stylus, a dual-channel amplifier with an audio power output of 15 watts peak per-channel, and a large record storage compartment. The modules can be joined or separated. Speaker systems may be adjusted either simultaneously or individually. There are seven inputs on the rear of the central unit. The Model 580, in walnut, lists for \$350 in most states. V-M Corp., Benton Harbor, Mich. (ELECTRONIC TECHNICIAN 3-3)



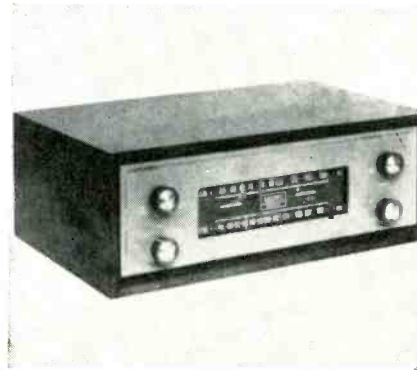
Harman-Kardon TUNER →

The Madrigal, model ST350, stereo tuner contains separate AM and FM sections for simulcast (stereo) reception, and provides both signal and power to drive the new MA350 Multiplex Adapter. Space to accept the adapter in the enclosure is provided. The AM Noise Filter, AM, AM/FM Stereo, Multiplex, FM, FM-AFC and Power Off—are operated by the push-button control center. \$199.95. Harman Kardon, Inc., 520 Main St., Westbury, N. Y. (ELECTRONIC TECHNICIAN 3-4)



Ampex HI-FI COMPONENTS

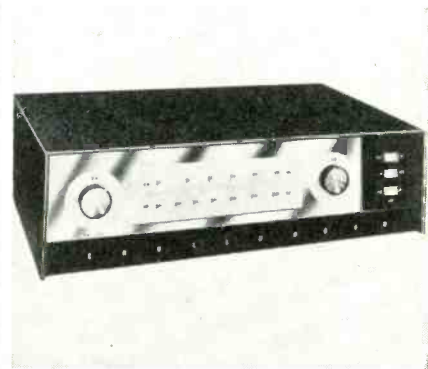
The Stereo AM-FM Tuner model 502 incorporates on a single chassis two independent tuners, for either or both AM and FM broadcast reception. AM circuitry includes broad and sharp selectivity positions. Tuner has 17 tubes,



visual tuning indicators, and flywheel tuning mechanisms. The new Audio Control Center/Preamplifier model 402 offers two channels equipped with push-buttons. Ampex Audio, Inc., 1020 Kifer Rd., Sunnyvale, Calif. (ELECTRONIC TECHNICIAN 3-5)

Bogen-Presto COMPONENTS

The Challenger AC210-A (not shown) stereo preamp-amplifier allows for complete flexibility in installation. It may be used as a regular 20-watt monophonic amplifier, or as a dual-channel 10-watt stereophonic amplifier, or as a 20-watt second channel plus dual pre-



amplifier for a stereophonic system. The model TC200-A, companion stereo FM/AM tuner provides three-way listening for monophonic AM or FM broadcasts, or AM/FM stereo reception with excellent sensitivity on both channels. Features AFC & AVC. Bogen-Presto Div. Siegler Corp., Paramus, N. J. (ELECTRONIC TECHNICIAN 3-6)

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2 Wire, Cable & Tubing: New catalog T-258, with price sheets, comprise 32 pages of listings, with specifications, of "in stock" wire, cable and tubing. (2B3: Birnbach Radio Co.)

3 Potentiometers: An 8-page, illustrated, brochure "Potentiometer Definitions" lists functional definitions. It is designed as a guide to help avoid misinterpretation of terminology between supplier and buyer. (3B3: Clarostat Mfg. Co.)

4 Cartridges: "Application Considerations in the Use of Stereo Cartridges" is a new 16-page booklet (EP-681). Subjects include: factors influencing stereo performance; tracking force; loading; problem diagnosis; connections; and wiring practices. Practical applications are illustrated. (4B3: General Electric Co.)

5 Rectifiers & Diodes: A new 16-page short form catalog gives ratings, electrical characteristics and descriptive data on 405 types of sili-

con and selenium rectifiers and diodes. (5B3: International Rectifier Corp.)

6 Generators: A new, portable standard signal generator, specially designed for the mobile communications industry, is covered, with detailed specifications, in bulletin 560. (6B3: Measurements, McGraw-Edison Div.)

7 Receivers: Crystal controlled mobile FM receivers, models MC-40 and MC-160, are illustrated and technically described on a new catalog page. (7B3: Monitoradio Div. I.D.E.A., Inc.)

8 Speakers: A new series of speaker enclosures and an integrated speaker system, designed for hi-fi stereo reproduction, are covered in descriptive literature. (8B3: North American Philips Co.)

9 Electronic Parts: A new 400-page 1959 electronics catalog has five sections. Includes: components; test equipment; outdoor and indoor parts and accessories; and phono and audio parts and accessories. (9B3: Philco Corp.)

10 Cartridges: The stereo custom Dynetic phono cartridge is described in a new illustrated data sheet. Specifications, mounting, con-

nections, phasing, associated equipment, speaker placement and stylus replacement are included. (10B3: Shure Bros.)

11 Stereo: Hi-fi stereophonic reproduction is explained in a new pocket-size booklet, "Stereo Simplified." It is designed to help consumers in the purchase of new stereo equipment or in converting present monophonic sets. (11B3: Sonotone Corp.)

12 Stereo Converter: 2-page bulletin describes "Stereo-Ette Gold Bug" which converts mono phono to stereo by transmitting second channel to AM radio now in use. No extra speaker or amplifier needed. (12B3: Stereo-Ette Co.)

13 Testers: Catalog No. 38-T describes the firm's latest electronic, electrical, radio, TV and industrial testers. (13B3: Triplett Electrical Instrument Co.)

14 Speakers: A new, colorful, illustrated, 16-page brochure is a guide to hi-fi stereo and monophonic speaker systems and components. Contains practical suggestions helpful in building or improving a mono or stereo hi-fi speaker system. (14B3: University Loudspeakers, Inc.)

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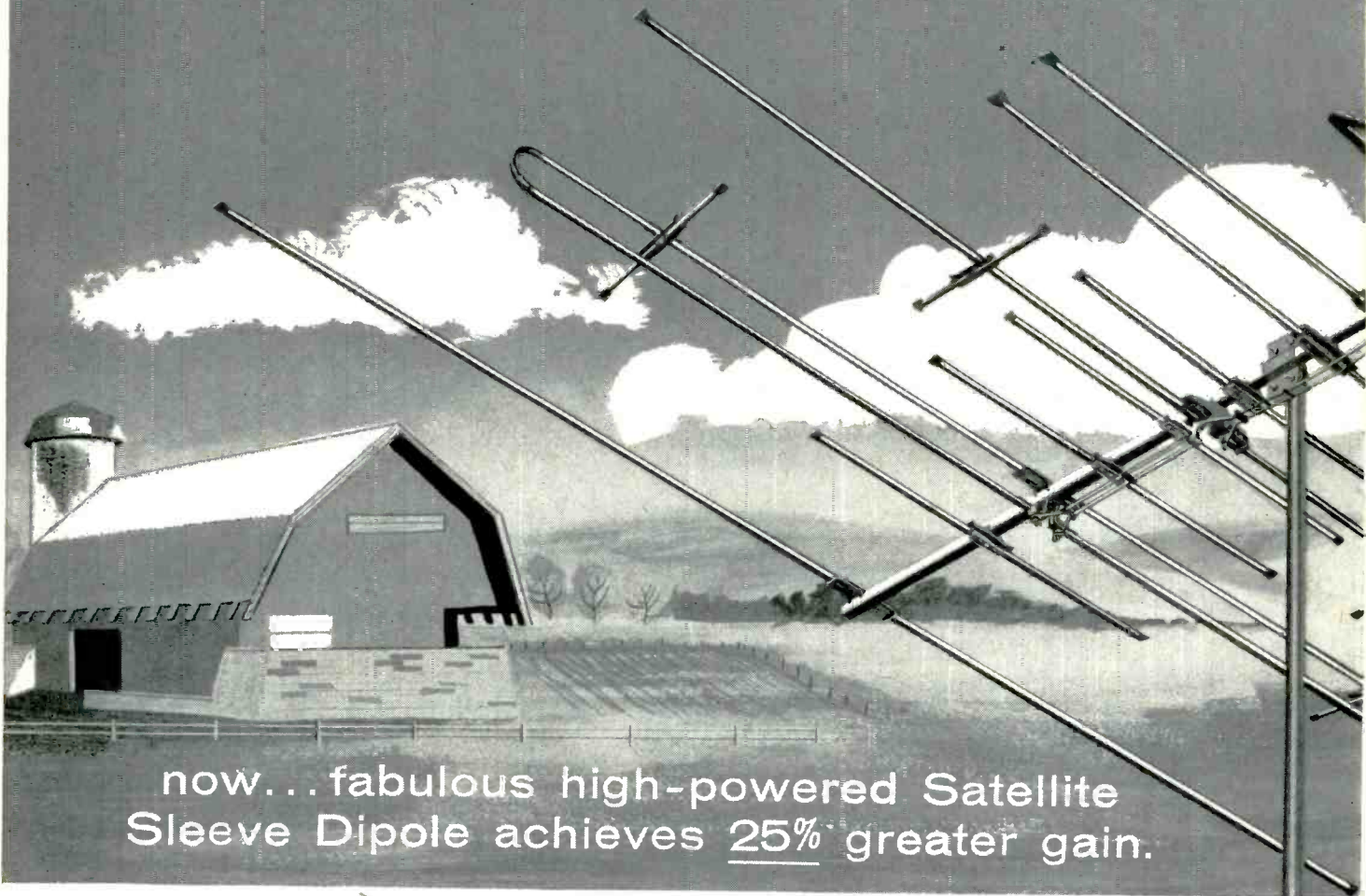
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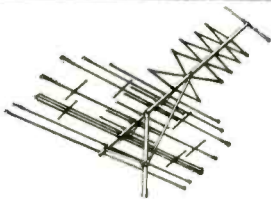
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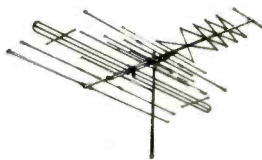


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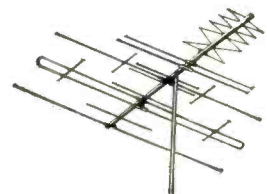
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AX911 anodized

POWER-HELIX



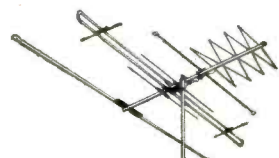
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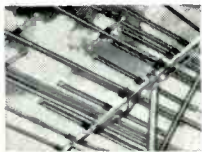
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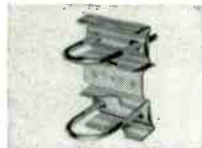
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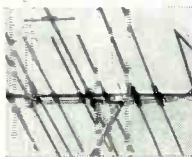
- Highly directive microwave helical probe (based on satellite telemetering antenna principles) pin-points stations—sidesteps ghosts.



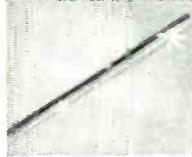
- Double U-bolt mast assembly freezes antenna on target for rock-steady reception.



- 1/2 inch seamless elements. All elements over 30 inches reinforced with 15 inch aluminum dcvels.



- Non-corrosive aluminum harness network made of rigidized busbar. Aluminum screw and nut take-offs insure permanent maximum signal transfer.



- Available in regular or gleaming diamond-hard Gold Anodized aluminum.

- Spearheaded by spectacular national JFD advertising for a record service-dealer Harvest of Profit.

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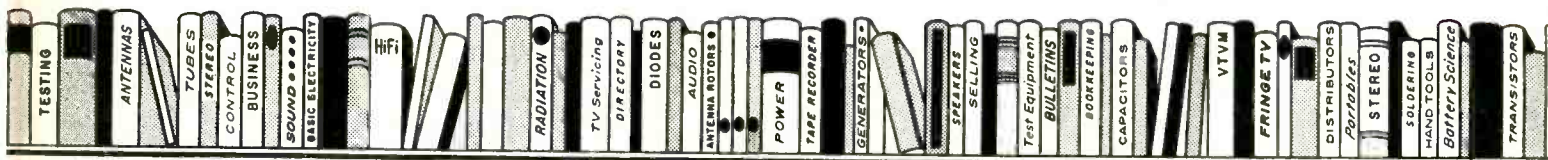
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INDUSTRIAL CONTROL CIRCUITS

By Sidney Platt. Excellent starting point for TV technician interested in learning about industrial electronics. Non-mathematical text explains circuitry and operation of power controls, relays, timers, photoelectric devices and instrumentation found in factories. Practical applications shown. Soft cover, 200 pages. Price \$3.90.

REPAIRING HI-FI SYSTEMS

By David Fidelman. How to find and correct troubles in hi-fi equipment with either little or elaborate test equipment. Among the many subjects covered are servicing amplifiers, preamps, tuners, tape recorders, changers, pickups and speakers. Construction and custom installations are discussed. Soft cover, 212 pages. Price \$3.90.

VACUUM TUBE CHARACTERISTICS

By Alexander Schure. This compact book clearly explains how tubes work. Electron emission, characteristic curves, amplification factor, transconductance, etc., are discussed. In addition, analytical fundamentals such as load line plotting are covered. Soft cover, 96 pages. Price \$1.80.

SHOOT TV & RADIO TROUBLE FAST

By Harry G. Cisin. The first part of this book relates to symptoms, faults and remedies for ac-dc radios. The second part covers TV, with each practical test and repair explanation related to a specific problem. Printed circuits are discussed. Soft cover, 40 large pages. Price \$1.50.

BASICS OF DIGITAL COMPUTERS (3 vols.)

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By Alexander Schure. Divided into five major sections, this informative book covers power transfer, impedance matching devices, matching at audio and r-f, and matching in transistor circuits. Complete with tables, schematics and computation examples. Soft cover, 128 pages. Price \$2.90.

RADIO OPERATOR'S LICENSE Q & A MANUAL

By Milton Kaufman. This sixth edition gives you the information you need to pass FCC license examinations. In question and answer form similar to actual FCC tests, all eight elements are covered, including law, radiotelephone, radiotelegraph, aircraft and ship radar. Abbreviations, code, etc. included. Hard cover, 736 pages. Price \$6.60.

HOW TO SERVICE TAPE RECORDERS

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STEREOPHONIC SOUND

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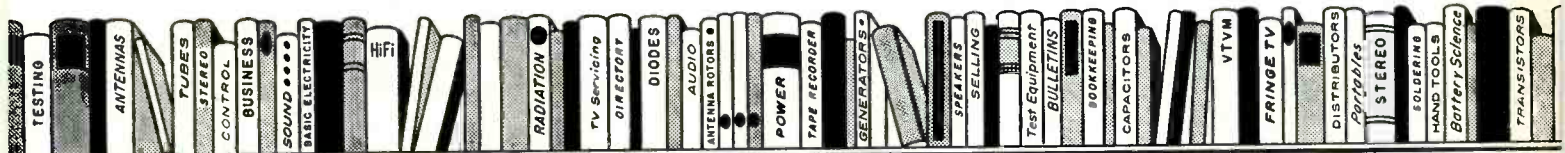
OBTAINING & INTERPRETING TEST SCOPE TRACES

By John F. Rider. This handbook shows how to get the most out of your oscilloscope. Over 800 traces are shown, including sine, square, rectangular, trapezoid, sawtooth differentiated and integrated types. Explains scope connections, manipulating controls and test setups. Soft cover, 190 pages. Price \$2.40.

SMALL APPLIANCE SERVICING

By P. T. Brockwell, Jr. This volume gives you professional small appliance servicing techniques and business procedures. Illustrated instructions tell how to test units. Covers irons, toasters, mixers, roasters, coffee makers, waffle irons, rotisseries and others. A profitable sideline for TV technicians. Hard cover, 180 pages. Price \$4.50.

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SERVICING TRANSISTOR RADIOS

By Leonard D'Airol: After a brief discussion of fundamentals, the text goes into radio circuits, servicing techniques, tests, measurements and dictionary of transistor terms. Interchangeability chart covers a variety of close replacements, including number and type. Soft cover, 224 pages. Price \$2.90.

HOW TO RUN A SMALL BUSINESS

By J. K. Lasser. Here is a basic business guidebook for service dealers and other operators of retail and small manufacturing firms. Covers record keeping, avoiding frauds, tax management, credit sales, insurance programs, how to buy an established business, financing and other important topics. Hard cover, 400 pages. Price \$4.95.

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INTRODUCTION TO PRINTED CIRCUITS	\$ 2.70
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INTRODUCTION TO COLOR TV	\$ 2.70
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INDUSTRIAL ELECTRONICS HANDBOOK

By William D. Cockrell. This is practically an encyclopedia of industrial electronics, containing data from over 100 authorities. Covers computers, instrumentation, regulators, transducers, geiger counters, controls, automations and much more. For advanced technicians. Hard cover, 1408 pages. Price \$22.50.

TV CONSULTANT

By H. G. Cisin. Rapid TV troubleshooting methods used here pinpoint cause of problem according to 24 sound symptoms, 213 pix symptoms and over 75 raster symptoms. Checks for each problem are noted. Also presented are explanations of rapid alignment technique and UHF servicing. Soft cover, 70 large pages. Price \$2.

Also See New Books on Page 77

FREE!!

STATION LISTINGS BOOK

With every book order for \$7.50 or more, you will be sent—without charge—a copy of the 64-page reference book, "Jones North American AM-FM-Radio-TV Station Listings." It lists over 5000 stations from official FCC information. Covers the United States and possessions, Canada, Cuba, Mexico and West Indies. Stations are cross-referenced by geographic location, by frequency, and by call letters. Lists AM and TV network affiliations and AM operating power. A wealth of broadcasting information!

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| <input type="checkbox"/> Repairing Hi-Fi Systems | @ \$3.90 | <input type="checkbox"/> Small Appliance Servicing | @ \$ 4.50 |
| <input type="checkbox"/> Vacuum Tube Characteristics | @ \$1.80 | <input type="checkbox"/> Servicing Transistor Radios | @ \$2.90 |
| <input type="checkbox"/> Shoot TV & Radio Trouble Fast | @ \$1.50 | <input type="checkbox"/> How to Run a Small Business | @ \$ 4.95 |
| <input type="checkbox"/> Basics of Digital Computers | @ \$7.50 | <input type="checkbox"/> Industrial Electronics Handbook | @ \$22.50 |
| <input type="checkbox"/> Impedance Matching | @ \$2.90 | <input type="checkbox"/> TV Consultant | @ \$2.00 |
| <input type="checkbox"/> Radio Operator's License Q & A Manual | @ \$6.60 | | |
| <input type="checkbox"/> How to Service Tape Recorders | @ \$2.90 | | |
| <input type="checkbox"/> Basic Pulses | @ \$3.50 | | |
| <input type="checkbox"/> Stereophonic Sound | @ \$2.25 | | |
| <input type="checkbox"/> Fundamentals of Transistors | @ \$3.50 | | |

BOOKS IN PREVIOUS ISSUES:

Enclosed is total payment of \$ _____ @ \$ _____
(If you have New York City address, add 3% sales tax)

Name _____

Address _____

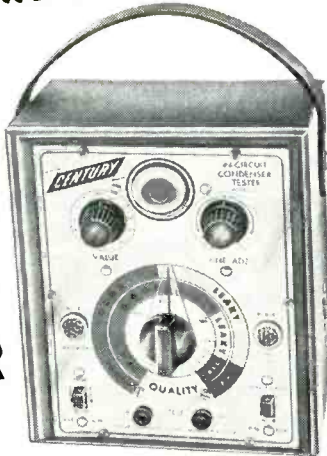
City _____ Zone _____ State _____

SHIPPED ON APPROVAL

an IN-CIRCUIT CONDENSER TESTER THAT DOES THE WHOLE JOB!

The CT-1 actually steps in and takes over where all other in-circuit condenser testers fail. The ingenious application of a dual bridge principle gives the CT-1 a tremendous range of operation . . . and makes it an absolute 'must' for every serviceman.

IN-CIRCUIT CONDENSER TESTER Model CT-1



Model CT-1—housed in sturdy
hammertone finish steel case
complete with test leads...only
\$34⁵⁰ Net

in-circuit checks:

- ✓ Quality of over 80% of all condensers even with circuit shunt resistance present . . . (leakage, shorts, opens, intermittents)
- ✓ Value of all condensers from 200 mmfd. to .5 mfd.
- ✓ Quality of all electrolytic condensers (the ability to hold a charge)
- ✓ Transformer, socket and wiring leakage capacity

out-of-circuit checks:

- ✓ Quality of 100% of all condensers . . . (leakage, shorts, opens and intermittents)
- ✓ Value of all condensers from 50 mmfd. to .5 mfd.
- ✓ Quality of all electrolytic condensers (the ability to hold a charge)
- ✓ High resistance leakage up to 300 megohms
- ✓ New or unknown condensers . . . transformer, socket, component and wiring leakage capacity

OUTSTANDING FEATURES

- Ultra-sensitive 2 tube drift-free circuitry
- Multi-color direct scale precision readings for both quality and value . . . (in-circuit or out of circuit)
- Simultaneous readings of circuit capacity and circuit resistance
- Built-in hi-leakage indicator sensitive to over 300 megohms
- Cannot damage circuit components
- Electronic eye balance indicator for even greater accuracy
- Isolated power line

Check all power rectifiers in-circuit

whether SELENIUM,
GERMANIUM,
SILICON, etc.

with the IN-CIRCUIT RECTIFIER TESTER Model SRT-1



Model SRT-1—housed in sturdy
hammertone finish steel case
complete with test leads...only
\$29⁵⁰ Net

With the growing trend towards compactness, portability and low price, TV manufacturers are resorting more and more to producing series-string TV sets employing selenium, germanium or silicon power rectifiers. Now the need for an in-circuit rectifier tester is greater than ever.

THE SRT-1 CHECKS ALL POWER RECTIFIERS IN-CIRCUIT AND OUT-OF-CIRCUIT WITH 100% EFFECTIVENESS FOR:

- ✓ Quality ✓ Fading ✓ Shorts ✓ Opens ✓ Arcing ✓ Life Expectancy

OUTSTANDING FEATURES

- Checks all types of power rectifiers rated from 10 ma. to 500 ma. (selenium, germanium, silicon, etc.) both in-circuit or out-of-circuit.
- Will not blow fuses even when connected to a dead short.
- Large 3" highly accurate multi-color meter . . . sensitive yet rugged.
- Separate meter scales for in-circuit and out-of-circuit tests.
- Cannot damage or over heat rectifier being tested.

SIMPLE TO OPERATE

Just clip SRT-1 test leads across rectifier under test right in the circuit without disconnecting rectifier from circuit. Press test switch and get an instant indication on the easy-to-read three-color meter scales . . .

ALL CENTURY INSTRUMENTS ARE GUARANTEED FOR ONE FULL YEAR

The extremely low prices are made possible because you are buying direct from the manufacturer.

TRANSISTOR TESTER Model TT-2

Every day more and more manufacturers are using transistors in home portable and car radios . . . in hearing aids, intercoms, amplifiers, industrial devices, etc. Since transistors go bad the need for TRANSISTOR TESTER is great. They can

develop excessive leakage, poor gain, shorts or opens. The TT-2 is an inexpensive quality instrument designed for accurate and dependable tests of all transistors and diodes — quickly and accurately.

OUTSTANDING FEATURES

- Checks all transistors, including car radio, power output, triode, tetrode and unijunction types for current gain, leakage, opens, shorts, cut-off current
- Checks all diodes for forward to reverse current gain
- All tests can be made even if manufacturers' rated gain is not available
- Less than half a minute required for tests of either transistors or diodes
- Large 3" meter is extremely sensitive, yet rugged . . . with multi-color scales designed for quick easy readings
- Power is supplied by an easy to replace 6-volt battery — current drain so small, service life almost equal to shelf life. Battery cannot be drained due to accidental shorting of test leads
- Cannot burn-out its own meter or damage transistor or diode under test
- Long test leads and insulated test clips enable tests without entirely removing transistor from circuit
- Test leads are identified by E.I.A. color code so that connection to the correct terminal is assured
- Comes complete with replaceable transistor set-up chart that fits into a special rear compartment.

IMPORTANT FEATURE: The TT-2 cannot become obsolete as the circuitry is engineered to enable you to check all new type transistors as they are introduced. New listings will be furnished at no cost.

Model TT-2—housed in sturdy
hammertone finish
steel case
complete with
test leads . . .
only

\$24⁵⁰ Net



EASY TO BUY IF SATISFIED
see order form on facing page 

FOR 10 DAY FREE TRIAL

try them for 10 days before you buy . . . only then, when satisfied, pay in easy-to-buy monthly installments — without any financing or carrying charges added.

STILL THE BEST SELLING TUBE TESTER IN THE FIELD FAST-CHECK TUBE TESTER

Model FC-2



The greatest testimonial ever paid an instrument . . . over 20,000 sold in a little more than a year—and still selling as fast as we can produce them. See for yourself at no risk why so many servicemen choose the FAST-CHECK above all other tube testers — regardless of price.

Model FC-2 — housed in hand-rubbed oak carrying case complete with CRT adapter . . . only

\$69.50
Net

SIZE: W: 14 5/8"
H: 11 1/4" D: 4 3/8"

Just 2 settings on the FAST-CHECK TUBE TESTER tests over 700 tube types completely, accurately — AND IN SECONDS!

PICTURE TUBE TEST ADAPTER INCLUDED WITH FAST-CHECK

Enables you to check all picture tubes (including the new short-neck 110 degree type) for cathode emission, shorts and life expectancy . . . also to rejuvenate weak picture tubes.

No other tube tester made at any price can match the value of the FAST-CHECK.

RANGE OF OPERATION

- ✓ Checks quality of over 700 tube types, employing the time proven dynamic cathode emission test. This covers more than 99% of all tubes in use today, including the newest series-string TV tubes, auto 12 plate-volt tubes, OZ4s, magic eye tubes, gas regulators, special purpose hi-fi tubes and even foreign tubes.
- ✓ Checks for inter-element shorts and leakage.
- ✓ Checks for gas content.
- ✓ Checks for life-expectancy.

IMPORTANT FEATURES

- No time consuming multiple switching . . . only two settings are required instead of banks of switches on conventional testers • No annoying roll chart checking . . . tube chart listing over 700 tube types is located inside cover. New listings are added without costly roll chart replacement • Checks each section of multi-section tubes and if only one section is defective the tube will read "Bad" on the meter scale
 - 41 phosphor bronze beryllium tube sockets never need replacement
 - 7-pin and 9-pin straighteners mounted on panel • Large 4 1/2" D'Arsonval type meter is the most sensitive available, yet rugged — fully protected against accidental burn-out • Special scale on meter for low current tubes • Compensation for line voltage variation • 12 filament positions • Separate gas and short jewel indicators • Line isolated — no shock hazards • Long lasting etched aluminum panel.
- NOTE: The Fast-Check positively cannot become obsolete . . . circuitry is engineered to accommodate all future tube types as they come out. New tube listings are furnished periodically at no cost.

NEW . . . For those looking for a real ECONOMY MULTIPLE SOCKET TUBE TESTER without sacrificing ACCURACY, SPEED and VERSATILITY MINI-CHECK TUBE TESTER

Model MC-1

Here is a multiple socket tube tester designed to meet limited budgets. Although low in price it boasts a unique circuitry that enables you to check over 600 tube types — and has a range of operation that far exceeds others in its price class.



Model MC-1 — housed in sturdy wrinkle finish steel case . . . only

\$39.50
Net

SIZE: W: 9"
H: 8 1/2"
D: 2 3/4"

OUTSTANDING FEATURES

- Checks emission, inter-element shorts and leakage of over 600 tube types. This covers OZ4s, series-string TV tubes, gas regulators, auto 12 plate volt, hi-fi and foreign tubes • 3 settings enable a test of any tube in less than 10 seconds
- Employs dynamic cathode emission test principle • 3 1/2" D'Arsonval type meter — most accurate type available . . . its greater sensitivity means more accuracy . . . its jewel bearing means longer life • 17 long lasting phosphor bronze tube sockets • Combination gas and short jewel indicator • 9 filament positions • Handy tube chart contained in special back compartment • New tube listings furnished periodically at no cost • Detachable line cord

plus these BONUS FEATURES . . . found in no other low price tube tester

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

CONVENIENT TIME PAYMENT PLAN — NO INTEREST OR FINANCING CHARGES

CENTURY ELECTRONICS CO., INC.

CHECK INSTRUMENTS DESIRED

- Model CT-1 In-Circuit Condenser Tester . . . \$34.50
\$9.50 within 10 days. Balance \$5 monthly for 5 months.
- Model SRT-1 In-Circuit Rectifier Tester . . . \$29.50
\$4.50 within 10 days. Balance \$5 monthly for 5 months.
- Model TT-2 Transistor Tester . . . \$24.50
\$4.50 within 10 days. Balance \$5 monthly for 4 months.
- Model FC-2 Fast-Check Tube Tester . . . \$69.50
\$14.50 within 10 days. Balance \$11 monthly for 5 months.
- Model MC-1 Mini-Check Tube Tester . . . \$39.50
\$9.50 within 10 days. Balance \$6 monthly for 5 months.

Prices Net F.O.B. Mineola, N. Y.

111 Roosevelt Avenue, Dept. 503, Mineola, New York

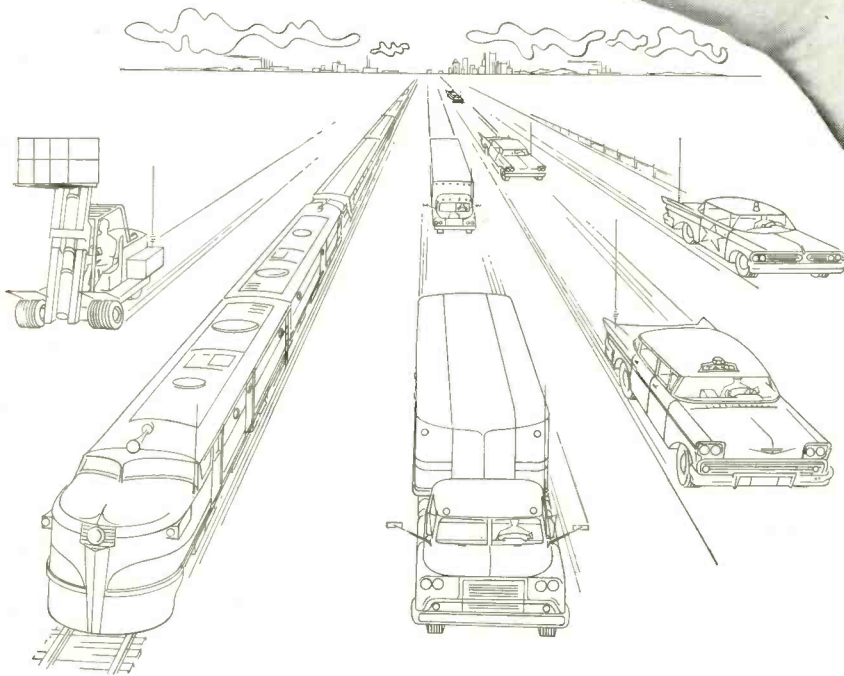
Please rush the instruments checked for a 10 day free trial. If satisfied I agree to pay the down payment within 10 days and the monthly installments as shown. If not completely satisfied I will return the instruments within 10 days and there is no further obligation. It is understood there will be NO INTEREST or FINANCING charges added.

Name _____ Please print clearly
Address _____
City _____ State _____

RCA Power Tubes

...mobile radio's finest

The best mobile communications systems rely on the best in radio power tubes—RCA!



Specified everywhere for industrial, transportation, and public service mobile radio systems, RCA Power Tubes are designed for (1) reliable performance, (2) maximum on-air time, (3) low tube cost per hour of operation. That's why it pays to use RCA Power Tubes.

RCA Power Tubes are available promptly from your RCA Industrial Tube Distributor.



RADIO CORPORATION OF AMERICA

Electron Tube Division

Harrison, N. J.

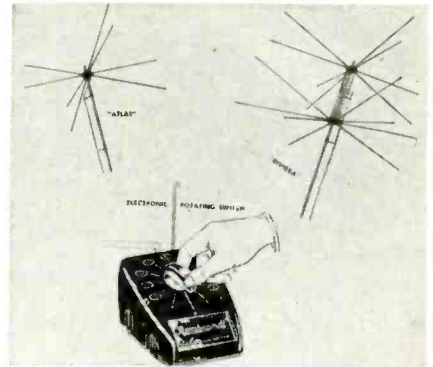


For the name of your nearest RCA Industrial Tube Distributor, call Western Union by phone number and ask for me, Operator 25.

New Products

All Channel ANTENNAS

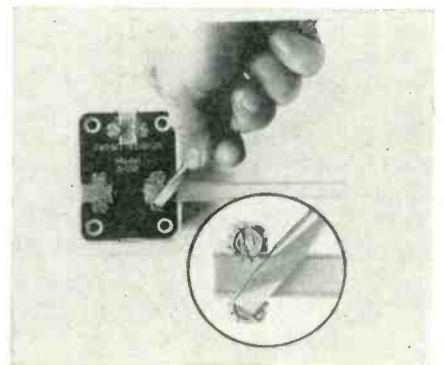
Called an "electronic rotating antenna," The Rembrandt Atlas 8-element unit comes with 12-position switch to beam antenna to strongest signal on every TV channel. No motors are used. Accessories included in price are mast, stand-offs, insulators and 70' of flat 4-conductor wire. List is \$29.95, less



\$10 trade-in for old antenna, netting \$19.95 with full dealer mark-up. The Riviera model at \$59.95 list, less \$10 trade-in, utilizes a 16-element antenna, 60" long elements, switch, attaching bars, 100' of line and accessories. Elements are 1/2" diameter. All Channel Products Corp., 47-39 49th St., Woodside 77, N. Y. (ELECTRONIC TECHNICIAN 3-26)

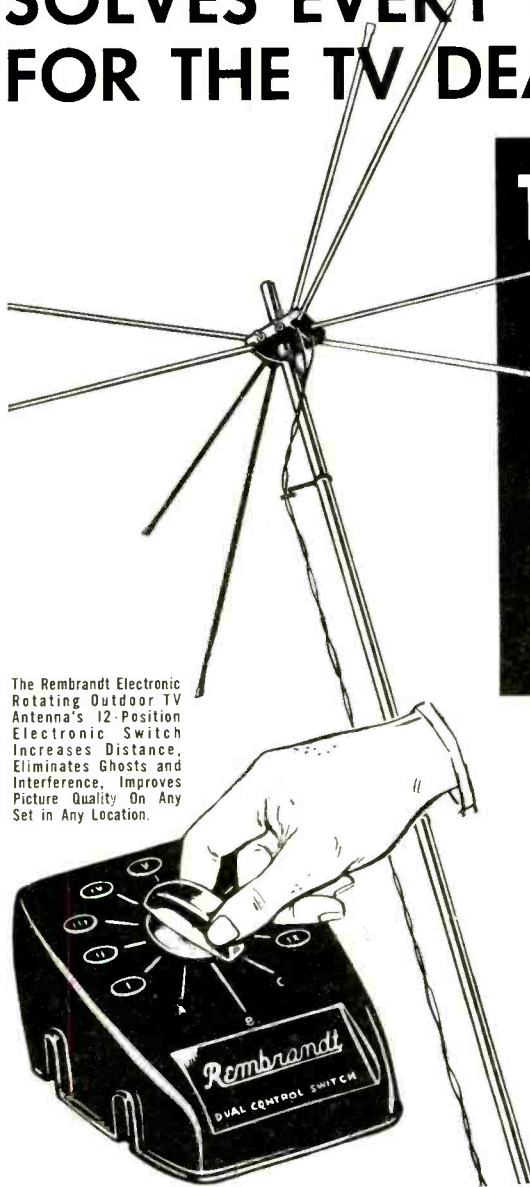
B-T COUPLERS

Stripless twin-line terminal connectors are featured on the Model A-102 two-set coupler. Installation is quick and easy. The terminals on the Model A-102 have brass screws and captive phosphor-bronze serrated washers. The connectors accommodate 300 ohm ribbon line simply by sliding the line



under the pronged washers and tightening down the screws. Model A-102 couples two TV or FM sets with minimum loss (3 db) and maximum isolation (12-20 db). May be mounted indoors or outdoors. Mounting is facilitated by A-100 stainless steel bracket at \$.90. A-102 lists for \$2.95. Blonder-Tongue Labs., 9 Alling St., Newark 2, N.J. (ELECTRONIC TECHNICIAN 3-21)

SOLVES EVERY INSTALLATION PROBLEM FOR THE TV DEALER AND SERVICE MAN



The Rembrandt Electronic Rotating Outdoor TV Antenna's 12-Position Electronic Switch Increases Distance, Eliminates Ghosts and Interference, Improves Picture Quality On Any Set in Any Location.

The Spectacular Rembrandt **ELECTRONIC ROTATING** Outdoor TV Antenna Kits

ENGINEERED FOR EVERY RECEPTION AREA
★ PROBLEM ★ FRINGE ★ DEEP FRINGE

All Channel scores another engineering triumph! Three revolutionary new single and double stacked Rembrandt outdoor TV antennas with 12-positional directional switch that *INSTANTLY* beams to the strongest signal on every channel *ELECTRONICALLY*... no motors, no external moving parts. Now you can offer your customers an outdoor TV antenna that offers all the performance advantages of rotor motor tuning at a fraction of its cost... and with no sacrifice of profit for you.

ALL REMBRANDT OUTDOOR TV ANTENNAS ARE SOLD WITH A GUARANTEED SALE MONEY BACK WARRANTY

All Channel's triple money back guarantee... Manufacturer to Distributor... Distributor to Dealer... Dealer to Consumer... the strongest profit protection warranty in the industry.



THE REMBRANDT SINGLE STACKED "ATLAS"
For Problem, Metropolitan & Semi-Fringe

Complete with TV Wire, Mast, Mounting Brackets and Stand-Offs. Pre-Wired and Pre-Assembled for Over-the-Counter Selling and Easy Installation. **19⁹⁵** List



THE REMBRANDT DOUBLE STACKED "ATLAS"
For Fringe Reception Areas

Complete with TV Wire, Mast, Mounting Brackets and Stand-Offs. Pre-Wired and Pre-Assembled for Over-the-Counter Selling and Easy Installation. **29⁹⁵** List



THE REMBRANDT DOUBLE STACKED "RIVIERA"
For Deep Fringe & Remote Areas

Complete with TV Wire, Mast, Mounting Brackets and Stand-Offs. Pre-Wired and Pre-Assembled for Over-the-Counter Selling and Easy Installation. **39⁹⁵** List

FAIR TRADED FOR PROFIT PROTECTION: The Rembrandt Electronic Rotating TV Antenna is Fair Traded on both distributor and dealer levels... and will be rigidly enforced.

LIBERAL DEALER CO-OP ADVERTISING: Powerful traffic producing advertisements in complete mat form ready for newspaper insertion available.

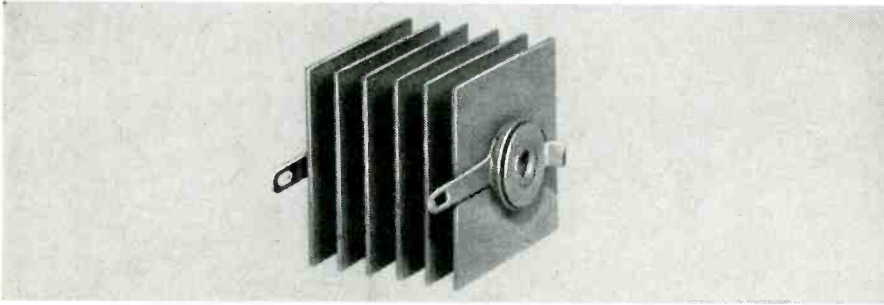
Limited Number of Choice Territories Still Available to Qualified Distributors... Write or Call Collect... EXeter 2-1336.

If Your Distributor Hasn't the Rembrandt Electronic Rotating TV Antennas, write direct for full dealer information

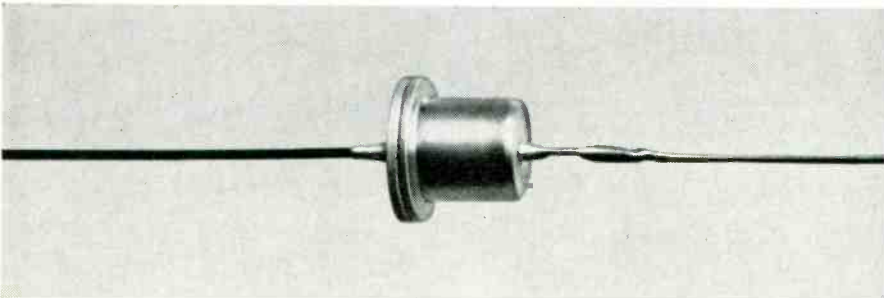
ALL CHANNEL PRODUCTS CORP., 47-39 49th ST., WOODSIDE 77, NEW YORK

ALL CHANNEL'S "REMBRANDT" AND "EMBASSY" INDOOR TV ANTENNAS WITH 12-POSITION ELECTRONIC DIRECTIONAL SWITCH OUTPERFORM AND OUTSELL EVERY OTHER LINE ON THE MARKET.

Next time you replace a...



with a



ask for...



With just two Sylvania silicon rectifier types, SR200 and SR500, you can replace over 83 selenium rectifier types made by 5 different manufacturers. Type SR200 with a maximum rating of 200ma, 300 v is intended for low-voltage general purpose applications. Type SR500 with a maximum rating of 500ma, 400 v is designed for medium-power rectifier applications. Both types are in stock at your authorized Sylvania distributor. Get your free copy of Sylvania's Selenium Rectifier Replacement Guide from your Sylvania Distributor or write Sylvania direct—1100 Main St., Buffalo, N. Y.

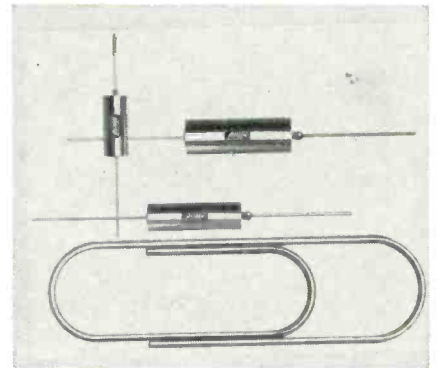
SYLVANIA

SYLVANIA ELECTRIC PRODUCTS INC.
1740 Broadway, New York 19, N. Y.
In Canada: P. O. Box 1190, Station
"O", Montreal 9.

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

Astron TANTALUM CAPACITORS

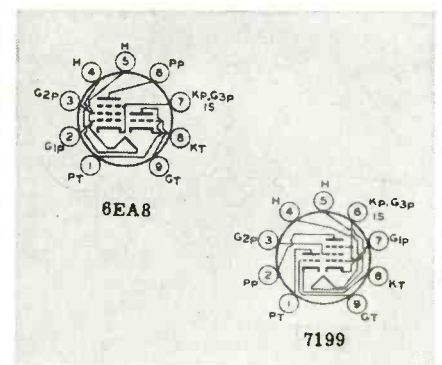
Line of subminiature, metal-cased hermetically sealed capacitors, Type TES, have a solid tantalum dielectric and solid electrolyte. The smallest unit is only 1/8" in diameter and 1/4" long. The longest of the present series is 11/64" diameter and 7/16" long. Capa-



citance range is from 0.0047 to 47 μ f with average variation $\pm 5\%$ to 25° C. Leakage current at rated voltage and 25° C is less than 0.04 μ a, per μ f per volt, or 2 μ a, whichever is greater. Temperature range is from -80 to 85° C. Astron Corp., 255 Grant Ave., East Newark, N. J. (ELECTRONIC TECHNICIAN 3-12)

RCA TUBES

Four new tubes have been introduced. The 6EA8 is a medium- μ triode—sharp-cutoff pentode of the 9-pin miniature type utilizing a 450 ma heater. It is intended as a combined oscillator and mixer tube in TV receivers utilizing 40 mc i-f circuits. A new 9-pin miniature type containing a medium- μ triode and sharp-cutoff pentode in one envelope, the RCA-7199 is especially designed for use in high-fidelity equipment where low hum and reduced



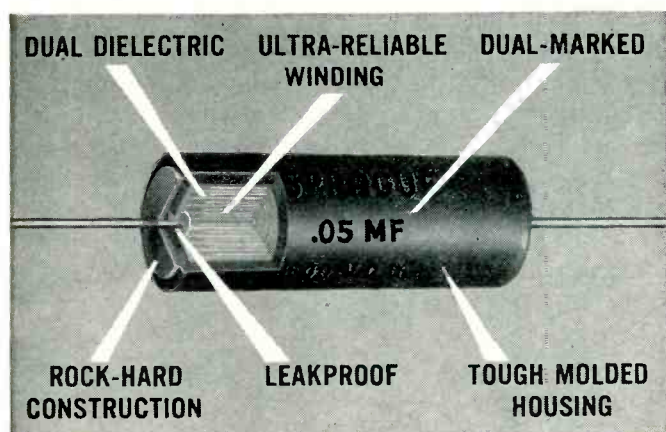
noises are necessary design requirements. It is particularly useful in tone-control circuits, phase-splitter and high-gain voltage-amplifier circuits. Also, not illustrated, two new, high-performance half-wave rectifier tubes (6DE4 and 17DE4) for damper use in 110° deflection circuits of black-and-white TV sets have been introduced. The 6DE4 has a 6.3-v/1.6-ampere heater. The 17DE4 is like the 6DE4 except that it has a 17-v/600-ma heater. RCA Electron Tube Division, Harrison, N. J. (ELECTRONIC TECHNICIAN 3-8)

NEW DIFILM[®] BLACK BEAUTY[®] MOLDED CAPACITORS

BEAT THE HEAT AND HUMIDITY!

Now Sprague's new DIFILM BLACK BEAUTY MOLDED CAPACITORS have taken the steam out of heat and humidity problems. These capacitors are so good you can *boil 'em* for 24 hours without affecting their performance.

Unlike straight polyester film tubulars, these capacitors operate in a 105°C environment *without derating*.



Look for the RED markings on the black case.

And the heart of these new DIFILM capacitors can't be beat. It's a dual dielectric which *combines the best advantages of both Mylar* polyester film and the highest grade of paper dielectric*. A rock-hard solid impregnant fills voids and pinholes in the film.

Talk about *reliability!* . . . these capacitors have it. DIFILM capacitors are actually low cost versions of the Sprague capacitors now being used in every modern military missile. The basic reliability and outstanding performance of missile-type Sprague capacitors are all yours in this outstanding new development. Why take chances when you can get the best—DIFILM BLACK BEAUTY MOLDED TUBULARS . . . at regular prices.

For the complete DIFILM BLACK BEAUTY story, write for Bulletin M-759 to Sprague Products Company, 65 Marshall St., North Adams, Mass.

*DuPont trademark

The major capacitor improvements
come from

SPRAGUE[®]

world's largest capacitor manufacturer

SPRAGUE RESEARCH IS CONSTANTLY PRODUCING NEW AND BETTER CAPACITORS FOR YOU



An
exclusive
service
by

Amperex®
distributors:

VALVO

RECEIVING TUBES

for replacement in
European radios

Many European radios and hi-fi components now popular in this country utilize the European-made VALVO tubes, which have thus far had no American distribution. As a special service to the trade, VALVO tubes are now being stocked by all franchised Amperex distributors. Replacement of the original tubes with completely identical types will assure optimum results in the repair and servicing of these European sets.



ask **Amperex**
for the name and address
of your nearest distributor

Amperex Electronic Corp.
230 Duffy Avenue Hicksville, L.I., N.Y.

Tube Racket—Four Years Later

• Four years ago, Electronic Technician editors became concerned over the growing number of advertisements offering "first quality" receiving tubes at unreasonably low prices. And curious too. How can people offer practically every tube type at prices far below what it costs the manufacturer to produce.

So Electronic Technician launched an investigation. Findings were published in its July 1955 issue. The result was the exposure of a multi-million dollar racket by unscrupulous receiving tube reproprocessors.

Briefly, here is what was uncovered. Old tubes were purchased from service technicians for 1¢ to 3¢ each, reprocessed by buffing, washing and flame treating, and rebranded to look new. Sometimes the internal elements were given a "hot shot" electrically to pep them up.

These tubes were either sold back to unsuspecting technicians for 30¢ to \$1.50 each, or returned to the distributor with a falsely forged in-warranty date code for credit. A dirty—but profitable—business.

A shopping survey conducted by ET investigators showed that 41.6% of such tubes were not usable. Many others were usable, but showed poor performance.

Backed with these facts, ET filed complaints against the offending companies with the Federal Trade Commission. In addition, data was furnished to the district attorney in New York City.

The results of ET's investigation and subsequent campaign are now history. The FTC cited these companies and forced them to desist from their deceptive sales practices. Other prosecutions resulted in jail sentences for those who actually practiced fraud. The names of the actual companies involved have been published in ET from time to time as legal action has put this information in the public domain.

Yes, much progress has been made, but vigilance should still be our watchword. Reprocessed tubes can be a lucrative attraction to sharp operators.

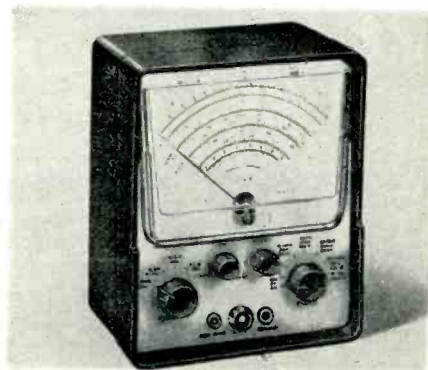
One tube manufacturer, Philco Corp., has renewed its "smash the tube racketeers" campaign. Technicians receive 5¢ credit toward the purchase of a new tube for every worn-out tube brought in. And the old tube is smashed right before your eyes. Over 3,000,000 old tubes have been so destroyed since Philco's campaigns started in 1955.

Technicians can help beat the tube counterfeiters too. Don't sell your discarded tubes to "junkies." When possible, clip a pin or two off replaced tubes. And very important, be wary of fantastic tube bargains which do not fully reveal whether or not the tubes being sold are new.

Through industry-wide cooperation, many tube racket companies have been put out of business during the past four years. Keep the pressure on 'em! •

Arkay VTVM

Multi-purpose VTVM, the VT-10, with edge-lighted 6" meter, is available as a kit at \$25.95 retail, or factory-wired at \$47.95. It has a sensitive 400 microamp movement within 2% accuracy. 1% precision resistors are used throughout the range switch for measurement stability. The instrument has 7 ac (rms) and dc ranges, 0 to 1500 v.; also 7 ac (peak-to-peak) ranges, 0 to 2000 v. Resistance of 0 to 1000 megohms, db and other essential ranges are also included. Arkay, Inc. 88-06 Van Wyck Expressway, Richmond Hill 18, N. Y. (ELECTRONIC TECHNICIAN 3-17)

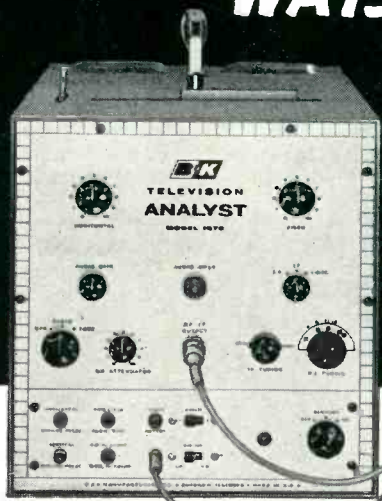


SAVE $\frac{1}{2}$ THE TIME

Make Twice The Profit!

in TV
Trouble-Shooting

THIS EASY
SIGNAL INJECTION
POINT-TO-POINT
DIRECT VIEWING
WAY



MODEL 1075



TELEVISION ANALYST

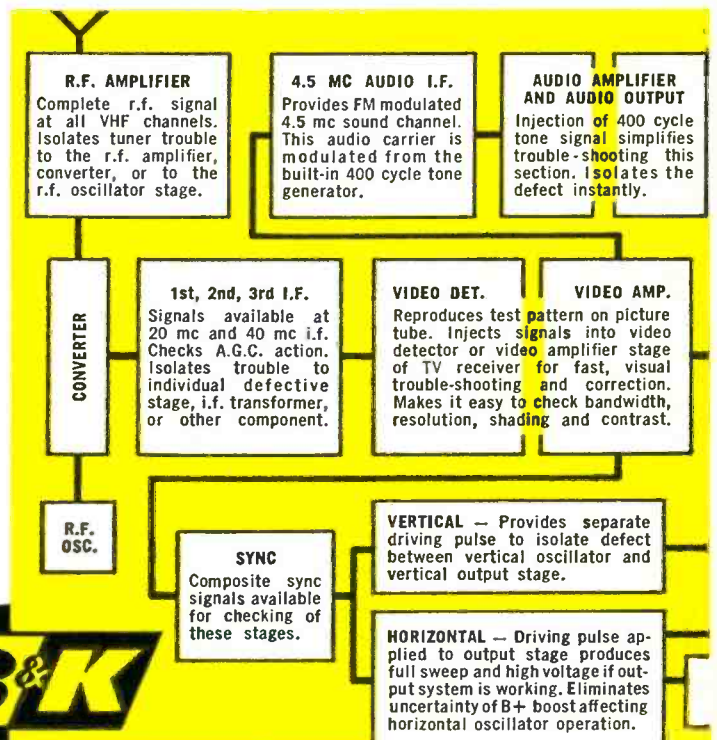
New Technique Makes TV Servicing Easier, Faster, More Profitable

Thousands of service technicians already save thousands of hours every day with the amazing B&K TELEVISION ANALYST. Enables you to inject your own TV signal at any point and watch the resulting test pattern on the picture tube itself. Makes it quick and easy to isolate, pin-point, and correct TV trouble in any stage throughout the video, audio, r.f., i.f., sync, and sweep sections of black & white and color television sets—including *intermittents*. Makes external scope or wave-form interpretation unnecessary. Enables any serviceman to cut servicing time in half, service more TV sets in less time, really satisfy more customers, and make more money. Color generator provides both rainbow pattern and color bars.

MODEL 1075 TELEVISION ANALYST. Complete with standard test pattern, white dot, white line, and color-bar slide transparencies, and one clear acetate. Net, **\$259⁹⁵**

See your B&K Distributor or Write for Bulletin ST21-T

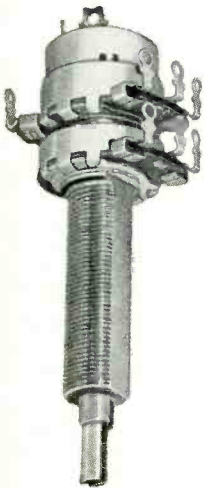
B & K MANUFACTURING CO.
3726 N. Southport Ave. • Chicago 13, Illinois
Canada: Atlas Radio Corp., 50 Wingold, Toronto 10, Ont.
Export: Empire Exporters, 458 Broadway, New York 13, U.S.A.



Auto Radio Control Replacement is Child's Play

with new **Centralab**®

Exact Replacement Controls



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

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

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

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

Centralab

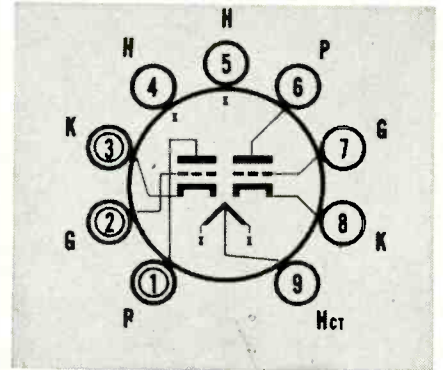
® B-5902

A DIVISION OF GLOBE-UNION INC.
902C E. KEEFE AVE. • MILWAUKEE 1, WIS.
IN CANADA: 804 Mt. Pleasant Rd. • Toronto 12, Ont.

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

CBS DUAL TRIODE

Type 7247, dissimilar-section double triode combines the first two stages of preamplification for hi-fi equipment. Section one is a hi-mu triode with low hum and noise output for low-level inputs. Section two is a medium-mu triode having characteristics similar to those of the 6C4. It is suitable for



cathode-follower or large-signal phase inverter. This 9-pin miniature minimizes hum and microphonism. It has folded-coil twin 150-ma heaters which may be connected in series or parallel for operation at 12.6 or 6.3 volts. CBS-Hytron, Parker St., Newburyport, Mass. (ELECTRONIC TECHNICIAN 3-7)

Raytheon TUBES & RECTIFIERS

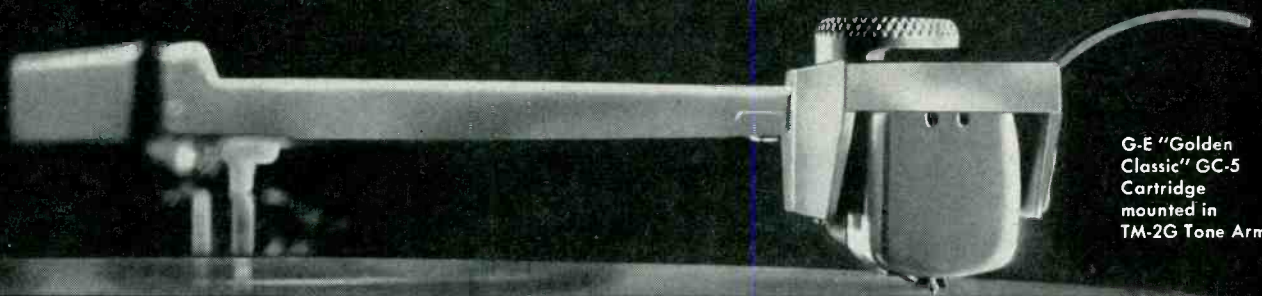
Five new receiving tubes are: 1S2A cathode type half-wave high-voltage rectifier for use as a TV flyback rectifier; 6AT8A triode-pentode converter for use as a combined oscillator and mixer tube in 450 ma series string circuits; 6AU6A r-f pentode, identical to 6CB6 except for 300 ma controlled heater warm up; and 6DN7 vertical deflection oscillator and amplifier double-triode. Also 1N1763 and 1N1764 welded, hermetically sealed, medium current diffused silicon rectifiers designed for reliable radio and TV power supplies, many industrial power supplies, and all TV rectifier circuits. Raytheon Mfg. Co., Distributor Products Div., 55 Chapel St., Newton 58, Mass. (ELECTRONIC TECHNICIAN 3-9)

Champion PLIERS

Four new, precision-made Channel-lock pliers feature slender, long-reach jaws and handles, precision-matched jaws and points, hand-honed specially hardened cutting edges and easy-to-handle blue plastic-coated grips. This new line includes a flat-nose plier, a diagonal cutter with wire-stripping notch, a round-nose plier and a long-reach end cutter. Champion DeArment Tool Co., Meadville, Pa. (ELECTRONIC TECHNICIAN 3-23)

For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 47

Stereo profits start here!



G-E "Golden Classic" GC-5 Cartridge mounted in TM-2G Tone Arm

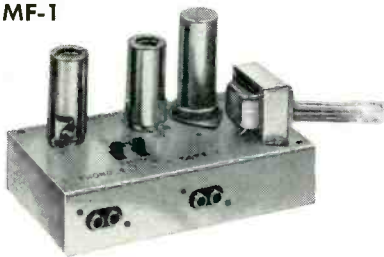
SPECIFICATIONS

- Compatible with both stereo and monaural records
- Full frequency response, 20 through 20,000 cycles
- "Floating armature" design increases compliance, reduces record wear
- Effective mass of stylus about 2 mg
- Output 8 mv
- Recommended tracking force with professional-type tone arm 2 to 4 grams
- Consistently high separation between channel signals (Specifications for GC-5)

Model GC-5 (shown) with .5 mil diamond stylus, **\$26.95**. Model GC-7 with .7 mil diamond stylus, **\$23.95**. Model CL-7 with .7 mil synthetic sapphire stylus, **\$16.95** (Manufacturer's suggested resale prices).

New Dual Stereo Preamp

Model MF-1



Easy, inexpensive way to convert stereo systems from ceramic to magnetic cartridges where necessary preamplification is not present. Dual inputs—stereo phono or tape. High sensitivity, low hum and noise, individual switching for each channel. **\$24.95** (Manufacturer's suggested resale price).

General Electric cartridges are easier to sell...offer better frequency response...greater compliance...less record wear...sensible prices!

Start your customers on stereo *the right way*—with General Electric's new "Golden Classic" stereo-magnetic cartridges. They provide the high compliance, low distortion and excellent channel separation required by the new stereo discs. Just as important, General Electric is the name *all* your customers know and trust.

Only one moving part: General Electric "Golden Classic" cartridges have only one moving part—the stylus—which "floats" freely in special-formula damping cushions. This means lower mass, higher compliance, reduced wear on records and stylus. It also means your customers are getting the finest possible stereo performance when you sell them a G-E "Golden Classic!"

FREE! 16-Page Booklet — "Application Considerations in the Use Of Stereo Phono Cartridges." Tells how to convert different record changers and turntables to stereo. Write today! General Electric Company, Specialty Electronic Components Dept., W. Genesee Street, Auburn, N. Y.

GENERAL  **ELECTRIC**

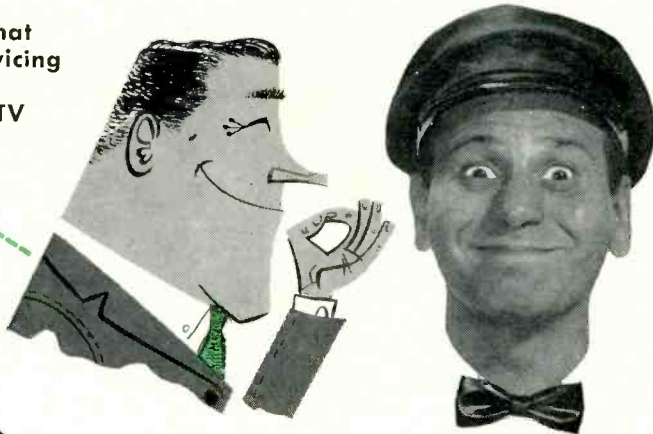
You're only doing half a servicing job if you're not checking the TV Antenna



One out of every two antennas is over three years old, worn out and defective



This means that half your servicing calls need a replacement TV Antenna



Why do half a job at half the profits when it's so easy to carry Clear Beam "top quality" antennas on your truck. Clear Beam "Do It Yourself" Kits, install yourself or sell kits outright.

Complete installation kits for every popular antenna . . . Conicals, Arrows, Yagis, Inlines.



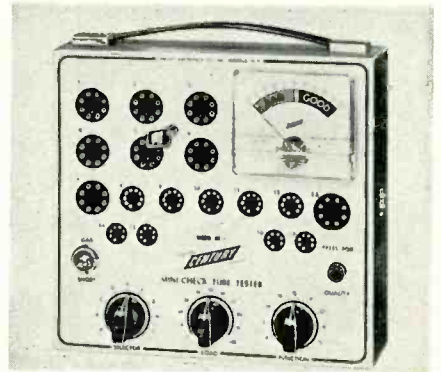
Write for Complete Sales Aid Kit . . . Today



CLEAR BEAM TV ANTENNAS • TELESCOPING MASTS • ACCESSORIES
• CANOGA PARK, CALIF. •

Century TUBE TESTER

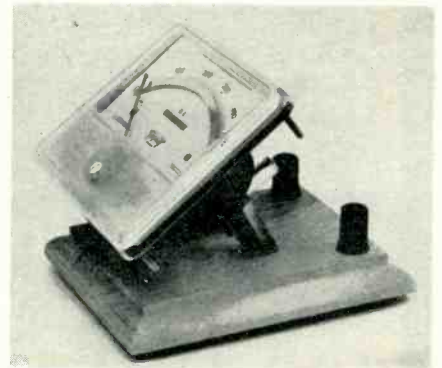
Economy multiple socket tube tester, the Mini-Check model MC-1, is priced at \$39.50. The circuitry has been designed to test over 600 tube types. It employs the dynamic cathode emission test, checking emission, inter-element shorts and leakage. It will also test



OZ4's, series-string TV tubes, gas regulators, auto 12 plate-volt tubes, hi-fi and foreign tubes. Only three settings enable a test of any tube in less than ten seconds. 3½" meter. Tube chart with new listings furnished. Century Electronics Co., Inc., 111 Roosevelt Ave., Mineola, N. Y. (ELECTRONIC TECHNICIAN 3-18)

Triplet UNIMETER

A new 4" Unimeter Series offers a variety of panel meters at low cost by combining any number of dial component sections with a separate basic movement section. Mirror scales eliminate parallax. Available with or without quick change instrument stand, on



which it is shown mounted. Assembly process is error-proof. Simply slide two sections together and lock with a thumbscrew on the back. Other features include self-shielded Bar-Ring movements and ac and dc linear scales. The Triplet Electrical Instrument Co., Bluffton, Ohio (ELECTRONIC TECHNICIAN 3-16)

FREE SEE

Put a color T.V. in my window;
The crowd oh's and ah's with surprise.
They gather outside by the hundreds
But nobody, nobody buys!

—P. Barlow

SUPER-METER

WITH NEW 6" FULL-VIEW METER



A Combination
VOLT-OHM MILLIAMMETER
Plus
CAPACITY, REACTANCE, INDUCTANCE, AND DECIBEL MEASUREMENTS
Also Tests
SELENIUM AND SILICON RECTIFIERS, SILICON AND GERMANIUM DIODES.

The model 79 represents 20 years of continuous experience in the design and production of SUPER-METERS, an exclusive SICO development. It includes not only every circuit improvement perfected in 20 years of specialization but, in addition, includes those services which are "musts" for properly servicing the ever-increasing number of new components used in all phases of today's elec-

tronic production. For example with the Model 79 SUPER-METER you can measure the quality of selenium and silicon rectifiers and all types of diodes—components which have come into common use only within the past five years, and because this latest SUPER-METER necessarily required extra meter scale, SICO used its new full-view 6-inch meter.

SPECIFICATIONS:

- D.C. VOLTS: 0 to 7.5/15/75/150/750/1,500.
- A.C. VOLTS: 0 to 15/30/150/300/1,500/3,000
- D.C. CURRENT: 0 to 1.5/15/150 Ma.
- 0 to 1.5/15 Amperes
- RESISTANCE: 0 to 1,000/100,000 Ohms, 0 to 10 Megohms.
- CAPACITY: .001 to 1 Mfd., 1 to 50 Mfd.
- REACTANCE: 50 to 2,500 Ohms, 2,500 Ohms to 2.5 Megohms.
- INDUCTANCE: 15 to 7 Henries, 7 to 7,000 Henries.
- DECIBELS: -6 to +18, +14 to +38, +34 to +58.

The following components are all tested for QUALITY at appropriate test potentials. Two separate BAD-GOOD scales on the meter are used for direct readings.

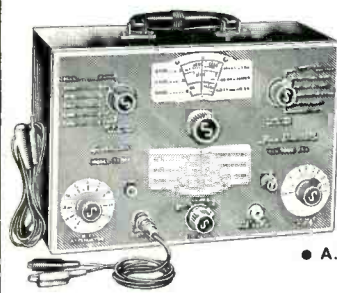
- All Electrolytic Condensers from 1 MFD to 1000 MFD.
- All Selenium Rectifiers.
- All Silicon Rectifiers.
- All Germanium Diodes.
- All Silicon Diodes.

\$38⁵⁰

Model 79 comes complete with operating instructions, test leads, and steamlined carrying case. Use it on the bench—use it on calls. Only

GENOMETER

7 Signal Generators in One!



- ✓ R.F. Signal Generator for A.M.
- ✓ R.F. Signal Generator for F.M.
- ✓ Audio Frequency Generator
- ✓ Marker Generator
- ✓ Bar Generator
- ✓ Color Dot Pattern Generator
- ✓ Cross Hatch Generator

This Versatile All-Inclusive GENERATOR Provides ALL the Outputs for Servicing:

- A.M. RADIO • F.M. RADIO • AMPLIFIERS
- BLACK AND WHITE TV • COLOR TV

R. F. SIGNAL GENERATOR: 100 Kilocycles to 60 Megacycles on fundamentals and from 60 Megacycles to 180 Megacycles on powerful harmonics.

VARIABLE AUDIO FREQUENCY GENERATOR: Provides a variable 300 cycle to 20,000 cycle peaked wave audio signal.

MARKER GENERATOR: The following markers are provided: 189 Kc.; 262.5 Kc., 456 Kc., 600 Kc., 1000 Kc., 1400 Kc., 1600 Kc., 2000 Kc., 2500 Kc., 3579 Kc., 4.5 Mc., 5 Mc., 10.7 Mc., (3579 Kc. is the color burst frequency.)

BAR GENERATOR: Pattern consists of 4 to 16 horizontal bars or 7 to 20 vertical bars.

DOT PATTERN GENERATOR (FOR COLOR TV): The Dot Pattern projected on any color TV Receiver tube by the Model TV-50A will enable you to adjust for proper color convergence.

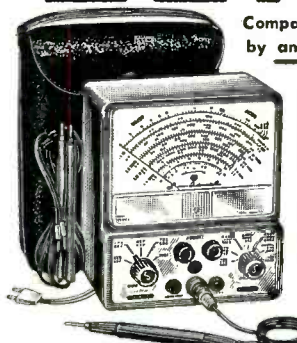
CROSS HATCH GENERATOR: The pattern consists of non-shifting horizontal and vertical lines interlaced to provide a stable cross-hatch effect.

The Model TV-50A comes complete with shielded leads and operating instructions. Only

\$47⁵⁰

VACUUM TUBE VOLTMETER

WITH NEW 6" FULL-VIEW METER



Compare it to any peak-to-peak V. T. V. M. made by any other manufacturer at any price!

- Uses new improved SICO printed circuitry.
- Employs a 12AU7 as D.C. amplifier and two 9006's as peak-to-peak voltage rectifiers to assure maximum stability
- Meter is isolated from the measuring circuit by a balanced push-pull amplifier
- Uses selected 1% zero temperature coefficient resistors as multipliers.

AS A DC VOLT-METER: The Model 77 is indispensable in Hi-Fi Amplifier servicing and a must for Black and White and color TV Receiver servicing where circuit loading cannot be tolerated.

AS AN ELECTRONIC OHMMETER: Because of its wide range of measurement leaky capacitors show up clearly. Because of its sensitivity and low loading, intermittents are easily found, isolated and repaired.

AS AN AC VOLT-METER: Measures RMS value if sine wave, and peak-to-peak value if complex wave. Pedestal voltages that determine the "black" level in TV receivers are easily read.

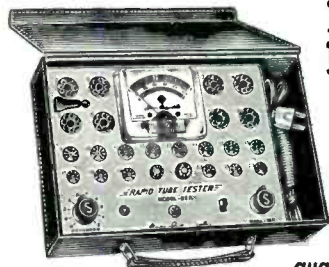
Comes complete with operating instructions, probe, leads, and steamlined carrying case. Operates on 110-120 volt 60 cycle. Only

\$42⁵⁰

- SPECIFICATIONS**
- DC VOLTS—0 to 3/15/75/150/300/750/1,500 volts at 11 megohms input resistance
 - AC VOLTS (RMS)—0 to 3/15/75/150/300/750/1,500 volts.
 - AC VOLTS (Peak to Peak)—0 to 8/40/200/400/800/2,000 volts.
 - ELECTRONIC OHMMETER—0 to 1,000 ohms/10,000 ohms/100,000 ohms/1 megohm/10 megohms/100 megohms/1,000 megohms.
 - DECIBELS—-10 db to +18 db, +10 db to +38 db, +30 db to +58 db. All based on 0 db = .006 watts (6 mw) into a 500 ohm line (1.73v).
 - ZERO CENTER METER—For discriminator alignment with full scale range of 0 to 1.5/7.5/37.5/75/150/375/750 volts at 11 megohms input resistance.

TUBE TESTER

Multi-Socket Type



TEST ANY TUBE IN 10 SECONDS FLAT!

- 1 Turn the filament selector switch to position specified.
- 2 Insert tube into a numbered socket as designated on our chart (over 600 types included).
- 3 Press down the quality button—

THAT'S ALL! Read emission quality direct on bad-good meter scale.

SPECIFICATIONS

- Tests over 600 tube types
- Tests OZ4 and other gas-filled tubes
- Employs new 4" meter with sealed air-damping chamber resulting in accurate vibrationless readings
- Use of 22 sockets permits testing all popular tube types and prevents possible obsolescence
- Dual scale meter permits testing of low current tubes
- 7 and 9 pin straighteners mounted on panel
- All sections of multi-element tubes tested simultaneously
- Ultra-sensitive leakage test circuit will indicate leakage up to 5 megohms

Model 82A comes housed in handsome, portable Saddle-Stitched Texon case. Only

\$36⁵⁰

(Picture Tube Adapter available for \$5.50 additional)

SHIPPED ON APPROVAL

NO MONEY WITH ORDER — NO C.O.D.

Try any of the above instruments for 10 days before you buy. If completely satisfied then send down payment and pay balance as indicated on coupon. **No Interest or Finance Charges Added!** If not completely satisfied return unit to us, no explanation necessary.

MOSS ELECTRONIC, INC.
 Dept. D-586 3849 Tenth Ave., New York 34, N. Y.

Please send me the units checked on approval. If completely satisfied I will pay on the terms specified with no interest or finance charges added. Otherwise, I will return after a 10 day trial positively cancelling all further obligations.

Name

Address

City Zone State

All prices net, F.O.B., N. Y. C.

Model 79... Total Price \$38.50 \$8.50 within 10 days. Balance \$6.00 monthly for 5 months.

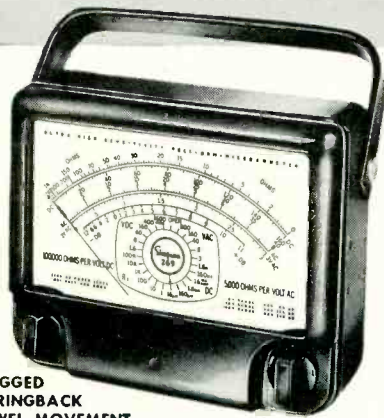
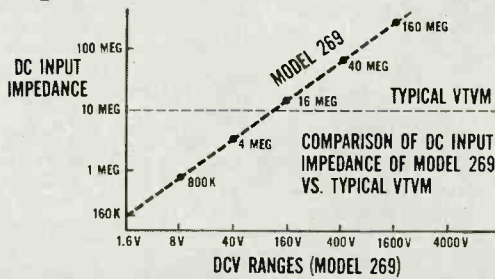
Model TV-50A... Total Price \$47.50 \$11.50 within 10 days. Balance \$6.00 monthly for 6 months.

Model 77... Total Price \$42.50 \$12.50 within 10 days. Balance \$6.00 monthly for 5 months.

Model 82A... Total Price \$36.50 \$6.50 within 10 days. Balance \$6.00 monthly for 5 months.

Include Model 82A Picture Tube Adapter at \$5.50

The only VOM with 100,000 OHMS / VOLT SENSITIVITY



RUGGED
SPRINGBACK
JEWEL MOVEMENT

Simpson 269

AC-DC VOLT-OHM-MICROAMMETER

Here's a VOM with so much capability, you'll find yourself using it more than any tester in the lab or shop. The 10 microampere movement handles tests other VOMs can't touch... even outdoes a VTVM on some checks. And, because the movement in the 269 is built with springbacked jewels, you don't have to baby it. Through the toughest service, it's always accurate and sensitive. The 269 is handy, too. Being self-powered, there's no plug-in required. You can make tests anywhere. A big, w-i-d-e 7-inch scale makes the 33 ranges easy to read and you select them merely by turning a knob. Your Electronic Parts Distributor will be glad to demonstrate these and other features like the Adjust-A-Vue handle and explain the *self-shielding* of its rugged core-type movement. Call him up about this super-sensitive VOM today.

DC Volts: 1.6, 8, 40, 160, 400, 1600, 4000... 100,000 ohms per volt.

AC Volts: 3, 8, 40, 160, 800... 5000 ohms per volt.

AF Output Voltage: 3, 8, 40, 160 volts.

Volume Level in Decibels: -12 to +45.5 DB in 4 ranges.

DC Resistance: 0-2K ohms (18 ohms

center); 0-20K ohms (180 ohms center); 0-200K ohms (1800 ohms center); 0-2 megohms (18K ohms center); 0-20 megohms (180K ohms center); 0-200 megohms (1.8 megohms center).

DC Current: 0-16, 0-160 μ a; 0-1.6, 0-16, 0-160 ma; 0-1.6, 0-16a.

Model 269 with Leads and Operator's Manual..... **\$8800**

Simpson Electric Company

5208 W. Kinzie St., Chicago 44, Illinois
Phone: EStebrook 9-1121

In Canada: Bach-Simpson Ltd.
London, Ontario

VOMs and VTVMs

A complete line for every job. Shown here is the world-famous 260.



JFD INDOOR ANTENNA

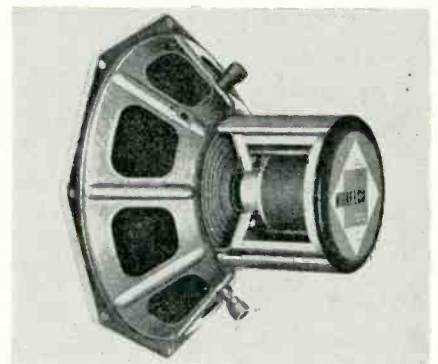
Approximately 8 million portable TV sets in use, with the number growing at the annual rate of 2½ million. This has created a demand for antenna replacements. The new "Exact Replacement Portable TV Antenna Merchandising Kit," No. PA500, contains five antennas covering 85% of the portable



TV sets now in use. Each is an exact duplicate of the antenna that is factory installed. Included are one each of models TA154, TA155, TA359, TA360, and TA442. Sets made from 1956 to 1958 are listed. Kit is \$11.95 to dealer. JFD Electronics Corp., 6101 16th Ave., Brooklyn 4, N. Y. (ELECTRONIC TECHNICIAN 3-19)

Norelco SPEAKERS

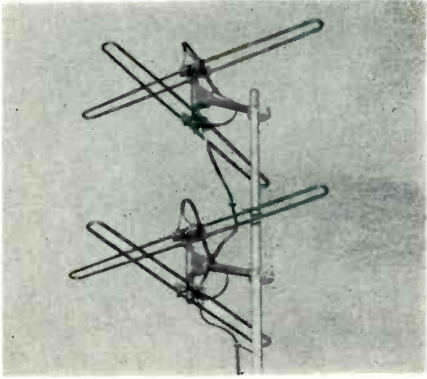
The new T-7 series of twin cone speakers feature magnets of high coercivity "ticonal" steel alloy. Models are: AD-5277M, 12", \$72.50; AD-4277M, 12", \$39; AD-4877M, 8", \$26; AD-3800M, 8", \$9.90 (illustrated); AD-3500M, 5", \$8.34; AD-3690M, 6x9", \$7.95; and



AD-2690M, 6x9", \$6.75. Ratings for the 5277M are 35 to 18,000 cps, 20 watts, 11,000 gauss flux density, 35 cps resonance, 8 ohms. All are designed with extra long air gap. Copper ring keeps coil impedance constant. North American Philips Co., 230 Duffy Ave., Hicksville, N. Y. (ELECTRONIC TECHNICIAN 3-25)

Winegard FM ANTENNA

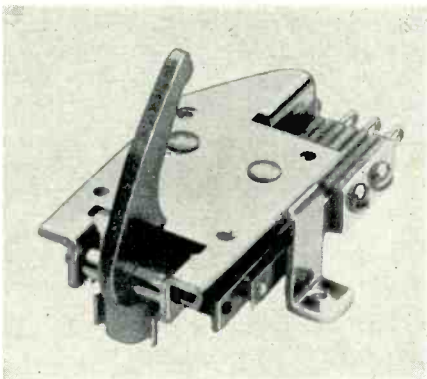
The FM radio market is rebounding rapidly due to hi-fi and stereo. In 1958, 45 new FM stations went on the air, bringing the total to 544. The new line of FM antennas includes a non-directional "turnstile" with a new kind of offset mount. Known as Model FM3T, this antenna is ready to mount on the



same mast with a TV antenna and can be stacked up to four bays using ordinary 300 ohm wire. Stacking two bays will increase power 30%; four bays 96%. It is anodized and has a gold finish and "wrap-around" mast clamp. Winegard Co., 3000 Scotten Blvd., Burlington, Iowa. (ELECTRONIC TECHNICIAN 3-20)

Switchcraft SWITCH

A new "Hook Switch" is used where it is desirable to actuate the switch by "hanging" an accessory on a "hook," such as hanging up a head set or microphone. Series 14000 mounts by frame (4 threaded holes.) Series B14000 has bracket for mounting on panel behind



switch (2 threaded holes). Springs are assembled into a conventional stack assembly, insulated from each other. Fine silver contacts rated at 3 amperes, 120 volts, ac non-inductive load (300 watts max.) are furnished. Switchcraft, Inc., 5555 N. Elston Ave., Chicago 30, Ill. (ELECTRONIC TECHNICIAN 3-11)

For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 47



FOR

GREATER

"SMALL-TUBE"

reliability

...replace with RCA

"Premiums" and

"Special Red" Tubes

Recommended wherever increased reliability of small-tube circuitry is important. Characteristics are uniform throughout useful life. Rigid controls and rigorous tests weed out "early failures". Designed and built to give dependable performance under conditions of shock and vibration. Available at RCA Industrial Tube Distributors.



RADIO CORPORATION OF AMERICA

Electron Tube Division

Harrison, N. J.

Handy data book RIT-104-A includes the tube characteristics you need to know when you install RCA "Premium" and "Special Red" Tubes. Free, from your RCA Industrial Tube Distributor.



look what
\$28⁹⁵
 buys in
 high fidelity
 equipment!

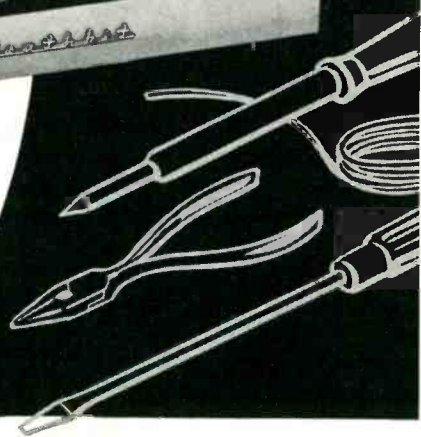
HEATHKIT

Manufacturer
 of the finest
 electronic equipment
 in kit form



A complete 12-watt hi-fi amplifier-preamplifier combination in one stylish unit . . . and at less than half the price you would expect to pay!
 Only

\$28.95



BOOKSHELF 12-WATT AMPLIFIER KIT

An amplifier and preamplifier in one compact unit. The EA-2 has more than enough power for the average home hi-fi system and provides full range frequency response from 20 to 20,000 CPS within ± 1 db, with less than 1% harmonic distortion at full 12 watt output over the entire audio range (20 to 20,000 CPS). IM distortion is less than 1.5% at 12 watts with low hum and noise. EL84 tubes are used in a push-pull tapped-screen output circuit. Inputs consist of crystal phono, tuner, and mag phono with RIAA equalization. Separate bass, treble and hum balance controls are featured. Taps provided for 4, 8 and 16 ohm speakers. Add this unit to your present system for simple stereo conversion. Complete instructions and pictorial diagrams show where every part goes and assures you of quick, easy assembly. Handsome vinyl clad steel cover measures 12½" W. x 8¾" D. x 4¾" H. Neon pilot light on front. Shpg. Wt. 15 lbs.



many more kits
 to choose from!

Send for this free catalog describing over 100 easy-to-build kits in hi-fi-test-marine and amateur radio fields.

HEATH COMPANY

Benton Harbor 18, Mich.



a subsidiary of Daystrom, Inc.

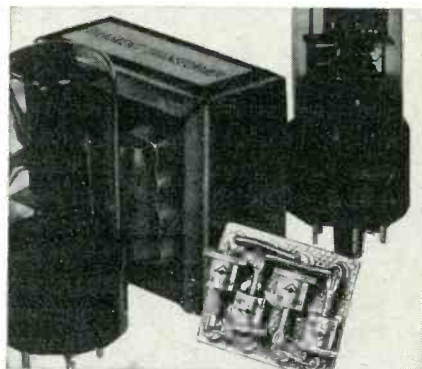
name _____

address _____

city & state _____

Int'l Rect. BRIDGE RECTIFIERS

Miniature silicon bridge rectifiers for replacement of vacuum tube units occupy only 1/10 of the volume and weigh ½ oz., less than 1/60 of equivalent tube circuitry. Size 1.22 x 1.03 x 0.75 in. Designed to miniaturize airborne and



ground system circuitry. Operates to 165° C. Available from 50 to 600 PIV, with dc output currents from 50 ma to 1.2 amperes. Half-wave, doubler and full-wave obtainable on special request. International Rectifier Corp., El Segundo, Calif. (ELECTRONIC TECHNICIAN 3-14)

Westinghouse TWIN-TRIODE

A new nine-pin miniature twin-triode tube, Type WL-7025, for low-level input voltage amplifiers for tape recorders and audio preamps, is interchangeable with tube types 12AX7, 12DF7, and ECC83. It offers low noise due to microphonism, induced hum and leakage. The tube uses a "V-shaped" spiral heater which can withstand high voltage surges. It is 20% shorter than previous designs. Plate voltage to 250 v; amplification factor 100; trans-conductance 1,600 μ mhos. Westinghouse Electric Tube Div., P. O. Box 284, Elmira, N. Y. (ELECTRONIC TECHNICIAN 3-10)

Alpha LACING CORDS

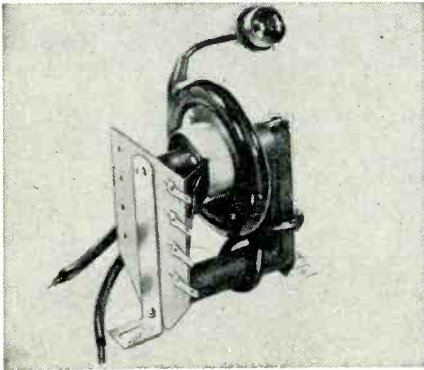
A complete line of 76 synthetic lacing cords and tapes is in stock. Round lacing cords and flat braided lacing tape are made of nylon, dacron and fiberglass. Round types have diameters of 0.017" to 0.050" and tensile strength of 10 to 70 lbs. Flat braided types have widths of 1/16" to ¼", tensile strength of 30 to 250 lbs. Alpha Wire Corp., 200 Varick St., New York 14, N. Y. (ELECTRONIC TECHNICIAN 3-24)

Triad TRANSFORMER

A new isolation transformer eliminates ground loop feedback in stereo sound systems where either amplifiers or pre-amplifiers use a common ground. Providing one-to-one impedance ratio at 0 dbm from 20 to 20,000 cps the A-210P is furnished with a standard plug and socket ready for immediate installation at the input connection on either pre-amp. Triad Transformer Corp., 4055 Redwood Ave., Venice, Calif. (ELECTRONIC TECHNICIAN 3-22)

Stancor FLYBACK

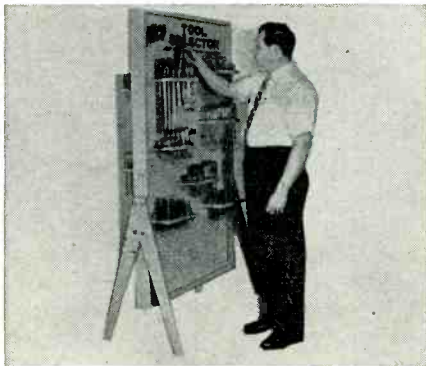
Exact replacement flyback Part No. HO-301, for use in Admiral TV sets replaces Admiral part numbers 79D65-2 and 79D65-4 in over 250 models and chassis. This unit can be installed in all of these 250 Admiral types without



chassis or circuit alterations. A detailed list of the Admiral models and chassis using Stancor flyback HO-301 will be found in Bulletin 554. Chicago Standard Transformer Corp., 3501 W. Addison St., Chicago 18, Ill. (ELECTRONIC TECHNICIAN 3-13)

Vaco TOOL SELECTOR

The "Tool Selector" is in the form of a yellow perforated masonite panel measuring 3 by 5 ft. 4". It comes complete with literature. There are six different ways "Tool Selector" may be set up: as a horizontal floor display against a wall; as a horizontal island display; as a vertical wall display; as a



horizontal wall display; as a vertical floor display; as a vertical island display. It is supplied gratis with the purchase of various tool assortments. Any selection of tools may be made—screwdrivers, nutdrivers, pliers, or wood chisels. Vaco-Products Co., 317 E. Ontario St., Chicago 11, Ill. (ELECTRONIC TECHNICIAN 2-22)

For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 47

Limited time only! *Weller*[®] INTRODUCTORY OFFER!



Buy both soldering tools and

SAVE \$200

"special" model 8240K

NEW DUAL HEAT SOLDERING GUN FOR YOUR KIT—

Model 8200 with triggermatic control that switches instantly to high (125 watt) or low (90 watt) heat as your job requires. Tip life is increased because high heat is used only when necessary. Newest design gun with high efficiency, copper iron-plated tip. Spotlight. Reg. \$5.95 list.

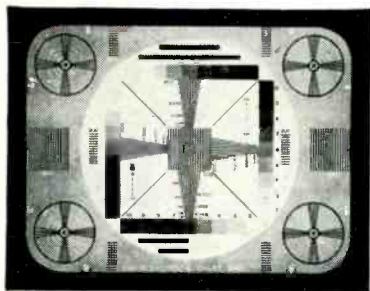
NEW TEMPERATURE-CONTROLLED IRON FOR YOUR

BENCH—Model TC-40. 40 watts. Built-in Magnastat temperature control at tip. Constantly maintains the proper soldering temperature—prevents overheating. Saves up to 50% on current used, gives 50% longer tip life. Ideal for printed circuit work. Reg. \$6.75 list.

A \$12⁷⁰ value • Special price \$10⁷⁰

On sale for a limited time at your Electronic Parts Distributor.

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



TV TIPS FROM TRIAD

NO. 2 IN A SERIES

The voice on the phone was painfully familiar. "No picture again," it said. The PTM (short for Professional Television Man) realized he was indeed on rather intimate terms with this particular receiver. Since installing a power transformer 8 months ago he had put in three 6CU6's, and two "exact replacement" flybacks.

"This is a blot on my escutcheon," said the PTM, who always used big words when talking to himself. "I'll fix it or buy it."

On the bench, the receiver revealed one flat 6CU6 and one flyback cooked to a turn.

First the PTM checked out the low voltage B+. Finding it excessive by 40 volts, he referred to the secondary rating and found it normal (660 volts where schematic called for 650).

"This can't be," he said, among other things. An outside salesman, attracted by the picturesque language, immediately presented the PTM with Triad's new Replacement Guide. "Check page 15," said the salesman, who was apparently blessed with total recall.

Here they find the rating that counts for the serviceman is the B+ he gets under actual conditions in the receiver; whether the set has one or two 5U4's; and, regardless, how fully loaded the circuit is. Actually the same power transformer can vary from 340 volts at 70% load with two 5U4 rectifiers to 285 volts with one 5U4 at 100%.

A Triad Service Aid called "Taking The Heat Off Flybacks" provides some additional information: "An increase of only 20 volts B+ can shorten tube and flyback life by 80%."

Better to fix the cause of the trouble than keep fighting the results. So the PTM looked up the current and voltage rating and selected the item that delivered it from his rectifier system. The picture was just as good but the whole set cooled down well below the boiling point.

MORAL: Too little information is a dangerous thing. Extra specifications—such as those you get from Triad—avoid callbacks. If you'd like to receive Triad Service Aids, communicate with **Triad Transformer Corp.**, 4055 Redwood Ave., Venice, Calif.

Radar Meters

(Continued from page 35)

of one of the antennas. The return signal plus some leakage from the original signal is picked up by the other antenna. The incoming signal is mixed and the resulting i-f component is detected. As mentioned previously, the i-f signal for this operating frequency is 31.15 times the miles-per-hour speed of the target. Graphic recorders for permanent records can be attached to most radar speed meters.

Servicing

Technicians who service radar speed meters should possess a first or second class radiotelephone or radiotelegraph operator license. A radio station license is also required. However, it is not necessary to be a licensed operator to turn on and use most of this equipment. Transmitter frequency should be checked periodically, at least every 6 months, with a frequency meter which can measure within an accuracy of at least 0.05%. In the case of the light-house tube, tuning of the transmitter is accomplished by moving the tube in and out of its cavity, and then locked with a clamping ring.

The frequency of a klystron tube can also be adjusted by modifying the size of its cavity. It is possible to obtain klystrons with the operating frequency preadjusted. When replacing a klystron the repeller adjustment should be made for maximum output. There may be two points in this adjustment where peak output readings are obtained. The one giving the higher reading should be accepted. For this adjustment the positive lead of a 0 to 50 microammeter is connected to the body of the cable connector, and the negative lead to the inner conductor pin.

Crystals can be checked most easily by replacement. One of the simplest, although not the best, checks is the forward to backward resistance ratio obtained with an ohmmeter. Normal readings vary from about 200 to 500 ohms in the forward direction, and from about 10,000 ohms and up in the other. Crystals can be easily damaged by excessive r-f fields, or by static dis-

SAVE TIME with

SENCORE

See other SENCORE ads in this issue.

SERVICE INSTRUMENTS CORP., 121 Official Rd. • Addison, Ill.

New!

SENCORE Electro-Sub

Check all **ELECTROLYTIC CAPACITORS** in Seconds!

Model ES-102

ONLY **\$15.95** DEALER NET

Less than you pay for the individual capacitors.

Carry it anywhere—measures only 4 3/4" H x 4 3/4" W x 2 1/4" D

... COMPLETELY SAFE—no arc or spark when connecting or disconnecting.

... AUTOMATIC CAPACITOR DISCHARGE—within seconds after releasing test switch by, unique surge protector circuit.

... NO CAPACITOR HEALING—surge protector circuit prevents accidental healing of capacitor being "bridged" in service work.

... Carefully select the electrolytic and substitute it. 10 big electrolytics from 4 to 350 Mfd. to safely substitute in any circuit from 2 to 450 volts.

charges. To minimize danger of damage from stray fields, when inserting the crystal in its holder, discharge the circuit.

A tuning fork may be used to calibrate the indicator. If a tuning fork is struck and held in front of the antenna, the indicator meter reading in mph will correspond to the frequency calibration of the fork. The frequency of the fork is 7.31 or 31.15 times the mph reading. Or, an audio signal of the proper frequency may be fed to the input of the amplifier. Accurate frequencies within 1% are usually selected for calibration at 60 to 80 mph. Calibrated forks are available for this purpose.

Adjustment of the expander circuit is accomplished by R245 in Fig. 3. With a test oscillator connected for an 80 mph indication, the following should occur. As the input voltage is increased the meter starts to read and when it reaches approximately 10 mph it should suddenly increase

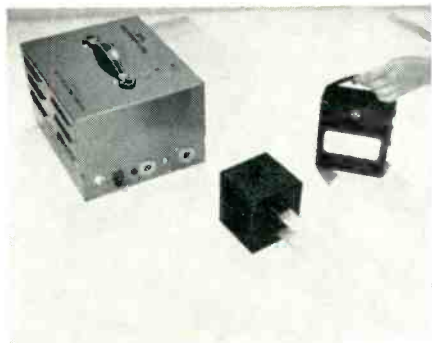


Fig. 4—Two polystyrene antennas lead to waveguides in center unit. The klystron oscillator requires no external tuned circuits.

to 80 mph without a further increase in the input signal. Then as the input signal is decreased to approximately one-half its value, the meter will gradually decrease to approximately 70 mph and then abruptly return to zero without further decrease of the input signal. When replacing tube V206 it is also necessary to make this adjustment.

Most of the other requirements for servicing and maintenance are the same as for other 2-way radio equipment. However, it is strongly advised that before attempting any adjustments or repairs the technician avail himself of the service manual for the particular piece of equipment. •

Illustrations & Credits

Automatic Signal Division, Eastern Industries, Inc., Norwalk, Conn.
Monument Engineering Co. Inc., 1625 Bellefontaine, Indianapolis, Ind.

General Instrument has
the **RIGHT RECTIFIER**
for every **TV set**

AUTOMATIC
PT5 Silicon
RECTIFIERS

RADIO RECEPTOR
Selenium
RECTIFIERS

Don't be fooled by an "all or nothing at all" approach. Selenium and Silicon rectifiers both have a place in today's TV sets . . . and General Instrument supplies the very best!

Radio Receptor "Safe Center" selenium rectifiers have proved their reliability and long life in millions of circuits through the years. When your replacement calls for *selenium* there is no better rectifier.

AUTOMATIC PT5 Silicon rectifiers are the first choice of leading TV set manufacturers switching to silicon in their new models. When replacing or converting to *silicon*, install the PT5 for maximum performance and picture brightness.

Both these outstanding rectifiers are brought to you by GENERAL INSTRUMENT, your finest source of semiconductor components!

General Instrument Distributor Division
RADIO RECEPTOR COMPANY, INC.
Subsidiary of General Instrument Corporation
240 Wythe Avenue, Brooklyn 11, N. Y. EVergreen 8-6000



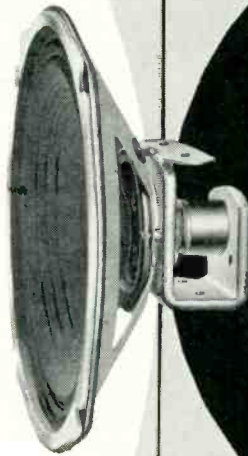
Radio Silence

(Continued from page 43)

filters are commercially available. Price of many commercially-made filters are considerably less than the labor and material cost of do-it-yourself devices. Preliminary checks of the effectiveness of the filter can be made by ear, but final checking is best performed with an oscilloscope. To insure that the filter is actually used with the machine at all times, it is desirable to mount it directly on the machine or stand. Permanent connections for power and ground wires, as shown in Fig. 5 are desirable. There is usually more than enough room underneath the stand to fasten the filter, without conflicting with the machine mount. It is important that the machine frame and stand be electrically bonded together. In many instances, the rubber shock mounts or feet underneath the machine, electrically isolate the machine from the stand. A wire bond, such as that shown in Fig. 6, may solve this problem.

Although the cord from the machine to the filter should be, and usually is, quite short, it can be a very effective radiator of assorted electrical noise, particularly those in the higher frequencies used in TV and aeronautical communications. This difficulty can be remedied by using a braid-shielded line cord between the machine and the filter, or even by slipping a length of screen door spring over the cord. One end of the spring shield should be effectively grounded. Protection against mechanical cord damage is also afforded by the spring, as shown in Fig. 7. Severe cases of interference may require that the cord from the stand to the outlet be shielded with woven copper braid or similar material. By use of fairly standard noise reduction methods and devices, interference can be reduced to almost any low value desired except zero. The machine and filter combination used as a practical example was developed for use in a meteorological office. It could be operated simultaneously with the raysonde receiver plugged into the same outlet, without causing interference. Experience has shown that merely fitting a filter to a machine is not enough to eliminate interference unless definite measures are taken to assure that the filter is made an integral part and is in use at all times when the equipment is turned on. •

**COMPARE
THE WEIGHT
of a**



QUAM
Adjust-a-Cone[®]
SPEAKER

**QUAM-NICHOLS
COMPANY**

226C EAST MARQUETTE ROAD
CHICAGO 37, ILLINOIS

ask for QUAM, the quality line for all your speaker needs.

**SAVE
TIME
with**

SENCORE

®

NOW CHECKS:

- ★ **Transistors** for opens, shorts, leakage and current gain. Only tester that tests power transistors as used in car radio outputs.
- ★ **Crystal Diodes** checks forward to reverse current ratio on all diodes.
- ★ **Selenium Rectifiers** checks forward and reverse currents.

Service Instruments Corp. 121 Official Road, Addison, Ill.

See other SENCORE ads in this issue.

**New! Improved!
TRANSISTOR
CHECKER**

*America's newest, most
popular test instrument*

Simple to Operate. 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.



MODEL TRC4
\$17.95
DEALER NET

Cannot become
obsolete.
Approved by
leading
manufacturers.

Association News

California

Society of Radio and Television Technicians, Van Nuys, member of Radio TV Technician Association, reports an 8-point short range and 3-point long range RTA program under consideration: Short range—1, war on captive service; 2, oppose parts discounting; 3, public education; 4, recruiting; 5, employment service; 6, credit bureau; 7, speaker booking office; 8, business information office. Long range—1, cash dividends to members; 2, political activity; 3, sales and technical aids.

Television Service Dealers Association, San Mateo County, urges opposition to manufacturer extended parts warranties and unrealistic service contract rates.

Illinois

The annual NATESA Spring meeting will be held April 17-18-19, 1959 at the Hermitage Hotel in Nashville, Tennessee to formulate plans for the National Convention

in the fall. All independent service operators are invited to attend this meeting. Registration for members is \$12.00, for ladies \$10.00.

ETA of NI has chosen the following officers: Pres., Don Nelson; V.P., Al Stalheim; Treas., John Balmer; Sec'y., Ed. Tanrath; NATESA Director, Bill Mosley; and as alternate, Ed. Tanrath.

Merrill W. Applebee, President of NEDA, during the meeting of the Board of Directors, recommended that Joseph A. DeMambro, immediate Past-President and W. D. Jenkins, former President be vested with the honorary title of "Chairman of the Board Emeritus." The Board of Directors unanimously adopted a resolution conferring the title of Chairman of the Board Emeritus upon DeMambro and Jenkins. A solid gold profile view of DeMambro mounted on a teakwood plaque was awarded to him.

Indiana

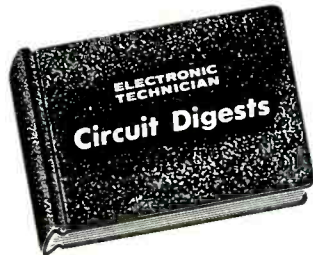
A TV license bill, number SB149, in this State has been reported out on the floor of the Senate. The TV License Committee in Indianapolis urges all those in favor of the bill to phone or write to the Senatorial Public Policy Committee. Association leaders are actively supporting this proposed legislation. The Indianapolis Better Business Bureau has offered its help by making its files available to any legislative group considering the license proposal. Bipartisan sponsorship of the bill is planned in the State Senate, with Senator Marshall F. Kizer (Dem.) and Senator Ruckelshaus (Rep.), introducing the measure.

Michigan

TSA Michigan reports that Detroit's TV Service License Ordinance works. Better Business Bureau records show a 60% drop in
(Continued on page 72)

BINDERS

for your
CIRCUIT DIGESTS . . .



10 3/4"
X
14 1/4"

... are now available to
ELECTRONIC TECHNICIAN
subscribers!

These sturdy spring-type (no holes to punch) binders are bound in dark red, hard bookcover material . . . they hold 24 monthly issues of CIRCUIT DIGESTS plus other reference literature.

. . . and are embossed in gold on the front and the back binding. Another ELECTRONIC TECHNICIAN service—to help you preserve and get more convenient use out of your valuable CIRCUIT DIGESTS!

\$2.95 each—Postpaid
(for Canada & Foreign—add 50¢ postage)

ELECTRONIC TECHNICIAN

480 Lexington Ave., New York 17, N. Y.
Please ship . . . "CIRCUIT DIGEST Binders." I enclose \$. . .
(please print)

Name
Street & No.
City Zone State

SO SAFE!



won't damage glass tubing
let alone wire or cable!

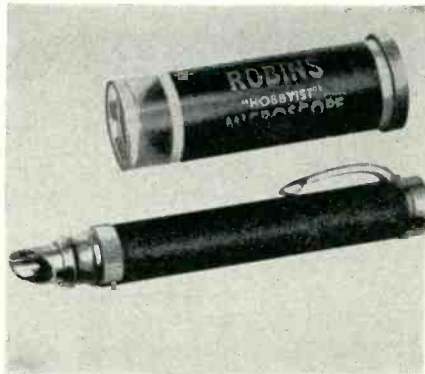
ARROW STAPLE GUNS can't damage wire or cable because driving blade automatically stops staple at right height! That's why Arrow Staple Guns are proved safer on jobs all over the country. And Arrow staples have tremendous holding power because they're rosin-coated, have diverging points that lock into wood.

T-25 (shown) for wires up to 1/4" in diameter. (Hi-Fi wire, radiant heating, bell, thermostat, telephone, inter-com, etc.) tapered striking edge gets into tight corners. Uses 3/8", 1/2", and 5/8" staples. List \$15
T-25B For burglar alarm wiring. Drives staples flush . . . List \$15
T-75 For non-metallic sheathed cable, Romex cable or any other object (such as copper tubing) up to 1/2" in diameter. Uses 3/8", 1/2", and 5/8" Arrow staples List \$15

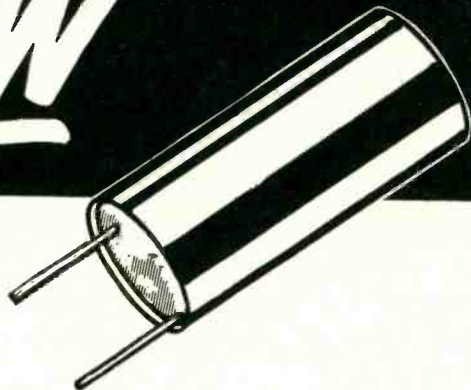
ARROW FASTENER COMPANY, INC.
1740 East New York Ave., Brooklyn 12, N. Y.

Robins **STYLUS MICROSCOPES** →

The best way to insure records against permanent damage is to check styli regularly with a stylus microscope. Even a diamond stylus will become worn, and "chew up" the grooves. Two new stylus microscopes have been added to the firm's line of record and tape care accessories. The MX-1 Professional, listing at \$2.60, features four precision optically ground lenses, focusing adjustment and a convenient slot to hold the stylus. The Hobbyist, MX-40, has a plastic lens. It lists at \$1.35. Robins Industries, 36-27 Prince St., Flushing 54, N. Y. (ELECTRONIC TECHNICIAN 3-15)



NEW



Type "SA" . . . small single section electrolytics for printed circuit boards . . . hermetically sealed in aluminum tubes covered with red kraftboard insulating jackets . . . extra heavy tinned terminals anchored for proper spacing by a high melting point wax . . . for 85°C operation . . . individually packaged. Recommended for TV, radio and industrial applications.

See Your Parts Distributor

"ENGINEERED FOR QUALITY"

GUARANTEED FOR ONE YEAR

PLANET SALES CORPORATION

225 Belleville Avenue
Bloomfield, N. J.

SERVICEMEN KNOW!

Here they pay less and get the best

HUSH®

Chemically-Electronically, engineered for Tuners and Switching Mechanisms.

When New HUSH is applied it will wash-away that dirt, leaving clean and positive contacts protected by a lasting lubricant. New HUSH is made from the finest solvents and it contains Electro-Silicone oils.

Also available—2 oz., 8 oz., 32 oz. containers 6 oz. Spray can **\$2.25 net**

EVER-QUIET®

Since 1949

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 the contacts and leaving a safe protecting film. Harmless to metals, wire or carbon.

Also available—32 oz. containers 6 oz. Spray can **\$1.59 net**

2 oz. Bottle & dispenser **79c net**



CHEMICAL ELECTRONIC ENGINEERING, INC. Matawan, New Jersey

complaints since the law was passed. There were 1160 complaints in 1956, and 466 in 1958. The bill was passed in mid 1957. Major points accomplished are: elimination of price in service advertising; establishment of a standard of competency, established responsibility of the service dealer; identified the technician on calls; and assured the customer of definite recourse in the event of questionable service.

MARDA in Lansing, with the help of other associations in the state, set up a steering committee with the power to hire a lobbyist, pay bills, and take steps to obtain a licensing law.

IDEA Officers and Sub-Committee members at present are: National Chairman, Karl W. Heinzman, TSA of Michigan; Vice Chairman, A. R. Neihaus, TEA of Texas; Sec'y., John C. Peres, ARTSD of Ohio; Industry Relations Chairman, Tilman Babb, TEA of Texas and committee consisting of John Graham ARTSD of Ohio and M. B. Magers NARDA of Kansas City, Mo.; Legislative Committee Chairman, John Hemak MINISE of Minnesota with committee members of John Geoghegan, Sr., TELSAs of Conn., W. C. Pecht TEAM of St. Louis, Mo. and Wayne Clem of TV Bureau, Elkhart, Ind.; Finance Committee Chairman, Robert Steer, TELSAs of Conn. with committee members Len Smith TEA of Texas and Don Wilson ARTSD of Columbus Ohio; Service Dealers Communications Chairman, Jack Barton TSA of Michigan and committee members Robert Sickels TESA of Indiana and Hal Chase, Editor of TSA News. Don Wilson ARTSD of Columbus, Ohio was elected Treasurer of the Finance Committee. Other sub-committees will be appointed in the near future.

Missouri

Television Electronics Service Association, St. Louis, tells of the unhappy experience a consumer had with a firm that advertises: "Don't call a serviceman, let us check your tubes free. Buy only the tube or tubes you need." The viewer spent \$45 as a result of the bait ad, including \$27.50 worth of tubes. The set still was not working at last report.

New York

ARTSNY elected the following officials to serve for the year 1959: Pres., Eddie Eisen; V. P., Charles

Edwards; Executive Sec'y., Harold Levinson; Treas., Phil Goldfarb; Recording Sec'y., Jacob Allen; Corresponding Sec'y., Peter La Presti; and Sgt-at-Arms, John Wagonny. Marty Boxer was appointed as representative on the N.Y. State Attorney General's Committee. O. Capitelli and Max Leibowitz were appointed as delegates, and Peter La Presti as alternate to ESFETA for the year 1959.

ESFETA went on record as favoring the N. Y. State Attorney General's bill on Certification by the state of N. Y., with suggested revisions. However, there was unanimous agreement on the part of the association, that stronger legislation is desirable. Pres. Robert Larsen has been serving as a member of the Attorney General's Committee. A special meeting with Steven Mihalic of General Electric, Dan Creato of RCA and Max Romey of Westinghouse, to discuss printed circuitry, means of cooperation between manufacturer and service, and promotion of the Association idea by the manufacturers was held in Syracuse.

CETA reports continued achievements in their educational program, which started more than five years ago. A formal series of lectures on servicing Closed Circuit TV is scheduled to run from February to June of this year. Live demonstrations with an actual installation at the New York Trade School will be presented. The last series of scheduled lectures was devoted to the subject of transistors and servicing transistor circuits. This is in addition to regular monthly technical meetings with manufacturers and distributors. Sylvania Home Electronics Division presented slides, movies, free literature, door prizes and The Sylvania Service Clinic #10 on March 3rd. CETA has long been an advocate of Certification and is a member of the N. Y. State Attorney General's Committee. They have been helping to formulate and strengthen the proposed bill.

Pennsylvania

TSA of Delaware Valley in a luncheon meeting with RCA Service Co. made a genuine attempt at resolving some of the irritating issues within the Electronic Service Industry. Pres. of the RCA Service Co., Donald H. Kunsman, presided. Discussed were the pricing structure, policy towards independent service, and other matters. Kunsman reported that there are 3 divisions in

the RCA Service Co.—Industrial Electronics and Hospital Services; the TV Service Division, once totaling 154 branches; and the Government Services Division, with great numbers of men in the missile program. Every Division must show a profit, and the most profitable has been the TV Service Division. Forty-six TV service branches were closed because they showed no profit.

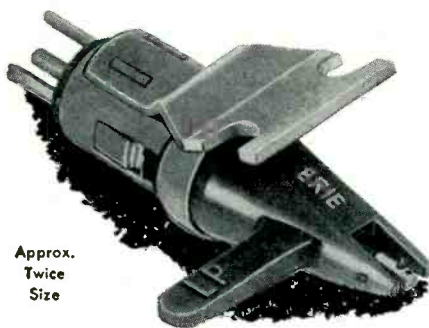
PRMSA, of Philadelphia, has arranged with two area distributors to have its members buy radio and TV sets at wholesale prices so that they

may resell them at full list, and permit a legitimate trade-in allowance. According to Pres. Richard Devaney, this is their method of combating bad advertising.

Texas

TEA of San Antonio reports the final draft of their handicapped worker training program is being prepared. The State would contribute \$40 per month to each shop taking one or two of these people. No salary is paid for the first nine months.

From the pioneer in ceramics for electronics



Approx.
Twice
Size

STEREO

the new single
ceramic element
Stereophonic
cartridge

DYNAMIC BALANCING MAKES THE DIFFERENCE

DYNAMIC BALANCING during manufacture provides full stereo reproduction. SINGLE ELEMENT DESIGN offers balanced outputs; excellent separation of 20 db over full audio-frequency range, with equal outputs from both channels. Compatible with stereo and monophonic discs.

SPECIFICATIONS

RESPONSE: 20 to 16,000 cps. OUTPUT VOLTAGE: 0.5 vrms at 1 KC each channel. COMPLIANCE: 3×10^{-6} cm/dyne, vertical & lateral. RECOMMENDED LOAD: 2 megohms. RECOMMENDED TRACKING PRESSURE: 5-6 grams. CHANNEL SEPARATION: 20 db. STYLII: Dual tip; 0.7 mil diamond or sapphire, and 3 mil sapphire. MOUNTING DIMENSIONS: EIA Standard $\frac{7}{16}$ " & $\frac{1}{2}$ " centers.

For additional information, see your Authorized ERIE Distributor



SAVE
TIME
with

SENCORE

Transi-Pak

A "Twin" to the
SENCORE
TRC4 Transistor
Checker

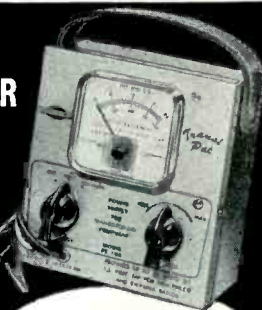
See other SENCORE
ads in this issue.

A Low Cost TRANSISTOR RADIO BATTERY ELIMINATOR

Here is a complete isolated power supply especially designed to replace batteries during repair time of all transistor radios.

- ★ Supplies up to 200ma
- ★ A must for Philco and Sylvania radios
- ★ Insures proper operating voltage and current for transistor radios

SERVICE Instruments Corp.
121 Official Road, Addison, Ill

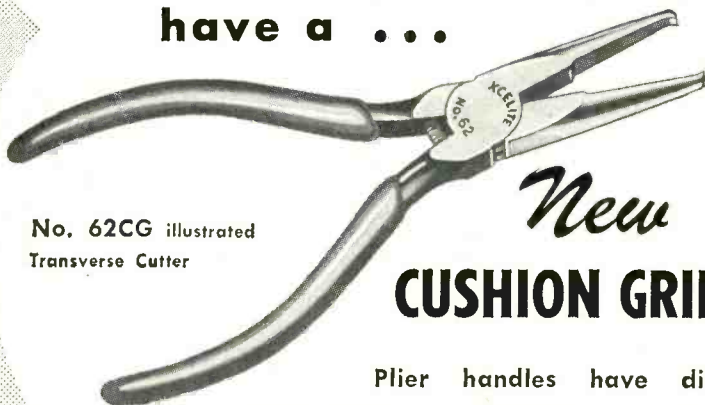


MODEL PS-103
\$17.95
DEALER NET

AT LEADING PARTS DISTRIBUTORS

XCELITE PLIERS

have a . . .



No. 62CG illustrated
Transverse Cutter

New
CUSHION GRIP!

Plier handles have dipped plastic coating . . . permanent, comfortable. Heads polished and buffed to a "mirror finish". All pliers available . . . See Your Distributor!

Gives pliers a "Feel" that inspires Craftsmanship!

XCELITE, INCORPORATED
ORCHARD PARK, NEW YORK
Canada: Charles W. Pointon, Ltd., Toronto

XCELITE
Quality Hand Tools
PREFERRED BY THE EXPERTS

Why "The Man On The Roof"

prefers

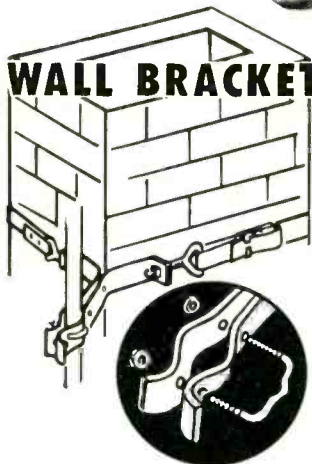
South River



for making superior television antenna installations

Take "Snap-In" Type
CHIMNEY MOUNTS and WALL BRACKETS
for instance . . .

Unique U Bolts instead of two screws make for quick, simple, antenna installation. Spring tension on steel mast retainers holds antenna mast while Special U Bolts are inserted and tightened. Saves installer time — permits greater safety. Same features are included in Snap-In Wall Brackets.



SN-50 CHIMNEY MOUNT
(Two To A Set)

*Products made better by design
— with the installer in mind*
MAKE IT EASY FOR YOURSELF
. . . Better for your Customers

Insist on mountings and accessories made by

South River **METAL PRODUCTS CO., INC.**
South River, New Jersey

PIONEER MANUFACTURER AND OUTSTANDING PRODUCER OF THE FINEST LINE OF ANTENNA MOUNTING ACCESSORIES

CANADA: LEN FINKLER & CO., TORONTO

Audio NEWS LETTER

JENSEN INDUSTRIES reports sales of 55,000 12-needle displays in 60 days.

BIGG of California announces the BOC 14-P speaker/enclosure system handling up to 50 watts peak. Size is 12" x 13" x 25-1/2".

SALT LAKE CITY Stereo & High Fidelity Music Show sponsored by Jack Matlack Enterprises is set for March 14-16. More information from Emerson S. Smith, Morrison Bldg., 112 E. 9th St., Salt Lake City, Utah.

ROBINS INDUSTRIES introduces the TL-1 turntable level @\$1.15; stylus microscopes MX-1 Professional @ \$2.60 and MX-40 Hobbyist @\$1.35; and TC-5 tape storage can @55¢. The company appoints Jack Gilbert Associates for advertising and public relations.

BOGEN - PRESTO publishes the stereo edition of "Understanding High Fidelity." This fourth edition has 64 pages, sells for 25 cents. The company also announced the appointment of Morris F. Taylor Co. as southeast rep. and Joseph B. Hersh as plant manager, replacing Erwin Rausch.

STEREO: TWO VIEWS. Says Dynavox Pres. Joseph Dworzen: "1958 hi-fi sales dropped as a result of a most confusing, ill-timed introduction of stereo. . . . Distributors, dealers and their sales personnel didn't know what to do with this Frankenstein. . . . Without (proper demonstration) 1959 will be another year for the public to play wait and see." Says Motorola Exec VP Edward Taylor: "Stereo is the most exciting aspect of the electronics art in ten years. People are upgrading their tastes in home entertainment. . . . 1958 sale of 750,000 stereophonic high fidelity instruments may increase to 3,000,000 units (in 1959)."

GRANCO names Herbert Frank director of sales.

SYD WIMPIE, ex-Rockbar president, forms rep firm at Mamaroneck, N. Y.

TURNER COMPANY names Thomas H. Moss VP. He continues as sales manager.

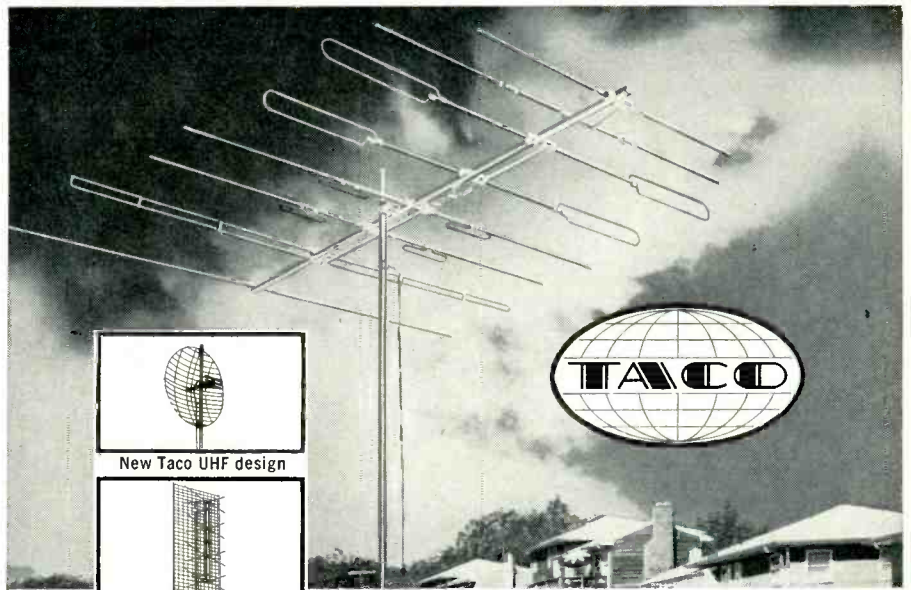
KLIPSCH names Donald B. Davis VP. Firm's "Pocket Facts" briefly explains how to obtain third stereo channel from two tracks.

CALIFONE introduces the Cue Master which lifts or lowers phono pickup at any desired record groove. It's intended for audio-visual work.

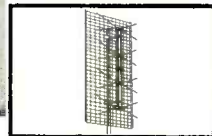
ORRADIO introduces the Tape Stroboscope @\$4.95. The device, invented by a radio-TV service technician, has a rotatable disc that is held against the moving tape. Check 3-3/4, 7-1/2 and 15 ips.

LARRY EPSTEIN has resigned as director of sales for UNIVERSITY LOUDSPEAKERS to become sales VP for UNITED AUDIO PRODUCTS, a newly activated subsidiary of United Optical Products, which will shortly introduce a component hi-fi line. Included will be the Dual combination turntable and changer. Dual, the European manufacturer, has been making record changers since 1910. Line will sell on limited franchise basis.

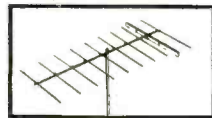
NATIONAL CREDIT OFFICE expects replacement parts business to increase at least 10% this year. In 1958, parts distributor failures were down to 11, or 13 less than the previous year. 38 new distributors were established, and sales totaled \$715,000,000, up 8% over 1957. There were 2433 distributor buying outlets in existence, including 1800 headquarter locations. Area leaders in sales gains were New England, Mid-Atlantic and Pacific. On the other side, East North Central faced a downturn. A fair number of distributors were down in hi-fi sales.



New Taco UHF design



Popular Taco Bowtie



Taco area-sized antennas



Use the best-
TO BE THE BEST-

Back up your skills and reputation with the best—always use a Taco antenna to assure top-notch performance and lasting satisfaction. You'll find Taco antennas go up easier and work better—and you make more money!

Write for complete details

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ANTENNAS

TECHNICAL APPLIANCE CORPORATION, Sherburne, New York.

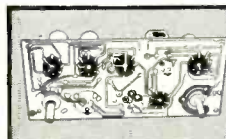
MORE *ACTIVE!*
EFFECTIVE!



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

AUDAX div. of REK-O-KUT has purchased the hi-fi speaker div. of RACON, retaining Saul White as chief engineer. An aggressive sales campaign will be carried out by Rek-O-Kut. The company also announced they are shipping the K33H version of their turntable kit, this one with hysteresis motor, priced at \$49.95, or \$10 over the K33.

ALTEC COMPANIES stock is being acquired by LING ELECTRONICS under a stock exchange arrangement. Altec will operate as a Ling subsidiary with no change in management or operations, it is said. Company name is expected to change to Ling-Altec Electronics, Inc. Lewis E. Gillingham has been named marketing director and ad manager of ALTEC COMPANIES.

ELECTRO-VOICE has filed a registration statement with SEC covering 150,000 shares of capital stock for public offering in February. Half will be sold for the company account, half for present stockholders. F. S. Moseley & Co. will distribute the stock. In the year ending Feb. 28, 1958, sales were \$9,379,000, earnings \$.90 per share. Earnings for 9 months ending Nov. 30, 1958, were \$1.04 per share.

CHANNEL MASTER breaks with a line of hi-fi components, initial distribution in the East. Stereo amplifier, 16 watts/channel @ \$119.95; mono amp, 20 watts, @\$79.95; AM/FM tuner @ \$84.95, all less cabinet; and 9" x 9" x 16" speaker system @ \$29.95. Cabinets are available in wood or metal. Sales through CM distributors and local dealers.

NATIONAL STEREOPHONIC RADIO COMMITTEE formed by Electronic Industries Association and headed by C. Graydon Lloyd of GE will study technical factors involved in broadcast stereo, and make findings available to FCC. Anyone with proposals should submit them to Virgil Graham, EIA Engineering Dept., 11 W. 42 St., New York 36, N. Y.

HARMAN-KARDON will offer 200,000 shares of common stock @\$3. Almost half is for the company, the rest is offered for VP Bernard Kardon who reportedly plans to retire from the company. Fourth-quarter 1958 sales and \$470,000 backlog were at record high. The firm also promotes Julian Kerwin and Fred Samuel to VP's.

IMPULSE BUYING plays vital role in sales of big-ticket items, according to a 5-year study by BBDO. 77% of all electrical appliance sales were made to people who did not intend to buy at the beginning of the year. 79% of aut. sales were so made. Moral to hi-fi producers: Get maximum product exposure through increased number of local sales outlets.



Ab...
that's my driver!

It's a **VACO**[®]

Service men all across the country agree... there's no other screw driver or nut driver with the built-in comfort of the VACO "comfordome" handle. Makes service work easy! Enjoy the luxury grip of a VACO... the driver that gives plenty of power, yet is always kind to hands. Next time choose a VACO and *feel the difference!*

Manufactured and Unconditionally Guaranteed by
VACO PRODUCTS CO., 317 E. Ontario St., Chicago 11, Ill.
In Canada: ATLAS RADIO CORP., Toronto 19, Ontario

SENCORE
CIRCUIT "Fuse Safe"
TESTER

Save Time with SENCORE

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, simulates operating conditions.

SENCORE
As Recommended by Leading Manufacturers
Service Instruments Corporation
121 Official Road, Addison, Illinois
See other SENCORE ads in this issue

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

TV SERVICING

RECEIVING TUBE SUBSTITUTION GUIDEBOOK By H. A. Middleton, #135.....\$3.00
 First Supplement, #139.....\$.99
 Second Supplement, #139-2.....\$.99
 Third Supplement, #139-3.....\$1.35
REPAIRING TELEVISION RECEIVERS By Cyrus Glickstein, #191.....\$4.40
HOW TO LOCATE AND ELIMINATE RADIO & TV INTERFERENCE by Fred D. Rowe, #158.....\$1.80

PICTURE BOOK OF TV TROUBLES

By Rider Lab Staff

Fabulous series of definitive, practical books that teach recognition of faults in TV receivers.

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VOL. 7: SOUND CIRCUITS & L-V POWER SUPPLIES, #168-7, 64pp.....\$1.50
TV PICTURE TUBE-CHASSIS GUIDE By Rider Lab Staff, #204.....\$1.35

HOW TO INSTALL TV ANTENNAS By Samuel L. Marshall, #172.....\$2.50

ADVANCED TELEVISION SERVICING TECHNIQUES By Zbar & Schildkraut

MAIN TEXT, #161.....\$3.60
LABORATORY WORKBOOK, #161-2.....\$.95

HOW TO TROUBLESHOOT A TV RECEIVER By J. Richard Johnson (2nd edition), #152.....\$2.50

SERVICING TV VERTICAL AND HORIZONTAL OUTPUT SYSTEMS By Harry Thomas, #150.....\$2.40

**THESE RIDER BOOKS
 WILL INCREASE YOUR
 '59 SERVICE PROFITS**

COLOR TELEVISION

INTRODUCTION TO COLOR TV (2nd edition) By Kaufman & Thomas, #156.....\$2.70
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AUDIO & HIGH-FIDELITY SERVICING

RIDER'S SPECIALIZED HI-FI AM-FM TUNER MANUAL, #7001.....\$3.50
HOW TO INSTALL & SERVICE INTERCOMMUNICATION SYSTEMS By Jack Darr, #189.....\$3.00
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REPAIRING HI-FI SYSTEMS By David Fidelman, #205.....\$3.90
RIDER'S SPECIALIZED TAPE RECORDER MANUAL, VOL. 1, #6001.....\$4.50

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HOW TO USE METERS By John F. Rider, #144.....\$2.40
HOW TO USE TEST PROBES By A. Ghirardi & R. Middleton, #165.....\$2.99
OBTAINING INTERPRETING TEST SCOPE TRACES By John F. Rider, #146.....\$2.40
HOW TO USE SIGNAL & SWEEP GENERATORS By J. Richard Johnson, #147.....\$2.10

RADIO SERVICING

RADIO RECEIVER LABORATORY MANUAL By Alex W. Levey, #178.....\$2.00
RADIO TROUBLESHOOTING GUIDEBOOK, VOL. 1 By Rider & Johnson, #149.....\$2.40

HOW TO INSTALL AND SERVICE AUTO RADIOS

By Jack Darr, #159.....\$1.80

REPAIRING PORTABLE & CLOCK RADIOS

By Ben Crisses & David Gnessin, #224.....\$2.75

Look for these books at the Rider display at your jobber, if not available order direct

ET-3



JOHN F. RIDER PUBLISHER, INC.

116 West 14th Street, New York 11, N. Y.

New Books

Book marked with an asterisk (*) may be obtained prepaid from Electronic Technician

* **TELEVISION SERVICING.** By Alex Levy & Murray Frankel. Published by McGraw-Hill Book Co. 534 pages. Hard Cover. \$7.75.

Here is a substantial reference, packed with much practical data on TV maintenance. Basic circuits are described, and servicing techniques explained for them. The procedures are then adapted to commonly used variations of the basic circuits. Topics include servicing power supplies, deflection, sync, video amplifier, pix tubes, detector, i-f, agc, tuner, sound and antenna. A 44-page section on field servicing includes many symptoms, with associated picture of screen, together with probable cause and servicing procedure. The text is well written.

* **HOW & WHY OF HI-FI & STEREO.** Prepared and published by Harry G. Cisin. 40 large pages. Soft cover. \$1.

Written on an intermediate technical level, this helpful little book utilizes more than 40 illustrations. Among the subjects explained by the author are the home hi-fi system, stereo and stereo conversion, tuners, amplifiers, speakers, record players, tape recorders and microphones.

* **MOBILE RADIO TELEPHONES.** By H. N. Gant. Published by The Macmillan Co. 125 pages. Hard cover. \$4.50.

This informative technical book, prepared by a British engineer, explains the functions of the various elements in radiophone systems. Performance requirements, installation, maintenance and testing are covered. Among the many subjects discussed are noise factor, modulation, interference, selectivity, receivers, transmitters, antennas, tuning, muting, spurious responses, etc. Several helpful schematics are included. The text, though well written, would have benefited from additional illustrations.

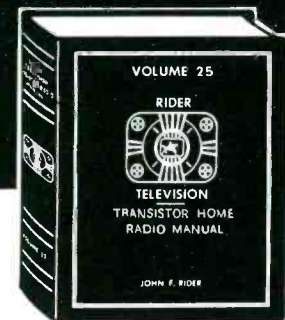
* **ELECTRONIC COMMUNICATIONS.** By Robert L. Shrader. Published by McGraw-Hill Book Co. 937 pages. Hard cover. \$13.

Starting with electronic fundamentals, this reference textbook goes through transmitters, FM, antennas, TV and shipboard radio to loran, radar and communication law. Coverage is so exhaustive that units such as transistors, batteries and motors are detailed. A prime purpose of this book is to prepare the reader for FCC license exams. The end of each chapter shows two lists of questions, one applicable to commercial, the other to amateur licenses. This comprehensive volume is a worthy addition to a technical library.

(Continued on page 79)

NOW...

**THE WORLD'S
 FINEST
 TV SERVICE DATA**
plus
**THE WORLD'S
 FINEST TRANSISTOR
 AND HOME
 RADIO SERVICE DATA**



**volume 25
 RIDER
 combination
 (TV - TRANSISTOR - HOME RADIO)
 manual**

Available April 17th

TELEVISION RECEIVERS

Latest service data covering products of 18 manufacturers.

TRANSISTOR RADIOS

Latest service data covering products of 18 manufacturers for the period October 1958 to January 1959.

HOME RADIOS

Latest service data of tube radios of 18 manufacturers for the entire year of 1958.

SAVE SERVICING TIME

No more hunting down of hard-to-get schematics...no more guesswork...no more trial and error! Factory accuracy and Factory coverage. All in one place—instantly available—permanent durable file of dependable service information at an economical price. Useful for many years. Only \$27.00 Start saving time now—order RIDER COMBINATION MANUAL 25 at your jobber today...Limited Printing.

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from

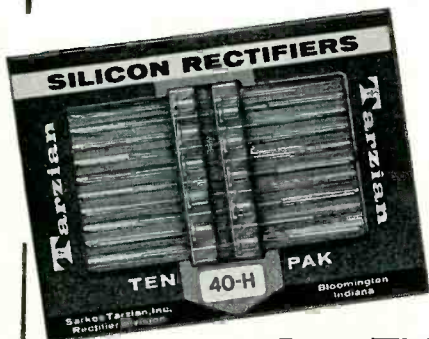
Tarzian



F-4

Lowest priced 750 mil. silicon rectifier available . . . Ten in a handy pack—rated at 0.75 amps. dc, 400 P.I.V. . . . For use in radio, television and electronics.

F-4



40-H

Industry standard top hat hermetically sealed silicon rectifier rated at 0.75 amps. dc, 400 P.I.V.

Send for prices and complete information

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BLOOMINGTON, INDIANA
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TEL. ROGER 2-7535
EXPORT: AD AURIEMA, INC., NEW YORK CITY

WANTED

As a public service, **ELECTRONIC TECHNICIAN** is publishing the following description of a fugitive from justice who might currently be engaged in the electronic maintenance industry.

Any person having information which might assist in locating him is requested to notify the special agent in charge of the nearest **FBI** division immediately. The telephone number is listed on the first page of local telephone directories.

Salvatore Richard Cortes is being sought by the Federal Bureau of Investigation for deserting the United States Marine Corps on July 11, 1944.

Cortes entered the Marine Corps on Feb. 19, 1944, at New York City. He deserted on July 11, 1944, while assigned to Company D, Signal Battalion, Official Training Regiment,

Training Command, Camp Lejeune, South Carolina.

Cortes had worked for the Tele-register Corp. for an extensive period of time as an indicator repair man on electronic equipment. He is well experienced in this field.

Description

Born Oct. 7, 1916, Bronx, N. Y. Height, 5' 8½" to 5' 10". Weight, 150 to 170 pounds. Build, medium, slender. Eyes, brown. Hair, black, wavy. Complexion, dark. Race, white. Nationality, American. Occupation, indicator repair man. Scars and marks, pock mark on stomach, scar on forehead, mole on right side of mouth, vaccination scar on left upper arm, mark on left side, pock mark in middle of shoulder, pock mark on right scapula (shoulder blade).

WANTED: Salvatore Richard Cortes



SAVE
TIME
with

SENCORE

SENCORE Handy "36"

R C-Substitution Unit

"36"—Most Often Needed Components at YOUR Fingertips!

3 Pole, 12 position switch individually selects one of the "36" components for direct substitution.

Contains:

- ★ 12—1 watt 10% resistors from 10 ohms to 5600 ohms
- ★ 12—½ watt 10% resistors from 10K ohms to 5.6 megohms
- ★ 10—600 volt capacitors from 100-mmf. to .5 mfd.
- ★ 1—10 mfd., 450V Electrolytic ★ 1—40 mfd., 450V Electrolytic
- ★ For Shop, Lab, or outside service



ONLY
\$1295
DEALER NET
Model
H-36
Completely Isolated
Available at all
Parts Distributors

Service Instruments Corp. 121 Official Road, Addison, Ill.

See other SENCORE ads in this issue.

NEW

HICKOK

Electronic Volt-Ohmmeter



Model 470

Features a High Sensitivity Transistor Bias Test (0 to 0.5 Volt D. C. range)

- Versatile, Light Weight Portable
- Large, 7" Hickok-built Meter
- Readability—0.2 Ohms to 1000 Megohms
- A.C.—Ohms—D.C., Single Unit Probe

This modern Electronic VOM is a high quality engineer's portable that incorporates the latest design advantages to provide a most useful and versatile tester with an unusual completeness of function.

D.C. VOLTMETER—Ranges: 0-1500 volts in 7 ranges—both plus and minus. Input Resistance: 13.3 megohm with probe furnished.

A.C. VOLTMETER—A.C. voltages are based on peak-to-peak detection and are calibrated in both RMS and Peak-to-Peak.

A.C. RMS: 0-1500 volts in 7 ranges.

PEAK-TO-PEAK: 0-4000 volts in 7 ranges.

FREQUENCY RESPONSE: 30 cps to 2.5 megacycles.

INPUT CAPACITY: 10 megohms shunted by approximately 150 mmf.

Attractive molded case 7" W., 6¼" H., 4" D. 6 lbs. Probe and leads are furnished.

\$ 84.50 NET

Now is the time to...
TRADE UP TO A HICKOK

Ask for a demonstration of the new 470 from your Authorized Hickok Distributor.

THE HICKOK ELECTRICAL INSTRUMENT CO.
10514 Dupont Ave. • Cleveland 8, Ohio

New Books

(Continued from page 77)

TELEVISION CHASSIS SERVICING TECHNIQUES. Prepared and published by General Electric TV Receiver Dept., Electronic Park, Syracuse, N.Y. Text with service manuals and bulletins, \$5 per year.

This text consists of eight separately published chapters on TV servicing, distributed free to subscribers to 1959 GE TV service manuals. Other bonus publications included in the package include replacement parts price lists, "Techni-Talk," and periodic technical bulletins.

TROUT'S SERVICING BULLETINS. Prepared and published by Wesley Trout, P. O. Box 575, Enid, Okla. Approximately 65 loose-leaf pages. \$3 per year.

This subscription service provides over 40 pages on servicing theatre sound systems, plus more than 25 pages on closed-circuit TV operation and maintenance. Several supplementary pages are sent periodically. A typical sheet has one page of technical discussion on a specific unit made by a particular manufacturer, and one page of schematic diagrams. For electronic technicians getting into theatre sound and closed-circuit TV work, these sheets offer a good service data reference.

MOST OFTEN NEEDED 1959 TV SERVICING INFORMATION. By M. N. Beitman. Published by Supreme Publications, Highland Park, Ill. 192 pages. Soft cover. \$3.

This collection of TV schematics covers a dozen set manufacturers, and a selection of various set models from each. In many cases, adjustment data and physical construction details are given, in addition to the circuit. The major drawback is where the schematic is printed across two pages, part of the drawing gets lost in the binding, making it difficult to follow the circuit connections. Otherwise, this is a useful shop reference.



"Don't thank me, . . . thank my boss, he found a way for me to deliver after the truck broke down."

there's nothing like the feel of the right gun...

or the right TOOL!

WEN

POWER TOOLS are "job-matched" for

easier handling, trustier performance!

Pick up a Wen tool. It fits in your hand like it grew there! Lightweight, streamlined Wen designs are extra easy-handling . . . quality-engineered to do the job right. Ask any Wen tool user. Your best dollar-for-dollar buy, too!



2-SPEED POWER DRILL
¾" capacity in steel, up to ¾" in hardwood. Smooth easy speed change, high torque motor. **\$29.95**



TOTER KIT
Perfect supplement to drill. 35 pieces including drill holder, Tote Box with tray. A whole workshop, only **\$9.95**



SOLDERING GUN KIT
Includes 4 tips for wide variety of uses, solder. "Quick-Hot" gun heats in only 2½ seconds. A buy at **\$9.95**

Burton Brown Advertising

See complete line of Wen power tools at your favorite dealer!

WEN PRODUCTS, INC.
5810 Northwest Highway • Chicago 31, Illinois

**FAST!
ACCURATE!**

SECO Test Equipment

**Saves time . . . makes
more money for you!**

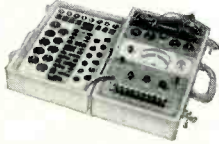
WRITE TODAY FOR COMPLETE
SPECIFICATIONS AND FEATURES!

- Outstanding Reliability and Performance!
- Unique, Time-Saving Features!
- Low First Cost Makes You Money From the Start!

107 TUBE TESTER—

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

MODEL 107 \$139.50 NET



GCT-8 GRID CIRCUIT TUBE TESTER

—Perfect companion to any tester—checks critical "control grid" condition of vacuum tubes fast, accurately.

Electron eye tube indicates faults at a glance. As many as eleven simultaneous checks—automatically.

MODEL GCT-8—Kit \$19.95 NET

MODEL GCT-8—Wired & tested . . . \$29.95 NET



208 VTVM — "Fool-proof"

—many new features! Easy - to - read 4 1/2" 200 microamp meter mounted on sloping panel — 7 DC, 7 AC, 7 ordinary Ohm ranges, plus RETMA (EIA) Ohm scale to check standard color-coded resistance values and tolerance limits.

Specially designed "shift-lever" type function switch identifies and automatically connects proper probe. With stand, 40" leads, and common lead with clip.

MODEL 208 \$74.50 NET

Leather, felt-lined carrying case. \$9.95 NET

PS-2 BATTERY ELIMINATOR

—Compact unit takes place of battery normally used to operate and service low-powered transistorized equipment. Supplies clean, filtered DC—can't be damaged by a short. Quickly spots faulty batteries by substitution. Output continuously variable from 0 to 15 V.—ideal for experimenters. Complete with jacks, leads, and clips.

MODEL PS-2 \$13.95 NET

FB-4 FLYBACK CIRCUIT AND INDUCTANCE ANALYZER

—Quick "yes" or "no" answer on condition of flyback transformer and yoke—100% accuracy!

MODEL FB-4 \$38.95 NET

NEW! HC-6 CURRENT CHECKER

Provides positive, on-the-spot method of checking TV horizontal output circuits—fast, accurate way to adjust horizontal drive and linearity. Easy to use—can be placed in circuit in seconds—compact size. Complete, ready to use.

MODEL HC-6 \$12.95 NET

Get the complete story on Seco's exciting line of test equipment. See your distributor—or write for complete information today!

SECO MANUFACTURING CO.



5015 Penn Avenue So.
Minneapolis, Minn.

Communications Statistics

A most important and informative book has been published by the Government. It's called "Federal Communications Commission 24th Annual Report—Fiscal Year 1958,"

and is available for 50¢ from: Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

(Continued on following page)

Table 1: First 3 statistical columns show number of stations authorized by FCC in 1957 and 1958. Last 3 columns show number of transmitters operated by these safety and special services.

Class of station	June 30, 1957	June 30, 1958	Increase or (decrease)	Land or fixed transmitters	Mobile station transmitters	Total transmitters
Amateur and disaster services: ¹						
Amateur.....	160,000	179,314	19,314	176,660	-----	176,660
Disaster.....	347	380	33	380	-----	380
RACES.....	5,561	7,668	2,107	7,526	-----	7,526
Total.....	165,908	187,362	21,454	184,566	-----	184,566
Aviation services:						
Aeronautical and fixed group.....	2,497	3,122	625	7,249	-----	7,249
Aircraft group.....	33,753	48,037	14,284	-----	59,199	59,199
Aviation auxiliary.....	230	254	24	51	1,291	1,342
Aviation radionavigation.....	342	327	(15)	387	-----	387
Civil Air Patrol.....	12,877	10,944	(1,933)	4,197	8,991	13,158
Total.....	49,699	62,684	12,985	11,884	69,451	81,335
Industrial services:						
Forest products.....	1,513	1,648	135	1,424	13,589	15,013
Industrial radiolocation.....	184	218	34	105	442	547
Low power industrial.....	1,861	2,333	472	4	25,324	25,328
Motion picture.....	60	71	11	52	646	698
Petroleum.....	6,899	7,151	252	8,809	39,094	47,903
Power.....	10,617	11,320	703	8,981	124,058	133,039
Relay press.....	121	130	9	98	1,487	1,585
Special industrial.....	14,456	17,107	2,651	15,697	176,781	192,478
Total.....	35,711	39,978	4,267	35,170	381,421	416,591
Land transportation services:						
Automobile emergency.....	765	962	197	945	8,047	8,992
Citizens.....	27,931	38,611	680	-----	125,000	125,000
Highway truck.....	606	503	(103)	385	6,615	7,000
Interurban passenger.....	62	59	(3)	7	720	727
Interurban property.....	1,034	1,386	352	1,312	24,337	25,649
Railroad.....	2,007	2,265	258	2,440	62,790	65,230
Taxicab.....	4,842	4,733	(109)	4,801	95,934	100,735
Urban passenger.....	109	110	1	111	2,829	2,940
Urban property.....	167	172	5	144	5,336	5,480
Total.....	37,523	48,801	1,278	10,145	331,608	341,753
Marine services:						
Alaskan group.....	909	1,054	145	2,152	-----	2,152
Coastal group.....	316	434	118	613	-----	613
Marine auxiliary group.....	104	92	(12)	641	-----	641
Marine radiolocation-land.....	21	23	2	24	-----	24
Ship group.....	62,494	70,911	8,417	189	75,000	75,189
Total.....	63,844	72,514	8,670	3,619	75,000	78,619
Public safety services:						
Fire.....	3,280	4,725	905	4,173	54,212	58,385
Forestry-conservation.....	2,959	3,264	305	6,972	26,946	33,618
Highway maintenance.....	2,131	2,580	449	2,316	25,227	27,543
Police.....	11,501	12,450	949	10,239	156,500	166,739
Public safety (combined).....	110	158	48	4,359	201	4,560
Special emergency.....	2,727	3,325	598	3,230	9,892	13,122
State guard.....	22	10	(12)	195	238	433
Total.....	23,270	26,512	3,242	31,184	273,216	304,400
Grand total.....	375,955	437,851	61,896	276,568	1,130,696	1,407,264

¹ Represents the number of licensed stations since no factual transmitter count is available in these services.

DEPENDABLE TV-RADIO TUBES



Tubes for TV-Radio Servicemen, Dealers, Experimenters.

Nationally sold ZALYTRON Tubes are BRAND NEW Tubes • NOT USED • NOT PULLED FROM EQUIPMENT • but ZALYTRON's First Quality! Why pay more? Try them once, you'll use them always. Every tube we ship is covered by our Full Refund Guarantee. YOU be the Judge! Send today for new Price List "ET".

1-YEAR GUARANTEE

BE YOUR OWN BOSS

RUN A SELF-SERVICE TUBE BUSINESS

Get This Modern Sturdy Tube Tester

FREE

with "Package Deal" order for nationally sold ZALYTRON Quality Brand Receiving Tubes. We'll show you how to start a successful Tube Tester Route, and get YOUR share of today's Big Profits in Self-Service Tube Sales! This is no "Get-Rich-Quick" scheme but a solid, proven business that will reward you well—if you WORK at it. But, INVESTIGATE before you INVEST! Get full details on the best "Deal" now being offered, send today for our Booklet "E".



ZALYTRON TUBE CORP.
220 West 42nd St.,
New York 36, N. Y.

"...worth their weight in gold and will do much more than you claim..."



Ernest L. Walker

Ernest L. Walker TV Service
Espanola, New Mexico



Here's why this low cost DC POWER SUPPLY can also earn extra dollars for you . . .

... more power, less ripple to handle more jobs.

... services all these without hum: Transistor auto and portable radios, "hybrid" auto and marine radios.

... and does all this, too: Operates relays, phone circuits. Battery charging. Electroplating. Laboratory work. Other low voltage operations.

2 ranges: 0-20 volts for transistor circuits; 0-16 volts for 12/6 volt tube and "hybrid" auto radios.

0.15% ripple up to 75 milliamperes. 0.5 ripple up to 5 amperes.

Separate milliammeter detects variations in transistor current.

Separate fuse in secondary circuit offers transistor protection.

Patented conduction cooling lowers cost per ampere output.

Compare with others — see how much more Electro gives you

MODEL PS-2 **\$49⁹⁵**

at your Parts Jobber

ALSO AVAILABLE—Model KPS-2
Kit version \$39.95

Send for detailed literature



ELECTRO PRODUCTS LABORATORIES

4501-T Ravenswood, Chicago 40
Canada: Atlas Radio Ltd., Toronto 9016

FCC Report Highlights Industry Growth

(Continued from preceding page)

Among the interesting figures included in this 182 page report, is the number of radio authorizations—2,132,585—outstanding as of June 30, 1958. Here is a class breakdown of authorizations, together with increases over the previous year:

Class	June 30, 1958	Increase Over '57
Safety & Special Services	437,851	56,701
Broadcast Services	9,037	1,003
Common Carriers	3,271	481
Experimental Services	834	46
Commercial Radio Operators	1,500,854	196,554
Amateur Radio Operators	180,738	15,543
Totals	2,132,585	270,328

It was a busy year for FCC. 537,-249 applications for licenses were received, 32,182 more than the previous year.

Of substantial note is the continued activity and scope of safety and special radio services, including aviation, industrial, transportation and marine. More and more electronic technicians are studying for and getting their FCC licenses to get into the maintenance end of communications. See Table I for a detailed statistical analysis of stations and transmitters in these services. The 1,407,264 authorized transmitters represent an increase of over 243,000 from the corresponding 1957 figure.

TV stations, which served over 90% of the population as of June 5, 1958, were counted as follows:

Class	VHF	UHF
Commercial, on-air	419	82
Educational, on-air	25	6
Commercial, authorized	461	202
Educational, authorized	32	21

AM broadcast stations increased by 115 over the previous year, bringing the 1958 total to 3,353.

FM radio's comeback resulted in 548 stations on the air of 634 authorized, a gain of 18 and 74 respectively. •

"So Smooth & Clean-

is the response of the Atlas WT-6 that we demonstrate it in our high-fidelity Audio-Torium," says Anton J. Schmitt, Harvey Radio Co., Inc., New York, N. Y.



New ATLAS
COAX-PROJECTOR WT-6

WT-6 NET \$34.50
support stand only,
SS-4 NET \$12.60

ALL-WEATHER—install it, forget it! — HIGH-EFFICIENCY . . . COMPACT . .

True HIGH FIDELITY TWO-WAY system — not just a "compromise" of two horns coupled to a single diaphragm. The WT-6 comprises a weather-proof cone type driver (with 6-inch throat) coupled to its individual woofer horn; a separate pressure-type driver loaded to its separate tweeter horn. The built-in crossover electronic filter supplements the electro-mechanical frequency-limiting characteristics of the 2 individual reproducers — providing for smooth frequency division as each speaker functions within its engineered range of frequencies.

Universally adjustable "U"-type rugged steel mounting . . . finished in high temperature baked modern beige enamel.

Power Rating 15 watts continuous
Freq. Resp. 140-15,000 cps
Impedance 8 ohms
Dispersion 120°
Dimensions Bell opening 15", overall depth 12"

See the WT-6 at your local distributor. Send for complete catalog ET-3.

ATLAS SOUND CORP.
1449-39 St., Brooklyn 18, N. Y.
Atlas Radio Ltd., Toronto, Canada

MORE OF EVERYTHING YOU WANT IN A V-O-M

- New Mirrored Scale Plate
- Wider Frequency Response AC Ranges
- New DC Polarity Reversing Switch
- 59 Extended AC and DC Ranges



...and at

**NO INCREASE
IN PRICE**

THE NEW **PRECISION** MODEL 120

20,000 ohms/volt DC • 5,000 ohms/volt AC

plus:

all the famous features of
the original **PRECISION 120**.

- An Extra-Low Resistance Range: 2 ohms at center scale.
- An Extra-Low Voltage Range: 1.2 volts full scale, AC and DC.
- An Extra-High Voltage Range: 6,000 volts full scale, AC and DC.
- An Extra-Large 5¼" Meter with wide-angle, easy-reading scales.

Model 120: Complete with batteries, test leads and tech manual. Overall case dimensions: 5½" x 7" x 3½". Net Price \$44.95

Model 120M: For special applications which require a V-O-M approaching laboratory accuracy. Net Price \$52.95

Available and on display at leading electronic parts distributors. Write for complete **PRECISION** catalog.

PRECISION
Apparatus Company, Inc.
70-31 84 St., Glendale 27, L. I., N. Y.
Export: 458 Broadway, New York 13
Canada: Atlas Radio Corp., Toronto 19

Rules For TV Set Owners & Technicians ... by TV GUIDE

A 10-point program to guide TV set owners in the selection of qualified and reputable TV technicians was featured in the January 3 issue of *TV Guide* magazine.

The questions, plus six designed for set owners, were prepared by Radio Station WWDC, approved by the Television Service Association of Metropolitan Washington.

The station arranged with the Electric Institute, a trade organization fostered by the Potomac Electric Power Co., to have a legitimate repairman create a single defect in three TV sets and then have the sets checked by various TV repair firms. Some of the repairmen chosen by the station were selected because their advertising aroused suspicion.

The magazine, in an editor's note, said: "*TV Guide* has often pointed out that most TV repairmen are trustworthy. There are, however, as in any other business, a few unscrupulous quacks who—to be blunt—

are TV service racketeers. Their dishonesty reflects upon the majority of TV repairmen, who charge fair prices for honest work. This article is published as a service to readers—and to the many thousands of completely reliable TV repairmen."

The first list concerns the repairman or the shop he represents:

1—Does the Better Business Bureau give him a clean bill of health?

2—Is he active in any association that is committed to promoting ethical repair and business practices?

3—Does he make it clear that his home-call cost will range from \$3.50 to \$6, depending on the circumstances?

4—Does he leave with you defective parts removed from sets?

5—Does he receive checks made out to his firm's name, date his bills, have them signed by the repairman who calls?

6—Are new parts itemized by cost and number?

YOU ARE NEEDED FOR THIS YEAR OF PROGRESS

You are unique. You are a one-of-a-kind man needed to think for a new world of tomorrow. Your greatest gift to progress can be your ability to apply your differences in thought and background to your field of specialty in radio electronics.

To help you think, to help you generate new ideas, come see the Radio Engineering Show that requires all 4 floors of New York City's Coliseum. Come hear your choice of more than 200 papers to be given during the Convention. You are needed. Yes, it takes a coliseum to hold the greatest show on earth. Then, it takes you to have the great thought, the inspiration in radio electronics.

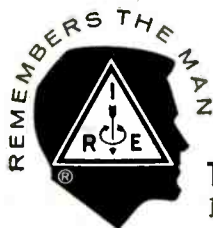
THE IRE NATIONAL CONVENTION

Waldorf-Astoria Hotel

AND THE RADIO
ENGINEERING SHOW

Coliseum, New York City

MARCH
23 • 24
25 • 26



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

7—Does he guarantee, in writing, new parts installed as well as labor?

8—Does he pick up and return sets promptly when shop work is needed?

9—Does his bill state clearly the nature and cost of labor performed? (Remember, labor costs are often justifiably much greater than the cost of parts.)

10—When necessary to take set to shop, does his final bill approximate the cost quoted to you in your home?

The second list of questions concerns the set owners:

1—Do you realize that you're inviting a padded TV repair bill if you patronize firms which advertise house calls for \$2 or less?

2—Do you realize that a big TV repair bill does not automatically mean you have been taken?

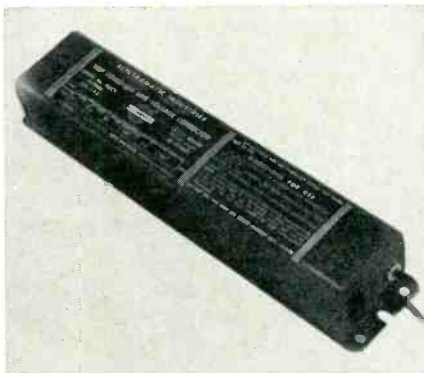
3—Do you realize that the great majority of TV repairmen are sincerely attempting to do a creditable job?

4—Do you treat the TV serviceman courteously?

5—Do you realize that even though a TV repairman may correct one defect one day, another defect—entirely unanticipated and unrelated to the first—may crop up the next?

EI LINE VOLTAGE CORRECTOR

Model 185TV is designed to provide a regulated output of 118 volts ac, 60 cycles, over an input range of 75 to 135 volts. Capable of handling loads to 200 watts, model 185TV boasts: automatic overload and underload protection,



short circuit protection to the appliance. Maximum to no load variation is not more than 1 v. Retail at \$19.95. Model 185TV may be used with TV, hi-fi, radios, recorders, etc. Other units in line to 2.5 kw. Electromatic Industries Corp., 3000 Taft St., Hollywood, Fla. (ELECTRONIC TECHNICIAN 3-27)

For more information write in ELECTRONIC TECHNICIAN's new product code number on coupon on page 47.



MODEL 12-C11

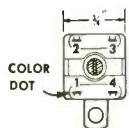
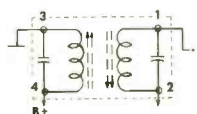
new MILLER 455 kc IF transformer

— an exact replacement for
G. E. RTL-143 and RTL-163
— at your MILLER distributor

Here's the IF transformer used in a broad line of G.E. clock and table radios—available from any Miller distributor. It comes to you complete with schematic and base layout, to speed installation. List price: \$2.30

This unit is one of many miniature IF transformers designed for replacement in "personal" radio receivers. The line includes:

MODEL	ITEM
12-H1	262 KC Input I.F. Trans.
12-H2	262 KC Output I.F. Trans.
12-C1	455 KC Input I.F. Trans.
12-C2	455 KC Output I.F. Trans.
6203	4.5 Input or Interstage
6205	4.5 Ratio Detector



Write for the Miller general catalog, and the TV replacement guide, or get them at your distributor.

EXPORT REPRESENTATIVE:
Roburn Agencies, Inc., N.Y. 13, N.Y.

CANADIAN REPRESENTATIVE:
Atlas Radio Corp., Ltd., Toronto 10, Ont.

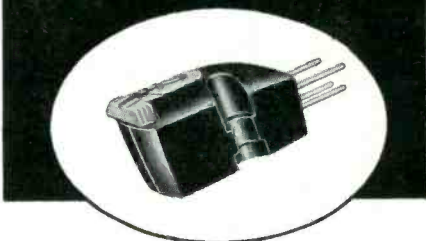
J. W. MILLER COMPANY

5917 S. Main St., Los Angeles 3, Calif.

More Profits with PICKERING Stereo Conversions!

Get into the profitable stereo high fidelity business with conversions and replacements using the finest quality components at popular prices — STANTON Stereo Components by Pickering.

Original equipment manufacturers have found the practical solution to quality stereo in Pickering... why not benefit from this... use Pickering for quality stereo conversions and replacement.



STANTON Model 371 STEREO FLUXVALVE

Fully compatible for both stereo and monophonic records, the STANTON Stereo-FLUXVALVE is fully encapsulated and hermetically sealed in lifetime polystyrene. Replaceable "T-GUARD" stylus contains all moving elements and the finest quality, precision polished .7 mil diamond. Makes your installation easy, true miniature design permits mounting into all arms with standard 1/2" mounting centers. Frequency response is flat within 2 db over the entire stereo range. Two balanced outputs connect to low mag inputs of all preamplifiers... no need for transformer or gain stage device. Interchannel separation better than 20 db. Recommended tracking is 3-6 grams for changers and 2-4 grams for manual arms. Four terminal output for greatest flexibility, straps for 3 or 4 terminal systems.

EVERYTHING YOU NEED FOR STEREO CONVERSION!

STANTON Model 603 STEREO KableKit



NEW! Low cost stereo cable assembly for converting automatic changers and manual tone arms. Prefabricated insulated and fully shielded harness assembly with all plugs and connector clips soldered... ready for instant installation! No soldering required for normal installation. Harness length 4 feet, comes complete with cable retention clips.

ASK FOR PICKERING AT YOUR JOBBER ... EASIER TO SELL AND INSTALL.

FREE! Pickering Service-File, complete technical file on quality products by Pickering. Includes valuable bulletins on hum elimination, installation, maintenance, etc. Address Dept. M-39 for your free Service-File.



For those who can hear the difference

FINE QUALITY HIGH FIDELITY PRODUCTS BY

PICKERING & COMPANY, INC.

Plainview, N. Y.

FLUXVALVE, T-GUARD, KableKit are registered trademarks

the specs are the proof . . .
the BEST BUYS are **EICO**[®]
for COLOR & Monochrome TV servicing



COLOR
and Monochrome
dc to 5 mc lab & tv
5" OSCILLOSCOPE
#460
Factory-wired \$129⁵⁰
Kit \$79⁹⁵

• Features DC Amplifiers!

Flat from DC-4.5 mc, usable to 10 mc. VERT. AMPL.: sens. 25 rms mv/in; input Z 3 megs; direct-coupled & push-pull thruout; K-follower coupling bet. stages; 4-step freq-compensated attenuator up to 1000:1. SWEEP: perfectly linear 10 cps-100 kc (ext. cap. for range to 1 cps); pre-set TV V & H positions (30 & 7875 cps); auto. sync. ampl. & lim. PLUS: direct or cap. coupling; bal. or unbal. inputs; edge-lit engraved lucite graph screen; dimmer; filter; bezel fits std photo equip. High intensity trace CRT. 0.06 usec rise time. Push-pull hor. ampl., flat to 400 kc, sens. 0.6 rms mv/in. Built-in volt. calib. Z-axis mod. Sawtooth & 60 cps outputs. Astig. control. Retrace blanking. Phasing control.



TV-FM SWEEP
GENERATOR
& MARKER #368
Factory-wired \$119⁹⁵
Kit \$69⁹⁵

Entirely electronic sweep circuit (no mechanical devices) with accurately-biased inductor for excellent linearity. Extremely flat RF output: new AGC circuit automatically adjusts osc. for max output on each band with min. ampl. variations. Exceptional tuning accuracy: edge-lit hairlines, 6:1 vernier. Swept Osc. Range 3-216 mc in 5 fund. bands. Variable Marker Range 2-75 mc in 3 fund. bands; 60-225 mc on harmonic band. 4.5 mc Xtal Marker Osc., xtal supplied. Ext. Marker provision. Sweep Width 0-3 mc lowest max. deviation to 0-30 mc highest max. dev. 2-way blanking. Narrow range phasing. Attenuators: Marker Size, RF Fine, RF Coarse (4-step decade). Cables: output, 'scope horiz., 'scope vertical.

DYNAMIC CONDUCTANCE



Tube & Transistor Tester
#666
Factory-wired \$109⁹⁵
Kit \$69⁹⁵

COMPLETE with steel cover and handle. SPEED, ease, unexcelled accuracy & thoroughness. Tests all receiving tubes (& Color & Monochrome pic tubes with adapter). Composite indication of Gm., Gp & peak emission. Simultaneous sel of any 1 of 4 combinations of 3 plate voltages, 3 screen voltages, 3 ranges of continuously variable grid voltage (with 5% accurate pot). New series-string voltages: for 600, 450, 300 ma types. Sensitive 200 ua meter. 5 ranges meter sensitivity (1% shunts & 5% pot). 10 SIX-position lever switches: free-point connection of each tube pin. 10 pushbuttons: rapid insert of any tube element in leakage test circuit & speedy sel. of individual sections of multi-section tubes in merit tests. Direct-reading of inter-element leakage in ohms. New gear-driven rollchart. Checks n-p-n & p-n-p transistors: separate meter readings of collector leakage current & Beta using internal dc power supply.

See the 50 EICO models IN STOCK at your neighborhood distributor. Write for FREE Catalog ET-3
EICO[®]
33-00 Northern Boulevard, L. I. C. 1, N. Y.

Prices 5% higher in West.

AD Campaign For Technicians

Sprague Products Co. has prepared a series of newspaper advertising mats to help TV service technicians increase their business. Advertisements, like the one below, point out the dangers and complications of do-it-yourself TV repairs. Lively sketches and provocative headings—TV TINKER-ACHES, HE DIDN'T KNOW THE SET WAS LOADED, SUFFERIN' TV SETS, DON'T SHOOT THAT TIRED TV—

all serve to attract the attention of TV owners and drive the point home. Service dealers merely add their name, address and phone at the bottom, and the advertisements, 1 column by 5 inches in size, are ready to run.

You can obtain a set of four mats by sending \$1.00 to Sprague Products Company, Attention Technical Service Dept., 65 Marshall St., North Adams, Mass. Ask for RP-200.



TV TINKER-ACHES

Tinker with your TV and you'll *both* suffer! Your TV is not made to take tinkering. Disturb the delicate balance of its thousands of parts and you make your set go bad and yourself go bleary-eyed.

Take the easy way out . . . at the very beginning. Call in one of our TV servicemen. Have him check over your set and replace faulty parts with quality components like Sprague Capacitors.

DEALER IMPRINT HERE



you'll find the newest audio items faster in the **'59 MASTER**

Complete descriptions, illustrations, prices for more profitable TV-radio-audio-industrial servicing. You can buy, sell and bill direct from the MASTER—world's largest electronic catalog at your jobber . . . only \$3.50. \$4.50 in Canada

FREE—24-page PANEL LAMP CHART at your jobber, or send 10c to:

THE RADIO-ELECTRONIC MASTER
60 T Madison Ave. · Hempstead, N.Y.

SPEAKERS for SOUND INSTALLATION

Regardless of your application . . . P.A., Inter-com, outdoor, extended range . . . OXFORD is the SPEAKER for you. Our very complete line includes speakers that will meet your every need . . . quality . . . delivery. Write for our new catalog today.

Leading distributors carry OXFORD.

OXFORD

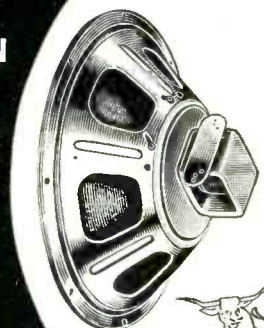
OXFORD BRANDS: Supreme Transformers, Hudson Lamps, Tempo Hi-Fi, Oxford Speakers & Rear Deck Kits.

COMPONENTS, INC.

556 West Monroe Street
Chicago 6, Illinois

Export: Raburn Agencies, New York

In Canada: Atlas Radio, Toronto



**Every House Call
A PROSPECT!**

**MAKE A
STEREO
SYSTEM
from any**



AND



WITH FABULOUS NEW

**Stereo-Ette^{*}
GOLD BUG**



Easy to Install!
Transistorized!
Top Fidelity!
No Drift! No Hum!
**Compatible—
Stereo/Mono!**
**No Extra Amplifiers
or Speakers!**

Model SDK-101. Less cartridge. List, \$16.75
Model SDK-102CS. With E-V 126ST dual sapphire compatible cartridge. List \$27.50
(above prices are less battery)

See it at your distributor, dealer or record store; or order direct.

*Trade Mark

**THE STEREO-ETTE CO.
4908 N. Lincoln, Chicago 25, Ill.**

Send FREE Bulletin No. CS101-T
 Send.....Model..... @ \$.....
Check or M.O. for \$..... enclosed. (No C.O.D.)

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

Reps & Distributors

(Continued from page 26)

CORNELL-DUBILIER ELECTRIC CORP., Newport Antenna Div., has named **JACK FIELDS SALES CO.**, Montclair, N. J. as rep.

ALLEN B. DU MONT LABS. has appointed **RICHARD W. BELLEW**, El Dorado, Ark., as rep for scientific instruments in Ark. and La.

VACO PRODUCTS CO. has appointed **UNGAR-MUELLER SALES CO.**, Los Angeles, as the firm's rep in southern Calif. and Ariz.

CLEVITE TRANSISTOR PRODUCTS announces the appointment of **W. E. FRY CO.** as sales rep for Mo., Kansas, Nebr., southern Ill., and western Iowa.

UNGAR ELECTRIC TOOLS, INC. reports that **UNGAR-MUELLER SALES CO.**, Los Angeles, has been named "Rep Firm of the Year."

MOTOROLA COMMUNICATIONS & ELECTRONICS, INC. has named **EARL SENZEL**, Service Mgr. for the 10-state Southern area. Headquarters: 7138 Envooy Court, Dallas, Texas.

Sell Garage Door Operators Without Stock

TV dealers can sell garage door operators without maintaining inventory or handling installation and service under a new plan announced by **The Alliance Mfg. Co.**, Alliance, Ohio.

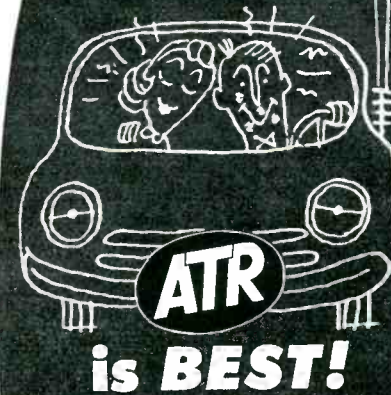
Dealers in the program refer completed sales of "Genie" operators to Alliance Contractors in their area who carry through installation and service. Dealers' profit is paid immediately.

The contractor stocks and installs the unit, and services it during the warranty period and after.

Ernest Davis, Alliance Service Manager, said the new program is designed to simplify sales by television and appliance dealers whose customers are in the market for automatic garage door operators. "The new Alliance program now makes it possible to sell for a substantial profit a high-quality garage door operator without ever seeing the unit," Davis said.

Davis said Approved Service Contractors appointed by Alliance, including independent technicians, take complete responsibility for installation and service.

**by
every
test**



**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 27 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.

Save
Time
with

SENCORE

See other
SENCORE
ads
in this
issue

SENCORE

LEAKAGE CHECKER

Check these outstanding New Features

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.

★ Checks 156 different tube types—more than any other "grid circuit" type checker. Includes UHF and latest type tubes.

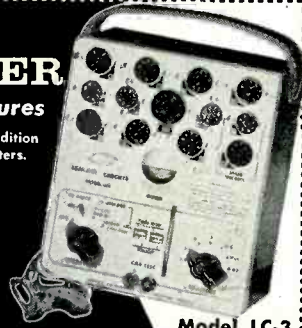
★ Checks picture tubes without removing tube from cabinet or chassis.

★ New Roll Chart prevents obsolescence—just dial the tube type and save time. Chart is easily replaced at no extra cost.

★ Provides instant filament checks on "Fil-Check" position—no need to carry a second filament checker. ★ Capacitor checks simplified.

★ Two spare preheating sockets to cut down testing time.

In stock at your local parts distributor.



Model LC-3
\$28.95

DEALER NET
Really Whips
Tough Dogs

Service Instruments Corp. 121 Official Road, Addison, Ill.

Conversion Opportunity: Update Yourself!

Brand New CREI Home Study Program

Equips You For Profitable Work in New Field of

AUTOMATION

and Industrial

ELECTRONICS

Can you handle machine control systems—data processing systems—digital and analog computers? Have you kept abreast of the times? Or do you need "conversion"? Alert radio-TV technicians are switching to Automation and Industrial Electronics maintenance, servicing and upkeep, with added income as a reward.

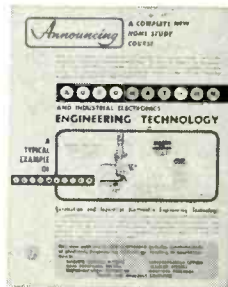
CREI's new home study course will bring you up-to-date in automation and industrial electronics—including automation, instrumentation, industrial electronics, aeronautical electronics, guided missiles, servomechanisms, computers, astronautics, telemetering.

Here's the history of one graduate: "Five years ago I started to work for my present employer as a

radio repairer and installer. Also started CREI course. Three years later I was a supervisory electronic engineer; a year later I was promoted to the position I now hold—asst. chief engineer of a large radar instrumentation station at White Sands Proving Grounds."—Ralph Leo Gagnon, 1255 Gardner Ave., Las Cruces, N. M.

Get this FREE Brochure

Write Capitol Radio Engineering Institute, Dept. 323X, 3224 - 16th St., N.W., Wash. 10, D. C.



MAIL THIS COUPON FOR FREE BOOKLET!

CAPITOL RADIO ENGINEERING INSTITUTE

ECPD Accredited Technical Institute Curricula • Founded 1927

Dept. 323X, 3224 - 16th Street, N.W., Washington 10, D. C.

Please send me without cost or obligation your brochure describing your brand-new home study course in Automation and Industrial Electronics Engineering Technology.

Name.....Age.....

Street.....

City.....Zone.....State.....

To obtain fast, immediate service and to avoid delay, it is necessary that the following information be filled in:

Employed By.....

Type of Present Work.....

Education:
Yrs. High School.....

Other.....

Electronics Experience.....

Catalogs & Bulletins

ELECTRONIC COMPONENTS: A new 44-page catalog is available. Herman H. Smith, Inc. 2326 Nostrand Ave., Brooklyn 10, N. Y. (ELECTRONIC TECHNICIAN B3-5)

STUDY COURSE: A colorful 4-page circular describes two special self-study courses for radio and TV technicians. Supreme Publications, 1760 Balsam Rd., Highland Park, Ill. (ELECTRONIC TECHNICIAN B3-6)

BATTERIES: A colorful, illustrated 8-page technical bulletin covers applications, electrical characteristics, construction, charging, activation, etc. Yardney Electric Corp., 40-50 Leonard St., New York, N. Y. (ELECTRONIC TECHNICIAN B3-8)

SPEAKER SYSTEMS: A 20-page, three color, illustrated catalog covers the firm's line of hi-fi and stereo loud-speaker systems. Model numbers, specifications, sizes and enclosure descriptions are included. R. T. Bozak Sales Co., Darien, Conn. (ELECTRONIC TECHNICIAN B3-1)

MINIATURE TRANSFORMERS: A new short form catalog provides a quick run-down of the firm's miniature, sub-miniature, transistor, MIL-T-27A and industrial transformers which are available from distributors' stock. Microtran Co., 145 E. Mineola Ave., Valley Stream, N. Y. (ELECTRONIC TECHNICIAN B3-4)

SOLDERING IRON TIPS: The new catalog #601, superseding #600, is available. It shows 81 new shapes and sizes—a total of 124. Illustrations, dimensions, advice on use and care and list prices are included. Hexacon Electric Co., 180 W. Clay Ave., Roselle Park, N. J. (ELECTRONIC TECHNICIAN B3-3)

TV PROJECTOR: A large screen TV projector and a new remote projection unit are described and illustrated in a 4-page folder. Electrical and mechanical specifications, potential applications and optional accessories are covered. GiantView Closed Circuit Television Network, Div. Meilink Steel Safe Co., 901 Livernois, Ferndale 20, Mich. (ELECTRONIC TECHNICIAN B3-2)

ANTENNAS: "Techniques for Accurate Measurement of Antenna Gain" is the title of a new 10-page publication, describing techniques developed at the National Bureau of Standards to minimize experimental error. Methods for minimizing and measuring matching losses are included. Price: 15¢. Send payment with your order to Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

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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.

SIMPLIFY TEST and TROUBLE-SHOOTING PROCEDURES

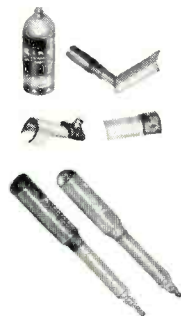
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Models EA-1 and VS-5 Kingston Absorption Analyzers provide electrostatic signal tracing and extreme sensitivity. For trouble-shooting any equipment with wave forms. CRT displays wave-form from each stage.



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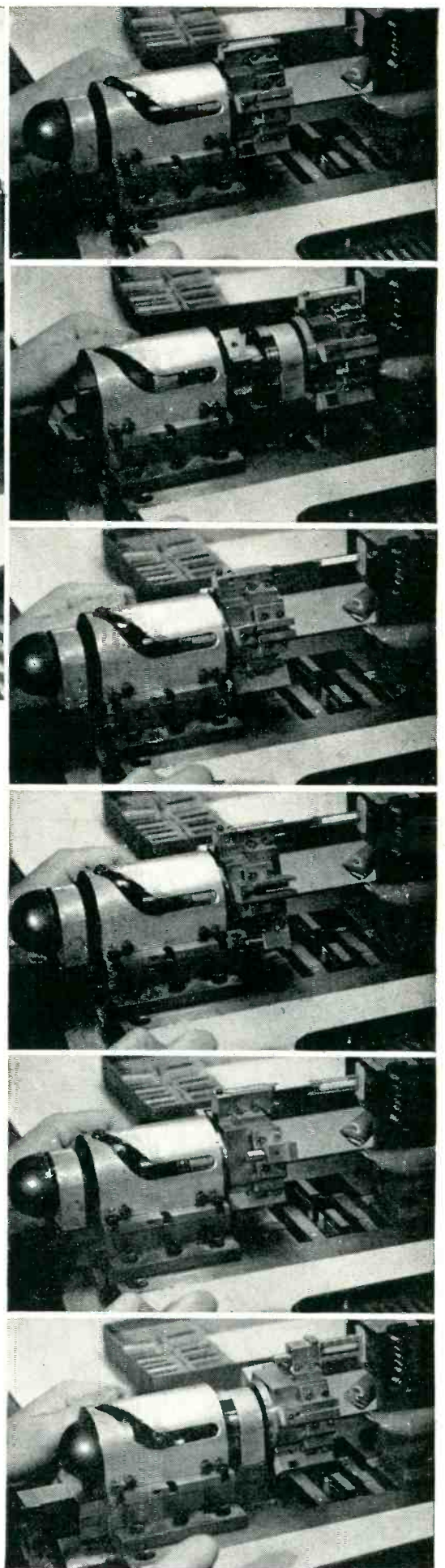
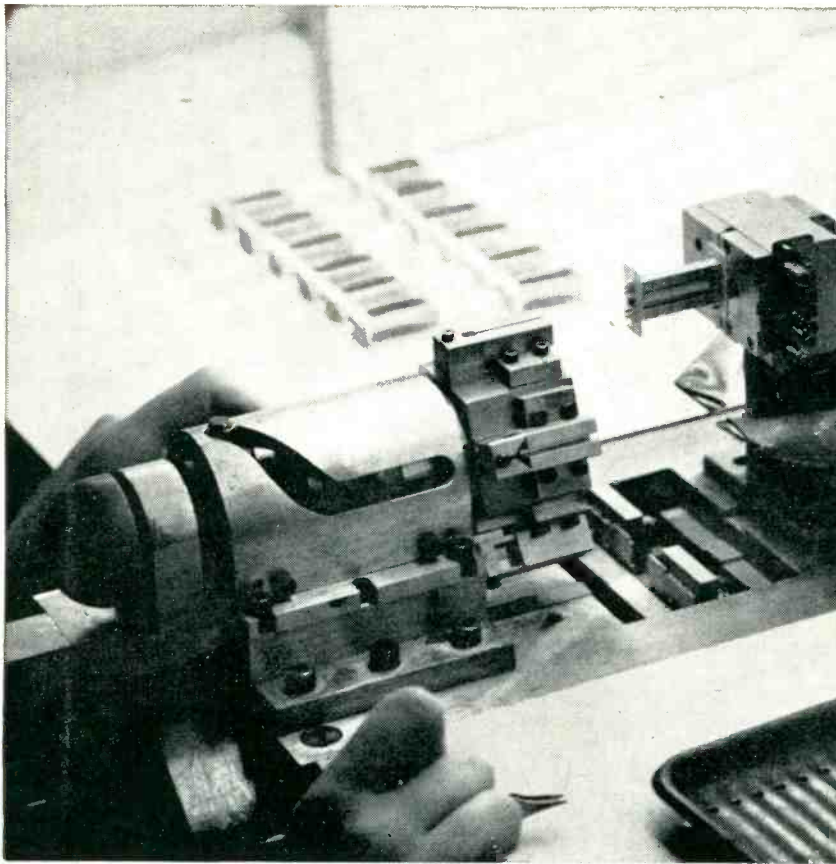
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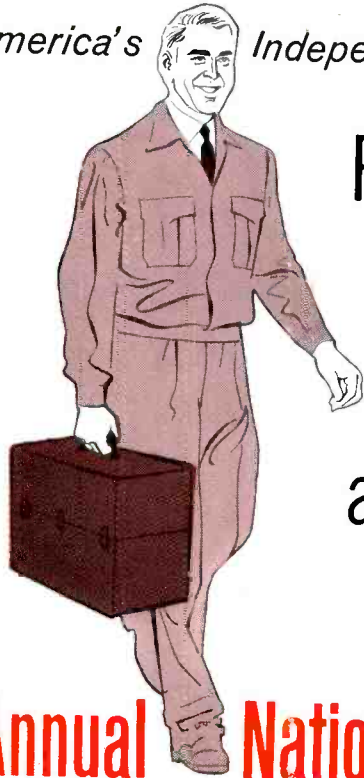


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