

ELECTRONIC TECHNICIAN

Including 16 pages of
Circuit Digests

W. E. GURTONSKI
BERKS ELECTRONICS
1452 KENHORST BLVD
READING PA
TN7-58N AR 5F991M

GOVERNMENT REGULATION of RADIO DEVICES

50¢

June 1958

YES! WE HAVE

STILL NO PRINTED CIRCUITRY IN CHASSIS

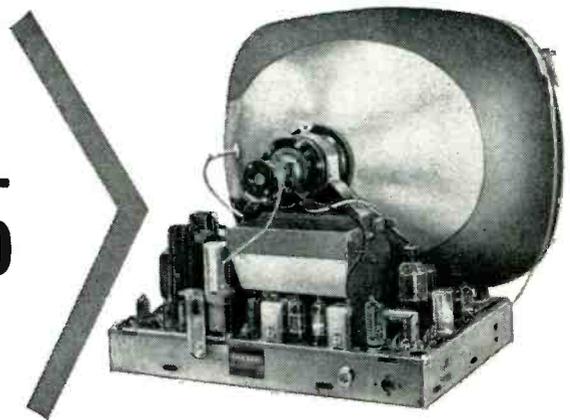


Even though Dr. Alexander Ellett, head of Zenith's research department, is recognized as the daddy of printed circuitry through his work on radio proximity fuses, still Zenith uses no printed circuitry in its TV chassis because it means more service headaches and often causes service delays.

LESS SERVICE HEADACHES FOR SERVICEMEN

Easier to service...more accessible

ZENITH'S **HANDCRAFTED**
SERVICE-SAVER **HORIZONTAL**
CHASSIS WITH **NO PRINTED**
CIRCUITS IN THE CHASSIS



We think it's worth the extra cost of HANDcrafted standard circuitry to get the best performance and fewer service headaches and so do thousands of dealers who would sooner sell customer satisfaction than a price tag.



ZENITH RADIO CORPORATION, Chicago 39, Illinois

The quality goes in before the Zenith name goes on.

Backed by 39 years of leadership in radionics exclusively.

Also makers of Radio, High-Fidelity Instruments and fine Hearing Aids.

NO PRINTED
CIRCUITS IN
ZENITH
TV CHASSIS

**ZENITH HANDCRAFTED
STANDARD CIRCUITRY
COSTS MORE BUT IT MEANS MORE
SATISFIED CUSTOMERS FOR
ZENITH DEALERS AND SERVICEMEN**

QUALITY BY
ZENITH[®]
THE ROYALTY OF TELEVISION



David Stolfi, right, in charge of Service Department, directs Richard Avery.

“We count on the Yellow Pages to bring us service business from prospects in our market”

says **MICHAEL STOLFI**
STOLFI'S, INC., Stamford, Conn.

“Every year new families move into our market area. They don't know us, but we know our Yellow Pages advertising helps turn many of them into customers.”

Advertising in the Yellow Pages gets your sales messages right into the homes of your prospects. The Yellow Pages are within easy reach when their set breaks down, ready to remind them of your name, telephone number and the type of service you offer. Call your telephone business office for facts and figures on how the Yellow Pages can help build service business for you.

Stolfi's INC.
 “WHERE SERVICE IS GUARANTEED”
 36 Richmond Hill Ave.
 Stamford
 75 Elm Street
 New Canaan Woodward 6-4000



TELEVISION
 Servicing On All Makes Including Color

Our Trucks Are Manned By Factory Trained Men & Equipped With Radio

Phone For Prompt Service also SALES • SERVICE
 RCA • ADMIRAL • PHILCO
 ZENITH • MAGNAVOX
 and many other Brands

Call Fireside 8-7371

ZENITH TELEVISION

We are proud to service Zenith television, made by a world leader in radionics whose famous research laboratories have contributed many “firsts” in television progress.



“FOR SERVICE CALL”

SERVICE

Cove Television & Service
 590 Cove Rd. ----- Firesid 8-0269
DARIEN ELECTRICAL & FLOOR COVERING
 SHOP INC 1090 Post Rd. --Darn OLivr 5-1441
ED'S RADIO & TELEVISION
 95 Main ----- NC Woodward 6-1641
STOLFI'S INC
 36 Richmond Hill Av. ----- Firesid 8-7371

THIS DISPLAY AD, shown reduced, under *Television-Dealers*, reaches prospects when they need Stolfi's services.

LISTINGS UNDER 14 TRADE-MARK HEADINGS direct customers to Stolfi's for authorized service on their brand of television set.

Editor's Memo



Back in 1955, our editorial staff became concerned with the super-bargains being offered in receiving tubes. Certain advertisers were selling \$1.95 tubes for only 40¢. How could they do it?

We started an investigation to find out . . . and we sure did. After shopping numerous companies, we discovered that many of the tubes were used ones that had been washed and rebranded. On a simple emission test, it turned out that 41.6% were defective. In our July 1955 issue, we exposed the whole re-processed tube racket for our readers.

Our first corrective step was to make these firms reveal in their advertising if their tubes were new, used, seconds, etc. Naturally, the hustlers stopped advertising as expected. Other publications later instituted similar policies to curb sharp operators, though a few magazines still continue to carry this misleading advertising.

Next, we filed legal complaints with the Federal Trade Commission, charging false and misleading advertising. A great many readers have written to me, asking the names of the companies we investigated. Since our FTC cases were still pending against a number of these firms, we thought it improper to mention names.

However, a number of cases have been closed, so now we feel free to NAME NAMES; here are some of the ones against whom FTC complaints have been issued, charging “false, deceptive and misleading statements”:

STANLEY ELECTRONICS, FTC Docket 7078.

TAB & TECHNICAL APPARATUS BUILDERS, FTC Docket 7125.

MAJOR BRAND TUBE CO., TELTRON ELECTRIC, VIDEO ELECTRIC & SOLAR ELECTRONICS, FTC Docket 7019.

RAD TEL TUBE CO., FTC Docket 6954.

CONCORD RADIO CORP., & FAY-BILL DISTRIBUTING CO., FTC Docket 7097.

The following companies have either gone out of business or abandoned tube sales:

PREMIER TV RADIO SUPPLY DIV., CONTINENTAL CORP., FTC File 5723210.

COLUMBIA ELECTRONICS, FTC File 5723212.

HI-LITE ELECTRONICS SALES, FTC File 5723215.

Al Foman

SENSIBLE · HONEST · DEPENDABLE



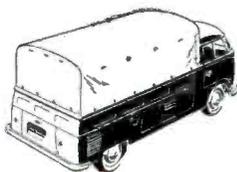
VOLKSWAGEN PANEL DELIVERY

...and ECONOMICAL

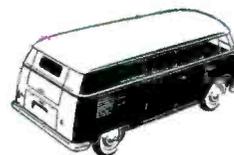
Volkswagen Light Trucks have all these virtues... outstanding gas economy... air-cooled engine... no radiator problems... sturdy construction that takes the bumps of rough terrain. Volkswagen has unusual visibility and ease of driving and parking. The Volkswagen Panel Delivery gives radio and TV servicemen a whopping big 170 cu. ft. of usable storage space. It loads from wide

side doors, as well as the rear loading door. You can install a complete test shop inside... save time- and dollar-wasting trips. Top and sides... front and rear give you a bonus in free space for distinctive advertising. But above all, remember: *a Volkswagen costs less to buy, run and maintain.* This we can prove! Sales and Service in 48 states. Look for the Authorized Volkswagen Dealer with this  emblem.

VOLKSWAGEN DELIVERS THE GOODS... FOR LESS!



PICK-UP—1764-lb. payload... 45 sq. ft. floor area plus 20 sq. ft. in a lockable weather-tight compartment underneath. Sides and back drop down for easy loading.



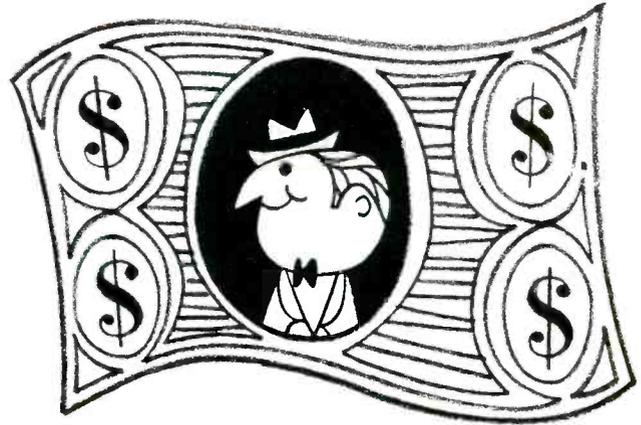
KOMBI—it's even more than a Panel Delivery. It converts into a comfortable station wagon in minutes... just by putting the seats back in.

VOLKSWAGEN

Reputation Builder #5: it pays to charge a reasonable price

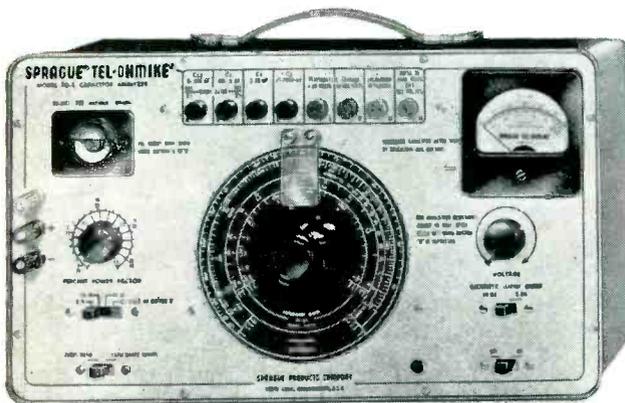


- Two very easy ways to go broke... charge too little, or charge too much.



- But...you'll continue to do business when you keep your basic service charge between five and seven dollars.

it pays to use the New To-5 Tel-Ohmike® Capacitor Analyzer



- Another way to build and hold a reputation is to insist on top quality test equipment. Callbacks due to inadequate or incorrect testing not only cost you money . . . they also cost you customers! Use less than the best service equipment and you place your reputation at stake. In capacitor analyzers, the best is *Sprague*.
- The NEW TO-5 TEL-OHMIKE Capacitor Analyzer gives quick and dependable measurements of capacitance, power factor, leakage current, and insulation resistance. It is compact, highly accurate, and easy to use. Outstanding features of this indispensable instrument include . . . improved accuracy, jumbo dial for easy reading, special color-keyed push buttons for instant range selection, automatic release for added safety, magic-eye tube for simplified bridge balancing. An added feature is a turns-ratio bridge circuit for audio and power transformers. Complete price, only \$83.90 net.
- For a more complete description and demonstration, see your distributor today. Or write for your free copy of Sprague's latest radio and TV service catalog, C-612. Address request to Sprague Products Co., Distributors' Division of Sprague Electric Company, 65 Marshall Street, North Adams, Massachusetts.

don't be vague . . . insist on

SPRAGUE®

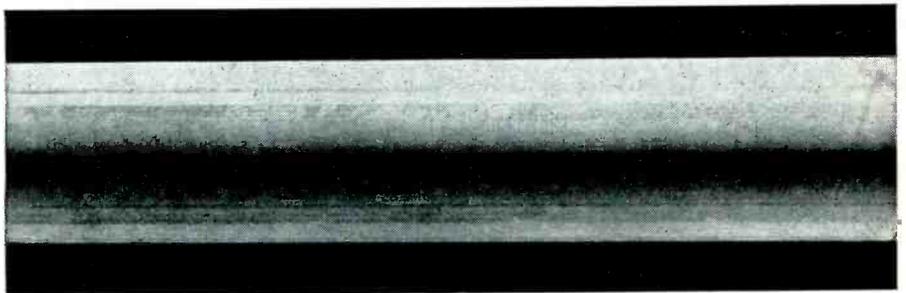
world's largest capacitor manufacturer

SPRAGUE RESEARCH IS CONSTANTLY PRODUCING NEW AND BETTER CAPACITORS FOR YOU



Sell masts that last...

Gain customer confidence and satisfaction
with masts of Armco ZINCGRIP Tubing



After 7 years' exposure in an industrial atmosphere the special coating on Armco ZINCGRIP Tubing continues to protect it against rust.

When you sell a TV mast made of Armco ZINCGRIP Tubing you can be sure your customer will be satisfied, that its performance will help build confidence in you, your service and your merchandise.

Armco ZINCGRIP Tubing has a special hot-dip zinc coating that protects against rust. Its tough skin of zinc doesn't flake or crack off when the mast is fabricated or erected. Your customers get masts that keep their attractive appearance much longer than those made of electro-galvanized or painted tubing.

Armco ZINCGRIP Tubing gives masts sturdy strength and rigidity to resist driving winds and snow- and ice-loads. Antenna stay in alignment for trouble-free reception. ZINCGRIP Tubing also combines lightness with strength. Masts are easy to erect, even when good reception demands maximum antenna elevation.

Armco ZINCGRIP Tubing saves money for your customers because masts give maintenance-free service. It boosts your

profits, too, because satisfied customers, with confidence in your recommendations, will want your other products and services.

Sell masts that last . . . masts made of Armco ZINCGRIP Tubing. Let us send you the names of manufacturers of television masts made of this durable steel. Just fill out and mail the coupon.

ARMCO STEEL CORPORATION
2108 Curtis Street, Middletown, Ohio

Send me names of manufacturers who make masts of Armco ZINCGRIP Tubing.

Name _____

Company _____

Street _____

City _____ Zone _____ State _____

ARMCO STEEL

ARMCO STEEL CORPORATION • 2108 CURTIS STREET, MIDDLETOWN, OHIO



SHEFFIELD DIVISION • ARMCO DRAINAGE & METAL PRODUCTS, INC. • THE ARMCO INTERNATIONAL CORPORATION

Because You Demand Jerrold Quality In UHF Converters

... we proudly introduce

ULTRACON

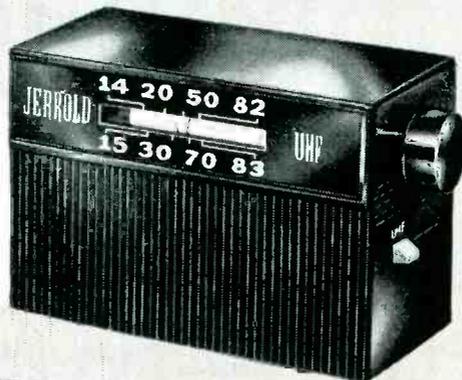
Your Choice of 2 Models Featuring:

- **PRESELECTION**—a "must" in 2-channel areas, UHF or VHF.
- **COAXIAL TUNING**—for no drift—stability, low noise operation, no wiping contacts.
- **LONG LIFE OPERATION**—newly developed 6AF4A oscillator tubes, low noise mixer-diodes.
- **VERNIER TUNING**—coupled to slide rule dials for easy station selection.

ULTRACON MODEL TCU

for quality reception in normal signal areas. Lowest noise figure over entire UHF band of any similarly priced converter! Handsomely styled cabinet.

\$22.95 list



ULTRACON DE LUXE MODEL FTC

for excellent reception in areas where other units don't work. Combines high-gain amplification with low loss circuitry. Built-in UHF antenna. Matched Impedance. Handsome mahogany or blonde cabinet.

\$39.95 list



"Radar Designed" dual cavity tuner is the heart of DE LUXE ULTRACON. Completely sealed unit contains nothing to cause noise!

For full information, see your Jerrold distributor, or write:

JERROLD

ELECTRONICS CORPORATION
Dept. PD62 • 15th & Lehigh, Philadelphia 32, Pa.

Jerrold Electronics Corp., Ltd., Toronto, Canada
Export Representative, CBS International, New York 22, New York

LOOK TO JERROLD FOR AIDS TO BETTER TELEVIEWING

LETTERS

To the Editor

TV Sets In A Drug Store

Editor, ELECTRONIC TECHNICIAN:

I enjoy the cartoons that appear in your magazine. Sometimes the most comical incidents that happen in real life are not always so to the people involved. A customer placed his TV set on a wagon and wheeled it into the drug store. He then proceeded to check all his tubes on a do-it-yourself tube tester. The store's closing time came and went. Efforts on the part of the management to get the customer, his TV set, and his wagon out of the store, were to no avail. In spite of the management's desire to close up shop, the customer refused to leave until he had completed the tests on all tubes.

JOSEPH N. BASAR
Basar Radio & TV Service
Cleveland, Ohio

● *The druggist might have avoided the need for aspirins or tranquilizers, by just blowing a fuse.—Ed.*

Associations Wanted

Editor, ELECTRONIC TECHNICIAN:

We are interested in starting a service association for Tucson and Pima County. There have been many attempts made in the past, but due to a lack of interest, they have resulted in failure. Would you kindly send me information on NATESA, laws, charters, etc.

CLINTON R. PIERCE
Tucson, Arizona

... I would like to join an electronic technicians association or guild. Please send name and address of some organizations.

HANS J. DU BOIS
Chicago, Ill.

● *NATESA, 5906 S. Troy St., Chicago, Ill. has been helping technicians join and organize associations. Suggest you contact them directly. You may also keep yourself informed about local and national activities by following the Association News Department in each issue of Electronic Technician. Page 42 of the May 1958 issue contains the 1958 Roster of Technician Associations, including addresses.—Ed.*

Humor Mistaken for Mockery

Editor, ELECTRONIC TECHNICIAN:

I find the cartoon on page 62 in your February issue in poor taste. It mocks the American flag and all it stood for at Iwo Jima. Kindly refrain from this sort of thing in the future. Thank you.

WALTER S. ANDARIESE
Walt's Radio Service
E. Rutherford, N.J.

(Continued on page 10)



For dependability and long life use ZENITH QUALITY BATTERIES



EXTRA PROFIT ITEM!

Zenith Mercury Batteries

Zenith pioneered the use of Mercury cells for transistor radios. They are easy to sell, because they provide up to four times the playing life of ordinary cells—and they provide extra profits because of higher unit price.

Specially engineered for transistor radio operation

Dependability is built into every battery that carries the Zenith name. Advanced design provides maximum hours of listening pleasure. Special construction insures long life and keeps batteries fresh longer.

Rigid manufacturing specifications, production quality controls and performance tests make doubly certain that all Zenith batteries are completely dependable and insure customer satisfaction. A complete line of Zenith batteries is available from your Zenith distributor.

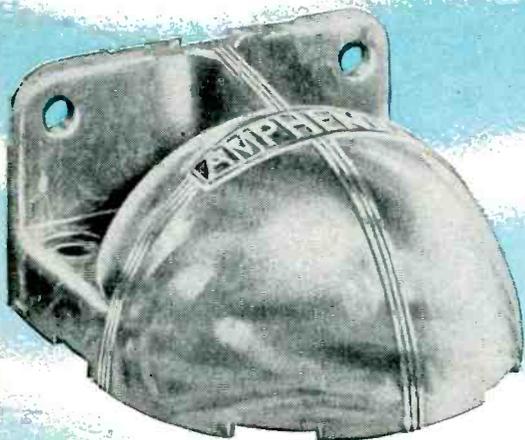
*40 years of leadership in radionics exclusively.
The quality goes in before the Zenith name goes on.*

SEE YOUR ZENITH DISTRIBUTOR

ZENITH **MEANS QUALITY**

ZENITH RADIO CORPORATION • PARTS AND ACCESSORIES DIVISION
6001 W. DICKENS, CHICAGO 39, ILLINOIS

SUPER RELIABLE!



TV

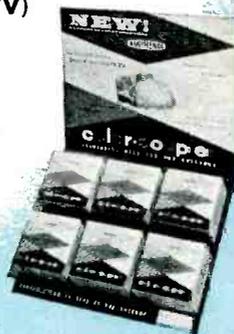


Color COUPLER

New design ideas in performance, appearance and mounting make AMPHENOL's Color-Couplers best for coupling of Color and/or Black & White TV sets as well as FM radio. Incorporating a super reliable resistive network, Color-Coupler provides

1. Effective isolation
2. Low insertion loss
3. Almost perfect impedance match
4. Flat signal response (a must for Color TV)
5. Built-in twin lead strain relief
6. Horizontal or vertical mounting

To Help You Merchandise this superior coupler AMPHENOL provides a free 3-color counter-top display. Included with each standard package of 9 114-097 2 set Color-Couplers, this eye-catching display mounts 6 Color-Coupler cartons for reach-and-buy action!



Color-Couplers are also available as three and four set models. Your AMPHENOL Distributor has all the data.



AMPHENOL ELECTRONICS CORPORATION
chicago 50, illinois

(Letters continued from page 8)

Change Designers

Editor, ELECTRONIC TECHNICIAN:

Kindly accept my compliments for the Editor's Memo which appeared in the April issue. It was very good, and presented much food for thought. I particularly enjoyed the last item—"The technician who slugged the designer of inaccessible electronic equipment." I am certain that there would be some changes made if some of these designers had to fix their own sets.

C. E. GREGG

Ontario, Calif.

Satellite Signals

Editor, ELECTRONIC TECHNICIAN:

I have a few SCR 522 radios. Could you tell me what crystal to use in order to listen to the U.S. satellites on 108 mc.

WASHINGTON E. BOUCHER

Boucher Radio Service
Marshfield, Wisconsin

• Crystal frequency is 8,000 kc. This crystal is in the local oscillator stage and operates on the 12th harmonic, which brings the oscillator out to 96 mc. The i-f frequency is 12 mc. You will also have to adjust the r-f amplifier stage to 108 mc.—Ed.

Filing System

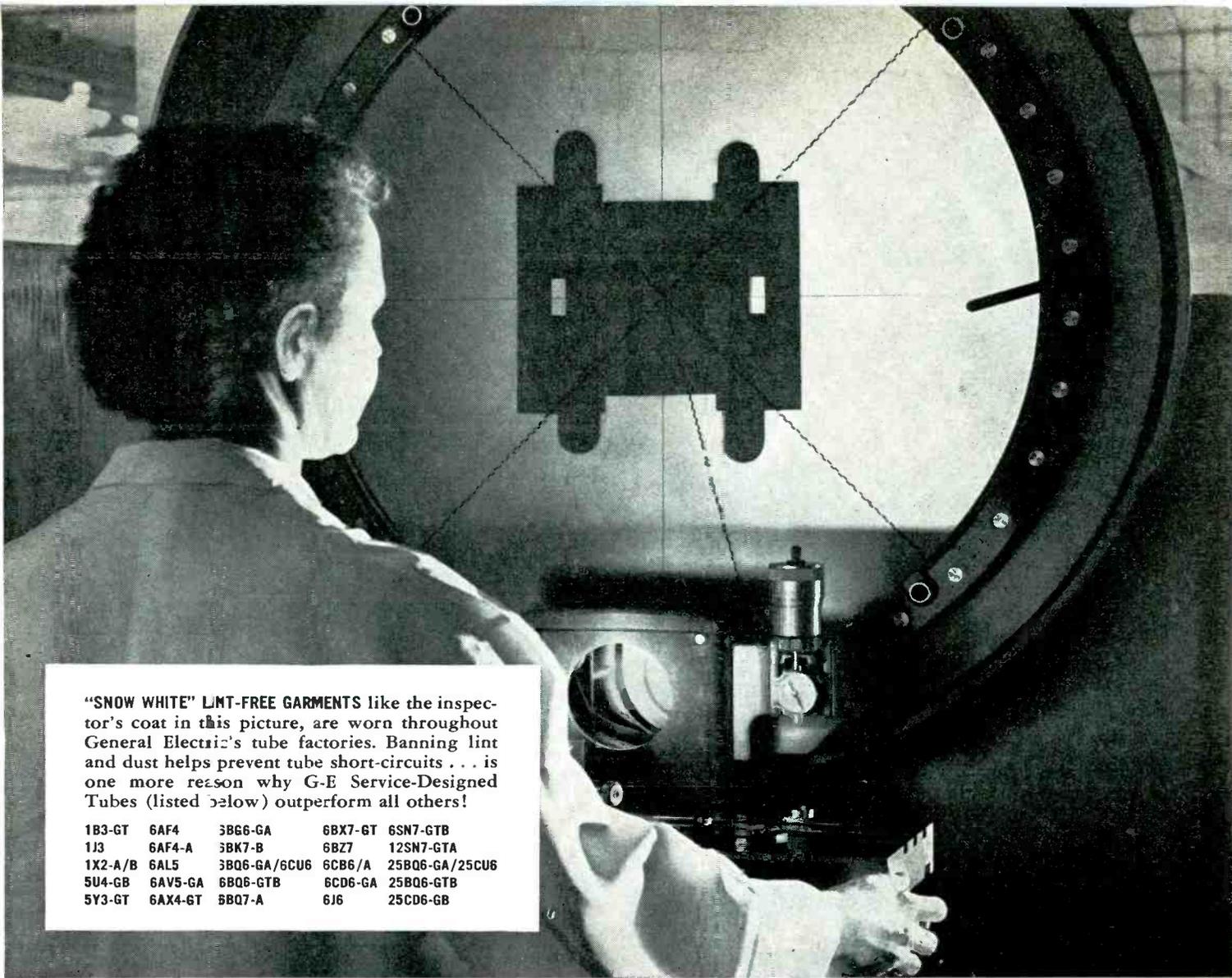
Editor, ELECTRONIC TECHNICIAN:

Here is the filing system I use in looking up a schematic in Circuit Digests. First you stack them numerically. If your operation calls for portability, you purchase the binders, or if you happen to have an old expanding type manila file around, affix a designation tab at appropriate points to indicate years.

Now when you have a "Tough-Dog" to challenge (and who needs a schematic otherwise), you simply pull out an original tube, look at the code date. Code date indicates a '54 set. Grab the twelve copies for that year and thumb through them quickly. What could be easier? If you think there may be an overlap, e.g., '58 sets coming out in late '57, you can always search back a little into the '57 schematics to see if the '58 prints were published to coincide with production.

I have also found through the years, that some schematics are almost identical to others. There are instances where a manufacturer will change nothing but the size of the CRT and cabinet and maybe just beef up the horizontal and vertical sweep to supply the requirements of a larger tube. So why feel that you need the exact print? There are several instances whereby you will find the same circuit configuration on sets that were manufactured back to back. For example, look at the horizontal

(Continued on page 14)



"SNOW WHITE" LINT-FREE GARMENTS like the inspector's coat in this picture, are worn throughout General Electric's tube factories. Banning lint and dust helps prevent tube short-circuits . . . is one more reason why G-E Service-Designed Tubes (listed below) outperform all others!

1B3-GT	6AF4	3BQ6-GA	6BX7-GT	6SN7-GTB
1J3	6AF4-A	3BK7-B	6BZ7	12SN7-GTA
1X2-A/B	6AL5	3BQ6-GA/6CU6	6CB6/A	25BQ6-GA/25CU6
5U4-GB	6AV5-GA	6BQ6-GTB	6CD6-GA	25BQ6-GTB
5Y3-GT	6AX4-GT	6BQ7-A	6J6	25CD6-GB

Easy to see, in G-E Service-Designed Tubes . . . high-precision workmanship!

What you're looking at is a comparator—or industrial "magic lantern"—which shows the plate of a General Electric Service-Designed 6BQ7-A magnified in area 1,600 times.

The G-E inspector is checking close-to-perfect workmanship. Remember, the plate itself is less than 1/2 inch wide and long! Yet symmetry of structure is apparent; so are the plate's clean, precise outlines. Tolerances of this part are held to a few thousandths of an inch.

General Electric Service-Designed Tubes do a superior job in television sets because they're

far better designed and built. High-precision manufacture such as you see above—of plates, cathodes, heaters, grids—pays off for you in fewer customer complaints and callbacks.

Best news of all: Service-Designed Tubes cost you no more! Your G-E tube distributor has them. Phone him today! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.*

Progress Is Our Most Important Product

GENERAL  ELECTRIC

11-11-123

BEAM CURRENT (MICROAMPERES)

100

200

400

600

1,000

(LINE WIDTH (INCHES))

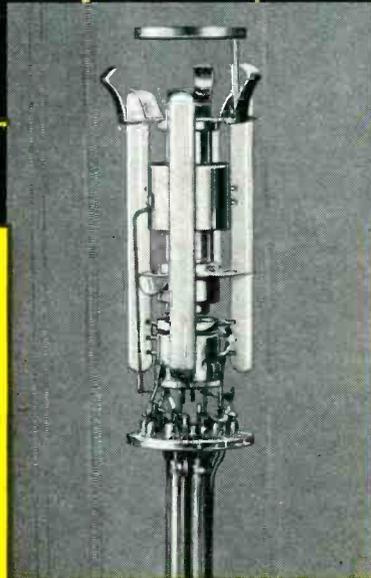
.050

.040

.030

.010

DU MONT POSITIVE QUALITY



Du Mont "Stubby" electron guns showed the industry the way to short neck tubes, and are recognized as the industry's best. The gun is the heart of the picture tube — the determining factor in picture sharpness.

38% SHARPER PICTURES

Another positive fact about Du Mont Positive Quality . . .
You get not only sharper pictures with a Du Mont picture tube — "blossoming" in picture highlights is minimized — line width is retained, resulting in sharper, clearer pictures that make and keep customers happy. Always use Du Mont Positive Quality picture tubes and receiving tubes . . .

*Send for your free copy of the
Du Mont Picture Tube Data Chart.



DU MONT®

TELEVISION TUBE DIVISION, ALLEN B. DU MONT LABORATORIES, INC., 750 BLOOMFIELD AVE., CLIFTON, N. J.



BUSS FUSES *can help protect your reputation
for sales and service*

When you sell or install BUSS fuses — you help avoid 'kicks' or complaints from customers that the fuses you furnish fail to protect when trouble occurs — or that the fuses blow needlessly.

BUSS fuses provide dependable electrical protection under all service conditions because . . . every BUSS fuse is tested in a sensitive

electronic device that automatically rejects any fuse not correctly calibrated, properly constructed and right in all physical dimensions.

Why take a chance with your good name by furnishing fuses that might be faulty? Standardize on genuine BUSS fuses. They protect your profits and reputation.

To meet service needs . . . there's a complete line of BUSS fuses, — plus a companion line of fuse clips, blocks and holders.

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

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

BUSS fuses are made to protect — not to blow needlessly



A COMPLETE LINE OF FUSES FOR HOME, FARM, COMMERCIAL, ELECTRONIC, AUTOMOTIVE AND INDUSTRIAL USE.



Announcing...

PROJECT

INFO

Whatever your industry...whatever your product...if electronics is now at work for you, INFO can become important to your operations.

Ask your nearest RCA Industrial Tube Distributor to tell you how!



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

(Continued from page 10)

oscillator of an R.C.A. set manufactured in late 1953 and early 1954. They are identical.

I know what you're thinking now. Okay, so there was a production change of a cathode resistor by 200 ohms from the 17" set to the 21" set to improve stability. This may be right in the circuit that you are trouble shooting. Actually this change should have been incorporated in the first place with the 17" set, but the stability problem was not recognized until the sets were used in the field. An oscilloscope study of the waveform produced by this stage will immediately tell you whether or not this stage is functioning properly. The mighty oscilloscope will tell you whether or not you need more or less cathode resistor to effect proper bias of the stage, after finding no leaking capacitors in and out of that stage.

Working with a print that is close enough to the original often requires that the technician possess a good working knowledge of prints in general and a fairly good background in electronics.

JOSEPH ARCHETTI

O'Co-Nee Radio & T.V.
Bay Shore, N.Y.

• *May 1958 Circuit Digests contains an index of all schematics published to date.—Ed.*

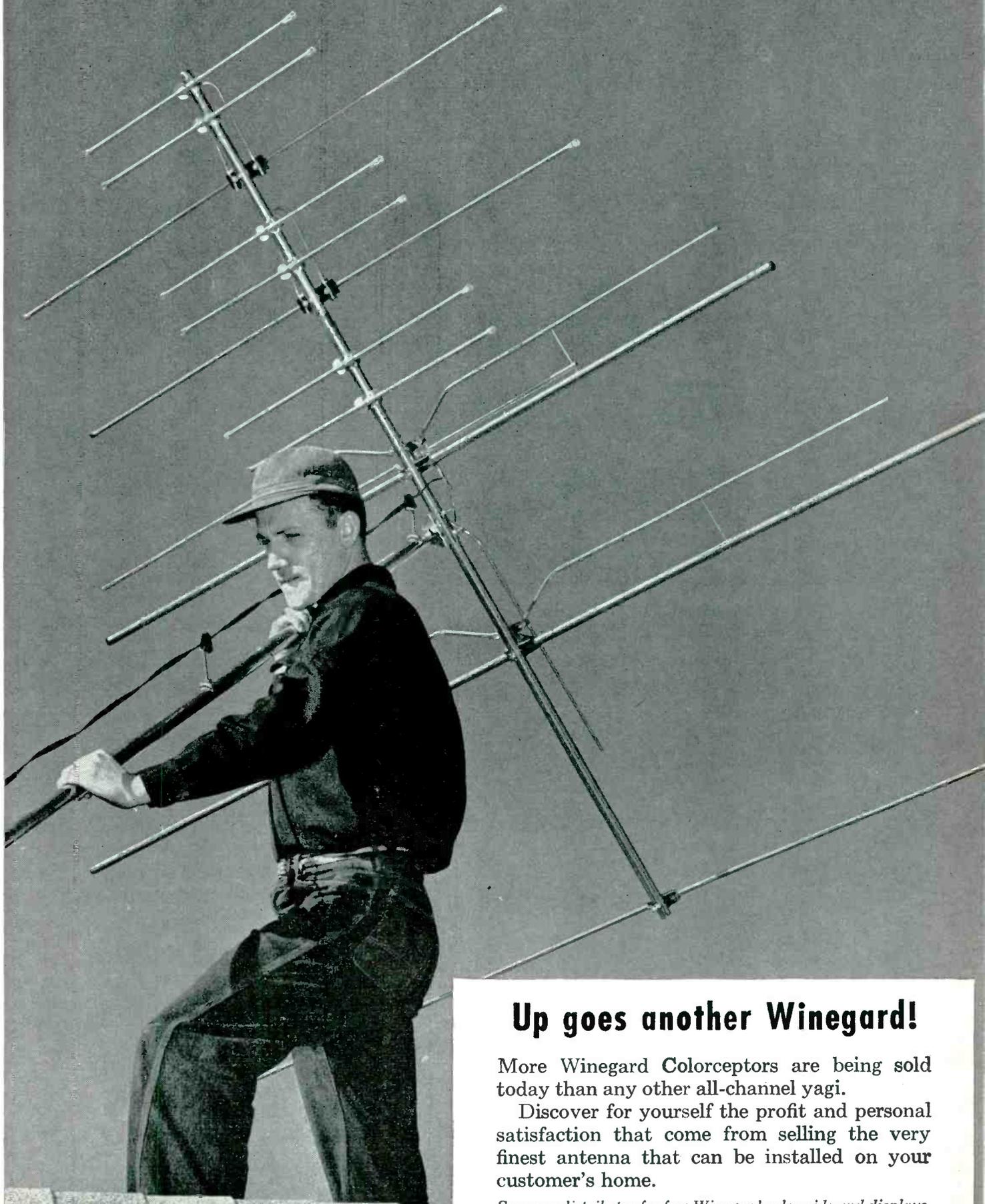
News of the Industry

GENERAL ELECTRIC CO., Receiving Tube Dept. announces the appointment of GORDON E. BURNS as Distributor Sales Manager, succeeding JOHN T. THOMPSON. Headquarters are Owensboro, Ky.

CBS-HYTRON & COLUMBIA RECORDS have acquired jointly a modern 28,000 square-foot warehouse in Los Angeles to accommodate west coast sales and engineering offices and storage facilities.

PYRAMID ELECTRIC CO. has elected the following: MILTON N. LAPUIDUS, Board Chairman; RALPH M. SCARANO, Pres.; ARNOLD R. ANDREWS, Vice Pres., Sales; FRANK J. STAKLINSKI, Vice Pres., Mfg.; KARL MOEGLICH, Vice Pres., Eng'g & Research; SAMUEL SIEGLER, Treas.; DAVID UNTERBERG, Secy.; NATHAN H. WEISS, Ass't Treas. Also, announcement has been made of the removal of the firm's manufacturing plant from North Bergen, N. J. to Darlington, S. Car. Their sales and accounting departments and jobber warehouse remain at North Bergen, and their manufacturing operation at Gastonia, N. C. continues.

(Continued on page 18)



Up goes another Winegard!

More Winegard Colorceptors are being sold today than any other all-channel yagi.

Discover for yourself the profit and personal satisfaction that come from selling the very finest antenna that can be installed on your customer's home.

See your distributor for free Winegard sales aids and displays.
Write for Technical bulletin WCL4.



Winegard Co.

3019-6 Scotten Blvd., Burlington, Iowa

Shown is Model CL-4

Photo by R. K. Sunderbruch

What's Better
than a
BEST-SELLER?

A BEST SELLER *plus* A SMASH PROMOTION!

It's Yours **ONLY** From V-M!

The Best-Sellers:

V-M TAPE RECORDERS!

Who Says so? **BILLBOARD** Says so!

THE BILLBOARD'S authoritative sales survey shows V-M tape recorders are BEST-SELLERS ACROSS THE NATION—IN EVERY CATEGORY!

THE SMASH PROMOTION: **V-M STEREO TAPE LIBRARY, '58!**



V-M Stereo Tape Library, '58

Classics—jazz, pops—FOUR tapes, beautifully boxed. A \$40 VALUE priced so low you can GIVE IT AWAY with every V-M tape recorder you sell! And, brother, you'll sell plenty!

who says so?

V-M DEALERS

EVERYWHERE say so!

Last Fall, V-M originated the stereo tape library promotion—a success on every count! From all sections of the country, dealers large and small reported volume and profits jumped to all-time levels! NOW V-M DOES IT AGAIN WITH A BRAND-NEW AND BEAUTIFUL PACKAGE OF STEREO TAPE RECORDINGS!

MOVE THE BIG STEREO MARKET TO YOUR STORE WITH V-M!

Call your Voice of Music Distributor
TODAY!

Tape Recorders from \$100-\$200	Total Stores
V-M	135
Webcor	118
RCA Victor	82
Wollensack	18
Columbia	12
(5 others listed)	

Tape Recorders Over \$200

V-M	114
Webcor	104
RCA Victor	44
(4 others listed)	

Recorders or Playback for Stereo Tapes

V-M	82
Webcor	60
RCA Victor	34
Amplex	15
(4 others listed)	



V-M 'Celeste' table-model tape recorder plays stacked AND staggered stereo tapes, records and plays back monaurally in flawless high-fidelity. (Legs Optional) Model 750 \$275.00 List*.



V-M tape-o-matic® portable tape recorder. All-stereo playback, authentic high-fidelity monaural recording and playback. Model 714, \$225 List*.

*Slightly higher in the West.

the **Voice**  of **Music**®

V-M CORPORATION

BENTON HARBOR, MICHIGAN

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

mounts in seconds!

completely waterproof! highest "Q"!

NOW...

LOK-MATIC by WARD!

It's today's most revolutionary antenna!

Truly a "fingertip" installation—done in seconds—by one man—entirely from the outside!

So advanced, it will fit all cars—even '59 and '60 models.

Positive . . . easy . . . fool-proof. New exclusive triple interlocking parts fall into place automatically—provide tighter, easier installation. The *only* completely waterproof mount—highest "Q" ever. The Lok-matic antenna extends to 55" from 19½" collapsed. Has 3 sections. Adjusts to 43°. 54" low-loss Elektran lead cable. Fits any hole from 15/16" to 1 1/8". Popularly priced. Put the easiest mount of all at your fingertips—order the Lok-matic antenna (Model L-1000) from your distributor today! Pre-assembled — no loose parts. *Only* Ward has it!

Self-locating rocker locks automatically, can't spread. Positive ground. Self-aligning pad. Completely waterproof. Interlocking features of insulator and cap prevent twisting. Dome-shaped nut.

Pat. App. For

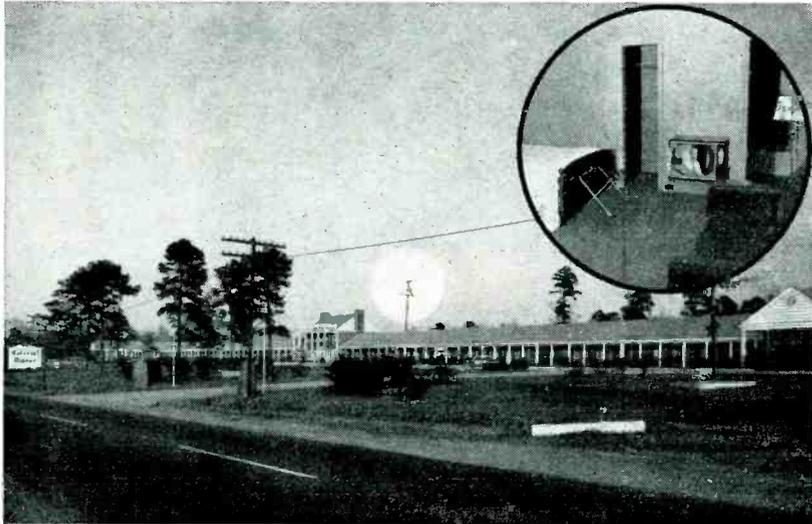
watch **w a r d** WARD
PRODUCTS
CORP.

1148 Euclid Ave., Cleveland 15, Ohio • Division of The Gabriel Company
In Canada: Atlas Radio Corp., Ltd., 50 Wingold Avenue, Toronto, Canada



HELPS YOU CASH IN ON THE GROWING MOTEL MARKET

MASTERLINE Amplifiers — proven top performers in leading motel master TV system installations. FREE engineering service — provides actual system layouts. POWERFUL ads in leading motel publications build business for you...



INSTALLATION BY LIVESAY S. ROANOKE RAPIDS, N. C.
ENGINEERING BY WOMACK ELECTRONICS, INC. ROCKY MOUNT, N. C.



MASTER TV SYSTEM BRINGS COLONIAL MANOR HOTEL GUESTS 100 MILE TV RECEPTION

Modern Colonial Manor Motel on busy highway 301 in Weldon, North Carolina offers its guests traditional warm southern hospitality and all the modern conveniences to make their stay comfortable. Free television in 36 of its units is one of the modern conveniences that helps build business for this motel.

Blonder-Tongue amplified master TV system equipment is the heart of the installation that brings Colonial Manor guests sharp, trouble-free reception on three channels. Channel 3 in Norfolk is 100 miles away; Channel 5 in Raleigh 80 miles away; and Channel 9 in Greenville is 60 miles away.

The Colonial Manor arranged for the installation of its master system utilizing the vast engineering know-how of Blonder-Tongue and two local electronics firms. The system includes B-T Masterline master TV equipment (amplifiers, line couplers, TV wall outlets) and a single master antenna. Besides providing the best TV reception possible regardless of distance and terrain, B-T equipment is economical. Per outlet cost is low; maintenance

Write today for FREE information on how to cash in on this market.



BLONDER-TONGUE LABORATORIES, INC. Dept. T-6
9 Alling Street, Newark 2, N. J.

Name _____
Company _____
Address _____
City _____ Zone _____ State _____



(Continued from page 14)

WINEGARD CO. reports that sales increased 9.6% in the first quarter of 1958 over the same period in 1957.

ROHN MFG. CO. has added a complete new enameling process plant to its recently expanded facilities.

TEXAS INSTRUMENTS, Inc. reports price reductions ranging from 5% to 25% on entertainment type germanium transistors.

CLEVELAND INSTITUTE OF RADIO ELECTRONICS has named CAPTAIN ROLAND A. REUTHER (U.S.N. (Ret.)) as Assistant to the Vice President.

BURGESS BATTERY CO. has elected FRED J. KIRKMAN as Pres., formerly Executive Vice Pres. and General Manager; DAN W. HIRTLE, former Pres., was elected to the newly created post of Vice Chairman of the Board.

RADIO CORP. OF AMERICA will establish, in collaboration with New York University, a \$100,000 Educational Television Workshop to develop and disseminate TV teaching techniques for the Nation's schools.

EITEL-MCCULLOUGH, INC. announces the following appointments: GORDON M. PETERSON to the new position of Adm. Ass't to the Director of Marketing; and JOHN R. QUINN as Sales Engr. in Commercial Marketing.

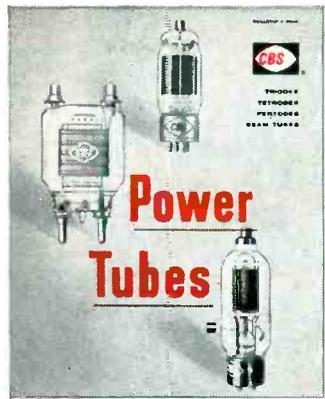
UNIVERSAL TRANSISTOR PRODUCTS CORP. announces that MAURICE L. GOODMAN has been promoted to General Sales Manager of the entire company, from Sales Manager of the firm's Universal Atomics division. PAUL BIRMAN has been promoted to Sales Engineer.

PHILCO CORP. announces the following appointments: WILLIAM BALDERSTON, JR. to Products Mgr. and DANIEL LERNER as Field Sales Engr. for these new positions in the expanding Appliance-Laundry parts and accessories department of the Accessory Div.

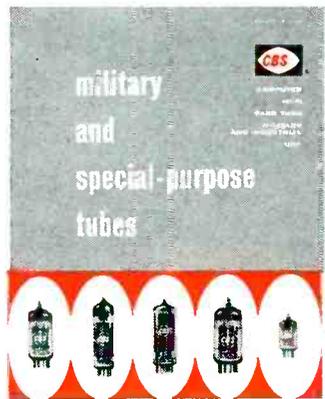
MOTOROLA, INC. reports the following executive changes: JOHN T. HICKEY, Manager of the firm's Semiconductor Division in Phoenix, has been appointed Ass't to the Pres. on the corporate staff in Chicago. DR. LESTER HOGAN will head the Semiconductor Div.

(Continued on page 20)

**POWER TUBES
E-290T**
triodes, tetrodes,
pentodes and beam tubes
— 8 pages.



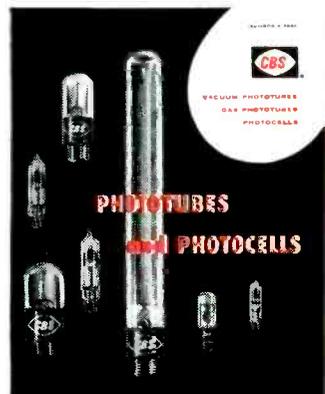
**MILITARY AND SPECIAL-
PURPOSE TUBES
E-290S**
military, computer,
uhf, hi-fi and pass tubes
— 12 pages.



**GAS TUBES AND
POWER RECTIFIERS
E-290C**
gas diodes, gas triodes
and tetrodes (cold cathode
and thyatron) and power
rectifiers — 16 pages.



**PHOTOTUBES AND
PHOTOCELLS
E-290P**
vacuum and gas
phototubes and photocells
— 12 pages.



Now...the most
comprehensive
industrial
tube line
...over 400
CBS types!

In keeping with the growing importance of industrial tubes, CBS-Hytron has more than doubled its industrial tube line. Over 400 types make it the most extensive line. For example, CBS-Hytron now offers the widest selection of gas tubes, phototubes and photocells.

The four industrial tube catalogs illustrated include: reference charts with ratings and typical operating conditions, basing and circuit diagrams, and application notes. Ask your CBS-Hytron distributor or write us for the ones you need.



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

For the best in entertainment tune to CBS

(Continued from page 18)

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



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

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



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



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



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

FREE catalog

Mail coupon below for
your copy—Now!

HEATH COMPANY
A SUBSIDIARY OF DAYSTROM, INC.,
BENTON HARBOR 24, MICHIGAN

Name

Address

City & Zone

State

PARAMOUNT ENTERPRISES, INC. has named SAMUEL OLCHAK as Sales Manager of the firm's HALLMARK division.

RAYTHEON MFG. CO. announces the appointment of JOHN T. THOMPSON as Manager of the newly-formed Distributor Products Division.

BRITISH INDUSTRIES CORP. reports that MELVIN ZALKIN has joined their organization as Sales Manager of the Multicore Solders Div.

HYCON MFG. CO. reports the promotion of WILLIAM T. SNEBOLD to Vice Pres. and General Mgr., formerly Financial Vice Pres. and Secy.-Treas. He will continue as Secy.-Treas.

BLONDER-TONGUE LABORATORIES announces the following appointments: HERB GERSON as Assistant Advertising Manager; and AMES F. GIORDANO as Chief Engineer.

Reps & Distributors

AMPEREX ELECTRONIC CORP. announces the appointment of THOMAS & SUKUP, Indianapolis, Ind. as representative covering Ind. and Ky.

CBS-HYTRON announces the awards made to service-dealers by the firm's Philadelphia CRT distributors as: a free trip for two to Paris won by BYRON FRANK; and a Columbia record player by AL GREEN.

AUDIO DEVICES, INC. has appointed GERARD CAFARO and GEORGE KULPER as sales engineers for the firm's new rectifier division, Santa Ana, Calif. Their headquarters will be in the New York City office.

TRU-OHM PRODUCTS has appointed the following distributors to cover the territories as stated: ALLEN I. WILLIAMS CO., Denver, Colo., Nebr., Ariz., Utah, New Mex., Wyo., S.E. Idaho, El Paso County, Texas; EUGENE SCHOMBURG CO., Rochester, N. Y., Upper N. Y. and Erie, Pa.; QUENTIN P. BLONIGEN, Osseo, Minn., Minn., N. and S. Dak., western Wisc.; FLOYD FAUSETT & CO., Atlanta, Ga., Fla., Ga., Miss., N. and S. Car., Tenn., Va.; R. C. MERCHANT & CO., Detroit, Mich., state of Mich.

IT&T Components Div. has appointed the JOHN G. TWIST CO., Chicago, Ill., as sales reps to handle industrial accounts including radio-TV manufacturers, in Ill. and southeastern Wisc.

ACME ELECTRIC CORP. reports the appointment of L. P. WIEGAND as direct factory representative for southern Calif. His headquarters are at the firm's West Coast division plant in Los Angeles.

PHALO PLASTICS CORP. has named as sales representatives: HIPPLER SALES CO., Webster Groves, Mo., to cover Mo. and Kan; and ROBERT G. MITCHELL CO., Cedar Rapids, Iowa, for Iowa and Nebr.

HOFFMAN ELECTRONICS CORP., Consumer Products Div., has appointed FOWLER DISTRIBUTING CO., Portland, Ore., to handle sales of TV receivers, radios and hi-fi instruments. HOFFMAN SALES CORP., Portland is being discontinued.

PHILCO CORP. Lansdale Tube Div. announces that a new distributor organization is being formed. The complete transistor line will be stocked in all leading industrial areas. Direct factory franchises are being granted with key distributors for local sale and service.

BLONDER-TONGUE LABS reports that two of their representatives recently attended a luncheon meeting with all leading Philadelphia electronic parts distributors and the WHY-Y-TV staff, for the purpose of acquiring public support for Channel 35's educational, civic and cultural programming.

INDUSTRO TRANSISTOR CORP. announces the appointment of two new reps to handle germanium alloy-junction PNP transistors. JULES J. BRESSLER & CO., Union City, N. J. will cover New York and Northern New Jersey, (South up to and including Monmouth and Middlesex Counties). EDWARD HOFFMAN CO., St. Paul, Minn., will cover Minn., North and South Dakota, and Wisc.

GENERAL INSTRUMENT CORP. has formed a distributor division to handle sales of semiconductor products of its subsidiary RADIO RECEPTOR CO., and of silicon rectifiers made by AUTOMATIC MFG. DIV. OF GENERAL INSTRUMENT. JERRY MELTZER, formerly semiconductor distributor sales manager of RADIO RECEPTOR CO., is head of the new division. Headquarters are at the RADIO RECEPTOR CO. plant at 240 Wythe Ave., Brooklyn 11, N. Y.

CORNELL-DUBILIER CAPACITORS



The extra values are "on the house"

Want more capacitor for your dollar? Here's how: Cornell-Dubilier has originated a "preferred-type" program on twist-prong electrolytics. Now, a relatively few types fill over 90% of all replacement requirements. You need less - to do more. Fewer types means improved production efficiency, lowered costs - savings to you. How is it done? Instead of producing hundreds of types with odd and critical capacitance and voltage ratings, each "preferred type" carries the highest value and rating called for in each category. In most cases you get more capacitor at lower cost - plus added safety factor, improved performance and "call-back" protection. It's on the house! To get more capacitor for your dollar, ask your C-D Distributor about Preferred Type Twist-Prong Electrolytics or write Cornell-Dubilier Electric Corporation, South Plainfield, New Jersey.



CORNELL-DUBILIER CAPACITORS

Consistently Dependable



America's Fastest-Growing Service Capacitor Line...



NEW!

TOBE MYLAR* MOLDED TUBULAR CAPACITORS

- *Molded of DuPont Mylar*, one of the finest insulation materials ever developed.
- *Thermoset Case Construction* secures leads and sections firmly to withstand extremes of handling, vibration, shock and soldering temperatures.
- *High Insulation Resistance*: Average megohm values per unit 10,000 at 25°C. Small capacitance variation with thermal change.
- *Temperature Operating Range*: -55° to +130°C.
- *Moisture Resistant*: Exceeds JAN-C-91 requirements.
- *Non-Inductive*: Extended foil construction insures low resistance connections and low RF impedance.

DESIGNED FOR SERVICE DEALERS

NEW TOBE MYLAR* CAPACITOR KIT

FREE KIT CONTAINS
80 CAPACITORS

ONLY

\$15⁸⁴



Compact, clear-plastic dispenser contains an assortment of 80 Tobe Mylar capacitors in the most popular sizes, ratings and quantities for quick, efficient servicing. Covers over 60 different ratings at 200, 400 and 600 working volts and from .0001 to 1.00 mfd. Dealer pays only for the Tobe Mylar capacitors, kit is free.

Today, order your Tobe Mylar Kit from your Tobe Distributor



TOBE RADIART CAPACITORS

MORRIS F. TAYLOR CO., Mfrs' Rep. firm, announces the appointment of **RALPH J. PALMISANO** as Fla. District Manager. Pres. **R. H. VAN DUSEN** who formerly covered Fla. and supervised all southern states will devote the major part of his time as Regional Manager of the southern states served by the company.

"THE REPRESENTATIVES" Mid-Lantic Chapter reports newly elected officers as: **J. T. Stinson**, Pres.; **L. P. Naudain**, Vice Pres.; **James P. Faries**, Sec'y.; and **C. W. Lienau**, Treas.

"THE REPRESENTATIVES" New York Chapter honored its past presidents at a dinner on May 8. The Chapter is holding a Dutch Treat Dinner with the Purchasing Agents on June 9.

ALLEN B. DU MONT LABS reports that **DU MONT NATIONAL DISTRIBUTORS** has appointed **WILLIAM CHEEVER** as sales manager of the newly established Boston headquarters, which succeeds the **L. J. MCALLISTER CO.** as the firm's distributor of TV receivers, hi-fi instruments and radios. Also, **LIFSEY DISTRIBUTING CO.**, Flint, Mich., has been appointed distributor covering northeastern Mich.

Catalogs & Bulletins

TUBES: A new 11 x 14 inch wall-type chart provides suggested retail prices for 839 electron tubes used in radio, TV and hi-fi applications. Available through Tung-Sol distributors. Tung-Sol Electric, Inc., 95 Eighth Ave., Newark 4, N. J. (ELECTRONIC TECHNICIAN B6-11)

KITS: The new 24-page, 1958 catalog illustrates and describes the latest additions of stereo, hi-fi, ham, marine and test equipment. Some items are so new that some of the prices are yet to be announced. An explanation of stereo and how to plan your Hi-Fi system is also included. Heath Co., Benton Harbor, Mich. (ELECTRONIC TECHNICIAN B6-10)

HOME LAUNDRY ACCESSORIES: Parts data for more than 150 home laundry washing machine models are listed in a new catalog. 1958 Philco-Bendix models, Bendix models back to 1948, all Crosley models, all Philco wringer washers and all models manufactured during the Philco-Dexter changeover are covered. Philco Corp., Accessory Div., "C" & Westmoreland Sts., Philadelphia 34, Pa. (ELECTRONIC TECHNICIAN B6-7)

(Continued on page 43)



PILOT RADIO appoints Ira L. Joachim as advertising manager.

DUOTONE has published a pictorial self-service needle replacement catalog.

OXFORD ELECTRIC has published a 28-page book giving complete dimensional data on its speakers.

GENERAL ELECTRIC will market its new stereo magnetic variable reluctance cartridge in the autumn.

PARAMOUNT ENTERPRISES has announced a line of stereo phono systems and stereo records under the HALLMARK label.

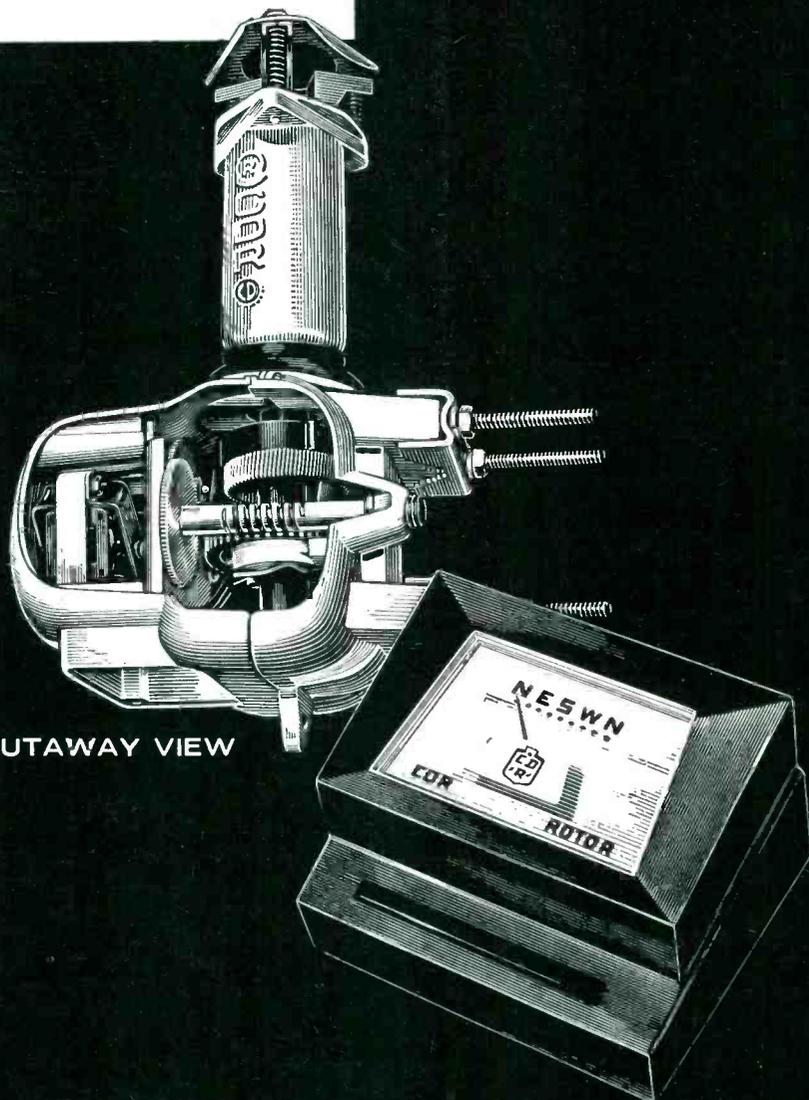
ATLAS is marketing the 15-watt coax-projector Model WT-6 weatherproof speaker. It has two drivers. The woofer is loaded with a folded exponential horn; a concentric wide-angle tweeter is included. Depth is 11"; bell opening 15".

HEATH has formed a dealer organization to distribute and service the firm's kits in Boston, Providence, Philadelphia, San Francisco, Los Angeles, Seattle and Washington, D. C. Direct mail operations will not be affected. Prices from dealers will be slightly higher than direct mail.

BROADCAST STEREO excited interest at recent NAB convention. Sending one channel on FM and other on AM has had only limited success. Real hope for future is FM multiplex being urged on FCC. Commission will have to choose between narrow-band system, which allows transmission of background music on third channel, and 2-channel wide-band system, which allows better quality.

(Continued on page 58)

CDR ROTORS



CUTAWAY VIEW

All new features

Completely designed from the ground up, CDR Model TR-15 and TR-16 Rotors have features never before available in the popular price range. Check these refinements and you'll see why: Quick mounting mast collet... speedy installation (no loose parts to assemble)... self-centering sawtooth clamps take masts up to 1½" O.D.... instant locking prevents drift... mechanical brake releases magnetically... instantly reversible... makes complete revolution in 45 seconds... meets JAN salt water test... great strength thrust bearing support... low weight... completely weather-sealed... fits standard towers... streamlined to reduce wind resistance... mahogany or blonde finish control box. Get full details today from your local CDR distributor.

CORNELL-DUBILIER ELECTRIC CORP.
South Plainfield, New Jersey

THE RADIART CORPORATION
Indianapolis, Indiana



CDR

Antenna Rotors

Old Hands at Dependability

NEW, IMPROVED



1B3GT

Made possible by

RUGGED, RAYTHEON FLY-BACK LIFE TESTS

At Raytheon, we test tubes to find out how *good* they are, not how bad. Accepted methods of testing tubes like the 1B3GT often resulted in subpar tubes. To improve and maintain the quality of Raytheon 1B3GT Tubes, Raytheon developed an expensive but super-accurate method of life testing these tubes.

Tests on the improved Raytheon 1B3GT far exceeded our expectations. Receiver life tests of the Raytheon 1B3GT showed not a single failure at 600 hours. (No worries about early life tube failure here.) At 1850 hours a sensational 93% of these tubes were still operating at rated efficiency in spite of the fact that *these sets were operated at 10% above their rated line input and cycled on and off every two hours.*

These torturous Raytheon Tube tests not only prove the quality of Raytheon Tubes, they help maintain

that quality. Tubes are constantly checked and tested and any variance in quality is instantly noted and quickly corrected.

That's why you can use Raytheon TV and Radio Tubes with complete confidence in their quality — with full knowledge that you are giving your customers tubes that are **RIGHT . . .** for Sound and Sight.

New Raytheon 1G3GT, 1J3GT and 1K3GT Tubes are also subjected to the Raytheon Fly-Back Tests — and as a result meet Raytheon's highest standards of quality. Ask your Raytheon Tube Distributor for them.



RAYTHEON MANUFACTURING COMPANY

Receiving Tube and Semiconductor Operations

NEWTON 58, MASS.
55 Chapel Street

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

ATLANTA 6, GA.
1202 Zonolite Rd., N.E.

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

Raytheon makes all these

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



Excellence in Electronics

ELECTRONIC TECHNICIAN

Including
Circuit Digests



Read the above words again . . . and think them over.

Good businessmen recognize that it is more economical to purchase needed equipment than to try to struggle with limited, worn, or outdated facilities. This is true even if it is necessary to run to the bank for a loan. If time is money, then time saved is money saved. If the right test equipment will save time—and it will—then the right test equipment will save money.

The road to professional status is much smoother when lined with the right kind of test equipment. The technician who is well equipped will often be given the benefit of doubt as to his ability and experience, and is in a position to attract the greatest amount of trade. Our experience in the past has shown that many repair jobs would have been much simpler, less aggravating, and taken less time had we been able to make more comprehensive tests.

Present demands more than justify the investment—tax deductible at that—in the right kind of test equipment.

It is difficult to venture beyond elementary procedure in electronic servicing without proper test equipment.

Hi Fi, communications, industrial electronics, and color are just a few of the many fields of endeavor for the radio and TV technician. The good radio and TV workshop is usually the one that is well equipped.

Remember, you pay for needed test gear one way or another—either through business loss and inefficiency, or through actual equipment purchases. Getting the equipment into your shop is by far the better choice.

That's what we mean when we say: "The technician who needs new test equipment is already paying for it."

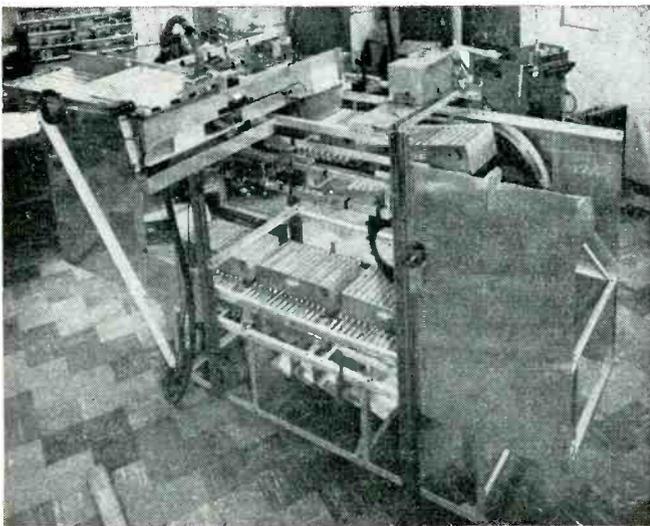
Tuning In the

TV OWNERSHIP INCREASES. More than 4 out of 5 U.S. households have TV sets. About 1 in 14 have two or more sets. The average of 83% is exceeded by metropolitan areas with 89%. Other areas 75%. Rural proportions jumped from 53% to 68% since February 1956. Regional breakdown is as follows: Northeast, 90%; Northcentral, 87%; West, 82%; and South, 74%.

DRUNK DRIVERS. New York's Traffic Commissioner, T. T. Wiley, challenged leading electronic engineers at the first national conference on electronic controls and highway safety, a three-day meeting, arranged by the Safety Education Institute of Columbia University to develop a device that would stop a car driven by a drunk driver. The experts agree that electronic controls is the answer to greater highway safety.

HOSPITAL VISITS. Children, ordinarily forbidden to visit hospital patients, now will be able to visit their parents who are patients at Bryn Mawr Hospital in Philadelphia—over closed circuit TV. A camera and broadcasting booth installed in the hospital lobby requires a quarter, from the visitor, to see the patient. Both can talk over the hospital phone. The tele-visit booth is connected to a Jerrold master antenna system which also picks up off-the-air channels and feeds them into the patients' rooms when not used for closed circuit programming.

Automatic Machine Sorts Mail



Laboratory prototype machine developed for the Post Office for the automatic high-speed sorting of letter mail. It can sort at the rate of 36,000 letters per hour into as many categories as may be needed. See page 50 for story.



"I have to motivate them . . ."

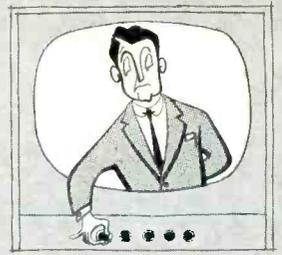
PAY-TV STALLED. In spite of recent and continual increases in the number of subscribers, the cable theatre in Bartlesville, Oklahoma, has been losing money steadily, and so after nine months of operation has closed up shop. They hope to reopen when conditions become more favorable.

NO SOAP. An all-new electronic detergent control unit was seen at the National Restaurant Association Show. Calgon Company's device electronically analyzes detergent solution in the washing tank and, as dilution occurs, adds the exact amount of detergent necessary to maintain predetermined concentrations. If no more detergent is available, the operator has two minutes to satisfy the machine or it will stop automatically.

SPEED READING. Over 2300 words read, and a four sentence abstract produced in three minutes by giant electronic brain at IBM. The abstracts are now being psychologically tested; if they are good, as much information will be obtained from reading the abstracts as from reading the entire article.

ELECTRONIC TECHNICIANS WANTED. An examination for Electronic Technician has been announced by the United States Civil Service for filling positions paying from \$3,175 to \$7,570 a year in various Federal agencies in the Washington, D. C., area. Electronic Technicians are needed to install and maintain electronic equipment such as computers, detectors, and testing and communications equipment; they are also needed to assist in research and development of such equipment. No written test is required. Full details will be sent to persons who apply. Further information and application forms may be obtained from most post offices throughout the country and from the United States Civil Service Commission, Washington 25, D. C.

Picture



PRINTED CIRCUITS. EIA reports that sales of printed circuit packages caused the cash registers to ring, in 1957, to the tune of \$7.3 million.

TRANSISTORIZED TV SET. Westinghouse now has a laboratory model, portable battery operated TV set. Equipped with 23 transistors, it can also operate on house current. The batteries can be recharged either from house current or car battery. It is expected that the final production model will require only 20 transistors, and weigh less than 30 pounds. A new 14-inch CRT was developed for this set.

SLOWER PLEASE. Cars entering the grounds of RCA's David Sarnoff Research Center pass over electronic loops buried in the entrance road. Transistorized detector units connected to the loops count each passing car, measure the speed of each, and flash a polite warning saying "Slower Please" to every driver exceeding the posted speed limit. It is part of a vehicle control system for the electronic highway of tomorrow.

INTERFERENCE PROBLEMS may be relieved somewhat by a new Power Control device now undergoing engineering by G-E. It automatically adjusts transmitted power of a base station to match the incoming power of a mobile radio. The outgoing power, therefore becomes proportional to the signal received from a mobile transmitter. This should bring base stations in mobile radio systems into full agreement with FCC's requirement that only the power needed to perform the communication service be used. The device will result in less co-channel interference and more effective utilization of the radio spectrum.

CALENDAR OF COMING EVENTS

- June 16-18: Second National Convention on Military Electronics, Sheraton Park Hotel, Washington, D. C.
- June 20-22: Radio & TV Service Assns. of Dela. Valley, The Claridge, Atlantic City, N. J.
- Aug. 19-22: Western Electronic Show & Convention (WESCON), Pan Pacific Auditorium, Los Angeles, Calif.
- Aug. 25-28: Rocky Mountain Parts Conference, Glenwood Springs, Colo.
- Sept. 24-25: Industrial Electronic Conference, Rockham Memorial Bldg., Detroit, Mich.
- Oct. 8-10: IRE Canadian Convention, Exhibition Park, Toronto, Can.
- Oct. 13-15: National Electronics Conference, Hotel Sherman, Chicago, Ill.
- Oct. 27-29: Radio Fall Meeting, Sheraton Hotel, Rochester, N. Y.
- Oct. 30-31: Electron Devices Meeting, Shoreham Hotel, Washington, D. C.

Hi-Fi Shows

- Sept. 19-21: Chicago. Palmer House.
- Sept. 30-Oct. 4: New York. (Institute Hi-Fi Mfrs.) N.Y. Trade Show Bldg.
- Oct. 10-12: Philadelphia. (Institute Hi-Fi Mfrs.) Benjamin Franklin Hotel.
- Oct. 17-19: Boston. Hotel Touraine.
- Oct. 24-26: Milwaukee. (Institute Hi-Fi Mfrs.) Wisconsin Hotel.

OPERATION UPTURN. G-E's receiving tube department implemented an aggressive nation-wide movement to accelerate an upswing in business. A series of seminars has been planned to speed the flow of up-to-date information on high reliability tubes and other components. The program will bring together G-E product engineers and user personnel for frank discussions of maintenance and supply problems.

RANDOM NOISE

40% OF PORTABLE TV SET OWNERS USUALLY KEEP THEM IN THE BEDROOM, REPORTS GE - HALF OF THEM FALL ASLEEP WITH THE SET ON - ALSO, 37% USE SETS IN LIVING ROOM, 9% IN DEN, 7% IN KITCHEN AND 7% IN OTHER ROOMS

LATEST REPORT FROM BRUSSELS WORLD FAIR IS THAT WOMEN WILL BE ABLE TO ALTER THEIR MEASUREMENTS IN YEAR 2000 SIMPLY BY PUSHING BUTTONS - RADIOACTIVITY AND ELECTRONICS ARE EXPECTED TO ELIMINATE REDUCING

4 in 1

FOUR-TRACK TAPES RECORDED AT 3 3/4 IPS WILL BE AVAILABLE THIS SUMMER, SAYS AMPEX. THIS WILL ALLOW TWO DUAL-STEREO TRACKS ON ONE TAPE

TOM HIGGINS JR.

Government Regulation of

Radio Devices

Radio And Industrial Gadgets And Other Radiation Devices

Cause Harmful Interference To Radio And TV Reception

FCC REGULATIONS

Part 15—Incidental Radiation
Restricted Radiation

Part 18—Radiation Control
Industrial Equipment
Heating
Ultrasonic
Medical Equipment
Diathermy
Scientific Equipment
Electronic

JULES DEITZ
TECHNICAL RESEARCH DIV.
FEDERAL COMMUNICATIONS COMMISSION

• For interference to occur, a radio gadget must:

1 Produce radiation on frequencies and within the coverage areas of licensed radio stations.

2 Operate at the same time as such stations.

3 Produce fields of such character and intensity as to produce destructive effects.

Since we would not expect to control where or when a radio gadget is to be operated, our attention must be directed to condition three if interference is to be avoided. When all three of these conditions combine simultaneously, we have a situation which is known as actual interference. Prior to the unfavorable

combination, we have a condition known as potential interference. To those who are mathematically minded, it would be correct to say that actual interference takes place when the probability of a particular interference possibility becomes 100%. Compared to the potential possibilities of interference, actual interference seldom occurs. This highly fortunate state should not be allowed to mislead you since we, nevertheless, are experiencing a considerable amount of gadget interference each year. In other words, the threat is enormous and increasing. There will be no let-up as the radio services expand and radio gadgets multiply.

It therefore follows that gadget interference control must involve regulations that will provide a decrease in the probability that interference will occur. Serious study of the matter will reveal that we come to accept this approach not by choice, but by necessity.

There is in the hands of the general public a tremendous and growing number of radio interference producing gadgets. The dictionary defines "gadget" as "a device for doing something." Although not so intended, the gadgets we are referring to are all quite capable of "doing something" highly undesirable to radio communications. It has only been through the last decade that serious attention has been given to this matter, and we are still involved with developing optimum methods for controlling the situation.

In the very early days, radio station operators had little appreciation for the need of frequency allocations. Similarly, today we are just

beginning to develop an awareness on the part of the public that those gadgets, of which they are so fond, are a threat to the enjoyment, convenience, and safety that radio communications is expected to provide.

In the popular meaning of the word, these radio gadgets are not really gadgets at all. The FCC calls them "devices" and "equipment." The majority of them are considered to be indispensable, and the only problem is how can they live with the authorized radio services.

Although real progress has been made in the past ten years, much remains to be considered. One question is—whether or not gadget interference prevention would be more effective if controls were applied directly to the manufacturer rather than to the operator of the device. This has been done to a certain extent. Manufacturers of diathermy and miscellaneous equipments may obtain type approval under Part 18 of the Rules. If a particular equipment complies with the technical requirements of the Rules, it is issued a type approval number which may be attached to identical equipment. This procedure, however, involves tests by the Commission Laboratory, and the very thought of extending it to radio gadgets in general is just about overwhelming.

A more practical approach when dealing with gadgets of lower power is the rather recent innovation in the field of receiver certification. All receivers that tune in the range 30 to 890 mc must be certificated to demonstrate compliance with the interference limits contained in Part 15 of the Commission's Rules. This re-



quirement is directed to the receiver operator, but he need not certificate his own receiver if the manufacturer does it for him. Each certificated receiver is required to have a permanently attached "distinctive" label that is readily visible by prospective customers. This approach appears to be a promising one, and it has been recently extended to Low Power Communication Devices.

Separate Regulation

Regulation-wise, it is convenient to segregate radio stations from gadgets. From a legal point of view, it can be said that the gadgets operate under a "blanket" license. To be more helpful than legal, let us say that a radio gadget is required to be operated under such limiting conditions that the Commission does not require an individual license for its use. These conditions are specified in Part 18 of the Rules Governing the Industrial, Scientific and Medical Service (ISM), and in Part 15 of the Rules Governing Incidental and Restricted Radiation Devices. Considering the large number and diverse nature of devices and equipment encompassed by these rules, individual licensing is not considered to be practical.

The Commission has organized its rules on the basis of radio "services." These Services provide for licensing of radio stations operated by users interested in various safety, industrial, entertainment and other activities. This methodical arrangement makes it possible to share and control the use of the radio spectrum with the precision that is needed to avoid chaos. Of course, there are

many interference problems created by one licensed station to another—but this type of interference is not the subject of this discussion.

Part 18 controls the radiation from industrial heating equipment, diathermy equipment, and various miscellaneous equipments. The regulations provide seven frequencies throughout the radio spectrum on which unlimited radiation is permitted. These frequencies have been established by international agreement in order to encourage the concentrated grouping of radiations from ISM equipment. Radiations on other than ISM frequencies are required to be suppressed to specific limits which are based in a compromise between the probability of interference and the practical consideration of cost. ISM devices must be either type approved or certificated. Type approval is performed by the Commission's laboratory on one of each model of diathermy and miscellaneous equipments. Miscellaneous equipments are such devices as epilators, ultrasonic machines and electronic cookers. Type approval constitutes the recognition that units identical to the prototype are capable of complying with the Commission's rules. Because of its bulk, industrial heating equipment is certified by an engineer employed by the operator to attest compliance with the Commission's technical requirements.

Other Devices

Part 15 regulates devices not covered by other parts of the Commission's Rules. These devices are separated into two groups; namely, Incidental Radiation Devices and

Restricted Radiation Devices.

Incidental Radiation Devices are those electrical devices which, although not designed to generate r-f energy, do produce such energy. Interference may be caused when this energy is radiated as in the case of electrical appliances, fluorescent lights, switches, motors, generators and automotive ignition systems. Considering the almost infinite variety of such devices and present lack of knowledge as to what limitations to apply, the Commission is presently regulating incidental radiation devices on the basis that any harmful interference they cause to radio reception must be promptly eliminated. Incidental radiation devices are numbered in the billions.

Restricted Radiation Devices, on the other hand, deliberately generate small amounts of r-f which are used for a wide variety of applications such as oscillators in receivers, carrier-current devices, test equipment and low-power communication devices. Low-power communication devices are such things as short-range walkie-talkies, phonograph oscillators and radio controllers for opening garage doors. Carrier-current systems are widely used by public utilities for communication, telemetering and control purposes. It is also used on college campuses for short range broadcasting and for distributing TV signals over community antenna systems. The Commission's technical requirements appear in the Rules in the form of operating frequency restrictions, radiation or power limits and antenna specifications. In general, the Rules require that restricted radiation de-

(Continued on page 47)

Effective Use Of

Save Time And Money By Following EIA Tolerance Standards,

How To Determine—

Ratings

Tolerance
Leakage
Peak Voltage

Stacking Arrangement

Capacitance Increase
Voltage Increase

Interaction

Between Sections
Bypassing

ABE KOSAKOWSKY
PYRAMID ELECTRIC CO.

- "What constitutes a good substitute for a filter capacitor if the exact replacement cannot be obtained?"

In order to answer this question, it is necessary to take into consideration some of the important characteristics of filter capacitors and their applications. Their ability to withstand surge currents and voltages; to stand up under sustained voltage and load conditions; to provide proper filtering action; and to avoid leakage current as much as possi-

usual temperature specifications for normal operating conditions. An-

DC Working Volts	Maximum or Surge Voltage
3	4
6	8
10	12
15	20
25	40
50	75
150	185
250	300
300	350
350	400
400	475
450	525

Table 2—In the absence of peak voltage ratings, those shown here may be assumed.

other fortunate circumstance is that filter capacitors can function properly over a very wide capacity range providing certain minimum conditions are maintained.

Tolerance

Since the larger the capacitance the better the filtering action, the main consideration is the minimum amount needed to provide the necessary filtering. Hence, it is not unusual to find capacitance tolerance ratings of -10% to +100%. Table 1 represents the manufacturing tolerance standard as set forth by the Electronic Industries Association. From this table it can be seen that a 40 μ f capacitor at 450 wvdc could read from 36 to 60 μ f and still be within acceptable limits. Capacitor manufacturers hold their limits as close to rated specifications as possible, but in view of the wide tolerance range permissible in a filter circuit, the technician has a considerable amount of leeway when re-

placing original equipment filter capacitors.

The d-c working voltage (wvdc) rating is the maximum allowable voltage for continuous operation under proper ambient temperature conditions. Another specification usually given is the maximum d-c voltage. This represents the maximum voltage the capacitor can be expected to withstand for very short periods. Line voltage surges and other voltage fluctuations due to varying load conditions should be within the capacitor's specified limits. Flexibility and tolerance for both types of voltage ratings is in one direction only, and that is up. The higher the rating the greater the safety factor, and the less chance of blowing capacitors and rectifiers. The relationship between working volts and maximum or surge voltage rating is shown in Table 2.

Leakage

Another important characteristic sometimes overlooked when checking electrolytic capacitors used in filter networks is leakage current. This can be defined as the d-c current flowing through a capacitor while operating under its full rated d-c working voltage. This should not be confused with initial current flow when voltage is first applied. New electrolytics, especially those which have not been adequately formed or aged, will pass higher than normal current for a while. Both new and old electrolytics which have not been in use for a long time may also pass excessive amounts of current. When testing for leakage current under these conditions, it is advisable to form the capacitors by first momentarily charging and then discharging them. This cycle should be repeated several times. If leakage current falls off the longer the voltage is applied to the circuit, the proper

DC Working Volts	Capacitance Tolerance
3 to 50	-10% to +250%
51 to 350	-10% to +100%
351 to 450	-10% to +50%

Table 1—Capacitance tolerance range permitted for electrolytics is based upon its wvdc.

ble, are the most important functions. In some cases it is also necessary to evaluate r-f bypass capabilities. Operating temperature conditions should also be considered; fortunately most radio and TV applications do not require any un-

Electrolytic Capacitors

Stacking, Bypassing And Performing Proper Tests.

thing to do is to wait until a steady state is reached. This may take as long as 15 minutes or more. Table 3

Capacitance μf	WVDC 3-100 ma	WVDC 101-250 ma	WVDC 251-350 ma	WVDC 351-450 ma
4	.34	.38	.4	.46
8	.38	.46	.5	.62
10	.4	.5	.55	.7
12	.42	.54	.6	.78
16	.46	.62	.7	.94
20	.5	.7	.8	1.1
30	.6	.9	1.05	1.4
40	.7	1.1	1.3	1.9
50	.8	1.3	1.55	2.3
60	.9	1.5	1.8	2.7
80	1.1	1.9	2.3	3.5
100	1.3	2.3	2.8	4.3
125	1.55	2.8	3.425	5.3
150	1.8	3.3	4.05	6.3
200	2.3	4.3	5.3	8.3
250	2.8	5.3	6.55	—
300	3.3	6.3	7.8	—

Table 3—Maximum leakage current is based upon capacitance and d-c working volts.

shows maximum leakage current limits for the more popular capacitance values in general use. According to this table the leakage current limit for a 10 μf capacitor rated at 50 wvdc is 0.4 ma. The table was worked out from the formula

$$I = KC + .3$$

where

I = leakage current in milliamperes
C = rated capacitance in microfarads
K = constant according to wvdc as follows:

WVDC	K
3-100	0.01
101-250	0.02
251-350	0.025
351-450	0.04

Many instrument and capacitor manufacturers have introduced testers, which provide a series of rapid and simple checks for locating short circuits, open circuits, intermittents, high r-f impedance, high power fac-

tor, and other characteristics of electrolytic capacitors.

In the manufacture of multi-section electrolytics, sections are produced by a series of taps from one winding; similar to the construction of a tapped transformer. The possibility of interaction between sections of a multi-section capacitor makes it advisable to replace the entire unit even though only one section has broken down. It may seem to be more economical to install a new single capacitor in place of a defective portion of a multi-section unit. It is not considered good procedure. A good general rule to follow is, a defect in one part of the capacitor is a defect in the entire unit.

A possible source of trouble which may go undetected is leakage between sections, because each individual section passed the various checks on a capacitor tester. There is a fairly simple method for checking this interaction. Fig. 1 shows a dual section capacitor connected in a typical π filter network. Check the a-c voltage at point A with a VTVM. Break the connection at point X and check the a-c voltage at point B. There should be no a-c component present at this point of the filter. If an indication is obtained the filter should be replaced.

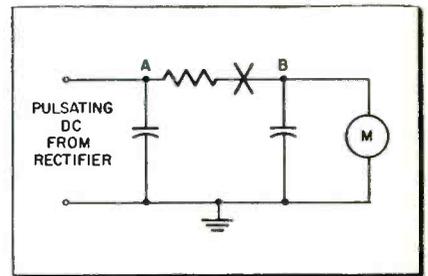


Fig. 1—A-C voltage present at point B when circuit is broken at point X is a sign of leakage between sections.

Where higher working voltages are needed, individual capacitors may be placed in series. The total wvdc is equal to the sum of the rated wvdc each unit, and the total capacitance is equal to the reciprocal of the sum of the reciprocals, or

$$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \text{etc.}$$

$$\text{or } C_T = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \text{etc.}}$$

If a filter capacitor exhibits a high r-f impedance characteristic and is able to pass the other tests, it is economical to place a small bypass capacitor in parallel with the electrolytic rather than install a replacement.

From the foregoing discussion it can readily be seen that it is important to remember the following:

1. Wherever possible an exact replacement should be used.

2. In view of the flexible requirements of filter circuits it is technically and economically feasible to be governed by EIA tolerance standards when replacing defective electrolytic capacitors.

3. It is good practice to replace the entire multi-section capacitor even though only one unit of the combination is defective. •

Stacking

Difficulty in obtaining exact replacements, or trying to make use of stock on hand may justify some simple stacking arrangements to provide the necessary capacitance or working voltage ratings. Two or more sections of a multiple unit capacitor can be tied together in parallel to obtain a higher capacitance rating. The working voltage of this configuration would be no higher than the unit having the lowest rated wvdc. The total capacitance for units connected in this manner is equal to the sum of all the units.



Radio And TV Technicians Can Service Electronic Organs

The Voices Of The Organ

JACK DARR

• Electronic pipe organs are becoming more and more common around the country. They can be found in the smallest towns, in churches, funeral homes, and even in private homes. Servicing these instruments can be very profitable. In general, they are well-built, and parts are accessible. Service work is easy.

The electronic circuitry of most organs is quite simple. However, no work should be attempted, without a full set of service information and schematics. This data is usually obtainable from the manufacturer, or from the dealer who made the original sale. Most dealers are glad to find a source of local service. Some manufacturers are a bit stuffy about providing service data on their instruments, but most will cooperate freely; in fact, one major maker says in the foreword of his instruction manual, "A qualified radio technician will have no difficulty in serv-

icing the organ." Even if the data is not obtainable, after the technician has serviced several instruments, he should be able to make out except perhaps in the most difficult cases. Tubes used are standard radio-TV types; 5U4, 6SN7, 6SL7, 12AX7, etc.

Terminology

For the man who knows only English, the terminology used in describing some of the organ's functions will sound like a foreign language; actually, English, French, German and Italian are used. The problem is to translate some of these names from "Music" into "Technicalese." The first impression of an organ is that of an apparatus which has two piano keyboards mounted piggy-back, a bunch of bed-slats on the floor, and a bunch of little white flippers above the keyboards, marked in incomprehensible terms. The keyboard is called a manual. In a two-manual organ, two keyboards are mounted one above the other. The upper one is called the Swell and the lower, the Great. The keys have the same musical arrangement as a standard piano. Above the manuals is a set

of small controls. The purpose or function of these controls is usually inscribed in the language of the musician. The controls on some organs are sliders, which slide in and out, however most organs have keys which move up or down. In the down position the controls are in the circuit; in the up position, they have no effect. These are called the stops or voices of the organ.

Stops

The stops change the sound of the organ, to suit different musical compositions. They can make it softer, louder, higher or lower in pitch, etc. Each stop has its own individual characteristic, and only a trained organist could tell exactly what each one does. The term stop dates back to the original pipe organ, which was actually a group of huge whistles, blown by a bellows. The length of these pipes determined the pitch of the tone it produced. They ranged in length from 2 to 32 feet, and the original stop was merely a lid which could be clapped over the end of the normally open tube to change its pitch. A pipe closed at the top produces a note

one octave (8 notes, or a frequency ratio of 2:1) lower than an open pipe of the same length. The stops do not change the musical note. A pipe which produces middle A, 440 cps, when stopped will produce an A, one octave lower, 220 cps.

In modern organs, the stops change the quality of the note being played, giving it different expressions, musically. An A, for instance, when played on a piano sounds quite different from the same note played on a violin or trumpet, but it is still the same note. Electronically, the timbre of the tone can be changed by inserting various LC, RC, or LCR filters into the circuit.

In most organs at least one stop must be in the circuit, if the organ is to make any sound at all. The smaller 2 and 4 foot stops, will have quite a bit less volume than the 8 and 16-foot stops. When checking for maximum volume, always have two or three of the larger stops closed.

Operating Tests

To make an operating test of the organ, set up at least one stop, preferably one of the larger ones, such as the 16' diapason, and sound each note on the keyboard, beginning at the left end. Even a musically untrained person can detect a flaw if a note is badly off-pitch. An off-pitch note may be due to a defective tube or component in one of the tone generators. In organs such as the Hammond, it is unlikely that any one note would be off pitch, as all notes are generated by the same mechanism. If one was off they would all be off.

The actual tuning of these instruments is best left to an expert tuner. It requires the use of a full set of standard tuning forks, and an expert musical ear. Fortunately, tuning is seldom required. Table 1 lists the most common stops found on commercial organs, and their general tonal effect. Even if a technician is not familiar with the various stops and their functions, he can still determine if any action is taking place. In general, each stop must have some effect upon the tone of the organ; the amount and type depending upon which stop or combination of stops are used.

Other Controls

An on-off switch is used if the organ is a full-electronic type, in which all tones are generated by oscillators. Start and run switches are used in organs like the Hammond. This instrument generates

tones by rotating small metal toothed wheels within a magnetic field. Starting the instrument calls for turning the start switch on, and holding it until the motor has come up to full speed, about five or six seconds. The start switch is released and the run switch flipped on simultaneously.

Vibrato Control

The Vibrato control switch as well as the above on-off switch, is sometimes located near the stops above the manuals. Some organs use an adjustable vibrato control and others use only a plain on-off switch. Another control, very similar in effect to the untrained ear, is Tremolo. There is a difference. Vibrato is a periodic change in the frequency or pitch. Tremolo is a change in amplitude with no change in pitch. Many different methods are employed to produce these effects, but they do sound a good deal alike. They can be easily checked. When switched

on the sound should seem to waver or flutter somewhat like a phonoturntable with a lot of wow in it.

On the floor below the manuals is the pedal keyboard. This is a duplicate of the upper keyboards but with fewer notes, and is played with the feet. Key arrangements are exactly like the lower end of the Great manual. The pedals are used mainly for the bass notes. Also down below is the gain control. It is actuated by a large flat foot-pedal, usually located in an opening in the body of the organ. Full-down position is maximum volume and all the way up is minimum. The control itself is a standard potentiometer, driven by a long rack-gear attached to the foot-pedal.

For things electronic and even mechanical in the electronic organ, the electronic technician is well qualified to undertake this kind of work, but for the final test, a qualified organist should actually play the instrument, and evaluate its tone and performance. •

Table 1—Stops or voices are ordinarily divided into three sections for a two-manual organ with foot-pedals. Pedal—controls the voicing of the foot-pedals. Great—controls the lower manual, and Swell—controls the upper manual. Stops begin at the left side of the control panel, and are ordinarily arranged in descending order.

GREAT STOPS	EFFECT	SWELL STOPS	EFFECT
Dulciana 16'	Deep, rich tone. One of the louder stops.	Bourdon 16'	Similar to Bourdon on Pedal. Deep, soft tone. (See Note 1)
Trumpet 8'	Brassy tone, to imitate a brass horn. Loud.	Dulciana 16'	Like Bourdon. Slightly sweeter tone.
Diapason 8'	Full toned, deep and sweet.	French Horn 8'	A bit more ring than Dulciana. Slightly brassy tone. Supposed to imitate horns.
Dulciana 8'	Similar to Diapason, but mellow and softer.	Vox Humana 8'	Supposed to sound like human voices in choral effects, just a bit whiny.
Flute 8'	Like Flute stop on Swell manual.	English Horn 8'	Similar to French Horn, a little higher.
Aeoline 8'	Literal translation, Windy. Softer tone, medium volume.	Melodia 8'	Close to a Dulciana stop, but higher.
Violin 4'	Soft sweet, thin stop, not much volume.	Clarinet 8'	Melodious and a little sweeter. About same pitch, but with a reedy sound.
Flute 4'	Like Flute 8', but higher pitched and softer.	Genshorn 8'	About the same as Clarinet 8', but with different tone quality; the difference between a reed and a brass instrument.
PEDAL STOPS	EFFECT	Orch. Oboe 8'	A bit more hollow and reedy than the horns; like an oboe.
Bourdon 16'	Low, soft tone, sweet.	Clarion 4'	Similar to Clarinet, higher pitch, thinner tone.
Violone 16'	A string-like tone. Soft, sweet and deep.		
Gedeckt 16'	This means blocked in German, similar to Diapason, blocked Flute.		
Diapason 8'	A full rich tone. Slightly higher than the Bourdon.		

Note 1. When using only Dulciana stop on some organs the lower left hand octave will repeat itself. In other words, when sounding one note at a time from the left end, the first seven notes will go up, then the 8th note will be the same as the first note, then go up in order from there on. This is normal for this stop, on either manual.

Note 2. Many organs have a stop marked Swell-to-Great coupler. This simply transfers the stops set up on the Swell keyboard to the Great keyboard. Thus, when the organist hits a single note on the lower keyboard, it has the same effect as if played on both keyboards at once. Each tone is a whole chord, instead of only a single tone.

Oscilloscope Waveform Distortion

How To Recognize And What To Do About Overloading, Frequency Response, Phasing And Non-Linearity Conditions

ROBERT G. MIDDLETON

• Waveform distortion can be greatly misleading if not recognized. It can cause incorrect conclusions about circuit operation, with a resultant loss of valuable bench time.

Many distorted patterns are due to simple overload conditions, which can be easily corrected. Still other forms of distortion may be due to a defect in the scope and other test equipment, or the circuit under test, which may require extensive repairs before proceeding with any further waveform analysis.

Overloading

Overloading is the easiest to detect and yet the most often recurring difficulty. An awareness of this problem can help the technician to readily remedy the situation. A knowledge of the approximate peak-to-peak voltage and normal waveform to be observed is of primary importance. If the amplitude of the signal exceeds the scopes capabilities, it will appear distorted. There is always the danger of damaging the instrument. Fortunately, most of the signals that are of interest in TV

work do not have sufficient amplitude to do any damage. However, there are over 1000 volt peak-to-peak signals present in the vertical and more than ten times that amplitude in the horizontal sections of a TV receiver. Some means of protecting the test equipment and probes must be considered when checking these circuits. Voltage dividers, either resistive or capacitive types, can be used for this purpose.

A good operating rule is to set the continuous vertical gain control in a high position, and the coarse attenuator on a low step. The low-capacity probe may be used instead of the direct probe to further reduce the signal before it reaches the scope. In most cases the probe has an attenuation factor of ten.

When clipping is suspected, the scope can be checked out by varying the vertical gain controls and observing the waveform. In normal operation, as the controls are varied, the amplitude but not the shape will also vary. Clipping action can be noted by a flattening out action.

Excessive loading of a TV set's i-f amplifiers during alignment pro-

cedures may show up as a distorted waveform, as shown in Fig. 1.

The double-peaked response curve which normally appears in this example is reduced to a single-humped display. Note that a marker cannot be displayed on the top of an overloaded curve. The clipping action wipes out the marker. In many instances the distorted curve will appear to be what might be considered a perfect response pattern. Instead

Fig. 1—Top, normal i-f response curve. Bottom, distortion due to overloading.

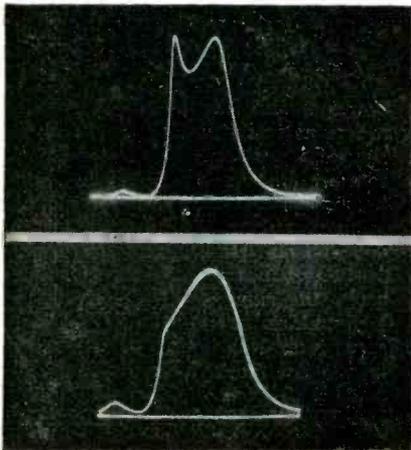


Fig. 2—Top, normal output from (R-Y) demodulator, using a rainbow signal. Bottom, same signal distorted by an overload condition.

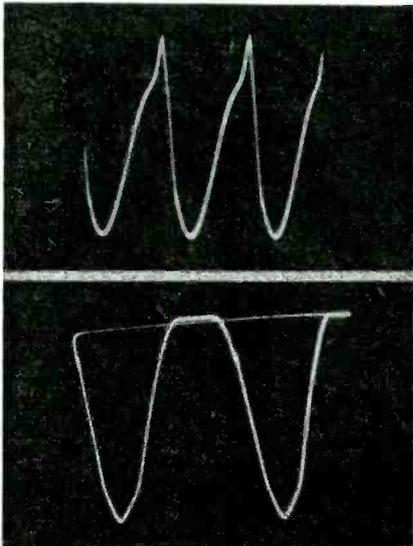
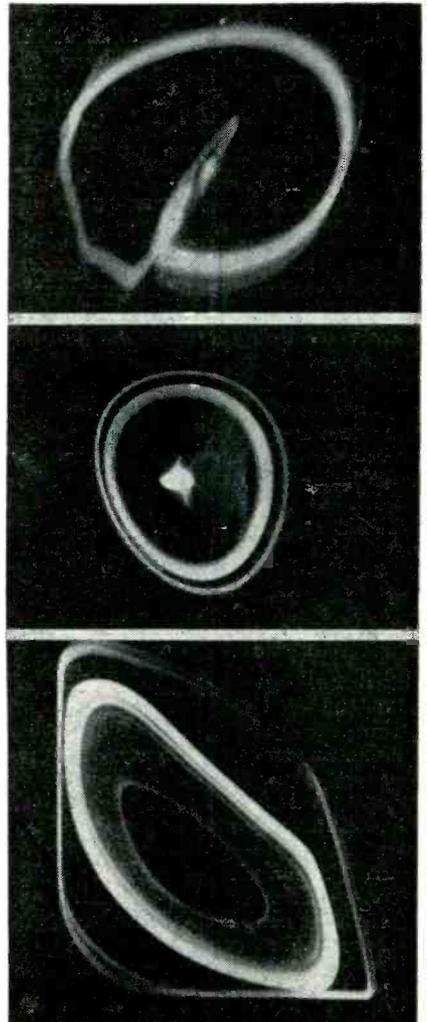


Fig. 3—Top, normal vector-scope pattern. Center, whirling pattern occurs when color sync is lost. Elliptical shape is due to quadrature misadjustment. Bottom, distortion due to overloaded chroma circuits.



of the normal double hump, an almost perfect flat top may be displayed. Too good a curve should be inspected for overloading conditions.

The remedy for i-f overload is to reduce the signal applied to the receiver, and to advance the gain of the scope, to retain satisfactory pattern height. In most cases, especially in alignment work, it is necessary to maintain the proper bias on the agc controlled stages with an external bias box.

The top of Fig. 2 shows the normal output from an (R-Y) demodulator in a color receiver, when the set is energized with a rainbow signal. The result of applying too much signal to the receiver can be seen in the lower photo. The flat top on the waveform shows that the chroma circuits are clipping the signal. The remedy is to reduce the output from the rainbow generator below the overload level. It should be noted that this type of distortion can also occur in the vertical amplifier of the scope. If mental compensation for this clipping action were employed, the tendency would be to assume that the top of the curve resembles

Fig. 4—Vertical amplifier response to 4.5 mc of three different scopes shows flat, down 50%, and no response from top to bottom respectively.

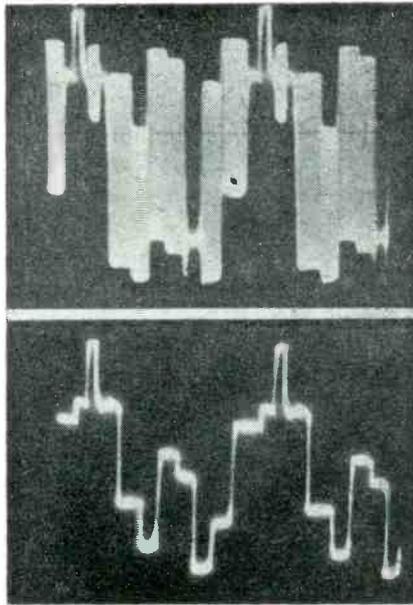
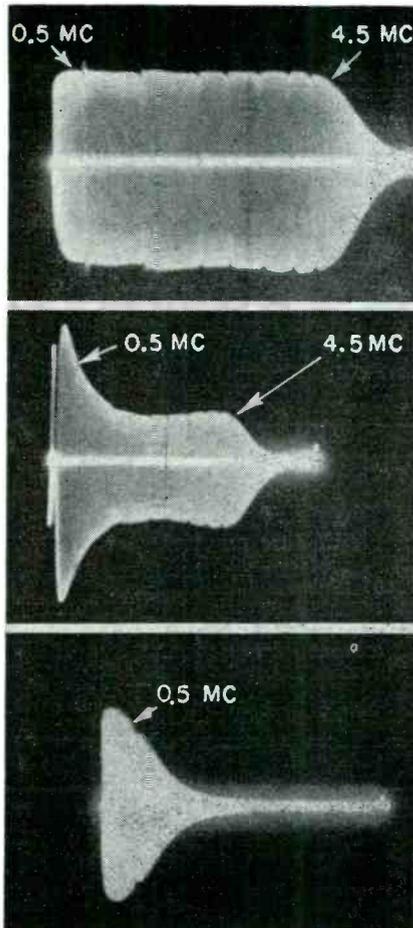


Fig. 5—Top, normal color-bar signal as seen on a wide-band scope. Bottom, the same signal displayed on a narrow-band scope shows only the Y signal. The 3.58 mc chroma signal is wiped out.

the bottom. The fallacy in this line of reasoning is obvious. Another interesting pattern obtained in color work is shown in Fig. 3.

A typical vector pattern, obtained when the outputs from the (R-Y) and (B-Y) detectors are applied to

Fig. 6—Top, normal trace and retrace pattern not in phase. Center, same pattern in phase and with good layover. Bottom, blanked retrace forms a zero-volt reference.

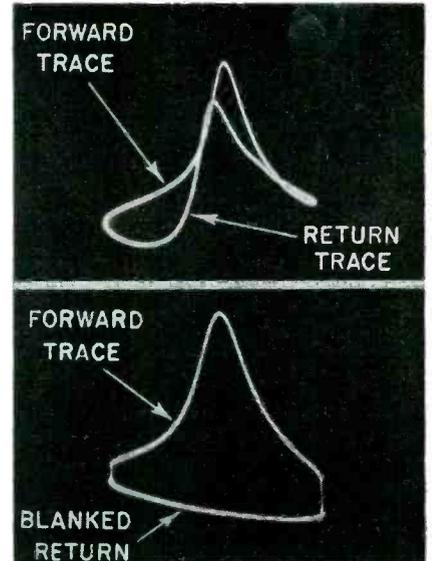
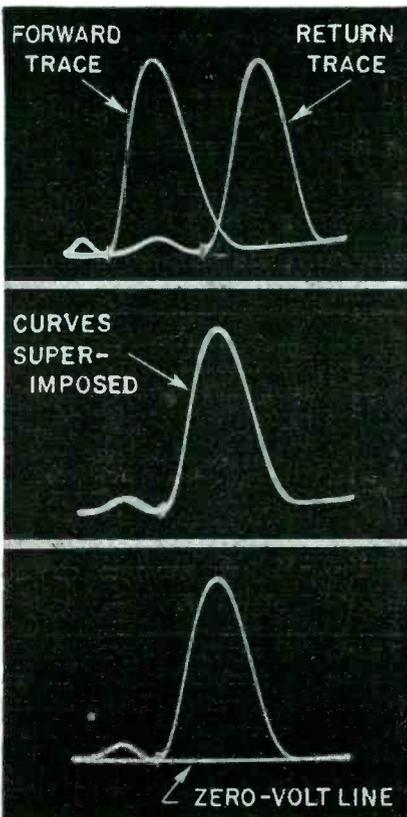
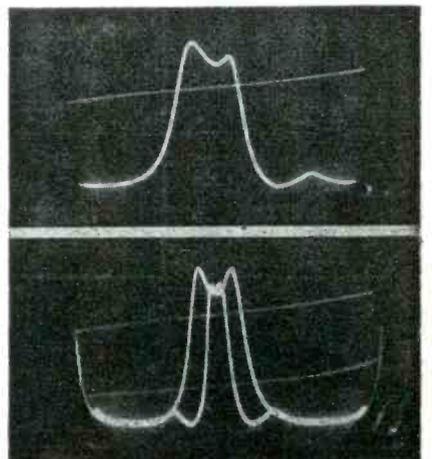


Fig. 7—Top, reactive distortion causes poor layover. Bottom, same pattern with blanking.

the vertical and horizontal inputs of a scope, is shown at the top. Loss of color sync results in the whirling pattern shown in the center photo. If the rainbow signal input is increased, the circular pattern becomes flattened and distorted, as shown in the bottom photo.

It is essential to use a scope which has an adequate frequency response for intended tests. For example, an old-style narrow-band scope will distort high-frequency waveforms as pictured in Figs. 4 and 5. The frequency response of three different scopes is shown in Fig. 4. The frequency response of the vertical amplifier in a scope which is flat, and other scopes which are down 50% (Continued on page 52)

Fig. 8—Top, response curve obtained with a 60-cycle sinewave sweep, which is the same as the swept frequency rate of the signal generator. Bottom, two waveforms superimposed on each other when the scope's horizontal sweep is driven at 120 cycles, or twice the normal generator sweep rate.



SHOP HINTS



Tips for Home and Bench Service

Soldering Aid

Need a third hand to solve the problem of holding small parts while they are being soldered? A test clip was attached to a solder spool with a small self-tapping metal screw. The hole in the clip had to be en-



Convenient clamp on solder spool holds work.

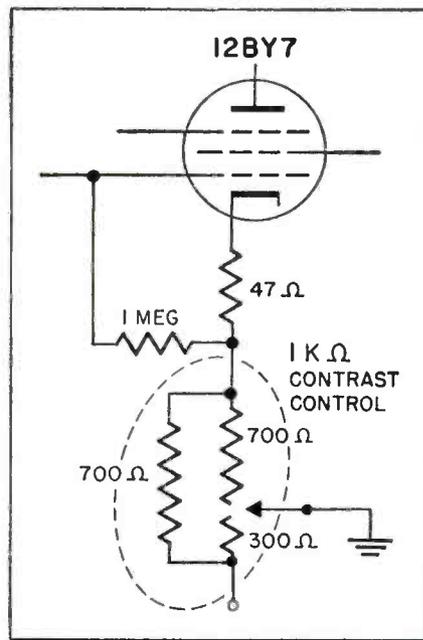
larged slightly and a small hole punched in the spool's flange to give the screw a start.

The clip may be used to hold either the work, or the end of the solder. Additional clips may be kept with the spool, to be used as clamps when the parts to be soldered cannot be brought within reach of the solder spool.—*John A. Comstock, Wellsboro, Pa.*

Shunt Control

The contrast control in the cathode circuit of the 12BY7 video amplifier had a clean break just at the point of optimum setting. No control in the tube caddy and the customer ready to pay a bonus if he won't have to miss the ball game. The break in the 1,000 ohm control was at the 300 ohm point from the cathode end. By reversing the connections I was now able to get a range of adjustment from 0 to 700 ohms which included the optimum point. Actually this was as far as I had to go, but the thought of establishing control over the remaining 300 ohms without getting a

new control was a challenging one. For what it's worth, here's how I worked it out. By connecting a 680 ohm resistor (didn't have a 700 ohm



Shunt restores control range in an emergency.

unit) across the control, the remaining range from 1,000 to 700 ohms was easily covered. If the crazy way the control works disturbs the customer, at least it works. I got the bonus too.—*Howard Newcombe, Myrtle Creek, Oregon*

Power Tuner

There are two ways to operate the power tuning units on the General Electric U2, TV chassis. Either by using the push-button on the set, or by remote control. If the remote unit operates the tuner, and the push-buttons do not, there is a break in the push-button circuit. This is usually due to poor contact between the brass cup washer and

the individual contact springs or between the cup washer and the center shaft.

Tightening the center hex screw, located behind the channel indicator window will usually provide the necessary contact. If this is not effective, disassemble the push-buttons and discard the old brass cup. Replace with two new cups placed back-to-back. One cup will fit over the spring contacts as before, and the other cup will accommodate the plastic knob retainer. Reassemble and tighten the hex screw. This procedure doubles the number of contact points from 6 to 12 thus assuring trouble-free service.—*General Electric Co., N.Y.*

Beam Aligner

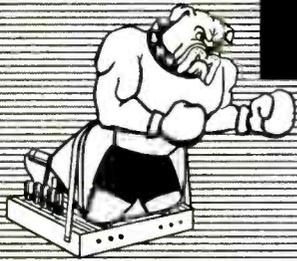
It may be noticed that on some non-ion trap tubes, another magnet, similar in appearance to the ion trap, is used. It is a beam alignment magnet and should not be confused with the ion trap. Its function is to ensure that the electron beam follows the path most conducive to highest picture quality. When replacing a non-ion trap CRT equipped with this magnet:

1. Try the new tube without the magnet.
2. If objects appear to be smeared or fuzzy, focus may be improved by using this magnet.
3. To adjust the beam magnet, place and adjust in the same manner as an ion trap. Try to eliminate smear or fuzziness especially in those areas where there is a sharp transition from black to white. RCA Victor Co., Ltd., Montreal, Canada.

SHOP HINTS WANTED!

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

"Tough Dog"

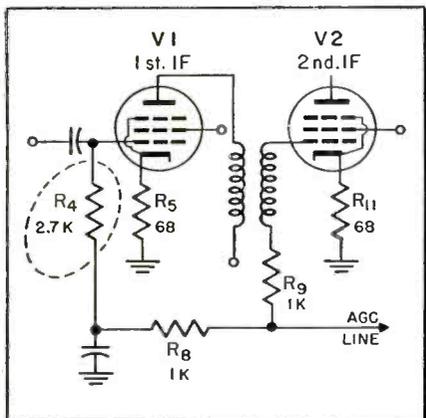


Corner

Difficult Service Jobs Described by Readers

Intermittent Grid Circuit

After 10 or 15 minutes of operation only the raster remains, the picture blanks out, and the sound becomes barely audible. As soon as a probe is attached anywhere in the i-f or video amplifier, the picture and sound reappears. I decided to attach the VTVM to the grid of the video amplifier and let the set cook. Sure enough after 15 minutes it went off. The meter which had previously read -2 volts, now read zero. Pre-



Reason for loss of sound and video was hard to find because of an intermittent resistor.

sumably the trouble was in the i-f or agc circuit. The scope's r-f probe was next connected to the 2nd i-f grid and the VTVM d-c probe to the 1st i-f grid. An hour later the set was still playing fine. After a bit of a huddle, I decided that one of the two grid circuits was intermittently opening and the probe attached to it was acting as a substitute grid leak. So I changed the procedure slightly. Another VTVM was brought into play, one VTVM was attached to each cathode in these

two i-f stages. About 15 minutes later the set cut out as usual. V1 was not conducting. No joints appeared to be bad and I knew it wasn't the tube. As a start I replaced R4, a 2,700-ohm resistor. The set has been fine since. I tortured the resistor, heated, froze, twisted and banged it and it still measured 2,700 ohms. In fact, it improved, because when I placed it back in the set to see if it would cut out again, it ran for an hour before opening up.—Bob Eldridge, Vancouver, B. C.

—This item was accepted because of its general applications, however, kindly mention make and model of set when submitting tough dogs.—Ed

Tunable Hum

After experiencing much trouble with tunable hum, I decided to investigate.

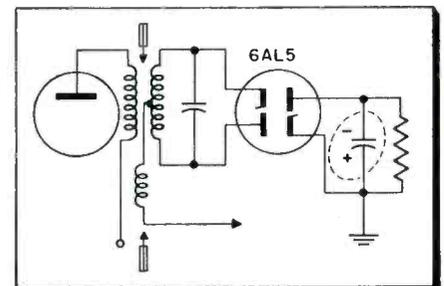
This item may or may not come under the heading of Tough Dogs, but it could very well save some technicians a headache when looking for excessive tunable hum in some of the four or five year old TV sets which use a ratio detector. I use the word "tunable" in that the hum will vary with the setting of the fine tuner but cannot be tuned out entirely.

The cause of this hum in most cases appears to be the 5 or 10 μ fd electrolytic low-voltage filter in the detector circuit. When these electrolytics dry out, their capacitance decreases and their ability to limit amplitude variations is considerably reduced. Other symptoms are very broad tuning of the ratio-detector transformer—leading in some cases to the erroneous assumption that the transformer is defective.

A check of 10 consecutive receivers, using this circuit, brought into the shop for repair shows the following results:

- 2—close to original capacity (relatively new receivers).
- 3—capacity down 10 to 25%.
- 1—completely open. No measurable capacity. Receiver 6 yrs. old.
- 4—capacity down over 25%.

A quick check for this trouble



Tunable hum may be caused by a defective electrolytic capacitor in the detector circuit.

would be to bridge a 5 or 10 μ fd. capacitor across the original one before disturbing any of the sound i-f and detector adjustment slugs. If the hum drops appreciably and the sound clears up, replace the capacitor and readjust the slugs for best alignment. A good policy to follow is to replace those capacitors when a set comes in for repair when the receiver is over 4 years old.—M. G. Goldberg, St. Paul, Minn.

TOUGH DOGS WANTED!

\$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 "Tough Dogs" Editor, ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

Small Firm Cracks Industrial Market

Case History

Technicians Can Get Into Industrial Electronics

L. GERMANY

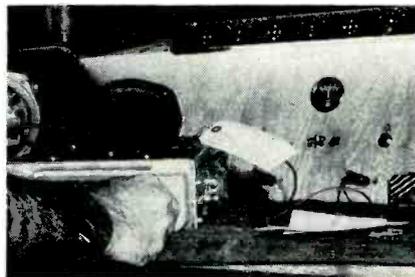
• The industrial electronics market in Houston is a hard nut to crack. In a sense this is paradoxical since Houston is known as the industrial capital of the Southwest and there should be plenty of this choice business to go around. However, most of the larger industrial plants have their own departments for the maintenance of electronics equipment. Those who don't, place their work with the larger shops.

For these two reasons, it's not exactly usual for a six-man operation such as Maxwell Radiotronics to be cutting itself such a large slice of the industrial electronics pie, but that is exactly what this enterprising firm is doing. Founded by ambitious Fred Maxwell, Jr. some 24 years ago, the firm today has several thousand industrial accounts, does all the two-way radio communications systems work for the Harris County Sheriff's Department, the Commissioner's Court and the F. B. I. in the Houston area, and has a large volume car radio repair business.

How does a shop grow from a one-man operation to a position as one of the top names in industrial electronics? It's a slow, hard climb. It's deciding that you want to get into this field from the very beginning and gradually building up your

clientele. Maxwell was always interested in industrial electronics. Of course he never turned away any TV service work either and today TV accounts for about 10 percent of the business.

A talk with long-time employee Wayne Warmack revealed what apparently is the consensus of the



One of six auto radio work benches includes; 6 and 12-volt power source, a-c outlets, built-in speaker, and overhead light fixture.

firm's thinking: "Anybody can get into the industrial electronics business without any great outlay in equipment provided he has at least the minimum test gear for TV work, and the nerve to tackle something that may find him on unfamiliar ground."

Specialties are Maxwell's meat and they have a reputation for never turning down a job. Consequently they have gone into some rather unusual fields of industrial elec-

tronics. They service electronic welding and heating equipment; moisture control units; ship radios, including ship-to-shore phones; etc. They have, as a regular customer, a weather service firm for whom facsimile equipment is kept in tip-top condition.

When the shop gets a call from a customer seeking service on some unfamiliar equipment they answer the call anyway. The task is simplified if they can find a diagram showing the tube or components layout. "Basic know-how is all you really need—most of the time," Warmack commented, "Generally it's a matter of adjusting relays or replacing tubes. But sometimes there isn't any diagram and you're working strictly in the dark. It's much harder, but even then it doesn't take too long for a well-trained technician to diagnose and correct the trouble." This points up, he believes, two basic things wrong with the average small operator who wishes for industrial accounts. "They're afraid to get their feet wet. Maybe they've had plenty of experience, but not on some of the more complex equipment. They turn it down, thinking it's safer to stick to what they are familiar with. Then there's the other small operator who doesn't have anybody in his shop with enough general electronics knowledge. This can kill chances of ever getting into the lucrative industrial electronics field."



Elmer Koenig, left, and Wayne Warmack check out a two-way radio.



Fred Maxwell Jr. owner of Maxwell's Radiotronics in Houston, Texas.

Though most of Maxwell's employees are considered specialists in a particular field of electronics work, all are also diversified technicians. "You have to be to compete with the very large firms who have whole staffs of specialists" Warmack further noted. Only experienced men are hired. One man is currently receiving on-the-job GI training. Three have FCC licenses which are necessary in order to work on the two-way radios. Maxwell has been in the business since 1917; Warmack and another employee since 1935.

Most of the business comes to us, is the way Maxwell explains it. Very little advertising is done; with the exception of a display in the classified telephone directory under TV service. Customer referral is the biggest source of new business. However many of the major accounts were landed by personal calls. This is how they obtained many of their industrial accounts, including all the two-way radio business of one of Houston's largest general contracting firms. About 75 percent of the TV service business comes in over the phone. The other 25 percent is off the street. Though located on a busy thoroughfare carrying only one-way traffic, the firm is set just far enough back from the street to allow for a driveway alongside the building. A customer can drop out of traffic, pull up to the office entrance, leave his work, and

get out again into the flow of traffic in a matter of minutes. Even two-way radios, when there isn't much wrong with them, can be checked and serviced right in the driveway.

Industrial work accounts for about 90 percent of the firm's business, but nearly half of this is car radios. This is also classified as industrial since about $\frac{3}{4}$ of it is volume work from dealers and automotive shops. There are as many as 40 cars in the shop per day. Three men are detailed to this work full time. There are two stall spaces which can accommodate two cars each. About 10 of Houston's major auto dealers are under contract. On much of this work the manufacturer sets the rate since many of the radios are still under 90-day warranty. Hourly rates on individual car radio jobs, TV and much of the electronics servicing is \$5.00 an hour. This rate is not set, but suggested by the Texas Electronics Technicians Association of which they are members. Work on the more than 150 two-way radios which the firm regularly services is also done under contract.

Maxwell keeps a \$10,000 parts inventory. He has about \$3,500 in test equipment including voltmeters, signal generators and oscilloscope. The success story in a nutshell is; regardless of the job, Maxwell will take it and do it. If they don't have the equipment, they get it. They anticipate trends, by being able to service new products, and build a

reputation in its field in hopes of getting and handling future volume demand. Their newest specialty; testing electronic headlight dimmers.

Specialized two-way radio test equipment is housed in a separate room and includes test mikes and high quality signal generators. The shop is tuned in to the sheriff's department radio at all times. TV repairs are also performed in a separate area. Six work tables for radio testing are located at various spots throughout the building. Each has its own built-in light, speaker, 110-volt outlet, and a 6 and 12 volt power source.

Industrial intercom systems add up to two or three jobs a month. House calls on TV and radio customers take up the full time of one employee. To make routine calls, deliveries, special jobs, and to handle emergencies, the firm keeps a fleet of six vehicles including, one panel truck, three station wagons and two jeeps. Most carry a few parts such as tubes and a volt-ohm meter. Being "well wheeled" is a situation which has paid off especially on major industrial jobs. Even a few minutes may often be of great significance.

The firm's eagerness to determine what lies ahead in electronics and to be ready with know-how, experience, and proper test equipment when it comes is the sort of attitude which will reap many rewards and make possible a success story. ●

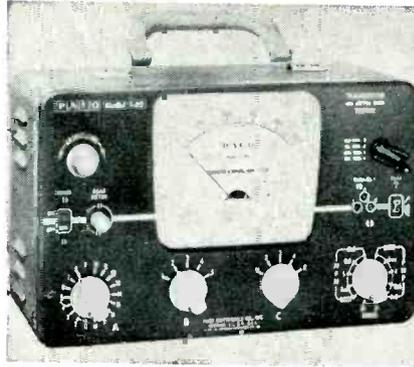
"The Technician Who Needs
New Test Equipment... Is
ALREADY PAYING FOR IT!"

Latest Test Equipment

For more information, use the convenient coupon on page 56.

Paco TRANSISTOR TESTER →

Model T-65 is a new tester designed in accordance with the recommendations of leading transistor manufacturers. Some of the features are: five ranges of direct I_{cho} readings in terms of true collector current on a wide-angle 5½", 100 μa meter; direct reading gain ranges with five separate injection currents; and leakage tests check emitter-to-collector current at fixed collector bias. Net priced at \$39.95. Paco Electronics Co., 70-31 84th St., Glendale 27, N. Y. (ELECTRONIC TECHNICIAN 6-31)



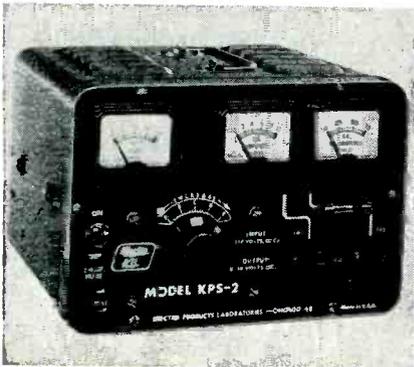
Jerrold SWEEP GENERATOR →

Two rugged, portable, wide-band sweep generators designed for the test and alignment of r-f circuits in the frequency range from 4 to 225 mc, have been introduced. Models 601 and 602 contain an all-electronic sweep circuit, of the saturable reactor type, with a continuously variable sweep range. Both models have highly effective agc circuitry for constant output. Jerrold Electronics Corp., 23rd & Chestnut Sts., Philadelphia 3, Pa. (ELECTRONIC TECHNICIAN 6-32)



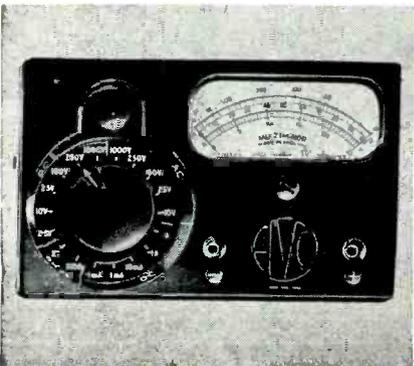
Electro POWER SUPPLY →

The dual range d-c power supply kit, model KPS-2, is a well-filtered unit designed for servicing transistor portable radios as well as the new 12-volt auto radio receivers. Each range has its own output current meter and output terminals. The 0-75 ma meter for the transistor range can detect minute variations in transistor current. The auto radio output range is 0 to 16 volts. Electro Products Laboratories, 4500 N. Ravenswood Ave., Chicago 40, Ill. (ELECTRONIC TECHNICIAN 6-33)



AVO MULTIMETER →

The Multiminor is a miniaturized multimeter featuring accuracy, versatility and ruggedness. D-C voltages from 2 mv to 1,000 v are measured in 7 ranges, at a sensitivity of 10,000 ohms-per-volt. A-C voltages from 200 mv to 1,000 v are measured in 5 ranges, at a sensitivity of 1,000 ohms-per-volt. In addition, d-c current from 2 μa to 1 amp and resistance from 5 ohms to 2 megohms can be measured. British Industries Corp., 80 Shore Rd., Port Washington, N. Y. (ELECTRONIC TECHNICIAN 6-34)



SICO NEON TESTER

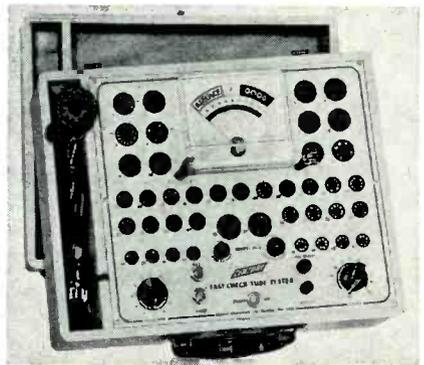
A new pocket tester can quickly check for live outlets and determine if voltage is present at fuses, sockets, switches, lines and terminals. The one piece probe is styled as a handy, easily carried automatic pen or pencil. Made of molded durable black thermoplastic, the tester has a convenient pocket carrying clip and a fully protected neon tube. Superior Instruments Co., 2435 White Plains Rd., New York 67, N. Y. (ELECTRONIC TECHNICIAN 6-37)

Franklin DIGITAL VTVM

A new portable all-electronic digital Volt-Ohmmeter, Model 400A, which is completely insensitive to tube selection, provides greater, more lasting reliability. It measures d-c volts with ±0.5% of full scale absolute accuracy; ac and ohms with ±1.0% absolute accuracy in each of 3 ranges. It measures positive or negative voltages from .01 to 1000 volts dc, a-c voltage to 1000 volts, and resistances from 10 ohms to 10 megohms. The unit measures up to 100 kc with the standard probe. Franklin Electronics Inc., Bridgeport, Pa. (ELECTRONIC TECHNICIAN 6-36)

Century TUBE TESTER

A new Fast-Check tube tester, model FC-2, requires just two settings to check for quality, inter-element shorts and leakage, gas content, and life expectancy of over 600 tube types, including the latest TV tubes, picture tubes, 0Z4's, magic-eye tubes, gas regulators



and special purpose tubes. This covers more than 99% of all tubes in use today. An important feature is that it checks each section of multi-section tubes separately and even if one section is defective, the tube will read bad. Century Electronics Co., 111 Roosevelt Ave., Mineola, N. Y. (ELECTRONIC TECHNICIAN 6-35)

Cut testing time in half— DOUBLE TUBE SALES



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Makes Money for
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**NEW
MODEL
650**

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

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

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

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

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

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

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

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



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

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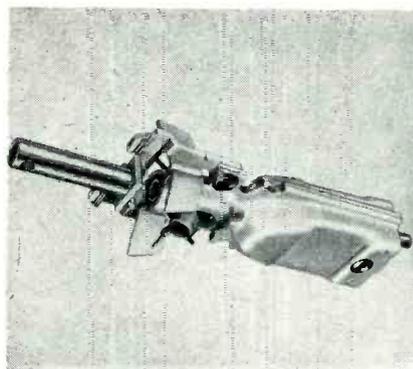
New Audio Products

For more information, use the convenient coupon on page 56.



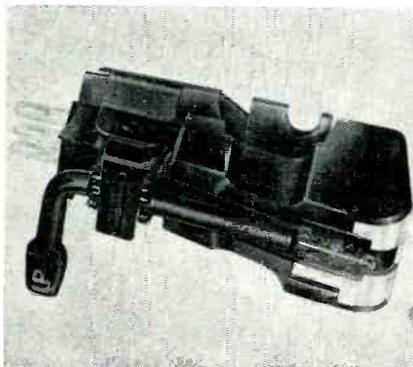
Jensen CARTRIDGES →

A comprehensive line of 32 new phonograph cartridges supplements the firm's already established line of phonograph needles and needle accessories. They are designed to replace 80% of the cartridges on the market. The cartridges feature a simplified needle changing method, built-in needle guard, and printed needle number. A shadowgraph-type outline identifies correct cartridge replacement. Jensen Industries, 7333 W. Harrison St., Forest Park, Ill. (ELECTRONIC TECHNICIAN 6-1)



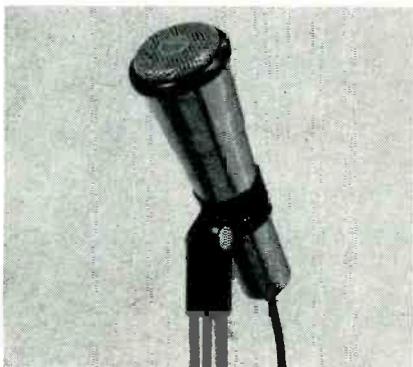
Sonotone STEREO CARTRIDGE →

The new low priced, compatible ceramic pickup will play both stereo and monaural records. The model 8T features a built-in rumble suppressor and replaceable needles. Voltage output is enough to drive the amplifiers directly without requiring the use of separate preamplifiers. The needle size for the stereo side is 7/10 mil. This will also improve the playing of present micro-groove records for which a one-mil needle is now used. Sonotone Corp., Elmsford, N. Y. (ELECTRONIC TECHNICIAN 6-2)



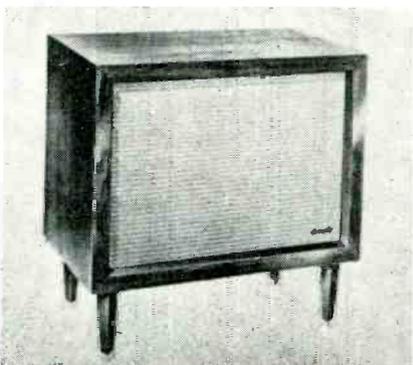
Turner MICROPHONE →

The new 200 Series is engineered to function as a hand, stand, desk or lavalier mike. This multi-use design feature allows a smaller stock of microphones. It is available as a crystal, dynamic or ceramic type. The mike is made of die-cast zinc alloy and has a satin chrome finish. Comes complete with a 12 foot cable. Specifications are Crystal, 60-10,000 cps, -53 db; Dynamic, 60-13,000 cps, -53 db; Ceramic, 60-10,000 cps, -60 db. The Turner Co., 909 17th St. N. E., Cedar Rapids, Iowa (ELECTRONIC TECHNICIAN 6-3)



University DEBONAIRE →

This compact unit operates on the phase inversion principle and comes in three different versions. Two are high quality three-element speaker systems and one, the EN-1215, a custom finished enclosure into which a wide variety of 12" or 15" speaker systems may be installed. Overall dimensions are 27 $\frac{3}{8}$ " wide, 16" deep, 25 $\frac{3}{8}$ " high (including adjustable legs). There is a choice of mahogany for \$63.00, blond or walnut for \$69.00. University Loudspeakers, Inc., 80 S. Kensico Ave., White Plains, N. Y. (ELECTRONIC TECHNICIAN 6-4)



Oxford SPEAKER KIT

A low-priced, complete rear seat speaker kit named the Satellite features a 6x9 or 5x7-inch speaker of rugged construction; chrome-plated switch plate and grill; and a 3-position slide switch. Comes complete with all hardware and will fit all cars. Oxford Components, Inc., 556 W. Monroe St., Chicago 6. Ill. (ELECTRONIC TECHNICIAN 6-6)

Astatic CARTRIDGES

New stereo, Soundflo, turnover, two-needle, plug-in cartridge series and holder-brackets are each equipped with four terminal contacts, providing for hum-free operation in ac-dc circuits. Soundflo stereo cartridges are reported to have a channel separation of 25 db and a frequency response of 20 to 15,000 cycles. Output is 0.5 volts. They fit standard pickup and record changer arms and mount on 7/16" or 1/2" centers. Astatic Corp., Conneaut, Ohio (ELECTRONIC TECHNICIAN 6-7)

Bogen INTERCOM

The new Challenger model CHS-2 is a low-priced two-station intercom system for use in the home, office and business. Features simple operation, easy installation, and durability. The master has a volume control which regulates both master and remote and a talk-listen switch. The remote has a talk-listen switch, in addition to a privacy switch. Master, remote and 45 ft. of wire is priced at \$39.95. David Bogen Co., P. O. Box 500, Paramus, N. J. (ELECTRONIC TECHNICIAN 6-8)

Audax STEREO ARMS

The 12-inch model KT-12, and the 16-inch model KT-16 stereo pickup arm in kit form, is physically, identical to its predecessor, the monaural kit. However, the stereo kit is wired to accept both stereo and monaural cartridges. Those who wish to convert their monaural arms to stereo, can do so by obtaining a conversion kit. Model KTS contains a stereo cartridge housing and stereo lead wire, a gauge tube, 2 aluminum spacers and instructions. \$4.95 net. Audax, Inc., 38-19 108th St., Corona 68, N. Y. (ELECTRONIC TECHNICIAN 6-5)

Catalogs & Bulletins

(Continued from page 22)

CAPACITORS: A 4-page bulletin contains engineering data and electrical characteristics for new types 101, 103, 106 and 107 Mylar capacitors. Pyramid Electric Co., 1445 Hudson Blvd., North Bergen, N. J. (ELECTRONIC TECHNICIAN B6-12)

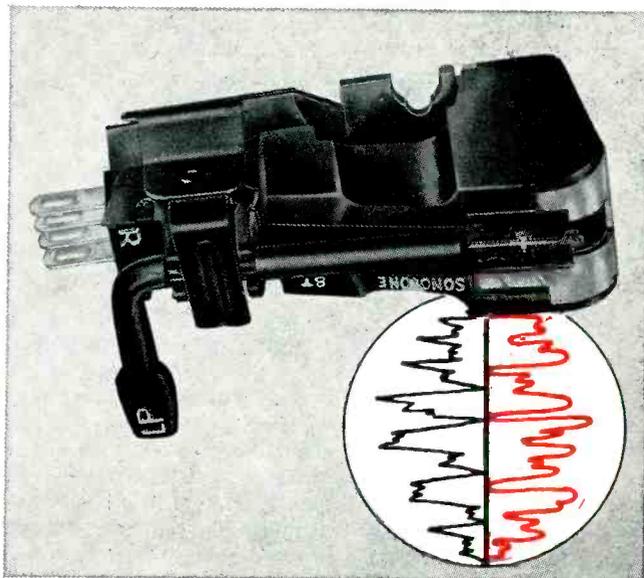
ELECTROLYTIC REPLACEMENT CAPACITORS: A new manual lists some 40 makes of automobile radios. Capacitor replacements for use in auto radios manufactured from 1946 through 1957 are cross-referenced to the original part numbers and described by rating and part designation. Prices are included. Available without charge from Sprague distributors or by sending 10¢ to Sprague Products Co., 65 Marshall St., North Adams, Mass. (ELECTRONIC TECHNICIAN B6-9)

CAPACITORS: Electrolytic motor-start and paper oil motor-run capacitors for the motor repair market, refrigeration and air conditioning service fields, as well as for OEM requirements, are covered in a new catalog. Features voltage ratings, configurations, caps and brackets, and testing and checking procedures. Ask for catalog XTR-MOT. Cornell-Dubilier Electric Corp., South Plainfield, N. J. (ELECTRONIC TECHNICIAN B6-3)

(Continued on page 58)

ANOTHER ADVANCE FROM SONOTONE

—world leader in ceramic cartridges:



STEREO MODEL 8T COMPATIBLE CERAMIC CARTRIDGE

Plays both stereo and regular discs!

- Opens the door now to the biggest equipment boom since LP!
- Plays all 4 speeds—does *not* obsolete present equipment!
- Has Sonotone's unique, built-in vertical rumble suppressor so vital to stereo use! Doesn't need pre-amp!
- Famous Sonotone quality with top specifications!

The best thing that's happened to stereo discs!

Response	Smooth from 20 to 12,000 cycles, gradual rolloff beyond.
Output Voltage	0.3 volt.
Compliance	2.0×10^6 cm/dyne.
Recommended Load	1-5 megohms.
Tracking Pressure	5-7 grams.
Cartridge Weight	7.5 grams.
Channel Isolation	20 decibels.
Stylus	Dual jewel tips, 0.7-mil microgroove and 3-mil 78 rpm.
Mounting Dimensions	Standard 7/16 to 1/2 inch centers.

Priced at only

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LIST
sapphire

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LIST
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Another
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Time-
Saver

America's newest,
most popular test
instruments

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leakage and cur-
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cludes new
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FREE LITERATURE

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1 Ultra - Linear Amplifier Kit: Schematic, photographs, specifications, and a description of the Ultra-Linear II, 60-watt high fidelity amplifier are all included in this informative folder. Construction time is approximately two hours. (1B6: Acro Products Co.)

2 Wire Dispenser Kit: A colorful Bulletin, No. 8146, describes 14 work-bench hook up wire dispenser kits. Kit number, contents, and wire specifications are listed. Photographs of a free dispenser rack show a neat arrangement for storing and dispensing hook-up wire near the work-bench. (2B6: Belden Mfg. Co.)

3 Industrial Tubes: Four new catalogs: Bulletins E-290 C,-P,-S and -T present technical data and application information for over 400 types of power tubes, and phototubes and photocells. Also tubes for mobile installations, long-life amplifiers, reliable versions of commercial types and hi-fi tubes. (3B6: CBS-Hytron)

4 Tuners: Model M-804 Royal FM tuner; L-803A Imperial FM-AM tuner; and the L-5000 A Troubadour hi-fi combination preamp, equalizer and power amplifier are pictured and described in this bulletin. Complete electrical characteristics are also included. (4B6: DeWald Div. United Scientific Labs.)

5 Power Tubes: The 1958 Quick Reference Catalog lists the complete line, prices and basic technical data. Includes klystrons, tetrodes, triodes, rectifiers, sockets and other accessories. Also included is "What's New With The Electron"—a 20-page, 2-color brochure on tube developments and specific new products. (5B6: Eitel-McCullough, Inc.)

6 Stereo Disks: "Stereo! . . . the easy way. What is it? What can it do for me?" A 16-page illustrated, interesting and easy-to-read booklet, answers many of the common questions about stereo. (6B6: Fairchild Recording Equip. Corp.)

7 TV Lead-In Wire: Colorful literature covers new Royalty 20-strand and Banner 10-strand lines. Available in 100 and 80 mil thickness, and in different colors. (7B6: Jersey Specialty Co.)

8 Indoor TV Antenna: Literature and specification sheets describe the Channel King indoor TV antenna. Using unbreakable flexible stainless steel arms, the antenna can be tuned for any channel. One knob control expands or contracts the arms from 0 to 42 inches. Available in six colors. (8B6: Marjo Technical Products Co.)

9 Stereophonic Systems: Colorful literature covers, model numbers, descriptions, specifications, cabinet finishes and list prices. Contains a free offer of ten stereo records with the purchase of certain models. The line includes records, tapes and cartridges. (9B6: Paramount Enterprises, Inc.)

10 Tape Recorders: Different stereophonic and monaural tape system components are shown in building block fashion and are described in these colorful bulletins. Illustrations and specifications are included. (10B6: Pentron Corp.)

11 Audio Amplifiers: Complete details and specifications for the completely redesigned Popular Economy and Grommes Premiere Sound lines are given in this brochure. (11B6: Precision Electronics, Inc.)

12 Auxiliary Speaker: Looks like a luxurious framed tapestry, and can be hung on the wall like a picture. Brochure illustrates six attractive scenes, and describes other technical details. (12B6: Q-Sonics, Inc.)

13 110° Yokes: Technical specifications and description of two new replacement yokes for Admiral, Packard-Bell and RCA include inductance and d-c resistance figures for both horizontal and vertical windings. Testing and troubleshooting is facilitated when these figures are known. (13B6: Ram Electronics)

14 Stereo Control Center: The Stereomaster control center is pictured in this catalog sheet. Only 7" long x 5 1/4" high x 5 1/2" deep, this unit simplifies stereo conversions, and adds flexibility to the hi-fi system. Application, description and installation information is included. (14B6: H. H. Scott Inc.)

15 Silicon Rectifiers: This new 40-page, colorful, revised handbook is crammed full of illustrations, tables, charts and information including: theory of operation; manufacturing process; characteristics; applications; precautions and other important data. This book normally sells for \$1.00. (15B6: Sarkes Tarzian, Inc.)

16 Hi Fi Accessories: A transistorized Phono-Booster for phono preamplifier and equalizer applications and a Pow-R-Check meter calibrated in watts and db are pictured and described in this two-color catalog sheet. Also included is a crossover network for separate bass and treble amplifiers. No unit is over 3 3/4" in any dimension. (16B6: Van Norman Industries)

17 Antennas: Two beautifully illustrated catalog sheets in color, describe four basic models and four attachment kits that can be combined to produce more than 30 antenna combinations. The technician can increase the gain and/or front-to-back ratio of each antenna to meet different reception requirements. (17B6: Winegard Co.)

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Delco TRANSISTOR

A high-power, high-frequency transistor, small size, model 2N553, is a PNP germanium type having many outstanding features. Among these are high voltage capability (maximum collector voltage is 80 volts), very low leakage current, and excellent high temperature characteristics. At 25°C, the collector cutoff current for a collector voltage



of 60 volts is only 2 ma maximum; at the important operating point of $V_c = 2$ volts, the collector cutoff current is 50 μ a. Even at 75°C mounting base temperature and a collector voltage of 30 volts, this transistor has a maximum collector cutoff current of only 2 ma. Delco Radio, Kokomo, Ind. (ELECTRONIC TECHNICIAN 6-54)

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Association News

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Another Sencore Time-Saver



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

- Checks 130 different tube types — more than any other "grid circuit" type checker. Includes UHF and latest type tubes.
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- Two spare preheating sockets to cut down testing time.
- Capacitor checks simplified.

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

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California

The San Francisco Television Service Guild elected the following officers: Pres., Edwin R. Hawkins; V.P., J. Jerrold Strauss; Secy., Bill Finnerty; Treas., Mrs. Gibson Bories; and Directors, Andy Cerisier, Earl Crocker, Ned Gramlich, Walt Kolbuss, Bryant McGrath, Jim Miller and Roy Norton. L. B. Gross was reappointed executive secretary.

The California State Electronics Association this week stepped into the forefront of opponents of pay TV. An unequivocal stand of opposition to all current proposals of promoters seeking to institute toll television was announced by H. "Larry" Schmitt, CSEA president, following a meeting of the board of directors in Bakersfield.

Chet Spink was appointed executive secretary of RTA of Santa Clara Valley, in addition to his duties as the association's magazine editor.

Florida

The Radio Television Service Association of the Tampa Bay Area, Clearwater, has entered into an agreement with the Radio Television Technicians Guild of Fla., Inc. to co-sponsor the Southeastern Electronic Service Convention to be held in Miami, June 5th to 8th, 1958. Sponsorship of this Convention is still open to any active organized Service Association in the Southeast United States. Subjects to be covered will be the latest advances in black-white and color TV; transistor receivers and circuit applications; stereophonic Hi-Fi, both tape and disc; communications, marine and aircraft; record changers; industrial electronics for home and industry; and special forums on small appliance repairing.

Illinois

Fifty-one associations from twenty-one states had representatives at the NATESA Spring Directors meeting at the Kentwood Arms Hotel in Springfield, Mo. 198 people registered for this one day convention of TV and electronic service people, making it the best attended Spring convention to date. George Crossland of the GE Tube Division spoke on "Customer Relations." The technical program was excellent and was well attended. Winston Starks of Winston Electronics, Inc., demonstrated four instruments for faster

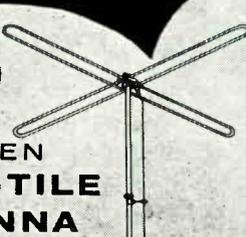
TV servicing. Norm Peterson, engineer of Kingston Electronics, demonstrated the new Kingston Absorption Analyzer and how it speeds up servicing. Many issues, such as captive service, licensing, emblems, membership extension, wholesale abuses, state association status, phony trade schools, adverse publicity and the NATESA Advertising & Publicity Program, were thoroughly discussed and plans made.

Indiana

ITTA of Indianapolis elected six new directors: Jack Mathews, Leon Howland, Marion Moody, Richard Deter, Van Briggie, Delbert Williams. Directors retained for one more year are: George Roberts, Ernest Marthin and Gib Fisher.

Television Bureau of Elkhart elected the following officers: Pres., Wayne Clem; V. P., Willis Roberts; Secy., Harry Carmien; and Treas., Dean R. Mock. Directors elected were: Wilbur Wenger, John Gray,
(Continued on page 48)

FULL RANGE
FM RECEPTION!



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GOLDEN
TURNSTILE
ANTENNA

Completely Preassembled

Non-rusting gold anodized aluminum elements snap into place. Everything is furnished; there is nothing else to buy. You get perfect reception up to 50 miles from transmitters.

COMPLETE KIT NO. A-125
(shown above) List **\$18.95**

TURNSTILE KIT NO. A-124
standard aluminum elements List **\$15.95**

FM Golden Dipole Kit
No. A-267 List **\$17.25**
Dipole Kit No. A-261
standard aluminum
elements List **\$14.95**

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*finest tv service
information
available anywhere*



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TV 23
AVAILABLE AUGUST 1st

*order today
at your
jobber*

Radiation Gadgets

(Continued from page 29)

vices be certificated in order to demonstrate that they are capable of complying with the Commission's regulations. There are millions of restricted radiation devices.

There are a few who feel that the authorized radio services must be completely protected from the likelihood of interference from radio gadgets and that cost should be no object. One school of thought prefers that radio gadgets be dealt with individually and only when they cause interference. This preference probably results from the rationale that for every radio gadget that causes interference, there are hundreds that do not. It is natural that this is often the viewpoint of the gadget operator or gadget manufacturer. It is also natural that this viewpoint is not shared by those people who become plagued by gadget interference. These harassed people have the sympathy of the radio interference reduction specialist who, in such cases, views the proverbial "an ounce of prevention is worth a pound of cure" as a gross understatement.

Consider the man-hours that are needed to pin-point the actual source of gadget interference, and add to that the cost of doing something about it. Consider, also, how many people have adjusted themselves to tolerate gadget interference, the underlying reason for this being the overwhelming task of ferreting out and dealing with each gadget individually. Even this scheme could not prevent the destructive effects that would have to be tolerated until each individual interference condition is eliminated. Nevertheless, there has been some comment that the case-by-case method is the most economical approach. Unfortunately, however, no plan has yet been devised that can reasonably be expected to make such an approach a practical success.

No radio gadget is permitted to cause harmful interference to the reception of signals from licensed radio stations. This is the FCC's "number one" requirement. A little serious thinking should make it clear that this requirement, by itself, is not enough. The reason being, of course, that there are many millions of gadgets.

That radio gadgets are here to stay is generally conceded. The conditions under which they can be permitted to operate is another matter. •

now... see what \$ **39⁹⁵** buys
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NEW dual purpose KPS-2



... powers transistor circuits,
"hybrid" and 12 volt auto radios *without hum*

Compare with any other kit and see how many more safety and time-saving features the new ELECTRO KIT KPS-2 offers you . . . and yet, it costs less than other kits.

Two output ranges: one for transistor circuits . . . one for today's 12 v. auto radios.

Milliammeter indicates minute transistor current variations.

Transistor protection provided by extra fuse.

Low ripple: up to 5 amps. 0.5%.
up to 75 MA 0.15%.

Conduction cooling: patented for long life.

Easily assembled with "step-on-step" diagrammed instruction sheets



NEW deluxe K-612T



... **only kit in the market**
to give you 10 amps. at 12 volts!

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

Powers transistor circuits, 12/6 volt "hybrid" and vacuum tube auto radios, marine radios

The new K-612T offers the same reliable, time-proven design and patented conduction cooling preferred by servicemen in the famous D-612T assembled power supply.

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Two variable DC ranges, 0-8 and 0-16 volts
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That's a lot of transistor portables that are going to be needing batteries this year . . . nearly three times as many as a year ago, and the figure is still growing.

For this skyrocketing new market, Mallory offers a complete line of transistor and portable radio batteries.

Mercury batteries, pioneered by Mallory, last longer, give steadier volume than ordinary batteries. Mallory Zinc-Carbon batteries are dependable and economical—meet all the requirements of today's modern portable radio sets, and flashlights as well.



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- Capacitors • Vibrators • Resistors • Controls • Switches • Filters
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Association News

(Continued from page 46)

Floyd Menges and LaMar Zimmerman, Jr.

RTSEA of Anderson had Bill Ashby, of Cornell-Dubilier present an interest-holding program on capacitors, and Mike Seybert furnished refreshments.

Michigan

TSA elected: Pres., Karl Heinzman; Central V.P., Charles March; North V.P., Thomas W. Taber, Jr.; Northwest V.P., Charles Judd; East V.P., Edward J. Brown; Southwest V.P., Stephen Raboczkay; Secy., Samuel J. Mooney; Treas., Mike Dallen. Standing Committee Chairman & Board Members: I. Katuah, E. Zecman, J. Keppinger and D. Fodor. Chairmen appointed by the president are: Jack Barton, Philip Fabian, Patrick Laforet, and Harold Chase.

Missouri

The TESA-Mo. meeting held in Columbia, at the Daniel Boone Hotel was a highly profitable day. After an excellent lunch, Andy Pozdel of CBS tube division addressed the group on transistors; Dave Doss, of Doss Electronics Research, Inc., of Kansas City gave an interesting discussion of equipment design, and Wayne Lemons of Buffalo addressed the group on flat-rate time billing. Charts were furnished to all in attendance.

TESA-Central Missouri Organized. A group of TV service shop owners, spearheaded by Jefferson City, have been authorized to use the registered name, Television Electronics Service Association. They are to incorporate as a non-profit organization and will make the eleventh local association in Missouri to affiliate with NATESA. Officers are: Pres., Vernon Towner; V.P., Al Idle; Secy. and Treas., John Reinsch. TESA-Central Missouri will cover the seven counties around Jefferson City and additional officers and directors will be elected at the next meeting to represent other towns in the area.

New York

ARTSNY's compilation of suggested minimum labor charges for TV repairs now appears on each shop repair bill. These bills are set up in pad form. A medical specialist

In Canada, Mallory Battery Company of Canada Limited, Toronto 4, Ontario

service benefit is now in effect and is available to all members at no extra cost.

RTG's of Long Island, Bob Larsen reports in the Guild News that the TV service industry on Long Island has been shocked by recent developments in the city of Long Beach, with its License Ordinance. Suspensions, which are in effect revocations, have been meted out to three service dealers. A suspension is understandable. However, if the suspension is allowed to remain in effect for an indefinite period, and results in putting a man out of business, it an abuse of the law. The Ordinance provides for a TV board to administer the Law, and consists of five members eligible to vote. Three of these members must be in the TV business. How would you like to have three of your competitors in your town on a board of this type? It would appear that State Licensing would be preferable. A state license would also eliminate the possibility of conflicting and confusing laws in neighboring communities.

Texas

SARTA to become TEA of San Antonio, thereby tying in directly with Texas Electronics Association. The same emblem will be used statewide, with each member city identified within its own emblem. At the regular quarterly meeting of TEA in Austin, it was decided to hold off working on a Licensing Law. Houston was 100% against it at this time, along with several other cities. The local association is still of the opinion that a good, workable Licensing Law, tailored to the needs of the industry in Texas, is needed. The 6th Annual Clinic and Fair, sponsored by the TEA in Dallas, will be held at the Statler-Hilton Hotel on August 1-3.



"That's the story of my life, Doc,—but like I was trying to tell you, I just came to fix your TV set."



Buy Mallory "Gems" in the new self-service Five-Pack

Mallory "Gem" capacitors now come in a convenient Five-Pack which has a sliding transparent cover that lets you remove exactly the number of capacitors you need, slides back in place to keep your spare "Gems" dust-free, with lead wires undamaged. You always know exactly how many capacitors of what values you have on hand. You can hang the "Gem" Five-Pack over your work bench within easy reach . . . ready for use.

Mallory "Gems" give you extra-cost features without premium price: • *Locked-in leads* can't loosen or open when pulled, even under soldering iron heat. • *"True center"* construction prevents premature failure. • *Moisture-proof* case of a high grade mica-filled bakelite gives real protection against humidity.

Use Mallory "Gems" for every by-pass, filter or buffer application. Get them today from your Mallory distributor.

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MAKERS
SPECIFY
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HIGH
IN PERFORMANCE

BLUE CHIP
QUALITY



TUNG-SOL[®]

Magic Mirror Aluminized
PICTURE TUBES

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

Automatic Machine for Sorting Letter Mail

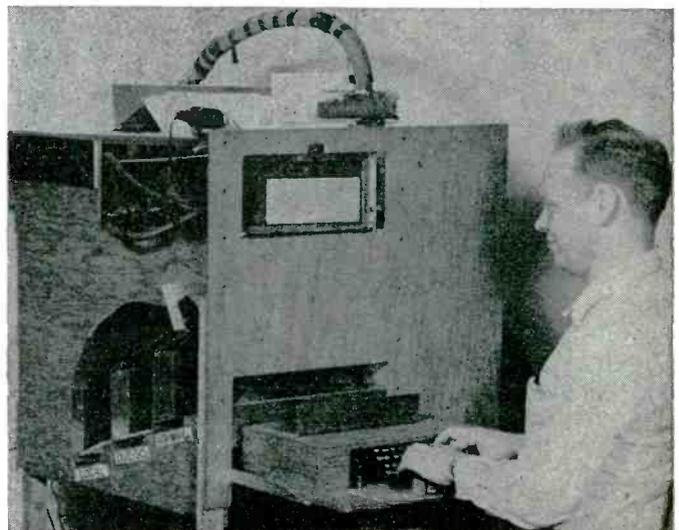
• A laboratory prototype machine for the automatic high-speed sorting of letter mail has been developed by the Rabinow Engineering Co. under a contract arranged and supervised by the National Bureau of Standards for the Post Office Department. The machine is designed to sort at the rate of 36,000 letters per hour into as many categories as may be needed. Sorting can be directed either by a built-in electronic control, by human operators, or by a combination of both. The system is of modular design and thus adaptable to the varying needs of different post offices, with regard to both sorting complexity and spatial requirements. The machine has proved successful in laboratory tests, and the Post Office Department has recently let a contract for the construction of a 1000-pocket production prototype to be used in a post office.

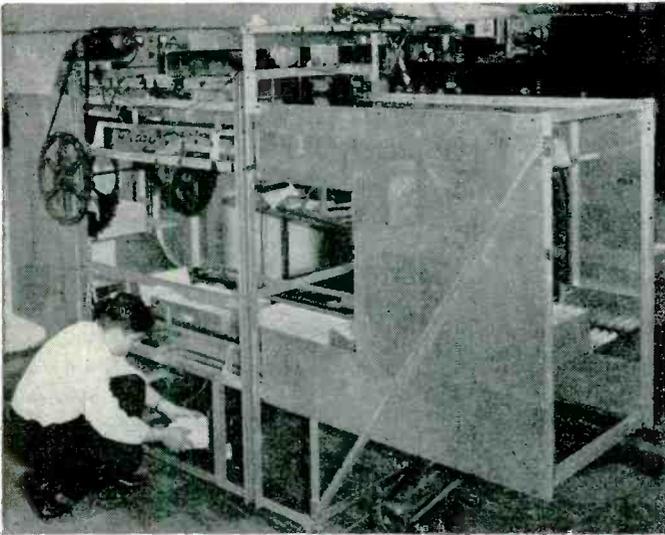
Two basic problems are involved in mechanized letter sorting. One is concerned with the information content of the address and with the mechanics of the control that must be provided by some computer-like device for directing the mail sort. The other problem is concerned with the physical handling of the mail. Today's envelopes and their contents are obviously not designed for mass handling by machine. This fact complicated the design of the present machine. If eventually standardized envelopes and addresses could be made acceptable for wide scale use the task of the machines would be much easier and the cost reduced.

The sorting machine consists essentially of a large number of pockets on an endless conveyor and electromechanical equipment that controls the dropping of a letter from a pocket into a specific fixed receptacle.

The mechanical sorting and coding of letter mail begins at the code printer. Here letters from a stack of "faced" mail, moved by a conveyor belt, are picked off one at a time and mechanically placed in a reading-and-coding position in front of an operator. He reads the addresses, abbreviates their important parts, and types these abbreviations.

Code printer uses binary form, which appears on the backs of the envelopes as a dot or no-dot, to indicate addresses.





Automatic letter mail sorting machine consists of a large number of pockets on an endless conveyor and electro-mechanical equipment that controls the dropping of a letter into a specified fixed receptacle.

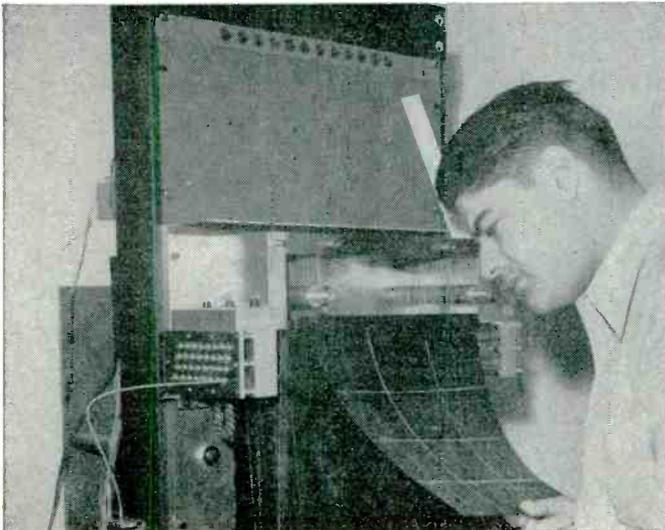
viations on the back of the envelope by means of a special printer.

The operator then chooses, by push-button operation, one of four possible destinations—local, outgoing, airmail, or miscellaneous—and sends the coded letter through its first sort. It is expected that only a few seconds will be required to code an average letter. This operation may ultimately become the only human one in the entire sorting process.

In a less complex version of the machine, letter sorting is controlled by human operators instead of the equipment. The sorting conveyor can be built in small modules so that machines of various sizes can be constructed to suit the particular size of the post office or of the sorting system used. Considerable effort was spent to design the machinery in such a way that the “facing” of the letters will be preserved, that is, that the addresses on the envelopes will still face in the same direction after being sorted. Thus, refacing will not be necessary for any subsequent processing.

The Bureau is making studies to find systems of sorting mail which will be economical both in cost of machinery and in the effective employment of operating personnel. •

The electro-mechanical-optical directory converts a 64-bit code to a 12-bit code corresponding to appropriate receptacles.



LEADING
INDEPENDENT
SERVICE
DEALERS
CHOOSE
TUNG-SOL

LOW
IN CALLBACKS



BLUE CHIP
QUALITY

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RECEIVING TUBES

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

***EXPERIENCE
SINCE 1894**

**Built into
American Beauty
ELECTRIC SOLDERING IRONS**

***EXPERIENCE: "Knowledge,
Skill, Or Technique Resulting From Experience."**

Since 1894 we have been designing, manufacturing and constantly improving our electric soldering irons! Today, no matter what the requirements, there's an American Beauty in the right model, correct tip size and proper watt input to do any soldering job quickly, properly, efficiently.



TEMPERATURE REGULATING STAND

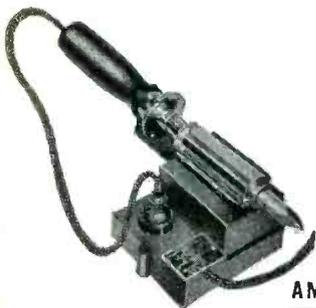
An automatic device for controlling tip temperature while iron is at rest. Prevents overheating of iron and eliminates frequent retinning of tip, while at same time maintaining it at any temperature that may be desirable or necessary.

Write for 16-page illustrated catalog containing full information on our complete line of electric soldering irons—including their use and care.

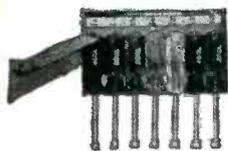
AMERICAN ELECTRICAL HEATER COMPANY

172-G

DETROIT 2, MICHIGAN



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XCELITE Tools are
the Finest!*



... Superbly made and designed for Radio, T.V. and Electronic Technicians. **See your Distributor** ... only one quality ... the finest—whether you choose individual items or the handy kits ...

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XCELITE, INCORPORATED
ORCHARD PARK, NEW YORK
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XCELITE
Quality Hand Tools
PREFERRED BY THE EXPERTS

Waveform Distortion

(Continued from page 35)

(-6db) and practically nil at 4.5 are shown in the photos from top to bottom respectively.

The waveform of a color-bar pattern on a scope with flat response through the color-burst frequency (3.58 mc) appears as shown at the top of Fig. 5. On the other hand, the same waveform observed on the screen of a narrow-band scope appears as shown in the lower photo. The high-frequency portion of the chroma waveform is completely wiped out.

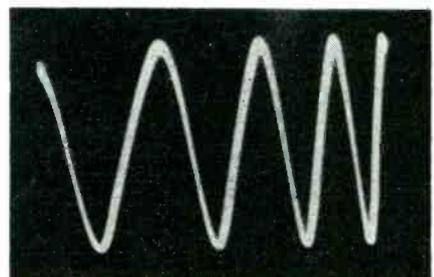
Phasing

In visual-alignment tests, the horizontal amplifier is customarily energized with a phased 60-cycle sine-wave voltage which causes both trace and a retrace to be equally visible. Trace and retrace should lay over each other when the phase control is properly adjusted. If blanking is provided, the return trace can then be blanked out. The retrace line thus formed, conveniently becomes a zero-volt reference line as shown in Fig. 6.

It is sometimes found that trace and retrace do not lay over properly, as shown in Fig. 7. This is commonly caused by reactive distortion, or by the presence of 60-cycle hum. Reactive distortion is caused, in many cases, by using too large a capacitor across the scope input terminals to sharpen the marker.

Scopes equipped with a 120-cycle sinewave sweep as well as 60-cycle can cause a peculiar pattern which may look like a phasing problem. Fig. 8 shows an i-f response curve obtained with each of the two horizontal sweep frequencies. The top photo shows the correct waveform. Since most sweep generators use the 60-cycle a-c line as a standard sweep rate, it is possible to use the scope's internal 60 cycle sine-sweep function, which is also taken from the a-c line, and still maintain sync.

Fig. 9—Non-linear sweep caused by a defect in the scope's horizontal amplifier.



Unless these sweep rates are identical, problems of sync and distortion would manifest themselves. One sure way to avoid trouble is to drive the scope's horizontal deflection circuit with a sample of the generator's own sweep voltage. The lower photo of Fig. 8 shows a double pattern when the scope's horizontal circuits are operating at twice the speed of the generator's swept rate.

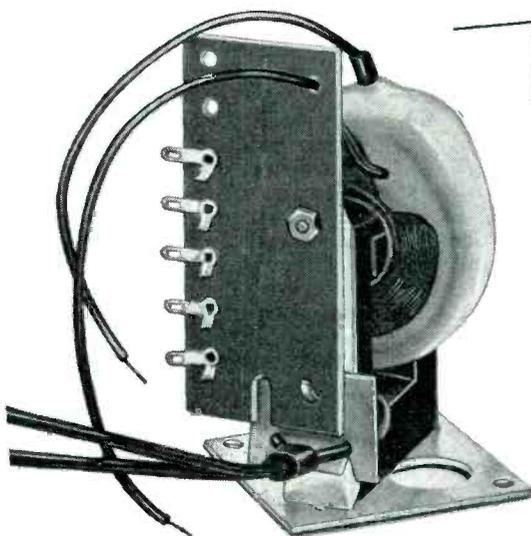
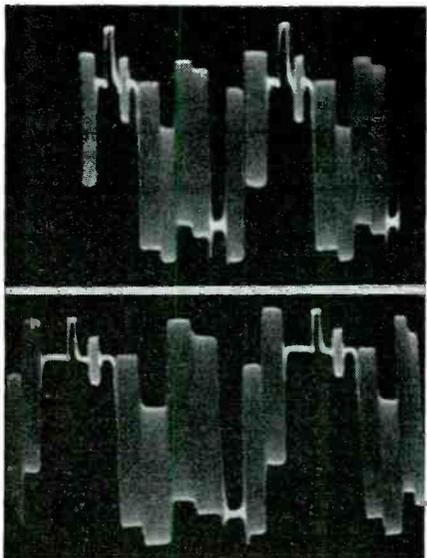
Non-Linearity

Most scopes are quite linear. However, a bad tube or component in the amplifier or sawtooth generator circuits can cause non-linear deflection. A horizontal defect can cause a sine-wave display to appear cramped at one end as shown in Fig. 9.

Distortion caused by non-linear deflection in the vertical circuits is shown in Fig. 10. The waveform becomes compressed at the top, or bottom, or both, as the vertical-gain control is advanced to obtain full-screen deflection. This resembles overloading; actually, the applied signal is not excessive in this case; but, a defect in the vertical amplifier limits its ability to handle even a normal signal. Notice how the horizontal sync pulse is compressed in the lower photo.

It may be thought that such distortions would rarely cause trouble. Field experience shows that these difficulties are quite common. The important consideration is that the technician become familiar with the basic types of waveform distortion, so that they can be easily recognized and quickly eliminated. •

Fig. 10—Top, normal pattern. Bottom, non-linear vertical deflection causes the same pattern to suffer from compression. Notice the clipped horizontal sync pulse.



here is **PROOF!**

This table of STANCOR'S exact replacement flyback coverage is based on an actual count of the models listed in the latest STANCOR TV Replacement Guide. Only exact replacement flybacks are listed. These percentages do not include flybacks that require chassis or circuit alteration. Actually, true coverage is even higher than these figures indicate since STANCOR covers all of the most heavily produced models.

Manufacturer	Stancor EXACT Repl. Flybacks	COVERAGE
Admiral	9	83%
Airline	11	81%
General Electric	14	95%
Olympic	4	83%
Philco	12	90%
RCA	11	91%
Silvertone	11	74%
Zenith	14	97%



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BASIC TELEVISION

by Dr. Alexander Shure, Ph.D.

Editors of leading electronic magazines, service technician publications and industrial magazines—the experts—unanimously acclaim Basic Television, new five volume "picture-book" training course as the easiest possible way of learning all about black and white television.

Electronic Technician, April 1958

"One picture is worth 10,000 words," so you can imagine the information contained in the more than 700 figures included here. Each of these drawings is illustrated in the manner which makes the most difficult concept readily understandable. Text is very clear... If you are a relative newcomer to TV, this work will be a most valuable "Bible"; if you are an old pro, you will be surprised at how much you can learn."

Radio Television News, May 1958

"For those who have thought about studying television but have been intimidated by the complexity of the average engineering text, this easy-to-take introduction to the subject should be encouraging... There is no reason why the student with an elementary radio and electronics background couldn't use this 'course' as a springboard to a career as a service technician in the television field."

Telephony, April 1958

"This is undoubtedly the most understandable presentation of the basic theory, operation and circuitry of black and white television ever published. Everything from the transmitter to the picture on the screen is explained with utmost clarity in words as well as illustrations that 'visualize' each concept discussed."

Signal, April 1958

"Only a knowledge of basic electronics and radio is presupposed. The coverage, ranging from the creation of the TV image in the studio to its appearance on the receiver screen, contains many topics absent in the more traditional text."

Navy News, April 1958

"Here is an excellent encyclopedia of television from A to Z... this is, indeed, the most complete work of its kind... suitable for the beginner as well as the advanced technician, and anyone interested in TV."

If you want to learn all about black and white television, quickly, easily and economically, this 5 volume "picture-book" course BASIC TELEVISION is the answer. Now available at your local bookstore or electronic parts distributor. If your dealer does not have this book, order direct.

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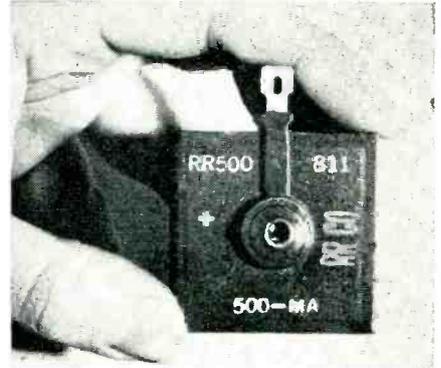
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City.....Zone.....State.....

New Components

RR SELENIUM →

A new line of all purpose, high density selenium rectifiers is now being offered exclusively to the radio and TV set replacement market. The RR500, shown is a 500 ma unit with 1.6" square cells. The six types in the new line which can replace any half-wave rectifier now in use in radio and TV sets, are rated at 130 v ac up to 650 ma, except for RR659, which is a 650 ma, 195 v unit. Radio Receptor Co., 240 Wythe Ave., Brooklyn, N. Y. (ELECTRONIC TECHNICIAN 6-21)



Int'l Rect. DIODES →

Miniaturized, hermetically sealed silicon power diodes, developed specifically for applications where savings in space and weight are prime considerations, are now available. They provide d-c forward currents up to 45 amperes with a maximum peak inverse voltage to 500 volts. These units are designed for use at high temperatures up to a junction temperature of 200° C. International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif. (ELECTRONIC TECHNICIAN 6-22)



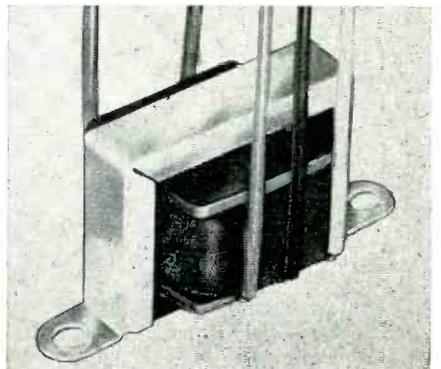
GC TUBE SAVER →

Electronic tubes in radios, TV's, movie projectors, Hi-Fi sets and other electronic appliances last three times longer with the aid of a new Wuerth Tube Saver. When connected to the set, it reduces the sudden flow of current to tube filaments. A resistor in the new unit warms slowly, then actuates a heat-sensitive contact that cuts the resistor out of the circuit. It is easy to install, simply plug it in between the outlet and the set. G-C Electronics Mfg. Co., 400 S. Wyman St., Rockford, Ill. (ELECTRONICS TECHNICIAN 6-23)



Stancor TRANSFORMERS →

Three new transistor transformers TA-15, TA-16 and TA-17 have been added to the line. TA-15 is an input transformer for matching low impedance microphones to a 2N156 or equivalent transistor. TA-16 is a driver transformer for single 2N156 or push-pull 2N278 transistors in class B operation. TA-17 is a modulation transformer for matching push-pull 2N278's class B to class C loads. Chicago Standard Transformer Corp., 3501 Addison St., Chicago 18, Ill. (ELECTRONIC TECHNICIAN 6-24)



Waldom TERMINALS

A new line of insulated and non-insulated solderless terminals are designed to save time and money. These new connectors make uniform, permanent connections in a fraction of the time required by soldering. Available in a wide range of styles and sizes for every wiring requirement. Waldom Electronics Inc., 4625 W. 53rd St., Chicago 32, Ill. (ELECTRONIC TECHNICIAN 6-26)

Philco TRANSFORMERS

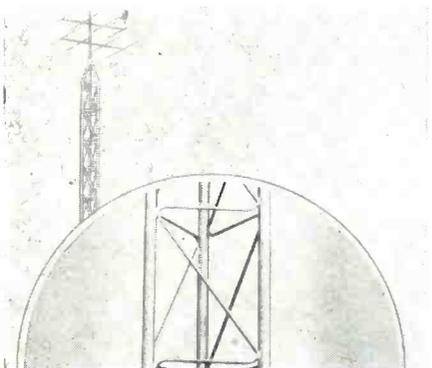
Items in the new line include video I-F coils and transformers, sound I-F transformers, sound detectors and discriminators, video-peaking coils, horizontal oscillators, radio I-F transformers and antenna matching coils. Also announced is a new universal audio output transformer line. Philco Corp., Accessory Div., "C" & Westmoreland Sts., Philadelphia 34, Pa. (ELECTRONIC TECHNICIAN 6-27)

Motorola TRANSISTOR

A new germanium high voltage power transistor, Model 2N618, has maximum ratings of collector-to-base voltage of 80 volts, and collector current of 3 amps. Collector dissipation at 25°C mounting base temperature is 45 watts. Collector dissipation at 80°C mounting base temperature is 10 watts. The grounded emitter current gain is specified as a minimum of 60 and a maximum of 140 at 25°C mounting base temperature. Motorola Inc., 4545 W. Augusta Blvd., Chicago 51, Ill. (ELECTRONIC TECHNICIAN 6-28)

Rohn TOWER

The No. 25 is a new general-purpose communication and heavy-duty TV tower. It features a 12½" equilateral triangular design, utilizing special 1¼" extra-heavy-gauge tubing for side rails and zig-zag solid steel cross-bracing. High-quality steel combines with



unique design and unequalled construction to give an extremely sturdy tower. It is self-supporting up to 50' heights, or can be guyed up to 150'. Towers are available in either hot-dipped galvanized or enamel finish. Rohn Mfg. Co., 116 Limestone, Bellevue, Peoria, Ill. (ELECTRONIC TECHNICIAN 6-51)

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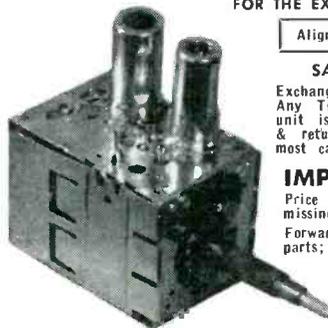
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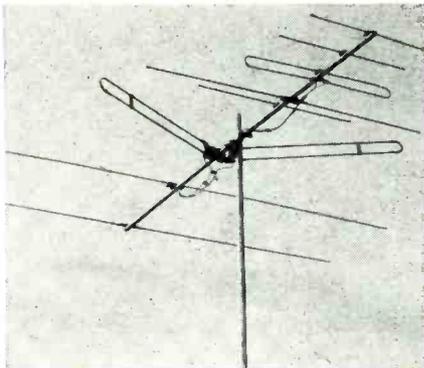
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New Products for Technicians

Channel Master ANTENNA →

The Color Prince, model No. 353A, is an all-channel VHF antenna designed for intermediate signal areas. It is similar in operation and performance to conical yagis, except that a T-W type controlled impedance dipole is used in place of the conical elements for greater gain. Three of the elements are driven. The elements snap into place without the need for tools or tightening. It can be stacked by using a connecting rod. Channel Master Corp., Ellenville, N. Y. (ELECTRONIC TECHNICIAN 6-11)



Ward ANTENNA →

The Super "8" auto antenna, model TCF-4 incorporates the famous "8-ball" mount which enables adjustments and positioning up to 35°. The new antenna is triple chrome plated and has 4 telescoping sections. It extends to 57". It is designed for easy, one-man installation from the outside. Comes complete with a 54" Elektran lead cable. This extra heavy premium antenna is available at regular price. Ward Products Corp., 1148 Euclid Ave., Cleveland 15, Ohio (ELECTRONIC TECHNICIAN 6-12)



Luxo WORK LAMP →

The Crown Lite resembles the model L-1. However, it is simpler in construction details and lower in price. A combination of springs and friction balance are used. It will move to any position and stay put. It can cover a wide work area with good comfortable light. It can be moved out of the way when not needed or easily reinstalled on other benches. It is well suited for TV and radio assembly and repair work. Luxo Lamp Corp., 102 Columbus Ave., Tuckahoe, N. Y. (ELECTRONIC TECHNICIAN 6-13)



JSC 300-OHM WIRE

The new Royalty line is available in 100 or 80 mil thickness, with 20 strands of copper on each side for a total of 40 strands. The new Banner line is a 10 strand wire in standard width, available in 100 or 80 mil. No extra charge for colors. Jersey Specialty Co., Burgess Place, Mountain View, N. J. (ELECTRONIC TECHNICIAN 6-16)

Walsco PUNCHES

New punches for cutting holes require 50% less effort to use. A new process of electro-coating the steel of the punch reduces friction and thus lowers the torque necessary to cut through metal. The new line, known as "L.T." (Low Torque) covers all the standard sizes for round, square, key and "D" chassis holes. Walsco Electronics Mfg. Co., 100 W. Green St., Rockford, Ill. (ELECTRONIC TECHNICIAN 6-17)

Ungar SOLDERING PISTOL

This innovation in soldering irons has a comfortable hand fitted grip. It is light weight and balanced for fatigue-free soldering. The cool grip and easy handling makes the soldering pistol good for industry, service and research. Comes equipped with a long lasting 2½" Tellurium copper chisel tip. Adjustment knob permits 180° tip rotation. Interchangeable components can be fitted into this new tool. List price \$4.50. Ungar Electric Tools, Inc., 4141 Redwood Ave., Los Angeles 66, Calif. (ELECTRONIC TECHNICIAN 6-15)

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Philco ANTENNA

A new fast lock conical antenna, model 262F2, is a "full dimensioned" conical type, featuring: six aluminum driven elements, 48" long x 3/8" in diameter with 4" wood dowels; aluminum retaining springs; aluminum "butterfly" plates; durable laminated insulator; completely preassembled snap-out reflector; two aluminum elements 54" long x 3/8" in diameter; seamless aluminum cross arm; serrated U-bolt; and full gain on all VHF channels. Philco Corp., Accessory Div., "C" & Westmoreland Sts., Philadelphia 34, Pa. (ELECTRONIC TECHNICIAN 6-14)

Kaar RADIOTELEPHONE

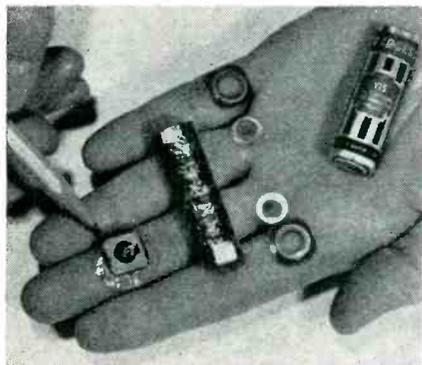
A 15-pound, weather-tight marine radiotelephone designed especially for use on outboard motor cruisers and runabouts where space is precious, is a 20-watt, 5-channel unit provided with a tunable broadcast band. The transmitter is equipped with a speech clipper and filter. The receiver has a series impulse type, automatic disabling noise silencer. Frequency range is 2 to 4.5 mc. The



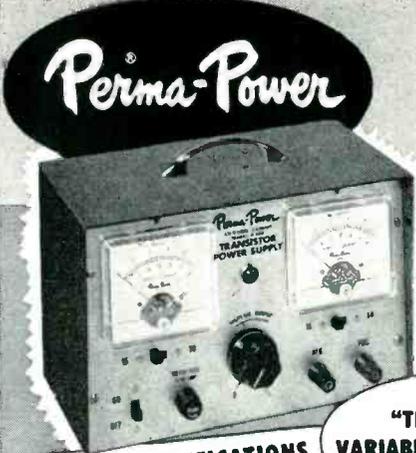
model 249 may be mounted against the bulkhead, behind the cockpit or under the dash. It is equipped with a transistorized power supply and operates from a 12-volt d-c source. The receiver draws only 2½ amperes, and when transmitting the total current drain is only 9 amperes. Kaar Engineering Corp., 2995 Middlefield Rd., Palo Alto, Calif. (ELECTRONIC TECHNICIAN 6-52)

Burgess DRY CELL

Tiny size of the new wafer cell and simple construction are features of this high-powered dry battery. The cell itself, smaller than a fingertip yet a third more powerful than conventional flat cells, is made entirely by machine and is sealed in an airtight pliofilm envelope. Merely stacking 15 such cells in a col-



umn wrapped tightly with transparent plastic and capping it in a leakproof tube of drawn aluminum produces this 22½ volt battery for pocket radios, hearing aids, geiger counters, and other small electronic, test and laboratory devices. Burgess Battery Co., Freeport, Ill. (ELECTRONIC TECHNICIAN 6-41)



Perma-Power

TRANSISTOR POWER SUPPLY

MODEL A-400

Especially designed to operate, service and test transistor portable radios and low power transistor circuits.

Highest quality components combined with careful engineering make this instrument extremely reliable and useful for laboratory and service applications.

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Input: 115 Volts 50/60 cycles
 Output Voltage: 0-15 Volts and 0-30 Volts
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 Accuracy: 2% on both voltage and current
 Ripple: Less than 500 microvolts (.002% at full output)
 Regulation: 1.2 Volts Maximum; Zero to full load current
 Internal Impedance: Less than 20 ohms DC to Radio Frequencies (including 7.0 ohm Meter Fuse, optionally removable)
 Terminals: 5-Way Binding Post
 Size: 10" x 6½" x 5¾"
 Weight: 16 pounds

FEATURES

- Continuously adjustable output using variable autoformer control.
- Two output voltage ranges for accurate setting of all transistor battery voltages.
- Two output current ranges monitor current for single transistor or entire set.
- Extremely low ripple for testing lowest level transistor circuits.
- Very low internal impedance providing excellent regulation.
- Precision D'Arsonval meters provide laboratory accuracy.
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A self-service tube testing route is a natural for servicemen. It's just like having branches of your shop in drug stores, luncheonettes, super-markets and other retail locations in your area, testing and selling tubes for you 12 hours a day — 7 days a week. Each Century self-service tube tester you place can net up to \$1000 a year . . . and there is no limit to how many you can handle.

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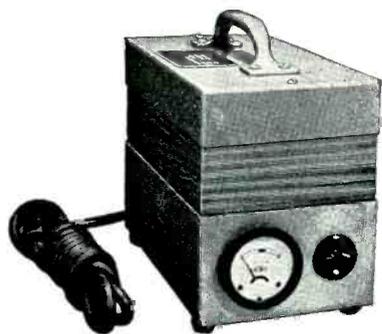
Please send me without obligation, FREE booklet and particulars about setting-up a self-service tube tester route. I understand no salesman will call.

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WITH THIS ACME ELECTRIC AUTOMATIC VOLTAGE STABILIZER

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Another feature to remember, this unit uses no current unless the TV set is in operation. An automatic relay disconnects primary circuit under "no load" conditions and automatically connects circuit when load is applied to the secondary circuit. Secondary voltage is indicated on voltmeter while unit is in operation. Furnished complete, ready to plug-in. See this Acme Electric Automatic Voltage Stabilizer at your dealer.

ACME ELECTRIC CORPORATION
886 WATER ST. CUBA, NEW YORK

Acme Electric
TRANSFORMERS

Audio News Letter

(Continued from page 23)

ARKAY's SP-6 stereo pre-amp is priced at \$34.95 kit, \$47.95 wired.

RONETTE is preparing initial shipments of "Binofluid" stereo cartridges to distributors. This unit is rated flat 20 to 12,000 cps, 14 kc roll-off, lateral and vertical compliances of 3.5, tracking force 4 to 6 grams. Stylus is clip-on type.

TRI-PHI, Albertson, N.Y. has introduced a 3-speed portable phono claimed to play over 6,000 record sides on 4 flashlight batteries. Transistors and printed circuits reduce weight to 6 lbs. Miniature turntable motor eliminates need for special batteries. List is \$49.95.

ELECTRO-VOICE has instituted a new cartridge promotion. A stamp worth \$1.58 is given jobbers for each sapphire Power Point bought before 6/30/58. This is equal to jobber cost for most units. These stamps are redeemed on a one-for-one basis on diamond Power purchases until 12/31/58. This is equivalent to an additional 24% discount on the diamond units. Also, a new plastic case packaging is being introduced.

SHURE has developed a stereo Professional Dynetic cartridge, but believes consumers and industry "can best be served by not rushing stereo into the market at a premature stage." To serve customers buying their new monaural Dynetic (\$27.50), Shure will accept it in trade for 75% of the price (\$20.63) as credit toward the M3D stereo Dynetic @ \$45. Similar arrangement applies for Studio models, priced at \$79.50 monaural, \$109.50 stereo. Trade can be made starting this fall-winter, as late as 12/31/59.

Catalogs & Bulletins

(Continued from page 43)

TEST INSTRUMENTS: Bulletin No. AP12 covers a TV analyst, tube checkers and test instruments for both in-the-home servicing and shop use. B&K Mfg. Co., 3726 N. Southport Ave., Chicago 13, Ill. (ELECTRONIC TECHNICIAN B6-1)

TRANSISTOR HOME-STUDY COURSE: Folder PA 176 describes a 10-lesson course. Gives complete table of contents for each lesson. CBS-Hytron, Danvers, Mass. (ELECTRONIC TECHNICIAN B6-2)

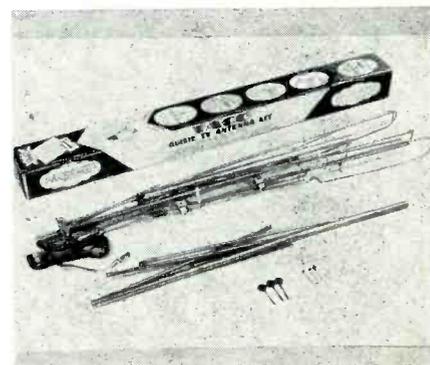
RELAYS: A new 20-page, 3-color, catalog contains engineering specifications and operational data plus illustrations and drawings for all major types of sub-miniature and micro-miniature relays. Filtors, Inc., Port Washington, N. Y. (ELECTRONIC TECHNICIAN B6-4)

OSCILLATORS & GENERATORS: A 56-page, illustrated, catalog covering electronic instruments features oscillators and generators. Specifications include frequency range, tuning, sweep width, etc. Kay Electric Co., Maple Ave., Pine Brook, N. J. (ELECTRONIC TECHNICIAN B6-6)

VOLTAGE REGULATORS: A 4-page illustrated brochure furnishes technical data on MVR magnetic voltage regulators. Product description, principles of operation, operating instructions and maintenance are covered. Sorensen & Co., Richards Ave., South Norwalk, Conn. (ELECTRONIC TECHNICIAN B6-8)

TACO ANTENNA

The first of a series of Quickie antenna kits was designed and field tested to insure high performance and durability. When shipped the antenna is fully assembled, including the transmission line which is anchored to the terminal points of the antenna, and the

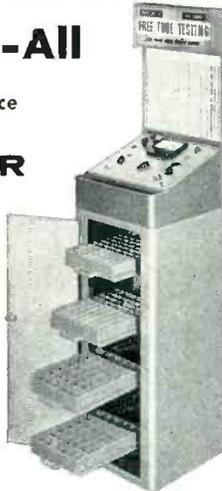


antenna is factory-assembled to the mast. The set terminations are by means of a unique attachment clip which is simply and effectively attached by the user. Technical Appliance Corp., Sherburne, N. Y. (ELECTRONIC TECHNICIAN 6-50)

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Features only six tube sockets for simple operation, yet tests over 600 types of radio-TV tubes. Occupies minimum floor space, only 15" x 15". Most obsolescence-proof, has master-switch dial control to accommodate new tubes. Attractively designed, ruggedly built. Big tube storage capacity. And it's only \$199.95!

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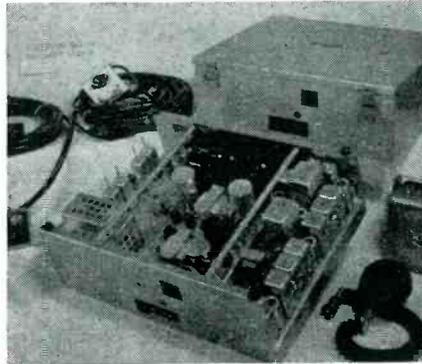
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New Products

COMCO MOBILE RADIO

The Fleetcom Super is a compact, 100-watt mobile, light-weight, all vibrator unit designed for 12-volt vehicles. It is designed for operation in the 25-54 mc band. It uses the same control box, cables and accessories (except for the case) as furnished for the lower powered Fleetcom or Fleetcom Senior models and can be used interchangeably by merely replacing the larger size case and replacing the main fuse. The inter-



changeable features allows the user to try the higher powered model for comparison and is also helpful for service benches that are equipped to maintain the Fleetcom series. The receiver is designed for either 40 kc or 20 kc channel spacing and can be easily changed from broad to narrow band operation in the field. Communications Company, 300 Greco Ave., Coral Gables, Fla. (ELECTRONIC TECHNICIAN 6-55)

Pyramid CAPACITORS

Mylar capacitors have an extremely high insulation resistance rating, high dielectric strength, and high resistance to moisture penetration. They are the smallest film capacitors made. The ends and wrap are sealed with thermosetting



resin. One failure out of twelve is permitted under accelerated life test of 250 hours with 140% of the voltage rating applied at the test temperature. Pyramid Electric Co., 1445 Hudson Blvd., North Bergen, N. J. (ELECTRONIC TECHNICIAN 6-48)

YOU CAN BE PROUD OF INSTALLING THE NEW Ultra Linear II AMPLIFIER



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Acrosound Ultra-Linear II reproduces the full audio spectrum the way it should sound, clean and natural.

Compare these specifications with any amplifier on the market and you will understand why the Ultra Linear II amplifier is the preferred choice of so many critical hi-fi enthusiasts.

POWER OUTPUT: 60 watts continuous,
120 watts peak

FREQUENCY RESPONSE:

18 cps to 30,000 cps \pm 1 db @ full 60 watts

HUM: 90 db below full output.

IM DISTORTION: Less than 0.5% @ 50 watts

SQUARE WAVE RESPONSE: Undistorted,
no ringing, 20 cps to 20 kc. maximum overshoot 5%

SENSITIVITY: 1.6 volts for 60 watts output

DAMPING FACTOR: Variable, 0.5 to 15

HARMONIC DISTORTION: Less than 1%
between 20 cps and 20 kc, within 1 db of 60 watts

PRICE \$109.50 WIRED (\$113.00 West Coast)

SAVE \$30.00 with KIT!

PERFECT FOR STEREO

This same remarkable amplifier, with high-stability Hybrid* feedback and new Acro T0-600 output transformer, may be obtained in kit form at a saving of \$30.00

CONSTRUCTION TIME IS ONLY 2 HOURS
Assemble the unit yourself and have a top-quality inexpensive amplifier available for the second channel you will need for magnificent stereo sound reproduction. Simple layout and partial prewiring enable you to cut construction time to 2 hours or less. Ultra Linear II kits have the same top performance as the wired units.

KIT PRICE only \$79.50 complete (\$83 West Coast) Available through leading distributors

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Sonic PHONOGRAPHS

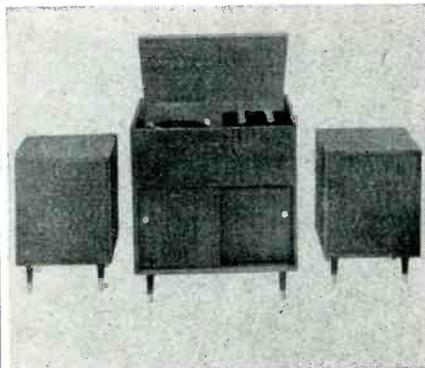
Seven stereophonic high fidelity phonographs with three matching extension stereo speaker units are available. Each console and portable in the new line incorporates dual, stereo high fidelity amplifiers for reproduction of both sound channels. Printed circuitry is used throughout. Stereo balance and tone controls provide a full range of ad-



justment for optimum performance. Four-speed stereo record changers are featured in all models. Model 3100, shown, delivers a total of 34-watts peak output. Negative feedback and quality components insure distortionless sound from 20 to 20,000 cycles. Sonic Industries, 19 Wilbur St., Lynbrook, N. Y. (ELECTRONIC TECHNICIAN 6-43)

Hallmark STEREO SYSTEM

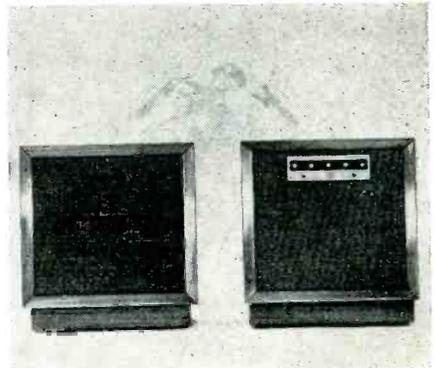
Nine different compatible stereophonic record sound units ranging in price from \$29.95, to a luxurious console model costing \$1500, plus nineteen different long playing records under a Blue and Gold label series are offered. Other records will be added to the



original list. As part of its marketing program, the company will present a \$50 record collection gratis to each customer purchasing their full dimensional stereophonic record sound unit. Paramount Enterprises Inc., 383 Concord Ave., Bronx, N. Y. (ELECTRONIC TECHNICIAN 6-53)

Pilot CONSOLE

New speaker-amplifier console system, model SA-1032, permits stereophonic reproduction of music. Monaural high fidelity systems can be easily and quickly converted to stereophonic operation. It incorporates: the new AA-903B amplifier-preamplifier, with continuous output of 16 watts, and



peak output of 32 watts; matched four-way, four speaker system consists of a 12" woofer, 8" lower mid-range speaker, 6" upper mid-range speaker and a 3" tweeter; and an acoustically isolated enclosure. Pilot Radio Corp., 37-06 36th St., Long Island City, N. Y. (ELECTRONIC TECHNICIAN 6-45)

Scott STEREO-DAPTOR

This new component acts as a control center for a complete stereo system using two separate amplifiers. The hi-fi owner simply plugs both amplifiers into the back of the Stereo-Daptor. It has a master volume control for both amplifiers so that rebalancing is not neces-



sary when volume is changed. It allows the playing of stereo records, stereo tape, stereo AM-FM, and playing monaural records with a stereo cartridge. H. H. Scott, 111 Powdermill Rd., Maynard, Mass. (ELECTRONIC TECHNICIAN 6-42)

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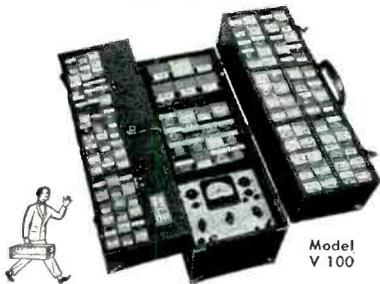
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New Books

ELECTRICAL DISCHARGES IN GASES. By F. M. Penning. Published by The Mac-Millan Co., 60 Fifth Ave., New York 11, N.Y. 75 pages. Hard cover. \$3.00.

This is a simply written, yet complex book for engineers and the most advanced technicians. It describes the basic gas discharge phenomena, including ion movement, arcs, breakdown, lightning and glow discharge. It's interesting and well-written, but has little to do with maintenance work.

BASIC ELECTRICITY. By Abraham Marcus. Published by Prentice-Hall, Inc., Englewood Cliffs, N. J. 493 pages. Hard cover, \$6.45.

This book is a text on the fundamentals of electricity intended for beginners. The style is that of a continuous story, going from concept to concept and continually building upon that which has gone before. It is therefore easy to read and understand. Illustrations, glossaries, charts, tables, and end of chapter questions are included. Subjects covered range from the introduction of electricity to electronics. Practical applications are also discussed.

SCIENTIFIC ENCYCLOPEDIA. Prepared by board of editors. Published by D. Van Nostrand Co., 120 Alexander St., Princeton, N.J. 1839 pages. Hard cover. \$30.

This third edition is a fine and extraordinary volume, covering many subjects in addition to electronics, radio and TV. To mention a few: Aeronautics, astronomy, botany, chemistry, geology, medicine, nuclear science, photography, zoology and lots more. Many technicians are interested in science generally, so this substantial work, explaining everything from A-Supply to Zygote, should be welcomed. This giant book is expensive, but it contains a world of fascinating information.

D-C CIRCUIT ANALYSIS. By Dr. Alexander Schure. Published by John F. Rider Publisher, Inc., 116 W. 14th St., New York 11, N. Y. 80 pages. Paper cover, \$1.35.

Part of the Electronics Technology Series, the book covers one of the most fundamental aspects of electricity. Beginning with a brief coverage of electrostatic principles and a chapter on resistance factors, it introduces the reader to the solution of circuit problems using Ohm's & Kirchhoff's laws. The most advanced techniques employing superposition and Thevenin's theorem are introduced in later chapters. Throughout the text worked examples show how circuits of increased complexity are solved. Review questions are included at the end of each chapter to test the reader's knowledge of the material.

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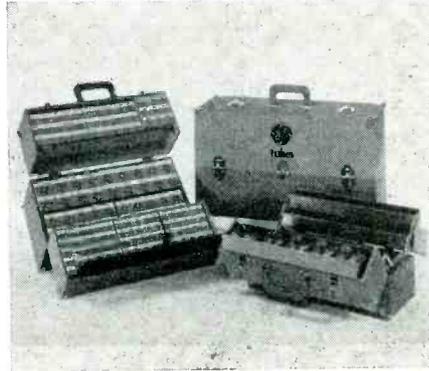
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GE TUBE CADDY

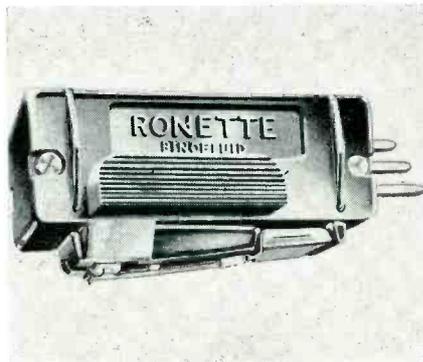
Colorful two-tone service cases for carrying tubes and tools are now available. The light-weight orange and gray cases feature heavy duty hardware and rugged construction. They come in two sizes: the G-E 240 holding 240 tubes in a practical field inventory arrangement;



and the G-E 160 holds 160 tubes. A matching tool case has four compartmented swinging shelves to permit an orderly, time-saving arrangement of tools and small parts. General Electric Co., Receiving Tube Dept., Owensboro, Ky. (ELECTRONIC TECHNICIAN 6-49)

Ronette CARTRIDGES

The dual-element Binofluid stereo cartridge is compatible with both monaural and stereo discs. It is credited with lateral and vertical compliances of 3.5×10^{-6} cm/dyne. Optimum stylus



pressure is 4-6 grams. Frequency response is flat from 20 to 15,000 cycles with a roll-off at 14,000 cycles. The cartridge uses a clip-on stylus. Ronette Acoustical Corp., 190 Earle Ave., Lynbrook, N. Y. (ELECTRONIC TECHNICIAN 6-44)

RCA TRANSISTORS

Eight new germanium alloy transistors have been specially designed for use in switching circuits. The 2N581, 2N583 and 2N585 are for medium speed while the 2N582 and 2N584 are for high-speed switching. The 2N578, 2N579 and 2N580 are designed for high current switching purposes. Radio Corp. of America, Semiconductor Div., Somerville, N. J. (ELECTRONIC TECHNICIAN 6-25)

Precision AMPLIFIERS

Completely redesigned line of Popular Economy sound and mobile amplifiers for all indoor and outdoor applications. All units are housed in sturdy steel ventilated cabinets finished in hammer-oid tan and burgundy. Phonograph tops are available for both the 20 and 30-watt models. Also introduced is a new line of Grommes Premiere Sound



High Fidelity public address amplifiers, preamplifiers and booster amplifiers. They are available in 20, 30 and 50-watt models. New feedback circuitry and oversized components provide quality performance and durability. Precision Electronics Inc., 9101 King St., Franklin Park, Ill. (ELECTRONIC TECHNICIAN 6-46)

Westinghouse TUBE CADDY

The five-in-one tube caddy represents an entirely new concept in caddy design. Termed a portable warehouse tailored to carry all types of tubes, the new caddy consists of four separate boxes plus a cover. Snap lock catches on each of the sections permit any combination of boxes, from a single one to all four, to be fastened together and



carried as one unit. Complete, the model 555 holds more than 350 tubes plus tools, instruments, etc. It is covered with gray plastic, lettered in bright blue and orange, and comes with a distortion-free mirror mounted in the cover. Westinghouse Electric Corp., Elmira, N. Y. (ELECTRONIC TECHNICIAN 6-47)



"OK! OK! So the Fred Astaire always comes out in you when you hear a JENSEN NEEDLE."

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3B5	.85	6B6T	1.15	7A5	.90	1A7	1.30
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4B7	1.40	6B7A	1.35	7F8	1.30	3A5	.85
5A6	1.10	6B8	1.10	7F7	1.15	3A7	.75
5A8B	1.15	6B8	1.45	7H7	1.10	35L6GT	.80
5A8B	1.25	6B8	1.00	7J7	1.00	35W4	.80
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5A8B	1.35	6B8	.80	787	1.40	31	.90
5A8B	1.25	6B7	1.40	787	1.30	42	.90
5A24	.85	6B8X155	1.60	774	1.30	43	1.00
5B8T	1.20	6C4	.60	7K7	1.30	50A5	1.10
5B8	1.20	6C8	.80	7Y4	.80	50B5	.90
5B07	1.40	6C8S	2.75	7J1	.80	50C5	.75
5C8	1.15	6C86	.90	8A8A	1.40	50L6GT	.85
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508	1.15	6C16	1.30	12A15	.65	81	1.75
5V4G	1.15	6C86	.95	12A7G	.75	83	1.25
5W4GT	.90	6C87	.85	12A7	1.05	117L7GT	2.70
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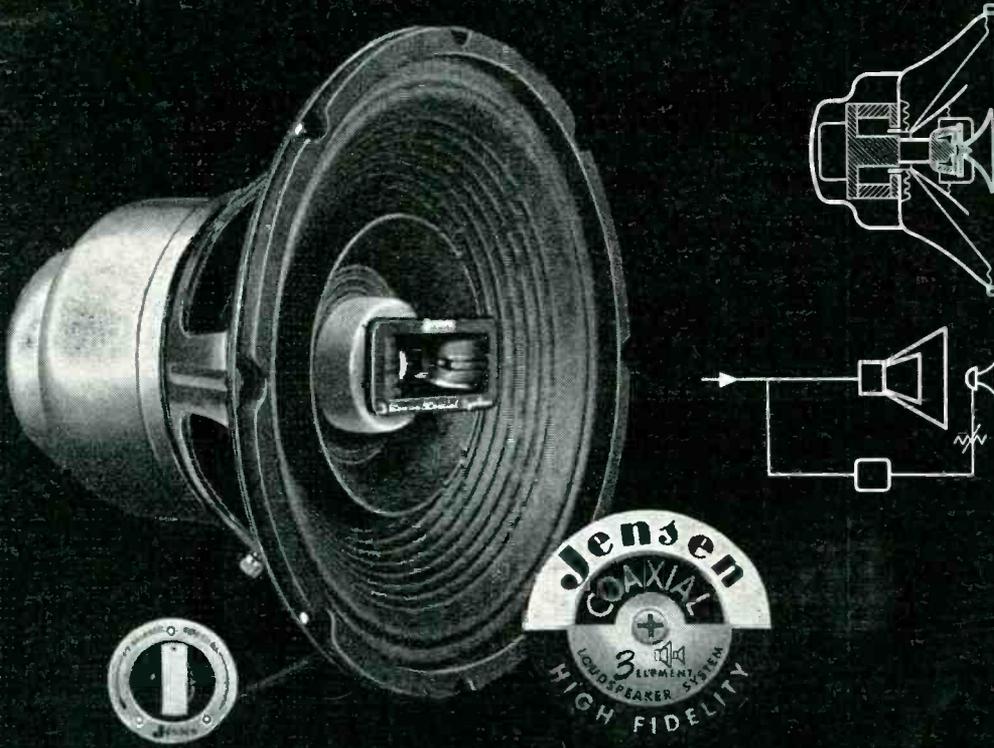
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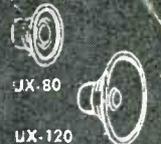
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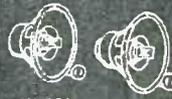


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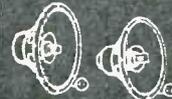
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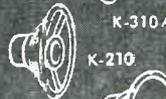
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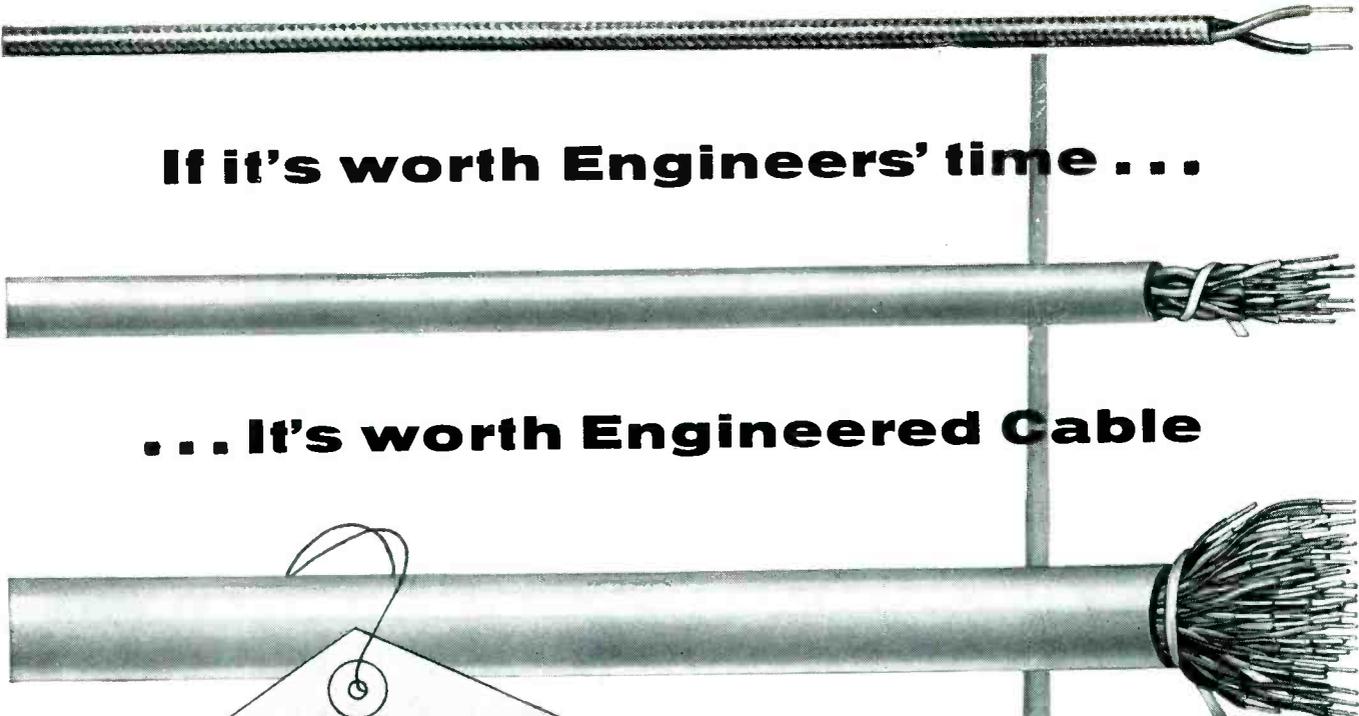


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